BUREAU OF FISHERIES



# REPORT

OF THE

# UNITED STATES COMMISSIONER OF FISHERIES

FOR THE FISCAL YEAR 1918

WITH

# APPENDIXES



HUGH M. SMITH
Commissioner



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

# National Oceanic and Atmospheric Administration

## Report of the United States Commissioner of Fisheries

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# FOR THE FISCAL YEAR ENDED
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# REPORT

OF THE

# COMMISSIONER OF FISHERIES.

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DEPARTMENT OF COMMERCE,
BUREAU OF FISHERIES,
*Washington, September 30, 1918.*

SIR: I have the honor to submit herewith a report in which are outlined the operations of the Bureau of Fisheries during the fiscal year ended June 30, 1918. The major divisions, into which the report naturally falls, are general administrative matters, the propagation and distribution of food fishes, the artificial propagation of fresh-water mussels, the Bureau's relations with the fishing industry, biological and physical investigations and experiments, the Alaska fisheries service, the Alaska fur-seal service, protection of the minor fur-bearing animals of Alaska, and miscellaneous activities and relations.

## GENERAL ADMINISTRATIVE MATTERS.

### ADAPTATION TO WAR CONDITIONS.

The Bureau has continued to conduct its operations with reference to the peculiar situation created by war, and has actively cooperated with other governmental agencies—Army, Navy, Food Administration, War Trade Board, Shipping Board, Fuel Administration, etc.—in furthering the country's interests so far as its powers and resources permit. This has resulted in a curtailment of activities in certain lines, but in essential respects has given to the operations an importance never before assumed.

Seagoing vessels of the Bureau suitable for naval purposes have been placed at the disposal of the Navy Department and are rendering good service. The Navy Department has taken over the entire plant of the marine biological station at Beaufort, N. C. The extensive docks and spacious buildings at the marine station at Woods Hole, Mass., have been largely and constantly used as headquarters for a naval-reserve force.

The estimates of appropriations for 1920 have been submitted with reference to urgent conditions, which make unwise the expenditure of any moneys not actually required for operations on a war basis. Under other circumstances, larger appropriations would have been requested; and, in due time, such funds as the Bureau needs for the proper performance of its functions and the fulfillment of its obligations to the country will be estimated for and strongly urged before Congress, which in the past has dealt with this service in a liberal manner.

PERSONNEL.

The personnel of the Bureau, both at headquarters and in the field, has performed with efficiency and fidelity the ordinary duties devolving thereon, and, furthermore, has assumed in admirable spirit the added personal, official, and civic responsibilities imposed by the state of war. Throughout the Bureau, employees have freely offered themselves for active military duty; a comparatively large number have entered the Army and Navy; and in the relatively few cases in which deferred classification has been asked, the Bureau, rather than the employees themselves, has taken the initiative in recognition of certain definite needs of the fishery service. It is an honor no less than a pleasure to commend to the Secretary a loyal, capable corps of technical and clerical assistants, both permanent and temporary, to whom is to be attributed the success of the Bureau's operations and the enlarged scope and increasing public appreciation of its activities.

The administrative staff at headquarters during the fiscal year 1918 comprised the following persons: H. F. Moore, deputy commissioner; Irving H. Dunlap, assistant in charge of office; Henry O'Malley, assistant in charge of fish culture; Robert E. Coker, assistant in charge of inquiry respecting food fishes and the fishing grounds; Lewis Radcliffe, assistant in charge of statistics and methods of the fisheries; Ward T. Bower, chief agent of the Alaska service. At the beginning of the fiscal year 1919, Mr. O'Malley was transferred to the position of field assistant for the Pacific coast, a place newly created by Congress, and Glen C. Leach, field superintendent and an employee of the fish-cultural branch since 1902, became assistant in charge of the division.

The Bureau has long been handicapped by the extremely small salaries allowed by Congress in the lower grades, particularly in the clerical and fish-cultural forces. In recent years, and particularly in the fiscal year 1918, the situation has become acute because of the difficulty, often the impossibility, of inducing persons to accept statutory positions or of retaining persons who may have been willing to enter the service. The result is that a very large proportion of the low-grade positions in the fish hatcheries has been vacant much of the time, and there has been in the Washington office a floating corps of clerks, many of them appointed without regard to civil-service qualifications. The entrance salaries in the fish-cultural branch are so low as to be almost absurd under present industrial conditions. The clerical service is overcrowded at the bottom, and there is little opportunity for advancing capable and deserving juniors.

As a move toward the remedying of this situation, there has been included in the estimates of appropriations for 1920 provision for the substitution of a reduced number of higher-grade clerical positions in lieu of certain low-grade positions and for general increase in the salaries of the field force in the fish-cultural branch.

Other recommendations affecting personnel that have been placed in the estimates of appropriations for the next fiscal year are as follows: Increase in the salaries of assistants in charge of divisions; creation of a chief of the Alaska service; provision for eight additional technical assistants for work in fish culture, biological investigation, and commercial fisheries; provision for two new statistical

agents for canvassing the fisheries; a clerk to the deputy commissioner and a clerk for the Seattle office; change in designation and increase in salary of the principal Government officials on the Pribilof Islands; provision for personnel of the station at Block Island, R. I.; and an alternative estimate for the segregation of the different grades of all field employees, in lieu of detailed estimate by stations, cars, etc., as at present, in the interest of a more elastic force that can be more economically employed.

## APPROPRIATIONS AND ALLOTMENTS.

The appropriations for the Bureau of Fisheries for the fiscal year 1918, including regular, deficiency, and special appropriations, aggregated $1,263,560, as follows:

| | |
|---|---|
| Salaries, including $8,000 deficiency for steamer *Roosevelt* | $440,560 |
| Miscellaneous expenses: | |
| Administration | 10,000 |
| Propagation of food fishes | 375,000 |
| Maintenance of vessels | 90,000 |
| Inquiry respecting food fishes | 50,000 |
| Statistical inquiry | 7,500 |
| Protecting sponge fisheries | 3,000 |
| Protecting seal and salmon fisheries of Alaska, including deficiency of $35,000 | 110,000 |
| Developing aquatic sources of leather | 10,000 |
| Repairs, steamer *Fish Hawk* | 35,000 |
| Distribution cars | 15,000 |
| Motor vessel for Woods Hole, Mass | 3,000 |
| Rebuilding laboratory, Fairport, Iowa (deficiency) | 80,000 |
| Improvements and purchase of land at fish-cultural stations: | |
| Cape Vincent, N. Y | 5,500 |
| Edenton, N. C | 3,500 |
| San Marcos, Tex | 7,500 |
| Improvements at fish-cultural stations: | |
| Bozeman, Mont | 7,500 |
| Orangeburg, S. C | 3,500 |
| Saratoga, Wyo | 7,000 |

A detailed statement of the expenditures under the foregoing appropriations will be submitted in accordance with law.

In addition to the amounts appropriated by Congress, there were provided for the extension of the Bureau's activities certain allotments from the fund for the national security and defense. These allotments, approved and authorized by the President on the recommendation of the Secretary, have enabled the Bureau to undertake important work that otherwise would have been altogether impossible or possible on only a limited scale.

The first allotment, amounting to $30,000, was made on January 2, 1918, for the purpose of securing an immediate increase in the production of aquatic foods on all parts of the United States coast, through such educational and publicity methods as have heretofore proved successful.

The second allotment, of $20,000, was given on February 27, 1918, to enable the Bureau to cooperate with the Food Administration and the State fishery authorities in increasing the production of food fish in the Gulf States.

On April 9, 1918, an allotment of $25,000 was provided for the purpose of enabling the Bureau to install at the Pribilof Islands a plant for the utilization of seal carcasses in producing a commercial

grade of oil and fertilizer. It was represented that, by the use of material that would otherwise be wasted, valuable by-products would result that would pay for the plant in the first season of its operation.

On July 2, 1918, pursuant to a formal presentation of the matter on June 23, 1918, the President allotted $125,000 to permit the erection and maintenance of a fisheries-products laboratory in Washington, D. C. The primary purpose of the laboratory is to induce increased production and consumption of aquatic foods through the dissemination of knowledge of improved methods of preservation.

## PROPAGATION AND DISTRIBUTION OF FOOD FISHES.

### PROGRESS OF FISH CULTURE.

The general trend and progress of Federal fish culture may be regarded as satisfactory. Some of the great commercial fisheries which, because of their magnitude and intensity, have a constant tendency to affect adversely the abundance of the fishes sought have been brought well within the control of the fish-culturist and may, in general, be maintained at a high level because of the advances that have been made in artificial propagation, supplemented by minimum rational restrictions.

Other fisheries, of which the lobster and sturgeon are conspicuous examples, have long been prosecuted in such flagrant and notorious disregard of the laws of nature and of man that artificial propagation seems hopeless, and dependence thereon only serves to condone pernicious practices. An exception should, of course, be made in the case of lobster rearing which, if conducted on a sufficiently extensive scale in the principal centers of the lobster fishery, and supported by local popular sentiment in favor of lobster conservation, would undoubtedly do much to arrest the decline and restore depleted waters.

Of the littoral marine fishes that have come under artificial propagation, the winter flounder is most extensively hatched and supports the largest fishery. It is most worthy of continued attention at the hands of the fish-culturist, because of its inherent qualities and because its abundance may readily be affected, favorably or unfavorably, by man.

Judged by mere numbers, the fish-cultural work of the Bureau in the fiscal year 1918 showed a decrease of approximately 20 per cent compared with 1917. The aggregate output of the hatcheries was 4,098,105,000. The smaller production was chiefly attributable to adverse weather conditions prevailing during the spawning time of various commercial fishes whose eggs are handled in large numbers, particularly the cod, pollock, and pike perch. Other species which showed a reduced output were shad, cisco, humpback and chum salmons, lake trout, smelt, white perch, and lobster. An increase is to be noted in the production of buffalofish, carp, catfish, whitefish, chinook and sockeye salmons, yellow perch, and winter flounder.

From the very nature of the fish-cultural work, the young of some of the species hatched are planted as fry, and this will no doubt continue to be the practice for many years to come, perhaps indefinitely. The fishes so handled are those whose eggs are obtained in comparatively large numbers from the commercial fishermen and whose fry have a very short yolk-sac stage, common examples being the whitefish, shad, pike perch, yellow perch, striped bass, and vari-

ous marine species. Other fishes, however, which in the early days of fish culture also were planted soon after hatching, are now being held for longer and longer periods as the facilities for rearing are improved; and a conspicuous feature of the recent operations is the greatly increased percentage of fishes liberated as fingerlings and yearlings. The fishes which require this treatment are the salmons and trouts, which have a large, slowly absorbed yolk-sac, the carrying of which renders them more or less helpless and a ready prey to their natural enemies, and the fresh-water basses, which are especially adapted for pond culture. In the fiscal year 1918, over 168,000,000 fish were distributed by the Bureau as fingerlings, yearlings, and adults, this being by far the largest output of such fish, both in actual number and in percentage. The year 1917, which established a record in this respect, showed only 82,000,000 fishes distributed as fingerlings, yearlings, and adults. It should be understood that fishes stranded on the overflowed lands along the Mississippi River and tributaries and rescued by the Bureau's agents are included in the foregoing figures.

There follows a summarized statement of the output of the Bureau in 1918:

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1918.

| Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total |
|---|---|---|---|---|
| Catfish | | | 12,733,330 | 12,733,330 |
| Carp | | 3,250,000 | 1,660,941 | 4,910,941 |
| Buffalofish | | 28,260,000 | 2,417,052 | 30,677,052 |
| Shad | | 52,543,900 | | 52,543,900 |
| River herring | | 100,000 | 3,700,000 | 3,800,000 |
| Whitefish | 75,540,000 | 408,492,000 | | 484,032,000 |
| Lake herring (cisco) | | 65,130,000 | | 65,130,000 |
| Silver salmon | | 980,300 | 10,534,115 | 11,514,415 |
| Chinook salmon | 17,574,900 | 6,028,920 | 63,176,244 | 86,780,064 |
| Sockeye salmon | 13,000,000 | 38,137,000 | 45,599,785 | 96,736,785 |
| Humpback salmon | | 5,193,065 | 3,754,000 | 8,947,065 |
| Chum salmon | | 9,892,145 | | 9,892,145 |
| Steelhead salmon | 1,570,000 | 172,000 | 7,022,488 | 8,764,488 |
| Rainbow trout | 1,139,250 | 22,000 | 1,654,477 | 2,815,727 |
| Atlantic salmon | | 2,577,000 | 671 | 2,577,671 |
| Landlocked salmon | 478,000 | 306,395 | 87,837 | 872,232 |
| Blackspotted trout | 1,090,000 | 3,821,000 | 1,878,500 | 6,789,500 |
| Loch Leven trout | | | 56,000 | 56,000 |
| Lake trout | 21,718,000 | 39,599,200 | 226,797 | 61,543,997 |
| Brook trout | 378,175 | 3,876,265 | 7,882,668 | 12,137,108 |
| Sunapee trout | | | 7,372 | 7,372 |
| Smelt | | 1,218,750 | | 1,218,750 |
| Pike and pickerel | | | 106,408 | 106,408 |
| Fresh-water drum | | | 83,473 | 83,473 |
| Crappie | | | 2,905,812 | 2,905,812 |
| Largemouth black bass | | 283,500 | 970,020 | 1,253,520 |
| Smallmouth black bass | | 172,500 | 155,674 | 328,174 |
| Rock bass | | | 83,055 | 83,055 |
| Warmouth bass | | | 9,220 | 9,220 |
| Sunfish | | | 1,644,558 | 1,644,558 |
| Pike perch | 14,560,000 | 56,000,000 | 1,954 | 70,561,954 |
| Yellow perch | | 182,899,000 | 459,282 | 183,358,282 |
| White perch | | 2,900,000 | | 2,900,000 |
| White bass | | | 47,261 | 47,261 |
| Striped bass | | 14,349,000 | | 14,349,000 |
| Mackerel | | 4,648,000 | | 4,648,000 |
| Cod | | 77,659,000 | | 77,659,000 |
| Pollock | | 233,700,000 | | 233,700,000 |
| Haddock | | 17,830,000 | | 17,830,000 |
| Winter flounder | | 2,455,371,000 | | 2,455,371,000 |
| Miscellaneous fishes | | | 100,200 | 100,200 |
| Lobster | | 66,680,000 | 5,700 | 66,685,700 |
| Total | 147,048,325 | 3,782,091,940 | 168,964,894 | 4,098,105,159 |

### HATCHERIES OPERATED.

No new hatcheries were in operation during the year. The hatchery near Havre de Grace, Md., at the mouth of the Susquehanna River, closed by order of the Secretary in the last fiscal year, has remained closed. The Bureau is not informed of any action taken by the Maryland Legislature that would justify the reopening of this station. The equipment has been largely removed for use in other fields. The station at San Marcos, Tex., closed by order of the Secretary in May, 1917, was reopened July 1, 1918, the Texas Legislature having in March, 1918, enacted a law to meet the requirements imposed by Congress. Following is a list, in alphabetical order, of the fish-cultural stations operated during the year, with the principal auxiliary or subsidary stations thereunder, the period of active work, and the species handled. The numerous minor field stations and mere egg-collecting points are not shown.

Congress has provided a permanent personnel for the Berkshire trout hatchery, and regular operations thereat have begun. Although the donation of this valuable property was formally accepted by the Government in July, 1916, the Department of Justice has not yet made the report on the title, as required by law, so that the Bureau has not been able to assume formal control.

FISH-CULTURAL STATIONS AND PRINCIPAL AUXILIARIES OPERATED DURING THE FISCAL YEAR, 1918.

| Designation. | Period of operation. | Species handled. |
|---|---|---|
| Afognak, Alaska | Entire year | Sockeye and humpback salmons. |
| Seal Bay, Alaska | July-October | Do. |
| Atchafalaya, La | March-April | Buffalofish. |
| Baton Rouge, La | April-May | Black bass, buffalofish, carp, catfish, crappie, drum, sunfish, white bass. |
| Baird, Cal | Entire year | Chinook salmon. |
| Battle Creek, Cal | do | Do. |
| Mill Creek, Cal | do | Do. |
| Hornbrook, Cal | do | Chinook salmon, rainbow trout. |
| Baker Lake, Wash | do | Sockeye, chinook, and silver salmons. |
| Birdsview, Wash | do | Sockeye, chinook, chum, humpback, silver, and steelhead salmons. |
| Brinnon, Wash | July-February | Chum, humpback, and steelhead salmons. |
| Darrington, Wash | do | Chinook, chum, humpback, silver, and steelhead salmons. |
| Day Creek, Wash | July-May | Chinook, chum, and steelhead salmons. |
| Duckabush, Wash | Entire year | Chum, humpback, silver, and steelhead salmons. |
| Hlabott Creek, Wash | July-January | Chinook, chum, humpback, silver, and steelhead salmons. |
| Quilcene, Wash | Entire year | Chum, humpback, silver, and steelhead salmons. |
| Sultan, Wash | do | Chinook, humpback, silver, and steelhead salmons. |
| Berkshire, Mass | do | Brook and rainbow trouts, steelhead salmon. |
| Boothbay Harbor, Me | do | Flounder, lobster. |
| Bozeman, Mont | do | Blackspotted, brook, and rainbow trouts. |
| Meadow Creek, Mont | March-June | Rainbow trout. |
| Yellowstone Park, Wyo | July, August, and June | Blackspotted trout. |
| Bryans Point, Md | March-May | Shad, yellow perch, alewife. |
| Cape Vincent, N. Y | Entire year | Brook, lake, and rainbow trouts, lake herring, pike, and yellow perches, whitefish. |
| Central station, Washington, D. C | do | Black bass, brook trout, humpback, salmon, shad, sunfish, whitefish. |
| Clackamas, Oreg | do | Blackspotted, brook, and rainbow trouts, chinook, silver, and steelhead salmons. |
| Applegate, Oreg | do | Chinook, silver, and steelhead salmons. |
| Big White Salmon, Wash | do | Chinook, salmon. |
| Little White Salmon, Wash | do | Do. |
| Rogue River, Oreg | do | Blackspotted trout, chinook, silver, and steelhead salmons. |
| Upper Clackamas, Oreg | do | Rainbow trout, chinook, silver, and steelhead salmons |

FISH-CULTURAL STATIONS AND PRINCIPAL AUXILIARIES OPERATED DURING THE FISCAL YEAR, 1918—Continued.

| Designation. | Period of operation. | Species handled. |
|---|---|---|
| Clackamas, Oreg.—Contd. | | |
| Willamette, Oreg. | July, May, and June | Shad. |
| Astoria, Oreg. | do | Do. |
| St. Helens, Oreg. | do | Do. |
| Cold Springs, Ga. | Entire year | Black bass, catfish, sunfish. |
| Craig Brook, Me. | do | Atlantic, humpback, and landlocked salmons, brook trout. |
| Duluth, Minn. | do | Brook and lake trouts, pike perch, whitefish. |
| Edenton, N. C. | do | Black bass, shad, sunfish, yellow perch. |
| Weldon, N. C. | April-May | Striped bass. |
| Erwin, Tenn. | Entire year | Brook and rainbow trouts, black bass, carp, rock bass, sunfish. |
| Fairport, Iowa | do | Black bass, buffalofish, carp, catfish, crappie, drum, pike, sunfish, white bass, yellow perch. |
| Gloucester, Mass. | do | Cod, flounder, haddock, pollock. |
| Green Lake, Me. | do | Brook and lake trouts, landlocked salmon, smelt. |
| Grand Lake Stream, Me. | do | Lake trout, landlocked salmon, white perch. |
| Homer, Minn. | do | Black bass, buffalofish, carp, catfish, crappie, pike perch, pike, rock bass, sunfish, white bass, yellow perch. |
| La Crosse, Wis. | do | Black bass, buffalofish, carp, catfish, crappie, drum, pike, white bass, pike and yellow perches, brook and rainbow trouts. |
| Leadville, Colo. | do | Blackspotted, brook, lake, Loch Leven, and rainbow trouts. |
| Louisville, Ky. | do | Brook and rainbow trouts, black bass, crappie, pike perch, rock bass, smallmouth bass, sunfish. |
| Mammoth Spring, Ark. | do | Black bass, rock bass. |
| Manchester, Iowa | do | Brook and rainbow trouts, crappie, rock bass, smallmouth bass. |
| Bellevue, Iowa | July-December | Black bass, buffalofish, carp, catfish, crappie, drum, pike, river herring, sunfish, warmouth bass, white bass, yellow perch |
| North McGregor, Iowa | do | Do. |
| Meredosia, Ill. | do | Black bass, buffalofish, carp, catfish, crappie, drum, rock bass, smallmouth bass sunfish, yellow perch. |
| Nashua, N. H. | Entire year | Brook and rainbow trouts, landlocked salmon, smallmouth bass. |
| Neosho, Mo. | do | Black bass, crappie, rock bass, smallmouth bass, sunfish, yellow perch, rainbow trout. |
| Northville, Mich. | do | Brook, lake, and rainbow trouts, smallmouth bass, steelhead salmon |
| Alpena, Mich. | October-March | Lake trout, whitefish. |
| Charlevoix, Mich. | November-June | Lake trout, steelhead salmon, whitefish |
| Orangeburg, S. C. | Entire year | Black bass, sunfish. |
| Put in Bay, Ohio | do | Carp, lake trout, pike perch, whitefish |
| Quinault, Wash. | do | Sockeye, chinook, and silver salmons. |
| St. Johnsbury, Vt. | do | Brook, lake, rainbow, and sunapee trouts, landlocked and steelhead salmons, smallmouth bass. |
| Holden, Vt. | do | Brook and lake trouts, landlocked and steelhead salmons. |
| Swanton, Vt. | April-June | Pike and yellow perches. |
| Saratoga, Wyo. | Entire year | Blackspotted, brook, and rainbow trouts, steelhead salmon. |
| Spearfish, S. Dak. | do | Blackspotted, brook, lake, and rainbow trouts. |
| Springville, Utah | do | Blackspotted, brook, and rainbow trouts. |
| Tupelo, Miss. | do | Black bass, crappie, sunfish, warmouth bass. |
| Friar Point, Miss. | July-December | Black bass, catfish, crappie, rock bass, sunfish. |
| White Sulphur Springs, W. Va. | Entire year | Brook and rainbow trouts, smallmouth bass. |
| Woods Hole, Mass. | do | Cod, flounder, mackerel. |
| Wytheville, Va. | do | Brook and rainbow trouts, black bass, rock bass, smallmouth bass, sunfish. |
| Yes Bay, Alaska | do | Sockeye salmon. |

### DISTRIBUTION OF FOOD FISHES.

The food fishes produced at the Bureau's stations and assigned to private applicants, State fishery authorities, or public waters, received a nation-wide distribution.

The 6 special cars employed in distributing the output in 1918 traveled 102,330 miles, of which 10,024 miles were without cost to the Bureau. The remaining mileage was at a cost of 10 to 25 cents per mile, which includes moving of cars and fares of attendants. Car messengers, detached from their cars and charged with special shipments of fish, traveled 468,244 miles, of which 54,578 miles were free and the remainder at 2 to 4 cents per mile. The cars were hauled over 47 railroads and the messengers traveled on 190 different railroads.

Poor service rendered by express companies during the year, owing in part to railway congestion and in part to neglect of explicit instructions, resulted in the loss of various shipments of fish eggs to State fishery authorities and between stations of the Bureau.

### RELATIONS WITH STATES AND FOREIGN COUNTRIES.

In cooperation with the fishery authorities of the various States, the Bureau has continued to supply considerable numbers of fish eggs for incubation in State hatcheries, the resulting fish being planted in local waters under the direction of the State commissioners. Limited numbers of fry, fingerlings, yearlings, and adults also are furnished to the States. In 1918 this form of cooperation was extended to 27 States, as follows:

ALLOTMENTS OF FISH AND FISH EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1918.

[All figures are for eggs unless otherwise indicated. Fingerlings are designated *a* and fry *b*.]

| State and species. | Number. |
|---|---|
| California: Chinook salmon | 14,321,900 |
| Connecticut: | |
| Largemouth black bass | a 515 |
| Catfish | a 750 |
| Crappie | a 1,500 |
| Sunfish | a 2,400 |
| Illinois: | |
| Largemouth black bass | a 825 |
| Catfish | a 12,200 |
| Crappie | a 21,850 |
| Lake trout | 100,000 |
| Pike and pickerel | a 688 |
| Sunfish | a 9,730 |
| White bass | a 2,665 |
| Whitefish | 5,000,000 |
| Yellow perch | a 2,575 |
| Iowa: | |
| Brook trout | 50,000 |
| Lake trout | 50,000 |
| Rainbow trout | 94,000 |
| Kentucky: | |
| Brook trout | a 600 |
| Pike perch | b 2,400,000 |
| Rainbow trout | a 1,600 |
| Maine: | |
| Brook trout | 100,000 |
| Lake trout | 100,000 |
| Landlocked salmon | 378,000 |
| Maryland: | |
| Catfish | a 180 |
| Crappie | a 200 |
| Smallmouth black bass | a 88 |
| Massachusetts: Pike perch | 5,000,000 |
| Michigan: Lake trout | 2,550,000 |
| Minnesota: | |
| Lake trout | 300,000 |
| Steelhead salmon | 50,000 |
| Montana: | |
| Blackspotted trout | 300,000 |
| Largemouth black bass | a 1,400 |
| Catfish | a 3,000 |
| Rainbow trout | 300,000 |
| Sunfish | a 100 |
| Nebraska: Rainbow trout | a 16,000 |
| Nevada: | |
| Blackspotted trout | 50,000 |
| Rainbow trout | 50,000 |
| New Hampshire: | |
| Lake trout | 100,000 |
| Pike perch | 2,000,000 |
| Whitefish | 500,000 |
| New Jersey: | |
| Largemouth black bass | a 200 |
| Landlocked salmon | 25,000 |
| Rainbow trout | 50,000 |
| Steelhead salmon | 50,000 |
| New York: | |
| Lake trout | 11,766,000 |
| Landlocked salmon | 50,000 |
| Steelhead salmon | 400,000 |
| Whitefish | 15,000,000 |
| Ohio: Lake trout | 700,000 |
| Oklahoma: | |
| Rock bass | a 1,550 |
| Sunfish | a 1,550 |
| Yellow perch | a 100<br>b 10,000 |
| Oregon: | |
| Brook trout | a 36,000 |
| Chinook salmon | 3,150,000 |
| Sockeye salmon | 3,000,000 |
| Steelhead salmon | 750,000 |
| Pennsylvania: Whitefish | 38,280,000 |

ALLOTMENTS OF FISH AND FISH EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1918—Continued.

| State and species. | Number. | State and species. | Number |
|---|---|---|---|
| Rhode Island: | | Washington: | |
| Brook trout | 50,000<br>[a] 20,000 | Blackspotted trout | 200,000 |
| Smallmouth black bass | [a] 690 | Lake trout | 300,000 |
| South Dakota: | | Wisconsin: | |
| Largemouth black bass | [a] 1,050 | Largemouth black bass | [a] 3,425 |
| Brook trout | [a] 6,000 | Catfish | [a] 900 |
| Catfish | [a] 12,300 | Crappie | [a] 1,200 |
| Crappie | [a] 2,200 | Lake trout | 5,402,000 |
| Sunfish | [a] 5,100 | Whitefish | 15,000,000 |
| Tennessee: | | Wyoming: | |
| Brook trout | 25,000 | Blackspotted trout | 200,000 |
| Rainbow trout | 100,000 | Rainbow trout | 50,000 |
| Vermont: | | Steelhead salmon | 50,000 |
| Lake trout | 300,000 | | |
| Landlocked salmon | 10,000 | Total | 133,307,900<br>[b] 2,410,000<br>[a] 170,771 |
| Pike perch | 7,056,000 | | |
| Steelhead salmon | 50,000 | | |

In various fields the agents of the Bureau and the different States have joined forces in the collection of eggs. The States, on their part, have facilitated the fish-cultural work of the Bureau, and an excellent cooperative spirit prevails throughout the country. Especially helpful during the fiscal year 1918 was the assistance rendered by the fishery officials of the States of Vermont, New York, Michigan, Wisconsin, Minnesota, Illinois, Iowa, Louisiana, Utah, Washington, and Oregon. Before supplying to individuals or organizations fishes not indigenous to given States, the Bureau takes the precaution of referring the applications to the State officials and securing their approval.

An assignment of sockeye-salmon eggs was made from Alaska to British Columbia, with the intention of having the resulting young planted in the Fraser River. The shipment arrived in bad condition, and only comparatively few young were produced. Limited consignments of chinook-salmon and rainbow-trout eggs were made to Japan, and small numbers of black bass and yellow perch were sent to Mexico. At the request of the authorities of the Canal Zone, 7,875 fingerling black bass, carp, catfish, and sunfish were planted in Gatun Lake. The details of the foreign shipments are as follows:

SHIPMENTS OF FISH AND FISH EGGS TO CANAL ZONE AND FOREIGN COUNTRIES DURING THE FISCAL YEAR 1918.

| | | |
|---|---|---|
| Canada: Sockeye salmon | eggs | 10,000,000 |
| Japan: | | |
| Chinook salmon | do | 100,000 |
| Rainbow trout | do | 100,000 |
| Mexico: | | |
| Largemouth black bass | fingerlings | 750 |
| Yellow perch | do | 200 |
| Canal Zone: | | |
| Largemouth black bass | do | 1,000 |
| Carp | do | 1,875 |
| Catfish | do | 3,000 |
| Sunfish | do | 2,000 |

The possibilities of increased fish-cultural work on the Great Lakes, particularly on Lakes Erie and Ontario, as a result of more intimate cooperation between the United States and Canada have recently become more evident, and arrangements have been made by which all available sources of egg supply will be exploited. Especially valuable during recent seasons has been the courteous action of the fishery officials of Canada in opening to spawn takers from the Cape Vincent station the whitefish spawning grounds in the Bay of Quinte, Lake Ontario.

### RESCUE OF STRANDED FISHES.

The important work of rescuing food fishes from landlocked waters in districts of the Mississippi and Illinois Rivers assumed a wider scope and produced more noteworthy results than in previous years. All of the important old fields were occupied and some new territory was covered, the operations extending from Minnesota to Louisiana, both States inclusive. The principal centers of rescue work were Homer, Minn.; La Crosse, Wis.; Fairport, North McGregor, and Bellevue, Iowa; Meredosia, Ill.; Friar Point, Miss.; and Baton Rouge, La.

With a view to an increased output and a reduced unit cost several valuable new features were introduced in 1918, including the stationing in the immediate vicinity of the rescuing parties of houseboats to be used as living quarters for the fishing crews and improvements to the tank equipment for the holding and hardening of fish intended for transfer to distant points.

The number of food fishes rescued in the fiscal year 1918 was 25,970,041, as against 9,885,005 in 1917. The number of each of the important species was as follows:

| | |
|---|---|
| Black bass, largemouth | 365,424 |
| Black bass, smallmouth | 2,433 |
| Buffalofish | 2,417,052 |
| Carp | 1,660,776 |
| Catfish | 12,718,930 |
| Crappie | 2,899,462 |
| Drum | 83,473 |
| Pike | 106,408 |
| Pike perch | 1,954 |
| River herring | 3,700,000 |
| Rock bass | 5,940 |
| Sunfish | 1,393,835 |
| Warmouth bass | 7,970 |
| White bass | 47,261 |
| Yellow perch | 458,923 |
| Miscellaneous | 100,200 |
| Total | 25,970,041 |

A very large percentage of the fishes rescued are returned to the adjacent open waters of the rivers and are not liable again to be stranded for another year; meanwhile they will have increased in size and economic value. Small numbers of these fishes of all species, but particularly black bass, crappie, sunfish, and catfish, are used by the Bureau in filling applications for stocking ponds, lakes, and streams in the adjoining or remote States. The fish thus delivered

to applicants aggregated 692,732, or less than 3 per cent of the total number handled.

The importance of this work arises from (1) its insignificant cost, (2) the inevitable waste of the fishes unless they are salvaged, and (3) the recognized edible qualities of all the fishes thus saved and the great mass of wholesome food they represent. The results are such as merit adequate financial support, so that the whole vast territory may be adequately covered each year and every available young food fish that would otherwise perish may be saved for ultimate consumption by man.

## ACCLIMATIZATION.

In November, 1917, a carload of adult eastern lobsters, numbering 6,000 equally divided as to sex, was sent from Boothbay Harbor, Me., via Bath, to Anacortes, Wash., in charge of Superintendent E. E. Hahn. The lobsters arrived at their destination on November 13, having been in transit since the 7th instant. The loss was only 5 per cent, and the shipment was regarded as the most successful of its kind. After a lot of 60 was reserved for experimental work, the lobsters, all in a very healthy, vigorous condition, were transferred to live cars, towed to the San Juan Islands, and liberated at selected points.

This was the sixth lot of adult lobsters sent by the Bureau to Puget Sound in recent years in the effort to establish this valuable creature on the Pacific Coast. In arranging for the shipment special precautions were taken, not only in the selection of the stock, but in the preparation of packing cases and material. The consignment included only individuals that had been carefully hardened in advance. The experience of the previous year having demonstrated the utility of a special barrel, built with shelves in the center at intervals of 6 inches and provided with ice compartments on either side, 40 such barrels, or a sufficient number to hold one-third of the shipment, were constructed. The remaining lobsters were carried in 130 specially designed crates, two layers to the crate, and in 90 large boxes having one layer each. All straw used for packing was first immersed in strong brine. All the packages carried well, but the lobsters in the shallow boxes with brine-soaked straw were somewhat stronger, and this method has apparently advantages over the others and leaves little to be desired for long-distance shipments.

Arrangements are being made to conduct a thorough search for eastern lobsters in Puget Sound, by setting regular lobster pots in charge of competent fishermen. As showing the apparent adaptability of the lobsters to these waters, it may be noted that those reserved from the November shipment and retained in a live car at Anacortes remained in excellent condition, taking culled canned salmon regularly, and sustaining a loss of only four, until January 17, 1918, when they escaped during an unusually high tide.

Noteworthy results have attended the acclimatization of the humpback or pink salmon on the coast of Maine, and the possible economic outcome appears to justify a continuance of the work.

From a shipment of 1,000,000 humpback eggs from Puget Sound arriving at the Craig Brook station in November, 1917, 934,235 fry

were hatched in January; and during March and April the resulting fingerlings were planted in Dennys and Pembroke Rivers, at points 2 to 4 miles above tidewater.

In August, September, and October, 1917, many thousand humpbacks entered rivers in eastern Maine. A few fish were observed or reported in Penobscot, St. George, Medomac, St. Croix, and other streams, but the principal runs were in Dennys and Pembroke Rivers.

Several representatives of the Bureau visited streams in which the humpbacks were reported and secured first-hand information regarding the runs. Arrangements were made to take eggs for hatching purposes, but the run at any given point was so short after the arrival of the fish-culturist that only a few thousand eggs could be obtained, most of the fish being spent. Net fishing at this season is prohibited by the local law, and a considerable number of the fish were able to spawn naturally, although the conditions for the passage of fish up some of the streams could be greatly improved by the installation of fishways.

At the dam in Penobscot River at Bangor 10 humpbacks were captured between August 13 and 31. In Pembroke River, on September 27, at a time when the salmon were present by hundreds, the State fish warden collected 25 specimens and placed them above the dam at Pembroke. In Dennys River, in the vicinity of Dennysville, during the week of September 29–October 6, at least 1,200 adult humpbacks were seen and many more fish were known to be in the deep pools and on the rips about 6 miles upstream from the head of tidewater. Many fish congregated under some large rafts of logs in that section and could not be driven out, so that their number could not be estimated. On one visit of a fish-culturist from the Craig Brook hatchery about 50 fish were seen on the rips. Altogether, at least 2,000 fish were observed in Dennys River and 500 in Pembroke River.

Some poaching on the part of the people living on the streams occurred, and the pickling of humpbacks on Pembroke River was reported, the fish having been taken with pitchforks. Some people at Dennysville were reported to have been made ill by eating a humpback that had been picked up by a small boy as it drifted downstream in a moribund condition after having spawned. The superintendent of the Craig Brook station went among the river people and advised them that these fish are not suitable for food when in spawning condition and should be eaten only when taken in salt water or immediately after coming in from the sea.

A number of specimens of humpbacks from Dennys River were forwarded to Washington, and one of them, weighing 6½ pounds and 22 inches in length has been on exhibition in the Secretary's office. The average weight of the fish observed by the Bureau's agents was about 5 pounds; the largest, a male, weighed 10 pounds 9 ounces, and the smallest, a female, weighed 2½ pounds. Some examples, together with a collection of scales from others, have been examined by Dr. Charles H. Gilbert, the well-known authority on the Pacific salmons, and it is shown therefrom that the humpback in its new environment retains its Pacific habit of proceeding to the ocean shortly after it begins to swim and returning to the rivers to spawn and die when 2 years old.

## ARTIFICIAL PROPAGATION OF FRESH-WATER MUSSELS.

The work of propagating fresh-water pearly mussels at various places in the basin of the Mississippi River was conducted as usual under the direction of the Fairport laboratory. The number of young mussels (glochidia) liberated in a condition of parasitism on fishes was 209,132,800, as compared with 252,478,700 in the fiscal year 1917. The decrease was largely accounted for by the fact that during a considerable portion of the season most favorable for collecting the fish hosts very few of the mussels were gravid. This was especially the case with the mucket, the principal mussel handled. The number of fishes infected prior to release was 252,259, of which 159,190 were seined in open waters, 83,982 were rescued from landlocked pools and lakes, and 9,087 were propagated and reared at the Fairport station.

Three new fields for mussel propagation were opened during the year, namely, New Boston, Ill., on the Mississippi, a point on the Ohio River near Louisville, and Lake Pokegama, Minn. The collecting of juvenile mussels in Lake Pepin indicated that the artificial propagation of the local species of mucket in that water is producing good results. Collecting done in the White River, Ark., yielded numbers of young niggerheads and yellow sandshells but no muckets.

The cost of mussel propagation in 1918 was considerably in excess of that in the previous year. The cost of glochidia planted was $0.0536 per thousand, as compared with $0.373 per thousand in 1917. The increased cost of equipment, material, and labor contributed largely to the increased expense of the propagation work. This computed cost of propagation includes salaries of permanent employees actually engaged, overhead charges, and depreciation of $0.004 per thousand. The overhead charges include one-third the director's salary; one-half the superintendent's salary, and one-half the clerk's salary.

The experimental propagation of mussels at the Fairport station was continued. Especially gratifying results were obtained in one pond, from which a total of 1,391 young of the Lake Pepin mucket were obtained when drained October 8 to 16, 1917. These mussels were the result of plants in the preceding season from fish held in open-bottom crates over an especially prepared bottom of sand. They varied considerably in size, measuring from about 1 inch to 2½ inches in length, indicating that they resulted from several plants. These results are especially important, as this is by far the largest number of mussels ever reared under artificial conditions at one time. Fish infected with this mucket had also been placed in crates in two other ponds in the spring of 1917, and when these were drained in the fall 382 mussels were recovered. Specimens resulting from a plant made in 1914 continued to grow in the station ponds, and by October, 1917, some had reached a length of more than 3½ inches.

MUSSEL PROPAGATION, FISCAL YEAR ENDED JUNE 30, 1918—POINTS OF DEPOSIT AND SPECIES OF GLOCHIDIA PLANTED.

| Species. | Fairport, Pokegama | Fairport, Mississippi River. | New Boston, Mississippi River. | Lake Pepin. | Black River. |
|---|---|---|---|---|---|
| Yellow sandshell (*Lampsilis anodontoides*) | ..... | 3,547,900 | 4,548,000 | ..... | ..... |
| Mucket (*Lampsilis ligamentina*) | ..... | 11,758,850 | 26,687,400 | ..... | 19,296,500 |
| Butterfly (*Plagiola securis*) | ..... | 38,800 | ..... | ..... | ..... |
| Lake Pepin mucket (*Lampsilis lutcola*) | 30,417,700 | 65,000 | ..... | 91,226,800 | ..... |
| Total | 30,417,700 | 15,410,550 | 31,235,400 | 91,226,800 | 19,296,500 |

| Species. | White River. | Cumberland River. | Lake Keokuk. | Ohio River | Total. |
|---|---|---|---|---|---|
| Yellow sandshell (*Lampsilis anodontoides*) | 11,000 | 15,500 | 149,200 | ..... | 8,271,600 |
| Mucket (*Lampsilis ligamentina*) | 1,797,000 | 2,338,500 | 248,000 | 5,925,100 | 68,051,350 |
| Butterfly (*Plagiola securis*) | 518,000 | ..... | 34,000 | ..... | 590,800 |
| Lake Pepin mucket (*Lampsilis luteola*) | ..... | ..... | 9,707,100 | ..... | 131,416,600 |
| Black sandshell (*Lampsilis recta*) | 115,325 | ..... | 22,500 | ..... | 137,825 |
| Pocketbook (*Lampsilis ventricosa*) | 664,650 | ..... | ..... | ..... | 664,650 |
| Tota | 3,105,975 | 2,354,000 | 10,160,800 | 5,925,100 | 209,132,825 |

## INVESTIGATIONS AND EXPERIMENTS REGARDING AQUATIC PRODUCTS.

### MODIFICATION OF THE SCIENTIFIC WORK.

The conditions of war have necessarily led to marked modifications of the Bureau's general plan of scientific work. Efforts have been devoted primarily to such studies or practical experiments as could be expected to contribute promptly to the increase of the supply of food or other useful aquatic products, but there has been no exclusion of biological and chemical investigations which have to do chiefly with our preparation for meeting the problems that will confront the Nation after the war. An outline of the scope of the chief investigations and other work appropriately associated with the scientific inquiries, and in some cases the actual results obtained, are briefly summarized.

### EXPERIMENTS RELATING TO THE PRESERVATION OF FISHERY PRODUCTS.

An important phase of the Bureau's scientific work is the solving of problems in the preservation of fishes for food. No more useful service for the prevention of waste and the promotion of the use of aquatic foods can be rendered than by ascertaining the conditions leading to spoilage of fresh and cured fish and by discovering more effective methods of preservation. Especially is it important to find means of treatment or of preservation which are suited to the fishes that can not be adequately utilized by old methods or are adapted to climatic or transportation conditions under which the common means of preservation fail of their purpose.

Principal among investigations of this character are the experiments in the preservation of fresh fishes by methods of desiccation.

Similar modes of preservation have established their efficiency for the preservation of vegetables both in the home and in the industries. Dried salt fish are well known in the market, but under the climatic conditions prevailing in the United States the sun-drying of fresh fish has not proved commercially feasible.

*Drying of fresh fish.*—Working in the Woods Hole laboratory during the summer of 1917 an investigator conducted experiments in drying various species of fresh fish and squid. Domestic fruit driers, steam-heated fish driers, driers with air heated by means other than steam, driers which force air over the fish at varying temperature, and the methods and limitations of sun-drying were tried.

Several species of fish, including cod, haddock, and whiting, have been successfully prepared for commerce by preliminary steaming, picking the meat from the bones and skin, passing through a meat chopper, and drying in commercial fish driers. Further experiments may lead to improvements of methods from the viewpoints of economy in production and appearance of the product. Experiments in rehydration of the dried product have also been conducted.

Methods of desiccation have obvious advantages over other methods of preservation in the saving of storage space, in economy of transportation, and in the indefinite preservation of the product without continuous expense. It is also true in some cases, at least, that there is much less waste of soluble nutritive substances, and that the natural flavors may be better maintained.

The results in the case of squid are noteworthy. Squid, in the drying process, is reduced to broad, thin sheets of inviting appearance which may be chopped to form chowder or soup stock. There is a characteristic and particularly agreeable flavor which, together with the very high protein content, promises much for the eventual addition of the squid to the American dietary. Subsequent experiments have shown that the tenderness of the product is much improved by steam cooking before the squid is dried. While squid can be conveniently canned, the process of canning fails to preserve the characteristic flavor sc well as the method of desiccation. The palatability of the squid has been so thoroughly tested by people of many Asiatic and European countries that one must consider the lack of acquaintance with it as the only bar to its use by Americans. Important facts of practical value that have now been definitely determined are: (1) The toughness of the meat is overcome by methods of steam cooking and drying, after which the squid can be kept for an indefinite period without deterioration; (2) the excellent flavor and delicate aroma are not lost by the methods of drying or by subsequent cooking by proper methods, such as by boiling over a hot fire or by stewing for a short time in a small amount of hot water and serving in the juice in which it was cooked.

*Bacteriology of preserved fish.*—In the field of bacteriology, investigations have been directed first at determining if bacteria play an important part in the initial stages of decompositon of fish during storage in ice. Freshly caught fish of several types were stored in ice boxes similar to those in use in the average fish market, and at regular intervals some were removed and the muscle tissue was subjected to bacteriological examinations to determine the number of aerobic bacteria present that would develop at 22° and 37° C. in both

plain and fish agar. The following conclusions were drawn from the experiments: (1) Fresh muscle tissue is practically sterile; (2) drawn fish show more bacteria than undrawn fish as the period of storage in ice progresses and in a shorter time; (3) undrawn fish stored for a period of two or three weeks in ice and totally unfit for food showed relatively few bacteria; (4) autolysis seems to play a more important part than bacteria in the initial stages of the decomposition of fish stored in ice.

Further studies relate to organisms which cause the "reddening" of salt fish, especially of the cod, a condition which detracts from the appearance of the fish, diminishes the market value of the product, and causes serious economic waste. After a period of preliminary studies in the laboratory during the early part of the year, it was determined to transfer the work to the seat of industrial operations at a principal fishing port. The conditions determining the prevalence of this infection, for such it is, are now pretty well understood, and it is believed that the solution of the problem of preventing the infection is about to be realized.

*Miscellaneous investigations of problems of preservation.*—Other scientific investigations of immediately practical application have related to the salting and smoking of shark meat, the utilization of grayfish eggs through the preparation of a soluble acid albumen, the extraction of the oil from grayfish eggs, the preparation of gelatin from the heads, fins, and tails of the grayfish, and the relation of ammonia production in the grayfish to the corroding of tin. The alleged toxic qualities of the roe of the garfish have been studied both from chemical and physiological points of view, and some experiments have been made to determine the origin of a certain objectionable flavor which is said to characterize caviar prepared from the roe of the carp. None of these investigations has as yet reached a point justifying the publication of results.

The more directly scientific investigations have been supplemented by practical trials of the preservation of fish in various ways, and in some cases important results have been obtained in the application of old methods to new fishes. The demonstrations associated with such trials have been productive of much good, not only through instruction of fishermen in the use of approved methods of preservation which were previously unknown or unused in certain localities, but, as well, through the education of fishermen with reference to the value of extreme care in the adaptation of commercial methods to the particular species of fish, to the local or seasonal conditions, and to the demands of the market which it is intended to supply.

The scientific assistants in the regular employ of the Bureau and the specialists from without who have associated themselves temporarily with the Government fisheries service have taken an active and effective part in the work of propaganda or public education in the more general and more intelligent use of fish as food. In such work these men of science render a particularly valuable service, because they can speak or write without bias and with a knowledge of the nutritive value of fish food and its appropriate place in the diet. The Bureau has had ample evidence that the public generally has appreciated such service and that it has responded in a practical way to the counsel which has been offered.

Although culinary demonstrations are not strictly a part of the scientific inquiries, nevertheless it has been found impossible to dissociate them from the work of investigation. In some cases skilled cooks have been engaged in association with the investigators or independently, and demonstrations have been given at State or county fairs, before women's organizations, or men's clubs, or in open meetings, whenever the public could be most effectively reached. In this way it has been possible to bridge completely and promptly the common gap between the discovery of useful facts and the final practical application in the individual household of the knowledge gained. In such public services the Bureau has been enabled to cooperate with various bureaus of the Department of Agriculture, notably with the States Relations Service and with the United States Food Administration.

The lack of vessels for offshore investigations has made it impossible to make explorations of oceanic fishing grounds. Reference may be made, however, to an investigation of an alleged waste of fishes on the coast of Cape Cod. It was learned that certain kinds of fishes, especially the whiting, were being taken in the trap nets in quantities far in excess of the capacities of the cold-storage plants, as well as of the market demand for fresh fish of these kinds. The Bureau, therefore, took steps with some success to encourage the preservation of such fishes and to stimulate a public demand for the prepared product.

## INVESTIGATIONS RELATING TO SOURCES OF SUPPLY.

The carp has long been the most important commercial fish living exclusively in fresh waters. There has been a good demand for carp in the principal cities, and, because of the increased demand for fish which has developed during the recent food shortage, the prices of carp have risen to relatively high figures. Nearly all of the carp for market have been shipped from a few States in the Middle West. Nevertheless, carp is known to occur in abundance over a large part of the country. In many waters carp has only a relative abundance and could not be counted on as a source of supply for commercial fishery. Nevertheless, these small supplies in the aggregate constitute a considerable quantity of food, and, if they were more generally used in local markets, a substantial reduction would result in the quantity of other foods it would be necessary to import into the several communities.

It is commonly recognized that when prepared in an offhand manner the carp makes a table dish of inferior quality. It is not so generally known that when properly prepared and served the carp takes a very favorable rank among other food fishes. In the effort to popularize this fish, the Bureau has prepared and published an economic circular giving an account of the food value of the carp, with recipes for its proper preparation. Effective posters were also given wide distribution directing attention to this neglected resource and bearing information that the circulars could be had on application to the Bureau.

Believing that there were supplies of carp in some of the southern States sufficient to support a commercial fishery, the Bureau under-

took a special investigation of the subject in the waters of South Carolina as typical of the conditions in several southern States. The survey covered a period of several months and involved many experiments or fishing trials intended to determine the proper sorts of gear to use under the varying local conditions. The results of the survey may be summarized as follows:

The "upstate" waters will support only limited commercial fisheries and the output of these may be consumed locally; much local interest was found among farmers and others who possessed some sort of equipment for catching fish which they were unable to use because of the severe legal restrictions upon the fishery. The larger rivers, especially in their lower courses, offer favorable opportunities for the development of larger commercial fisheries. It is probable that fishing for carp in rivers near the coast for shipment to northern markets will prove distinctly profitable, especially if, as expected, the carp can be taken successfully during the winter months, when the conditions for transportation are at the best and the market prices are most attractive. Local fishermen witnessed and participated in the fishing trials.

An incidental result of the experiments and the inquiries associated therewith was the preparation of a paper treating of the methods of capturing carp commercially under different conditions. The information thus furnished will be applicable in all parts of the country where unutilized carp resources exist.

Other investigations have been directed toward locating beds of sea mussels on the North Atlantic coast which will support a commercial fishery of importance, and toward completing surveys of the sea-mussel resources of the coast of California and the shellfish resources of the northwest coast.

### EXPERIMENTAL FISH CULTURE.

The investigations and experiments conducted at the fisheries biological station at Fairport, Iowa, and directed toward the establishment of a more scientific foundation for fish culture in ponds, have continued to yield interesting and useful results. Both the buffalofish and the channel catfish have again responded satisfactorily to the attempts at propagation in ponds.

A comprehensive study has been made of the abundance, life history, habits, and importance of many species of dragon-flies and damsel-flies in fish ponds. In their relation to fish it is learned that while the larvæ feed to some extent upon the same kinds of food as some fishes, they also subsist to a considerable degree upon animals that are directly harmful to fish; and while, under stress of hunger, they occasionally eat small fishes, they themselves afford an abundant food supply for fish. Although the nonaquatic adults sometimes prey upon beneficial insects, the larger part of their subsistence comprises positively injurious insects. The dragon-flies and damsel-flies have a distinct economic importance in their effect upon the balance of life both within and without the ponds.

Studies of aquatic plants in relation to fish culture are making satisfactory progress and are contributing to the desired fund of knowledge regarding the utility of both the higher and the lower

forms of plant life. Such investigations are of fundamental importance because all food of fish is provided through the medium of plants. There can be no fish or animal life except as the inorganic materials are converted by green plants into materials that are suitable for the food of animals. Fish are thus dependent upon plant life whether they forage directly upon the plants or subsist upon smaller animals that derive their food directly or indirectly from the vegetation. But some plants are more useful than others, and some are undoubtedly injurious in their effects upon ponds. It is necessary, therefore, that previous knowledge be obtained regarding the biological and economic relations of the various forms of plant life within the fish pond.

A significant anatomical study of the salmon, conducted principally in the Washington laboratory, has brought to light previously unrecognized facts regarding the structure of the reproductive organs and the normal manner of extrusion of the eggs. These facts are found to have a direct bearing upon fish-cultural practices, and they dictate the necessity for certain changes in method and for extreme care in the handling and stripping of spawning trout and eastern salmon in order that the loss of eggs and permanent injury to the breeding fish may be avoided.

Reference may be made to an investigation of the possibility of utilizing the abandoned rice fields of South Carolina and Georgia for the culture of carp on a commercial scale.

### INVESTIGATIONS AND PRACTICAL WORK IN ANTIMALARIAL CAMPAIGNS.

With the measures which are generally relied upon for the control of the abundance of mosquitoes and the eradication of malaria, this Bureau has no direct concern. They lie within the domain of sanitation and entomology. It may be said, however, that it has become very clear to all concerned that under many conditions the direct methods of sanitary science generally employed in combating the mosquito, whether physical, chemical, or engineering, either are not practicable of application, or else, when applied, fail of accomplishing the desired purpose. It has been found necessary in many cases to rely to a great extent upon nature's method of controlling the abundance of organisms through their competitors and enemies. It is well known, however, that nature's control of the abundance of mosquitoes, as of other animals and plants generally, is relative and not absolute. The problem in this case is to find means of making the enemies of mosquito larvæ dominant over their natural prey, of making them efficient in the extermination of the larvæ of anophelid mosquitoes at least.

The problem is primarily within the domain of aquatic biology and concerns especially the small mosquito-eating fishes and other associates; and in this problem, in its phases both of investigation and of practical work, the assistance of the Bureau of Fisheries has been solicited by the Bureau of Entomology and the Public Health Service.

The cooperation with the Public Health Service has been principally in the urgent task of protecting the health of soldiers in one of the large southern cantonments. The plan of work comprised

the use of all available means of protecting and increasing the supply of top minnows (Gambusia) in the area under protection, and the careful observation of the effectiveness of these and other fishes in the extermination of mosquito larvæ. To increase the number of minnows in the extra-cantonment area, propagation was resorted to and fish were also brought in from places outside of the protected area. As the top minnows were found to be a favorite live bait in angling, the cooperation of the public was sought and received through the use of posters, placed at or near the various small ponds, bearing a warning that the small fish were given protection as a health measure.

It has been fully demonstrated that the small fishes are in many cases most effective agents for the control of mosquitoes, but it has also been positively ascertained that the efficiency of fish even when present in abundance is by no means universal and complete. Much depends upon the physical and biological conditions in the water, such as the presence of débris and of plants of various species, wave action, fluctuations of level, and various other factors. There is, as yet, lacking the degree of knowledge necessary to define fully the conditions under which fish are effective, or to govern the change of conditions so as to make the fish as efficient as is desired. It is with reference to securing a sure foundation of knowledge concerning the relations of fish and mosquito larvæ that the campaign of observation and experiment in cooperation with the Bureau of Entomology was undertaken two years ago at Mound, La., as mentioned in previous reports. The investigations at Mound have been continued actively and bid fair to make substantial contributions to knowledge which will be of direct and decisive importance in the future conduct of antimalarial compaigns.

### DISEASES AND PARASITES OF FISHES.

The Bureau has given special attention to the diseases of fishes as bearing upon the loss of fish in hatcheries, fish ponds, and public waters. While the subject is broad and the problems arising are difficult and tedious of solution, substantial progress has, nevertheless, been made during the year in the study of some of the affections to which fish are subjected in artificial and natural bodies of water.

*A new parasite of the buffalofish.*—An investigator of the Fisheries Biological Station at Fairport, Iowa, has discovered a new and evidently important form of trematode worm which infests buffalofish in ponds. The life history of the parasite has been definitely worked out and is briefly as follows:

The adult trematode, living in the alimentary tract of the buffalofish, expels its eggs, which pass out into the water. From each of these eggs, which are "laid" during the late summer, there hatches in the fall a ciliated embryo (mericidium), which swims in the water until it finds a snail of the species *Planorbis trivolvis*. Into this snail it works its way and eventually encysts in its host's liver. In the usual manner it grows and multiplies there during the winter and spring, and in summer emerges from the snail as a tailed and styleted cercaria. This larva can live for several hours in the water, but must find a May fly larva for its second intermediate host, into which

it bores and encysts just beneath the cuticle. If the buffalofish eats the infected larva it obtains the young parasite, which very rapidly develops and assumes in the late summer the adult form ready to expel its eggs. The association of the buffalofish, the snail, and the May fly larva seems to be essential for the perpetuation of the parasite. The probable importance of the form is suggested by the fact that a serious mortality occurred among the fishes that were so infested.

The life history of a trematode parasite of the bluegill sunfish was also investigated. It is found in the larval stage in that fish and in the adult stage in the kingfisher.

*Investigation of protozoan parasites.*—Investigations of protozoan parasites at the Bureau's station at Fairport, Iowa, during the summers of 1916 and 1917 produced interesting results which promise to be of practical value to fish culture. The myxosporidia are quite common on fish from the Mississippi River, and evidence seems to prove that they are to a degree seasonal in occurrence. Under certain conditions they may cause serious injury to the host, but in the case of the buffalofish, and possibly of other species, it is believed that danger from infection in ponds might be lessened by a proper rotation of the fish in a series of ponds, as the young seem to become infected from the adults placed in the same pond to spawn.

A hitherto undescribed species of coccidia is believed to have caused the death of young carp after transference from one of the ponds to hatchery troughs, as an exceptionally heavy infection of the intestines with these parasites was associated with a serious degree of mortality. Although infection of the pond fish with the ciliate parasites Ichthyophthirius, Chilodon, and Cyclochæta was quite common, a much heavier infection after transference of the fish from the ponds to the tank house, probably induced by change of environment, would seem to indicate that these parasites have been largely responsible for the previous heavy mortality of the fish in the tanks.

*Peculiar disease in brook trout.*—At a commercial hatchery in Rhode Island a peculiar disease of brook trout caused the loss of a large number of fish. The diseased fish at first became apathetic, then turned black and became blind. Just before death the fish would dart jerkily through the water for a time, losing equilibrium toward the last. As the result of the experiments conducted under the guidance of the fish pathologist of the Bureau, the cause of this unusual affection of trout was traced to the nonoil substances in linseed meal, the latter being a constituent of the food then used at this hatchery. The harmful effects of the linseed meal are believed to be due to action of a cyanogenetic glucoside or its decomposition products, though the actual proof will require further experimentation.

*Miscellaneous studies of disease and parasites.*—During the year a serious condition of diminished vitality and disease of the blue pike was reported from several points on Lake Erie. Specimens of fish received from Cleveland, Ohio, were found to be unusually heavily infected with a species of parasitic copepod (identified as *Ergasilus centrarchidarum*), which is known to occur abundantly on perch, sunfish, and bass, but is not generally found in numbers on blue pike and saugers. The fact of the peculiar abundance of parasites

on this particular species was held to indicate that some other condition had diminished the powers of resistance of the fish and made them an easier prey to parasites. There was some evidence of malnutrition and internal disorders, but investigation in the limited time available failed to reveal the original cause of the trouble.

A systematic examination of the parasites of fishes in Oneida Lake, N. Y., was made in cooperation with the biological department of the New York School of Forestry, but the study of the material obtained has not yet been completed. Further comprehensive study of the internal parasites of marine fishes was made in connection with the Woods Hole, Mass., laboratory.

Visits by the fish pathologist of the Bureau were made to various Government and commercial hatcheries for the purpose of inquiring into the cause of mortality and of offering suggestions for the prevention of loss by disease.

### MISCELLANEOUS INVESTIGATIONS.

While the scientific work has been restricted generally to matters relating to the winning of the war, the Bureau has, nevertheless, continued several investigations which are of great ultimate importance and could not be interrupted without unwarranted sacrifice. Some of these investigations that have not reached a stage for report may be mentioned as follows: The intimate study of the habits and propagation of salmon of Pacific waters; problems of the oyster industry; the properties of the roe of certain fishes alleged to be toxic or distasteful; systematic relations, habits, and migrations of salmonoid fishes in the Great Lakes; the utilization of marine algæ; biological and physical conditions of fish life in inclosed waters; the distribution and habits of pelagic fishes off southern California. Among others the following may be cited:

*Nature of "fat" oysters.*—Technical studies have shown conclusively that so-called "fat" oysters are rich, not in fats, but in glycogen, a carbohydrate food. The processes of "fattening" must, then, be based upon conditions favoring glycogen formation. The place of oysters in the dietary is not just the same as that of meats and fish, which are eaten for their protein and fat content. Oysters furnish protein, but little fat, and, if they are in prime condition, they also furnish a significant amount of carbohydrate material, such as is usually made up by the cereal and vegetable elements of the dietary.

*Protection of wood against marine borers.*—The experiments and studies on this subject, which have been conducted in cooperation with the Forest Products Laboratory at Madison, Wis., and the Bureau of Forestry, have been practically completed as regards the use of creosote oils. Some of the results have been published independently by the investigators. Since the conclusions will be useful to all those who are directly concerned with the use of wood in the waters of warmer latitudes, they may be summarized in the words of the investigators, as follows:

1. The toxicity of creosote fractions decreases as the boiling point rises; that is, the creosote and its distillates, arranged in the order of decreasing toxicities, are: Fraction I, fraction II, creosote, fraction III, fraction IV, fraction V. The high toxicity of fraction II,

which is solid with naphthalene, was probably due mainly to tar acids.

2. The creosote light oils are definitely poisonous for the borers. Benzol is the most and xylol is the least toxic. The toxicity of toluol lies between these two.

3. The tar acids are all highly poisonous to the borers. Their toxicity steadily increases with rise in molecular weight; that is, arranged in order of increasing toxicity, they are: Phenol, the cresols, and the naphthols. The three isomeric cresols, which exert practically the same degree of toxic action, are about twice as poisonous as carbolic acid; while the two naphthols, also equally toxic, are 10 or more times as poisonous as phenol.

4. Tar-base fractions all show a high toxicity for the borers, and this toxicity increases with rise of boiling point of the fractions. Pure quinoline, boiling at 239° C., is several times as poisonous as pyridine, with a boiling point of 115° C. The toxicities of the tar bases are fairly comparable with those of tar acids of approximately the same boiling points.

5. In comparison with the tar acids or bases or even the lighter hydrocarbon oils, the solid hydrocarbons of creosote are only very slightly toxic. Arranged in the order of decreasing effectiveness, they are naphthalene, phenanthrene, acenaphthene, and anthracene. Naphthalene is perhaps five times as toxic as anthracene.

It has apparently been assumed that the more poisonous a creosote oil is the more effectively will it prevent attacks of marine borers. It will be noted, however, that the conclusions drawn from these direct toxicity tests, especially with reference to creosote and its fractionates, are diametrically opposed to the conclusions drawn from the service tests above; that is, the highest boiling fraction, which was the least poisonous, stood up the best in actual service. It has been pointed out that the principal object is to prevent an original attack of the larval shipworm when it is of but microscopic size. Heavy treatments with a proper type of creosote will still prove inadequate as long as areas of superficially treated sapwood, heartwood, knots, etc., are left exposed for the lodgment of shipworm larvæ.

The investigators conclude that a proper creosote oil for marine work should contain a large proportion of constituents boiling above 320° C., as well as considerable amounts of high-boiling tar acids and bases.

*Marine algæ of the Pacific Coast.*—Through the cooperation of a specialist from the University of California, marine algæ have been collected on the Pacific Coast from Grays Harbor, Wash., to Sitka, Alaska. Many new forms were discovered and the range of species previously known was extended. Of about 875 species previously reported on the Pacific Coast of North America from Mexico to Bering Sea about half are now represented in a collection prepared for the Bureau which will be deposited in the National Museum.

Interest in the marine algæ arises from the intimate relations existing between them and the fishes and shellfishes; from the significance of marine plants as ultimate sources of organic material in the sea, and thus as an indirect source of food for fishes; and from the fact that the algæ are resources useful in some cases for human food and in others as the basic material for potash, iodine, gelatin,

and other products useful in the arts and industries. The marine algæ, although the use of certain groups has recently been greatly increased, may in general be regarded as neglected resources in the United States.

### WORK AT THE FISHERIES LABORATORIES.

The use of the marine laboratories at Beaufort, N. C., and Woods Hole, Mass., for naval purposes has necessarily restricted the work of the Bureau thereat. During the early part of the fiscal year, before the Beaufort station had been turned over to the Navy, the laboratory served as a base for practical experiments in the preservation of fish by methods of salting and smoking, and for propaganda both among fishermen of the near-by coast and among consumers in the interior of the State, directed at better utilization of the local fish supply for food.

At this station also there was completed early in the year the field work of the investigation pertaining to the use of creosote oils for the protection of wood against marine borers, the results of which are referred to elsewhere. The Bureau has now entirely discontinued its operations at this place, with the exception of experiments in perfecting the culture of the diamond-back terrapin.

The Woods Hole, Mass., laboratory was employed during the early part of the fiscal year for experiments and investigations relating to the preparation of fish and bacteriological studies of fish tissues. Further attention was given also to the nutrition of oysters, the parasites of fishes, and the food of young fishes in local waters.

At the marine station at Key West, Fla., two buildings of small size have been constructed, one affording necessary living accommodations for some of the employees, and another space for the pumping equipment and for a provisional laboratory. These, with the canal and pool for water supply largely completed during this and the preceding year, are regarded as among the most essential requirements for the effective prosecution of work. The difficulties of obtaining labor and materials and the very high prices prevailing have made it unavoidable that progress in construction should be slow. Under the present conditions and with the limited funds available, further constructions are not contemplated. In spite of the inadequate equipment, an effective beginning of the scientific work of this station has been made. Useful information has been gathered regarding the fishes of the region, and the studies and experiments with the spiny lobster have yielded information that is interesting and promising of practical usefulness.

At the Fairport, Iowa, laboratory the investigation of mussel problems and the various studies relating to fish-cultural work, elsewhere referred to, were continued with satisfactory progress. The results of mussel propagation are given in another place. The Bureau suffered a severe loss at this station through the accidental destruction by fire of the main laboratory building in the early morning of December 20, 1917. Besides the building there were lost a library which, though small, had been assembled with much care, and valuable scientific records and natural history specimens. Fortunately the water-supply system and the smaller buildings remained unharmed, so that many phases of the important work of the station

could be continued without interruption. Congress has provided an appropriation for the erection of a fireproof building to replace the original building, which was of frame construction. At the close of the fiscal year plans for the new laboratory were nearing completion.

## RELATIONS WITH THE FISHING INDUSTRIES.

### INCREASING THE CONSUMPTION OF AQUATIC FOODS.

It is possible to record more active and effective work than in any previous year in making the American people better acquainted with the merits and availability of our aquatic resources as food and in pointing out sources of supply. This work has assumed a wide scope and many phases, but the primal effort and purpose have been to increase public reliance on such resources as staple articles of food, to dissipate unwarranted prejudices, and to cause the discontinuance of wasteful practices in the utilization of water products.

The Bureau is fully cognizant of the important service it can and should render the fishing industries, by determining and making known the suitability of many of our fishes to new and untried methods of preservation; by sending trained experts to the fishing centers to give instruction in those methods which prove meritorious; by improving methods in common practice and discouraging the use of unsatisfactory methods; by introducing into our fisheries useful foreign methods and processes; by increasing the use of the little-used or neglected fishes and fishery products; by developing methods of preparation and new uses for the waste products of the fisheries; by furnishing to fishermen and others practical advice relative to special equipment required for new methods and processes that may be in contemplation; and by contributing by all available means to the upbuilding of the fisheries, while at the same time safeguarding these resources from possible depletion or exhaustion.

During the past year the demands on the fishing resources of the country have been of such magnitude that the Bureau has found an unprecedented opportunity for rendering service in the field of endeavor before outlined. It has devoted all possible energies to the solution of those problems which promised the largest and most immediate results, and has diverted men and funds to work of this character in so far as it was possible so to do. The small available force of trained assistants has been the principal factor in limiting the activities. The meager funds allowed by Congress for this work have been supplemented by the special allotment elsewhere referred to.

Aid has been rendered in developing markets for such inadequately used or partly neglected fishes as the herring of Alaska, bowfin, burbot, carp, crevalles, drum, elops, eulachon, grayfish, gizzard shad, jewfish, menhaden, rays, redfish, river herrings, robalo, rockfishes, sablefish, sea catfishes, sea robins, sharks, skates, tarpon, and tilefish; such aquatic mammals as dolphins, porpoises, and whales; and such neglected food products as fish roe and milt. For some species the Bureau has developed new and suitable methods of preservation, discouraged the practice of unprofitable methods, and assisted in solving difficulties which were obstructive to the full use of the product.

One of the agents has devoted his entire time to a study of practical problems of the west-coast fisheries. This work has been pro-

ductive of much good, and has enabled the Bureau to render more effective service in this field. Another of its agents has been conducting a campaign of education in the Middle West as to the merits of the South Atlantic and Gulf coast fishes which can be supplied in large quantities. In cooperation with other Government agencies, the Bureau has been instrumental in bringing Gulf coast fishes into Tennessee, Kentucky, and Indiana in carload lots at a time when it was difficult to obtain in that region satisfactory supplies of fresh fish at reasonable cost. Within two months of the inauguration of this service, about 200,000 pounds of fish were shipped and plans are being perfected for the extension of this kind of service to other sections.

In order to bring newly introduced fishes or other products to the attention of the consuming public, it is necessary to conduct a systematic and well-sustained advertising campaign. By the issuance and wide distribution of posters and placards devoted to particular fishes, by having the newer products tested by workers skilled in cookery to determine the best methods of preparation for the table, and by the printing, in inexpensive form, of cook books embodying the results of tests, the Bureau has been able to interest a large number of people in the merits of water products with which they were not previously acquainted. A still more direct appeal to the public has been the employment of well-qualified demonstrators for the purpose of educating housewives in fish cookery, teaching them to recognize the qualities of each kind of fish and prepare it in the manner best suited to its character, and showing how to utilize heads, bones, and other waste parts for savory sauces, soups, and chowders. On the Pacific coast the demonstrations have been exceedingly popular and well patronized, and local fish dealers report much larger sales of cheaper fish in consequence of this work. Plans are being perfected for the extension of this service to other parts of the country.

It has, as yet, been possible to form no reliable estimate of the actual results of the campaigns for the introduction of bowfin, drum, eulachon, menhaden, sharks, roe and buckroe, mussels, etc.; but, on the basis of fresh weight, it is known that upward of 32,500,000 pounds of burbot, grayfish, sablefish, tilefish, whiting, and Scotch-cured Alaska herring were marketed in 1917, and most of this quantity can be attributed to the recent activities of the Bureau.

Among the products in whose behalf there were special activities the following may be mentioned:

*Fish roe and buckroe.*—The eggs of such fishes as the sturgeon and spoonbill catfish, or paddlefish, are made into caviar, which is classed among the most valuable of our fishery products. The roes of various others, such as cod, haddock, mullet, river herring, shad, and whitefish, are quite extensively used for food, either fresh, salted, or canned. On the other hand, large quantities of roe, and practically all of the buckroe or milt of marketed fishes, are wasted. These are essentially nitrogenous foods, with a considerable quantity of fat, and differ in composition but little from the flesh of the fish. They do, however, contain a larger quantity of an important constituent of food, organic phosphorous, in the form of lecithin. The buckroe, or milt roe, of the male, which corresponds to the egg mass of the female

and is sometimes called soft roe, as shown by analysis, compares favorably in food value with the roe and flesh of the fish. This is an excellent product, a delicate and palatable food, which lends itself to preparation in all the ways in which sweetbreads and brains are served. These products may be used fresh or canned.

The Bureau has encouraged fishermen to pack these products, has aided in the marketing of such stocks as have been accumulated, and is educating the public to their merits. In addition to the usual packs of roe of various fishes, small quantities of the buckroe of the river herring, sea herring, and cod have been put up and preparations have been made for the pack of the buckroe of other species in season. Now that the packers are beginning to appreciate the quality of the product and the fact that it can be marketed, it is believed that much larger packs will be put up in the future.

*River herring or alewives.*—The fishery for these species is of great importance in the Chesapeake Bay region and the sounds of North Carolina. The Bureau has given considerable attention to the development of much-needed improvements in the methods of handling and preservation of the catch, and has emphasized the importance of the packers adopting these measures. Experiments in Scotch curing indicated that these fish, preserved in this manner, will not yield a high-grade product. They may be preserved as Russian sardines, but are slightly inferior to the sea herring because of their larger size and lower fat content. Some of the fish were experimentally canned in tomato sauce, mustard sauce, and vinegar. The addition of the tomato sauce greatly improves the quality of the fish, and, if the packers will overcome the present difficulty of shrinkage in the can and process the fish carefully with the addition of the sauce, it is the consensus of opinion that a product of high quality, acceptable to the trade, can be produced. Fish soused in brine made of vinegar, salt, and sugar, in the proportion of about 18 pounds of salt, 6 pounds of sugar, and 8 quarts of pure grain spirit vinegar to 24 quarts of water, then smoked lightly and canned were very palatable. Because of the added expense and labor, it may not be practicable to pack the fish by this method for market. It is unfortunate that not all of the packers appreciate the importance of packing only sound fish, under sanitary conditions, which must be done if the fishery is to continue to thrive.

*Menhaden.*—The menhaden is one of the most abundant species in our Atlantic coastal waters. It has been used almost solely for conversion into fish oil and fertilizer, and the catch for this purpose has in a single year amounted to over 1,000,000,000 fish, weighing more than 635,000,000 pounds. The possibilities of this fish as a material factor in our food supply are obvious. Small quantities of fresh menhaden are eaten by the fishermen and small numbers are sometimes included with shipments of miscellaneous fresh fish to our larger cities. The number marketed in this manner is increasing. In New York City during September, 1917, 29,638 pounds of the fresh fish were marketed, and in October, 33,379 pounds. Considerable quantities were marketed in Washington City in the autumn of 1917, as many as 50 barrels (about 10,000 pounds) having been sold at the wharves in one day. During the fall fishing for menhaden in the Chesapeake Bay region, each fisherman on the menhaden boats

is privileged to salt for winter use a barrel of select menhaden and many of the fishermen avail themselves of this privilege. Experiments conducted by the Bureau indicate that this fish can be rendered very palatable by salting and smoking, and also that it makes an acceptable canned food.

*Sharks.*—The value of sharks as food has been recognized in the countries bordering on the Mediterranean, in Great Britain, in Japan, and in many other countries. Until recently their use for food in the United States has been limited mainly to seafaring people in scattered localities, and to the markets of some of our larger cities, where they are not infrequently sold under the name of more highly valued fishes. The number of markets offering these fishes for sale is increasing, and more and more of the product is being sold for what it is.

The flesh is white, slightly gelatinous, and compares favorably in food value with other staple food fishes and meats. The flesh of the young and of the smaller varieties, such as the grayfish, common to our coastal waters, is very good fresh. The flesh of the larger sharks may be salted, smoked or kippered, salted and dried, flaked or shredded. Experiments conducted by the Bureau indicate that the product lends itself particularly to light salting and hot smoking, and the kippered product may be canned to advantage.

Results of private investigations reveal the presence of a large percentage of hydrocarbon oil in the liver oil of some sharks. This property or the presence of some alkaloid may account for the reputed unsuitability for food of the livers and of the flesh of some of the species occurring in Arctic waters. However, the flesh of practically all of the species taken on our coasts has been tried and pronounced suitable for human consumption; in fact, that of a number of species is spoken of highly as the equal of some of our choicest fishes.

*Carp.*—The carp is the most abundant, most widely distributed, and most valuable fish in the fresh waters of the United States. During a considerable part of the past year difficulty has been experienced in supplying the demand for this fish. With the increase in demand for it in those sections where its merits as a food fish are appreciated and with the inability of the regular fisheries to supply the demand, the need of developing additional fisheries has been felt. The Bureau has extended aid to various sections in widening the markets and studying the possibilities for establishing fisheries, and has encouraged the use of this fish by people who have been prejudiced against its use for food. Among the services performed may be mentioned that of establishing connections between producers seeking markets and the trade in the larger consuming centers.

A number of the States have also appreciated the importance of utilizing more of the carp and other less-esteemed species, such as the buffalofish and suckers, to relieve the food shortage in the present time of stress. Noteworthy among these are Wisconsin and Minnesota. During the period from September 1, 1917, to April 1, 1918, under the supervision of the State Conservation Commission of Wisconsin, 1,264,680 pounds of carp, buffalofish, and suckers were taken from the inland waters of that State. As an immediate result of the action of the Game and Fish Department of Minnesota in suspending regulations in so far as they apply to the capture of rough fish,

1,382,187 pounds of carp were taken and marketed between October 1, 1917, and February 1, 1918.

*Drum.*—The common drum is found on the coasts of the Middle Atlantic, South Atlantic and Gulf States, sometimes in very large schools. It is a bottom feeder, subsisting largely upon crustaceans and mollusks, and reaches a weight of about 150 pounds. Personal prejudice, because of the presence of muscle parasites in the posterior part of the back, has greatly restricted the use of this important food fish. On the other hand, some persons familiar with this condition consider the infested portion the most desirable part of the fish. While the fish may be marketed fresh or preserved in various ways, it is as a canned product that it is most appetizing. Prepared in this manner, it has been likened to the meat of chicken.

The Bureau has given considerable attention to the development of markets for this fish, but, because of the irregular movements of the schools, some difficulty has been encountered in obtaining steady sources of supply. It is expected, however, that this difficulty will be overcome and that larger quantities of this wholesome fish will be made available.

*Whales and porpoises.*—Whales and porpoises being mammals and their bodily activities being essentially the same as those of a cow, horse, or other land mammal, their flesh is "meat" rather than "fish." The meat of the whale resembles beef in texture and appearance, and, although by some it has been compared to venison in taste, it nevertheless has a distinctive flavor of its own. A sample of canned whale meat, analyzed by the Bureau, contained 30.11 per cent protein, 6.52 per cent fat, and 1.8 per cent ash. Of the whales, the humpback (*Megaptera nodosa*) is probably the best for food, but the sei whale (*Balænoptera borealis*) and the finback (*Balænoptera velifera*) *also* yield excellent meat. From a humpback whale about 6 tons of edible meat may be obtained, from the sei whale 5 tons, and from the finback 8 tons. The whales which are largely available for food subsist almost entirely on a small shrimp (*Euphausia*). In fact, none of these whales eat fish habitually and only do so at all when shrimp are not to be obtained.

Whale meat holds an important place in the dietary of the Japanese and is growing in favor in other countries. The Bureau has emphasized the importance of utilizing this product for food, and very satisfactory progress has been made in saving and marketing it. On the west coast one whaling company in August, 1917, completed a 25-ton cold-storage plant, with a sharp freezer to care for 50 tons, and during the season marketed over 80 tons of the fresh meat in American markets, principally in west-coast cities. Arrangements have been made for marketing 500 to 600 tons during the 1918 fishing season, and shipments are being made in carload lots as far east as Boston. A British Columbia plant also marketed a large amount of the fresh meat and was prepared to pack about 50,000 cases of the canned meat in 1918.

Porpoises and dolphins are excellent for food, by some preferred to the larger whales. The Bureau has been instrumental in bringing the value of these forms to the attention of fishermen on the Atlantic and Gulf coasts, and progress is being made in the establishment of

markets for the meat of these creatures. It appears that the oily taste, which may be more or less objectionable to some, can be avoided by removing the connective tissue which lies between the blubber and the meat.

### UTILIZATION OF FISH WASTE AND WASTE FISH.

Twenty-five per cent or more of the original weight of fish is inedible. It is possible to convert this residue into products of high market value, and more of it should be so employed instead of being wasted. In the salmon fisheries of the Pacific coast alone it is estimated that the value of this material, if fully utilized, would amount to several million dollars annually. It is also possible to manufacture much of this refuse and such fishes as the menhaden into products having a high economic value. For example, the scrap made from menhaden may be converted into fish meal as a feed for hogs, poultry, and cattle, rather than into fertilizer with which to grow feeds. The best use man can make of fish is to eat it. In like fashion, the best use for fish scrap is to feed it to stock intended to supply the wants of man. By the employment of the animal manure as a fertilizer, it can be made to serve both purposes.

In the case of fish meal greater progress has been made abroad than in the United States. For a number of years before the war, the Germans not only used all they could produce but imported many thousand tons annually from Great Britain and Norway. Considering the costs of transportation, manufacture, and distribution, it is evident that the product was highly valued. Feeding experiments conducted abroad and in this country have demonstrated this value.

One cause that has militated against the use of this product has been the impression that the flesh of animals to which it is fed will become flavored thereby. This feeling is presumably due to the fact that the flesh of animals reared in fishing camps and villages and supplied with an excessive or unlimited diet of fish acquires a fishy taste. As a matter of fact, if the animals are fed intelligently on fish meal with a low oil content, no untoward effects will be experienced.

Fish meal may be prepared by the same general methods as are now employed in the manufacture of the scrap for fertilizer; that is, by steam cooking, pressing, and drying. In addition, it may be necessary to grind it for the purpose of breaking up such sharp spines and pointed bones as remain. It should be made from fresh raw material, under sanitary conditions, dried at a sufficiently low temperature to prevent scorching, and should contain preferably not more than 10 per cent of fat (oil). It is suggested that those employing hot-air driers use charcoal or anthracite and avoid the use of long-flaming fuels to prevent scorching. It should be evident that the higher the percentage of oil in the meal, the greater will be the care required in feeding it. As fish meal is a protein food, it is to the advantage of the producer to reduce the oil content to a minimum, and thus obtain a higher protein (ammonia) analysis. Furthermore, the oil has a higher value when sold as such than if left in the meal.

The higher grades of tankage, with a guaranteed protein content of 60 per cent, are used extensively for feeds, and command as much as $100 per ton or more in carload lots. The supply of this material is inadequate. Experiments, conducted by the Department of Agriculture, indicate that fish meal is fully the equal of tankage as a feed. As to demand, it has been estimated that Nebraska alone can use 30,000 to 40,000 tons annually. In the United States, there are grown each year 60,000,000 or more hogs, each of which will require an average of not less than 50 pounds of a feed of this character. From the evidence at hand it would appear that satisfactory markets are assured.

On the west coast and in New England the production of fish meal is increasing. In 1917 the reported output in the Pacific Coast States and Alaska was 5,297 tons, an increase of more than 100 per cent over the previous year. Considering the demand and the importance of this product to the country, it is imperative that those engaged in the fisheries render all possible aid to meet the demand.

The subject of rendering fish oils suitable for edible purposes is also receiving more attention. In 1914 Denmark used 20,000 barrels of hardened whale fat in the margarin industry, and more recently Norway has been experimenting with this article and is preparing to employ it for the same purpose. It is reported that this product has been proved to be well suited for making margarin that keeps well and tastes well, and to be even better suited for making lard. Experiments are in progress in the United States with fish oils to determine the practicability of rendering these suitable for edible purposes and marketing them commercially.

The Bureau has continued its efforts to accomplish a more complete utilization of fish waste to the best possible advantage. The importance of doing this has been brought directly to the attention of those engaged in the industry, and many inquirers in this country and abroad have been furnished with data relative to methods, machinery, and markets. On the Atlantic seaboard the Bureau has interested menhaden companies in the production of fish meal. In this field it has had the cooperation of the Bureau of Animal Industry of the Department of Agriculture in bringing the use of this product to the attention of hog growers, in giving suggestions relative to preparing the product so that it will be acceptable for feeding purposes, and in arranging for additional feeding experiments at various agricultural experiment stations. Tangible results have already been obtained, and it is expected that ultimately this fishery will yield annually about 40,000 tons of this material. The Bureau's efforts to establish fisheries for grayfish and other species of sharks has been of benefit to the fish-oil industry in that those engaging in these fisheries have been interested to recover and market the liver oil.

### HOME CANNING OF FISH.

Although the preservation of fish in the home by canning affords an excellent opportunity for the increased saving of fish, the housewife has made little use of this method. With the development of small pressure cookers, purchasable at reasonable cost, it is possible for the housewife to process fish in the home, duplicating the work

of the commercial canner. In this manner she may practice a measure of economy and provide a supply of palatable and nutritious food in seasons of the year when fish are abundant for use in periods of scarcity.

The primary object of "processing" fish, or cooking them under steam pressure, is to sterilize them to prevent spoiling. An additional advantage of the method is that if the heating is continued for a sufficient length of time, the organic matter in the bones is dissolved, leaving only a soft, friable, mineral matter that can be eaten along with the meat. With the bones thus softened the fish is much more acceptable as food. Thus, small bony fishes that would otherwise be useless, or fishes of small market value, may be saved, and the larger staple fishes made more attractive.

The time required to soften the bones of fishes varies with the species, the size of the fish, and the pressure and temperature employed. In domestic canning, unless the required time is known, time and fuel may be wasted by overcooking, or by insufficient cooking the bones may not be properly softened.

A recent journal article calls attention to the small amounts of calcium present in most of the common foods and presents a table showing that comparatively large amounts of the ordinary foods are required to yield four-tenths gram of calcium oxide per day, which is about one-half the daily requirement of the average adult. The bones of fish, properly softened as they are by domestic or commercial canning, render available an abundant amount of calcium in acceptable form, not encountered in such amounts in any other common food. In addition to this they supply phosphoric acid and other valuable minerals. It is, therefore, not only good housekeeping, but good dietetics, to can fish for home use.

The Bureau has conducted experiments to determine the time required to soften the bones of about 30 common marine and freshwater fishes of different sizes. In the table which follows the time given is that determined experimentally for the sizes mentioned. It will be a simple matter to interpolate the time periods required to soften the bones of fishes of the same species but of sizes different from those represented. The term "softening," as here used, means the point in cooking when the small bones, ribs, etc., are soft, but when the large vertebræ are not yet sufficiently soft to be consumed along with the muscle. In some of the larger fishes whose large bones could scarcely be eaten, even if they were softened, it would appear to be a waste of time and fuel to carry them to the point of complete cooking, and in such cases it ought to be sufficient to soften the small bones and sterilize the contents of the can. For such a purpose the "softening" rather than the "soft" point may be used.

These experiments refer to fish cooked in Mason glass jars of quart size. The time periods are measured from the point when the given pressure and temperature are reached (at the top of the cooker) to the time when the heat is shut off. The heating-up and cooling-off periods of time are thus not included. The fish were salted, but no water was added. Samples of fish canned during the course of these experiments were kept six weeks at room temperature (about 68° F.) and were then incubated at 98° for 48 hours. All were sterile.

TIME REQUIRED TO SOFTEN THE BONES OF VARIOUS SPECIES OF FISH, 10 POUNDS PRESSURE, 240° F.

| Species. | Weight. | Softening. | Soft. | Species. | Weight. | Softening. | Soft. |
|---|---|---|---|---|---|---|---|
| Black bass: | *Lbs.* | *Mins.* | *Mins.* | *Lemon sole:* | *Lbs.* | *Mins.* | *Mins.* |
| Large | 5 - 6 | 100 | 120 | Large | 2½- 3½ | 80 | 90 |
| Small | ¾- 1 | 100 | 110 | Small | ¾- 2 | 60 | 70 |
| Bluefish: | | | | Mackerel, medium | ¾- 1½ | 60 | 70 |
| Large | 6 - 9 | 90 | 100 | Mackerel, Spanish, medium | 1½- 2½ | 100 | 110 |
| Small | 1 - 2 | 80 | 90 | Perch, white, medium | ¾- 1 | 100 | 110 |
| Butterfish, medium | ¼- ½ | 60 | 80 | Perch, yellow, medium | ¾- 1 | 90 | 100 |
| Carp | 8 -12 | 110 | 120 | Pollock, medium | 5 - 7½ | 60 | 70 |
| Catfish: | | | | Salmon, medium | 13 -19 | 90 | 100 |
| Large | 1½- 2 | 70 | 80 | Sea bass, medium | 1 - 1½ | 60 | 70 |
| Small | ¾ | 60 | 70 | Shad | 5½ | 90 | 100 |
| Cero, medium | 10 -13 | 80 | 90 | Smelt: | | | |
| Cod: | | | | Large | (a) | 60 | 70 |
| Large | 6 -16 | 80 | 90 | Small | (b) | 50 | 60 |
| Small | 1 - 2 | 50 | 60 | Snapper, red: | | | |
| Croaker: | | | | Large | 10 -15 | 110 | 120 |
| Large | ¾- 1 | 90 | 100 | Small | 5- 6 | 90 | 100 |
| Small | ¼- ½ | 50 | 60 | Squeteague: | | | |
| Eel | 2 - 3½ | 100 | 110 | Large | 2½- 4 | 80 | 90 |
| Flounder: | | | | Medium | 2 | 60 | 70 |
| Large | 1 - 1¾ | 70 | 80 | Small | ¾- 2 | 50 | 60 |
| Small | ½- 1 | 50 | 60 | Striped bass: | | | |
| Haddock: | | | | Large | 10-15 | 110 | 120 |
| Medium | 3 - 5 | 60 | 70 | Small | ¾- 1½ | 70 | 80 |
| Small | 1 - 2 | 50 | 60 | Sucker, medium | ½- 1½ | 80 | 90 |
| Halibut, medium | 50 -90 | 70 | 80 | Tilefish, medium | 6 -12 | 90 | 100 |
| Hickory shad, medium | 1½- 2 | 60 | 70 | Whiting, medium | ½- 1 | 50 | 60 |
| Hogfish | ¼ | 50 | 60 | | | | |
| Kingfish, medium | ½- 1 | 60 | 70 | | | | |

[a] From 5 to 7 to the pound. [b] From 15 to 20 to the pound.

Some experiments have recently been made to apply a known principle to the domestic canning of fish so as to obviate the necessity for employing a pressure cooker. The reference is to boiling the cans or jars in a saturated salt solution; that is, at 228° F. for a time. For this process, only apparatus usually found in the home, such as a wash boiler, is employed. By this method, the bones are softened satisfactorily and the fish thoroughly cooked, and difficulties in closing fruit jars to withstand the pressure created are overcome. Nearly 100 containers of glass and tin have been processed and some success has been attained. It is planned to make additional tests before recommending the use of the method to the public.

### DEVELOPMENT OF AQUATIC SOURCES OF LEATHER.

The Bureau has continued to cooperate effectively with tanners, fishermen, and others interested in the development of new sources of leather from the skins of aquatic animals. Among the advances to be recorded in this work during the past year the following may be mentioned: (1) The development of types of nets suitable for catching sharks and devices claimed to be satisfactory for quickly removing the hides from the fish; (2) progress in the development of methods suitable for tanning the hides of the smaller fishes on a commercial scale; (3) perfection of arrangements by tanners to engage in the industry; (4) establishment of connections with the fishing centers for supplies of raw materials; (5) preparations for the establishment at various points on our coasts of small plants for fishing for sharks, the flesh to be used for food, the liver oil to be extracted and marketed, the hides to be tanned into leather, and the refuse to be

used for fertilizer; and (6) experiments with leather made from fish skins to determine fitness for manufacture into shoes and other articles. The Bureau has also given assistance in expediting shipments of raw hides from producing centers to tanners.

A seine constructed for the Bureau, which has proved very successful for the capture of sharks up to 6 or 8 feet in length, is 600 yards long, 18 feet deep, with 4-inch bar mesh of 36 thread; top and bottom lines of one-half inch, 18-thread rope, fitted with seine corks 5 inches in diameter placed 2 feet apart on the cork line, and 4-ounce trap leads with the same interspace on lead line, the entire net being tarred. With this type of apparatus, from 50 to 200 sharks have been taken in a single day's fishing, and during the brief period in which two of these nets have been operated, approximately 2,000 sharks ranging in length from 3½ to 15 feet have been taken. For the purpose of taking the larger sharks a heavier net of larger mesh is required. One now under construction which the Bureau believes will prove satisfactory is 300 yards long, 12 feet deep, with 10-inch bar mesh of 60-thread tarred cotton twine hung on three-eighths inch 12-thread rope, fitted with haul-seine corks 4 inches in diameter placed 3 feet apart on cork line and 2-ounce round leads placed 6 feet apart on lead line.

Through the cooperation of the Bureau of Standards the services of a technically trained tanner were obtained, and some tanning experiments were started at a large tannery with the company's cooperation. The tanner remained in this work only a short time before entering the military service and the results accruing should be credited largely to the company. The experiments showed that shark skins could be tanned into upper leather for shoes by known methods of tanning and also that the shagreen could be removed from the skins very satisfactorily. To do this, the hides, after tanning and neutralizing, are first coated with paraffin and oil, tacked and dried. They are then smooth plated and shaved on the grain side to remove the coarest part of the denticles, and the grain is then gone over lightly on a rapidly revolving carborundum wheel. After this treatment the hides are ready for finishing. Some of the hides have been given a gun-metal finish suitable for shoes, others have been tanned for lining leather and as cordovan. The average tensile strength of two shark skins submitted to the Bureau was 3,905 and 4,742 pounds per square inch.

Owing to shortage of labor, transportation difficulties, and other drawbacks, progress in the development of this industry has been somewhat retarded. In fact, it has practically become necessary for the tanning companies to start fisheries of their own at various points along the coast to insure a supply of raw materials at the present time. With the increase in demand for shark meat and oil, the fishermen are showing increased interest in the fishery, and the outlook is regarded as promising.

### NEW ENGLAND VESSEL FISHERIES.

The vessel fisheries centering at Boston and Gloucester, Mass., and Portland, Me., have been in a prosperous condition during the past year. There was some decrease in the quantity of fishery products

landed, but a large increase in the value, as compared with the previous year. The decline in quantity occurred at Gloucester and Portland, while there was considerable increase over the previous year in the receipts at Boston. Statistics of these fisheries have been collected during the year by the local agents and published in monthly bulletins showing by species and fishing grounds the quantities and values of fishery products landed by American fishing vessels at these ports. Two annual bulletins also have been issued, one showing the catch by months, and the other by fishing grounds.

The fishing fleet which landed fishery products at these ports during the calendar year 1917 included 493 sail, steam, and gasoline screw vessels. These vessels landed at Boston 2,962 trips, aggregating 98,650,139 pounds of fish, valued at $5,166,440; at Gloucester, 3,074 trips, aggregating 58,134,944 pounds, valued at $2,451,484; at Portland, 3,248 trips, aggregating 18,645,503 pounds, valued at $743,408. The total for the three ports amounted to 9,284 trips, aggregating 175,430,586 pounds of fresh and salted fish, having a value to the fishermen of $8,361,332. Compared with the previous year there was an increase of 339 trips, and a decrease of 10,393,839 pounds, or 5.59 per cent, in the quantity, with an increase of $1,977,426, or 30.97 per cent, in the value of the fish landed. The catch of haddock decreased 7,000,957 pounds, hake 5,257,653 pounds, pollock, 1,095,838 pounds, cusk, 2,518,994 pounds, halibut 1,692,701 pounds, herring 5,494,676 pounds, and miscellaneous products 2,232,214 pounds, but all of these species except cusk, halibut, herring, and the miscellaneous products increased in value. The catch of Newfoundland herring decreased 4,462,479 pounds, or 39.58 per cent, in quantity, and $98,202, or 30.12 per cent in value. The cod catch increased 12,823,966 pounds, or 29.39 per cent, in quantity, and $813,952, or 52.28 per cent, in value, and the mackerel catch 1,535,714 pounds, or 9.65 per cent, in quantity and $404,831, or 38.58 per cent, in value. There was also an increase in the catch of swordfish of 201,206 pounds, or 11.35 per cent, in quantity, and $53,890, or 22.61 per cent, in value. The catch of tilefish landed at Boston during the year amounted to 1,211,450 pounds, valued at $44,743, an increase over the previous year of 338,308 pounds, or 38.74 per cent, in quantity and $20,448, or 84.16 per cent, in value.

The following tables present in detail, by fishing grounds and by months, the products of the vessel fisheries of Boston and Gloucester, Mass., and Portland, Me., for the calendar year 1917. The weights of fresh and salted fish given in these statistics represent the fish as landed from the vessels, and the values are those received by the fishermen. The grades, or sizes, given for certain species are those recognized in the trade.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS.

| Fishing grounds. | Number of trips. | Cod. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Large (10 pounds and over). | | | | Market (under 10 and over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | |
| | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | | | | | | | | | | | | | |
| *East of 66° west longitude.* | | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| La Have Bank | 21 | 271,580 | $16,756 | | | 203,311 | $8,419 | | | 31,960 | $642 | | |
| Western Bank | 172 | 2,538,097 | 150,585 | | | 2,322,057 | 104,093 | | | 164,664 | 4,027 | | |
| Quereau Bank | 11 | 63,850 | 3,110 | | | 40,100 | 1,345 | | | | | | |
| Grand Bank | 1 | | | | | | | | | | | | |
| St. Peters Bank | 4 | 31,525 | 1,662 | | | 37,130 | 1,149 | | | 2,100 | 33 | | |
| Cape Shore | 94 | 300,361 | 20,019 | | | 378,038 | 14,830 | | | 151,450 | 2,943 | | |
| St. Anns Bank | 1 | 30,100 | 1,505 | | | 22,600 | 678 | | | 2,250 | 34 | | |
| *West of 66° west longitude.* | | | | | | | | | | | | | |
| Browns Bank | 160 | 1,287,960 | 75,151 | | | 1,502,859 | 57,567 | | | 242,845 | 4,769 | | |
| Georges Bank | 481 | 3,271,229 | 191,520 | | | 3,297,689 | 133,751 | | | 291,210 | 6,868 | | |
| Cashes Bank | 11 | 32,440 | 1,632 | | | 20,205 | 789 | | | 5,685 | 108 | | |
| Fippenies Bank | 6 | 37,470 | 2,547 | | | 16,455 | 766 | | | 5,830 | 160 | | |
| Middle Bank | 162 | 104,197 | 8,053 | | | 96,154 | 6,347 | | | 33,419 | 857 | | |
| Jeffreys Ledge | 516 | 276,544 | 20,428 | | | 248,510 | 13,592 | | | 69,140 | 1,749 | | |
| Ipswich Bay | 2 | 175 | 15 | | | 460 | 28 | | | 200 | 4 | | |
| South Channel | 251 | 811,777 | 51,097 | | | 1,011,060 | 46,269 | | | 272,820 | 5,664 | | |
| Nantucket Shoals | 47 | 141,620 | 10,556 | | | 552,699 | 25,448 | | | 48,415 | 1,119 | | |
| Off Chatham | 606 | 1,968,538 | 119,555 | | | 2,015,108 | 87,160 | | | 507,869 | 10,071 | | |
| Off Race Point | 26 | 1,000 | 50 | | | 790 | 40 | | | 175 | 5 | | |
| Bay of Fundy | 1 | 11,900 | 397 | | | 3,500 | 105 | | | 500 | 8 | | |
| South Shore, general | 39<br>350 | 185,853 | 10,477 | | | 136,343 | 5,563 | | | 42,274 | 947 | | |
| Total | 2,962 | 11,366,216 | 685,115 | | | 11,905,068 | 507,939 | | | 1,872,806 | 40,008 | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | | | | |
| La Have Bank | 6 | 115,510 | 3,375 | 6,960 | $348 | 30,690 | 810 | 3,455 | $155 | 500 | 5 | | |
| Western Bank | 20 | 506,489 | 15,929 | 109,433 | 5,566 | 538,345 | 15,851 | 198,320 | 9,315 | 133,225 | 1,489 | 21,620 | $804 |
| Quereau Bank | 144 | 5,464,522 | 160,241 | 2,347,016 | 121,556 | 8,812,975 | 232,222 | 3,038,226 | 144,335 | 253,866 | 3,165 | 253,496 | 9,301 |
| Green Bank | 1 | | | 8,000 | 420 | | | 1,740 | 78 | | | | |
| Grand Bank | 17 | 392,490 | 11,957 | 301,305 | 15,725 | 23,815 | 695 | 43,985 | 1,903 | 50 | 2 | 960 | 30 |
| Bacalieu Bank | 1 | 62,735 | 1,882 | 36,000 | 1,800 | 2,525 | 69 | 1,540 | 69 | | | | |
| Off Newfoundland | 27 | 20,528 | 551 | 30,635 | 1,582 | 6,380 | 153 | 11,460 | 516 | | | | |
| Cape North | 2 | 95,200 | 2,973 | 37,480 | 1,874 | 41,795 | 1,079 | 16,360 | 736 | 5,770 | 75 | 1,140 | 34 |
| Cape Shore | 41 | 130,797 | 4,537 | 4,120 | 206 | 74,482 | 2,068 | 6,230 | 218 | 7,585 | 89 | 1,750 | 44 |
| The Gully | 8 | 268,130 | 8,195 | 8,120 | 390 | 36,307 | 1,000 | 2,989 | 119 | | | 180 | 5 |
| *West of 66° west longitude.* | | | | | | | | | | | | | |
| Browns Bank | 16 | 380,730 | 12,353 | | | 296,560 | 8,287 | | | 12,960 | 129 | | |
| Georges Bank | 33 | 574,537 | 19,599 | 5,512 | 289 | 169,391 | 4,997 | 3,074 | 129 | 5,850 | 79 | 260 | 8 |
| Middle Bank | 1 | | | | | | | | | | | | |
| South Channel | 2 | 41,670 | 1,399 | | | 28,729 | 862 | | | 485 | 5 | | |
| Nantucket Shoals | 214 | 94,260 | 2,580 | | | 99,435 | 2,468 | | | | | | |
| Off Chatham | 34 | | | | | | | | | | | | |
| Seal Island | 2 | 18,430 | 645 | | | 6,717 | 201 | | | | | | |
| Shore, general | 2,505 | 1,817,823 | 111,204 | | | | | | | | | | |
| Total | 3,074 | 9,983,851 | 357,420 | 2,894,581 | 149,756 | 10,168,146 | 270,762 | 3,327,379 | 157,573 | 420,291 | 5,038 | 279,406 | 10,226 |
| LANDED AT PORTLAND. | | | | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | | | | |
| La Have Bank | 1 | 1,000 | 60 | | | 900 | 45 | | | | | | |
| Western Bank | 22 | 980,100 | 32,286 | 22,000 | 1,210 | 88,350 | 2,978 | 5,000 | 238 | 1,965 | 36 | | |
| Quereau Bank | 2 | 3,000 | 90 | 2,180 | 131 | 87,000 | 2,610 | 1,610 | 81 | | | | |
| Grand Bank | 5 | 5,000 | 94 | 39,240 | 2,158 | | | 2,295 | 109 | | | | |
| St. Peters Bank | 1 | | | | | | | | | | | | |
| Bacalieu Bank | 1 | | | | | | | | | | | | |
| *West of 66° west longitude.* | | | | | | | | | | | | | |
| Browns Bank | 2 | 10,410 | 554 | | | 3,370 | 94 | | | 360 | 7 | | |
| Georges Bank | 4 | 8,740 | 274 | | | 11,865 | 354 | | | | | | |
| Cashes Bank | 45 | 51,475 | 2,155 | | | 48,108 | 1,436 | | | 12,985 | 215 | | |
| Platts Bank | 5 | 4,570 | 353 | | | 6,580 | 387 | | | 1,795 | 45 | | |
| Jeffreys Ledge | 87 | 37,327 | 2,715 | | | 42,265 | 2,182 | | | 14,942 | 411 | | |
| South Channel | 3 | 55,000 | 1,925 | | | | | | | | | | |
| Bay of Fundy | 1 | 1,985 | 75 | | | 2,315 | 69 | | | 250 | 4 | | |
| Shore, general | 3,069 | 1,294,352 | 81,448 | | | 1,095,722 | 42,530 | | | 284,728 | 7,638 | | |
| Total | 3,248 | 2,452,959 | 122,029 | 63,420 | 3,499 | 1,386,475 | 52,685 | 8,905 | 428 | 317,025 | 8,356 | | |
| Grand total | 9,284 | 23,803,026 | 1,164,564 | 2,958,001 | 153,255 | 23,459,689 | 831,386 | 3,336,284 | 158,001 | 2,610,122 | 53,402 | 279,406 | 10,226 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

| Fishing Grounds. | Haddock. | | | | | | | | Hake. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | | Large (6 pounds and over). | | | | Small (under 6 pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | | | | | | | | | | | | | | | | |
| *East of 66° west longitude.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| La Have Bank | 296,206 | $17,595 | ..... | ..... | 85,610 | $2,994 | ..... | ..... | 90,030 | $4,497 | ..... | ..... | 149,555 | $4,468 | ..... | ..... |
| Western Bank | 8,025,694 | 423,282 | ..... | ..... | 4,440,717 | 150,069 | ..... | ..... | 14,994 | 778 | ..... | ..... | 80,366 | 3,392 | ..... | ..... |
| Quereau Bank | 32,350 | 988 | ..... | ..... | 950 | 23 | ..... | ..... | ..... | ..... | ..... | ..... | 12,000 | 420 | ..... | ..... |
| St. Peters Bank | 87,265 | 4,499 | ..... | ..... | 9,155 | 147 | ..... | ..... | 5,400 | 270 | ..... | ..... | 4,700 | 204 | ..... | ..... |
| Cape Shore | 1,630,585 | 85,437 | ..... | ..... | 265,947 | 6,623 | ..... | ..... | 70,265 | 3,659 | ..... | ..... | 84,780 | 3,076 | ..... | ..... |
| St. Anns Bank | 13,300 | 665 | ..... | ..... | 1,000 | 15 | ..... | ..... | ..... | ..... | ..... | ..... | 70 | 4 | ..... | ..... |
| *West of 66° west longitude.* | | | | | | | | | | | | | | | | |
| Browns Bank | 3,589,990 | 176,215 | ..... | ..... | 663,860 | 18,039 | ..... | ..... | 47,110 | 2,324 | ..... | ..... | 116,230 | 4,277 | ..... | ..... |
| Georges Bank | 4,260,092 | 196,926 | ..... | ..... | 1,718,895 | 61,694 | ..... | ..... | 38,350 | 1,661 | ..... | ..... | 50,395 | 1,939 | ..... | ..... |
| Cashes Bank | 13,385 | 720 | ..... | ..... | 610 | 20 | ..... | ..... | 19,625 | 1,348 | ..... | ..... | 87,098 | 3,763 | ..... | ..... |
| Fippenies Bank | 23,230 | 642 | ..... | ..... | 4,735 | 194 | ..... | ..... | 3,550 | 205 | ..... | ..... | 7,400 | 335 | ..... | ..... |
| Middle Bank | 484,402 | 36,984 | ..... | ..... | 51,851 | 2,158 | ..... | ..... | 104,780 | 7,555 | ..... | ..... | 477,285 | 21,462 | ..... | ..... |
| Jeffreys Ledge | 1,846,918 | 128,250 | ..... | ..... | 328,796 | 15,367 | ..... | ..... | 181,437 | 13,643 | ..... | ..... | 1,007,251 | 51,557 | ..... | ..... |
| South Channel | 7,108,997 | 352,413 | ..... | ..... | 2,834,585 | 99,300 | ..... | ..... | 184,819 | 9,154 | ..... | ..... | 428,096 | 16,787 | ..... | ..... |
| Nantucket Shoals | 101,775 | 6,683 | ..... | ..... | 8,625 | 351 | ..... | ..... | 2,445 | 153 | ..... | ..... | 7,020 | 311 | ..... | ..... |
| Off Chatham | 6,355,050 | 346,792 | ..... | ..... | 1,048,924 | 37,810 | ..... | ..... | 195,820 | 10,173 | ..... | ..... | 477,467 | 20,632 | ..... | ..... |
| Off Race Point | 1,875 | 94 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 | 9 | ..... | ..... |
| Bay of Fundy | 5,135 | 154 | ..... | ..... | ..... | ..... | ..... | ..... | 89,000 | 2,670 | ..... | ..... | ..... | ..... | ..... | ..... |
| Shore, general | 166,048 | 9,887 | ..... | ..... | 10,055 | 407 | ..... | ..... | 266,844 | 14,789 | ..... | ..... | 675,853 | 25,025 | ..... | ..... |
| Total | 34,042,297 | 1,788,206 | ..... | ..... | 11,474,315 | 395,211 | ..... | ..... | 1,314,469 | 72,879 | ..... | ..... | 3,665,866 | 157,661 | ..... | ..... |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LANDED AT GLOUCESTER.** | | | | | | | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | | | | | | | |
| La Have Bank | 25,410 | 607 | 475 | $14 | | | | | 81,505 | 1,956 | | | | | | |
| Western Bank | 178,318 | 5,282 | 748 | 22 | 3,150 | 95 | | | 174,920 | 4,199 | 3,350 | $179 | | | | |
| Quereau Bank | 1,238,764 | 24,199 | 144,820 | 4,439 | 8,820 | 47 | | | 151,920 | 3,599 | 58,292 | 1,745 | | | | |
| Green Bank | | | | | | | | | 17,834 | 492 | | | | | | |
| Grand Bank | 735 | 15 | 4,285 | 149 | | | 600 | $16 | 57,375 | 1,443 | 6,650 | 200 | | | | |
| Off Newfoundland | | | 120 | 4 | | | | | 15,277 | 404 | 3,415 | 102 | | | | |
| Cape North | 20,560 | 411 | 8,850 | 266 | | | | | 450 | 9 | | | | | | |
| Cape Shore | 96,375 | 4,369 | 55 | 2 | | | | | 13,980 | 359 | 20 | 1 | | | | |
| The Gully | 615 | 12 | | | | | | | 107,785 | 2,495 | 475 | 14 | 1,570 | 56 | | |
| *West of 66° west longitude.* | | | | | | | | | | | | | | | | |
| Browns Bank | 66,830 | 1,336 | | | 52,745 | 557 | | | 3,260 | 66 | | | | | | |
| Georges Bank | 13,045 | 261 | 140 | 3 | | | | | 25,195 | 555 | | | | | | |
| South Channel | 85 | 2 | | | | | | | | | | | | | | |
| Nantucket Shoals | 11,325 | 227 | | | | | | | 11,130 | 273 | | | | | | |
| Seal Island | 350 | 7 | | | | | | | 1,587 | 32 | | | | | | |
| Shore, general | 932,775 | 56,249 | | | | | | | 71,588 | 5,673 | | | | | | |
| Total | 2,585,187 | 92,977 | 159,493 | 4,899 | 64,715 | 699 | 600 | 16 | 733,856 | 21,555 | 72,202 | 2,241 | 1,570 | 56 | | |
| **LANDED AT PORTLAND.** | | | | | | | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | | | | | | | |
| La Have Bank | | | | | | | | | | | | | 4,070 | 163 | | |
| Western Bank | 3,083,385 | 107,989 | | | 38,540 | 1,288 | | | 125 | 6 | | | 15,375 | 477 | | |
| Quereau Bank | | | | | | | | | 2,500 | 75 | 580 | 17 | 2,500 | 50 | | |
| Grand Bank | | | | | | | | | 4,650 | 70 | | | | | 580 | $16 |
| *West of 66° west longitude.* | | | | | | | | | | | | | | | | |
| Browns Bank | 110 | 2 | | | | | | | | | | | 545 | 15 | | |
| Georges Bank | 35,500 | 1,065 | | | 52,000 | 1,560 | | | | | | | 40,860 | 1,372 | | |
| Cashes Bank | 13,535 | 805 | | | 4,155 | 136 | | | 16,903 | 736 | | | 9,249 | 408 | | |
| Platts Bank | 5,787 | 464 | | | 622 | 31 | | | 1,155 | 81 | | | 161,642 | 6,733 | | |
| Jeffreys Ledge | 257,014 | 19,228 | | | 30,365 | 1,247 | | | 39,677 | 2,633 | | | | | | |
| South Channel | 397,800 | 14,151 | | | 45,500 | 1,365 | | | | | | | | | | |
| Bay of Fundy | 150 | 5 | | | | | | | 7,100 | 284 | | | 11,410 | 349 | | |
| Shore, general | 1,188,487 | 82,075 | | | 75,278 | 3,285 | | | 302,545 | 18,642 | 300 | 17 | 1,503,488 | 54,779 | 1,429 | 70 |
| Total | 4,981,768 | 225,784 | | | 246,460 | 8,910 | | | 374,655 | 22,527 | 880 | 34 | 1,749,139 | 64,346 | 2,009 | 86 |
| Grand total | 41,609,252 | 2,106,967 | 159,493 | 4,899 | 11,785,490 | 404,820 | 600 | 16 | 2,422,980 | 116,961 | 73,082 | 2,275 | 5,416,575 | 222,063 | 2,009 | 86 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Pollock. | | | | Cusk. | | | | Halibut. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | | | | | | | | | | | | |
| *East of 66° west longitude.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| La Have Bank | 27,015 | $862 | | | 116,605 | $4,054 | | | 9,682 | $1,789 | | |
| Western Bank | 453,212 | 17,737 | | | 42,825 | 1,370 | | | 56,409 | 11,606 | | |
| Quereau Bank | 1,125 | 33 | | | 22,245 | 730 | | | 111,291 | 15,190 | | |
| Grand Bank | | | | | | | | | 46,000 | 3,680 | | |
| St. Peters Bank | 300 | 11 | | | | | | | 5,010 | 1,163 | | |
| Cape Shore | 26,560 | 937 | | | 152,599 | 5,302 | | | 12,438 | 2,557 | | |
| *West of 66° west longitude.* | | | | | | | | | | | | |
| Browns Bank | 220,352 | 9,185 | | | 707,848 | 23,120 | | | 96,028 | 17,309 | | |
| Georges Bank | 517,856 | 21,699 | | | 118,452 | 4,075 | | | 58,940 | 10,378 | | |
| Cashes Bank | 13,305 | 466 | | | 81,940 | 2,857 | | | 618 | 110 | | |
| Fippenies Bank | 21,190 | 859 | | | 51,345 | 1,910 | | | 1,747 | 365 | | |
| Middle Bank | 195,741 | 8,172 | | | 118,383 | 4,555 | | | 1,018 | 303 | | |
| Jeffreys Ledge | 918,088 | 43,916 | | | 337,293 | 13,409 | | | 10,080 | 1,890 | | |
| Ipswich Bay | 6,390 | 392 | | | | | | | | | | |
| South Channel | 281,356 | 12,768 | | | 43,940 | 1,553 | | | 33,078 | 5,473 | | |
| Nantucket Shoals | 30,863 | 1,370 | | | 8,315 | 338 | | | 4,516 | 676 | | |
| Off Chatham | 931,159 | 44,566 | | | 95,940 | 3,151 | | | 37,826 | 6,692 | | |
| Off Race Point | 1,590 | 80 | | | | | | | | | | |
| Bay of Fundy | 1,100 | 17 | | | 9,650 | 228 | | | 600 | 120 | | |
| Shore, general | 361,077 | 15,474 | | | 144,668 | 4,764 | | | 5,197 | 740 | | |
| Total | 4,008,279 | 178,544 | | | 2,052,048 | 71,416 | | | 490,478 | 80,041 | | |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | | | |
| La Have Bank | 2,640 | 46 | | | 146,575 | 3,303 | | | 92,655 | 11,375 | | |
| Western Bank | 12,835 | 237 | 2,651 | $80 | 98,790 | 2,296 | 95 | $4 | 59,833 | 6,126 | 786 | $45 |
| Quereau Bank | 121,788 | 2,204 | 34,457 | 1,050 | 28,027 | 677 | 13,970 | 400 | 194,842 | 16,134 | 27,017 | 2,029 |
| Green Bank | | | 647 | 19 | 1,200 | 29 | | | 45,000 | 6,350 | 45 | 5 |
| Grand Bank | 1,475 | 28 | 275 | 8 | 22,492 | 522 | 5,815 | 188 | 165,647 | 14,112 | 12,380 | 1,354 |
| Bacalieu Bank | | | | | | | | | 12,475 | 1,115 | 16 | 1 |
| Off Newfoundland | 3,250 | 57 | 600 | 18 | | | | | 8,730 | 1,020 | 130 | 6 |
| Cape North | | | | | | | | | 5,550 | 301 | 1,990 | 164 |
| Cape Shore | 8,822 | 161 | 240 | 7 | 42,870 | 922 | 475 | 14 | | | | |
| The Gully | 4,305 | 78 | 400 | 10 | 30,725 | 716 | 50 | 2 | 138,404 | 18,091 | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *West of 66° west longitude.* | | | | | | | | | | | | |
| Browns Bank | 9,045 | 166 | | | 37,730 | 684 | | | | | | |
| Georges Bank | 11,543 | 205 | 600 | 12 | 80,075 | 1,867 | | | 168,134 | 19,441 | | |
| Nantucket Shoals | 1,310 | 23 | | | 29,350 | 692 | | | 2,830 | 213 | | |
| Seal Island | 1,020 | 19 | | | 59,314 | 1,113 | | | 13,670 | 2,095 | | |
| Shore, general | 8,959,626 | 350,895 | | | | | | | | | | |
| Total | 9,137,659 | 354,119 | 39,870 | 1,204 | 577,148 | 12,821 | 20,405 | 608 | 907,770 | 96,373 | 42,364 | 3,604 |
| LANDED AT PORTLAND. | | | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | | | |
| La Have Bank | 325 | 13 | | | 1,125 | 45 | | | 23,766 | 3,995 | | |
| Western Bank | 60,625 | 1,108 | | | 21,130 | 505 | | | 65,319 | 8,667 | | |
| Quereau Bank | 395 | 12 | | | | | | | 19,697 | 1,917 | | |
| Grand Bank | 940 | 13 | | | | | | | 131,541 | 13,018 | | |
| St. Peters Bank | | | | | | | | | 35,818 | 5,903 | | |
| Bacalieu Bank | | | | | | | | | 24,170 | 2,970 | | |
| *West of 66° west longitude.* | | | | | | | | | | | | |
| Browns Bank | 1,965 | 40 | | | 540 | 19 | | | 1,458 | 292 | | |
| Georges Bank | 1,985 | 59 | | | 3,980 | 100 | | | 432 | 65 | | |
| Cashes Bank | 17,759 | 467 | | | 208,607 | 5,946 | | | 2,435 | 359 | | |
| Platts Bank | 3,739 | 145 | | | 11,850 | 478 | | | 147 | 21 | | |
| Jeffreys Ledge | 37,367 | 1,525 | | | 90,685 | 3,927 | 1,055 | 21 | 3,033 | 343 | | |
| South Channel | 3,265 | 41 | | | | | | | 3,414 | 222 | | |
| Bay of Funday | 250 | 5 | | | 6,950 | 177 | | | 16 | 2 | | |
| Shore, general | 1,192,957 | 41,961 | 412 | 12 | 551,335 | 23,001 | 2,445 | 50 | 14,206 | 1,440 | | |
| Total | 1,321,572 | 45,389 | 412 | 12 | 896,202 | 34,198 | 3,500 | 71 | 325,452 | 39,214 | | |
| Grand total | 14,467,510 | 578,052 | 40,282 | 1,216 | 3,525,398 | 118,435 | 23,905 | 679 | 1,723,700 | 215,628 | 42,364 | 3,604 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Mackerel. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2½ pounds). | | | | Medium (1½ to 2½ pounds). | | | | Small (under 1½ pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | | | | | | | | | | | | |
| *East of 66° west longitude.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Western Bank | 15,000 | $1,650 | | | 82,345 | $9,491 | | | | | | |
| Cape Shore | 1,739,227 | 91,563 | 173,700 | $10,497 | 221,663 | 8,966 | | | | | | |
| *West of 66° west longitude.* | | | | | | | | | | | | |
| Georges Bank | 394,160 | 33,550 | 43,400 | 4,288 | 46,326 | 2,134 | | | | | | |
| Middle Bank | 211,696 | 21,993 | 1,400 | 210 | 224,460 | 28,030 | | | | | | |
| South Channel | 8,200 | 1,057 | | | | | | | | | 3,600 | $504 |
| Nantucket Shoals | 106,205 | 10,300 | | | 43,265 | 2,112 | | | | | 48,800 | 5,480 |
| Off Chatham | 1,588,407 | 121,141 | | | 1,076,918 | 76,343 | | | 638,614 | $47,420 | 146,200 | 15,529 |
| Off Race Point | 232,489 | 25,212 | | | 376,827 | 40,396 | | | 12,435 | 1,119 | | |
| South | 8,899 | 1,022 | | | 880 | 62 | | | | | | |
| Shore, general | 1,535,518 | 127,837 | 1,400 | 210 | 501,862 | 43,617 | 3,600 | $270 | 282,050 | 24,707 | 73,410 | 6,884 |
| Total | 5,839,801 | 435,325 | 219,900 | 15,205 | 2,574,546 | 211,151 | 3,600 | 270 | 933,099 | 73,246 | 272,010 | 28,397 |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | | | |
| Cape North | 65,715 | 4,303 | 495,300 | 36,299 | 76,517 | 4,709 | 714,800 | 51,806 | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *West of 66° west longitude.* | | | | | | | | | | | | |
| Georges Bank | | | | | | | 79,000 | 8,460 | | | | |
| Middle Bank | | | 54,200 | 8,808 | | | | | | | | |
| Nantucket Shoals | 33,710 | 2,360 | 536,200 | 82,078 | 378,252 | 18,728 | 824,389 | 99,906 | 997,684 | 49,379 | 1,736,427 | 202,102 |
| Off Chatham | | | | | 26,650 | 536 | 50,725 | 5,224 | 179,733 | 8,173 | 88,495 | 8,455 |
| Shore, general | 123,000 | 7,247 | 216,000 | 29,461 | 36,167 | 1,827 | 100,040 | 9,074 | 154,513 | 7,000 | 19,160 | 1,017 |
| Total | 227,425 | 13,910 | 1,301,700 | 156,646 | 517,586 | 25,800 | 1,768,954 | 174,470 | 1,331,930 | 64,552 | 1,844,082 | 211,574 |
| LANDED AT PORTLAND. | | | | | | | | | | | | |
| *West of 66° west longitude.* | | | | | | | | | | | | |
| Shore, general | 450,840 | 34,167 | | | 101,885 | 7,442 | | | 54,705 | 1,964 | | |
| Total | 450,840 | 34,167 | | | 101,885 | 7,442 | | | 54,705 | 1,964 | | |
| Grand total | 6,518,066 | 483,402 | 1,521,600 | 171,851 | 3,194,017 | 244,393 | 1,772,554 | 174,740 | 2,319,734 | 139,762 | 2,116,092 | 239,971 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Miscellaneous. | | | | Total. | | | | Grand total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | | |
| LANDED AT BOSTON. | | | | | | | | | | |
| *East of 66° west longitude.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| La Have Bank | 19,465 | $817 | | | 1,301,019 | $62,893 | | | 1,301,019 | $62,893 |
| Western Bank | 106,769 | 5,481 | | | 18,343,149 | 883,561 | | | 18,343,149 | 883,561 |
| Quereau Bank | | | | | 283,911 | 21,839 | | | 283,911 | 21,839 |
| Grand Bank | | | | | 46,000 | 3,680 | | | 46,000 | 3,680 |
| St. Peters Bank | 2,000 | 40 | | | 184,585 | 9,178 | | | 184,585 | 9,178 |
| Cape Shore | 23,321 | 2,079 | | | 5,057,234 | 247,991 | 173,700 | $10,497 | 5,230,934 | 258,488 |
| St. Anns Bank | | | | | 69,320 | 2,901 | | | 69,320 | 2,901 |
| *West of 66° west longitude.* | | | | | | | | | | |
| Browns Bank | 88,808 | 4,756 | | | 8,563,890 | 392,712 | | | 8,563,890 | 392,712 |
| Georges Bank | 2,162,938 | 284,996 | | | 16,226,532 | 951,191 | 43,400 | 4,288 | 16,269,932 | 955,479 |
| Cashes Bank | 9,925 | 284 | | | 284,836 | 12,097 | | | 284,836 | 12,097 |
| Fippenies Bank | 4,425 | 99 | | | 177,377 | 8,082 | | | 177,377 | 8,082 |
| Middle Bank | 101,617 | 3,361 | | | 2,205,003 | 149,830 | 1,400 | 210 | 2,206,403 | 150,040 |
| Jeffreys Ledge | 483,961 | 12,660 | | | 5,708,018 | 316,461 | | | 5,708,018 | 316,461 |
| Ipswich Bay | 1,365 | 66 | | | 8,590 | 505 | | | 8,590 | 505 |
| South Channel | 727,646 | 25,827 | | | 13,746,374 | 627,362 | 3,600 | 504 | 13,749,974 | 627,866 |
| Nantucket Shoals | 52,994 | 1,437 | | | 1,108,757 | 60,854 | 48,800 | 5,480 | 1,157,557 | 66,334 |
| Off Chatham | 686,679 | 17,110 | | | 17,624,319 | 948,616 | 146,200 | 15,529 | 17,770,519 | 964,145 |
| Off Race Point | 2,230 | 176 | | | 629,711 | 67,181 | | | 629,711 | 67,181 |
| Bay of Fundy | 1,700 | 136 | | | 123,085 | 3,835 | | | 123,085 | 3,835 |
| South | [a]1,211,450 | 44,743 | | | 1,221,229 | 45,827 | | | 1,221,229 | 45,827 |
| Shore, general | 928,048 | 21,758 | | | 5,241,690 | 305,972 | 78,410 | 7,364 | 5,320,100 | 313,336 |
| Total | 6,615,341 | 425,826 | | | 98,154,629 | 5,122,568 | 495,510 | 43,872 | 98,650,139 | 5,166,440 |
| LANDED AT GLOUCESTER. | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | |
| La Have Bank | | | | | 495,485 | 21,477 | 10,890 | 517 | 506,375 | 21,994 |
| Western Bank | | | | | 1,705,905 | 51,504 | 337,003 | 16,015 | 2,042,908 | 67,519 |
| Quereau Bank | | | | | 16,275,524 | 442,488 | 5,917,294 | 284,855 | 22,192,818 | 727,343 |
| Green Bank | | | | | 64,084 | 6,871 | 10,432 | 522 | 74,516 | 7,393 |
| Grand Bank | | | | | 664,079 | 28,774 | 376,255 | 19,573 | 1,040,334 | 48,347 |
| Bacalieu Bank | | | | | 77,735 | 3,066 | 37,556 | 1,870 | 115,291 | 4,936 |
| Off Newfoundland | [b]487,946 | 15,484 | [b]6,321,810 | $212,317 | 542,111 | 17,669 | 6,368,170 | 214,545 | 6,910,281 | 232,214 |
| Cape North | | | | | 169,325 | 4,848 | 65,820 | 3,074 | 235,145 | 7,922 |
| Cape Shore | | | | | 517,143 | 21,517 | 1,222,990 | 88,597 | 1,740,133 | 110,114 |
| The Gully | | | | | 587,841 | 30,643 | 12,214 | 540 | 600,055 | 31,183 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *West of 66° west longitude.* | | | | | | | | | | |
| Browns Bank | | | | | 859,860 | 23,578 | | | 859,860 | 23,578 |
| Georges Bank | | | | | 1,047,770 | 47,004 | 88,586 | 8,901 | 1,136,356 | 55,905 |
| Middle Bank | | | | | | | 54,200 | 8,808 | 54,200 | 8,808 |
| South Channel | | | | | 70,969 | 2,268 | | | 70,969 | 2,268 |
| Nantucket Shoals | | | | | 1,659,286 | 76,943 | 3,097,016 | 384,086 | 4,756,302 | 461,029 |
| Off Chatham | | | | | 206,383 | 8,709 | 139,220 | 13,679 | 345,603 | 22,388 |
| Seal Island | | | | | 101,088 | 4,112 | | | 101,088 | 4,112 |
| Shore, general | 2,917,018 | 34,784 | | | 15,017,510 | 574,879 | 335,200 | 39,552 | 15,352,710 | 614,431 |
| Total | 3,404,964 | 50,268 | 6,321,810 | 212,317 | 40,062,098 | 1,366,350 | 18,072,846 | 1,085,134 | 58,134,944 | 2,451,484 |
| LANDED AT PORTLAND. | | | | | | | | | | |
| *East of 66° west longitude.* | | | | | | | | | | |
| La Have Bank | 520 | 99 | | | 31,706 | 4,420 | | | 31,706 | 4,420 |
| Western Bank | 25,877 | 2,146 | | | 4,380,791 | 157,484 | 27,000 | 1,448 | 4,407,791 | 158,932 |
| Quereau Bank | 9,795 | 156 | | | 124,887 | 4,910 | 4,370 | 229 | 129,257 | 5,139 |
| Grand Bank | 24 | 1 | | | 142,155 | 13,196 | 42,115 | 2,283 | 184,270 | 15,479 |
| St. Peters Bank | | | | | 35,818 | 5,903 | | | 35,818 | 5,903 |
| Bacalieu Bank | | | | | 24,170 | 2,970 | | | 24,170 | 2,970 |
| *West of 66° west longitude.* | | | | | | | | | | |
| Browns Bank | 13,392 | 1,936 | | | 31,605 | 2,944 | | | 31,605 | 2,944 |
| Georges Bank | 33,803 | 4,791 | | | 148,850 | 8,283 | | | 148,850 | 8,283 |
| Cashes Bank | 283,767 | 3,097 | | | 700,589 | 16,724 | | | 700,589 | 16,724 |
| Platts Bank | 4,310 | 88 | | | 49,804 | 2,501 | | | 49,804 | 2,501 |
| Jeffreys Ledge | 189,788 | 2,492 | | | 904,105 | 43,436 | 1,055 | 21 | 905,160 | 43,457 |
| South Channel | | | | | 504,979 | 17,704 | | | 504,979 | 17,704 |
| Bay of Fundy | 400 | 16 | | | 30,826 | 986 | | | 30,826 | 986 |
| Shore, general | 3,345,564 | 57,445 | | | 11,456,092 | 457,817 | 4,586 | 149 | 11,460,678 | 457,966 |
| Total | 3,907,240 | 72,267 | | | 18,566,377 | 739,278 | 79,126 | 4,130 | 18,645,503 | 743,408 |
| Grand total | 13,927,545 | 548,361 | 6,321,810 | 212,317 | 156,783,104 | 7,228,196 | 18,647,482 | 1,133,136 | 175,430,586 | 8,361,332 |

[a] Tilefish.

[b] Herring. Other items under "Miscellaneous" include bluebacks, 63,438 pounds, value $706; bonito, 100 pounds, value $2; butterfish, 21,907 pounds, value $1,900; catfish or wolffish, 207,138 pounds, value $6,131; eels, 4,720 pounds, value $408; flounders, 1,279,721 pounds, value $44,936; grayfish, 6,100 pounds, value $41; herring, 6,328,808 pounds, value $70,813; horse mackerel, 3,500 pounds, value $90; redfish, 181,827 pounds, value $3,877; salmon, 448 pounds, value $84; shad, 153,393 pounds, value $8,146; sharks, 63,673 pounds, value $1,799; skates, 700,366 pounds, value $18,412; smelt, 50,686 pounds, value $4,914; sturgeon, 2,235 pounds, value $190; swordfish, 1,973,518 pounds, value $292,169; tomcod, 40 pounds, value $2; whiting, 1,300 pounds, value $27; porpoise, 400 pounds, value $2; lobster, 862 pounds, value $224; squid, 20,935 pounds, value $301; livers, 959,420 pounds, value $19,780; sounds, 53,335 pounds, value $3,805; spawn, 148,591 pounds, value $9,334; and tongues, 1,688 pounds, value $41.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS.

| Month. | Number of trips. | Cod. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Large (10 pounds and over). | | | | Market (under 10 and over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | |
| | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| | | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| LANDED AT BOSTON. | | | | | | | | | | | | | |
| January | 191 | 370,473 | $23,651 | ..... | ..... | 414,598 | $15,504 | ..... | ..... | 145,889 | $2,938 | ..... | ..... |
| February | 197 | 451,092 | 35,236 | ..... | ..... | 557,967 | 25,486 | ..... | ..... | 142,178 | 3,124 | ..... | ..... |
| March | 214 | 628,434 | 41,311 | ..... | ..... | 542,452 | 22,505 | ..... | ..... | 75,157 | 1,644 | ..... | ..... |
| April | 177 | 679,208 | 37,651 | ..... | ..... | 662,725 | 27,556 | ..... | ..... | 105,865 | 2,072 | ..... | ..... |
| May | 198 | 1,527,822 | 63,929 | ..... | ..... | 1,059,281 | 36,330 | ..... | ..... | 106,135 | 2,036 | ..... | ..... |
| June | 252 | 1,178,574 | 55,091 | ..... | ..... | 1,209,132 | 43,142 | ..... | ..... | 187,417 | 3,445 | ..... | ..... |
| July | 327 | 976,752 | 61,566 | ..... | ..... | 1,362,241 | 58,161 | ..... | ..... | 174,780 | 3,609 | ..... | ..... |
| August | 394 | 800,575 | 55,371 | ..... | ..... | 1,194,147 | 54,818 | ..... | ..... | 211,625 | 4,474 | ..... | ..... |
| September | 292 | 1,063,921 | 70,519 | ..... | ..... | 1,303,596 | 58,347 | ..... | ..... | 204,037 | 4,492 | ..... | ..... |
| October | 326 | 1,086,202 | 77,524 | ..... | ..... | 1,306,912 | 56,775 | ..... | ..... | 172,039 | 4,003 | ..... | ..... |
| November | 223 | 1,503,971 | 86,861 | ..... | ..... | 1,200,334 | 56,100 | ..... | ..... | 133,856 | 3,119 | ..... | ..... |
| December | 171 | 1,099,192 | 76,405 | ..... | ..... | 1,091,683 | 53,215 | ..... | ..... | 213,828 | 5,052 | ..... | ..... |
| Total | 2,962 | 11,366,216 | 685,115 | ..... | ..... | 11,905,068 | 507,939 | ..... | ..... | 1,872,806 | 40,008 | ..... | ..... |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | |
| January | 318 | 68,035 | 2,731 | 8,590 | $430 | 41,000 | 1,027 | 8,170 | $277 | 94,920 | 762 | 1,750 | $44 |
| February | 144 | 131,178 | 11,565 | 4,685 | 234 | 2,665 | 80 | 2,804 | 112 | ..... | ..... | 260 | 8 |
| March | 265 | 488,159 | 34,499 | 9,880 | 492 | 4,052 | 102 | 5,200 | 208 | ..... | ..... | 330 | 10 |
| April | 328 | 813,464 | 39,235 | ..... | ..... | 184,245 | 5,071 | ..... | ..... | 9,330 | 93 | ..... | ..... |
| May | 518 | 1,357,050 | 53,227 | 2,952 | 161 | 738,226 | 21,872 | 1,079 | 49 | 24,855 | 250 | ..... | ..... |
| June | 172 | 1,584,237 | 51,296 | 786,070 | 39,865 | 1,897,136 | 56,235 | 771,253 | 35,062 | 41,306 | 673 | 62,607 | 2,081 |
| July | 91 | 1,654,530 | 49,599 | 646,356 | 32,066 | 2,303,712 | 62,620 | 512,360 | 22,765 | 71,725 | 756 | 33,555 | 1,169 |
| August | 189 | 2,240,854 | 61,926 | 671,513 | 33,792 | 3,306,487 | 81,703 | 727,340 | 33,291 | 120,700 | 1,799 | 72,572 | 2,497 |
| September | 111 | 971,668 | 27,111 | 234,355 | 12,094 | 1,267,100 | 31,082 | 291,155 | 12,808 | 30,100 | 349 | 27,397 | 851 |
| October | 105 | 404,334 | 12,186 | 351,305 | 18,873 | 333,133 | 8,502 | 593,698 | 27,827 | 15,870 | 206 | 26,935 | 975 |
| November | 495 | 183,032 | 8,572 | 177,785 | 11,692 | 79,605 | 2,173 | 412,320 | 25,084 | 10,135 | 130 | 52,980 | 2,560 |
| December | 338 | 87,260 | 5,473 | 1,140 | 57 | 10,725 | 295 | 2,000 | 90 | 1,350 | 20 | 1,020 | 31 |
| Total | 3,074 | 9,983,851 | 357,420 | 2,894,581 | 149,756 | 10,168,146 | 270,762 | 3,327,379 | 157,573 | 420,291 | 5,038 | 279,406 | 10,226 |

| LANDED AT PORTLAND. | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 353 | 113,991 | 8,930 | ..... | ..... | 143,465 | 7,321 | ..... | ..... | 51,848 | 1,574 | ..... | ..... |
| February | 350 | 107,928 | 8,602 | ..... | ..... | 107,237 | 6,021 | ..... | ..... | 32,196 | 1,226 | ..... | ..... |
| March | 408 | 193,193 | 11,724 | 2,180 | 131 | 172,095 | 7,577 | 1,610 | 81 | 42,681 | 1,076 | ..... | ..... |
| April | 351 | 220,775 | 11,199 | ..... | ..... | 184,449 | 6,794 | ..... | ..... | 37,362 | 804 | ..... | ..... |
| May | 301 | 165,510 | 6,682 | ..... | ..... | 96,280 | 3,089 | ..... | ..... | 19,808 | 336 | ..... | ..... |
| June | 269 | 109,619 | 4,204 | 39,240 | 2,158 | 39,004 | 1,177 | 2,295 | 109 | 10,130 | 157 | ..... | ..... |
| July | 156 | 597,280 | 21,698 | 22,000 | 1,210 | 18,621 | 886 | 5,000 | 238 | 6,383 | 115 | ..... | ..... |
| August | 183 | 457,964 | 18,252 | ..... | ..... | 104,679 | 3,495 | ..... | ..... | 4,033 | 81 | ..... | ..... |
| September | 235 | 158,443 | 10,339 | ..... | ..... | 50,797 | 2,172 | ..... | ..... | 15,907 | 328 | ..... | ..... |
| October | 160 | 204,065 | 9,704 | ..... | ..... | 301,381 | 3,747 | ..... | ..... | 20,285 | 492 | ..... | ..... |
| November | 289 | 64,429 | 5,270 | ..... | ..... | 79,563 | 4,512 | ..... | ..... | 34,008 | 881 | ..... | ..... |
| December | 193 | 59,762 | 5,425 | ..... | ..... | 88,904 | 5,894 | ..... | ..... | 42,384 | 1,286 | ..... | ..... |
| Total | 3,248 | 2,452,959 | 122,029 | 63,420 | 3,499 | 1,386,475 | 52,685 | 8,905 | 428 | 317,025 | 8,356 | ..... | ..... |
| Grand total | 9,284 | 23,803,026 | 1,164,564 | 2,958,001 | 153,255 | 23,459,689 | 831,386 | 3,336,284 | 158,001 | 2,610,122 | 53,402 | 279,406 | 10,226 |
| Grounds E. of 66° W. long | 603 | 11,281,014 | 435,807 | 2,952,489 | 152,966 | 12,746,800 | 390,094 | 3,333,210 | 157,872 | 755,385 | 12,540 | 279,146 | 10,218 |
| Grounds W. of 66° W. long | 8,681 | 12,522,012 | 728,757 | 5,512 | 289 | 10,712,889 | 441,292 | 3,074 | 129 | 1,854,737 | 40,862 | 260 | 8 |
| Landed at Boston in 1916 | 3,089 | 7,649,811 | 389,726 | ..... | ..... | 9,599,973 | 315,550 | ..... | ..... | 1,071,917 | 19,605 | ..... | ..... |
| Landed at Gloucester in 1916 | 2,864 | 7,725,906 | 225,800 | 4,446,695 | 209,857 | 6,610,007 | 148,109 | 2,783,712 | 115,512 | 379,201 | 3,058 | 298,725 | 8,739 |
| Landed at Portland in 1916 | 2,992 | 1,440,323 | 72,569 | 51,585 | 2,283 | 1,260,523 | 40,240 | 43,556 | 1,778 | 255,428 | 3,912 | 5,200 | 144 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

| Month. | Haddock. | | | | | | | | Hake. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | | Large (6 pounds and over). | | | | Small (under 6 pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| January | 3,220,675 | $173,863 | | | 1,461,342 | $45,513 | | | 56,415 | $4,113 | | | 182,391 | $10,197 | | |
| February | 4,130,526 | 226,686 | | | 2,033,642 | 67,309 | | | 38,763 | 3,009 | | | 139,205 | 8,185 | | |
| March | 4,582,532 | 222,092 | | | 1,889,094 | 65,863 | | | 26,090 | 2,119 | | | 149,043 | 8,944 | | |
| April | 2,943,228 | 141,285 | | | 964,020 | 35,866 | | | 23,733 | 1,473 | | | 122,091 | 5,540 | | |
| May | 2,278,318 | 109,279 | | | 672,350 | 21,718 | | | 60,630 | 2,747 | | | 285,100 | 9,518 | | |
| June | 2,059,660 | 92,896 | | | 735,580 | 22,514 | | | 68,755 | 2,953 | | | 246,504 | 6,572 | | |
| July | 1,748,340 | 88,562 | | | 558,000 | 18,873 | | | 167,319 | 8,329 | | | 297,047 | 11,210 | | |
| August | 2,591,370 | 111,421 | | | 486,419 | 15,299 | | | 319,915 | 12,813 | | | 431,295 | 13,184 | | |
| September | 3,023,720 | 149,412 | | | 710,045 | 24,503 | | | 231,410 | 13,193 | | | 334,827 | 15,140 | | |
| October | 2,951,614 | 169,448 | | | 686,965 | 27,236 | | | 175,432 | 10,602 | | | 560,906 | 24,425 | | |
| November | 2,560,035 | 155,763 | | | 742,866 | 26,503 | | | 121,943 | 8,972 | | | 675,927 | 30,525 | | |
| December | 1,952,279 | 147,499 | | | 533,992 | 24,014 | | | 24,064 | 2,556 | | | 241,530 | 14,221 | | |
| Total | 34,042,297 | 1,788,206 | | | 11,474,315 | 395,211 | | | 1,314,469 | 72,879 | | | 3,665,866 | 157,661 | | |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | | | | |
| January | 81,335 | 4,067 | 140 | $5 | | | | | 18,846 | 1,468 | 20 | $1 | | | | |
| February | 76,291 | 5,602 | 140 | 3 | | | | | 1,845 | 111 | 475 | 14 | 1,570 | 56 | | |
| March | 43,911 | 3,071 | 305 | 30 | | | 550 | $14 | 6,060 | 109 | 260 | 8 | | | | |
| April | 364,383 | 18,169 | | | | | | | 1,810 | 37 | | | | | | |
| May | 622,834 | 32,621 | | | 3,000 | 60 | | | 9,920 | 182 | | | | | | |
| June | 320,844 | 6,421 | 24,365 | 787 | 49,745 | 497 | | | 35,127 | 736 | 55,055 | 1,652 | | | | |
| July | 493,745 | 9,585 | 45,435 | 1,363 | 8,400 | 42 | | | 73,205 | 1,541 | 5,350 | 160 | | | | |
| August | 289,534 | 5,605 | 36,273 | 1,088 | 420 | 5 | | | 253,225 | 6,103 | 2,682 | 81 | | | | |
| September | 184,835 | 3,667 | 36,735 | 1,076 | | | | | 134,576 | 3,369 | 4,300 | 125 | | | | |
| October | 24,680 | 505 | 5,945 | 192 | | | 50 | 2 | 128,070 | 3,140 | 3,920 | 196 | | | | |
| November | 76,620 | 3,255 | 10,155 | 355 | 3,150 | 95 | | | 44,571 | 2,359 | | | | | | |
| December | 6,175 | 409 | | | | | | | 27,501 | 2,400 | 140 | 4 | | | | |
| Total | 2,585,187 | 92,977 | 159,493 | 4,899 | 64,715 | 699 | 600 | 16 | 733,856 | 21,555 | 72,202 | 2,241 | 1,570 | 56 | | |

| LANDED AT PORTLAND. | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 200,085 | 13,721 | ..... | ..... | 17,263 | 804 | ..... | ..... | 13,138 | 1,155 | ..... | ..... | 45,323 | 2,079 | ..... | ..... |
| February | 81,477 | 5,783 | ..... | ..... | 10,197 | 438 | ..... | ..... | 6,387 | 567 | ..... | ..... | 47,662 | 2,155 | ..... | ..... |
| March | 301,666 | 17,162 | ..... | ..... | 36,761 | 1,423 | ..... | ..... | 9,928 | 791 | 580 | 17 | 56,265 | 2,371 | ..... | ..... |
| April | 623,843 | 25,662 | ..... | ..... | 37,272 | 1,442 | ..... | ..... | 64,617 | 3,676 | ..... | ..... | 54,393 | 2,384 | ..... | ..... |
| May | 226,893 | 11,915 | ..... | ..... | 8,141 | 187 | ..... | ..... | 23,429 | 1,015 | ..... | ..... | 169,891 | 4,299 | ..... | ..... |
| June | 78,485 | 3,097 | ..... | ..... | 54,249 | 1,625 | ..... | ..... | 31,616 | 1,085 | ..... | ..... | 202,919 | 4,611 | 580 | $16 |
| July | 672,213 | 17,124 | ..... | ..... | 623 | 20 | ..... | ..... | 21,599 | 1,190 | ..... | ..... | 156,994 | 5,430 | ..... | ..... |
| August | 915,406 | 32,671 | ..... | ..... | 50,366 | 1,518 | ..... | ..... | 23,903 | 1,120 | 300 | 17 | 155,799 | 4,822 | 1,429 | 70 |
| September | 739,177 | 27,976 | ..... | ..... | 4,154 | 116 | ..... | ..... | 45,505 | 2,411 | ..... | ..... | 205,462 | 8,066 | ..... | ..... |
| October | 736,148 | 35,005 | ..... | ..... | 6,221 | 287 | ..... | ..... | 69,126 | 4,688 | ..... | ..... | 359,981 | 15,002 | ..... | ..... |
| November | 182,101 | 15,444 | ..... | ..... | 11,280 | 537 | ..... | ..... | 51,465 | 3,685 | ..... | ..... | 248,401 | 10,812 | ..... | ..... |
| December | 224,274 | 20,224 | ..... | ..... | 9,933 | 513 | ..... | ..... | 13,942 | 1,144 | ..... | ..... | 46,049 | 2,315 | ..... | ..... |
| Total | 4,981,768 | 225,784 | ..... | ..... | 246,460 | 8,910 | ..... | ..... | 374,655 | 22,527 | 880 | 34 | 1,749,139 | 64,346 | 2,009 | 86 |
| Grand total | 41,609,252 | 2,106,967 | 159,493 | 4,899 | 11,785,490 | 404,820 | 600 | 16 | 2,422,980 | 116,961 | 73,082 | 2,275 | 5,416,575 | 222,063 | 2,009 | 86 |
| Grounds E. of 66° W. long. | 14,729,562 | 675,350 | 159,353 | 4,896 | 4,853,889 | 161,299 | 600 | 16 | 809,060 | 24,311 | 72,782 | 2,258 | 354,986 | 12,310 | 580 | 16 |
| Grounds W. of 66° W. long. | 26,879,690 | 1,431,617 | 140 | 3 | 6,931,601 | 243,521 | ..... | ..... | 1,613,920 | 92,650 | 300 | 17 | 5,061,589 | 209,753 | 1,429 | 70 |
| Landed at Boston in 1916 | 34,351,555 | 1,215,663 | ..... | ..... | 14,199,920 | 311,844 | ..... | ..... | 2,233,257 | 84,591 | ..... | ..... | 5,420,587 | 136,345 | ..... | ..... |
| Landed at Gloucester in 1916 | 6,276,223 | 109,097 | 78,000 | 1,595 | 353,058 | 4,274 | 380 | 9 | 2,821,172 | 55,061 | 136,170 | 2,783 | 19,284 | 619 | 1,060 | 16 |
| Landed at Portland in 1916 | 4,481,916 | 105,226 | 104,816 | 2,661 | 708,814 | 11,278 | 1,100 | 28 | 732,688 | 21,414 | 528 | 27 | 1,802,103 | 36,266 | 5,450 | 118 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

| Month. | Pollock. | | | | Cusk. | | | | Halibut. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| January | 85,410 | $3,202 | | | 187,078 | $5,796 | | | 13,647 | $3,794 | | |
| February | 117,949 | 6,343 | | | 219,562 | 8,898 | | | 36,982 | 9,015 | | |
| March | 115,635 | 7,034 | | | 191,495 | 8,156 | | | 32,422 | 5,729 | | |
| April | 168,659 | 7,379 | | | 135,126 | 4,222 | | | 32,423 | 5,590 | | |
| May | 246,002 | 9,016 | | | 202,250 | 5,890 | | | 70,091 | 9,577 | | |
| June | 300,445 | 10,840 | | | 73,195 | 2,064 | | | 136,295 | 14,030 | | |
| July | 476,466 | 23,421 | | | 133,284 | 4,418 | | | 17,487 | 3,046 | | |
| August | 392,523 | 20,021 | | | 133,863 | 4,027 | | | 36,845 | 5,762 | | |
| September | 560,872 | 27,085 | | | 177,860 | 6,287 | | | 26,824 | 5,321 | | |
| October | 866,905 | 36,275 | | | 214,542 | 7,542 | | | 62,881 | 11,308 | | |
| November | 426,253 | 16,070 | | | 215,496 | 7,599 | | | 16,617 | 4,351 | | |
| December | 251,160 | 11,858 | | | 168,297 | 6,517 | | | 7,964 | 2,518 | | |
| Total | 4,008,279 | 178,544 | | | 2,052,048 | 71,416 | | | 490,473 | 80,041 | | |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| January | 2,154,159 | 67,147 | 240 | $7 | 110 | 2 | 475 | $14 | 20,280 | 2,047 | | |
| February | 173,991 | 11,025 | 600 | 12 | 400 | 12 | 50 | 2 | 35,885 | 6,018 | | |
| March | 85,501 | 6,118 | 400 | 10 | 400 | 8 | | | 96,410 | 9,514 | | |
| April | 163,071 | 8,205 | | | 20,890 | 344 | | | 8,656 | 904 | | |
| May | 303,543 | 12,662 | | | 81,915 | 1,558 | | | 79,838 | 10,070 | | |
| June | 438,151 | 6,995 | 11,510 | 345 | 44,221 | 1,004 | 5,815 | 188 | 222,489 | 18,815 | 21,196 | $2,064 |
| July | 65,180 | 1,207 | 7,720 | 240 | 169,975 | 3,951 | 2,010 | 66 | 131,495 | 11,339 | 14,051 | 956 |
| August | 36,335 | 663 | 11,153 | 332 | 159,237 | 3,622 | | | 161,976 | 17,612 | 6,245 | 509 |
| September | 14,882 | 238 | 2,797 | 84 | 76,035 | 1,721 | | | 135,488 | 18,086 | 405 | 32 |
| October | 835,210 | 32,584 | 4,035 | 125 | 14,930 | 365 | 12,005 | 336 | 12,410 | 1,601 | 467 | 43 |
| November | 2,992,430 | 114,563 | 1,250 | 44 | 9,035 | 234 | | | 2,843 | 367 | | |
| December | 1,855,206 | 92,712 | 165 | 5 | | | 50 | 2 | | | | |
| Total | 9,137,659 | 354,119 | 39,870 | 1,204 | 577,148 | 12,821 | 20,405 | 608 | 907,770 | 96,373 | 42,364 | 3,604 |

| LANDED AT PORTLAND. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 136,897 | 5,179 | | | 63,476 | 3,008 | 1,700 | 34 | 3,031 | 501 | | |
| February | 169,898 | 7,844 | | | 40,295 | 2,154 | 455 | 10 | 130 | 20 | | |
| March | 107,669 | 5,617 | 412 | 12 | 80,579 | 3,762 | 1,000 | 22 | 20,454 | 1,963 | | |
| April | 212,018 | 6,991 | | | 209,789 | 7,440 | 65 | 2 | 2,725 | 358 | | |
| May | 115,551 | 2,872 | | | 139,158 | 3,397 | | | 4,572 | 524 | | |
| June | 68,760 | 1,320 | | | 28,845 | 806 | 280 | 3 | 67,784 | 6,204 | | |
| July | 21,284 | 605 | | | 23,935 | 955 | | | 45,963 | 5,412 | | |
| August | 54,358 | 1,002 | | | 11,274 | 495 | | | 98,008 | 11,823 | | |
| September | 147,109 | 3,804 | | | 87,011 | 2,436 | | | 42,849 | 5,994 | | |
| October | 111,854 | 3,543 | | | 59,242 | 2,575 | | | 36,440 | 5,996 | | |
| November | 118,139 | 4,012 | | | 102,453 | 4,659 | | | 2,506 | 257 | | |
| December | 58,035 | 2,600 | | | 50,145 | 2,511 | | | 990 | 162 | | |
| Total | 1,321,572 | 45,389 | 412 | 12 | 896,202 | 34,198 | 3,500 | 71 | 325,452 | 39,214 | | |
| Grand total | 14,467,510 | 578,052 | 40,282 | 1,216 | 3,525,398 | 118,435 | 23,905 | 679 | 1,723,700 | 215,628 | 42,364 | 3,604 |
| Grounds E. of 66° W. long | 725,612 | 23,537 | 39,270 | 1,192 | 727,208 | 20,471 | 20,405 | 608 | 1,264,277 | 147,079 | 42,364 | 3,604 |
| Grounds W. of 66° W. long | 13,741,898 | 554,515 | 1,012 | 24 | 2,798,190 | 97,964 | 3,500 | 71 | 459,423 | 68,549 | | |
| Landed at Boston in 1916 | 3,792,169 | 108,797 | | | 3,657,429 | 77,702 | | | 1,141,955 | 144,128 | | |
| Landed at Gloucester in 1916 | 10,117,193 | 236,060 | 78,168 | 1,635 | 1,553,926 | 22,263 | 34,000 | 869 | 1,686,252 | 175,285 | 95,244 | 8,510 |
| Landed at Portland in 1916 | 1,593,125 | 36,721 | 22,975 | 403 | 805,172 | 18,450 | 17,770 | 166 | 535,314 | 57,662 | | |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

| Month. | Mackerel. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2¼ pounds). | | | | Medium (1¼ to 2¼ pounds). | | | | Small (under 1¼ pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| May | 8,899 | $1,022 | | | 880 | $62 | | | | | | |
| June | 1,892,719 | 103,122 | 173,700 | $10,497 | 221,663 | 8,966 | 3,600 | $270 | | | | |
| July | 927,975 | 64,532 | 43,400 | 4,288 | 93,205 | 5,276 | | | 7,500 | $575 | 9,200 | $572 |
| August | 1,418,708 | 105,236 | | | 831,143 | 51,950 | | | 372,713 | 22,252 | 173,800 | 18,314 |
| September | 656,507 | 64,418 | 2,800 | 420 | 636,609 | 55,716 | | | 382,966 | 34,200 | 89,010 | 9,511 |
| October | 932,738 | 96,499 | | | 788,692 | 88,675 | | | 169,920 | 16,219 | | |
| November | 2,255 | 496 | | | | | | | | | | |
| December | | | | | 2,354 | 506 | | | | | | |
| Total | 5,839,801 | 435,325 | 219,900 | 15,205 | 2,574,546 | 211,151 | 3,600 | 270 | 933,099 | 73,246 | 272,010 | 28,397 |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| June | 78,025 | 4,488 | 495,300 | 36,299 | 77,547 | 4,802 | 724,440 | 52,551 | | | | |
| July | 7,400 | 565 | 39,000 | 2,929 | 50,180 | 1,703 | 242,025 | 23,674 | | | | |
| August | | | | | 266,821 | 12,624 | 433,993 | 50,045 | 1,099,430 | 52,363 | 1,240,942 | 134,716 |
| September | 108,290 | 6,497 | 177,000 | 26,532 | 115,798 | 6,092 | 314,296 | 40,371 | 232,500 | 12,189 | 603,140 | 76,858 |
| October | 33,710 | 2,360 | 585,600 | 90,142 | 7,240 | 579 | 38,000 | 5,468 | | | | |
| November | | | 4,800 | 744 | | | 16,200 | 2,361 | | | | |
| Total | 227,425 | 13,910 | 1,301,700 | 156,646 | 517,586 | 25,800 | 1,768,954 | 174,470 | 1,331,930 | 64,552 | 1,844,082 | 211,574 |
| LANDED AT PORTLAND. | | | | | | | | | | | | |
| June | 234 | 28 | | | 57 | 7 | | | | | | |
| July | 3,591 | 514 | | | 2,634 | 268 | | | 447 | 50 | | |
| August | 10,020 | 1,141 | | | 50,071 | 3,728 | | | 21,848 | 1,581 | | |
| September | 436,995 | 32,484 | | | 49,173 | 3,439 | | | 32,410 | 333 | | |
| Total | 450,840 | 34,167 | | | 101,885 | 7,442 | | | 54,705 | 1,964 | | |
| Grand total | 6,518,066 | 482,402 | 1,521,600 | 171,851 | 3,194,017 | 244,393 | 1,772,554 | 174,740 | 2,319,734 | 139,762 | 2,116,092 | 239,971 |
| Grounds E. of 66° W. long | 1,819,942 | 97,516 | 669,000 | 46,796 | 380,525 | 23,166 | 714,800 | 51,806 | | | | |
| Grounds W. of 66° W. long | 4,698,124 | 385,886 | 852,600 | 125,055 | 2,813,492 | 221,227 | 1,057,754 | 122,934 | 2,319,734 | 139,762 | 2,116,092 | 239,971 |
| Landed at Boston in 1916 | 5,191,392 | 327,974 | 20,000 | 1,350 | 2,341,095 | 146,589 | 47,800 | 4,161 | 891,095 | 42,370 | 8,600 | 860 |
| Landed at Gloucester in 1916 | 344,838 | 14,518 | 1,823,066 | 148,126 | 850,162 | 39,257 | 2,235,131 | 203 178 | 429,472 | 18,339 | 931,696 | 63,708 |
| Landed at Portland in 1916 | 213,873 | 11,792 | | | 217,124 | 10,953 | 1,055 | 108 | 322,580 | 15,767 | 7,370 | 258 |

| Month | Miscellaneous.[a] | | | | Total. | | | | Grand total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh | | Salted | | Fresh. | | Salted. | | | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| January | 143,798 | $7,288 | ..... | ..... | 6,281,716 | $295,859 | ..... | ..... | 6,281,716 | $295,859 |
| February | 120,729 | 6,108 | ..... | ..... | 7,988,595 | 399,399 | ..... | ..... | 7,988,595 | 399,399 |
| March | 205,633 | 9,709 | ..... | ..... | 8,437,987 | 395,106 | ..... | ..... | 8,437,987 | 395,106 |
| April | 539,987 | 14,233 | ..... | ..... | 6,377,065 | 282,867 | ..... | ..... | 6,377,065 | 282,867 |
| May | 797,969 | 20,386 | ..... | ..... | 7,315,727 | 291,510 | ..... | ..... | 7,315,727 | 291,510 |
| June | 1,148,353 | 32,634 | ..... | ..... | 9,458,292 | 398,269 | 177,300 | $10,767 | 9,635,592 | 409,036 |
| July | 1,271,808 | 143,743 | ..... | ..... | 8,212,204 | 494,721 | 52,600 | 4,860 | 8,264,804 | 499,581 |
| August | 1,230,688 | 128,197 | ..... | ..... | 10,451,829 | 604,825 | 173,800 | 18,314 | 10,625,629 | 623,139 |
| September | 480,964 | 38,451 | ..... | ..... | 9,794,158 | 567,084 | 91,810 | 9,931 | 9,885,968 | 577,015 |
| October | 307,362 | 13,019 | ..... | ..... | 10,283,110 | 639,550 | ..... | ..... | 10,283,110 | 639,550 |
| November | 219,551 | 7,071 | ..... | ..... | 7,819,104 | 403,430 | ..... | ..... | 7,819,104 | 403,430 |
| December | 148,499 | 5,587 | ..... | ..... | 5,734,842 | 349,948 | ..... | ..... | 5,734,842 | 349,948 |
| Total | 6,615,341 | 425,826 | ..... | ..... | 98,154,629 | 5,122,568 | 495,510 | 43,872 | 98,650,139 | 5,166,440 |
| LANDED AT GLOUCESTER | | | | | | | | | | |
| January | ..... | ..... | 2,848,894 | $83,631 | 2,478,795 | 79,251 | 2,868,279 | 84,409 | 5,347,074 | 163,660 |
| February | 487,946 | 15,484 | 2,493,316 | 75,922 | 911,771 | 49,953 | 2,502,330 | 76,307 | 3,414,101 | 126,260 |
| March | ..... | ..... | ..... | ..... | 724,493 | 53,421 | 16,875 | 772 | 741,368 | 54,193 |
| April | 57,600 | 1,226 | ..... | ..... | 1,643,449 | 73,284 | ..... | ..... | 1,643,449 | 73,284 |
| May | 1,526,610 | 19,752 | ..... | ..... | 4,746,891 | 152,254 | 4,031 | 210 | 4,750,922 | 152,464 |
| June | 1,285,332 | 9,974 | ..... | ..... | 6,074,160 | 161,936 | 2,957,611 | 170,894 | 9,031,771 | 332,830 |
| July | ..... | ..... | ..... | ..... | 5,029,547 | 142,908 | 1,547,862 | 85,388 | 6,577,409 | 228,296 |
| August | 17,000 | 170 | ..... | ..... | 7,952,019 | 244,195 | 3,202,713 | 256,351 | 11,154,732 | 500,546 |
| September | ..... | ..... | ..... | ..... | 3,271,272 | 110,401 | 1,691,580 | 170,831 | 4,962,852 | 281,232 |
| October | ..... | ..... | ..... | ..... | 1,809,587 | 62,028 | 1,621,960 | 144,179 | 3,431,547 | 206,207 |
| November | 30,476 | 3,662 | ..... | ..... | 3,431,897 | 135,410 | 675,490 | 42,840 | 4,107,387 | 178,250 |
| December | ..... | ..... | 979,600 | 52,764 | 1,988,217 | 101,309 | 984,115 | 52,953 | 2,972,332 | 154,262 |
| Total | 3,404,964 | 50,268 | 6,321,810 | 212,317 | 40,062,098 | 1,366,350 | 18,072,846 | 1,085,134 | 58,134,944 | 2,451,484 |

[a] Includes herring from Newfoundland, 487,946 pounds frozen value $15,484, and 6,321,810 pounds salted, value $212,317.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

| Month. | Miscellaneous. | | | | Total. | | | | Grand total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | | |
| LANDED AT PORTLAND. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value* |
| January | 63,066 | $2,208 | | | 851,583 | $46,480 | 1,700 | $34 | 853,283 | $46,514 |
| February | 65,464 | 2,201 | | | 668,871 | 37,011 | 455 | 10 | 669,326 | 37,021 |
| March | 108,324 | 2,599 | | | 1,129,615 | 56,065 | 5,782 | 263 | 1,135,397 | 56,328 |
| April | 34,244 | 831 | | | 1,681,487 | 67,581 | 65 | 2 | 1,681,552 | 67,583 |
| May | 415,112 | 4,703 | | | 1,384,345 | 39,019 | | | 1,384,345 | 39,019 |
| June | 2,528,282 | 28,032 | | | 3,219,984 | 52,353 | 42,395 | 2,286 | 3,262,379 | 54,639 |
| July | 136,883 | 3,188 | | | 1,708,450 | 57,455 | 27,000 | 1,448 | 1,735,450 | 58,903 |
| August | 188,365 | 12,224 | | | 2,146,094 | 93,953 | 1,729 | 87 | 2,147,823 | 94,040 |
| September | 113,460 | 7,529 | | | 2,128,402 | 107,427 | | | 2,128,402 | 107,427 |
| October | 58,132 | 2,055 | | | 1,962,875 | 83,094 | | | 1,962,875 | 83,094 |
| November | 126,874 | 4,568 | | | 1,021,219 | 54,637 | | | 1,021,219 | 54,637 |
| December | 69,034 | 2,129 | | | 663,452 | 44,203 | | | 663,452 | 44,203 |
| Total | 3,907,240 | 72,267 | | | 18,566,377 | 739,278 | 79,126 | 4,130 | 18,645,503 | 743,408 |
| Grand total | 13,927,545 | 548,361 | 6,321,810 | $212,317 | 156,783,104 | 7,228,196 | 18,647,482 | 1,133,136 | 175,430,586 | 8,361,332 |
| Grounds E. of 66° W. long | 675,717 | 26,303 | 6,321,810 | 212,317 | 51,123,977 | 2,049,783 | 14,605,809 | 644,565 | 65,729,786 | 2,694,348 |
| Grounds W. of 66° W. long | 13,251,828 | 522,058 | | | 105,659,127 | 5,178,413 | 4,041,673 | 488,571 | 109,700,800 | 5,666,984 |
| Landed at Boston in 1916 | 6,712,473 | 375,230 | | | 98,254,638 | 3,695,994 | 76,400 | 6,371 | 98,331,038 | 3,702,365 |
| Landed at Gloucester in 1916 | 7,318,583 | 160,173 | 7,223,224 | 183,344 | 46,515,277 | 1,212,013 | 20,165,271 | 947,881 | 66,680,548 | 2,159,894 |
| Landed at Portland in 1916 | 6,182,411 | 71,421 | 40 | 2 | 20,551,394 | 513,671 | 261,445 | 7,976 | 20,812,839 | 521,647 |

The large quantity of fishery products landed at Boston and Gloucester, Mass., and Portland, Me., by American fishing vessels is taken principally from fishing grounds lying off the coast of the United States. In the calendar year 1917, 62.47 per cent of the quantity and 67.72 per cent of the value of the catch landed by the American fishing fleet at these ports were taken from these grounds; 4.91 per cent of the quantity and 3.94 per cent of the value, consisting chiefly of herring, were taken from fishing banks off the coast of Newfoundland; and 32.61 per cent of the quantity and 28.32 per cent of the value were from grounds off the Canadian Provinces. The receipts of Newfoundland herring constituted 3.88 per cent of the quantity and 2.72 per cent of the value of the fishery products landed at these ports during the year. The herring were taken on the treaty coasts of Newfoundland, but cod and other species from that region were obtained chiefly from fishing banks on the high seas. All fish caught by American fishing vessels off the Canadian Provinces were from offshore fishing grounds. The catch from each of these regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., IN 1917 FROM GROUNDS OFF THE COAST OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

| Species. | United States. | | Newfoundland. | | Canadian Provinces. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| Cod: | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Fresh | 25,064,491 | $1,210,065 | 584,278 | $18,247 | 24,224,068 | $821,040 | 49,872,837 | $2,049,352 |
| Salted | 8,846 | 426 | 477,160 | 24,390 | 6,087,685 | 296,666 | 6,573,691 | 321,482 |
| Haddock: | | | | | | | | |
| Fresh | 33,810,941 | 1,675,131 | 97,275 | 4,665 | 19,486,646 | 831,995 | 53,394,742 | 2,511,787 |
| Salted | 140 | 3 | 4,885 | 165 | 154,948 | 4,743 | 160,093 | 4,984 |
| Hake: | | | | | | | | |
| Fresh | 6,673,922 | 302,371 | 105,286 | 2,883 | 1,060,347 | 33,770 | 7,839,555 | 339,061 |
| Salted | 1,729 | 87 | 10,645 | 318 | 62,717 | 1,956 | 75,091 | 2,361 |
| Pollock: | | | | | | | | |
| Fresh | 13,740,878 | 554,496 | 5,965 | 109 | 720,667 | 23,447 | 14,467,510 | 578,015 |
| Salted | 1,012 | 24 | 1,522 | 45 | 37,748 | 1,147 | 40,282 | 1,216 |
| Cusk: | | | | | | | | |
| Fresh | 2,738,876 | 96,851 | 23,692 | 551 | 762,830 | 21,033 | 3,525,398 | 118,435 |
| Salted | 3,500 | 71 | 5,815 | 188 | 14,590 | 420 | 23,905 | 679 |
| Halibut: | | | | | | | | |
| Fresh | 445,753 | 66,454 | 474,391 | 49,331 | 803,556 | 99,843 | 1,723,700 | 215,628 |
| Salted | | | 12,571 | 1,366 | 29,793 | 2,238 | 42,364 | 3,604 |
| Mackerel: | | | | | | | | |
| Fresh | 9,831,350 | 746,875 | | | 2,200,467 | 120,682 | 12,031,817 | 867,557 |
| Salted | 4,026,446 | 487,960 | | | 1,383,800 | 98,602 | 5,410,246 | 586,562 |
| Herring: | | | | | | | | |
| Fresh | 6,319,808 | 70,736 | 487,946 | 15,484 | 9,000 | 77 | 6,816,754 | 86,297 |
| Salted | | | 6,321,810 | 212,317 | | | 6,321,810 | 212,317 |
| Swordfish: | | | | | | | | |
| Fresh | 1,944,684 | 288,246 | | | 28,834 | 3,923 | 1,973,518 | 292,169 |
| Tilefish: | | | | | | | | |
| Fresh | 1,211,450 | 44,743 | | | | | 1,211,450 | 44,743 |
| Miscellaneous: | | | | | | | | |
| Fresh | 3,775,886 | 118,333 | 2,024 | 41 | 147,913 | 6,778 | 3,925,823 | 125,152 |
| Total | 109,599,712 | 5,662,872 | 8,615,265 | 330,100 | 57,215,609 | 2,368,360 | 175,430,586 | 8,361,332 |

*Cod.*—In 1917 the fishing fleet landing fish at Boston, Gloucester, and Portland was not quite so large as in the previous year. There were 6 vessels employed in the salt bank fishery and 88 in the market fishery, landing their fares of cod and other ground fish at these ports. Large quantities of cod were also landed by vessels fishing on the shore grounds. The total quantity of cod landed during the year was 56,446,528 pounds, valued at $2,370,834, of which 49,872,837

pounds, valued at $2,049,352, were fresh, and 6,573,691 pounds, valued at $321,482, were salted.

*Haddock.*—The catch of haddock during the year was smaller than that of cod in quantity, but greater in value. There was a decrease in the catch as compared with the previous year of 7,000,957 pounds, or 11.56 per cent, in quantity, but an increase of $755,027, or 42.85 per cent, in the value. The total quantity landed during the year was 53,554,835 pounds, valued at $2,516,702, all of which were fresh except 160,093 pounds, salted, valued at $4,915.

*Hake.*—The yield of hake for the year was 7,914,646 pounds, valued at $341,385, all landed fresh except 75,091 pounds, salted, valued at $2,361. The catch declined 5,257,653 pounds, or 39.91 per cent, in quantity, but showed an increased of a little more than 1 per cent in value.

*Pollock.*—The pollock catch was nearly twice as large as that of hake, the quantity landed amounting to 14,507,792 pounds, valued at $579,268. This product was all fresh, with the exception of 40,282 pounds, salted, valued at $1,216. The catch was about 7 per cent less than that of the previous year in quantity, but increased 51 per cent in value.

*Cusk.*—The catch of cusk was 3,549,303 pounds, valued at $119,114, of which 23,905 pounds, valued at $679, were salted. There was a decrease of 41.51 per cent in the quantity of cusk landed, but the value was only slightly less than that of the previous year.

*Halibut.*—The yield of halibut was 1,766,064 pounds, valued at $219,232. This quantity included 42,364 pounds of salted halibut, valued at $3,604. There was a decline in the output of halibut, as compared with the previous year of 48.93 per cent in quantity and 43.14 per cent in value.

*Mackerel.*—The total catch of fresh mackerel taken by the American fishing fleet in 1917 amounted to 111,932 barrels, compared with 102,420 barrels the previous year, an increase of 9,512 barrels. The output of salted mackerel was 32,162 barrels, as compared with 32,066 barrels the previous year, an increase of 96 barrels. The quantity of mackerel landed at Boston, Gloucester, and Portland during the year was 17,442,063 pounds, valued at $1,454,119, of which 12,031,817 pounds, valued at $867,557, were fresh, and 5,410,246 pounds, valued at $586,562, were salted.

In 1918, up to June 30, the catch of fresh mackerel amounted to 27,992 barrels and of salted mackerel to 7,937 barrels, as compared with 38,947 barrels fresh and 7,131 barrels salted the previous year. The southern mackerel fleet numbered about 35 sail of seiners and 125 sail of netters. The seiners had a light catch, and reported considerable quantities of mackerel, but that they were wild, chasing live feed, and therefore hard to catch. They did not school much at night, but only during the day. The first seiner arrived at New York on May 6 with 13,000 large and medium mackerel, which were sold at 18 to 20 cents per pound. These fish were taken in 34 fathoms of water. The netters did not land as many mackerel as the previous year, but, owing to the higher prices received, they did well financially. The mackerel landed by the southern fleet this year were all large and medium fish and sold at 13 to 20 cents per pound,

according to market conditions. The Cape Shore fleet numbered 38 sail of vessels, being a little larger than the previous year. No vessel made more than one trip. A large body of fish was reported and all the vessels returned with good catches. The catch taken on the Cape Shore amounted to 1,689,000 pounds of fresh mackerel, and 7,558 barrels salted, compared with 2,229,900 pounds of fresh and 7,131 barrels salted the previous year. The first arrival from the Cape Shore was on June 8, and consisted of 50,000 large and medium fresh mackerel, which sold at 10½ cents per pound. One schooner, on her Cape Shore mackerel trip, obtained 95,000 pounds fresh and 375 barrels of salted mackerel, and stocked $15,665, the crew sharing $343 each. This is said to be the largest stock ever made on a single mackerel trip.

*Swordfish.*—The catch of swordfish landed at Boston, Gloucester, and Portland during the year amounted to 1,973,518 pounds, valued at $292,169. The number of vessels engaged in this fishery was 42, or 9 more than in the previous year.

*Flounders.*—The catch of flounders in the vessel fisheries amounted to 1,279,721 pounds, valued at $44,936. The catch taken by vessels under 5 tons net tonnage is not included in these statistics. These fish are taken chiefly with the flounder drag, an apparatus similar to an otter trawl, and adapted for use in this fishery. This apparatus is used by power vessels and boats. It varies in size according to the size of the vessel or boat using it. The foot line or chain varies in the different sizes of nets from about 48 to 70 feet in length. When being set the drag is thrown overboard from the stern of the boat, and the foot line, or chain, carries it quickly to the bottom. In the meantime the boat is under power, and when the water strikes the drag the bag or net is opened. As the boat moves forward two otter boards, or wooden doors, one at each end of the foot line, or chain, operate to spread the bag out to its full extent. The apparatus is drawn along the bottom by the vessel or boat for about two hours, and then it is taken on board and the fish are dumped out.

The Massachusetts fishermen have been catching during the past year, apparently for the first time in commercial quantities, a fish which is locally called sole or gray sole. This species, which has been identified as the pole flounder, craig flounder, or deep-sea flounder (*Glyptocephalus cynoglossus*), is found on both shores of the Atlantic Ocean, ranging as far south as Ireland and Delaware Bay in deep water. It was first found on our coast in 1877, when numerous specimens were secured by the Bureau in the deepest parts of Massachusetts Bay. It is an excellent food fish, and large quantities were taken in the fall of 1917 and also during the year 1918.

### VESSEL FISHERIES AT SEATTLE, WASH.

The vessel fisheries at Seattle, Wash., have not varied materially in extent from the previous year. The products landed by fishing vessels have been smaller in quantity, but have increased in value. In the products landed by collecting vessels there has been considerable increase in both quantity and value. Statistics of the vessel fisheries at Seattle have been collected by the local agent and pub-

lished as monthly and annual statistical bulletins, giving the quantity of fishery products landed by American fishing vessels at that port.

In 1917 the fishing fleet at Seattle landed at that port 620 trips, aggregating 16,553,944 pounds of fish, having a value to the fishermen of $1,738,802. This catch was taken from the various fishing grounds along the coast from off the Columbia River northward to Portlock Bank, Alaska. The localities from which the largest quantities of fish were taken were the Destruction Island Grounds, Flattery Banks, Hecate Strait, Yakutat Grounds, and Portlock Bank. The products included halibut, 13,949,683 pounds, valued at $1,625,409; sablefish or black cod, 2,430,105 pounds, valued at $107,350; and other species amounting to 174,156 pounds, valued at $6,043.

The fishery products taken in Puget Sound and landed at Seattle by collecting vessels during the year amounted to 12,821,353 pounds, valued at $988,559. The products included salmon, 10,869,193 pounds, valued at $935,915; steelhead trout, 165,024 pounds, valued at $16,233; herring, 1,211,224 pounds, valued at $6,393; smelt, 211,799 pounds, valued at $13,004; and other fishery products amounting to 364,113 pounds, valued at $17,014. These products included 3,909 pounds of whale meat, valued at $195.

Compared with the previous year there was an increase of 103 trips by fishing vessels, with a decrease of 857,491 pounds, or 4.92 per cent, in the quantity, and an increase of $377,569, or 27.73 per cent, in the value of the products landed. In the products landed by collecting vessels there was an increase of 2,683,966 pounds, or 26.47 per cent, in the quantity, and of $517,300, or 109.76 per cent, in the value. The quantity and value of fishery products landed at Seattle by fishing and collecting vessels in 1917 are given in detail in the following table:

## QUANTITIES AND VALUES OF CERTAIN FRESH FISHERY PRODUCTS LANDED AT SEATTLE, WASH., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917.

### BY FISHING GROUNDS.

| | Number of trips. | Halibut. | | Cod. | | Sablefish (black cod). | | "Lingcod." | | Red rockfish. | | Herring. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Columbia River grounds | 25 | 605,000 | $64,283 | ..... | ..... | 267,500 | $10,900 | ..... | ..... | ..... | ..... | ..... | ..... | 872,500 | $75,183 |
| Grays Harbor grounds | 7 | 90,500 | 14,516 | ..... | ..... | 149,500 | 6,435 | ..... | ..... | ..... | ..... | ..... | ..... | 240,000 | 20,951 |
| Destruction Island grounds | 32 | 661,000 | 65,761 | ..... | ..... | 413,000 | 16,520 | ..... | ..... | ..... | ..... | ..... | ..... | 1,074,000 | 82,281 |
| Flattery Banks | 246 | 2,099,400 | 228,595 | ..... | ..... | 873,700 | 42,281 | 23,000 | $460 | ..... | ..... | ..... | ..... | 2,996,100 | 271,336 |
| West coast, Vancouver Island | 65 | 610,900 | 90,992 | ..... | ..... | 301,400 | 14,422 | 60,000 | 2,400 | 5,000 | $191 | 8,000 | $1,260 | 985,300 | 109,265 |
| Cape Scott grounds | 38 | 590,000 | 59,173 | ..... | ..... | 4,000 | 160 | ..... | ..... | 1,000 | 30 | ..... | ..... | 595,000 | 59,363 |
| Hecate Strait | 83 | 2,254,600 | 307,056 | ..... | ..... | 176,000 | 7,180 | ..... | ..... | ..... | ..... | ..... | ..... | 2,430,600 | 314,236 |
| Noyes Island | 7 | 72,000 | 7,043 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 72,000 | 7,043 |
| Coronation Island | 28 | 806,200 | 80,176 | ..... | ..... | 13,870 | 402 | ..... | ..... | ..... | ..... | ..... | ..... | 820,070 | 80,578 |
| Cape Spencer | 3 | 130,000 | 13,480 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 130,000 | 13,480 |
| Yakutat grounds | 44 | 3,153,158 | 346,528 | ..... | ..... | 118,540 | 3,676 | 274 | 6 | 24,132 | 631 | ..... | ..... | 3,296,104 | 350,841 |
| Yakataga grounds | 2 | 100,000 | 18,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100,000 | 18,000 |
| Cape Cleare grounds | 1 | 34,725 | 4,176 | ..... | ..... | 1,000 | 50 | ..... | ..... | ..... | ..... | ..... | ..... | 35,725 | 4,226 |
| Portlock Bank | 39 | 2,742,200 | 325,630 | 15,000 | $226 | 111,595 | 5,324 | 8,500 | 253 | 29,250 | 586 | ..... | ..... | 2,906,545 | 332,019 |
| Total | 620 | 13,949,683 | 1,625,409 | 15,000 | 226 | 2,430,105 | 107,350 | 91,774 | 3,119 | 59,382 | 1,438 | 8,000 | 1,260 | 16,553,944 | 1,738,802 |

### BY MONTHS.

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 13 | 751,702 | $87,978 | ..... | ..... | 73,870 | $1,825 | ..... | ..... | ..... | ..... | ..... | ..... | 825,572 | $89,803 |
| February | 7 | 296,548 | 35,484 | ..... | ..... | 19,720 | 565 | 184 | $4 | 3,266 | $93 | ..... | ..... | 319,718 | 36,146 |
| March | 44 | 1,533,330 | 136,389 | ..... | ..... | 63,890 | 2,304 | ..... | ..... | 5,566 | 168 | ..... | ..... | 1,602,586 | 138,861 |
| April | 85 | 1,327,200 | 140,940 | ..... | ..... | 60,300 | 2,362 | ..... | ..... | 2,200 | 66 | ..... | ..... | 1,389,700 | 143,368 |
| May | 146 | 2,540,500 | 237,965 | ..... | ..... | 320,400 | 12,801 | ..... | ..... | 10,250 | 205 | ..... | ..... | 2,871,150 | 250,971 |
| June | 114 | 2,008,600 | 204,449 | ..... | ..... | 496,000 | 19,840 | 23,000 | 460 | ..... | ..... | ..... | ..... | 2,527,600 | 224,749 |
| July | 34 | 1,082,000 | 120,582 | 15,000 | $226 | 270,000 | 10,800 | 150 | 3 | 13,600 | 273 | ..... | ..... | 1,380,750 | 131,884 |
| August | 40 | 1,163,800 | 158,826 | ..... | ..... | 206,500 | 8,260 | ..... | ..... | ..... | ..... | ..... | ..... | 1,370,300 | 167,086 |
| September | 37 | 1,056,600 | 146,223 | ..... | ..... | 380,000 | 15,905 | ..... | ..... | 6,400 | 133 | ..... | ..... | 1,443,000 | 162,261 |
| October | 46 | 1,014,700 | 162,482 | ..... | ..... | 376,695 | 23,495 | ..... | ..... | ..... | ..... | 8,000 | $1,260 | 1,399,395 | 187,237 |
| November | 27 | 343,403 | 62,910 | ..... | ..... | 96,880 | 6,095 | 90 | 2 | 11,100 | 248 | ..... | ..... | 451,473 | 69,255 |
| December | 27 | 831,300 | 131,181 | ..... | ..... | 66,050 | 3,098 | 68,350 | 2,650 | 7,000 | 252 | ..... | ..... | 972,700 | 137,181 |
| Total | 620 | 13,949,683 | 1,625,409 | 15,000 | 226 | 2,430,105 | 107,350 | 91,774 | 3,119 | 59,382 | 1,438 | 8,000 | 1,260 | 16,553,944 | 1,738,802 |

FISHERY PRODUCTS, BY MONTHS, TAKEN IN PUGET SOUND AND LANDED AT SEATTLE, WASH., BY COLLECTING VESSELS DURING 1917.

| Species. | January. | | February. | | March. | | April. | | May. | | June. | | July. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Grayfish | | | | | 220 | $11 | | | 2,205 | $138 | 3,100 | $155 | 1,060 | $83 |
| Sturgeon | | | | | | | | | 109,950 | 866 | | | | |
| Herring | 2,000 | $30 | 359,324 | $1,797 | 739,950 | 3,700 | | | 7,600 | 380 | | | | |
| Shad | | | | | | | | | | | | | | |
| Salmon: | | | | | | | | | | | | | | |
| Humpback or pink | | | | | | | | | | | | | 23,850 | 477 |
| Chum or keta | 2,860 | 157 | | | | | | | | | | | 9,120 | 273 |
| King or spring | 200 | 22 | 318 | 27 | 132 | 7 | 8,400 | $773 | 229,565 | 17,772 | 326,130 | 24,460 | 497,165 | 34,801 |
| Coho or silver | 50 | 3 | 50 | 2 | | | | | | | 67,190 | 5,375 | 34,000 | 2,040 |
| Sockeye or red | | | | | | | | | 1,900 | 150 | 19,280 | 1,345 | 41,830 | 3,346 |
| Trout: | | | | | | | | | | | | | | |
| Steelhead | 24,687 | 2,716 | 25,330 | 2,723 | | | | | 14,350 | 1,135 | 24,000 | 1,920 | 11,650 | 699 |
| Salmon | | | 5,504 | 660 | 5,682 | 710 | 7,388 | 637 | 20,208 | 1,056 | 17,000 | 1,360 | | |
| Smelt | 3,000 | 90 | 2,000 | 100 | 3,205 | 128 | 4,200 | 210 | | | 2,400 | 134 | | |
| Perch | | | 97 | 1 | | | | | 2,500 | 25 | | | | |
| Red rockfish | 650 | 33 | 2,500 | 270 | 2,141 | 112 | | | | | | | 3,620 | 92 |
| "Lingcod" | 1,000 | 30 | 1,021 | 41 | 3,514 | 131 | 1,500 | 28 | 18,000 | 270 | 6,000 | 150 | 3,520 | 63 |
| Cod | | | 12,000 | 270 | 10,236 | 505 | | | | | | | | |
| Flounders | 1,425 | 21 | 2,350 | 35 | 2,600 | 39 | 500 | 8 | 4,700 | 71 | 6,400 | 128 | 960 | 14 |
| Sole | 3,075 | 85 | 9,040 | 249 | 9,051 | 272 | 2,500 | 63 | 2,200 | 38 | 8,000 | 320 | | |
| Other fish | | | | | | | | | | | | | 3,065 | 92 |
| Whale meat | | | | | | | | | 3,909 | 195 | | | | |
| Crabs | 6,324 | 287 | 4,100 | 238 | 2,000 | 100 | 1,320 | 150 | 2,076 | 400 | | | | |
| Clams | | | | | 12,900 | 129 | 4,000 | 50 | 3,105 | 34 | | | | |
| Total | 45,271 | 3,474 | 423,634 | 6,413 | 791,631 | 5,844 | 29,808 | 1,919 | 422,268 | 22,530 | 479,500 | 35,347 | 629,840 | 41,960 |

| Species. | August. | | September. | | October. | | November. | | December. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Grayfish | 1,000 | $10 | | | | | | | | | 1,000 | $10 |
| Sturgeon | 2,000 | 80 | 2,200 | $132 | 395 | $20 | | | | | 11,180 | 599 |
| Herring | | | | | | | | | | | 1,211,224 | 6,393 |
| Shad | | | | | | | | | | | 7,600 | 380 |
| Salmon: | | | | | | | | | | | | |
| Humpback or pink | 1,090,530 | 29,354 | 386,700 | 38,670 | 1,791 | 179 | | | | | 1,502,871 | 68,680 |
| Chum or keta | 120,636 | 6,032 | 448,890 | 22,445 | 3,795,630 | 379,563 | 870,490 | $56,869 | 158,790 | $16,466 | 5,406,416 | 481,805 |
| King or spring | 427,100 | 25,626 | 137,060 | 12,335 | 51,455 | 4,631 | 15,840 | 1,584 | 20,434 | 2,043 | 1,713,799 | 124,081 |
| Coho or silver | 123,335 | 2,745 | 395,856 | 39,586 | 976,808 | 146,521 | 64,260 | 8,158 | 2,340 | 234 | 1,663,889 | 204,664 |
| Sockeye or red | 223,890 | 22,389 | 287,630 | 28,763 | 7,688 | 692 | | | | | 582,218 | 56,685 |
| Trout: | | | | | | | | | | | | |
| Steelhead | 1,730 | 190 | 21,880 | 2,188 | 9,944 | 895 | 233 | 21 | 31,220 | 3,746 | 165,024 | 16,233 |
| Salmon | | | | | | | | | | | 55,782 | 4,423 |
| Smelt | | | 10,000 | 800 | 60,114 | 4,809 | 87,820 | 4,390 | 39,060 | 2,343 | 211,799 | 13,004 |
| Perch | | | 4,000 | 80 | | | 450 | 18 | | | 7,047 | 124 |
| Red rockfish | | | 520 | 10 | 135 | 4 | | | | | 9,566 | 521 |
| "Lingcod" | 1,500 | 15 | 1,265 | 25 | | | | | | | 37,320 | 753 |
| Cod | | | | | | | | | | | 22,236 | 775 |
| Flounders | 700 | 7 | 3,100 | 62 | | | | | | | 22,735 | 385 |
| Sole | | | 2,000 | 80 | | | 2,246 | 44 | 3,060 | 124 | 41,172 | 1,275 |
| Other fish | 4,400 | 308 | 1,464 | 59 | | | | | 44,000 | 1,320 | 52,929 | 1,779 |
| Whale meat | | | | | | | | | | | 3,909 | 195 |
| Crabs | | | | | | | 26,662 | 2,430 | 29,150 | 1,977 | [a] 71,632 | 5,582 |
| Clams | | | | | | | | | | | 20,005 | 213 |
| Total | 1,996,821 | 86,756 | 1,702,565 | 145,235 | 4,903,960 | 537,314 | 1,068,001 | 73,514 | 328,054 | 28,253 | 12,821,353 | 938,559 |

[a] 3,965 dozen.

## COASTAL FISHERIES OF NEW YORK AND NEW JERSEY.

A statistical canvass of the coastal fisheries of New York and New Jersey was made during the year for the calendar year 1917 similar to the previous canvass of these fisheries for the year 1915. The statistics included only fishes proper.

In New York there were 1,538 persons engaged in the coastal fisheries, exclusive of shellfish, in 1917; the investment in vessels, boats, fishing apparatus, and shore and accessory property was $1,370,823; and the products amounted to 68,315,888 pounds, valued at $1,376,360. The principal species taken were alewives, 788,875 pounds, valued at $14,617; bluefish, 961,340 pounds, valued at $183,136; butterfish, 800,499 pounds, valued at $47,979; flounders, 4,176,374 pounds, valued at $180,333; menhaden, 50,441,540 pounds, valued at $261,919; scup or porgy, 1,212,650 pounds, valued at $72,217; sea bass, 1,122,623 pounds, valued at $81,654; squeteague or weakfish, 2,292,050 pounds, valued at $170,861; tilefish, 1,480,828 pounds, valued at $100,551; and whiting, 1,488,800 pounds, valued at $33,510. The menhaden were caught chiefly in southern waters and landed at southern ports, but are properly credited to New York because taken by vessels belonging in that State.

Compared with the returns for 1915, there was a decrease of 966, or 38.5 per cent, in the number of persons engaged, and of $400,343, or 22.6 per cent, in the amount of capital invested; but an increase of 34,268,113 pounds, or 100.6 per cent, in the quantity, and of $254,719, or 22.7 per cent, in the value of the products. If the menhaden are excluded for both years, a decrease is shown in the quantity of all other fish of 1,654,615 pounds, or 8.4 per cent, and an increase in the value of $93,735, or 9.18 per cent.

In New Jersey in 1917 there were 2,137 persons engaged in the coastal fisheries for fishes proper; the investment in vessels, boats, fishing apparatus, and shore and accessory property was $1,235,550; and the products amounted to 49,979,375 pounds, valued at $1,953,076. The species taken in largest quantities were alewives, 2,051,172 pounds, valued at $28,746; bluefish, 1,122,158 pounds, valued at $150,605; butterfish, 4,227,745 pounds, valued at $200,564; croaker, 3,483,095 pounds, valued at $142,811; flounders, 1,369,848 pounds, valued at $85,643; hake, 2,092,195 pounds, valued at $27,338; menhaden, 1,433,984 pounds, valued at $14,664; scup or porgy, 3,673,173 pounds, valued at $137,004; sea bass, 5,323,116 pounds, valued at $313,137; squeteague or weakfish, 11,004,255 pounds, valued at $482,916; and whiting, 10,401,255 pounds, valued at $135,188.

Compared with 1915 there was a decrease of 166, or 7.2 per cent, in the number of persons engaged; an increase of $43,493, or 3.6 per cent, in the investment; of 2,123,199 pounds, or 4.4 per cent, in the quantity; and $604,409, or 44.8 per cent, in the value of the products. Excluding the menhaden for both years, there was an increase in 1917 in the quantity of all other fish of 5,044,004 pounds, or 11.59 per cent, and in the value of $626,347, or 47.73 per cent.

The statistics of these fisheries, by counties, are given in the following table:

## Coastal Fisheries of New York and New Jersey, by Counties, Exclusive of Shellfish, 1917.

| Items. | New York.[a] | | | | | | | | New Jersey. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nassau. | | New York and Richmond. | | Suffolk. | | Total. | | Atlantic. | | Burlington. | |
| | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Persons engaged | 74 | | 650 | | 814 | | 1,538 | | 292 | | 36 | |
| Vessels fishing | 2 | $2,500 | 41 | $497,460 | 60 | $87,430 | 103 | $587,390 | 19 | $66,200 | | |
| Tonnage | 15 | | 2,171 | | 563 | | 2,749 | | 301 | | | |
| Outfit | | 290 | | 230,706 | | 19,675 | | 250,671 | | 40,125 | | |
| Vessels transporting | 2 | 2,000 | | | 29 | 56,950 | 31 | 58,950 | | | | |
| Tonnage | 17 | | | | 322 | | 339 | | | | | |
| Outfit | | 90 | | | | 5,516 | | 5,606 | | | | |
| Sail, row, and house-boats | 16 | 560 | | | 410 | 16,548 | 426 | 17,108 | 47 | 1,140 | 21 | $350 |
| Gasoline boats | 18 | 7,950 | 1 | 800 | 232 | 104,000 | 251 | 112,750 | 27 | 10,650 | 5 | 400 |
| Pound nets | 1 | 4,000 | 1 | 800 | 485 | 141,265 | 487 | 146,065 | 1 | 1,500 | | |
| Seines | 7 | 610 | 31 | 34,200 | 95 | 13,176 | 133 | 47,986 | 35 | 7,330 | 5 | 325 |
| Gill nets | 181 | 4,390 | 160 | 2,100 | 589 | 15,930 | 930 | 22,420 | 71 | 10,125 | 23 | 360 |
| Fyke nets | | | | | 4,053 | 22,482 | 4,053 | 22,482 | 6 | 240 | | |
| Bag nets | | | | | | | | | 24 | 680 | 59 | 1,535 |
| Dip nets | | | | | 5 | 25 | 5 | 25 | | | | |
| Lines | | 420 | | 7,250 | | 756 | | 8,426 | | 3,190 | | |
| Otter trawls | 3 | 90 | | | 225 | 6,865 | 228 | 6,955 | 1 | 120 | | |
| Eel pots | 232 | 282 | | | 4,503 | 4,923 | 4,735 | 5,205 | 85 | 155 | | |
| Other apparatus | | [b] 2,939 | | | | 70 | | 3,009 | | 2 | | |
| Shore and accessory property | | 1,450 | | | | 74,325 | | 75,775 | | 7,910 | | 250 |
| Total | | 27,571 | | 773,316 | | 569,936 | | 1,370,823 | | 149,367 | | 3,220 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore and horse mackerel | 6,500 | $250 | 801 | $38 | 3,550 | $185 | 10,851 | $473 | | | | |
| Alewives | 10,800 | 424 | 5,000 | 150 | 773,075 | 14,043 | 788,875 | 14,617 | 13,578 | $570 | | |
| Bluefish | 8,800 | 1,990 | 869,511 | 165,011 | 83,029 | 16,135 | 961,340 | 183,136 | 251,830 | 32,325 | | |
| Bonito | 2,050 | 260 | 8,057 | 1,287 | 67,094 | 8,021 | 77,201 | 9,568 | 700 | 55 | | |
| Butterfish | 22,050 | 1,254 | | | 778,449 | 46,725 | 800,499 | 47,979 | 6,175 | 447 | | |
| Carp | | | | | 122,600 | 15,234 | 122,600 | 15,234 | | | | |
| Cod | 4,000 | 400 | 306,930 | 23,267 | 43,906 | 4,299 | 354,836 | 27,966 | 47,000 | 3,835 | | |
| Croaker | | | 7,025 | 281 | | | 7,025 | 281 | 442,878 | 17,188 | | |
| Drum | | | | | | | | | 550 | 22 | | |
| Eels, fresh | 26,000 | 2,825 | 6,248 | 326 | 383,359 | 42,342 | 415,607 | 45,493 | 13,865 | 1,006 | | |
| Flounders | 68,540 | 3,261 | 4,935 | 489 | 4,102,899 | 176,583 | 4,176,374 | 180,333 | 58,907 | 3,827 | 875 | $75 |
| Grayfish | 2,420 | 70 | 3,500 | 105 | 35,315 | 818 | 41,235 | 993 | 4,600 | 85 | | |
| Haddock | | | 24,775 | 2,135 | | | 24,775 | 2,135 | | | | |

[a] No fisheries were operated in Kings and Queens counties in 1917.

[b] Includes 1,950 sea-bass pots, valued at $2,925.

COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES, EXCLUSIVE OF SHELLFISH, 1917—Continued.

| Items. | New York. | | | | | | | | New Jersey. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nassau. | | New York and Richmond. | | Suffolk. | | Total. | | Atlantic. | | Burlington. | |
| PRODUCTS—continued. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Hake | 6,520 | $266 | 16,997 | $610 | 46,075 | $1,108 | 69,592 | $1,984 | 4,600 | $290 | ..... | ..... |
| Herring | ..... | ..... | ..... | ..... | 291,700 | 8,143 | 291,700 | 8,143 | ..... | ..... | ..... | ..... |
| Kingfish | 200 | 50 | ..... | ..... | 23,912 | 5,690 | 24,112 | 5,740 | 6,480 | 736 | ..... | ..... |
| Mackerel | 35,320 | 4,310 | 25,500 | 3,150 | 501,225 | 36,366 | 562,045 | 43,826 | 261,250 | 29,550 | ..... | ..... |
| Menhaden | 1,200 | 25 | 45,304,800 | 220,440 | 5,135,540 | 41,454 | 50,441,540 | 261,919 | 9,700 | 225 | ..... | ..... |
| Mullet, fresh | ..... | ..... | ..... | ..... | 250 | 13 | 250 | 13 | ..... | ..... | ..... | ..... |
| Mummichog | ..... | ..... | ..... | ..... | 221,100 | 2,015 | 221,100 | 2,015 | ..... | ..... | ..... | ..... |
| Pike | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 650 | 50 | ..... | ..... |
| Pollock | ..... | ..... | 168,776 | 8,469 | 110,675 | 6,256 | 279,451 | 14,725 | ..... | ..... | ..... | ..... |
| Scup or porgy | 2,550 | 223 | 662,438 | 42,080 | 547,662 | 29,914 | 1,212,650 | 72,217 | 672,250 | 22,513 | ..... | ..... |
| Sea bass | 160,800 | 9,664 | 396,339 | 28,868 | 565,484 | 43,122 | 1,122,623 | 81,654 | 767,100 | 41,505 | ..... | ..... |
| Sea robins | 3,500 | 70 | 150 | 5 | 97,650 | 2,141 | 101,300 | 2,216 | ..... | ..... | ..... | ..... |
| Shad | ..... | ..... | 2,160 | 306 | 12,987 | 2,296 | 15,147 | 2,602 | ..... | ..... | ..... | ..... |
| Sharks | 1,540 | 30 | 260 | 10 | 18,437 | 423 | 20,237 | 463 | 14,500 | 160 | ..... | ..... |
| Skates and rays | 880 | 17 | 5,438 | 191 | 177,750 | 2,088 | 184,068 | 2,296 | 11,000 | 170 | ..... | ..... |
| Smelt | 900 | 225 | ..... | ..... | 16,662 | 3,948 | 17,562 | 4,173 | ..... | ..... | ..... | ..... |
| Spanish mackerel | 100 | 20 | ..... | ..... | 388 | 70 | 488 | 90 | ..... | ..... | ..... | ..... |
| Spot | 550 | 33 | ..... | ..... | 787 | 66 | 1,337 | 99 | 1,600 | 94 | ..... | ..... |
| Squeteague or weakfish | 38,780 | 3,353 | 470,000 | 27,000 | 1,783,270 | 140,508 | 2,292,050 | 170,861 | 1,275,412 | 48,397 | 9,000 | $450 |
| Squid | 6,160 | 185 | ..... | ..... | 399,500 | 10,988 | 405,660 | 11,173 | 400 | 8 | ..... | ..... |
| Striped bass | 5,200 | 1,815 | ..... | ..... | 19,237 | 4,918 | 24,437 | 6,733 | 6,622 | 1,116 | 880 | 250 |
| Sturgeon | 220 | 35 | ..... | ..... | 17,524 | 3,400 | 17,744 | 3,435 | ..... | ..... | ..... | ..... |
| Sturgeon caviar | ..... | ..... | ..... | ..... | 175 | 437 | 175 | 437 | ..... | ..... | ..... | ..... |
| Suckers | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,175 | 189 | ..... | ..... |
| Swordfish | ..... | ..... | ..... | ..... | 2,000 | 240 | 2,000 | 240 | ..... | ..... | ..... | ..... |
| Tautog | 220 | 18 | ..... | ..... | 118,812 | 8,686 | 119,032 | 8,704 | ..... | ..... | ..... | ..... |
| Tilefish | ..... | ..... | 1,480,828 | 100,551 | ..... | ..... | 1,480,828 | 100,551 | 257,000 | 17,200 | ..... | ..... |
| Tomcod | ..... | ..... | ..... | ..... | 20,287 | 1,314 | 20,287 | 1,314 | ..... | ..... | ..... | ..... |
| Whitebait | ..... | ..... | ..... | ..... | 99,700 | 4,937 | 99,700 | 4,937 | ..... | ..... | ..... | ..... |
| White perch | ..... | ..... | ..... | ..... | 17,175 | 1,919 | 17,175 | 1,919 | 18,449 | 2,042 | 16,510 | 2,405 |
| Whiting | 89,800 | 2,245 | ..... | ..... | 1,309,000 | 31,265 | 1,488,800 | 33,510 | 1,710 | 14 | ..... | ..... |
| Yellow perch | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 650 | 50 | ..... | ..... |
| Other fish | ..... | ..... | ..... | ..... | 1,580 | 163 | 1,580 | 163 | 6,365 | 385 | 540 | 41 |
| Total | 505,600 | 33,318 | 49,770,468 | 624,769 | 18,039,820 | 718,273 | 68,315,888 | 1,376,360 | 4,158,996 | 224,054 | 27,805 | 3,221 |

COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES, EXCLUSIVE OF SHELLFISH, 1917—Continued.

| Items. | New Jersey. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cape May. | | Hudson. | | Middlesex. | | Monmouth. | | Ocean. | | Total. | |
| | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Persons engaged | 660 | | 10 | | 28 | | 507 | | 604 | | 2,137 | |
| Vessels fishing | 22 | $58,200 | 2 | $2,000 | | | 2 | $4,500 | | | 45 | $130,900 |
| Tonnage | 292 | | 11 | | | | 23 | | | | 627 | |
| Outfit | | 38,925 | | 625 | | | | 1,500 | | | | 81,175 |
| Vessels transporting | | | | | | | 2 | 5,500 | | | 2 | 5,500 |
| Tonnage | | | | | | | 24 | | | | 24 | |
| Outfit | | | | | | | | 2,050 | | | | 2,050 |
| Sail, row, and house boats | 34 | 600 | 5 | 85 | 7 | $135 | 45 | 1,065 | 191 | $7,680 | 350 | 11,055 |
| Gasoline boats | 149 | 86,825 | 4 | 700 | 3 | 1,250 | 169 | 75,525 | 133 | 54,625 | 490 | 229,975 |
| Pound nets | 64 | 101,750 | | | | | 55 | 90,961 | 42 | 91,771 | 162 | 288,982 |
| Seines | 18 | 5,190 | | | 7 | 2,050 | 3 | 900 | 56 | 5,440 | 124 | 21,235 |
| Gill nets | 347 | 23,641 | | | | | 158 | 11,690 | 1,971 | 12,258 | 2,570 | 58,074 |
| Fyke nets | 41 | 1,860 | 14 | 575 | 2 | 60 | 187 | 2,144 | 888 | 8,670 | 1,138 | 13,549 |
| Bag nets | | | | | | | | | | | 83 | 2,215 |
| Lines | | 5,115 | | 40 | | | | 2,155 | | 1,395 | | 11,895 |
| Otter trawls | | | | | | | | | | | 1 | 120 |
| Eel pots | | | 130 | 190 | 71 | 70 | 1,156 | 1,400 | 4,084 | 4,758 | 5,526 | 6,573 |
| Other apparatus | | 3 | | | | | | | | 37 | | 42 |
| Shore and accessory property | | 149,815 | | 225 | | 150 | | 110,500 | | 103,360 | | 372,210 |
| Total | | 474,924 | | 4,440 | | 3,715 | | 309,890 | | 289,994 | | 1,235,550 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore and horse mackerel | 5,035 | $344 | | | | | 17,890 | $1,375 | 18,100 | $989 | 41,025 | $2,708 |
| Alewives | 119,870 | 1,677 | | | 450 | $25 | 259,695 | 2,836 | 1,657,579 | 23,638 | 2,051,172 | 28,746 |
| Bluefish | 347,829 | 41,492 | 5,400 | $650 | 1,725 | 365 | 369,293 | 60,189 | 143,081 | 15,584 | 1,122,158 | 150,605 |
| Bonito | 8,613 | 623 | | | | | 30,407 | 3,791 | 104,632 | 12,153 | 144,352 | 16,622 |
| Butterfish | 1,802,599 | 86,384 | | | | | 555,412 | 25,268 | 1,865,559 | 88,465 | 4,227,745 | 200,564 |
| Carp | | | | | 1,050 | 155 | | | | | 1,050 | 155 |
| Cod | 28,935 | 2,037 | 1,400 | 162 | | | 2,504 | 216 | 1,400 | 100 | 81,239 | 6,350 |
| Croaker | 1,607,639 | 66,144 | 900 | 75 | 400 | 15 | 600,160 | 29,260 | 831,118 | 30,129 | 3,483,095 | 142,811 |
| Drum | 10,565 | 276 | | | | | 10,615 | 235 | 66,580 | 902 | 88,310 | 1,435 |
| Eels, fresh | 23,300 | 2,542 | 30,038 | 2,794 | 4,450 | 540 | 100,965 | 8,933 | 218,200 | 16,935 | 390,818 | 32,750 |
| Eels, smoked | | | 1,125 | 310 | | | | | | | 1,125 | 340 |
| Flounders | 389,673 | 21,485 | | | 5,300 | 350 | 333,027 | 20,092 | 582,066 | 39,808 | 1,369,848 | 85,643 |
| Goosefish | | | | | | | 43,900 | 266 | | | 43,900 | 266 |
| Grayfish | 750 | 6 | | | | | 40,572 | 358 | 4,000 | 67 | 49,922 | 516 |
| Hake | 158,530 | 2,166 | | | | | 1,110,847 | 13,751 | 818,218 | 11,131 | 2,092,195 | 27,338 |

COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES, EXCLUSIVE OF SHELLFISH, 1917—Continued.

| Items. | New Jersey. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cape May. | | Hudson. | | Middlesex. | | Monmouth. | | Ocean. | | Total. | |
| PRODUCTS—continued. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Herring | | | | | | | 27,485 | $322 | | | 27,485 | $322 |
| Hickory shad | | | | | | | 8,787 | 372 | | | 8,787 | 372 |
| Kingfish | 10,208 | $1,213 | | | | | 3,849 | 381 | 4,100 | $467 | 24,637 | 2,797 |
| Mackerel | 210,055 | 24,436 | | | | | 51,895 | 6,212 | 54,147 | 6,515 | 577,347 | 66,733 |
| Menhaden | 200,997 | 2,436 | | | 30,000 | $50 | 987,296 | 10,076 | 205,991 | 1,877 | 1,433,984 | 14,664 |
| Mullet, fresh | 5,050 | 281 | | | | | | | | | 5,050 | 281 |
| Mullet, salted | 5,600 | 402 | | | | | | | | | 5,600 | 402 |
| Pike | | | | | | | | | | | 650 | 50 |
| Pollock | 33,250 | 315 | | | | | 1,676 | 64 | 5,685 | 108 | 40,611 | 517 |
| Round herring | | | | | | | 92,277 | 3,612 | | | 92,277 | 3,612 |
| Scup or porgy | 2,583,198 | 95,710 | 450 | $50 | | | 91,918 | 4,612 | 325,357 | 14,119 | 3,673,173 | 137,004 |
| Sea bass | 3,583,112 | 199,958 | 2,200 | 320 | | | 173,996 | 13,525 | 796,708 | 57,829 | 5,323,116 | 313,137 |
| Sea robins | 2,850 | 21 | | | | | 31,639 | 482 | 8,500 | 102 | 43,289 | 605 |
| Shad | 1,100 | 191 | | | | | 11,794 | 2,538 | 1,388 | 292 | 14,282 | 3,021 |
| Sharks | 21,450 | 394 | | | | | 38,225 | 602 | 32,509 | 550 | 106,684 | 1,706 |
| Silverside | | | | | | | 1,326 | 25 | | | 1,326 | 25 |
| Skates and rays | 19,375 | 317 | | | | | 207,216 | 1,803 | 49,100 | 595 | 286,691 | 2,885 |
| Smelt | | | | | 7,100 | 2,050 | | | | | 7,100 | 2,050 |
| Spanish mackerel | 1,685 | 234 | | | | | 458 | 70 | 4,950 | 768 | 7,093 | 1,072 |
| Spot | 12,715 | 598 | | | | | 140,298 | 3,613 | 134,709 | 2,365 | 289,322 | 6,670 |
| Squeteague or weakfish | 4,476,717 | 167,602 | 650 | 75 | 89,700 | 4,650 | 2,119,538 | 126,445 | 3,033,238 | 135,297 | 11,004,255 | 482,916 |
| Squid | 57,776 | 1,340 | | | | | 185,950 | 3,512 | 447,084 | 7,177 | 691,210 | 12,037 |
| Striped bass | | | | | | | 1,475 | 260 | 2,645 | 655 | 11,622 | 2,281 |
| Sturgeon | 4,005 | 650 | | | | | 4,180 | 486 | 900 | 112 | 9,085 | 1,248 |
| Sturgeon caviar | 285 | 770 | | | | | 57 | 111 | 50 | 100 | 392 | 981 |
| Suckers | | | | | | | | | | | 3,175 | 189 |
| Swellfish | | | | | | | 10,125 | 58 | | | 10,125 | 58 |
| Tautog | 150 | 6 | 2,200 | 320 | | | 44,418 | 3,009 | 10,000 | 900 | 56,768 | 4,235 |
| Tilefish | | | | | | | | | | | 257,000 | 17,200 |
| Tomcod | | | 1,050 | 60 | 600 | 50 | 485 | 45 | | | 2,135 | 155 |
| Whitebait | | | | | | | 1,300 | 40 | | | 1,300 | 40 |
| White perch | 3,075 | 278 | | | | | 460 | 40 | 327,205 | 36,443 | 365,699 | 41,208 |
| Whiting | 327,384 | 5,358 | | | | | 5,157,783 | 61,716 | 4,914,378 | 68,100 | 10,401,255 | 135,188 |
| Yellow perch | 1,300 | 70 | | | | | | | | | 1,950 | 120 |
| Other fish | | | | | | | 41 | 20 | | | 6,946 | 446 |
| Total | 16,064,675 | 727,776 | 45,413 | 4,846 | 143,775 | 8,250 | 12,869,234 | 410,627 | 16,669,477 | 547,302 | 49,979,375 | 1,953,076 |

## FISHING ON FIVE-FATHOM BANK, NEW JERSEY, IN 1916 AND 1917.

For several years a considerable number of pound nets have been set on Five-Fathom Bank, lying about 10 miles off the coast of southern New Jersey. The Bureau has collected statistics of this fishery for 1916 and 1917. The information for 1917 is included in the foregoing statistics of the coastal fisheries of New Jersey for that year.

In 1916 there were 120 persons engaged in fishing pound nets or Five-Fathom Bank. The number of pound nets operated was 14, valued at $44,550; the number of boats used was 19, valued at $18,625; and the shore and accessory property was valued at $78,400; a total investment of $141,575. The products amounted to 3,224,140 pounds, valued at $133,612.

In 1917 there were 183 persons engaged in the fishery; the number of pound nets fished was 21, valued at $72,322; the boats numbered 27, valued at $25,900; and the shore and accessory property was valued at $104,250; a total investment of $202,472. The products aggregated 4,828,620 pounds, valued at $231,695.

The principal species of fish taken in each of these years were scup or porgy, sea bass, and squeteague or weakfish. Butterfish, croaker, flounders, mackerel, and various other species were also taken in considerable quantities.

Statistics of this fishery in 1916 and 1917 are given in the following table:

FISHING ON FIVE-FATHOM BANK, N. J., IN 1916 AND 1917.

| Items. | 1916 | | 1917 | |
|---|---|---|---|---|
| | *Number.* | *Value.* | *Number.* | *Value.* |
| Fishermen | 98 | ..... | 149 | ..... |
| Shoresmen | 22 | ..... | 34 | ..... |
| Pound nets | 14 | $44,550 | 21 | $72,322 |
| Gasoline boats | 18 | 18,600 | 25 | 25,850 |
| Other boats | 1 | 25 | 2 | 50 |
| Shore and accessory property | ..... | 78,400 | ..... | 104,250 |
| Total investment | ..... | 141,575 | ..... | 202,472 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Butterfish | 52,420 | $2,380 | 219,621 | $10,533 |
| Croaker | 72,460 | 2,202 | 200,512 | 7,882 |
| Flounders | 25,760 | 1,024 | 93,052 | 4,460 |
| Mackerel | 2,700 | 270 | 8,800 | 880 |
| Scup or porgy | 905,480 | 32,617 | 1,080,200 | 45,163 |
| Sea bass | 1,432,435 | 61,735 | 2,041,460 | 112,499 |
| Squeteague or weakfish | 618,040 | 30,193 | 1,034,960 | 46,211 |
| Whiting | 2,260 | 30 | 28,426 | 425 |
| Other fish | 66,295 | 2,320 | 79,005 | 2,800 |
| Squid | 46,290 | 841 | 42,584 | 842 |
| Total | 3,224,140 | 133,612 | 4,828,620 | 231,695 |

### SHAD FISHERY OF THE HUDSON RIVER.

In connection with the canvass of the coastal fisheries of New York and New Jersey, statistics were obtained of the shad fishery of the Hudson River for the years 1917 and 1918. In 1918 there were 227 fishermen engaged in this fishery, using 125 boats, valued at $4,790; 273 gill nets, valued at $10,756; 15 seines, valued at $1,370; and shore and accessory property valued at $3,191; a total investment of $20,107. The catch of shad was much larger than in any of the three preceding years, amounting to 67,403 in number, or 234,602 pounds, valued at $48,184. Of this quantity 63,404 shad, or 220,602 pounds, valued at $44,784, were taken on the New York side of the river, and 3,999 shad, or 14,000 pounds, valued at $3,400, were taken on the New Jersey side. In 1915 the total catch of shad in this river in both States was 15,855 fish, or 68,668 pounds, valued at $8,643; in 1916, 9,287 fish, or 40,173 pounds, valued at $5,465; and in 1917, 12,015 fish, or 43,384 pounds, valued at $6,540. The catch each year was taken chiefly with gill nets.

SHAD FISHERY OF THE HUDSON RIVER, 1917 AND 1918.[a]

**1917**

| Items. | New York. | | | New Jersey. | | | Total. | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Number.* | *Pounds.* | *Value.* | *Number.* | *Pounds.* | *Value.* | *Number.* | *Pounds.* | *Value.* |
| Fishermen | 141 | ..... | ..... | 8 | ..... | ..... | 149 | ..... | ..... |
| Rowboats | 70 | ..... | $2,940 | 4 | ..... | $130 | 74 | ..... | $3,070 |
| Gasoline | 1 | ..... | 200 | 1 | ..... | 300 | 2 | ..... | 500 |
| Gill nets | 213 | ..... | 6,500 | 2 | ..... | 700 | 215 | ..... | 7,200 |
| Seines | 13 | ..... | 1,135 | ..... | ..... | ..... | 13 | ..... | 1,135 |
| Shore and accessory property | ..... | ..... | 1,340 | ..... | ..... | 1,350 | ..... | ..... | 2,690 |
| Total | ..... | ..... | 12,115 | ..... | ..... | 2,480 | ..... | ..... | 14,595 |
| Shad caught: | | | | | | | | | |
| With gill nets | 9,535 | 34,420 | 5,225 | 1,400 | 5,040 | 720 | 10,935 | 39,460 | 5,955 |
| With seines | 1,080 | 3,924 | 585 | ..... | ..... | ..... | 1,080 | 3,924 | 585 |
| Total | 10,615 | 38,344 | 5,810 | 1,400 | 5,040 | 720 | 12,015 | 43,384 | 6,540 |

**1918**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fishermen | 224 | ..... | ..... | 3 | ..... | ..... | 227 | ..... | ..... |
| Rowboats | 122 | ..... | $4,240 | 1 | ..... | $100 | 123 | ..... | $4,340 |
| Gasoline | 1 | ..... | 250 | 1 | ..... | 200 | 2 | ..... | 450 |
| Gill nets | 272 | ..... | 10,456 | 1 | ..... | 300 | 273 | ..... | 10,756 |
| Seines | 15 | ..... | 1,370 | ..... | ..... | ..... | 15 | ..... | 1,370 |
| Shore and accessory property | ..... | ..... | 2,241 | ..... | ..... | 950 | ..... | ..... | 3,191 |
| Total | ..... | ..... | 18,557 | ..... | ..... | 1,550 | ..... | ..... | 20,107 |
| Shad caught: | | | | | | | | | |
| With gill nets | 61,583 | 214,196 | 43,413 | 3,999 | 14,000 | 3,400 | 65,582 | 228,196 | 46,813 |
| With seines | 1,821 | 6,406 | 1,371 | ..... | ..... | ..... | 1,821 | 6,406 | 1,371 |
| Total | 63,404 | 220,602 | 44,784 | 3,999 | 14,000 | 3,400 | 67,403 | 234,602 | 48,184 |

[a] Includes Columbia, Dutchess, Greene, Orange, Rockland, Ulster, and Westchester Counties in New York; and Bergen and Hudson Counties in 1917, and Bergen County in 1918, in New Jersey.

## STATISTICS OF THE WHOLESALE FRESH-FISH TRADE OF NEW YORK CITY.

Beginning with September 1, 1917, the Bureau undertook the collection of statistics showing by species the quantities and value of fresh fish handled by the wholesale trade of New York City. This was initiated as an experiment to determine the practicability of carrying on this work continuously as at Boston and Gloucester, Mass., Portland, Me., and Seattle, Wash., and the value of the information to the trade. Statistics were collected for the five months ending January 31, 1918. This afforded ample opportunity for a careful study of the local conditions. The complex nature of shipments received by the wholesale trade made it exceedingly difficult for the dealers to furnish complete returns, and entailed a considerable burden on their clerical force. For these reasons and because of the apathetic attitude of the trade toward the work, the Bureau decided to discontinue the collection of these statistics for the time being.

Statistics of the wholesale fresh-fish trade of New York City from September, 1917, to January, 1918, inclusive, are given in the following table:

FRESH FISH HANDLED BY THE WHOLESALE FISH TRADE OF NEW YORK CITY FROM SEPTEMBER, 1917, TO JANUARY, 1918.

| Species. | September. | | October. | | November. | | December. | | January. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore or horse mackerel | 15,884 | $1,312 | 6,053 | $561 | 9,714 | $619 | 89 | $8 | 385 | $29 |
| Amberfish | | | | | | | 2,800 | 250 | | |
| Anchovies | 350 | 11 | | | 2,150 | 52 | 369 | 18 | | |
| Angelfish or spadefish | 1,903 | 126 | 492 | 35 | 100 | 12 | | | 202 | 25 |
| Barracuda | | | | | | | 102 | 5 | | |
| Bluefish | 193,960 | 47,716 | 354,238 | 73,424 | 27,320 | 8,481 | 32,037 | 10,321 | 194,511 | 47,291 |
| Blue runner | | | | | 1,875 | 80 | 930 | 71 | | |
| Bonito | 37,978 | 5,868 | 8,529 | 1,376 | | | | | | |
| Bowfin | 50,003 | 3,508 | 66,288 | 4,296 | 80,416 | 5,259 | 33,588 | 2,738 | 31,444 | 3,086 |
| Buffalofish | 70,959 | 2,065 | 95,676 | 11,480 | 254,239 | 31,464 | 202,297 | 30,915 | 311,578 | 54,860 |
| Butterfish | 277,871 | 31,339 | 241,672 | 30,051 | 34,947 | 6,547 | 1,265 | 313 | 78,427 | 8,595 |
| Carp | 1,191,584 | 135,021 | 967,584 | 99,454 | 877,585 | 91,234 | 674,538 | 74,496 | 478,718 | 73,042 |
| Catfish and bullheads | 11,355 | 1,304 | 4,718 | 610 | 9,079 | 1,472 | 175,524 | 28,818 | 1,405 | 203 |
| Cero | | | 709 | 105 | 11,889 | 2,047 | 100,199 | 15,698 | 188,263 | 28,659 |
| Channel bass | | | | | 241 | 12 | 271 | 18 | 4,894 | 385 |
| Cisco or lake herring | 1,244,905 | 130,672 | 1,019,911 | 107,147 | 1,626,487 | 139,770 | 628,910 | 51,540 | 115,552 | 10,970 |
| Cod | 951,109 | 93,276 | 1,049,335 | 109,924 | 1,089,292 | 120,367 | 1,171,568 | 136,585 | 1,036,311 | 135,947 |
| Crevalle | | | | | | | 141 | 12 | | |
| Croaker | 191,075 | 14,384 | 119,036 | 9,938 | 109,425 | 9,729 | 2,388 | 270 | 346 | 21 |
| Cunner | 1,111 | 58 | 951 | 23 | 903 | 58 | 3,636 | 337 | 181 | 19 |
| Cusk | 5,338 | 231 | 10,489 | 603 | 6,271 | 315 | 2,402 | 105 | 31,211 | 2,375 |
| Drum, black | 13,088 | 489 | 648 | 27 | 5,358 | 332 | 8,741 | 641 | 18,086 | 1,388 |
| Eel | 245,698 | 26,667 | 233,724 | 24,657 | 121,578 | 15,754 | 286,659 | 48,881 | 48,291 | 6,355 |
| Eel, conger | | | | | | | 4,574 | 171 | 20,538 | 924 |
| Flounders | 943,280 | 55,409 | 1,545,895 | 119,407 | 1,852,084 | 115,534 | 1,683,778 | 124,107 | 753,110 | 74,821 |
| Garfish | 180 | 16 | 120 | 16 | | | 200 | 8 | | |
| Goosefish | | | 300 | 6 | 768 | 29 | 1,919 | 133 | | |
| Grayfish | | | | | 7,900 | 173 | 1,284 | 87 | 240 | 10 |
| Grouper | | | | | 2,573 | 232 | 4,895 | 672 | 933 | 105 |
| Haddock | 221,603 | 15,004 | 219,929 | 17,137 | 182,490 | 17,569 | 337,871 | 34,099 | 258,822 | 27,070 |
| Hake | 285,635 | 17,497 | 366,020 | 16,248 | 683,441 | 21,804 | 87,312 | 5,692 | 12,639 | 1,299 |
| Halibut | 327,878 | 65,239 | 196,939 | 43,756 | 185,670 | 42,842 | 235,559 | 53,772 | 216,380 | 45,501 |
| Herring, sea | 473,868 | 22,769 | 430,384 | 18,393 | 396,201 | 17,711 | 140,979 | 8,946 | 47,887 | 3,049 |
| Hickory shad | | | | | | | 1,503 | 55 | | |
| Hogfish or pigfish | | | | | | | 662 | 59 | 1,279 | 156 |
| Jewfish | | | | | 25,400 | 2,021 | 1,871 | 187 | 512 | 63 |
| Kingfish | 6,219 | 1,677 | 23,570 | 4,825 | 49,531 | 6,079 | 21,974 | 3,532 | 5,023 | 1,269 |
| Mackerel | 829,628 | 107,718 | 870,245 | 104,043 | 96,199 | 18,959 | 106,576 | 18,965 | 2,762 | 436 |
| Mackerel, Spanish | 16,827 | 3,427 | 24,035 | 4,465 | 178,834 | 35,572 | 371,909 | 70,857 | 475,792 | 73,397 |
| Menhaden | 29,638 | 697 | 33,379 | 715 | 1,550 | 31 | | | 128 | 13 |
| Mud shad | | | | | 745 | 32 | 2,979 | 106 | 2,425 | 673 |
| Mullet | 1,219 | 122 | 34,184 | 3,643 | 72,759 | 5,816 | 42,337 | 3,789 | 45,740 | 4,417 |
| Mummichog | | | | | | | | | 593 | 35 |
| Perch, white | 4,419 | 621 | 5,637 | 742 | 60,440 | 9,450 | 50,831 | 8,675 | 628 | 6,154 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Perch, yellow | 145,087 | 21,246 | 141,154 | 19,849 | 141,494 | 17,919 | 49,209 | 7,576 | 34,283 | 4,899 |
| Pickerel or grass pike | 118,136 | 18,089 | 111,582 | 15,104 | 77,768 | 11,600 | 44,535 | 7,307 | 38,336 | 6,535 |
| Pike perch (blue, yellow, or wall-eyed) | 349,793 | 62,933 | 266,292 | 52,378 | 177,284 | 37,671 | 66,443 | 19,460 | 40,799 | 12,383 |
| Pilotfish | | | | | 435 | 38 | | | | |
| Pollock | 342,944 | 27,530 | 1,009,504 | 62,953 | 639,092 | 46,476 | 769,781 | 58,325 | 106,053 | 12,441 |
| Pompano | 1,972 | 430 | 2,817 | 580 | 4,108 | 1,146 | 5,284 | 1,761 | 12,539 | 4,002 |
| Salmon: | | | | | | | | | | |
| Atlantic | 12,660 | 2,287 | 5,242 | 1,044 | | | | | 7,485 | 1,672 |
| Blueback | | | 2,042 | 350 | | | | | | |
| Chinook | 34,155 | 5,897 | 18,557 | 3,086 | 287 | 73 | | | | |
| Chum | 35,767 | 3,962 | 108,672 | 16,930 | 112,402 | 17,824 | | | 48,582 | 5,377 |
| Humpback | 6,000 | 660 | | | | | | | | |
| Silver | 44,475 | 8,113 | 135,166 | 26,418 | 103,968 | 19,366 | 6,723 | 1,966 | 57,182 | 10,399 |
| Steelhead | 64,782 | 7,860 | 1,681 | 184 | 150 | 27 | 23,176 | 7,587 | 31,851 | 7,182 |
| Scup or porgy | 99,822 | 10,682 | 31,539 | 3,203 | 6,850 | 1,059 | 1,512 | 190 | 163 | 19 |
| Sea bass | 184,944 | 27,820 | 67,500 | 13,690 | 99,915 | 15,364 | 73,735 | 13,976 | 60,410 | 10,793 |
| Sea robin | 37,113 | 1,053 | 12,473 | 374 | | | | | 450 | 12 |
| Sergeantfish | | | | | 2,561 | 214 | | | 6,258 | 777 |
| Shad | 176 | 8 | 161 | 35 | 12,450 | 2,190 | 33,841 | 7,769 | 40,214 | 10,931 |
| Sharks | 17,190 | 556 | 9,208 | 322 | 6,639 | 303 | 1,019 | 90 | 1,799 | 93 |
| Sheepshead or fresh-water drum | 24,508 | 2,170 | 29,721 | 2,947 | 5,841 | 482 | 2,972 | 349 | 22,104 | 2,880 |
| Sheepshead, salt-water | | | 5,960 | 646 | 10,934 | 1,379 | 16,335 | 2,622 | 1,396 | 320 |
| Silverside or spearing | 17,509 | 990 | 27,803 | 1,410 | 39,861 | 2,206 | 14,323 | 807 | 1,315 | 77 |
| Skates | 18,483 | 586 | 37,759 | 1,113 | 35,901 | 1,303 | 22,753 | 1,082 | 33,307 | 1,271 |
| Smelt | 12,561 | 1,911 | 166,867 | 26,107 | 274,259 | 55,074 | 482,076 | 90,668 | 534,198 | 104,515 |
| Snapper, red | | | 390 | 73 | 11,795 | 1,834 | 6,455 | 1,110 | 6,773 | 1,337 |
| Snapper, other | | | 552 | 69 | 2,117 | 337 | | | | |
| Spoonbill cat | | | 14,009 | 2,632 | 15,404 | 3,196 | 28,859 | 6,981 | 11,981 | 2,731 |
| Spot or Lafayette | 53,594 | 2,578 | 117,731 | 4,085 | 23,219 | 2,023 | 6,469 | 707 | 48,250 | 4,349 |
| Squeteague or weakfish | 759,080 | 96,994 | 697,986 | 82,642 | 412,409 | 65,694 | 123,534 | 24,773 | 136,579 | 27,771 |
| Squid | 158,343 | 11,063 | 147,154 | 9,133 | 129,225 | 6,403 | 20,741 | 1,081 | 81,796 | 4,046 |
| Striped bass | 5,258 | 1,418 | 50,827 | 11,308 | 65,801 | 16,426 | 65,288 | 17,247 | 21,837 | 6,921 |
| Sturgeon | 9,384 | 2,666 | 39,768 | 11,700 | 20,256 | 5,698 | 1,762 | 449 | 887 | 174 |
| Suckers | 251,644 | 27,753 | 233,893 | 25,524 | 150,621 | 19,159 | 166,630 | 22,831 | 134,558 | 18,715 |
| Sunfish | 24,538 | 1,825 | 45,458 | 4,105 | 37,545 | 3,270 | 28,361 | 2,720 | 22,734 | 2,045 |
| Swordfish | | | 3,960 | 267 | | | 100 | 15 | 500 | 100 |
| Tautog or blackfish | 15,176 | 1,512 | 55,735 | 4,940 | 47,545 | 4,526 | 13,980 | 1,761 | 778 | 96 |
| Tilefish | 82,153 | 6,336 | 264,517 | 21,830 | 217,199 | 20,129 | 135,621 | 13,866 | 107,526 | 12,211 |
| Tomcod | | | 1,280 | 98 | 11,098 | 562 | 115,569 | 7,116 | 99,182 | 6,228 |
| Trout: | | | | | | | | | | |
| Brook | 1,746 | 1,177 | 1,320 | 949 | 367 | 251 | 265 | 189 | 1,238 | 658 |
| Lake | 22,025 | 3,305 | 34,168 | 4,931 | 40,697 | 4,625 | | | 241 | 30 |
| Salmon | 6,058 | 617 | 8,449 | 1,217 | 13,575 | 2,087 | 1,447 | 229 | 3,521 | 757 |
| Whitebait | 758 | 77 | 1,445 | 288 | 6,987 | 860 | 1,728 | 263 | 106 | 31 |
| White bass | 7,597 | 911 | 11,719 | 1,124 | 2,074 | 261 | | | 2,066 | 386 |
| Whitefish | 43,534 | 9,418 | 156,905 | 30,561 | 189,204 | 32,990 | 38,489 | 8,417 | 5,275 | 872 |
| Whiting | 744,955 | 33,958 | 1,403,546 | 53,111 | 1,984,718 | 60,275 | 269,913 | 11,989 | 155,177 | 6,267 |
| Yellowtail or silver perch | 7,080 | 332 | 7,465 | 381 | | | | | 4,803 | 416 |
| Miscellaneous | 38,902 | 4,268 | 50,444 | 4,152 | 17,384 | 1,698 | 28,625 | 3,184 | 18,139 | 1,495 |
| Total | 11,444,467 | 1,202,284 | 13,471,111 | 1,330,050 | 13,216,941 | 1,211,476 | 9,068,030 | 1,082,275 | 6,362,952 | 906,953 |

Of the preceding, the following were landed by fishing vessels:

| Species. | September. | | October. | | November. | | December. | | January. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore or horse mackerel | 868 | $55 | 176 | $12 | | | | | | |
| Bluefish | 52,332 | 15,360 | 143,515 | 36,356 | | | | | | |
| Bonito | 8,795 | 1,099 | 1,922 | 327 | | | | | | |
| Butterfish | 391 | 51 | | | | | | | | |
| Cod | 54,309 | 3,826 | 139,718 | 13,422 | 107,507 | $9,417 | 28,437 | $2,660 | 2,704 | $353 |
| Croaker | | | 72 | 6 | 4,492 | 404 | | | | |
| Eel | | | 142 | 5 | | | 168 | 26 | 142 | 19 |
| Eel, conger | | | | | | | | | 926 | 46 |
| Flounders | 7,288 | 905 | 7,088 | 876 | 8,732 | 200 | | | | |
| Grayfish | | | | | 7,900 | 173 | 1,205 | 84 | | |
| Haddock | 2,677 | 214 | 15,984 | 1,520 | 9,671 | 1,012 | 2,881 | 315 | 135 | 18 |
| Hake | 563 | 23 | 2,015 | 135 | 1,693 | 86 | 533 | 27 | 605 | 59 |
| Herring, sea | 7,017 | 300 | | | | | | | | |
| Mackerel | 377 | 56 | | | | | | | | |
| Menhaden | 8,262 | 103 | | | | | | | | |
| Pollock | 498 | 37 | 3,215 | 236 | 3,457 | 277 | 373 | 32 | | |
| Scup or porgy | 29,454 | 3,150 | 1,655 | 269 | | | | | | |
| Sea bass | 1,953 | 284 | 3,018 | 630 | 5,508 | 1,053 | | | | |
| Skates | 116 | 4 | 2,139 | 56 | 840 | 33 | 1,497 | 90 | 4,284 | 204 |
| Spot | 4,373 | 384 | | | | | | | | |
| Squeteague or weakfish | 33,464 | 4,327 | | | | | | | | |
| Tilefish | 82,153 | 6,335 | 256,917 | 21,227 | 214,924 | 19,911 | 127,052 | 13,001 | 105,874 | 12,021 |
| Whiting | 1,560 | 100 | | | 266 | 11 | | | | |
| Other fish | 297 | 27 | | | 73 | 5 | | | | |
| Total | 296,747 | 36,640 | 577,576 | 75,077 | 365,063 | 32,582 | 162,146 | 16,235 | 114,670 | 12,720 |

## FISHERIES OF LAKE PEPIN AND LAKE KEOKUK.

A statistical canvass of the fisheries of Lakes Pepin and Keokuk for 1917 was made during the year, covering the same ground as in the canvass of these lakes for the year 1914. Lake Pepin is about 25 miles long, being an expansion of the Mississippi River between Minnesota and Wisconsin. Lake Keokuk, which was called Lake Cooper in the returns for 1914, but changed to Lake Keokuk by the United States Geographic Board, is formed by the dam across the Mississippi River at Keokuk, Iowa, the water backing up for a distance of about 50 miles.

Since the building of the dam, much speculation has been indulged in by the fishermen as to its effect on the fishing in the upper river. Considerable interest, therefore, attaches to the statistics of the fisheries in these lakes for the years mentioned, the first canvass having covered the first calendar year following the closing of the dam.

*Lake Pepin.*—In 1917 there were 131 persons engaged in the fisheries of this lake; the value of boats, fishing apparatus, and shore and accessory property employed was $59,051; and the products taken amounted to 1,212,809 pounds of fish, having a value to the fishermen of $78,555.

The most important forms of fishing apparatus used were fyke nets, seines, and anchored gill nets. Fyke nets, known locally as hoop nets, took 595,769 pounds of fish, or 49.1 per cent of the total catch, valued at $46,333; seines, 459,504 pounds, or 37.8 per cent, valued at $21,929; and anchored gill nets, 150,465 pounds, or 12.4 per cent, valued at $9,991. The remainder of the catch, amounting to 7,071 pounds, valued at $302, was taken with trap nets and trot lines.

The principal species taken were buffalofish, catfish, fresh-water drum, and Asiatic carp. These species constituted about 94 per cent of the total output. A number of other species, including bowfin, quillback or white carp, and suckers, were also taken in considerable quantities.

Compared with the returns for 1914, there was a slight decrease in the number of persons engaged, but an increase of $15,452, or 35.4 per cent, in the amount of capital invested, and of 454,139 pounds, or 59.8 per cent, in the quantity, and $44,836, or 132.9 per cent, in the value of the products. There was a large increase in the catch of bowfin or dogfish, buffalofish, catfish, Asiatic carp, and mooneye, but a decrease in fresh-water drum, quillback, spoonbill, lake sturgeon, and suckers.

*Lake Keokuk.*—The number of persons engaged in the fisheries of this lake in 1917 was 118, the value of boats, fishing apparatus, and shore and accessory property was $21,879; and the products amounted to 1,800,986 pounds, valued at $89,117.

Fyke nets were the most important fishing apparatus used, the catch amounting to 1,670,657 pounds of fish, or 92.7 per cent of the total output, valued at $82,491. Trammel nets were next in importance, with a catch of 89,346 pounds, or 4.9 per cent of the total, valued at $3,625. The remainder of the products were taken with seines, anchored gill nets, trap nets, and trot lines.

The leading species taken in this lake were buffalofish, catfish, fresh-water drum, and Asiatic carp, and constituted about 96 per

cent of the total catch. Blackbass, bowfin, crappie, eels, quillback or white carp, sunfish, and various other species were taken in smaller quantities.

Compared with 1914, there was an increase of 12.3 per cent in the number of persons engaged, 35.1 per cent in the investment, and 1,139,851 pounds, or 172.4 per cent, in the quantity, and $65,817, or 282.4 per cent, in the value of the products. The catch of black bass increased from 15 pounds, valued at $1, to 4,163 pounds, valued at $418; crappie, from 70 pounds, valued at $4, to 17,560 pounds, valued at $1,103; and sunfish from 50 pounds, valued at $3, to 13,879 pounds, valued at $813. There was also a large increase in the catch of buffalofish, catfish, fresh-water drum, and Asiatic carp. A decrease occurred in the catch of eels, sand sturgeon, and suckers. The species reported in 1917 which were not shown in the returns for 1914 were bowfin or dogfish, pike, quillback or white carp, and spoonbill cat or paddlefish.

Statistics of the fisheries of these lakes in 1917, and also comparative statistics for the years 1914 and 1917, are given in detail in the following table:

FISHERIES OF LAKE PEPIN AND LAKE KEOKUK (MISSISSIPPI RIVER) IN 1917.

| Items. | Lake Pepin. | | Lake Keokuk. | |
|---|---|---|---|---|
| | *Number.* | *Value.* | *Number.* | *Value.* |
| Persons engaged: | | | | |
| Fishermen | 126 | ..... | 118 | ..... |
| Shoresmen | 5 | ..... | ..... | ..... |
| Total | 131 | ..... | 118 | ..... |
| Boats, apparatus, and other property: | | | | |
| Gasoline boats | 35 | $6,810 | 52 | $4,730 |
| Rowboats and barges | 52 | 1,395 | 64 | 810 |
| Houseboats | 3 | 250 | 16 | 3,975 |
| Fyke nets | 262 | 37,472 | 1,368 | 8,929 |
| Seines | 17 | 6,460 | 1 | 800 |
| Anchored gill nets | 371 | 2,350 | 12 | 180 |
| Trammel nets | ..... | ..... | 17 | 472 |
| Trap nets | 14 | 450 | 81 | 221 |
| Trot-lines | ..... | 13 | ..... | 132 |
| Shore and accessory property | ..... | 3,851 | ..... | 1,630 |
| Total | ..... | 59,051 | ..... | 21,879 |
| Products by apparatus: | | | | |
| With seines— | | | | |
| Bowfin (dogfish) pounds | 3,792 | 79 | ..... | ..... |
| Buffalofish do | 60,072 | 3,457 | 878 | 64 |
| Carp do | 275,439 | 12,210 | 6,197 | 329 |
| Catfish do | 52,041 | 4,252 | 2,422 | 235 |
| Crappie do | ..... | ..... | 16 | 1 |
| Fresh-water drum do | 52,742 | 1,381 | 1,417 | 85 |
| Mooneye, smoked do | 650 | 195 | ..... | ..... |
| Pike do | ..... | ..... | 4 | 1 |
| Quillback or white carp do | 9,245 | 136 | ..... | ..... |
| Spoonbill cat or paddlefish do | 1,375 | 83 | 512 | 35 |
| Sturgeon, lake do | 40 | 9 | ..... | ..... |
| Suckers do | 4,108 | 127 | ..... | ..... |
| Total | 459,504 | 21,929 | 11,446 | 750 |
| With fyke nets— | | | | |
| Black bass pounds | ..... | ..... | 4,163 | 418 |
| Bowfin (dogfish) do | 20,229 | 263 | 26,000 | 390 |
| Buffalofish do | 208,994 | 18,950 | 667,946 | 39,088 |
| Carp do | 100,422 | 6,411 | 678,149 | 25,253 |
| Catfish do | 175,535 | 17,524 | 97,486 | 7,089 |
| Crappie do | ..... | ..... | 17,544 | 1,102 |
| Fresh-water drum do | 59,839 | 1,926 | 158,058 | 7,991 |
| Mooneye, fresh do | 7,656 | 77 | ..... | ..... |
| Mooneye, smoked do | 6,600 | 660 | ..... | ..... |

FISHERIES OF LAKE PEPIN AND LAKE KEOKUK (MISSISSIPPI RIVER) IN 1917—Continued.

| Items. | Lake Pepin. | | Lake Keokuk. | |
|---|---|---|---|---|
| | *Number.* | *Value.* | *Number.* | *Value.* |
| **Products by apparatus—Continued.** | | | | |
| With fyke nets—Continued. | | | | |
| Pike.....pounds.. | | | 16 | $2 |
| Quillback or white carp.....do.... | 4,576 | $113 | 5,936 | 244 |
| Spoonbill cat or paddlefish.....do.... | 766 | 64 | 415 | 33 |
| Sturgeon, sand.....do.... | | | 365 | 30 |
| Suckers.....do.... | 11,152 | 345 | 700 | 38 |
| Sunfish.....do.... | | | 13,879 | 813 |
| Total..... | 595,769 | 46,333 | 1,670,657 | 82,491 |
| With anchored gill nets— | | | | |
| Buffalofish.....pounds.. | 31,742 | 2,602 | 5,625 | 461 |
| Carp.....do.... | 90,947 | 4,623 | 4,500 | 302 |
| Catfish.....do.... | 25,832 | 2,583 | 1,010 | 92 |
| Fresh-water drum.....do.... | 273 | 10 | 112 | 6 |
| Quillback or white carp.....do.... | 417 | 10 | | |
| Spoonbill cat or paddlefish.....do.... | 782 | 68 | | |
| Sturgeon, lake.....do.... | 472 | 95 | | |
| Total..... | 150,465 | 9,991 | 11,247 | 861 |
| With trammel nets— | | | | |
| Buffalofish.....pounds.. | | | 22,094 | 950 |
| Carp.....do.... | | | 67,252 | 2,675 |
| Total..... | | | 89,346 | 3,625 |
| With trap nets— | | | | |
| Catfish.....pounds.. | 396 | 40 | 1,668 | 150 |
| Fresh-water drum.....do.... | 5,450 | 191 | | |
| Total..... | 5,846 | 231 | 1,668 | 150 |
| With trot-lines— | | | | |
| Carp.....pounds.. | 780 | 33 | 6,161 | 241 |
| Catfish.....do.... | 445 | 38 | 7,318 | 626 |
| Eels.....do.... | | | 2,087 | 318 |
| Fresh-water drum.....do.... | | | 967 | 48 |
| Sturgeon, sand.....do.... | | | 89 | 7 |
| Total..... | 1,225 | 71 | 16,622 | 1,240 |
| Grand total..... | 1,212,809 | 78,555 | 1,800,986 | 89,117 |
| **Products by species:** | | | | |
| Black bass.....pounds.. | | | 4,163 | 418 |
| Bowfin (dogfish).....do.... | 24,021 | 342 | 26,000 | 390 |
| Buffalofish.....do.... | 300,808 | 25,009 | 696,543 | 40,563 |
| Carp.....do.... | 467,588 | 23,277 | 762,259 | 28,800 |
| Catfish.....do.... | 254,249 | 24,437 | 109,904 | 8,192 |
| Crappie.....do.... | | | 17,560 | 1,103 |
| Eels.....do.... | | | 2,087 | 318 |
| Fresh-water drum.....do.... | 118,304 | 3,508 | 160,554 | 8,130 |
| Mooneye, fresh.....do.... | 7,656 | 77 | | |
| Mooneye, smoked.....do.... | 7,250 | 855 | | |
| Pike.....do.... | | | 20 | 3 |
| Quillback or white carp.....do.... | 14,238 | 259 | 5,936 | 244 |
| Spoonbill cat or paddlefish.....do.... | 2,923 | 215 | 927 | 68 |
| Sturgeon, lake.....do.... | 512 | 104 | | |
| Sturgeon, sand.....do.... | | | 454 | 37 |
| Suckers.....do.... | 15,260 | 472 | 700 | 38 |
| Sunfish.....do.... | | | 13,879 | 813 |
| Total..... | 1,212,809 | 78,555 | 1,800,986 | 89,117 |

COMPARATIVE STATISTICS OF THE FISHERIES OF LAKES PEPIN AND KEOKUK FOR THE YEARS 1914 AND 1917.

| Items. | 1914 | | 1917 | |
|---|---|---|---|---|
| LAKE PEPIN. | *Number.* | *Value.* | *Number.* | *Value.* |
| Persons engaged: | | | | |
| Fishermen | 135 | ..... | 126 | ..... |
| Shoresmen | 2 | ..... | 5 | ..... |
| Total | 137 | ..... | 131 | ..... |
| Boats, apparatus, and other property: | | | | |
| Gasoline boats | 28 | $7,625 | 35 | $6,810 |
| Rowboats and barges | [a] 53 | 1,300 | 52 | 1,305 |
| Houseboats | 1 | 100 | 3 | 250 |
| Fyke nets | 295 | 24,995 | 262 | 37,472 |
| Seines | 14 | 3,340 | 17 | 6,460 |
| Anchored gill nets | 664 | 4,421 | 371 | 2,350 |
| Trap nets | 8 | 480 | 14 | 450 |
| Trot and hand lines | ..... | 3 | ..... | [b] 13 |
| Shore and accessory property | ..... | 1,335 | ..... | 3,851 |
| Total | ..... | 43,599 | ..... | 59,051 |
| Products: | | | | |
| Bowfin (dogfish) ..... pounds | 1,534 | 16 | 24,021 | 342 |
| Buffalofish ..... do | 261,250 | 19,728 | 300,808 | 25,009 |
| Carp ..... do | 237,517 | 7,623 | 467,588 | 23,277 |
| Catfish ..... do | 26,830 | 1,745 | 254,229 | 24,437 |
| Fresh-water drum ..... do | 131,785 | 2,450 | 118,304 | 3,508 |
| Mooneye, fresh ..... do | 9,300 | 88 | 7,656 | 77 |
| Mooneye, smoked ..... do | 1,465 | 70 | 7,250 | 855 |
| Pike ..... do | 50 | 5 | ..... | ..... |
| Quillback or white carp ..... do | 60,605 | 864 | 14,238 | 259 |
| Spoonbill cat or paddlefish ..... do | 8,877 | 557 | 2,923 | 215 |
| Sturgeon, lake ..... do | 1,067 | 129 | 512 | 104 |
| Suckers ..... do | 18,340 | 439 | 15,260 | 472 |
| Sunfish ..... do | 50 | 5 | ..... | ..... |
| Total | 758,670 | 33,719 | 1,212,809 | 78,555 |
| LAKE KEOKUK. | | | | |
| Persons engaged: Fishermen | 105 | ..... | 118 | ..... |
| Boats, apparatus, and other property: | | | | |
| Gasoline boats | 36 | 3,870 | 52 | 4,730 |
| Rowboats | 84 | 1,250 | 64 | 810 |
| Houseboats | 10 | 1,075 | 16 | 3,975 |
| Fyke nets | 1,378 | 5,693 | 1,368 | 8,929 |
| Seines | ..... | ..... | 1 | 800 |
| Anchored gill nets | ..... | ..... | 12 | 180 |
| Trammel nets | 14 | 304 | 17 | 472 |
| Trap nets | ..... | ..... | 81 | 221 |
| Trot and hand lines | ..... | 153 | ..... | [b] 132 |
| Shore and accessory property | ..... | 3,845 | ..... | 1,630 |
| Total | ..... | 16,190 | ..... | 21,879 |
| Products: | | | | |
| Black bass ..... pounds | 15 | 1 | 4,163 | 418 |
| Bowfin (dogfish) ..... do | ..... | ..... | 26,000 | 390 |
| Buffalofish ..... do | 249,900 | 9,252 | 696,543 | 40,563 |
| Carp ..... do | 302,365 | 7,823 | 762,259 | 28,800 |
| Catfish ..... do | 71,535 | 4,855 | 109,904 | 8,192 |
| Crappie ..... do | 70 | 4 | 17,560 | 1,103 |
| Eels ..... do | 3,800 | 250 | 2,087 | 318 |
| Fresh-water drum ..... do | 26,860 | 827 | 160,554 | 8,130 |
| Pike ..... do | ..... | ..... | 20 | 3 |
| Quillback or white carp ..... do | ..... | ..... | 5,936 | 244 |
| Spoonbill cat or paddlefish ..... do | ..... | ..... | 927 | 68 |
| Sturgeon, sand ..... do | [c] 1,900 | 121 | 454 | 37 |
| Suckers ..... do | 4,640 | 164 | 700 | 38 |
| Sunfish ..... do | 50 | 3 | 13,879 | 813 |
| Total | 661,135 | 23,300 | 1,800,986 | 89,117 |

[a] No barges were reported in 1914.
[b] No hand lines were reported for 1917.
[c] Reported as lake sturgeon in 1914.

## ALASKA FISHERIES SERVICE.

### EXTENT OF THE ALASKA FISHERIES.

In 1917 the fisheries of Alaska attained their highest development up to that time. The number of persons employed was 29,491, an increase of 5,497 over 1916. The capital invested was $54,937,549, an increase of $15,367,937. The value of the products as first placed on the markets was $51,466,980, an increase of $25,310,421. This marked advance in value, amounting to 96 per cent, was due partly to a larger catch and pack of important species, but mostly to an extraordinary increase of the market prices of canned salmon, ranging from 56 per cent for red salmon, 64 per cent for cohoes, 76 per cent for humpbacks, and 84 per cent for chums to 94 per cent for kings. The salmon industry continues to overshadow all other branches, and in 1917 surpassed all previous records as regards the quantity of products taken and the market value thereof. The augmented production was due in part to increased fishing and canning operations and in part to extremely heavy runs of fish in certain regions. The additional canneries numbered 18, including 3 which, while in existence in 1917, were not then devoted to salmon. Southeastern Alaska had a very heavy run of humpbacks, which gave an increased pack of more than 1,000,000 cases. In central Alaska there was a decline in the catch of both red and humpback salmon, but the Karluk and Alitak sections showed even larger runs of red salmon than in the exceptionally good year of 1916. Western Alaska had the largest catch of red salmon ever made there, aggregating more than 24,000,000 fish, or 2,500,000 in excess of the best previous year, 1914. The total number of salmon taken in all Alaska in 1917 was slightly over 92,600,000, of which 44,875,000 were humpbacks and 36,497,000 were reds.

The 118 salmon canneries in operation packed 5,947,286 cases (of 48 one-pound cans), valued at $46,304,090, an increase of more than 1,000,000 cases over 1916. The other products of the salmon industry—namely, fresh, frozen, mild-cured, pickled, dry-salted, and smoked fish—had a value of $1,473,991.

Ranking next to the salmon industry came the halibut fishery, with a catch valued at $1,120,226; the herring fishery, $767,729; the cod fishery, $744,976; and the whale fishery, $654,852, all of which were of greater value in 1917 than in the previous year.

Detailed statistics of all branches of the Alaska fisheries have been gathered by the Bureau and have been published, with discussion, in the annual report of the Alaska service.

### TAX ON SALMON CANNED IN ALASKA.

The act of June 26, 1906, for the protection and regulation of the fisheries of Alaska, provides that packers of canned salmon shall pay a license tax on their output at a rate per case depending on the species packed. Salmon in Alaska is packed in cases containing 48 1-pound cans, 48 half-pound cans, or 96 half-pound cans. The bulk of the salmon is packed in 1-pound cans, 48 to the case. The Bureau of Fisheries has always assumed that a case of salmon for

the purpose of the law in question meant a definite amount, namely, 48 pounds of salmon, and in assembling statistics of the fisheries of Alaska it has consistently considered a package containing 48 half-pound cans of salmon as a half case.

Recently the clerk of the district court in southeastern Alaska, acting in accordance with an opinion by the United States attorney at Juneau, insisted that salmon canneries pay a license tax upon their canned product at so much per case, without reference to the quantity of salmon involved. This action was manifestly arbitrary in that the amount of taxes to be collected would be based not upon the quantity of salmon packed but upon a condition brought about by the desires of salmon packers or the changing notions of the public as to the size of case which could be handled to the best advantage.

The situation was brought to the attention of the Bureau of Fisheries by the Association of Pacific Fisheries. Upon the request of the Bureau, the Solicitor for the Department of Commerce rendered an opinion in regard to the matter, which was to the effect that a case of salmon within the meaning of the fisheries act of June 26, 1906, was a definite amount, 48 pounds of salmon. The matter was then referred to the Attorney General of the United States with the request that if he concurred in the opinion of the Solicitor, instructions be issued to the United States attorney at Juneau to enforce the collection of license taxes on that basis. The Attorney General concurred with the opinion of the Solicitor for the Department of Commerce, and instructions were issued to collect the tax on canned salmon in accordance therewith.

### INSPECTION OF PRIVATE SALMON HATCHERIES.

Representatives of the Bureau have made the usual inspections of private salmon hatcheries maintained by companies engaged in salmon canning. Three of these plants, located at Loring, Quadra, and Hetta, were operated in 1917-18. Their work was in general found to be conducted in a satisfactory manner, but additional facilities for rearing salmon should be provided in order that they may fulfill their highest purpose. The output of these hatcheries during the fiscal year 1918 was 23,712,000 red-salmon fry, all of which were planted in local waters. Under the law, the rebates of taxes on canned fish allowed as an offset to the hatching operations amounted to $9,484.80.

### WATERS CLOSED TO COMMERCIAL FISHING.

Pursuant to the authority conveyed by section 6 of the act approved June 26, 1906, and for the purpose of giving needed protection to salmon in various parts of Alaska, the following orders prohibiting or restricting salmon fishing were promulgated during the fiscal year 1918 after hearings held in accordance with law. The orders became effective on January 1, 1918.

*Karluk River, under date of November 30, 1917.*—That until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, excepting only the native Indians taking limited numbers of salmon for their own consumption and not for sale or barter, be and is hereby prohibited in waters of Alaska, as follows: In Karluk River and Lagoon, and all tributary waters.

*Bering River, under date of November 30, 1917.*—That until further notice all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, be and is hereby prohibited in waters of Alaska, as follows: Bering River and all tributary waters, including Bering Lake, above a line extending at right angles across Bering River from a point approximately eight hundred (800) feet northwesterly from the mouth of Gandil River, Alaska.

*Copper River, under date of December 29, 1917.*—That until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, in the Copper River and its delta, and all tributary waters, Alaska, be, and is hereby, made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. Commercial fishing is prohibited in all waters of the Copper River delta from 6 a. m. on January 1 to 6 a. m. on June 1 of each year, and in the waters of Miles Lake and Abercrombie Canyon from 6 a. m. on January 1 to 6 a. m. on June 5 of each year.

2. A weekly close season from 6 p. m. Saturday to 6 a. m. of the Monday following shall be observed in all of the waters herein referred to, in which fishing is permitted.

3. Commercial fishing in the waters of the delta shall be limited to set nets, stake nets, and drift gill nets: *Provided, however,* That the four existing traps east of Cape Whitshed may be continued in operation, but without change of location or increase in size. No stake net, set net, or drift gill net shall exceed 1,000 feet in length. Only one stake net or set net shall be extended out from shore from one location, and no offshore stake nets or set nets will be permitted; the lateral distance interval between all such nets in the waters of the delta shall be not less than 1,800 feet.

4. All fishing is prohibited from the head of the delta to the foot of Miles Lake at all times.

5. All fishing in Miles Lake shall be limited to stake nets and set nets. No such nets shall exceed 600 feet in length, and only one such net shall be extended out from shore from one location; no offshore nets will be permitted in the lake. The lateral distance interval between all nets in Miles Lake shall be not less than 600 feet.

6. Fishing in Abercrombie Canyon shall be restricted to the use of dip nets operated by hand, such nets not to exceed 16 inches in greatest diameter and only one dip net shall be operated by a person. On the east side of the canyon there shall be distance intervals of at least 300 feet between fishermen operating dip nets. No fishing will be permitted in the so-called bear holes near the upper end of Abercrombie Canyon.

7. No fishing will be permitted at any time in the waters of the Copper River above Abercrombie Canyon, or in any of the waters tributary thereto, except in the case of local residents, who may take limited numbers of salmon for domestic use: *Provided,* That such fishing shall at no time be upon the spawning grounds of any salmon.

8. No set net or stake net shall be operated in any other than substantially a straight line.

9. For the purposes herein considered, the delta of the Copper River will be regarded as including all waters south of an east and west line passing through Mile 27 on the Copper River & Northwestern Railway, as at present established, and inside of a line from Point Martin to Cape Whitshed drawn so as to include the waters of the Martin Islands, the Egg Islands, and all tidal flats and islands between.

10. The lower end of Miles Lake shall be considered as at the bridge of the Copper River & Northwestern Railway at Mile 49. The upper end of Miles Lake shall be considered as at a point near Mile 52½ on the Copper River & Northwestern Railway where the river loses its identity in the lake, this point to be as indicated by notices posted by duly authorized representatives of the Bureau of Fisheries.

11. Abercrombie Canyon shall be considered as extending from the upper end of Miles Lake to Tunnel Point, near Mile 53½ on the Copper River & Northwestern Railway.

12. For the purposes of this order the following definitions are adopted to apply to the words in question where the same are used: "Stake net," a gill net attached or affixed to piles or stakes; "set net," an anchored gill net.

FISHERY PATROL AND STREAM WATCHMEN.

During the fishing season of 1917 the Bureau employed in the fishery patrol of the Alaskan coast two small vessels, named the *Murre* and the *Auklet*, after local sea birds, which had been built to order and put in commission in July. These are seaworthy craft, constructed after the well-tried salmon purse-seine boat, and have given entire satisfaction. In addition to the *Osprey*, which was put into commission in the latter part of the fiscal year, the Bureau hired for the fishery patrol of the Prince William Sound, Cook Inlet, and Nushagak regions a schooner and three launches.

For the season of 1918 there was placed in service at Fairbanks a boat which the Bureau had built for the use of its employees in connection with field work on the Yukon River and its tributaries. This boat will greatly facilitate the work of the wardens and others in enforcing the laws for the protection of fisheries and also fur-bearing animals in the interior of Alaska. This boat, named the *Swan*, is 32 feet in length and is equipped with a 20-horsepower motor. There are sleeping accommodations for two persons. Heretofore employees of the Bureau have been dependent upon private boats for transportation in these waters.

For the fishing season of 1918 the Bureau inaugurated an additional feature for securing the more adequate enforcement of the fishery laws. A number of temporary employees, designated as stream watchmen, were detailed to important fishing grounds in southeastern and central Alaska. Each watchman was assigned a limited area to patrol, which he was expected to keep under continuous observation. In certain regions where fishing is carried on by means of gill nets, haul and purse seines, or other movable apparatus, these watchmen will be much more effective than patrol boats. Patrol boats can enforce the law in respect to movable apparatus only while actually present at the fishing grounds where it is used. The appropriation necessarily limited the number of men who could be advantageously employed in this way. However, by selecting certain strategic points for operations and by shifting the watchmen from one stream to another in response to changing conditions in respect to fishery operations it is thought that a very considerable amount of protection may be afforded the fisheries at comparatively small cost.

Ten men were employed to undertake this work. Seven of them were secured through the dean of the University of Washington, five of the seven being students at the university and two being professors, while an eighth was a graduate of the university. One man was secured in the State of Washington, and the tenth man was engaged in southeastern Alaska. Five of the men were assigned to work in southeastern Alaska and five in central Alaska under the immediate direction of the Bureau's regular officers. A number of small boats were hired for the use of these men.

Various prosecutions have been instituted in the Alaska courts and before United States commissioners for violations of laws and regulations for the protection of salmon. The violations consisted mostly of nonobservance of the weekly close season, operation of gear within prohibited distances of other gear, and failure to mark

pound nets so that ownership could be determined. In most cases a plea of guilty was entered and fines were imposed.

### CENSUS OF RED SALMON IN WOOD RIVER.

The Bureau has continued to make the annual count of the red salmon passing up Wood River to their spawning grounds in Lake Aleknagik. The 1917 census, conducted as in previous years, and with the usual indispensable assistance of the Alaska Packers Association and the Alaska-Portland Packers' Association, showed an escapement from the active fishing in the Nushagak River of 1,081,508 red fish between June 26 and August 1. The heaviest runs occurred on July 11 to 14, inclusive, when 529,588 fish were counted.

The purpose of this census has been fully explained in previous reports. The results since its inception have been as follows:

| | Number. | | Number. |
|---|---|---|---|
| 1908 | 2,600,655 | 1913 | 753,109 |
| 1909 | 893,244 | 1915 | 259,341 |
| 1910 | 670,104 | 1916 | 551,959 |
| 1911 | 354,299 | 1917 | 1,081,508 |
| 1912 | 325,264 | | |

### FISHERY INTELLIGENCE SERVICE.

The Bureau has continued to carry out the wishes of the Legislature of Alaska, as set forth in a memorial asking that the Bureau of Fisheries, in conjunction with the Washington-Alaska Military Cable and Telegraph System, arrange to have the prices of fresh fish at Seattle and Ketchikan bulletined every day at the cable office of every town on the Alaska coast where fishing vessels call for the purpose of shipping fish southward and to have once a week the prices of salt fish of the varieties caught in Alaska waters bulletined at the cable offices of the Alaska coast. The War Department, which operates the Washington-Alaska Military Cable and Telegraph System, expressed its willingness to receive, transmit, and post bulletins furnished by the Bureau of Fisheries, and early in July, 1917, the service was initiated, the information thus furnished including (1) the forwarding each day, Sundays and holidays excepted, to Juneau, Petersburg, Ketchikan, Wrangell, Sitka, Valdez, Seward, Cordova, and Skagway the noon Seattle prices for fresh halibut, sablefish, and red rockfish; (2) inclusion with the Seattle quotations on Monday of each week the prices of pickled sablefish, salmon, and herring; and (3) the furnishing from Ketchikan of local information, corresponding to that furnished from Seattle, to the other Alaska towns supplied with the Seattle quotations. The purpose of this service is to keep the fishermen of this remote coast in touch with market conditions, so that they may dispose of their catches more profitably, and thereby be induced to increase the production of fish. The service has met with general favor.

### FISHERY EXPLOITATION WORK.

The success which attended the Alaska work of the Bureau in the fishing season of 1917 in distributing literature and sending special assistants to the field to demonstrate practical operations, particularly

with respect to introducing the Scotch method of curing herring, encouraged it in renewing similar operations in the 1918 season. The results have proved the value of this undertaking, and there is every reason to believe that there will be a further gratifying increase in the production of herring and various more or less neglected fishes.

ESTABLISHMENT OF SALMON CANNERIES ON YUKON RIVER.

The proposed establishment in 1918 of a salmon cannery at Andreafski on the Yukon River brought forth strong protest from many quarters. It was advanced that cannery operations on the Yukon would deplete the supply of salmon upon which the natives living along the river and its tributaries depended in a large degree for their subsistence. It was also claimed that the white population would suffer if this source of food should be restricted to the extent feared. The Yukon and its tributaries drain a large extent of inhabited territory, and while most rivers in Alaska are fished near their mouths only, the waters of the Yukon are the scene of fishery operations from Bering Sea to points in Canada many hundreds of miles from the sea.

On account of the protests which were made, a hearing was held at Seattle on May 17, 1918, at which persons interested in the matter were given an opportunity to be heard. At the hearing it did not develop that there was any particular alarm in regard to the depletion that would be caused by the operation of a single cannery. The apprehension was that this particular cannery would be but one of many to be built, the aggregate result of which would be the depletion of the Yukon salmon supply. The Bureau has made arrangements to hold another hearing in regard to the matter at Seattle on November 20, 1918. Meanwhile, steps have been taken for a survey of the salmon resources of the Yukon and its tributaries and determination of the extent to which salmon are utilized by natives and other residents of the region in question. A number of employees of the Bureau have been detailed to make a special study of the situation on the ground. All persons known to be interested in the matter have been supplied with schedules to be filled out by them and returned to the Bureau, which it is hoped will develop further information. The Bureau of Education is cooperating with the Bureau of Fisheries in the matter, and officials of the Department of Justice in Alaska are rendering assistance.

PERMITS FOR COMMERCIAL FISHERY OPERATIONS IN ALEUTIAN ISLANDS.

In the fiscal year 1918 permits authorizing certain fishery operations within the Aleutian Islands Reservation were issued as follows:

1. Alaska Commercial Co., authorized to engage in the business of preserving cod and salmon for commercial purposes, erection of any cannery excepted.

2. Umnak Livestock Co., authorized to engage in the business of preserving cod and salmon for commercial purposes, erection of any cannery excepted.

3. Paul Buckley, authorized to engage in the business of taking and utilizing whales for commercial purposes, erection of any cannery excepted.

4. N. E. Bolshanin, authorized to engage in the business of salting cod and salmon for commercial purposes, erection of any cannery excepted.

5. Kuskokwim Fishing & Transportation Co., authorized to establish a shore station for use in connection with the taking and preservation of cod and salmon for commercial purposes, erection of any cannery excepted.

6. Alaska Fishing Co., authorized to take not to exceed 1,000 barrels of salmon and to sell the same either fresh or salted.

7. Northern Fisheries (Inc.), authorized to engage in the business of preserving cod for commercial purposes, erection of any cannery excepted.

8. Alaska Commercial Co., authorized to purchase fish from natives resident of the reservation and to preserve and sell the same for commercial purposes.

9. O. K. Quean, authorized to pack and dispose of for commercial purposes not to exceed 20 tons of cod and 200 barrels of salmon.

10. Edwin H. Larsen, authorized to establish and operate a saltery for use in connection with the taking and preservation of cod and salmon for commercial purposes.

11. Northern Fisheries (Inc.), authorized to engage in the pickling of salmon, trout, atkafish, and other fishes for commercial purposes.

12. Buckley Livestock, Fisheries & Transportation Co., authorized to engage in cod-fishery operations upon Unalaska Island and to build thereon suitable bunk houses, cookhouses, and storage buildings necessary to carry on the business of catching, salting, and otherwise curing codfish.

13. Buckley Livestock, Fisheries & Transportation Co., authorized to construct and operate on Unalaska Island a plant for the canning or salting of salmon or other food fishes taken in the vicinity of Unalaska Island.

14. Unalaska Atkafish Co., authorized to engage in the salting or mild curing of atkafish, codfish, and salmon for commercial purposes.

15. A. C. Goss, authorized to engage in miscellaneous fishery operations, construction or operation of any cannery excepted.

16. Alaska Fishing Co., authorized to engage in commercial fishery operations at Unalaska Island, construction or operation of any cannery excepted.

## ALASKA FUR-SEAL SERVICE.

### GENERAL ADMINISTRATIVE MATTERS.

A very full report on the fur-seal service in all its branches during the season of 1917 is contained in the document entitled "Alaska Fisheries and Fur Industries in 1917." This may be consulted by persons desiring to know details of the affairs of the Pribilof Islands natives, fur seals, foxes, reindeer, and other matters.

The greatly increased cost of supplies of all kinds rendered inadequate the appropriation for the fur-seal branch of the general Alaska service for 1918 and necessitated an appeal to Congress for a deficiency appropriation of $35,000, which became available in October, 1917.

In April, 1918, there were sent to the Pribilofs three motor trucks, two for St. Paul Island and one for St. George Island. Reports indicate that these trucks have already proved very useful in various ways; and with the gradual extension of road facilities, in which the trucks will be of great aid, their usefulness will undoubtedly increase.

It is gratifying to record that the natives of the Pribilof Islands responded in a patriotic way to the third call for Liberty Loan subscriptions. From funds held in the custody of the Commissioner of Fisheries for certain of these natives, seven on St. Paul and four on St. George requested that bonds aggregating $1,150 be purchased for them. One woman subscribed for $400. From funds due for taking fox skins, 24 natives subscribed for bonds aggregating $1,200, each of the 24 subscribing for a $50 bond.

The act providing for the sundry civil expenses of the Government for the fiscal year 1919 appropriated $20,000 for the purchase or construction of a wooden power lighter for use at the Pribilof Islands. Arrangements have been made for the construction of a suitable vessel. The craft will be about 70 feet in length and 17 feet in breadth, with a cargo capacity of 30 to 40 tons, and provided with an internal-combustion engine of about 80 horsepower. Sleeping accommodations will be available for 6 employees of the Bureau and for 10 natives. The vessel will be substantial and seaworthy, and able to make trips when necessary from the Pribilof Islands to Unalaska, a distance of 250 miles across Bering Sea. It is planned that the vessel will be ready for service next season.

Early in 1918, in response to the request of the Department of Commerce, the Navy Department arranged for the detail of a Coast Guard vessel for patrolling the North Pacific Ocean and Bering Sea for the protection of fur seals and sea otters. A patrol for the purpose indicated is required by the provisions of the North Pacific Sealing Convention of July 7, 1911.

In order to obviate the waste of such valuable products as oil and fertilizer, obtainable from the carcasses of seals, the installation of a reduction plant has been a great desideratum at the Pribilof Islands. Money for this purpose having been made available by the President, the necessary machinery, equipment, and other materials have been purchased and forwarded to St. Paul Island, and the plant will shortly be ready for use.

The transportation of persons and supplies to the seal islands and of persons and products therefrom has been efficiently performed by the steamer *Roosevelt*, which during the fiscal year made three trips from Seattle and gave the islands a more adequate service than was ever before possible. While operating expenses of this vessel are considerable, they are far less than would be required for the unsatisfactory transportation such as was formerly rendered by chartered vessels. In fact, the work performed by the *Roosevelt* during the year would, if done by a private vessel, have cost the Government a sum that would cover the purchase price of this vessel.

With the publication of Funsten Bros. & Co.'s catalogue which announced the sale of sealskins at St. Louis on April 22, 1918, there were formally adopted new terms for use in classifying sealskins.

The terms formerly used represented the fortuitous outgrowth of years and were in some cases misleading in that they gave the uninitiated the impression that skins were taken from seals which are never killed for commercial purposes at the Pribilofs. The new terms avoid the faults of the old, and each one means that the skin to which it is applied has a length varying only within specified limits. It is believed that this innovation will meet with general approval by the fur-buying public. A comparison of the old and new terms, with the size limits of the new terms, follows:

| Old classification. | New classification. | Lengths. |
|---|---|---|
| | | *Inches.* |
| Wigs | Wigs | Above 55 |
| Middlings | Extra extra large | 49 to 55 |
| Middlings and smalls | | |
| Smalls | Extra large | 46 to 48 |
| Large pups | Large | 43 to 45 |
| Middling pups | Mediums | 39 to 42 |
| Small pups | Small mediums | 35 to 38 |

RESUMPTION OF SEAL KILLINGS FOR COMMERCIAL PURPOSES.

By the provisions of the act of Congress approved August 24, 1912, giving effect to the North Pacific Sealing Convention of July 7, 1911, it became permissible to take fur-seal skins for commercial purposes at the Pribilof Islands after August 24, 1917. The season when sealskins can be obtained for commercial purposes to best advantage ends about August 10, and for this reason no considerable number of skins were secured in 1917. Early in 1918 the Secretary of Commerce tentatively authorized the taking of 25,000 skins during 1918, this number to be increased later should the conditions warrant. The quota was apportioned between the two islands as follows: 20,000 to St. Paul Island and 5,000 to St. George Island. By July 31, 1918, the take of sealskins on St. Paul Island in the calendar year was 23,889 and on St. George Island 6,711. Following the unanimous opinion expressed by responsible Government representatives on the islands, the Secretary in July, 1918, authorized an increase in the season's quota from 25,000 to 35,000 skins, 28,000 being apportioned to St. Paul Island and 7,000 to St. George Island. To August 10, 1918, the skins taken numbered 33,881.

In connection with the expansion of sealing operations at the Pribilofs it was evident that outside assistance would be necessary on St. Paul Island if the desired number of skins was to be taken. Arrangements were accordingly made whereby Funsten Bros. & Co., of St. Louis, the firm which sells for the Department the sealskins taken at the Pribilofs, sent 5 men to assist with those features of the work which require more or less expert knowledge of the handling and care of furs. To supplement the services of the natives of St. Paul in the killing of seals, the taking of skins, etc., 11 natives were hired at Unalaska and taken to the islands early in the sealing season.

AUTHENTICATION OF FUR-SEAL SKINS TAKEN BY WASHINGTON INDIANS.

The Bureau has again had the cooperation of the superintendent of the United States Indian Service at Neah Bay, Wash., in the matter of authenticating fur-seal skins lawfully taken by Indians dwell-

ing on the coast of Washington. The North Pacific Sealing Convention of July 7, 1911, permits these Indians to take sealskins under certain restricted conditions.

To July 31, 1918, the skins thus authenticated numbered 395. The records submitted show that 388 of the seals involved were taken in April, May, and June, 1918. Information as to when the other 7 were captured is not stated but it is assumed that they were taken in the same months. The records also show that 251 of the seals were males, 142 females, the sex of 2 not being given. All of the seals were speared from canoes operating from 10 to 25 miles west of La Push, Wash.

While it is regretted that so large a proportion of female seals were captured, yet so long as the Indians are to have the privilege of taking seals it is not seen how the killing of females can be prevented. The Indians should undoubtedly continue to have the privilege which they now possess, and with the herd in its present condition the number of females taken can not materially affect its status.

### CONDITION OF THE SEAL HERD.

The census of the Alaskan seal herd in 1917 gave a total of 468,692 seals of all ages. The census was again under the immediate charge of G. Dallas Hanna, of the Alaska service, who was assisted by Dr. Harold Heath and members of the islands staff. The 1918 census, although taken in the early part of the fiscal year 1919, should be noted in this report. It was made under the same circumstances as formerly, Mr. Hanna in charge and Dr. Heath assisting. The number of pups born was 143,005, representing an equal number of breeding cows, and the total strength of the herd as of date of August 10 was computed to be 496,611, exclusive of 33,881 seals killed for commercial purposes during the year. The only variation from former methods of calculation was to increase from 12½ to 20 per cent the annual natural mortality among the bulls, a course which appeared to be justified by information gained during this census.

The great preponderance of old male seals, resulting from the enforced suspension of commercial sealing for five years, is the only unsatisfactory feature of the herd. The breeding males on the islands in 1918 were sufficient for a herd of 740,000 cows, allowing 30 cows to a harem.

### SALES OF PRIBILOF ISLANDS PRODUCTS.

During the fiscal year 1918 the revenue derived from the sale of products of the Pribilof Islands was $417,815.20 gross and $296,228.85 net, the difference being largely in the cost of dressing and dyeing sealskins before their sale at public auction. There were two sales of sealskins, in October, 1917, and April, 1918, the number disposed of being 9,339 and the gross receipts $379,392. Fox skins, taken during the winter of 1916–17, were sold in October, 1917, 567 being blue and 39 white; the gross receipts therefrom were $35,680.50. Two lots of old seal bones, aggregating 193,570 pounds, brought $2,742.70 gross.

## MINOR FUR-BEARING ANIMALS OF ALASKA.

### ENFORCEMENT OF LAWS AND REGULATIONS.

The wardens and other employees of the Bureau have enforced the laws and regulations for the protection of the minor fur-bearing animals throughout Alaska. This duty has been performed as efficiently as the number of the agents permitted. Through the cooperation of the governor of Alaska the Bureau will be enabled to increase its personnel for the protection of fur-bearing animals in Alaska by the employment of game wardens in the Territory as special fur wardens. In return the Bureau has authorized the governor to appoint a number of its wardens as ex-officio game wardens.

### FURS SHIPPED FROM ALASKA.

It is indicated by statistics compiled by the Bureau that during the period from November 16, 1916, to November 15, 1917, the value of the furs shipped from Alaska was $1,028,719, exclusive of the fur seal and fox skins of the Pribilof Islands, as against $911,244 in the preceding similar period. In a number of instances there was a decrease in the number of pelts shipped, but the average price of practically all furs showed a material advance, hence the aggregate value of the shipments in 1917 was considerably greater than that of the previous year.

Acknowledgment is made of the cooperation of the Post Office Department in securing accurate statistics of shipments of furs by mail. The arrangements in effect for several years were reaffirmed when under date of May 4, 1917, the Postmaster General issued an order slightly modifying the previous arrangement. It is now the duty of each postmaster in Alaska to furnish report blanks prepared by the Bureau of Fisheries to persons who present furs for mailing, and to see that no furs are sent to outside points until after the shipper has filled out the blank. The postmaster signs the blank and dispatches the shipment of furs without examining the contents. The report is forwarded to the Bureau of Fisheries.

### NEW REGULATIONS FOR PROTECTION OF FUR-BEARING ANIMALS.

The only change made in the fiscal year 1918 in the regulations for the protection of fur-bearing animals in Alaska was one approved by the Secretary of Commerce under date of March 4, 1918, extending the close season on beaver until November 1, 1923. This change was made at the request of the Bureau, and was based in large part on the recommendations of wardens in its service and at the solicitation of the governor of Alaska and other persons having the welfare of the Territory at heart.

Beavers in Alaska have been afforded entire protection for a number of years and the resulting increase in their numbers has fully justified the action of the Department in the past. It was felt, however, that the reestablishment of the beaver in Alaska had been local rather than general, and that since the colonial habits of the beaver make extermination a comparatively easy matter, there should be complete protection for a further period of five years.

### FUR FARMING IN ALASKA.

As for a number of years past, there has been some activity in fur farming. This has consisted chiefly of the liberation of adult foxes on islands, although in a number of instances corrals have been constructed and the work has been conducted along scientific and businesslike lines. Reports have been received indicating that there were 8 fur farms in operation in the interior of Alaska and that 20 islands were occupied for the breeding of fur-bearing animals. At the end of the fiscal year 1918 five islands under the jurisdiction of the Department had been leased for the propagation of fur-bearing animals; these were Middleton, Simeonof, Little Koniuji, Marmot, and Pearl Islands. The lease of Marmot Island was forfeited in 1918.

## MISCELLANEOUS MATTERS.

### SPECIAL CONSTRUCTIONS AND IMPROVEMENTS.

In January, 1918, the Rhode Island Legislature granted the United States permission to purchase the property which the Bureau has desired to acquire on Block Island for a marine fish hatchery. The land has since been purchased, title thereto has been perfected, plans for the station have been made, and construction will be begun if the greatly increased cost of material and labor will permit the completion of the hatchery and pumping plant within the appropriation.

No bid within the limit of the appropriation could be obtained for the new motor boat authorized for the Woods Hole (Mass.) station. The construction of two steel fish-distribution cars has not been possible, owing to the inability of properly equipped establishments to handle this kind of work at this time. Another piece of construction work that has lapsed is the lobster-rearing plant for which Congress made a small appropriation in 1917. The reduction of the size of this proposed plant to a point that greatly impairs its value still leaves its estimated cost far in excess of the appropriation. The project will have to be held in abeyance or Congress must increase the appropriation.

With the additional appropriation for the laboratory at Key West, Fla., there have been constructed a director's residence and a pump house, both of terra cotta hollow tile, and a concrete cistern for fresh water with a capacity of 2,000 gallons.

At the Cape Vincent (N. Y.) station, new machinery has been installed, and the purchase of about 7.5 acres of additional land is contemplated in order to construct ponds and institute pond culture at this point.

A double frame building for quarters has been built at the Bozeman (Mont.) station. Each part is 30 by 50 feet and contains 6 rooms.

At the Orangeburg (S. C.) station 5 new ponds have been constructed, and at the Saratoga (Wyo.) station 2 new ponds have been completed, and there have been extensive improvements to the water supply, including the addition of a filtering system.

### VESSEL SERVICE.

The repairs which the steamer *Albatross* was undergoing at the Mare Island Navy Yard at the beginning of the year were completed

early in November, and on the 19th of that month the vessel was formally taken over by the Navy for the period of the war.

The steamer *Fish Hawk* was used by the Navy under an informal agreement from July 1 until January 11, when the vessel was sent to the yard of the Old Dominion Marine Railway Corporation at Berkley, Va., for repairs to hull and machinery, for which a special appropriation was provided. The principal items of work on the hull embrace a complete overhauling throughout, rebolting of sheathing, replacing worn plates, rearranging and modernizing space and quarters, a new keel, and a new main deck. There were installed a new condenser and fore-and-aft compound engines, designed to develop 200 horsepower. Although the repairs were not completed until August, 1918, the vessel was taken over by the Navy on July 18.

Two of the smaller steamers of the Bureau, the *Halcyon* and the *Phalarope*, have also been at the disposal of the Navy Department during the entire year.

Three of the older vessels, the *Grampus*, the *Curlew*, and the *Blue Wing*, having outlived their usefulness, have been condemned and sold.

While the *Roosevelt* was discharging cargo of supplies at the seal islands in May, 1918, an epidemic which had broken out among the crew was diagnosed as diphtheria. After the administration of antitoxin by the physician at St. Paul Island, the *Roosevelt* proceeded to Unalaska to enter quarantine. While there a situation developed which led to the *Roosevelt's* making a most noteworthy series of rescues of lives and vessels. A number of cannery vessels had become caught in the ice in Bering Sea, and a great loss of life and property was imminent. Request was made for the assistance of the Coast Guard cutter *Unalga* and of the *Roosevelt*. The *Roosevelt* started out on the rescue work as soon as possible, and by reason of its construction the master was able to take it through the heavy pack ice and to meet the emergency in a way which probably could not have been done with any other vessel afloat. In the course of the operations the *Roosevelt* rescued the *St. Nicholas*, the *Centennial*, and the *Star of Chile*. Twenty-one persons from the wrecked vessel *Tacoma* were also rescued from a water-logged iceberg. It was estimated that at the time of rendering assistance to the *St. Nicholas* that vessel could not have survived more than 12 hours; more than 300 persons were aboard. The *Centennial*, with 161 persons aboard, might have survived another week at the time of its rescue.

## FISHERY MATTERS IN CONGRESS.

No legislation affecting the Bureau aside from appropriation bills was passed by Congress during the fiscal year 1918, but a number of important measures in which the Bureau is concerned or interested were introduced and considered by the appropriate committees, including (1) a bill authorizing the construction of a building for the Bureau of Fisheries in the District of Columbia, (2) a bill to protect and conserve the halibut fisheries of the Pacific Ocean, (3) a bill to prohibit traffic in lobsters taken outside the territorial waters of Canada by United States vessels during the close season for lobsters in such waters, and (4) bills transferring the control of the fisheries of Alaska to the Territorial Legislature.

A bill to ratify the agreement or compact between the States of Washington and Oregon regarding concurrent jurisdiction over the Columbia River in connection with the fisheries passed the House of Representatives in March, the Senate in April, and became a law on April 8, 1918. The passage of this bill was advocated by the Bureau because of the stability it gives to laws for the protection of the salmon in the Columbia River.

### AMERICAN-CANADIAN FISHERIES CONFERENCE.

The Commissioner was associated with the Secretary and the Assistant Secretary of Commerce as a member of the American-Canadian Fisheries Conference, appointed to consider outstanding fishery questions between the United States and Canada. Following meetings in Washington, D. C., in January, 1918, the conference held public hearings in Boston and Gloucester, Mass., St. John, New Brunswick, Seattle, Wash., Ketchikan, Alaska, and Vancouver and New Westminster, British Columbia. At a meeting of the conference in Ottawa in May, adjournment was taken until September, in order that the testimony and exhibits might be fully considered before the preparation of a final report with findings and recommendations. The subjects that came before the conference were:

1. Privileges to the fishing vessels of either country in the ports of the other.
2. Rehabilitation and protection of the sockeye salmon of the Fraser River system.
3. Protection of the Pacific halibut fishery.
4. Fishing by United States lobster well-smacks off Canadian coast.
5. Protection of the fisheries of Lake Champlain.
6. Requirements imposed on Canadian fishing vessels passing through territorial waters of Alaska.
7. Protection of the sturgeon fisheries.
8. International protection of whales.

As an emergency war measure, in order that no restrictions may be placed on the production of food, the two Governments have reached an agreement under which the fishing vessels of either country are accorded in the ports of the other all the privileges enjoyed by domestic vessels. A bill has been drawn and introduced in Congress having for its object the suppression of the United States traffic in lobsters caught off the Canadian coast when there is a close time for lobsters on that coast. The Canadian Government has taken the necessary action to give to the fish in the Canadian waters of Lake Champlain the same protection that is accorded in New York and Vermont. The former discriminatory practice of requiring Canadian fishing vessels passing through the territorial waters of Alaska to enter and clear has been discontinued. The other subjects before listed as coming before the conference will require legislation or a treaty, or both.

Respectfully submitted.

H. M. SMITH,
*Commissioner of Fisheries.*

To Hon. WILLIAM C. REDFIELD,
*Secretary of Commerce.*

# THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1918

HENRY O'MALLEY
*Assistant in Charge of Fish Culture*

Appendix I to the Report of the U. S. Commissioner of Fisheries for 1918

# CONTENTS.



## INDEX TO SPECIES DISTRIBUTED.

# THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1918.

## CHARACTER OF WORK.

Fully nine-tenths of the fish-cultural resources of the Bureau of Fisheries are devoted to the restoration and maintenance of the commercial fisheries of the United States. The eggs of such important commercial species as the salmons, shad, cod, whitefish, lake trout, pike perch, pollock, and flatfish would be sent to market in the fish and thus lost were they not taken by the Bureau from fish caught by commercial fishermen, and the fry developed therefrom in specially equipped hatcheries.

While it constitutes a comparatively small part of the Bureau's output, the upbuilding and extension of the fisheries of inland waters is by no means a negligible factor, comprising as it does the production and dissemination of valuable fresh-water fishes of many kinds for introduction into public lakes, streams, and ponds, and also for the stocking of preserves under private control. One of the leading features of this branch of the work is the furnishing of suitable stock fish for the establishment of a supply in the waters of regions far remote from the markets, where dependence for food fishes must be placed entirely on local resources.

Among the fishes most extensively cultivated for the fresh-water streams and lakes of the interior are several species of trout, the black basses, crappies, bream, and catfishes. Trout are artificially hatched from eggs which are taken from both wild and domesticated stock, while the supply of black bass and other pond fishes of the same general character is secured by allowing the mature fish to breed naturally in specially prepared ponds. Owing to the great demand for fishes suitable for culture in ponds, the Bureau is compelled to supplement its station supplies by making collections of young fishes which become stranded each season on the overflowed lands adjacent to the Mississippi and Illinois Rivers. Less than 1 per cent of the fishes thus obtained are reserved for distribution in distant waters, while the remainder are either returned to the main channels of these rivers or placed in their immediate tributaries.

Prevailing weather conditions have a great deal to do with the measure of success attained in the Bureau's annual rescue operations in the Mississippi Valley. Sometimes it is impossible to secure

young fish of the desired varieties in that field in numbers sufficient to fill all applications, which contingency necessitates the continuance of the unfilled applications on file for attention during the succeeding year. This accounts for the delay in supplying pond fishes to applicants in the great majority of instances. Rescue work can not be undertaken until the rivers have attained a low-water stage. This is usually in July or August, and, owing to the short season in which collections are possible, the Bureau has adopted the policy of not listing for supply during the current year any applications received later than July 1. In this way the duplication of trips to many sections of the country is obviated, and the expense of the distribution work is kept down to a minimum.

The salvage of fishes from temporary lagoons and lakes is of great importance, as it means the conservation of millions of fish which would otherwise be lost, either through the drying or the freezing of the waters. The Bureau has received valuable assistance in this work from various State fisheries authorities, club representatives, and public-spirited citizens of the Mississippi Valley.

## METHOD OF DISTRIBUTION.

The fry hatched from the shad, whitefish, salmons, lake trout, lake herring, pike perch, white perch, yellow perch, striped bass, cod, lobster, pollock, flounder, and haddock are planted on the spawning grounds from which the eggs are derived or utilized for the stocking of new and suitable waters in an effort to extend the fisheries.

With respect to the game and food fishes of the interior, which are propagated in comparatively small numbers, provision is made for the return of a sufficient number of young fish to the waters where eggs are collected for the maintenance of the supply therein; the remainder of the stock is then assigned to suitable lakes or streams for which applications have been submitted by responsible individuals. This class includes the various trouts, basses, sunfishes, and catfishes.

Blanks upon which formal applications for fish can be made are furnished by the Bureau on request. Upon the receipt of applications properly executed and bearing the indorsement of a United States Senator or Representative, an assignment of fish is made, suitable for the waters described and to the Bureau's facilities to supply, and the delivery is arranged for as soon as possible thereafter. Applicants should confine their choice of fishes to species that are indigenous to the region of the waters to be stocked. Nonindigenous species of fishes are assigned only upon the recommendation of the State fisheries authorities, and not then unless such recommendation conforms to the Bureau's judgment.

The Bureau refuses requests for such predaceous fishes as the black bass, sunfish, and kindred species for introduction into waters in

California, Oregon, Washington, Idaho, Nevada, Wyoming, or western Montana, as it is believed their presence in such waters might prove harmful to the trout and salmon fisheries of that region.

Each species of fish spawns at a specific time during the year—the brook trout and the domesticated rainbow trout of eastern waters in the fall or early winter; the blackspotted trout, steelhead trout, and the wild rainbow trout of western waters during the spring; while all of the pond fishes reproduce in the spring or early summer.

The product of each season is distributed as the fish attain proper size for shipment, and after the exhaustion of the stock of one season no more are available until the same season the following year.

The distribution of trout in the Eastern States begins in March and is completed by the last of June, while trout shipments to applicants in the Middle States extend from about May 1 until well along in July. In the Rocky Mountain States the trout distributions occur somewhat later, the work usually starting by September 1 and continuing into the early winter.

The black basses produced at the Bureau's pond-cultural stations are distributed between May and August, while the miscellaneous fishes rescued from overflowed lands and the output of rock bass, crappie, sunfish, and catfish from these stations are shipped simultaneously, the distribution usually extending from August to December.

It is the policy of the Bureau to fill applications in the order of their receipt so far as practicable, but it is impossible to state definitely, in advance, when the fish requested by an applicant can be furnished, the approximate time of delivery depending upon transportation facilities, which are not always available on a given date, and, in the case of the pond or river fishes, upon the degree of success attained in the collections.

The number of fish assigned on an application must necessarily be governed by the available supply of the species requested and the time of year scheduled for the delivery, it being obvious that very young fishes which have not been fed can be furnished in much larger numbers than those which have been held at considerable expense at the Bureau's stations until they have attained the size of fingerlings. It is the aim of the Bureau in all cases to allot a sufficient number of a given species to form a brood stock for the water area described, and those interested in the lake or stream so stocked are relied upon to see that the fish are afforded proper protection by the restriction or prohibition of fishing until a sufficient length of time has elapsed for them to reproduce, a period which will vary from two to three years, according to the species furnished.

Fry or very young fish can be shipped in much larger numbers than those of the fingerling sizes. A 10-gallon transportation can will safely carry from 2,000 to 3,000 fry of the trouts or black basses,

from 500 to 1,000 one-inch fish of these species, and of those 2 inches long, from 100 to 300. It has been calculated that the varying numbers of the different sizes stated have practically equal value for stock purposes, as the losses in open waters from natural causes are in about the ratios indicated.

Some of the commercial species propagated—whitefish, pike perch, white perch, and shad, which are distributed only as fry—are so small that as many as 100,000 can be carried in a 10-gallon can.

Fish intended for applicants are carried to destination in specially equipped railroad cars belonging to the Bureau, or in the regular baggage cars attached to passenger trains, an experienced messenger accompanying them for the purpose of aerating the water en route. The only expense the applicant is put to in connection with the transaction is that of transporting the fish from the railroad station designated in the application to the waters in which they are to be liberated. Some days in advance of an intended delivery the consignee is notified and given detailed instructions regarding the reception and care of the fish after they are turned over to him. He is notified again by wire a few hours before the arrival, in order that he may meet the train and receive the consignment, which will be handed to him from the car by the messenger.

During the fiscal year ended June 30, 1918, the Bureau received 8,504 applications from individuals and associations for fish to stock public and private waters. Requests for blanks upon which to submit applications for fish should be addressed to the Commissioner of Fisheries, Washington, D. C.

## SPECIES CULTIVATED.

During the fiscal year 1918 the Bureau handled some 50 species of fish and the lobster. Of these the following were produced at its regular propagating stations:

THE CATFISHES (SILURIDÆ):
- Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).
- Marbled cat (*Ameiurus nebulosus marmoratus*).

THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):
- Smallmouth buffalofish (*Ictiobus bubalus*).
- Common buffalofish (*Ictiobus cyprinella*).
- Black buffalofish (*Ictiobus urus*).

THE SHADS AND HERRINGS (CLUPEIDÆ):
- Shad (*Alosa sapidissima*).
- Alewife (*Pomolobus pseudoharengus*).

THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ):
- Common whitefish (*Coregonus albus* and *C. clupeaformis*).
- Lake herring, cisco (*Leucichthys artedi*).
- Chinook salmon, king salmon, quinnat salmon (*Oncorhynchus tschawytscha*).
- Silver salmon, coho (*Oncorhynchus kisutch*).
- Blueback salmon, redfish, sockeye (*Oncorhynchus nerka*).
- Humpback salmon (*Oncorhynchus gorbuscha*).
- Chum salmon (*Oncorhynchus keta*).

THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ)—Continued.
Steelhead (*Salmo gairdneri*).
Rainbow trout (*Salmo irideus*).
Atlantic salmon (*Salmo salar*).
Landlocked salmon (*Salmo sebago*).
Blackspotted trout, Yellowstone Lake trout, cutthroat trout (*Salmo lewisi*).
Loch Leven trout (*Salmo trutta levenensis*).
Lake trout, Mackinaw trout, longe, togue (*Cristivomer namaycush*).
Brook trout, speckled trout (*Salvelinus fontinalis*).
Sunapee trout (*Salvelinus aureolus*).
THE SMELTS (ARGENTINIDÆ):
American smelt (*Osmerus mordax*).
THE MACKERELS (SCOMBRIDÆ):
Common mackerel (*Scomber scombrus*).
THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
Crappie (*Pomoxis annularis*).
Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
Warmouth, goggle-eye (*Chænobryttus gulosus*).
Smallmouth black bass (*Micropterus dolomieu*).
Largemouth black bass (*Micropterus salmoides*).
Bluegill sunfish (*Lepomis incisor*).
Other sunfishes, chiefly *Eupomotis gibbosus*.
THE PERCHES (PERCIDÆ):
Pike perch, wall-eyed pike, yellow pike, blue pike (*Stizostedion vitreum*).
Yellow perch, ring perch (*Perca flavescens*).
THE SEA BASSES (SERRANIDÆ):
Striped bass, rockfish (*Roccus lineatus*).
White perch (*Morone americana*).
THE CODS (GADIDÆ):
Cod (*Gadus callarias*).
Haddock (*Melanogrammus æglifinus*).
Pollock (*Pollachius virens*).
THE FLOUNDERS (PLEURONECTIDÆ):
Winter flounder, American flatfish (*Pseudopleuronectes americanus*).
CRUSTACEANS:
American lobster (*Homarus americanus*).

The fishes rescued from overflowed lands in the Mississippi Basin and returned to the original streams were as follows:

THE CATFISHES (SILURIDÆ):
Spotted cat, blue cat, channel cat (*Ictalurus punctatus*).
Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).
THE SUCKERS AND BUFFALOFISH (CATOSTOMIDÆ):
Common sucker (*Catosomus commersonii*).
Black sucker (*Hypentelium nigricans*).
Smallmouth buffalofish (*Ictiobus bubalus*).
Common buffalofish (*Ictiobus cyprinella*).
Black buffalofish (*Ictiobus urus*).
THE MINNOWS AND CARPS (CYPRINIDÆ):
Carp (*Cyprinus carpio*).
THE HERRINGS (CLUPEIDÆ):
Skipjack (*Pomolobus chrysochloris*).
THE PIKES AND PICKERELS (ESOCIDÆ):
Pike (*Esox lucius*).
Pickerel (*Esox reticulatus*).

THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
Crappie (*Pomoxis annularis*).
Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
Warmouth, goggle-eye (*Chænobryttus gulosus*).
Largemouth black bass (*Micropterus salmoides*).
Smallmouth black bass (*Micropterus dolomieu*).
Bluegill sunfish (*Lepomis incisor*).
Other sunfishes, chiefly *Eupomotis gibbosus*.
THE PERCHES (PERCIDÆ):
Yellow perch, ring perch (*Perca flavescens*).
THE SEA BASSES (SERRANIDÆ):
White bass (*Roccus chrysops*).
Yellow bass (*Marone interrupta*).
THE CROAKERS (SCIÆNIDÆ):
Fresh-water drum, lake sheepshead (*Aplodinotus grunniens*).

## SUMMARIZED STATEMENT OF DISTRIBUTION.

The following table shows the number of fish and eggs actually distributed during the fiscal year 1918, or, in other words, the output of the hatcheries, with all losses in transportation deducted:

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR ENDED JUNE 30, 1918.

| Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|---|---|---|---|---|
| Catfish | | | 12,733,330 | 12,733,330 |
| Carp | | 3,250,000 | 1,660,941 | 4,910,941 |
| Buffalofish | | 28,260,000 | 2,417,052 | 30,677,052 |
| Shad | | 52,543,900 | | 52,543,900 |
| River herring | | 100,000 | 3,700,000 | 3,800,000 |
| Whitefish | 75,540,000 | 408,492,000 | | 484,032,000 |
| Lake herring (cisco) | | 65,130,000 | | 65,130,000 |
| Silver salmon | | 980,300 | 10,534,115 | 11,514,415 |
| Chinook salmon | 17,574,900 | 6,028,920 | 63,176,244 | 86,780,064 |
| Sockeye salmon | 13,000,000 | 38,137,000 | 45,599,785 | 96,736,785 |
| Humpback salmon | | 5,193,065 | 3,754,000 | 8,947,065 |
| Chum salmon | | 9,892,145 | | 9,892,145 |
| Steelhead salmon | 1,570,000 | 172,000 | 7,022,488 | 8,764,488 |
| Rainbow trout | 1,139,250 | 22,000 | 1,654,477 | 2,815,727 |
| Atlantic salmon | | 2,577,000 | 671 | 2,577,671 |
| Landlocked salmon | 478,000 | 306,395 | 87,837 | 872,232 |
| Blackspotted trout | 1,090,000 | 3,821,000 | 1,878,500 | 6,789,500 |
| Loch Levan trout | | | 56,000 | 56,000 |
| Lake trout | 21,718,000 | 39,599,200 | 226,797 | 61,543,997 |
| Brook trout | 378,175 | 3,876,265 | 7,882,668 | 12,137,108 |
| Sunapee trout | | | 7,372 | 7,372 |
| Smelt | | 1,218,750 | | 1,218,750 |
| Pike and pickerel | | | 106,408 | 106,408 |
| Fresh-water drum | | | 83,473 | 83,473 |
| Crappie | | | 2,905,812 | 2,905,812 |
| Largemouth black bass | | 283,500 | 970,020 | 1,253,520 |
| Smallmouth black bass | | 172,500 | 155,674 | 328,174 |
| Rock bass | | | 83,055 | 83,055 |
| Warmouth bass | | | 9,220 | 9,220 |
| Sunfish | | | 1,644,558 | 1,644,558 |
| Pike perch | 14,560,000 | 56,000,000 | 1,954 | 70,561,954 |
| Yellow perch | | 182,899,000 | 459,282 | 183,358,282 |
| White perch | | 2,900,000 | | 2,900,000 |
| White bass | | | 47,261 | 47,261 |
| Striped bass | | 14,349,000 | | 14,349,000 |
| Mackerel | | 4,648,000 | | 4,648,000 |
| Cod | | 77,659,000 | | 77,659,000 |
| Pollock | | 233,700,000 | | 233,700,000 |
| Haddock | | 17,830,000 | | 17,830,000 |
| Winter flounder | | 2,455,371,000 | | 2,455,371,000 |
| Miscellaneous fishes | | | 100,200 | 100,200 |
| Lobster | | 66,680,000 | 5,700 | 66,685,700 |
| Total | 147,048,325 | 3,782,091,940 | 168,964,894 | 4,098,105,159 |

## ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1918.

[Eggs are indicated by an asterisk (*); fry are indicated by a dagger (†); all others are fingerlings and adults]

| State and species. | Number. |
|---|---|
| California: Chinook salmon | *14,321,900 |
| Connecticut: | |
| Black bass | 515 |
| Catfish | 750 |
| Crappie | 1,500 |
| Sunfish | 2,400 |
| Illinois: | |
| Black bass | 825 |
| Catfish | 12,200 |
| Crappie | 21,850 |
| Lake trout | *100,000 |
| Pike and pickerel | 688 |
| Sunfish | 9,370 |
| White bass | 2,665 |
| Whitefish | *5,000,000 |
| Yellow perch | 2,575 |
| Iowa: | |
| Brook trout | *50,000 |
| Lake trout | *50,000 |
| Rainbow trout | *94,000 |
| Kentucky: | |
| Brook trout | 600 |
| Pike perch | †2,400,000 |
| Rainbow trout | 1,600 |
| Maine: | |
| Brook trout | *100,000 |
| Lake trout | *100,000 |
| Landlocked salmon | *378,000 |
| Maryland: | |
| Catfish | 180 |
| Crappie | 200 |
| Smallmouth bass | 88 |
| Massachusetts: Pike perch | *5,000,000 |
| Michigan: Lake trout | *2,550,000 |
| Minnesota: | |
| Lake trout | *300,000 |
| Steelhead salmon | *50,000 |
| Montana: | |
| Black-spotted trout | *300,000 |
| Black bass | 1,400 |
| Catfish | 8,000 |
| Rainbow trout | *300,000 |
| Sunfish | 100 |
| Nebraska: Rainbow trout | 16,000 |
| Nevada: | |
| Black-spotted trout | *50,000 |
| Rainbow trout | *50,000 |
| New Hampshire: | |
| Lake trout | *100,000 |
| Pike perch | *2,000,000 |
| Whitefish | *500,000 |
| New Jersey: | |
| Black bass | 200 |
| Landlocked salmon | *25,000 |
| New Jersey—Continued. | |
| Rainbow trout | *50,000 |
| Steelhead salmon | *50,000 |
| New York: | |
| Lake trout | *11,766,000 |
| Landlocked salmon | *50,000 |
| Steelhead salmon | *400,000 |
| Whitefish | *15,000,000 |
| Ohio: Lake trout | *700,000 |
| Oklahoma: | |
| Rock bass | 1,550 |
| Sunfish | 1,550 |
| Yellow perch | †10,000<br>100 |
| Oregon: | |
| Blueback salmon | *3,000,000 |
| Brook trout | 36,000 |
| Chinook salmon | *3,150,000 |
| Steelhead salmon | *750,000 |
| Pennsylvania: Whitefish | *38,280,000 |
| Rhode Island: | |
| Brook trout | *50,000<br>20,000 |
| Smallmouth bass | 690 |
| South Dakota: | |
| Black bass | 1,050 |
| Brook trout | 6,000 |
| Catfish | 12,300 |
| Crappie | 2,200 |
| Sunfish | 5,100 |
| Tennessee: | |
| Brook trout | *25,000 |
| Rainbow trout | *100,000 |
| Vermont: | |
| Lake trout | *300,000 |
| Landlocked salmon | *10,000 |
| Pike perch | *7,056,000 |
| Steelhead salmon | *50,000 |
| Washington: | |
| Black-spotted trout | *200,000 |
| Lake trout | *300,000 |
| Wisconsin: | |
| Black bass | 3,425 |
| Catfish | 900 |
| Crappie | 1,200 |
| Lake trout | *5,402,000 |
| Whitefish | *15,000,000 |
| Wyoming: | |
| Black-spotted trout | *200,000 |
| Rainbow trout | *50,000 |
| Steelhead salmon | *50,000 |
| Total | *133,307,900<br>†2,410,000<br>170,771 |

## SHIPMENTS OF FISH AND EGGS TO CANAL ZONE AND FOREIGN COUNTRIES, FISCAL YEAR 1918.

[Eggs are indicated by an asterisk (*); all others are fingerlings and yearlings.]

| Country and species. | Number. |
|---|---|
| Canada: | |
| Sockeye salmon | *10,000,000 |
| Japan: | |
| Chinook salmon | *100,000 |
| Rainbow trout | *100,000 |
| Mexico: | |
| Black bass | 750 |
| Yellow perch | 200 |
| Canal Zone: | |
| Black bass | 1,000 |
| Carp | 1,875 |
| Catfish | 3,000 |
| Sunfish | 2,000 |
| Total | *10,200,000<br>8,825 |

## DETAILS OF OUTPUT FOR 1918.

The following table shows the work of the different stations in 1918, the period of operation, and the eggs and fish furnished by each station for distribution. It will be noted that transfers of fish and eggs from station to station are frequent. Such transfers are made in the interest of economy and convenience where the shipments consist of eggs, and give advantageous distribution centers in the case of young fish.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918.

[NOTE.—See explanations of this table on p. 15.]

| Station and period of operation. | Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|---|---|---|---|---|---|
| Afognak, Alaska:[a] | | | | | |
| Entire year | Sockeye salmon | 13,000,000 | 18,650,000 | 14,610,000 | 46,260,000 |
| | Humpback salmon | | 1,326,000 | | 1,326,000 |
| Seal Bay, Alaska— | | | | | |
| Aug.-Sept. | Sockeye salmon | | 2,712,000 | | 2,712,000 |
| | Humpback salmon | | 800,000 | | 800,000 |
| Atchafalaya, La.: | | | | | |
| Mar.-Apr. | Buffalo fish | | 28,260,000 | | 28,260,000 |
| Baton Rouge, La.— | | | | | |
| Apr.-May | Largemouth black bass | | | 7,150 | 7,150 |
| | Buffalo fish | | | 9,800 | 9,800 |
| | Carp | | | 8,550 | 8,550 |
| | Catfish | | | 11,225 | 11,225 |
| | Crappie | | | 30,600 | 30,600 |
| | Drum | | | 3,175 | 3,175 |
| | Miscellaneous | | | 50,425 | 50,425 |
| | Sunfish | | | 113,600 | 113,600 |
| | White bass | | | 2,700 | 2,700 |
| Baird, Calif.: | | | | | |
| Entire year | Chinook salmon | | | 2,760,000 | 2,760,000 |
| Battle Creek, Calif.— | | | | | |
| Entire year | do | 760,000 | | 4,050,500 | 4,810,500 |
| Hornbrook, Calif.[b]— | | | | | |
| Entire year | do | 275,900 | | | 275,900 |
| Mill Creek, Calif.— | | | | | |
| Entire year | do | 13,386,000 | | 3,878,900 | 17,264,900 |
| Baker Lake, Wash.: | | | | | |
| Entire year | Sockeye salmon | | 1,125,000 | 9,205,000 | 10,330,000 |
| | Chinook salmon | | | 7,500 | 7,500 |
| | Silver salmon | | 440,000 | 1,850,750 | 2,290,750 |
| Birdsview, Wash.[c]— | | | | | |
| Entire year | Sockeye salmon | | | 114,275 | 114,275 |
| | Chinook salmon | | | 320,860 | 320,860 |
| | Chum salmon | | 47,400 | | 47,400 |
| | Humpback salmon | | | 2,915,000 | 2,915,000 |
| | Silver salmon | | | 1,322,000 | 1,322,000 |
| | Steelhead salmon | 270,000 | | 1,589,500 | 1,859,500 |
| Brinnon, Wash.— | | | | | |
| Entire year | do | | | 129,000 | 129,000 |
| Darrington, Wash.— | | | | | |
| Entire year | Chinook salmon | | 69,468 | | 69,468 |
| | Chum salmon | | 76,600 | | 76,600 |
| | Humpback salmon | | 116,891 | | 116,891 |
| | Silver salmon | | 192,800 | | 192,800 |
| | Steelhead salmon | | | 150,000 | 150,000 |
| Day Creek, Wash.— | | | | | |
| Entire year | Chinook salmon | | | 14,000 | 14,000 |
| | Chum salmon | | 23,000 | | 23,000 |
| | Steelhead salmon | | 43,000 | | 43,000 |
| Duckabush, Wash.— | | | | | |
| Entire year | Chum salmon | | 5,233,795 | | 5,233,795 |
| | Humpback salmon | | 440,840 | | 440,840 |
| | Silver salmon | | | 77,465 | 77,465 |
| | Steelhead salmon | | | 422,020 | 422,020 |
| Illabott Creek, Wash.— | | | | | |
| Entire year | Chinook salmon | | 115,750 | | 115,750 |
| | Chum salmon | | 1,841,000 | | 1,841,000 |
| | Humpback salmon | | 434,100 | | 434,100 |
| | Silver salmon | | 139,500 | | 139,500 |
| | Steelhead salmon | | | 418,100 | 418,100 |

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

| Station and period of operation. | Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|---|---|---|---|---|---|
| Baker Lake, Wash.—Con. | | | | | |
| Quilcene, Wash.— | | | | | |
| Entire year | Chum salmon | | 2,670,350 | | 2,670,350 |
| | Humpback salmon | | 1,135,000 | 770,000 | 1,905,000 |
| | Silver salmon | | | 366,000 | 366,000 |
| | Steelhead salmon | | | 284,000 | 284,000 |
| Sultan, Wash.[d] | | | | | |
| Entire year | Chinook salmon | | | 68,700 | 68,700 |
| | Humpback salmon | | | 51,000 | 51,000 |
| | Silver salmon | | | 3,228,900 | 3,228,900 |
| | Steelhead salmon | 50,000 | 60,000 | 490,000 | 600,000 |
| Berkshire, Mass.: | | | | | |
| Entire year | Brook trout | | 50,500 | 481,400 | 531,900 |
| | Rainbow trout | | | 11,050 | 11,050 |
| | Steelhead salmon | | | 6,600 | 6,600 |
| Boothbay Harbor, Me.: | | | | | |
| Entire year | Flounder | | 1,231,559,000 | | 1,231,559,000 |
| | Lobster | | 66,680,000 | 6,000 | 66,686,000 |
| Bozeman, Mont.:[e] | | | | | |
| Entire year | Blackspotted trout | | 1,668,000 | 30,000 | 1,698,000 |
| | Brook trout | | | 746,650 | 746,650 |
| | Rainbow trout | 875,000 | | 131,000 | 1,006,000 |
| | Steelhead salmon | | | 18,000 | 18,000 |
| Yellowstone Park, Wyo.— | | | | | |
| July-June | Blackspotted trout | 1,090,000 | 1,975,000 | | 3,065,000 |
| Bryans Point, Md.:[f] | | | | | |
| Apr.-May | Alewife | | 100,000 | | 100,000 |
| | Shad | | 36,309,800 | | 36,309,800 |
| | Yellow perch | | 139,329,000 | | 139,329,000 |
| Cape Vincent, N. Y.:[g] | | | | | |
| Entire year | Brook trout | | 711,000 | | 711,000 |
| | Lake herring | | 65,130,000 | | 65,130,000 |
| | Lake trout | | 7,876,629 | | 7,876,629 |
| | Rainbow trout | | 10,000 | | 10,000 |
| | Whitefish | 5,500,000 | 27,482,000 | | 32,982,000 |
| | Yellow perch | | 37,750,000 | | 37,750,000 |
| Central Station, Washington, D. C.: | | | | | |
| Entire year | Largemouth black bass | | | 50 | 50 |
| | Brook trout | | | 8,000 | 8,000 |
| | Humpback salmon | | | 18,000 | 18,000 |
| | Shad | | 750,000 | | 750,000 |
| | Sunfish | | | 150 | 150 |
| | Whitefish | | 750,000 | | 750,000 |
| Clackamas, Oreg.: | | | | | |
| Entire year | Brook trout | | | 165,620 | 165,620 |
| | Chinook salmon | 3,000 | 2,000,000 | 9,299,400 | 11,302,400 |
| | Rainbow trout | | | 178,280 | 178,280 |
| | Silver salmon | | | 18,800 | 18,800 |
| | Steelhead salmon | | | 68,465 | 68,465 |
| Applegate, Oreg.— | | | | | |
| Entire year[h] | Chinook salmon | | | 36,750 | 36,750 |
| | Silver salmon | | | 300,100 | 300,100 |
| | Steelhead salmon | 1,250,000 | | 1,991,700 | 3,241,700 |
| Big White Salmon, Wash.— | | | | | |
| Entire year | Chinook salmon | | 1,500,000 | 18,960,357 | 20,460,357 |
| Little White Salmon, Wash.— | | | | | |
| Entire year | ....do | 3,150,000 | 500,000 | 21,611,277 | 25,261,277 |
| Rogue River, Oreg.— | | | | | |
| Entire year | Black spotted trout | | | 11,500 | 11,500 |
| | Chinook salmon | | | 864,000 | 864,000 |
| | Silver salmon | | | 66,400 | 66,400 |
| | Steelhead salmon | | | 819,000 | 819,000 |
| Upper Clackamas, Oreg.— | | | | | |
| Entire year | Chinook salmon | | 1,843,700 | 1,084,000 | 2,927,700 |
| | Rainbow trout | | | 17,699 | 17,699 |
| | Silver salmon | | 8,000 | | 8,000 |
| | Steelhead salmon | | | 493,000 | 493,000 |
| Astoria, Oreg.— | | | | | |
| July | Shad | | 932,000 | | 932,000 |
| St. Helens, Oreg.— | | | | | |
| July, May-June | ....do | | 8,100,450 | | 8,100,450 |
| Willamette, Oreg.— | | | | | |
| July, May-June | ....do | | 3,592,650 | | 3,592,650 |

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

| Station and period of operation. | Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|---|---|---|---|---|---|
| Cold Springs, Ga.: Entire year | Largemouth black bass | | | 223,237 | 223,237 |
| | Catfish | | | 16,550 | 16,550 |
| | Sunfish | | | 61,130 | 61,130 |
| Milltown, Ga.— Apr.-May | Largemouth black bass | | | 73,500 | 73,500 |
| Craig Brook, Me.: Entire year | Atlantic salmon | | 2,577,000 | 671 | 2,577,671 |
| | Brook trout | | 517,000 | 84,700 | 601,700 |
| | Humpback salmon | | 934,235 | | 934,235 |
| | Landlocked salmon | | 82,460 | | 82,460 |
| Duluth, Minn.: Entire year | Brook trout | | 172,000 | | 172,000 |
| | Lake trout | 600,000 | 13,240,000 | 60,000 | 13,900,000 |
| | Pike perch | | 4,000,000 | | 4,000,000 |
| | Whitefish | | 19,260,000 | | 19,260,000 |
| Edenton, N. C.: Entire year | Largemouth black bass | | 29,000 | 21,815 | 50,815 |
| | Shad | | 2,859,000 | | 2,859,000 |
| | Sunfish | | | 6,100 | 6,100 |
| | Yellow perch | | | 230 | 230 |
| Weldon, N. C.— Apr.-May | Striped bass | | 14,349,000 | | 14,349,000 |
| Erwin, Tenn.: Entire year | Largemouth black bass | | 20,500 | 990 | 21,490 |
| | Brook trout | 25,000 | | 107,000 | 132,000 |
| | Carp | | | 165 | 165 |
| | Rainbow trout | | | 346,275 | 346,275 |
| | Rock bass | | | 35,700 | 35,700 |
| | Smallmouth black bass | | 1,000 | 4,105 | 5,105 |
| | Sunfish | | | 7,200 | 7,200 |
| Fairport, Iowa: Entire year | Largemouth black bass | | | 12,097 | 12,097 |
| | Buffalofish | | | 84,398 | 84,398 |
| | Carp | | | 57,645 | 57,645 |
| | Catfish | | | 145,394 | 145,394 |
| | Crappie | | | 82,375 | 82,375 |
| | Drum | | | 47 | 47 |
| | Pike perch | | | 270 | 270 |
| | Pike and pickerel | | | 301 | 301 |
| | Sunfish | | | 34,602 | 34,602 |
| | White bass | | | 211 | 211 |
| | Yellow perch | | | 50 | 50 |
| | Miscellaneous | | | 175 | 175 |
| New Boston, Ill.— Aug.-Nov | Largemouth black bass | | | 26,286 | 26,286 |
| | Buffalofish | | | 89,683 | 89,683 |
| | Carp | | | 67,795 | 67,795 |
| | Catfish | | | 190,810 | 190,810 |
| | Crappie | | | 61,487 | 61,487 |
| | Drum | | | 726 | 726 |
| | Pike perch | | | 84 | 84 |
| | Pike and pickerel | | | 219 | 219 |
| | Rock bass | | | 167 | 167 |
| | Sunfish | | | 60,044 | 60,044 |
| | White bass | | | 17,494 | 17,494 |
| | Yellow perch | | | 83 | 83 |
| | Miscellaneous | | | 29,005 | 29,005 |
| Red Wing, Minn.— Sept. | Carp | | | 600 | 600 |
| | Catfish | | | 162,750 | 162,750 |
| | Crappie | | | 9,990 | 9,990 |
| | Pike perch | | | 40 | 40 |
| | Pike and pickerel | | | 275 | 275 |
| | Smallmouth black bass | | | 2,345 | 2,345 |
| | Sunfish | | | 9,490 | 9,490 |
| | Yellow perch | | | 2,500 | 2,500 |
| | Miscellaneous | | | 2,060 | 2,060 |
| Black River, Ark.— Oct.-Dec | Largemouth black bass | | | 1,914 | 1,914 |
| | Buffalofish | | | 4,212 | 4,212 |
| | Carp | | | 60 | 60 |
| | Catfish | | | 642 | 642 |
| | Crappie | | | 10,185 | 10,185 |
| | Pike and Pickerel | | | 1,159 | 1,159 |
| | Sunfish | | | 7,890 | 7,890 |
| | White bass | | | 281 | 281 |
| | Yellow perch | | | 82 | 82 |
| | Miscellaneous | | | 995 | 995 |
| Lake Pepin, Minn.— Oct. | Carp | | | 85 | 85 |
| | Catfish | | | 2,250 | 2,250 |
| | Pike and pickerel | | | 260 | 260 |
| | Miscellaneous | | | 140 | 140 |

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

| Station and period of operation. | Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|---|---|---|---|---|---|
| Gloucester, Mass.: Entire year | Cod | | 72,940,000 | | 72,940,000 |
| | Flounder | | 180,530,000 | | 180,530,000 |
| | Haddock | | 17,830,000 | | 17,830,000 |
| | Pollock | | 233,700,000 | | 233,700,000 |
| Green Lake, Me.: Entire year | Brook trout | | 782,200 | | 782,200 |
| | Lake trout | | | 76,000 | 76,000 |
| | Landlocked salmon | 278,000 | 179,937 | | 457,937 |
| | Smelt | | 1,218,750 | | 1,218,750 |
| Grand Lake Stream, Me.—k Entire year | Lake trout | | 23,570 | | 23,570 |
| | Landlocked salmon | 200,000 | 45,000 | 65,150 | 310,150 |
| | White perch | | 2,900,000 | | 2,900,000 |
| Homer, Minn.: Entire year | Largemouth black bass | | | 38,250 | 38,250 |
| | Buffalofish | | | 30,214 | 30,214 |
| | Carp | | | 55,791 | 55,791 |
| | Catfish | | | 2,340,113 | 2,340,113 |
| | Crappie | | | 1,276,475 | 1,276,475 |
| | Pike perch | | | 1,360 | 1,360 |
| | Pike and pickerel | | | 46,266 | 46,266 |
| | Rock bass | | | 532 | 532 |
| | Sunfish | | | 437,339 | 437,339 |
| | White bass | | | 7,320 | 7,320 |
| | Yellow perch | | | 348,628 | 348,628 |
| La Crosse, Wis.: Entire year | Largemouth black bass | | | 25,395 | 25,395 |
| | Brook trout | | | 235,000 | 235,000 |
| | Buffalofish | | | 44,800 | 44,800 |
| | Carp | | | 175,150 | 175,150 |
| | Catfish | | | 3,086,300 | 3,086,300 |
| | Crappie | | | 255,980 | 255,980 |
| | Drum | | | 1,250 | 1,250 |
| | Pike perch | | | 200 | 200 |
| | Pike and pickerel | | | 17,605 | 17,605 |
| | Rainbow trout | | | 66,000 | 66,000 |
| | Rock bass | | | 236 | 236 |
| | Sunfish | | | 234,990 | 234,990 |
| | White bass | | | 730 | 730 |
| | Yellow perch | | | 48,325 | 48,325 |
| Leadville, Colo.: l Entire year | Blackspotted trout | | | 1,577,000 | 1,577,000 |
| | Brook trout | 275,000 | | 3,716,000 | 3,991,000 |
| | Lake trout | | | 50,000 | 50,000 |
| | Loch Leven trout | | | 56,000 | 56,000 |
| | Rainbow trout | | | 160,200 | 160,200 |
| Louisville, Ky.: Entire year | Largemouth black bass | | | 6,000 | 6,000 |
| | Brook trout | | | 600 | 600 |
| | Crappie | | | 2,150 | 2,150 |
| | Pike perch | | 2,800,000 | | 2,800,000 |
| | Rainbow trout | | | 9,600 | 9,600 |
| | Rock bass | | | 9,550 | 9,550 |
| | Smallmouth black bass | | | 5,750 | 5,750 |
| | Sunfish | | | 14,900 | 14,900 |
| Mammoth Spring, Ark.: m Entire year | Largemouth black bass | | | 1,722 | 1,722 |
| | Rock bass | | | 8,600 | 8,600 |
| Friar Point, Miss.: July-Dec. | Largemouth black bass | | | 21,009 | 21,009 |
| | Catfish | | | 2,970 | 2,970 |
| | Crappie | | | 12,860 | 12,860 |
| | Rock bass | | | 4,055 | 4,055 |
| | Sunfish | | | 115,925 | 115,925 |
| Manchester, Iowa: n Entire year | Brook trout | 3,175 | | 113,925 | 117,100 |
| | Crappie | | | 400 | 400 |
| | Rainbow trout | 164,250 | | 90,200 | 254,450 |
| | Rock bass | | | 2,225 | 2,225 |
| | Smallmouth black bass | | | 995 | 995 |
| Bellevue, Iowa— July-Dec. | Largemouth black bass | | | 136,900 | 136,900 |
| | Buffalofish | | | 1,862,700 | 1,862,700 |
| | Carp | | | 1,192,400 | 1,192,400 |
| | Catfish | | | 4,132,780 | 4,132,780 |
| | Crappie | | | 835,250 | 835,250 |
| | Drum | | | 1,075 | 1,075 |
| | Pike and pickerel | | | 32,028 | 32,028 |
| | River herring | | | 3,270,000 | 3,270,000 |
| | Sunfish | | | 241,420 | 241,420 |

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

| Station and period of operation. | Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|---|---|---|---|---|---|
| Manchester, Iowa—Con. | | | | | |
| Bellevue, Iowa—Con. | | | | | |
| July–Dec. | Warmouth bass | | | 7,710 | 7,710 |
| | White bass | | | 18,500 | 18,500 |
| | Yellow perch | | | 19,480 | 19,480 |
| | Miscellaneous | | | 17,400 | 17,400 |
| North McGregor, Iowa— | | | | | |
| July–Dec. | Largemouth black bass | | | 75,370 | 75,370 |
| | Buffalofish | | | 219,445 | 219,445 |
| | Carp | | | 30,100 | 30,100 |
| | Catfish | | | 2,509,600 | 2,509,600 |
| | Crappie | | | 212,760 | 212,760 |
| | Drum | | | 61,000 | 61,000 |
| | Pike and pickerel | | | 8,295 | 8,295 |
| | River herring | | | 430,000 | 430,000 |
| | Sunfish | | | 45,835 | 45,835 |
| | Warmouth bass | | | 260 | 260 |
| | White bass | | | 25 | 25 |
| | Yellow perch | | | 13,675 | 13,675 |
| Meredosia, Ill.: o | | | | | |
| Entire year. | Largemouth black bass | | | 21,053 | 21,053 |
| | Buffalofish | | | 71,800 | 71,800 |
| | Carp | | | 72,600 | 72,600 |
| | Catfish | | | 134,096 | 134,096 |
| | Crappie | | | 111,500 | 111,500 |
| | Drum | | | 16,200 | 16,200 |
| | Rock bass | | | 950 | 950 |
| | Smallmouth black bass | | | 88 | 88 |
| | Sunfish | | | 92,700 | 92,700 |
| | Yellow perch | | | 26,100 | 26,100 |
| Nashua, N. H.: | | | | | |
| Entire year. | Brook trout | | | 481,400 | 481,400 |
| | Landlocked salmon | | | 6,400 | 6,400 |
| | Rainbow trout | | | 81,000 | 81,000 |
| | Smallmouth black bass | | 30,000 | 3,200 | 33,200 |
| Neosho, Mo.: p | | | | | |
| Entire year. | Largemouth black bass | | | 16,325 | 16,325 |
| | Crappie | | | 9,000 | 9,000 |
| | Rainbow trout | 100,000 | | 41,908 | 141,908 |
| | Rock bass | | | 13,240 | 13,240 |
| | Smallmouth black bass | | | 3,535 | 3,535 |
| | Sunfish | | | 45,748 | 45,748 |
| | Yellow perch | | 20,000 | 164 | 20,164 |
| Northville, Mich.: q | | | | | |
| Entire year. | Brook trout | | 534,000 | 51,750 | 585,750 |
| | Lake trout | 21,118,000 | | | 21,118,000 |
| | Rainbow trout | | 12,000 | 53,000 | 65,000 |
| | Smallmouth black bass | | 99,000 | 135,300 | 234,300 |
| | Steelhead salmon | | 46,000 | | 46,000 |
| Charlevoix, Mich.— | | | | | |
| Nov.–June. | Lake trout | | 17,900,000 | | 17,900,000 |
| | Whitefish | | 32,000,000 | | 32,000,000 |
| Detroit, Mich.— | | | | | |
| Nov.–May. | Pike perch | | 1,100,000 | | 1,100,000 |
| | Whitefish | 15,260,000 | 103,000,000 | | 118,260,000 |
| Orangeburg, S. C.: | | | | | |
| Entire year. | Largemouth black bass | | | 141,217 | 141,217 |
| | Sunfish | | | 32,330 | 32,330 |
| Put in Bay, Ohio: r | | | | | |
| Entire year. | Carp | | 3,250,000 | | 3,250,000 |
| | Lake trout | | 593,000 | | 593,000 |
| | Pike perch | | 28,100,000 | | 28,100,000 |
| | Whitefish | 54,780,000 | 226,000,000 | | 280,780,000 |
| Quinault, Wash.: | | | | | |
| Entire year. | Sockeye salmon | | 2,500,000 | 3,386,010 | 5,886,010 |
| | Chinook salmon | | | 220,000 | 220,000 |
| | Silver salmon | | 200,000 | 3,303,700 | 3,503,700 |
| St. Johnsbury, Vt.: | | | | | |
| Entire year. | Brook trout | 75,000 | 930,000 | 196,584 | 1,201,584 |
| | Lake trout | | 6,000 | 1,722 | 7,722 |
| | Landlocked salmon | | | 5,767 | 5,767 |
| | Rainbow trout | | | 300 | 300 |
| | Smallmouth black bass | | | 3,801 | 3,801 |
| | Steelhead salmon | | 23,000 | 27,498 | 50,498 |
| | Sunapee trout | | | 7,372 | 7,372 |
| Holden, Vt.— | | | | | |
| Entire year. | Brook trout | | 258,500 | 22,504 | 281,004 |
| | Lake trout | | 10,000 | | 10,000 |
| | Landlocked salmon | | | 10,520 | 10,520 |
| | Steelhead salmon | | | 35,605 | 35,605 |

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table below.]

| Station and period of operation. | Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|---|---|---|---|---|---|
| St. Johnsbury, Vt.—Con. | | | | | |
| Swanton, Vt.— | | | | | |
| Apr.-May | Pike perch | 14,560,000 | 20,000,000 | | 34,560,000 |
| | Yellow perch | | 5,800,000 | | 5,800,000 |
| Saratoga, Wyo: [s] | | | | | |
| Entire year | Blackspotted trout | | | 57,000 | 57,000 |
| | Brook trout | | | 520,000 | 520,000 |
| | Rainbow trout | | | 104,000 | 104,000 |
| | Steelhead salmon | | | 80,000 | 80,000 |
| Spearfish, S. Dak.: | | | | | |
| Entire year | Blackspotted trout | | 196,000 | | 196,000 |
| | Brook trout | | | 699,425 | 699,425 |
| | Lake trout | | | 39,075 | 39,075 |
| | Rainbow trout | | | 30,690 | 30,690 |
| Springville, Utah: [t] | | | | | |
| Entire year | Brook trout | | | 4,500 | 4,500 |
| Tupelo, Miss.: | | | | | |
| Entire year | Largemouth black bass | | 234,000 | 111,910 | 345,910 |
| | Crappie | | | 650 | 650 |
| | Sunfish | | | 75,200 | 75,200 |
| | Warmouth bass | | | 1,250 | 1,250 |
| White Sulphur Springs, W. Va.: | | | | | |
| Entire year | Brook trout | | | 276,610 | 276,610 |
| | Rainbow trout | | | 108,400 | 108,400 |
| | Smallmouth black bass | | 34,000 | 2,050 | 36,050 |
| Woods Hole, Mass.: | | | | | |
| Entire year | Cod | | 4,719,000 | | 4,719,000 |
| | Flounder | | 1,043,282,000 | | 1,043,282,000 |
| | Mackerel | | 4,648,000 | | 4,648,000 |
| Wytheville, Va: [u] | | | | | |
| Entire year | Largemouth black bass | | | 16,275 | 16,275 |
| | Brook trout | | | 33,000 | 33,000 |
| | Rainbow trout | | | 227,505 | 227,505 |
| | Rock bass | | | 9,600 | 9,600 |
| | Smallmouth black bass | | 10,000 | 2,020 | 12,020 |
| | Sunfish | | | 10,950 | 10,950 |
| Yes Bay, Alaska: | | | | | |
| Entire year | Sockeye salmon | | 13,150,000 | 18,284,500 | 31,434,500 |
| Gross output | | 147,048,325 | 3,782,241,640 | 109,068,014 | 4,038,357,979 |
| Loss in transit | | | 149,700 | 103,120 | 252,820 |
| Net output | | 147,048,325 | 3,782,091,940 | 168,964,894 | 4,038,105,159 |

NOTES REFER TO REFERENCE CHARACTERS IN PRECEDING TABLE.

For convenience in handling, transfers were made as follows:

[a] Afognak to Quinault, 5,000,000 sockeye salmon eggs.
[b] Hornbrook to Clackamas, 154,000 rainbow-trout eggs.
[c] Birdsview to Craig Brook, 1,000,000; to Central Station, 25,000 humpback-salmon eggs; to Charlevoix, 25,000; to Spearfish, 50,000 steelhead-salmon eggs.
[d] Sultan to Saratoga, 50,000 steelhead-salmon eggs.
[e] Bozeman to Rogue River, 50,000; to Leadville, 100,000 rainbow-trout eggs.
[f] Bryans Point to Central Station, 2,340,000 yellow-perch eggs; 994,000 shad eggs.
[g] Cape Vincent to Central Station, 500,000 whitefish eggs; to Green Lake, 25,000 lake-trout eggs.
[h] Applegate to St. Johnsbury, 100,000; to Holden, 50,000; to Green Lake, 50,000; to Northville, 50,000; to Rogue River, 250,000; to Clackamas, 40,000 steelhead-salmon eggs.
[i] Duluth to Spearfish, 50,000; to Cape Vincent, 2,500,000 lake-trout eggs.
[j] Erwin to Cold Springs, 2,000; to Friar Point, 8,900 rock bass; to Wytheville, 3,000 sunfish fingerlings.
[k] Grand Lake Stream to Nashua, 20,000; to Craig Brook, 100,000; to St. Johnsbury, 15,000 landlocked-salmon eggs; to Swanton, 3,500,000 white-perch eggs.
[l] Leadville to Clackamas, 200,000; to Bozeman, 272,000; to La Crosse, 300,000 brook-trout eggs.
[m] Mammoth Spring to Tupelo, 7,684 rock-bass fingerlings.
[n] Manchester to La Crosse, 76,000; to Northville, 86,000; to Cape Vincent, 50,000; to Nashua, 75,000 rainbow-trout eggs.
[o] Meredosia to Neosha, 1,200 catfish fingerlings.
[p] Neosha to Meredosia, 5,000 rock bass; to Erwin, 181,000 rainbow-trout eggs.
[q] Northville to Duluth, 5,000,000; to Cape Vincent, 14,100,000; to Put in Bay, 1,400,000; to Green Lake, 100,000; to St. Johnsbury, 50,000; to Leadville, 50,000 lake-trout eggs.
[r] Put in Bay to Duluth, 23,000,000; to Detroit, 158,520,000; to Alpena, 32,200,000; to Central Station, 1,800,000 whitefish eggs; to Louisville, 2,500,000 pike-perch eggs.
[s] Saratoga to Neosho, 25,000 rainbow-trout eggs.
[t] Springville to Leadville, 200,000 rainbow-trout eggs.
[u] Wytheville to Bellevue, 5,000 rock bass; to White Sulphur Springs, 150,000; to Nashua, 100,000; to Northville, 100,000; to Neosho, 20,000; to Willow Brook Trout Co., 150,000 rainbow-trout eggs.

The eggs hatched at the main stations listed in the foregoing table are in many cases obtained from auxiliary sources, usually temporary stations occupied during the season only or, in some instances, mere camps which are shifted from year to year. In the Great Lakes and off the New England coast collections are made by the Bureau's vessels or boats in favorable localities. The following temporary stations and collecting points furnished eggs of the given species for the main hatcheries during 1918.

LIST OF EGG-COLLECTING STATIONS, FISCAL YEAR 1918.

| Station. | Period of operation. | Species handled. |
|---|---|---|
| Afognak, Alaska: | | |
| Uganak, Alaska | August | Sockeye salmon. |
| Boothbay Harbor, Me.: | | |
| Portland, Me | July and August | Lobster. |
| Bozeman, Mont.: | | |
| Meadow Creek, Mont | March-June | Rainbow trout. |
| Clear Creek, Wyo | July-August | Blackspotted trout. |
| Columbine Creek, Wyo | July | Do. |
| Cub Creek, Wyo | July-August | Do. |
| Lake Creek, Wyo | July-September, June | Do. |
| Soda Butte, Wyo | June | Do. |
| Cape Vincent, N. Y.: | | |
| Amherst Island, Canada | October-November | Lake trout. |
| Bay of Quinte, Canada | November-December | Whitefish. |
| Chaumont, N. Y | ....do | Lake herring, whitefish. |
| Fair Haven, N. Y | November | Do. |
| Green Bay, N. Y | April | Yellow perch. |
| Henderson Harbor, N. Y | November | Lake herring. |
| Old Forge, N. Y | ....do | Whitefish. |
| Pigeon Island, Canada | November-December | Lake trout. |
| Pope Mills, N. Y | April | Pike perch. |
| Sodus Bay, N. Y | November-December | Lake herring. |
| South Bay, Canada | ....do | Whitefish. |
| Stony Island, N. Y | October-November | Lake trout. |
| Three Mile Bay, N. Y | November-December | Lake herring, whitefish. |
| Duluth, Minn.: | | |
| Grand Marais, Minn | October-November | Lake trout. |
| Isle Royale, Mich | ....do | Lake trout, whitefish. |
| Marquette, Mich | ....do | Do. |
| Munising, Mich | ....do | Do. |
| Ontonagon, Mich | ....do | Do. |
| Portage, Mich | ....do | Do. |
| Leadville, Colo.: | | |
| Annex-Antero Lakes, Colo | May and June | Blackspotted trout. |
| Crystal Lake, Colo | November | Brook trout. |
| Engelbrecht Lakes, Colo | October-November | Do. |
| Musgrove Lakes, Colo | ....do | Do. |
| Seven Lakes, Colo | June | Blackspotted trout. |
| Station Lakes, Colo | October-December | Brook trout. |
| Turquoise Lake, Colo | ....do | Do. |
| Woodland Park, Colo | October-November | Do. |
| Northville, Mich.: | | |
| Belle Isle, Mich | ....do | Whitefish. |
| Beulah, Mich | November | Do. |
| Cheboygan, Mich | October-November | Lake trout. |
| Detour, Mich | ....do | Do. |
| Fairport, Mich | ....do | Do. |
| Frankfort, Mich | December | Whitefish. |
| Leland, Mich | November-December | Lake trout, whitefish. |
| Manistique, Mich | October-November | Do. |
| Naubinway, Mich | November | Whitefish. |
| Northport, Mich | November-December | Lake trout, whitefish. |
| St. Ignace, Mich | October-November | Lake trout. |
| St. Joseph, Mich | October | Do. |
| Scotts Point, Mich | November | Whitefish. |
| Put in Bay, Ohio: | | |
| Catawba Island, Ohio | November-December | Do. |
| Kellys Island, Ohio | ....do | Do. |
| Middle Bass, Ohio | ....do | Do. |
| Monroe, Mich | November | Do. |
| North Bass, Ohio | November and April | Whitefish, pike perch. |
| Port Clinton, Ohio | ....do | Do. |
| Toledo, Ohio | November, April, and June | Whitefish, pike perch, carp. |

LIST OF EGG-COLLECTING STATIONS, FISCAL YEAR 1918—Continued.

| Station. | Period of operation. | Species handled. |
|---|---|---|
| St. Johnsbury, Vt.: | | |
| Darling Pond, Vt | July-November | Brook trout. |
| Lake Mitchell, Vt | September, December | Do. |
| Spearfish, S. Dak.: | | |
| Schmidt Ranch, S. Dak | October-December | Do. |
| Sand Creek, Wyo | October-January | Do. |
| Springville, Utah: | | |
| Fish Lake, Utah | October-November, April, and May | Brook and rainbow trout. |
| Strawberry Reservoir, Utah | June | Blackspotted trout. |
| Woods Hole, Mass.: | | |
| Hadley Harbor, Mass | March | Flounder. |
| Menemsha, Mass | do | Do. |
| Quissett, Mass | March and April | Do. |
| Waquoit, Mass | January-March | Cod, flounder. |
| Wickford, R. I | March and April | Flounder. |

## DISTRIBUTION OF FISH AND EGGS, BY STATES, WATERS, AND SPECIES, DURING THE FISCAL YEAR 1918.

On the pages following is shown in detail the distribution of fish eggs, fry, fingerlings, yearlings, and adults, by species, by States and municipalities, alphabetically arranged, and by waters, for the fiscal year ended June 30, 1918.

The distribution was composed largely of fingerlings, yearlings, and adults, though quite a number of eggs and fry of some species were distributed. In succeeding pages where figures are preceded by an asterisk (*) they indicate an egg distribution; if preceded by a dagger (†), a fry distribution. All other enumerations represent fingerlings, yearlings, and adults.

*Distribution of fish and eggs, fiscal year 1918.*

CATFISH.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Alabama: | | California: Mecca, Cottonwood Pond | 250 |
| Abbeville, Kirkland Pond | 1,200 | Colorado: | |
| Capps, Oak Log Lake | 600 | Bovina, Poorman's pond | 250 |
| Poor Creek | 600 | Colorado Springs, Bates Lake | 200 |
| Clanton, Mill Spring Pond | 200 | Denver, Webb's pond | 200 |
| Cusseta, Lumpkin Creek | 600 | Falcon, Big Spring Pond | 250 |
| Headland, Abby Creek | 900 | Homestead Pond | 500 |
| Brackin's pond (A) | 300 | Grand Junction, Grand River | 65 |
| Brackin's pond (B) | 300 | Redland Creek | 90 |
| McLenny Pond | 600 | Welsh Creek | 65 |
| Todd Shingel Mill Pond | 300 | Las Animas, Adobe Lake | 500 |
| Murpheys, West Choctawhatchie River | 900 | Montrose, Rouse's ponds | 750 |
| Salem, Little Uchee Creek | 1,500 | Paonia, Water Cress Lake | 500 |
| Arizona: | | Ramah, Kernes Pond | 250 |
| Elgin, Double Pond | 200 | Connecticut: | |
| Globe, Roosevelt Lake | 3,200 | East Haddam, Joshua Pond | 750 |
| Holbrook, Mormon Lake | 750 | Winsted, Doolittle Pond | 150 |
| Peoria, Dysart's pond | 200 | Shepard Pond | 150 |
| Perkinsville, Verde River | 750 | Georgia: | |
| Pinto, Turberville's pond | 250 | College Park, Hathcock's pond | 100 |
| San Simon, Darsey's pond | 200 | Comer, Lake View | 600 |
| Winslow, Chevelon Creek | 750 | Sorrells's pond | 400 |
| Arkansas: | | Watson Mill Pond | 400 |
| Black Rock, Black River | a 294 | Conyers, Peek Pond | 200 |
| Browns Lake, Black River | a 33 | Covington, Willow Lake | 200 |
| Gravette, White's pond | 75 | Crawfordville, Ogeechee River | 800 |
| Manson, Black River | a 315 | Dawson, Browns Mill Pond | 200 |
| Prairie Grove, Combs's pond | 100 | Douglasville, Eason's pond | 600 |
| | | Durand, Lake Martha | 100 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

CATFISH—Continued.

| Disposition. | Number. |
|---|---|
| Georgia—Continued. | |
| Gainesville, Vicker's pond | 100 |
| Jasper, Mill Creek | 150 |
| Loganville, Garrett's pond | 200 |
| Watson's pond | 200 |
| Lumpkin, Sand Branch Pond | 200 |
| McDonough, Lowe's pond | 600 |
| Meldean, Mossy Creek | 200 |
| Monroe, Adams Pond | 200 |
| Nacoochee, Nacoochee River | 200 |
| Newborn, Evergreen Pond | 200 |
| Sharpsburg, Pitman's pond | 300 |
| Temple, Little Tallapoosa River | 900 |
| Roberson's pond | 600 |
| Thomson, Little River | 400 |
| One Mile Pond | 200 |
| Tignall, Gully's pond | 300 |
| Illinois: | |
| Apple River, Apple River, North Branch | 400 |
| Blanding, Mississippi River | a 123,080 |
| Carbondale, Lake Blanche | 200 |
| Freeport, Waters of Illinois | 10,200 |
| Galena Junction, Mississippi River | a 403,500 |
| Hanover, Mississippi River | a 314,500 |
| Hillsboro, Hope's pond | 450 |
| Joliet, Hickory Creek | 300 |
| Lane, Mammossor Lake | 800 |
| Meredosia, Illinois River | a 121,120 |
| Naperville, DuPage River, West Branch | 1,000 |
| New Boston, Mississippi River | a 190,810 |
| Nora, Apple River, East Branch | 400 |
| Pana, Sider's pond | 450 |
| Scales Mound, Mill Creek | 400 |
| Indiana: | |
| Amo, Ray's pond | 200 |
| Angola, Loon Lake | 400 |
| Dupont, Marble Valley Pond | 100 |
| Eaton, Mississinewa River | 1,000 |
| Edinburg, Sugar Creek | 300 |
| Mishawaka, St. Joseph River | 400 |
| Worthington, Smith's pond | 100 |
| Iowa: | |
| Bellevue, Mississippi River | a 2,000,900 |
| Clayton, Mississippi River | a 239,600 |
| Coin, Whipp Lake | 100 |
| Cresco, Iowa River | 600 |
| Turkey River | 600 |
| Fairport, Mississippi River | a 145,394 |
| Green Island, Mississippi River | a 1,156,000 |
| Guttenburg, Mississippi River | a 10,000 |
| Iowa Falls, Iowa River | 4,400 |
| Keswick, Willow Pond | 100 |
| Manchester, Maquoketa River | 3,330 |
| North McGregor, Mississippi River | a 1,040,850 |
| Orient, Rexall Lake | 100 |
| Ottumwa, Lock Lamore Pond | 200 |
| Perry, North Raccoon River | 1,000 |
| Raccoon River | 2,200 |
| Pleasant Creek, Mississippi River | a 75,000 |
| Quarry, Iowa River | 5,500 |
| Sny Magill, Mississippi River | a 300,000 |
| Yellow River, Mississippi River | a 200,000 |
| Kansas: | |
| Codell, Stockwood Pond | 100 |
| Hutchinson, Reformatory Pond | 300 |
| Topeka, Berry Creek | 200 |
| Kentucky: | |
| Demossville, Licking River | 300 |
| Franklin, Harris Pond | 100 |
| Leak Pond | 100 |
| Sewell Pond | 100 |
| Lancaster, Bratton's pond | 200 |
| Lebanon, McEby's pond | 200 |
| Morganfield, Flournoy's pond | 100 |
| Paris, Lindsay Pond | 100 |
| Rowletts, Lester's pond | 100 |
| Louisiana: | |
| Baton Rouge— | |
| Amite River | a 50 |
| Mississippi River | a 11,175 |
| Maryland: | |
| Baltimore, State Ponds | 180 |
| Keedysville, Antietam Creek, Tributary of | 400 |
| Millers, Hoover's pond | 200 |
| Massachusetts: | |
| Clinton, Coachlace Pond | 150 |
| Lake Wauschacum, East | 150 |
| Little Pond | 150 |
| Mossy Pond | 150 |
| South Meadow Pond | 150 |
| West Lake | 150 |
| Fitchburg, Whalom Lake | 450 |
| Milford, North Pond | 300 |
| State Line, Leete Pond | 150 |
| Michigan: | |
| Allenville, Lake Brevort | 500 |
| Covington, Parents Lake | 600 |
| Cressey, Crooked Lake | 500 |
| Holton, Hemlock Lake | 200 |
| Homer, Homer Mill Pond | 300 |
| Jackson, Browns Lake | 200 |
| Jackson Mill Pond | 300 |
| Lake George, Lake George | 400 |
| Richland, Long Lake | 300 |
| Vanderbilt, Round Lake | 300 |
| Minnesota: | |
| Homer, Mississippi River | a 2,333,113 |
| Lake Pepin, Mississippi River | a 2,250 |
| Red Wing, Mississippi River | a 52,750 |
| Mississippi: | |
| Corinth, Hinton's pond | 200 |
| Falkner, Jackson's pond | 125 |
| Stonewall, Cubley's pond | 160 |
| Waynesboro, Limestone Creek Pond | 360 |
| Missouri: | |
| Chadwick, Cook Pond | 100 |
| Iantha, Lily View Pond | 100 |
| Mindenmines, Starr Lake | 350 |
| Seligman, Roller's pond | 100 |
| Thayer, Oldbricht's pond | 100 |
| Viburnum, Acorn Pond | 150 |
| West Plains, Swarton Lake | 200 |
| Twin Ponds | 100 |
| Montana: | |
| Billings, Yellowstone River | 700 |
| Malta, Bish Brothers Pond | 200 |
| Nelson Lake | 300 |
| Miles City, Yellowstone River | 3,000 |
| Nebraska: | |
| Ashby, Barr's pond | 300 |
| Nebraska City, Pine Ridge Pond | 900 |
| Rushville, Big Bend Pond | 300 |
| Stromsburg, Happy Hollow Pond | 300 |
| Verdon, Franenfelder's pond | 200 |
| Harden's pond | 300 |
| New Hampshire: | |
| Concord, Contoocook River | 150 |
| North Walpole, Connecticut River | 450 |
| New Jersey: | |
| Burlington, Delaware River | 900 |
| Penns Grove, Layton Lake | 1,200 |
| New Mexico: | |
| Capitan, Deane's pond | 200 |
| Deming, Willow Loch Pond | 400 |
| Folsom, Dry Cimarron River | 750 |
| French, French Lake | 750 |
| Kenna, Hendrix's pond | 200 |
| Roswell, Golf Lake | 200 |
| Lenox Lake | 100 |
| New York: | |
| Addison, Canisteo River | 800 |
| Altimont, Thompson Lake | 300 |
| Avon, Horseshoe Pond | 400 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

CATFISH—Continued.

| Disposition. | Number. |
|---|---|
| New York—Continued. | |
| Cohocton, Cohocton River | 500 |
| Hamilton, Chenango Canal | 500 |
| Horseheads, Shappell's pond | 100 |
| Newark, Coffey Lake | 500 |
| Poultney, Hill View Pond | 100 |
| Schenevus, Schenevus Pond | 300 |
| Worcester, Schenevus Creek | 300 |
| North Carolina: Pee Dee, Blewett Falls Lake | 900 |
| North Dakota: | |
| Engleville, Lone Tree Lake | 750 |
| Forbes, Spring Lake | 500 |
| St. John, Lakes of Rolette County | 2,000 |
| Ohio: | |
| Albany, Stotts's pond | 100 |
| Wood's pond | 200 |
| Belleville, Clear Fork Creek | 300 |
| Cutnaw Lake | 200 |
| Gatton Lake | 200 |
| Honey Creek | 200 |
| Lily Pond | 100 |
| Mahood Pond | 300 |
| Plank Dam Creek | 100 |
| Bethel, McCarty's pond | 100 |
| Brinkhaven, Dry Fork Pond | 200 |
| Carey, Carey Association Pond | 200 |
| Cridersville, Moyer's pond | 100 |
| Lake View, Indian Lake | 500 |
| Milford, Water Lily Pond | 100 |
| Salem, Mahoning Lake | 100 |
| Utica, Millbrook Pond | 200 |
| Zoar, Tuscarawas River | 200 |
| Oklahoma: | |
| Asher, Merrill's pond | 200 |
| Bessie, Harms's pond | 150 |
| Byars, Alexander's pond | 200 |
| Cushing, Dunkin Lake | 150 |
| Glencoe, Murphy's pond | 150 |
| Goteba, Spring Lake | 150 |
| Grandfield, Porter's pond | 200 |
| Guthrie, Sunnyside Lake | 200 |
| Haskell, Willow Grove Pond | 200 |
| Lawton, Lake Milliken | 150 |
| Mangum, Trotter's pond | 200 |
| Moore, Brand's pond | 200 |
| Morris, Morris Gin Pond | 200 |
| Pawhuska, Jim Creek Lake | 200 |
| Sand Creek | 400 |
| Perry, City Lake | 800 |
| Pittsburg, Allen Lakes | 200 |
| Roosevelt, Hallinen Pond | 300 |
| Stillwater, Lakeview Pond | 300 |
| Parks's pond | 600 |
| Tangier, Turkey Creek | 300 |
| Twin Lake | 100 |
| Walter, Johnson's pond | 150 |
| Lokey's pond | 150 |
| Woodward, Allen Lake | 200 |
| Excelsior Ranch Lake | 100 |
| Pennsylvania: | |
| Altoona, Juniata River | 6,000 |
| Canton, Lake Nepahwin | 400 |
| Chicora, Frederick's pond | 200 |
| Clarks Summit, Mill Pond | 400 |
| Collegeville, Perkiomen Creek | 800 |
| Cressey, Ten Mile Run | 300 |
| Denver, Cocalico Creek | 400 |
| East Greenville, Perkiomen Creek | 600 |
| Fallen Timber, Slate Run | 600 |
| Green Lane, Perkiomen Creek | 400 |
| Hendricks, Perkiomen Creek | 400 |
| Hosensack, Hosensack Creek | 400 |
| Kratz, Perkiomen Creek | 400 |
| Landisville, Big Chiques Creek | 600 |

| Disposition. | Number. |
|---|---|
| Pennsylvania—Continued. | |
| Lititz, Bricker's pond | 200 |
| Conestoga Creek | 800 |
| McLeans, Perkiomen Creek | 400 |
| Manheim, Chickies Creek | 600 |
| Mifflinburg, Knauer Pond | 600 |
| Oaks, Perkiomen Creek | 800 |
| Pennsburg, Perkiomen Creek | 1,200 |
| Pequea, Susquehanna River | 400 |
| Perkiomenville, Perkiomen Creek | 400 |
| Preston Park, Potato Creek Pond | 300 |
| Red Hill, Perkiomen Creek | 400 |
| Royersford, French Creek | 400 |
| Mill Dam Pond | 200 |
| Pigeon Creek | 200 |
| Stony Run | 400 |
| Spring Mount, Perkiomen Creek | 800 |
| West Grove, Lynch's pond | 200 |
| Zeiglersville, Perkiomen Creek | 800 |
| South Dakota: | |
| Colome, Hughes's pond | 300 |
| Flandreau, Big Sioux River | 400 |
| Philip, Fairview Pond | 200 |
| Gale Dam Pond | 200 |
| Sioux City, waters of South Dakota | 12,300 |
| Spearfish, Sunnyside Pond | 150 |
| Wessington Springs, Toffiemeir's lake | 200 |
| Tennessee: | |
| Ashland City, Sycamore Creek | 500 |
| Rugby Road, High Pond | 100 |
| Shelbyville, Duck River | 250 |
| Virginia: | |
| Bedford, Rucker's pond | 75 |
| Byllesby, Buck Dam Pond | 150 |
| Byllesby Pond | 150 |
| Cripple Creek | 150 |
| Elk Creek | 150 |
| New River | 150 |
| Farmville, Lower Pond | 150 |
| Front Royal, Barnet's pond | 300 |
| Gate City, Wid Pond | 75 |
| Lorton, Occoquan Creek | 225 |
| Orange, Rapidan River | 225 |
| Wytheville, Reed Creek | 150 |
| West Virginia: | |
| Albright, Little Sandy Creek | 500 |
| Berkeley Springs, Sleepy Creek | 1,000 |
| Bramwell, Bluestone River | 146 |
| Cascade, Falls Run | 500 |
| Terra Alta, Goff's pond | 250 |
| Youghiogheny River | 500 |
| Wisconsin: | |
| Alma, State fish commission | 900 |
| Bagley, Mississippi River | [a] 30,000 |
| Bay City, Mississippi River | [a] 110,000 |
| Beaver Dam, Beaver Dam Lake | 1,500 |
| Beaver Dam River | 1,000 |
| Genoa, Mississippi River | [a] 295,000 |
| Glen Haven, Mississippi River | [a] 20,000 |
| Helenville, Borck Reul Lake | 500 |
| Johnson Creek, Rock River | 600 |
| La Crosse, Mississippi River | [a] 2,787,200 |
| North Freedom, Mirror Lake | 500 |
| Prairie du Chien, Mississippi River | [a] 267,700 |
| Woodyard, Mississippi River | [a] 110,000 |
| Wyalusing, Mississippi River | [a] 246,000 |
| Wyoming: | |
| Aladdin, Pearson's pond | 300 |
| Parkman, Cooper Lake | 300 |
| Canal Zone: | |
| Gatun Lake, Gatun Lake | 3,000 |
| Total [b] | 12,733,330 |

[a] Rescued from overflowed lands and restored to original waters.
[b] Exclusive of 2,150 lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

CARP.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Arkansas: | | Minnesota: | |
| Black Rock, Black River | a 50 | Homer, Mississippi River | a 55,791 |
| Manson, Black River | a 10 | Lake Pepin, Mississippi River | a 85 |
| Illinois: | | Red Wing, Mississippi River | a 490 |
| Blanding, Mississippi River | a 8,000 | Ohio: | |
| Galena Junction, Mississippi River | a 59,500 | Port Clinton, Portage River | †1,500,000 |
| Hanover, Mississippi River | a 20,000 | Put in Bay, Lake Erie | †1,750,000 |
| Meredosia, Illinois River | a 72,600 | South Dakota: Murdo, Holland's pond | 100 |
| New Boston, Mississippi River | a 67,795 | Virginia: Ceres, Walker Pond | 165 |
| Iowa: | | Wisconsin: | |
| Bellevue, Mississippi River | a 764,425 | Bay City, Mississippi River | a 110 |
| Clayton, Mississippi River | a 300 | Genoa, Mississippi River | a 21,000 |
| Fairport, Mississippi River | a 57,645 | La Crosse, Mississippi River | a 154,150 |
| Green Island, Mississippi River | a 313,500 | Prairie du Chien, Mississippi River | a 400 |
| North McGregor, Mississippi River | a 18,600 | Canal Zone: Gatun Lake, Gatun Lake | 1,875 |
| Pleasant Creek, Mississippi River | a 25,000 | | |
| Sny Magill, Mississippi River | a 10,800 | Total | †3,250,000<br>1,660,941 |
| Louisiana: Baton Rouge, Mississippi River | a 8,550 | | |

BUFFALOFISH.

| | | | |
|---|---|---|---|
| Arizona: Globe, Roosevelt Lake | 420 | Louisiana: | |
| Arkansas: | | Atchafalaya, Atchafalaya River | †4,500,000 |
| Black Rock, Black River | a 2,463 | Bayou Teln | †6,000,000 |
| Browns Lake, Black River | a 75 | Gulohreaux Slough | †8,000,000 |
| Manson, Black River | a 1,670 | Mississippi River | a 9,800 |
| Illinois: | | Opelousas Bay | †9,760,000 |
| Blanding, Mississippi River | a 14,000 | Minnesota: | |
| Galena Junction, Mississippi River | a 101,000 | Clearbrook, Olson Lake | 200 |
| Galesburg, Glenwood Lake | 125 | Homer, Mississippi River | a 30,214 |
| Hanover, Mississippi River | a 35,500 | Virginia: White Stone, Antipoison River | 200 |
| Meredosia, Illinois River | a 71,675 | | |
| New Boston, Mississippi River | a 89,683 | Wisconsin: | |
| Iowa: | | Genoa, Mississippi River | a 25,000 |
| Bellevue, Mississippi River | a 1,526,500 | La Crosse, Mississippi River | a 19,600 |
| Fairport, Mississippi River | a 84,398 | Prairie du Chien, Mississippi River | a 200 |
| Green Island, Mississippi River | a 85,500 | | |
| Guttenburg, Mississippi River | a 25 | Total | †28,280,000<br>2,417,052 |
| North McGregor, Mississippi River | a 218,800 | | |
| Pleasant Green, Mississippi River | a 100,000 | | |

SHAD.

| | | | |
|---|---|---|---|
| District of Columbia: Highway Bridge, Potomac River | †750,000 | Oregon: | |
| Maryland: | | Astoria, Youngs River | †932,000 |
| Broad Creek, Potomac River | †4,631,600 | Oregon City, Willamette River | †1,532,650 |
| Moxley Bar, Potomac River | †613,000 | St. Helens, Willamette River | †8,100,450 |
| Piscataway Creek, Potomac River | †8,722,000 | Willamette Falls, Willamette River | †2,060,000 |
| Pomonkey Creek, Potomac River | †3,310,700 | Virginia: | |
| Swan Creek, Potomac River | †3,704,200 | Dogue Creek, Potomac River | †5,504,700 |
| Tent Landing, Potomac River | †779,600 | Mount Vernon, Potomac River | †1,866,500 |
| North Carolina: Edenton, Albermarle Sound | †2,859,000 | Occoquan, Potomac River | †6,150,600 |
| | | Pohick, Potomac River | †1,028,900 |
| | | Total | †52,543,900 |

RIVER HERRING.

| | | | |
|---|---|---|---|
| Illinois: | | Maryland: Bryans Point, Potomac River | †100,000 |
| Galena Junction, Mississippi River | a 1,260,000 | | |
| Hanover, Mississippi River | a 660,000 | Total | †100,000<br>a 3,700,000 |
| Iowa: | | | |
| Bellevue, Mississippi River | a 1,350,000 | | |
| North McGregor, Mississippi River | a 430,000 | | |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

WHITEFISH.

| Disposition. | Number. |
|---|---|
| Illinois: Springfield, State fish commission | *5,000,000 |
| Michigan: | |
| Alpena, Lake Huron | †4,800,000 |
| Antrim City, Grand Traverse Bay | †5,000,000 |
| Belle Isle, Detroit River | †46,000,000 |
| Cathead Reef, Lake Michigan | †3,000,000 |
| Charlevoix, Pine River | †15,000,000 |
| Cheboygan, Hammonds Bay | †600,000 |
| Saddle Bag Bay | †600,000 |
| Crystall Falls, Anderson Lake | †300,000 |
| Detroit, Aquarium | *260,000 |
| Fighting Island, Detroit River | †10,000,000 |
| Fort Wayne, Detroit River | †5,000,000 |
| Gilchrist, Lake Michigan | †2,500,000 |
| Gould City, Lake Michigan | †2,500,000 |
| Grace Harbor, Lake Superior | †750,000 |
| Grassy Island, Detroit River | †10,000,000 |
| Indian River, Bush Lake | †600,000 |
| Iron River, Pickerel Lake | †400,000 |
| Sunset Lake | †400,000 |
| McCargoes Cove, Lake Superior | †1,550,000 |
| McLeods Channel, Lake Superior | †2,000,000 |
| Manistique, Lake Michigan | †2,000,000 |
| Marquette, Lake Superior | †4,375,000 |
| New Richmond, Lake Michigan | †1,200,000 |
| Point Fishery, Detroit River | †4,000,000 |
| St. Ignace, Lake Huron | †1,200,000 |
| Mackinaw Straits | †2,000,000 |
| Tobins Harbor, Lake Superior | †500,000 |
| Willis Fishery, Detroit River | †19,000,000 |
| Wrights Island, Lake Superior | †1,250,000 |
| Minnesota: | |
| Duluth, Lake Superior | †10,000 |
| Grand Portage, Lake Superior | †825,000 |
| Turner, Mud Lake | †300,000 |
| Wanless, Harrison Lake | †300,000 |
| Twin Lakes | †300,000 |
| Montana: Somers, applicant | *500,000 |
| New Hampshire: Warren, State fish commission | *500,000 |
| New York: | |
| Albany, State fish commission | *15,000,000 |
| Allan Otty Shoal, Lake Ontario | †100,000 |
| Bear Point, Lake Ontario | †3,632,000 |
| Fair Haven, Lake Ontario | †25,000 |
| Fox Island, Lake Ontario | †500,000 |
| Fullers Bay, Lake Ontario | †3,400,000 |
| Grenadier Island, Lake Ontario | †5,800,000 |
| Long Lake West, Little Tupper Lake | *1,000,000 |
| Niagara Falls, Niagara River, lower | †1,000,000 |
| Plattsburg, Lake Champlain | †1,000,000 |
| Pleasant Lake, Longfellow Lake | †25,000 |
| Pleasant Lake | †25,000 |
| Point Peninsula, Lake Ontario | †2,500,000 |
| Port Henry, Lake Champlain | †500,000 |
| Sodus Point, Lake Ontario | †125,000 |
| Stony Point, Lake Ontario | †3,400,000 |
| Three Mile Bay, Lake Ontario | †50,000 |
| Tibbetts Point, Lake Ontario | †4,400,000 |
| Watkins, Seneca Lake | †750,000 |
| Wilson Bay, Lake Ontario | †1,000,000 |
| Ohio: | |
| Catawba Island, Lake Erie | †11,000,000 |
| Isle St. George, Lake Erie | †65,000,000 |
| Kellys Island, Lake Erie | †10,000,000 |
| Locust Point, Lake Erie | †10,000,000 |
| Middle Bass, Lake Erie | †40,000,000 |
| Port Clinton, Lake Erie | †40,000,000 |
| Put in Bay, Lake Erie | †50,000,000 |
| Toledo, Lake Erie | †10,000,000 |
| Pennsylvania: | |
| Erie, State fish commission | *4,280,000 |
| Union City, State fish commission | *34,000,000 |
| Wisconsin: | |
| Amnicon River, Lake Superior | †6,000,000 |
| Sheboygan, State fish commission | *15,000,000 |
| Total | †*75,540,000<br>††408,492,000 |

LAKE HERRING (CISCO).

| | |
|---|---|
| New York: | |
| Allan Otty Shoal, Lake Ontario | †3,960,000 |
| Bear Point, Lake Ontario | †3,000,000 |
| Charity Shoal, Lake Ontario | †4,140,000 |
| Fair Haven, Lake Ontario | †5,000,000 |
| Fox Island, Lake Ontario | †13,080,000 |
| Henderson Harbor, Lake Ontario | †2,500,000 |
| Point Peninsula, Lake Ontario | †4,080,000 |
| New York—Continued. | |
| Sodus Point, Lake Ontario | †5,000,000 |
| Syony Point, Lake Ontario | †4,080,000 |
| Three Mile Bay, Lake Ontario | †7,450,000 |
| Tibbetts Point, Lake Ontario | †6,420,000 |
| Wilson Bay, Lake Ontario | †6,420,000 |
| Total | †65,130,000 |

SILVER SALMON.

| | |
|---|---|
| Oregon: | |
| Applegate, Applegate Creek | 300,100 |
| Clackamas, Clackamas River | 18,800 |
| Trail, Rogue River | 66,400 |
| Upper Clackamas, Clackamas River | †8,000 |
| Washington: | |
| Baker Lake, Baker Lake | †440,000<br>1,850,750 |
| Birdsview, Day Creek | 45,000 |
| Grandy Creek | 1,032,000 |
| Phinney Creek | 245,000 |
| Brinnon, Walcotts Slough | 77,465 |
| Washington—Continued. | |
| Darrington, Bennetts Slough | †192,800 |
| Illabott, Illabott Creek | †139,500 |
| Quilcene, Big Quilcene River | 286,000 |
| Little Quilcene River | 80,000 |
| Quinault, Falls Creek | †200,000<br>1,797,000 |
| Quinault Lake | 1,508,700 |
| Sultan, Elwell Creek | 3,228,900 |
| Total | †980,300<br>10,534,115 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

CHINOOK SALMON.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| California: | | Washington—Continued. | |
| Baird, McCloud River | 2,760,000 | Birdsview, Grandy Creek | 270,860 |
| Battle Creek, Battle Creek | 4,050,500 | Phinney Creek | 30,000 |
| Mill Creek, Mill Creek | 3,878,900 | Skagit River | 20,000 |
| Sisson, State fish commission | *14,321,900 | Darrington, Bennetts Slough | †51,500 |
| New York: Ithaca, applicant | *3,000 | Sauk River | †17,970 |
| Oregon: | | Day Creek, Day Creek | 14,000 |
| Applegate, Applegate Creek | 36,750 | Illabott, Illabott Creek | †115,750 |
| Bonneville, State fish commission | *3,150,000 | Little White Salmon, Little White Salmon River | †500,000<br>21,611,277 |
| Clackamas, Clackamas River | †2,000,000<br>9,299,400 | Quinault, Falls Creek | 66,600 |
| | | Quinault Lake | 153,400 |
| River Mill, Clackamas River | †1,843,700<br>1,084,000 | Sultan, Elwell Creek | 21,500 |
| | | Skyomish River | 47,200 |
| Trail, Rogue River | 884,000 | Japan: Kobe, Japanese Government | *100,000 |
| Washington: | | | |
| Baker Lake, Baker Lake | 7,500 | | |
| Big White Salmon, Big White Salmon River | †1,500,000<br>18,960,357 | Total | *17,574,900<br>†6,028,920<br>63,176,244 |

SOCKEYE SALMON.

| | | | |
|---|---|---|---|
| Alaska: | | Washington—Continued. | |
| Afognak, Hatchery Creek | †6,200,000 | Birdsview, Grandy Creek | 114,275 |
| Letnik Lake | †12,450,000<br>14,610,000 | Quinault, Quinault Lake | †2,500,000<br>3,386,010 |
| Seal Bay Creek, Seal Bay | †2,712,000 | British Columbia: Agassiz, Canadian Government | *10,000,000 |
| Yes Bay, Hatchery Creek | †13,150,000 | | |
| Lake McDonald | 18,284,500 | | |
| Oregon: Bonneville, State fish commission | *3,000,000 | Total | *13,000,000<br>†38,137,000<br>45,599,785 |
| Washington: | | | |
| Baker Lake, Baker Lake | †1,125,000<br>9,205,000 | | |

HUMPBACK SALMON.

| | | | |
|---|---|---|---|
| Alaska: | | Washington—Continued. | |
| Afognak, Letnik Bay | †675,000 | Darrington, Bennetts Slough | †57,000 |
| Letnik River | †651,000 | Sauk River | †59,890 |
| Seal Bay Creek, Seal Harbor | †800,000 | Duckabush, Duckabush River | †448,840 |
| Maine: | | Illabott, Illabott Creek | †434,100 |
| Dennysville, Dennys River | †618,000 | Quilcene, Big Quilcene River | †600,000<br>770,000 |
| Pembroke, Pembroke River | †316,235 | Sultan, Elwell Creek | 51,000 |
| New Jersey: Mays Landing, Egg River | 18,000 | | |
| Washington: | | | |
| Birdsview, Grandy Creek | 3,915,000 | Total | †5,193,065<br>3,754,000 |
| Brinnon, Wolcotts Slough | †535,000 | | |

CHUM SALMON.

| | | | |
|---|---|---|---|
| Washington: | | Washington—Continued. | |
| Birdsview, Grandy Creek | †47,400 | Illabott, Illabott Creek | †1,841,000 |
| Brinnon, Wolcotts Slough | †1,663,820 | Quilcene, Big Quilcene River | †1,425,000 |
| Darrington, Bennetts Slough | †76,600 | Little Quilcene River | †825,350 |
| Day Creek, Day Creek | †23,000 | | |
| Duckabush, Duckabush River | †3,989,975 | Total | †9,892,145 |

STEELHEAD SALMON.

| | | | |
|---|---|---|---|
| Massachusetts: | | New Hampshire: | |
| Athol, Tom Swamp Pond | 1,000 | Conicut, Lake Tarleton | 6,000 |
| Hartsville, Green River | 1,500 | Newport, Butternut Pond | †3,000 |
| Harmon Brook | 1,100 | Cold Pond | †5,000 |
| Kingston, Brookdale Brook | *100,000 | Pike, Lake Tarleton | 11,000 |
| Michigan: | | New Jersey: Hackettstown, State fish commission | *50,000 |
| Aloha, Mullet Lake | †26,000 | | |
| Long Lake, Au Sable Lake | †10,000 | | |
| Ossineke, Devil River | †10,000 | New York: | |
| Minnesota: St. Paul, State fish commission | *50,000 | Albany, State fish commission | *400,000 |
| Montana: Whitefish, Whitefish River | 10,000 | Au Sable Forks, Taylor Pond | 5,000 |
| | | Riverside, Schroon Lake | 3,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

STEELHEAD SALMON—Continued.

| Disposition. | Number. |
|---|---|
| Oregon: | |
| Applegate, Applegate Creek | 1,991,700 |
| Butte Falls, State fish commission | *750,000 |
| Clackamas, Clackamas River | 60,465 |
| Trail, Rogue River | 819,000 |
| Upper Clackamas, Clackamas River | 493,000 |
| Pennsylvania: Glen Eyre, Lake Giles | *50,000 |
| Vermont: | |
| Bellows Falls, Saxtons River | 3,000 |
| Danville, Joes Pond | 348 |
| Hardwick, Nichols Pond | 1,000 |
| Holden, Chittenden Dam | 23,605 |
| Hyde Park, Lamoille River | 1,000 |
| Middlebury, Leicester River | 1,000 |
| New Haven River | 3,000 |
| Newport, Clyde River | †5,000 |
| Missisquoi River | †5,000 |
| Orleans, Willoughby River | †5,000 |
| Plainfield, Winooski River | 1,000 |
| Randolph, Railway Brook | 5,000 |
| Roxbury, State fish commission | 1,000 |
| St. Johnsbury, Sleepers River | *100,000 |
| West Danville, Joes Pond | 350 |
| Washington: | 1,000 |
| Birdsview, Alder Creek | |
| Day Creek | 50,000 |
| Grandy Creek | 344,000 |
| Mill Creek | 760,000 |
| Phinney Creek | 50,000 |
| Vogler's Lake | 326,000 |
| | 50,000 |

| Disposition. | Numbed. |
|---|---|
| Washington—Continued. | |
| Brinnon, Dusewallips River | 129,000 |
| Chico, Valley Tracts Pond | 14000 |
| Clallam, Beaver Lake | 3,000 |
| Pysht River | 5,000 |
| Darrington, Bennetts Slough | 150,000 |
| Day Creek, Day Creek | †43,000 |
| Duckabush, Duckabush River | 422,320 |
| Illabott, Illabott Creek | 418,100 |
| Olympia, Lake Neuwatsel | 2,000 |
| Pomeroy, Pataha Creek | 3,000 |
| Quilcene, Big Quilcene River | 189,000 |
| Little Quilcene River | 95,000 |
| Stevenson, Washougal River | 3,000 |
| Sultan, Elwell Creek | †60,000 |
| | 490,000 |
| Wisconsin: Spooner, applicant | *20,000 |
| Wyoming: | |
| Encampment, Encampment River | 18,000 |
| Evenston, Snowden's pond | 6,000 |
| Gold Hill Lake, Gold Hill Lake | 20,000 |
| Jacks Creek, Jacks Creek | 3,000 |
| Pass Creek, Pass Creek | 10,000 |
| Saratoga, Cedar Creek | 6,000 |
| North Platte River | 8,000 |
| Spring Creek | 9,000 |
| Sheridan, State fish commission | *50,000 |
| Teton, Phelps Lake | 8,000 |
| Total | *1,570,000<br>†172,000<br>7,022,488 |

RAINBOW TROUT.

| | |
|---|---|
| Alaska: | |
| Fairbanks, applicant | |
| Hames, Mud Lake | *25,000 |
| Alabama: Courtland, Sandy Creek | *25,000 |
| Arizona: | 4,000 |
| Flagstaff, Mormon Lake | |
| Holbrook, Show Low Creek | 1,000 |
| Silver Lake | 1,000 |
| Walnut Spring Pond | 1,000 |
| Jerome Junction, Fritsche Lake | 1,000 |
| Portal, Cave Creek | 500 |
| Safford, Ivy Canyon Creek | 1,500 |
| Morijilda Canyon Creek | 1,000 |
| Sycamore, Sycamore Creek | 1,000 |
| Tucson, 3 C Ranch Pond | 1,000 |
| Arkansas: | 1,000 |
| Green Forest, Harbert's pond | |
| Harrison, Buffalo Creek | 500 |
| Springdale, Clear Creek | 1,500 |
| East Brush Creek | 3,000 |
| Hickory Creek | 3,000 |
| Spring Creek | 2,000 |
| Colorado: | 3,000 |
| Antero, Antero Lake | |
| Aspen, Blue Lake | 3,000 |
| Castle Creek | 1,000 |
| Fall Creek | 1,500 |
| New York Lake | 2,000 |
| North American Lake | 5,000 |
| Taylor Lake | 6,500 |
| Bailey, Entriken Meadow Lake | 1,500 |
| Breckenridge, Blue Lake | 1,000 |
| Buffalo, Buffalo Creek | 1,500 |
| Goose Creek | 1,500 |
| Carbondale, Snowmass Creek | 1,500 |
| Cassells, Cassells Lake | 4,000 |
| Cebolla, Carpenter's pond | 1,500 |
| Cebolla Creek | 1,500 |
| Gunnison River | 1,500 |
| Cimarron, Butte Lake | 1,500 |
| Cliff, King's pond | 1,000 |
| Clyde, Bison Creek | 500 |
| | 1,000 |

| | |
|---|---|
| Colorado—Continued. | |
| Cotopaxi, Lake Creek Lake | 2,500 |
| Creede, Rio Grande | 2,500 |
| Crossons, Crossons Pond | 500 |
| DeBeque, Leon Creek | 1,500 |
| Denver, Bear Creek | 2,000 |
| Durango, Potato Lake | 1,000 |
| Florence, Beaver Creek | 2,000 |
| Fort Collins, Big Thompson River | 1,500 |
| Cache La Poudre River | 3,500 |
| Georgetown, Murry Lake | 2,000 |
| Naylor Lake | 2,000 |
| Grant, Geneva Creek | 2,000 |
| Gunnison, Clarke Creek | 1,000 |
| Cottonhurst Creek | 1,000 |
| Hayden, Yoast's pond | 1,000 |
| LaVeta, Mill Lake | 1,000 |
| Leadville, Empire Creek | 500 |
| Frying Pan River | 2,000 |
| Middle Evergreen Lake | 6,000 |
| Loveland, Big Thompson River | 1,500 |
| Big Thompson River, North Fork | 1,500 |
| Marble, Beaver Lake | 1,000 |
| Carbonate Creek | 1,000 |
| Crystal River | 1,000 |
| Lost Trail Creek | 1,000 |
| Yule Creek | 1,000 |
| Mineral Hot Springs, Wild Cherry Creek Lake | 5,000 |
| Minturn, Gore Creek | 1,500 |
| Moffat, Saguache Creek | 2,500 |
| Nast, Frying Pan Lake | 4,000 |
| Norrie, Savage Lake | 4,000 |
| Pitkin, Quartz Creek | 1,000 |
| Red Cliff, Eagle River | 1,500 |
| Ridgway, Blue Lake | 1,500 |
| Ruedi, Ruedi Lake | 800 |
| Salida, South Arkansas River | 1,500 |
| Shawnee, South Platt River, North Fork | 1,500 |
| South Cheyenne, South Cheyenne Creek | 1,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

RAINBOW TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Colorado—Continued. | |
| South Platte, South Platte River | 1,500 |
| Steamboat Springs, Aqua Frio Lake | 1,000 |
| Slide Lake | 1,000 |
| Tabernash, Ranch Creek | 1,500 |
| Thomasville, Fairview Lake | 4,000 |
| Lime Creek | 5,000 |
| Little Lime Creek | 2,400 |
| Ward, Forest Lake | 1,000 |
| Westcliffe, Vanable Lake | 1,500 |
| Woodland Park, Northfield Lake | 1,500 |
| Connecticut: Simsbury, Eno's pond | 600 |
| Georgia: | |
| La Fayette, Big Spring Pond | 2,000 |
| Lakemont, Tiger Creek | 3,000 |
| Tiger Creek Pond | 2,000 |
| Turpin Creek | 3,000 |
| Robertstown, Dukes Creek | 4,000 |
| Hiawassee River | 3,000 |
| Tiger, Ramey Creek | 2,000 |
| Idaho: | |
| Ashton, Phoenix Ranch Pond | 6,000 |
| Drummond, Condah Creek | 7,000 |
| Illinois: Chicago, applicant | *1,000 |
| Indiana: | |
| Crawfordsville, Country Club Lakes | 7,000 |
| Mishawaka, Willow Creek | †4,000 |
| Iowa: | |
| Calmar, Protivin Creek | 1,500 |
| Cedar Rapids, applicant | *2,500 |
| Cresco, Bealk Creek | 800 |
| Silver Creek | 1,200 |
| Lansing, State fish commission | *94,000 |
| North McGregor, Bloody Run | 800 |
| Kentucky: | |
| Glasgow, Fallen Timber Creek | 8,000 |
| Harlan, Cumberland River, Martin Fork | 1,600 |
| Louisiana: | |
| Amite, Chappapela Creek | 200 |
| Spring Branch | 100 |
| Arcola, Spring Branch | 100 |
| Kentwood, Line Creek | 100 |
| Minden, Orphans Lake | 125 |
| Maine: | |
| Jackman, Crocker Pond | 5,000 |
| Portland, Pleasant River | 7,000 |
| Maryland: | |
| Baltimore, Greens Branch | 4,000 |
| Myersville, Stotelmyer's pond | 300 |
| Massachusetts: | |
| Foxboro, Lake Neponset | 6,000 |
| Greenfield, Stone Brook | 1,500 |
| Kingston, applicant | *100,000 |
| Hunts Ponds | 300 |
| Lowell, Burgess Pond | 3,000 |
| Forge Pond | 4,000 |
| Long Pond | 4,000 |
| Long-Sought-For-Pond | 3,000 |
| Spectacle Pond | 3,000 |
| Pittsfield, Morewood Lake | 1,000 |
| Secum Brook | 1,000 |
| Michigan: | |
| Graylings, Tilula Lake | 300 |
| Montrose, Glenn Lake | 10,000 |
| Ravenna, Crockery Creek | 5,000 |
| Reed City, Hersey River | 12,000 |
| Wingleton, Pere Marquette River | 11,000 |
| Minnesota: | |
| Cedar Brook, Cedar Brook | 5,000 |
| Dover, Whitewater Creek | 3,000 |
| Preston, Camp Creek | 2,000 |
| Forestville Creek, North Branch | 1,000 |
| Partridge Creek | 2,000 |
| South Branch Creek | 1,000 |
| Spring Creek | 1,000 |
| Trout Creek | 1,000 |
| Watson Creek | 1,000 |
| Willow Creek | 2,000 |
| Rochester, Washspring Creek | 5,000 |
| Minnesota—Continued. | |
| Rushford, Enterprise Creek | 2,000 |
| Pine Creek | 2,000 |
| Rust Creek | 2,000 |
| Uodine Creek | 2,000 |
| Whitewater Creek | 2,000 |
| Wiscoy Creek | 2,000 |
| St. Cloud, Little Watab River | 5,000 |
| Tamarack, Turtle Lake | 4,000 |
| Wadena, Finn Creek | 3,000 |
| Missouri: | |
| Birch Tree, Johnie Hollow Run | 2,000 |
| Columbia, Rock Bridge Creek | 1,500 |
| Diamond, Banum Branch | 500 |
| Lebanon, Ha Ha Tonka Lake | 5,000 |
| Montier, Searcy Run | 1,500 |
| Neosho, Clear Creek | 4,000 |
| Hearrell Branch | 126 |
| Hickory Creek | 182 |
| Saginaw, Osborn's pond | 150 |
| Springfield, Jordan River | 585 |
| Steeleville, Westover Creek | 2,500 |
| Verona, Spring River | 1,000 |
| Montana: | |
| Anaconda, State fish commission | *300,000 |
| Bozeman, East Rainbow Lake | 1,000 |
| Mystic Lake | 1,000 |
| West Rainbow Lake | 1,000 |
| Butte, applicant | *113,000 |
| Conrad, Barber's pond | 1,000 |
| Williams Pond | 1,000 |
| Gilman, Sun River, North Fork | 10,000 |
| Glacier Park, Boulder Creek | 3,000 |
| Gunsight Lake | 4,000 |
| St. Marys River, Middle Fork | 5,000 |
| Swift Current Creek, Upper | 3,000 |
| Havre, Clear Creek | 5,000 |
| Joplin, Big Sage Creek | 2,000 |
| Lodge Grass, Lodge Grass Creek | 16,000 |
| Manhattan, Bull Creek | 3,000 |
| Oyler Creek | 4,000 |
| Waters Creek | 2,000 |
| Marion, Lang Trout Pond | 1,000 |
| Norris, South Meadow Creek | 20,000 |
| Plentywood, Park Lake | 3,000 |
| Troy, applicant | *50,000 |
| Twin Bridges, Wisconsin Lake | 2,000 |
| Nebraska: | |
| Andrews, White River | 2,625 |
| Gretna, Niobrara River | 16,000 |
| Nevada: | |
| Elko, Humbolt River | 3,000 |
| Verdi, State fish commission | *50,000 |
| New Hampshire: | |
| Bennington, Moose Brook | 4,000 |
| North Branch River | 10,000 |
| Canaan, Fales Brook | 4,000 |
| Hinkson Brook | 5,000 |
| Lakewood, Ossippee Lake | 8,000 |
| Lebanon, Mascoma River | 4,000 |
| Nashua, Silver Lake | 5,000 |
| Newport, Sugar River, South Branch | 10,000 |
| Suncook, Boat Meadow Brook | 3,000 |
| New Jersey: | |
| Hackettstown, State fish commission | *50,000 |
| Oak Ridge, Stony Brook Lake | 500 |
| New Mexico: | |
| Carlsbad, Dark Canon Creek | 1,000 |
| Carrizozo, Ruidioso River | 1,000 |
| Chama, Brazos River | 1,000 |
| Canjilon Creek | 1,000 |
| Canones Creek | 1,000 |
| Chama River | 1,000 |
| Chavez Creek | 1,000 |
| Rio de Tierra Amarilla | 1,000 |
| Rio Nutritis | 1,000 |
| Mountainair, Tajique Canyon Creek | 1,000 |
| Onava, Bass Lake | 2,500 |
| Upper Armstrong Lake | 1,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

RAINBOW TROUT—Continued.

| Disposition. | Number. |
|---|---|
| New Mexico—Continued. | |
| Springer, Orchard Spring Pond | 500 |
| Taos Junction, Blue Lake | 1,000 |
| Tularosa, Indian School Pond | 500 |
| New York: | |
| Ardsley, Nepperhan River | 1,250 |
| Benson Mines, Star Lake | 4,000 |
| Twin Lakes | 3,000 |
| Canaseraga, Windsor Creek | †2,000 |
| Chappaqua, White Birch Pond | 200 |
| Elmira, Shepard Creek | 4,000 |
| Sing Sing Creek | 2,000 |
| Hornell, Big Creek | 4,000 |
| Canacadea Creek | 4,000 |
| Canisteo River | 8,000 |
| Car Valley Brook | 3,000 |
| Ithaca, applicant | *3,750 |
| Malone Junction, Salmon River | 4,000 |
| North Ilion, Miller Mill Creek | 4,000 |
| Purdys, Holmes Lake | 2,000 |
| Syracuse, Butternut Creek | 4,500 |
| Onondaga Creek | 4,500 |
| Tarrytown, Little Mohawk Pond | 500 |
| White Plains, Rye Lake | 1,250 |
| Wyandanch, Carlls River | 1,250 |
| North Carolina: | |
| Black Mountain, Broad River | 3,500 |
| Broad River, Rush Branch | 1,400 |
| Grassy Creek | 2,100 |
| Swannanoa River, North Fork | 10,500 |
| Swannanoa River, Sugar Fork | 2,100 |
| Bryson, Kirkland Creek | 2,800 |
| Dillard, Big Creek | 3,000 |
| Salt Rock Branch | 2,000 |
| Satulah Creek | 2,000 |
| Shoal Creek | 3,000 |
| Slab Cabin Branch | 2,000 |
| Wildcat Lake | 2,000 |
| Elkin, Church's pond | 1,000 |
| Grassy Creek | 3,000 |
| Elkland, Brushy Fork Creek | 1,000 |
| Elk Creek | 1,000 |
| Elk Park, Elk River | 7,000 |
| Little Elk Creek | 5,000 |
| Farner, Hiawassee River | 750 |
| Hendersonville, Maxwell Creek | 4,200 |
| Rocky Broad River | 11,900 |
| Hickory, Rockett's pond | 1,400 |
| Linville, Camp Creek | 4,000 |
| Johnson's pond | 1,000 |
| Mill Timber Creek | 3,000 |
| Upper Toe River | 8,000 |
| Wilson Creek | 6,000 |
| Montezuma, Chestnut Heights Lake | 5,000 |
| Mt. Sterling, Big Creek | 4,000 |
| Laurel Creek | 6,000 |
| Murphy, Cook Creek | 4,900 |
| Wauchesee Creek | 3,500 |
| Noland, Andrews Creek | 3,500 |
| Bald Creek | 3,500 |
| Bear Pen Creek | 2,100 |
| Deer Creek | 2,800 |
| Horse Cove Creek | 2,100 |
| Indian Creek | 2,100 |
| Laurel Branch | 2,100 |
| Mill Creek | 2,100 |
| Noland Creek | 3,500 |
| North Wilkesboro, Moravian Creek Pond | 700 |
| Reddies River | 1,000 |
| Roaring River, Middle Fork | 4,200 |
| Roaring River, West Fork | 4,200 |
| Old Fort, Catawba River | 2,100 |
| Mill Creek | 3,500 |
| Pisgah Forest, Davidson River | 14,400 |
| Mills River, South Fork | 15,000 |
| Shulls Mills, Cane Creek | 5,000 |
| Upper Laurel Creek Pond | 4,000 |
| North Carolina—Continued. | |
| Toecane, Byrd's pond | 1,000 |
| Byrd and Wilson Creek | 3,000 |
| Tryon, Bullings Creek | 7,000 |
| Waynesville, Caldwell Fork Creek | 4,900 |
| Cataloochee Creek | 5,600 |
| Horse Creek | 4,200 |
| Indian Creek | 5,600 |
| Richland Creek | 4,200 |
| Woodys Creek | 5,600 |
| West Jefferson, Cranberry Creek | 2,500 |
| North Dakota: Halliday, Hans Creek | 500 |
| Ohio: | |
| Castalia, Castalia Trout Run | 5,000 |
| Middlefield, Orchard Pond | †3,000 |
| | 3,000 |
| Ravenna, Cuyahoga River, tributary of | †5,000 |
| Oklahoma: | |
| Smithville, Mountain Fork | 1,600 |
| Spavinaw, Spavinaw Creek | 1,600 |
| Strang, Spavinaw Creek | 2,500 |
| Wyandotte, Brushy Creek | 3,000 |
| Oregon: | |
| Butterfield, Saunders Lake | 5,000 |
| Clackamas, Clackamas River | 13,580 |
| Clear Creek, Clear Creek | 31,000 |
| Eagle Creek, Eagle Creek | 10,000 |
| Oregon City, Molala River | 25,000 |
| Upper Clackamas, Clackamas River | 17,699 |
| Pennsylvania: | |
| Altoona, Roaring Spring Creek | 600 |
| Benton, Fishing Creek | 3,200 |
| Bryn Mawr, Cobbs Creek | 4,000 |
| Cowanesque, Purple Brook | 200 |
| Cedar Hollow, Valley Creek | 4,000 |
| Central, Fishing Creek | 3,200 |
| Coles Creek, Fishing Creek | 3,200 |
| Edsons, Fishing Creek | 3,200 |
| Forks, Fishing Creek | 3,200 |
| Gaines Junction, Big Hollow Creek | 300 |
| Elk Run, south fork | 300 |
| Gal Run | 900 |
| Kettle Creek | 800 |
| Lick Run | 400 |
| Long Run | 500 |
| Pine Creek | 1,200 |
| Smith Run | 300 |
| Spring Brook | 300 |
| Spring Run | 500 |
| Thompson Hollow Creek | 800 |
| Gap, Livingstone Run | 4,000 |
| Grass Mare Park, Fishing Creek | 3,200 |
| Howellville, Valley Creek | 4,000 |
| Ivyland, Pleasant Plains Pond | 1,000 |
| Jamison, Fishing Creek | 3,200 |
| Johnstown, Alwine Run | 900 |
| Benns Creek | 1,200 |
| Cold Spring Run | 900 |
| Roaring Run | 1,200 |
| Salt Lick Run | 900 |
| King of Prussia, Trout Creek | 2,000 |
| Lancaster, Little Conestoga Creek | 5,000 |
| Laubachs, Fishing Creek | 3,200 |
| Narvona, Dennis Run | 4,000 |
| Little Conestoga Creek | 3,000 |
| New Centerville, Trout Creek | 2,000 |
| Valley Creek | 4,000 |
| New Germantown, Fowlers Run | 900 |
| Parkerson River | 1,200 |
| Sheaffers Run | 600 |
| Norristown, Neilson's pond | 1,000 |
| Oak Hall, Blue Spring Run | 2,000 |
| Paoli Road, Valley Creek | 4,000 |
| Petersburg, Armon Run | 600 |
| Massey Run | 1,200 |
| Shovers Creek | 1,200 |
| Pine Grove Furnace, Fuller Lake | 2,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

RAINBOW TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Pennsylvania—Continued. | |
| Plainbrook, Valley Creek | 4,000 |
| Pocono Summit, Tobuhanna Creek | 1,500 |
| St. Clair, Wolf Creek Pond | 3,200 |
| Slatington, Aquashicola Creek | 7,000 |
| Big Creek | 4,000 |
| Trout Creek | 3,000 |
| Wild Creek | 4,000 |
| Stillwater, Fishing Creek | 3,200 |
| Susquehanna, Canawacta Creek | †3,000 |
| Starrucca Creek | †5,000 |
| Tamaqua, Cold Run | 500 |
| Valley Store, Valley Creek | 4,000 |
| Warren, Farnsworth Creek | 2,400 |
| Wilkes-Barre, Thorn Lake | 3,200 |
| Wyalusing, Sugar Run Creek | 8,000 |
| Wyalusing Creek | 8,000 |
| South Carolina: | |
| Greenville, Brushy Creek | 4,000 |
| Cox Creek | 3,000 |
| Hillhorn Creek | 3,000 |
| Matthews Creek | 4,000 |
| Mills Creek | 3,000 |
| Oil Camp Creek | 4,000 |
| Saluda River and branches | 14,800 |
| Stone's pond | 1,000 |
| Terry Creek | 3,000 |
| Whitney, Dawson Fork Creek | 12,000 |
| South Dakota: | |
| St. Onge, False Bottom Creek | 2,000 |
| Spearfish, Camp No. 2 Lakes | 115 |
| Tennessee: | |
| Austral, Gee Creek | 9,000 |
| Del Rio, Big Creek, Dry Fork | 5,000 |
| Doe, Doe Creek | 6,000 |
| Elkmont, Jakes Creek | 3,000 |
| Laurel Creek | 3,000 |
| Little River | 12,000 |
| Pigeon River | 12,000 |
| Pigeon River, West Prong | 12,000 |
| State fish commission | *100,000 |
| Erwin, Rocky Fork Creek | 5,000 |
| Etowah, Lost Creek | 750 |
| Hampton, Spring Lake | 75 |
| McFarland, Coker Creek | 1,000 |
| Morristown, Crystal Lake | 1,000 |
| Roan Mountain, Doe River | 5,000 |
| Spring City, Hinch's pond | 1,000 |
| Tullahoma, Hurricane Creek | 5,000 |
| Utah: | |
| Murray, applicant | *25,000 |
| Ogden, Burton's pond | 1,000 |
| Winter's ponds | 2,500 |
| Virginia: | |
| Abingdon, White Top Creek | 15,000 |
| Appomattox, Appomattox River | 400 |
| Blackstone, Daniels's pond | 500 |
| Bonsacks, Beechwood Place Pond | 500 |
| Boone Mill, Maggodee Creek | 2,000 |
| Byllesby, Brushy Creek | 2,000 |
| Taylor Run | 2,000 |
| Cripple Creek, Rosebaum's pond | 500 |
| Kimballton, Big Stony Creek | 1,000 |
| Marion, Staley Creek | 1,500 |
| Mount Jackson, Big Stony Creek | 600 |
| New Castle, Sinking Creek | 1,200 |
| News Ferry, Birch Creek | 500 |
| Paint Bank, Paint Bank Creek | 250 |
| Pamplin, Sacony Creek | 500 |
| Pearisburg, Nobusiness Creek | 2,000 |
| Pembroke, Laurel Creek | 2,000 |
| Richmond, Harnish's pond | 1,000 |
| Roanoke, Prater Creek | 7,000 |
| Rugby, Cabin Creek | 1,000 |
| Rural Retreat, Cripple Creek | 500 |
| Salem, McAfee Run | 2,000 |
| Tazewell, Little Creek | 2,000 |
| Roaring Fork Creek | 2,000 |
| Troutville, North Fork Branch | 500 |
| Tye River, Davis Creek | 4,000 |
| Piney River | 4,000 |
| Shoe Creek | 4,000 |
| Virginia—Continued. | |
| Waynesboro, Pratt Creek | 1,200 |
| Wytheville, Cove Creek, North Fork | 1,000 |
| Little Creek | 2,000 |
| Stony Fork Creek | 1,000 |
| Tates Run | 165 |
| Washington: | |
| Aberdeen, Black Creek | 3,000 |
| Dalazine Creek | 3,000 |
| Johns River | 3,000 |
| Mooney Creek | 3,000 |
| Neushka Creek | 4,000 |
| Newman Creek | 3,000 |
| Salmon Creek | 3,000 |
| Vesta Creek | 2,000 |
| Widerind Creek | 3,000 |
| Chewelah, Waits Lake | 5,000 |
| Colville, applicant | *50,000 |
| Olympia, Red Creek | 3,000 |
| Stevenson, Blue Lake | 5,000 |
| Columbia River, tributary of | 7,200 |
| Tacoma, Spanaway Creek | 4,500 |
| Vancouver, Battle Ground Lake | 4,000 |
| Lewis River | 19,000 |
| Washougal River | 19,000 |
| West Virginia: | |
| Amblersburg, Salt Lick Pond | 200 |
| Clay Run, Tygarts Valley River | 1,800 |
| Richwood, Cherry River, South Fork | 1,500 |
| Sewell, Glade Creek | 600 |
| Manns Creek | 1,800 |
| Shepherdstown, Town Run | 2,400 |
| Sleepy Creek, Meadow Branch | 2,000 |
| Spangler, Elk River | 1,200 |
| Elkwater Creek | 1,500 |
| Wisconsin: | |
| Baldwin, Cady Creek | 3,000 |
| Nyes Creek | 1,000 |
| Timberlake Spring Brook | 1,000 |
| Willow Creek, East Fork | 2,000 |
| Blue Mounds, Austin Creek | 400 |
| Bohris Creek | 400 |
| Bloeys Creek | 400 |
| McKinney Creek | 400 |
| Ruste Creek | 400 |
| Blue River, Gorman Branch | 1,200 |
| Cashton, Schriener Creek | 1,000 |
| Chippewa Falls, Big Drywood Creek | 400 |
| Duncan Creek | 1,200 |
| Little Drywood Creek | 400 |
| Paint Creek | 1,200 |
| Cylon, Willow River, South Fork | 1,000 |
| Deer Park, Willow River | 5,000 |
| Dodgeville, Flint Creek | 800 |
| Eleva, Monson Creek | 1,200 |
| Elkhart Lake, Crystal Lake | 600 |
| Hayward, Namakagon River | 5,000 |
| Narrow Creek | 2,000 |
| La Farge, Bear Creek | 800 |
| Goose Creek | 400 |
| Indian Creek | 400 |
| Jug Creek | 400 |
| Otter Creek | 800 |
| Warner Creek | 800 |
| Wiester Creek | 800 |
| River Falls, Kinnickinick River | 8,000 |
| St. Croix Falls, St. Croix River | 4,000 |
| Sauk City, Sugar Grove Creek | 800 |
| Somerset, Power Pond | 3,000 |
| Spooner, Crystal Creek | 1,600 |
| Waukesha, Nillians Creek | 800 |
| Westby, Alderman Creek | 1,000 |
| Dahl Creek | 1,000 |
| Dauve Creek | 1,000 |
| Ellefson Creek | 1,000 |
| Esofea Creek | 1,000 |
| Freming Creek | 1,000 |
| Hagen Creek | 1,000 |
| Haugen Creek | 1,000 |
| Hansen Creek | 1,000 |
| Helge Larson Creek | 1,000 |
| Helgeson Creek | 1,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

RAINBOW TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Westby, Helseth Creek | 1,000 |
| Hollien Creek | 1,000 |
| Homsted Creek | 1,000 |
| Larson Creek | 1,000 |
| Laughers Creek | 1,000 |
| Moller Creek | 1,000 |
| Nelson Creek | 1,000 |
| Norbo Creek | 1,000 |
| North Bad Ax River | 1,000 |
| Olson Creek | 1,000 |
| Rentz Creek | 1,000 |
| Sandbakken Creek | 1,000 |
| Sanding Creek | 1,000 |
| Seas Branch | 1,000 |
| Shannon Creek | 1,000 |
| Sletto Creek | 1,000 |
| Spring Valley Creek | 1,000 |
| Sween Creek | 1,000 |
| Swenson Creek | 1,000 |
| Tomten Creek | 1,000 |
| Twenty Four Valley Creek | 1,000 |
| Van Ruden Creek | 1,000 |
| Warm Spring Creek | 1,000 |
| Woodman, Little Green Creek | 800 |
| Wyoming: | |
| Cody, Blackwater Creek | 2,000 |
| Browns Spring Creek | 2,000 |
| Eagle Creek | 1,000 |
| Goff Creek | 3,000 |
| Gunbarrel Creek | 2,000 |
| Jim Creek | 2,000 |
| Wyoming—Continued. | |
| Cody, Jones Creek | 2,000 |
| Mormon Creek | 2,000 |
| Shoshone River and Branches | 8,000 |
| Sweetwater Creek | 1,000 |
| Encampment, Encampment River | 23,000 |
| Evanston, Russell's ponds | 8,000 |
| Snowden's pond | 3,000 |
| Gold Hill Lake, Gold Hill Lake | 20,000 |
| Jacks Creek, Jacks Creek | 4,000 |
| Lander, Dinwoodie Creek | 1,575 |
| Little Popo Agie River | 1,575 |
| Louis Lake | 1,050 |
| Lower North Fork River | 2,625 |
| Popo Agie River and branches | 5,250 |
| Sweetwater River | 6,825 |
| Laramie, State fish commission | *50,000 |
| Newcastle, Lower Stockade Creek | 3,000 |
| Middle Beaver Creek | 3,000 |
| Parkman, Dayton Creek | 5,000 |
| Powder River, Eccles Lake | 1,050 |
| Rock River, Rock Creek | 10,000 |
| Saratoga, Cedar Creek | 8,000 |
| Greyhound Lake | 10,000 |
| North Platte River | 10,000 |
| Spring Creek | 8,000 |
| Japan: Kobe, Japanese Government | *100,000 |
| Total [a] | *1,139,250<br>†22,000<br>1,654,477 |

ATLANTIC SALMON.

| | |
|---|---|
| Maine: | |
| Brownville, Pleasant River | †600,000 |
| Cherryfield, Narraguagus River | †225,000 |
| Dennysville, Dennys River | †627,000 |
| Grindstone, Mattawamkeag River, East Branch | †375,000 |
| Oakfield, Mattawamkeag River, East Branch | †375,000 |
| Maine—Continued. | |
| Orland, Orland River | 671 |
| Pembroke, Pembroke River | †375,000 |
| Total | †2,577,000<br>671 |

LANDLOCKED SALMON.

| | |
|---|---|
| Maine: | |
| Bingham, Rowe Pond | †3,000 |
| Bridgeton Junction, Barker Pond | †3,000 |
| Brownfield, Burt Meadow Pond | †3,000 |
| Caribou, State fish commission | *278,000 |
| Cornish, Stanley Pond | †3,000 |
| Dedham, Green Lake | †5,000 |
| Dexter, Main Brook | †10,000 |
| Eagle Lake, Eagle Lake | †16,000 |
| Square Lake | †10,000 |
| East Orland, Toddy Pond | †82,460 |
| Farmington, Big Barnard Pond | †4,000 |
| Bog Pond | †4,000 |
| Long Pond | †6,000 |
| Lower Pond | †6,000 |
| Natanias Pond | †6,000 |
| Tee Pond | †4,000 |
| Forest, Farrar Lake | †5,000 |
| Grand Lake, Grand Lake | †45,000<br>65,150 |
| Greenville Junction, Sawyer Pond | †3,000 |
| Hartland, Great Moose Lake | †7,500 |
| Island Falls, Mattawamkeag Lake | †4,000 |
| Jackman, Lake Wood | †4,500 |
| Kineo, Moose River | †7,500 |
| Moosehead Lake | †7,500 |
| Roach River | †3,000 |
| Mattocks, Sand Pond | †3,000 |
| Moodys Crossing, Moors Pond | †4,000 |
| Mount Desert Ferry, Morancy Pond | †5,000 |
| Oquossoc, Rangeley Lakes | †8,000 |
| Otis, Green Lake | †3,935 |
| Portage, Portage Lake | †8,000 |
| Maine—Continued. | |
| South Windham, State fish commission | *100,000 |
| Stockholm, Square Lake | †16,000 |
| Unity, Winnecook Lake | †6,000 |
| New Hampshire: | |
| Laconia, Winnesquam Lake | 4,000 |
| Newport, Crescent Lake | 2,400 |
| New Jersey: Hackettstown, State fish commission | *25,000 |
| New York: | |
| Keepawa, Big Rock Lake | 1,000 |
| Lake George, Lake George | 3,000 |
| Long Lake West, Doctors Pond | *5,000 |
| Nehasane, Lake Lila | 1,000 |
| Warrensburg, State fish commission | *50,000 |
| Pennsylvania: Bellefonte, Sugar Run Lake | *10,000 |
| Vermont: | |
| Canaan, Big Averill Lake | 800 |
| Little Averill Lake | 400 |
| Derby Center, Salem Pond | 2,367 |
| Greensboro, Caspian Lake | 2,000 |
| Holden, Lake Dunmore | 1,520 |
| Newport, Seymour Lake | 2,000 |
| Orleans, Willoughby Lake | 2,000 |
| Readsboro, Newton Pond | 200 |
| Roxbury, State fish commission | *10,000 |
| Total [b] | *478,000<br>†306,395<br>87,837 |

[a] Exclusive of 2,640 fingerlings lost in transit.

[b] Exclusive of 1,000 fry lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BLACKSPOTTED TROUT.

| Disposition. | Number. |
|---|---|
| Alaska: Juneau, applicant | *100,000 |
| Arizona: | |
| Flagstaff, Oak Creek | 47,500 |
| Globe, East Verde Creek | 5,000 |
| Pine Creek | 5,000 |
| Tonto Creek, West Branch | 10,000 |
| Workman Creek | 5,000 |
| Sycamore, Sycamore Creek | 7,500 |
| Winslow, East Clear Creek | 20,000 |
| California: Point Reyes, Olema Creek | *10,000 |
| Colorado: | |
| Baileys, South Platte River | 50,000 |
| Breckenridge, Barton Creek | 5,000 |
| Crystal Lake | 5,000 |
| Indiana Creek | 5,000 |
| McCollough Creek | 5,000 |
| North Ten Mile Creek | 5,000 |
| Spruce Creek | 5,000 |
| Upper Blue River | 5,000 |
| Cebolla, East Elk Creek | 12,500 |
| Cimarron, Little Cimarron River | 20,000 |
| Colorado Springs, Broadmoor Lake | 6,000 |
| Cheyenne Lake | 4,000 |
| Como, Four Mile Creek | 5,000 |
| Creede, Lower Clear Creek | 5,000 |
| Rio Grande | 10,000 |
| Crested Bluff, East River | 20,000 |
| Cripple Creek, Gillett Lake | 4,000 |
| Del Norte, Los Pinos Creek | 7,500 |
| Denver, Cub Creek | 5,000 |
| Dillon, Black Creek | 5,000 |
| Durango, Canyon Creek | 5,000 |
| Cascade Creek | 7,500 |
| Clear Creek | 2,500 |
| Dutch Creek | 5,000 |
| Hermosa Creek | 15,000 |
| Junction Creek | 17,500 |
| La Olata River | 22,500 |
| Lime Creek | 5,000 |
| Needle Creek | 5,000 |
| Eldora, Middle Boulder Creek | 8,000 |
| Florence, Middle Creek | 6,000 |
| South Hardscabble Creek | 8,000 |
| Foxton, South Platte River, North Fork | 6,000 |
| Fraser, Cabin Creek | 5,000 |
| Fraser River | 17,000 |
| Ranch Creek | 7,000 |
| St. Louis Lake | 5,000 |
| Glacier, Glacier Lake | 14,000 |
| Granby, Grand River, South Fork | 15,000 |
| Strawberry Creek | 5,000 |
| Graneros, St. Charles Creek | 5,000 |
| Granite, Lake Creek, North Fork | 5,000 |
| Lake Creek, South Fork | 5,000 |
| Gunnison, Gunnison River | 36,000 |
| Hayden, Bunker Creek | 5,000 |
| North Hunt Creek | 2,500 |
| Poose Creek | 5,000 |
| Rough Creek | 2,500 |
| Williams River, East Fork | 15,500 |
| Hierro, North Beaver Creek | 5,000 |
| Hot Sulphur Springs, Beaver Creek | 5,000 |
| Howard, Big Cottonwood Creek | 5,000 |
| Idaho Springs, Chicago Creek, West Fork | 4,000 |
| Vance Creek | 4,000 |
| Kremmling, Pass Creek | 10,000 |
| Lake City, Gunnison River, Lake Fork | 15,000 |
| Lake George, Tarryall Creek | 14,000 |
| La Veta, Cuchara Creek | 7,500 |
| Leadville, Little Homestead Creek | 5,000 |
| Twin Lakes Creek | 20,000 |
| Windsor Lake | 5,000 |
| Los Pinos Section House, Los Pinos River | 5,000 |
| Lyons, Big Thompson River, Middle Fork | 6,000 |
| Cabin Creek | 8,000 |
| Colorado—Continued. | |
| Lyons, Fall Creek | 6,000 |
| Fox Creek | 6,000 |
| North St. Vrain River | 10,000 |
| Maddox, South Platte River, North Fork | 26,000 |
| Malta, Rock Creek | 4,000 |
| Marble, Crystal River | 6,000 |
| Lost Trail Creek | 4,000 |
| Yule Creek | 4,000 |
| Nast, Chatman Lake | 4,000 |
| Ohio City, Gold Creek | 6,000 |
| Pagosa Springs, Falls Creek | 7,500 |
| Four Mile Creek | 5,000 |
| Piedra River, Middle Fork | 5,000 |
| Quartz Creek | 5,000 |
| Sand Creek | 5,000 |
| San Juan River, East Fork | 5,000 |
| San Juan River, West Fork | 5,000 |
| Silver Creek | 5,000 |
| Turkey Creek | 5,000 |
| Wolf Creek | 5,000 |
| Parshall, Grand River, Williams Fork | 7,500 |
| Phippsburg, Hunt Creek | 15,000 |
| Pine Grove, Platte River | 10,000 |
| Pitkin, Quartz Creek | 6,000 |
| Pueblo, St. Charles Creek | 8,000 |
| Radium, Sheephorn Creek | 15,000 |
| Rollinsville, Espy Lake | 5,000 |
| Rosemont, East Beaver Creek | 14,000 |
| Salida, Bear Creek | 5,000 |
| Browns Creek | 5,000 |
| Sapinero, Cement Creek | 10,000 |
| Curricanti Creek | 10,000 |
| Mill Creek | 6,000 |
| Ohio Creek | 8,000 |
| Sapinero Creek | 5,000 |
| Slate River | 6,000 |
| Taylor River | 10,000 |
| Silverton, South Mineral Creek | 5,000 |
| South Fork, Alder Creek | 5,000 |
| Elk Creek | 5,000 |
| Embargo Creek | 7,500 |
| Steamboat Springs, Big Creek Lake | 2,500 |
| Gem Lake | 2,500 |
| Gold Creek Lake | 2,500 |
| Green Creek | 2,500 |
| Harrison Creek | 4,000 |
| North Fork Lake | 2,500 |
| South Fork Lake | 2,500 |
| Upper Corral Lake | 2,500 |
| Walton Creek, North Fork | 4,000 |
| Sunset, Four Mile Creek | 6,000 |
| Tabernash, Cabin Creek | 15,000 |
| Crooked Creek | 5,000 |
| Fraser River | 9,000 |
| Pole Creek | 5,000 |
| Thomasville, Lime Creek | 75,000 |
| Victor, Number Ten Lake | 4,000 |
| Walkers Spur, Frying Pan River | 20,000 |
| Walsenburg, Huerfano River | 5,000 |
| Ward, Beaver Lake | 6,000 |
| Brainard Lake | 2,000 |
| James Creek | 8,000 |
| Long Lake | 2,000 |
| Middle St. Vrain River | 14,000 |
| Shadow Lake | 2,000 |
| South St. Vrain River | 6,000 |
| Wray, Matheney Lake | 2,000 |
| Robb Lake | 2,000 |
| Yampa, Coal Creek | 5,000 |
| Middle Hunt Creek | 16,500 |
| Watson Creek | 2,500 |
| Youman, Big Blue Creek | 10,000 |
| Idaho: Soda Springs, Blackfoot River | †7,500 |
| Michigan: Detroit, applicant | *10,000 |
| Montana: | |
| Anaconda, McCarthy's pond | †20,000 |
| State fish commission | *100,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BLACKSPOTTED TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Montana—Continued. | |
| Armstrong Spring Creek | †6,000 |
| Avon, Dog Creek | †5,000 |
| Snowshoe Creek | †5,000 |
| Trout Creek | †5,000 |
| Becket, Atherton Creek | †4,000 |
| Belgrade, Cottonwood Creek | †7,500 |
| Pass Creek | †10,000 |
| Belton, Cut Bank Creek | †7,500 |
| Lake McDermott | †2,500 |
| Lake McDonald | †7,500 |
| Red Eagle Lake | †2,500 |
| Two Medicine Lake | †2,500 |
| Big Timber, Blue Creek | †7,500 |
| Boulder River | †16,000 |
| Cayuse Creek | †6,000 |
| Upper Boulder Creek | †10,000 |
| Bozeman, Asbestos Creek | †3,000 |
| Beaver Creek | †3,000 |
| Buffalo Horn Creek | †3,000 |
| Deer Creek | †3,000 |
| East Bear Creek | 3,000 |
| Middle Creek | †3,000 |
| Middle Spanish Creek | †3,000 |
| North Spanish Creek | †3,000 |
| Olson Creek | 2,000 |
| Sour Dough Creek | †3,000 |
| South Spanish Creek | †3,000 |
| Spring Hill Creek | 3,000 |
| Trail Creek | 4,000 |
| West Bear Creek | 3,000 |
| West Fork Creek, North Branch | †2,000 |
| West Fork Creek, South Branch | †3,000 |
| Butte, applicant | *200,000 |
| Carabella, Miner Creek | †4,000 |
| Miner Lake | †6,000 |
| Rock Creek | †8,000 |
| Chadborn, Bangtail Creek | †6,000 |
| Clyde Park, Cole Creek | †4,000 |
| Rock Creek | †8,000 |
| Corwin Springs, Cedar Creek | †12,000 |
| Cutler Lake | †8,000 |
| Randall Lake | †2,000 |
| Twin Lakes | †4,000 |
| Daileys, Big Creek | †4,000 |
| Daileys Creek | †4,000 |
| Yellowstone River | †6,000 |
| Dillon, French Creek Pond | †5,000 |
| Gardiner, Gardiner River | †8,000 |
| Yellowstone River | †8,000 |
| Glacier Park, Red Eagle Lake | †7,500 |
| Hamilton, Bitter Root River | †2,500 |
| Blodgett Creek | †7,500 |
| Gird Creek | †5,000 |
| Skalkaho Creek | †5,000 |
| Sleeping Child Creek | †5,000 |
| South Willow Creek | †27,500 |
| Lennep, Bonanza Creek | †4,000 |
| Musselshell River, South Fork | †6,000 |
| Lewistown, Cottonwood Creek | †8,000 |
| Judith River, tributaries of | †14,000 |
| Livingston, Alkali Creek | †4,000 |
| Bloom Lake | †10,000 |
| Cayuse Creek | †4,000 |
| Cokedale Creek | †8,000 |
| East Duck Creek | †4,000 |
| Elbow Creek | †12,000 |
| Mortimer Creek | †12,000 |
| Strickland Creek | †12,000 |
| West Duck Creek | †4,000 |
| Yellowstone River | †44,000 |
| Lodge Grass, Lodge Grass Creek | †10,000 |
| Manhattan, Baker Creek | †7,500 |
| Camp Creek | †7,500 |
| Lehman Creek | †7,500 |
| Spring Creek | †5,000 |
| Martinsdale, Musselshell River, North and South Forks | †20,000 |
| Mission, Mission Creek | †6,000 |
| Missoula, Beaver Creek | †5,000 |
| Big Blackfoot River, North Fork | †7,500 |
| Bitter Root River | †7,500 |
| Blanchard Creek | †7,500 |
| Camas Creek | †5,000 |
| Cottonwood Creek | †7,500 |
| Finley Creek | †7,500 |
| Gold Creek | †7,500 |
| Grant Creek | †7,500 |
| Jocko Creek | †7,500 |
| Johnson Creek | †7,500 |
| Lo Lo Creek | †7,500 |
| Mill Creek | †5,000 |
| Miller Creek | †7,500 |
| Monture Creek | †7,500 |
| Rattlesnake Creek | †7,500 |
| Rock Creek | †7,500 |
| Twinn Creek | †5,000 |
| Mitchell, Big Sheep Creek | †5,000 |
| Park City, Yellowstone River | †20,000 |
| Perma, Burgess Lake | †10,000 |
| Pony, Hanson Lake | †5,000 |
| Pray, Lambert Creek | †4,000 |
| Mill Creek, North Fork | †4,000 |
| Mill Creek, South Fork | †4,000 |
| Simon Creek | †4,000 |
| Strawberry Creek | †2,000 |
| Saltese, Big Sunday Creek | †5,000 |
| Dominion Creek | †5,000 |
| Packer Creek | †7,500 |
| Packer Creek, East Fork | †5,000 |
| Packer Creek, West Fork | †5,000 |
| St. Regis River | †7,500 |
| Silver Creek | †5,000 |
| Sixteen, Dry Creek | †6,000 |
| Spring Creek | †6,000 |
| Soda Butte, Soda Butte Lake | †600,000 |
| Stevensville, Ambrose Creek | †2,500 |
| Bass Creek | †5,000 |
| Bitter Root River, Middle Fork | †2,500 |
| Gold Creek | †2,500 |
| Mill Creek | †5,000 |
| Sawmill Creek | †2,500 |
| Three Mile Creek | †5,000 |
| Thompson Falls, Cabin Creek | †12,000 |
| Taft, Rainy Creek | †5,000 |
| Randolph Creek | †5,000 |
| Townsend, Crow Creek | 15,000 |
| Greyson Creek | †5,000 |
| Ray Creek | †6,000 |
| Whitefish, Swift Creek | †20,000 |
| White Suphur Springs, Eagle Creek | †6,000 |
| Eight Mile Creek | †4,000 |
| Four Mile Creek | †8,000 |
| Little Birch Creek | †2,000 |
| Smith River | †8,000 |
| Willow Creek | †4,000 |
| Woods Gulch Creek | †4,000 |
| Wilsall, Crandall Creek | †2,000 |
| Daisy Dean Creek | †2,000 |
| Elk Creek, North Fork | †2,000 |
| Elk Creek, South Fork | †2,000 |
| Flathead River, South Fork | †2,000 |
| Flathead River, Upper | †2,000 |
| Flathead River, West Fork | †2,000 |
| Horse Creek | †2,000 |
| Horse Creek, North | †2,000 |
| Horse Creek, Upper | †2,000 |
| Little Muddy Creek | †2,000 |
| Porcupine Creek | †2,000 |
| Potter Creek | †2,000 |
| Shields River | †8,000 |
| Shields River, South Fork | †2,000 |
| Smith Creek | †2,000 |
| Winston, Beaver Creek | †5,000 |
| Nevada: Ely, State fish commission | *50,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BLACKSPOTTED TROUT—Continued.

| Disposition. | Number. |
|---|---|
| New Mexico: | |
| Buckman, Frijoles Canon Creek | 6,000 |
| Carrizozo, Ruidoso River | 12,500 |
| Chama, Brazos River | 2,500 |
| Chama River | 2,500 |
| Chamita River | 2,500 |
| Cimarron, Cimarron Reservoir | 7,500 |
| Little Ponil Creek | 10,000 |
| Cloudcroft, Monument Canyon Creek | 7,500 |
| Scott Able Canyon Creek | 7,500 |
| Embudo, Embudo Creek | 8,000 |
| Junta Rio Creek | 8,000 |
| Rio Pueblo | 16,000 |
| Santa Barbara River | 16,000 |
| Folsom, Dry Cimarron River | 2,500 |
| Trinchara Creek | 7,500 |
| Glorietta, Holy Ghost Creek | 12,500 |
| Jacks Creek | 12,500 |
| Pecos River | 7,500 |
| Rito Trita Amarilla | 5,000 |
| Winsor Creek | 5,000 |
| Jarosa, Costilla River | 22,000 |
| Rio Colorado | 10,000 |
| Ute Creek | 4,000 |
| Las Vegas, Gallinas Creek | 10,000 |
| Mora River | 5,000 |
| Rio de las Casa | 5,000 |
| Perea, Nutria Creek | 10,000 |
| Raton, Lake Maloya | 6,000 |
| Sugarite Creek | 6,000 |
| San Marcial, Nogal Creek | 15,000 |
| Santa Fe, Nembe River | 8,000 |
| Rio Medio | 8,000 |
| Santa Fe River | 8,000 |
| Tesuque River | 6,000 |
| Taos Junction, Little Rio Grande | 2,000 |
| Pot Creek | 2,000 |
| Rio Chiquito | 2,000 |
| Rio Hondo | 4,000 |
| Rio Valecitos | 8,000 |
| Taos Creek | 8,000 |
| Ute Park, Bitter Creek | 8,000 |
| Cimarron River | 12,000 |
| Goose Creek | 8,000 |
| Red River | 20,000 |
| New York: New York, Aquarium | *20,000 |
| Oregon: | |
| Antelope Lake, Antelope Lake | †7,500 |
| Clackamas, Molalla River | 18,000 |
| Estacada, Clackamas River | 10,000 |
| Oregon City, Deep Creek | 8,000 |
| Mill Creek | 18,000 |
| Molalla River | 10,000 |
| Trail, Rogue River | 11,500 |
| South Dakota: | |
| Englewood, Box Elder Creek and branches | †14,000 |
| Este Creek | †4,000 |
| Jim Creek | †6,000 |
| Little Elk Creek | †6,000 |
| Piedmont, Little Elk Creek | †6,000 |
| Pringle, Beaver Creek | †5,000 |
| Rapid City, Lower Box Elder Creek | †6,000 |
| Lower Rapid Creek | †6,000 |
| Lower Springs Creek | †6,000 |
| Rapid Creek | †6,000 |
| Rochford, Castle Creek | †5,000 |
| Spearfish, McLaughlin Creek | †6,000 |
| Ralphs Branch | †6,000 |
| Spearfish Creek, Cooper Branch | †6,000 |
| Sturgis, Parker's pond | †2,000 |
| Tilford, Pleasant Willow Pond | †2,000 |
| Washington: | |
| Aberdeen, East Hoquiam River | 7,500 |
| Hoquiam River | 7,500 |
| Little North Creek | 7,500 |
| North River | 7,500 |
| Washington—Continued. | |
| Aberdeen, Wynooche Creek | 7,500 |
| Burlington, State fish commission | *100,000 |
| Colville, State fish commission | *25,000 |
| Cleelum, State fish commission | *25,000 |
| Fisher, Simmons Lake | 3,000 |
| Kelso, Coal Creek | 20,000 |
| Orting, Miller Pond | 5,000 |
| Seattle, Snoqualmie River | *25,000 |
| Spokane, Shelley Lake | †14,000 |
| Stevenson, Little White Salmon River | 3,000 |
| Rock Creek | 3,000 |
| Wind River | 4,000 |
| Tacoma, Bay Lake | 4,000 |
| Bergh Creek | 2,500 |
| Carney Lake | 4,000 |
| Clear Lake | 4,000 |
| Clover Creek | 5,000 |
| Crescent Lake | 4,000 |
| La Camas Creek | 2,500 |
| Little Mashell River | 4,000 |
| Little Ohap Creek | 2,500 |
| Mashell River | 5,000 |
| Minter Creek | 4,000 |
| Orting Lake | 4,000 |
| South Creek | 3,000 |
| Spanaway Creek | 4,000 |
| Tanwax Creek | 5,000 |
| Vancouver, Big Tree Creek | *25,000 |
| John Creek | 5,000 |
| Little Washougal River | 8,000 |
| Wyoming: | |
| Basin, Paint Rock Creek and branches | 20,000 |
| West Tensleep Creek | 7,500 |
| Bellefourche, Sand Creek | †10,000 |
| Clearmont, Clear Creek | †5,000 |
| Cody, Anderson Creek | 2,500 |
| Gray Bull River | 7,500 |
| Murray Creek | 7,500 |
| Shoshone Lake | 7,500 |
| Shoshone River and branches | 17,500 |
| Wood River | 5,000 |
| Jacks Creek, Jacks Creek | 13,000 |
| Lander, Baldwin Creek | †3,000 |
| Big Wind River | †8,000 |
| Horse Creek | †8,000 |
| Little Popo Agie River | †3,000 |
| Little Warm Spring Creek | †8,000 |
| Popo Agie River and branches | †9,000 |
| Slate Creek | †8,000 |
| Twin Creek | †3,000 |
| Warm Spring Creek | †8,000 |
| Willow Creek | †8,000 |
| Parkman, Gulch Creek | †5,000 |
| Ranchester, Big Goose Creek, East and West Forks | †10,000 |
| Bull Creek | †2,500 |
| Fool Creek | †2,500 |
| Lake Creek | †2,500 |
| Lick Creek | †5,000 |
| Little Goose Creek | †5,000 |
| Tongue River, North Fork | †5,000 |
| Willow Creek | †2,500 |
| Rock Springs, Fremont Lake | 15,000 |
| Halfmoon Lake | 15,000 |
| Saratoga, Silver Lake | 14,000 |
| Sheridan, Jackson Creek | †5,000 |
| State fish commission | *200,000 |
| Sundance, South Miller Creek | †10,000 |
| Yellowstone Park waters | †1,975,000 |
| Total[a] | *1,090,000<br>†3,821,000<br>1,878,500 |

[a] Exclusive of 18,000 fry and 7,000 fingerlings lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LOCH LEVEN TROUT.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Colorado: | | | |
| Norrie, Chapman Lake | 30,000 | | |
| Thomasville, Charles Lake | 26,000 | | |
| Total | 56,000 | | |

LAKE TROUT.

| | | | |
|---|---|---|---|
| Colorado: | | Minnesota—Continued. | |
| Ivanhoe, Ivanhoe Lake | 10,000 | Susie Island, Lake Superior | †400,000 |
| Leadville, Twin Lakes | 40,000 | Two Harbors, Lake Superior | †750,000 |
| Illinois: Spring Grove, State fish commission | *100,000 | New Hampshire: | |
| Iowa: Lansing, State fish commission | *50,000 | Bristol, Newfound Lake | †3,000 |
| Maine: | | Enfield, Mascoma Lake | †2,000 |
| Big Lake, Big Lake | †10,000 | Laconia, State fish commission | *100,000 |
| Dedham, Manns Brook | 38,000 | Lebanon, Crystal Lake | †2,000 |
| Phillips Lake | 38,000 | Pike, Lake Tarleton | 1,722 |
| Grand Lake, Grand Lake | †13,570 | New York: | |
| North Belgrade, State fish commission | *100,000 | Albany, State fish commission | *11,766,000 |
| Massachusetts: | | Au Sable Forks, Crystal Lake | †13,330 |
| Lee, Greenwater Pond | †1,500 | Silver Lake | †10,000 |
| Laurel Lake | †1,500 | Bear Point, Lake Ontario | †992,250 |
| Shaw Pond | †1,500 | Charity Shoals, Lake Ontario | †702,900 |
| Stockbridge Lake | †1,500 | Dutch Point, Lake Ontario | †340,000 |
| Michigan: | | Fox Island, Lake Ontario | †762,750 |
| Alpena, Lake Huron | †175,000 | Gabriels, Clear Pond | †6,000 |
| Big Rock, Lake Michigan | †3,325,560 | Galloo Island, Lake Ontario | †427,950 |
| Cathead Reef, Lake Michigan | †301,200 | Gloversville, Lake Pleasant | †15,000 |
| Charlevoix Reef, Lake Michigan | †5,962,120 | Sacandaga Lake | †15,000 |
| Cheboygan, Lake Huron | †200,000 | Grenadier Island, Lake Ontario | †2,254,400 |
| Mackinaw Straits | †150,000 | Hardscrabble, Lake Ontario | †330,750 |
| Covington, Warm Lake | †8,000 | Hayes Point, Lake Ontario | †844,250 |
| Escanaba, Lake Michigan | †300,000 | Hopewell Junction, Sylvan Lake | †20,000 |
| Fishermens Island, Lake Michigan | †3,325,560 | Lake Placid, Lake Placid | †15,000 |
| Fish Island, Lake Superior | †600,000 | Long Lake West, Loon Pond | *50,000 |
| Frankford, Lake Michigan | †300,000 | Pigeon Island, Lake Ontario | †283,500 |
| Harbor Beach, Lake Huron | †100,000 | Port Henry, Clear Pond | †30,000 |
| Houghton, Lake Superior | †625,000 | Port Jervis, Bauer Lake | †10,000 |
| Irishmans Grounds, Lake Michigan | †1,108,520 | Stony Point, Lake Ontario | †1,181,250 |
| Iron River, Iron Lake | †10,000 | Tibbetts Point, Lake Ontario | †40,800 |
| Pickerel Lake | †8,000 | Trumansburg, Cayuga Lake | †37,500 |
| Long Point, Lake Superior | †800,000 | Westport, Ledge Lake | †12,000 |
| Manistique, Lake Michigan | †200,000 | Wawonaisa Lake | †12,000 |
| Mission Point, Grand Traverse Bay | †1,108,520 | Willsboro, Warm Pond | †20,000 |
| Munising, Lake Superior | †625,000 | Ohio: | |
| Nine Mile Point, Lake Michigan | †1,108,520 | Kellys Island, Lake Erie | †593,000 |
| Northville, State fish commission | *2,550,000 | Put in Bay, State fish commission | *700,000 |
| Presque Isle, Lake Superior | †625,000 | South Dakota: Fruitdale, Orman Reservoir | 4,275 |
| Rock Harbor, Lake Superior | †800,000 | Vermont: | |
| St. Ignace, Mackinaw Straits | †175,000 | Cambridge, State fish commission | *300,000 |
| Tioga Siding, Big King Lake | †8,000 | Middlebury, Lake Dunmore | †3,000 |
| Little King Lake | †8,000 | Washington: Chewelah, State fish commission | *300,000 |
| Tobins Harbor, Lake Superior | †585,000 | Wisconsin: | |
| Vanderbilt, Pickerel Lake | †10,000 | Brule River, Lake Superior | †240,000 |
| Washington Harbor, Lake Superior | †700,000 | Lake Millicent, Crystal Lake | 10,500 |
| Wrights Island, Lake Superior | †800,000 | Pembine, Lindquist Lake | 8,000 |
| Minnesota: | | Smith Lake | 6,000 |
| Beaver Bay, Lake Superior | †300,000 | Port Wing, Lake Superior | †1,000,000 |
| Chicago Bay, Lake Superior | †450,000 | Sheboygan, State fish commission | *5,402,000 |
| Clearbrook, Peterson Lake | 10,000 | Three Lakes, Mary Lake | 8,000 |
| Steenerson Lake | 6,000 | Wyoming: | |
| Duluth, Lake Superior | 1,500 | Lander, Little Popo Agie River | 28,800 |
| Ely, Eve Lake | 10,000 | McCarthy Lake | 2,000 |
| Fishermans Home, Lake Superior | †800,000 | Moccasin Lake | 2,000 |
| French River, Lake Superior | †750,000 | Shoshoni, Bar Gee Lake | 2,000 |
| Grand Marais, Lake Superior | †450,000 | | |
| Grand Portage, Lake Superior | †400,000 | Totals | *21,718,000<br>†39,599,200<br>226,797 |
| Knife River, Lake Superior | †750,000 | | |
| St. Paul, State fish commission | *300,000 | | |
| Sucker River, Lake Superior | †750,000 | | |

a Exclusive of 50,000 fry lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT.

| Disposition. | Number. |
|---|---|
| Alaska: Juneau, applicant | *100,000 |
| Arizona: | |
| Flagstaff, Oak Creek | 16,000 |
| Globe, Ash Creek | 8,000 |
| Tucson, Sabino Creek | 22,000 |
| California: Point Reyes, Lime Gulch Creek | *25,000 |
| Colorado: | |
| Alamosa, Rio Grande | 35,000 |
| Aspen, Fall Creek | 3,000 |
| New York Lake | 5,000 |
| North American Lake | 5,000 |
| Austin, Currant Creek | 10,000 |
| Surface Creek, Middle Fork | 8,000 |
| Tongue Creek | 16,000 |
| Bailey, Platte River and tributaries | 75,000 |
| Prossers Lake | 4,000 |
| Bear Creek, Bear Creek | 12,000 |
| Biglow, Frying Pan River, North Fork | 25,000 |
| Morman Creek | 10,000 |
| Savage Lake | 18,000 |
| Bilk Siding, Bilk Creek | 10,000 |
| Black Hawk, Dory Lake | 14,000 |
| Boulder, Four Mile Creek | 23,000 |
| Jim Creek | 23,000 |
| Left Hand Creek | 23,000 |
| Middle Boulder Creek | 10,000 |
| Middle St. Vrain River | 15,000 |
| Bowie, Hubbard Creek | 8,000 |
| Terror Creek | 10,000 |
| Buena Vista, Cottonwood Creek | 36,000 |
| Canon City, Beaver Creek | 10,000 |
| West Beaver Creek | 20,000 |
| Carbondale, Snowmass Creek | 6,000 |
| Cascade, Cascade Creek | 10,000 |
| Cathers Springs, Fountain Creek | 4,000 |
| Cimarron, Big Cimarron River | 26,000 |
| Lake Number One | 6,000 |
| Lake Number Two | 10,000 |
| Little Cimarron River, East Prong | 10,000 |
| Clyde, Middle Beaver Creek | 8,000 |
| Colorado Springs, Bentall's pond | 2,000 |
| Doners Pond | 6,000 |
| Glen Eyrie Lakes | 210,000 |
| Nursery Pond | 75,000 |
| Cotopaxi, Lake Creek Lake | 8,000 |
| Crossons, South Platte River | 40,000 |
| Durango, Florida River | 18,000 |
| Edwards, East Lake | 18,000 |
| Eldora, Lake Eldora | 8,000 |
| Eldora Lake, Middle Boulder Creek | 15,000 |
| Fort Collins, Cache La Poudre River | 30,000 |
| Cache La Poudre River, North Fork | 26,000 |
| Fort Garland, Ute Creek | 20,000 |
| Fraser, Elk Creek | 14,000 |
| Ranch Creek | 12,000 |
| Granby, Stillwater Creek | 13,000 |
| Grousemont, Platte River and tributaries | 75,000 |
| Gypsum, Gypsum Creek | 16,000 |
| Hartsel, Antero Lake | 100,000 |
| Hotchkiss, Crystal Creek | 12,000 |
| Ivanhoe, Ivanhoe Creek | 10,000 |
| Ivanhoe Lake | 15,000 |
| Morman Lake | 10,000 |
| Lake George, Turkey Creek | 12,000 |
| Laramie, McIntyre Creek | 10,000 |
| McIntyre Lake | 15,000 |
| Leadville, Busk Creek | 15,000 |
| Empire Creek | 1,000 |
| Musgrove Lakes | 380,000 |
| Turquoise Lake | 260,000 |
| Loveland, Big Thompson River | 55,000 |
| Malta, Crystal Lake | 13,000 |
| Lake Creek | 15,000 |
| Mancos, East Mancos Creek | 10,000 |
| Meredith, Jakeman Creek | 15,000 |
| Midland, Loshbaugh Lakes | 2,000 |
| Mineral Hot Springs, Wild Cherry Creek Lake | 6,000 |
| Colorado—Continued. | |
| Minturn, Two Elk Creek | 8,000 |
| Nast, Frying Pan Lake | 6,000 |
| Frying Pan River, South Fork | 60,000 |
| Ivanhoe Creek | 10,000 |
| Newcomb, Boulder Creek, South Fork | 18,000 |
| Norrie, Deeds Creek | 10,000 |
| Frying Pan River | 25,000 |
| Savage Lake | 6,000 |
| Oak Creek, Silver Creek | 12,000 |
| Ophir, Deep Creek | 8,000 |
| Wilson Creek | 6,000 |
| Palmer Lake, Butler Pond | 6,000 |
| Pitkin, Quartz Creek | 4,000 |
| Placerville, Beaver Creek | 12,000 |
| Naturita Creek | 12,000 |
| Saltado Creek | 8,000 |
| Placita, Lily Lake | 20,000 |
| Mountain View Lake | 10,000 |
| Wood Creek | 6,000 |
| Radium, Gutzbis Lake | 8,000 |
| Red Cliff, Fall Creek | 8,000 |
| Notch Mountain Creek | 6,000 |
| Turkey Creek | 10,000 |
| Rosemont, Engelbrecht Lakes | 6,000 |
| Ruedi, Ruedi Creek | 20,000 |
| Saderland, Gould Creek | 8,000 |
| Salida, Cochetopa Creek | 15,000 |
| South Arkansas River, North Fork | 15,000 |
| Sellar, Cunningham Creek | 12,000 |
| Shawnee, Platte River and tributaries | 105,000 |
| Silver Plume, Clear Creek, Middle Fork | 18,000 |
| Singleton, Singleton Lake | 4,000 |
| South Fork, Rio Grande, South Fork | 19,000 |
| Steamboat Springs, Summit Lake | 39,000 |
| Stoner Creek, Stoner Creek | 10,000 |
| West Dolores River | 12,000 |
| Texas Creek, Spruce Creek Lake | 17,000 |
| Thomasville, Engelbrecht Lakes | 440,000 |
| Fairview Lake | 6,000 |
| Lime Creek | 48,000 |
| Timber Spur, East Dolores River | 18,000 |
| West Dolores River | 18,000 |
| Vanadium, Big Bear Creek | 10,000 |
| Victor, Bison Lake | 20,000 |
| East Eight Mile Lake | 4,000 |
| Hughlitt's pond | 2,000 |
| Skaguay Lake | 6,000 |
| Ward, Duck Lake | 8,000 |
| Goose Lake | 60,000 |
| James Creek | 8,000 |
| Silver Lake | 60,000 |
| Yuki Lake | 8,000 |
| Weller, Platte River | 25,000 |
| Westcliffe, Venable Lake | 8,000 |
| Whitewater, West Creek | 12,000 |
| Woodland Park, Seven Springs Pond | 4,000 |
| Trout Creek | 10,000 |
| West Creek | 20,000 |
| Woodland Park Lakes | 44,000 |
| Yampa, Fish Lake | 9,000 |
| Connecticut: | |
| Haddam, Mill Creek | 600 |
| Hartford, Broad Brook | 2,000 |
| Copper Mine Brook | 5,000 |
| Hubbard Brook | 6,000 |
| Salmon Brook | 4,000 |
| Trout Brook, branch of | 5,000 |
| Jewett City, Broad Brook | 400 |
| Madison, Neck River | 600 |
| New London, Great Brook | 1,200 |
| New Milford, Kent Hollow Brook | 600 |
| West Aspatuck River | 2,000 |
| Norwich, Broad Brook | 2,400 |
| Choat Brook | 1,900 |
| Kimball Brook | 1,500 |
| Simsbury, Salmon, Bissel brooks | 2,000 |
| Unionville, Mill Brook | 2,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Connecticut—Continued. | |
| Vernon, Box Brook | 500 |
| Wauregan, Blackwell Brook | 1,000 |
| Georgia: | |
| Lakemont, Big Cove Creek | 1,000 |
| Nacoochee, Crumley Creek | 2,000 |
| Idaho: | |
| Drummond, Condah Creek | 1,500 |
| Harvard, Palouse River, North Fork | 1,500 |
| Hayden Lake, Hayden Lake | 3,000 |
| Humphrey, Beaver Creek | 1,250 |
| Idaho Falls, Teton River | 3,750 |
| Kooskia, Ingraham's pond | 900 |
| Naples, Fall Creek | 1,350 |
| Preston, Bear Creek | 5,000 |
| Salmon, Twin Lakes | 3,000 |
| Wallace, Coeur d'Alene River, North Fork | 1,500 |
| Weiser, Mann Creek | 2,000 |
| Monroe Creek | 2,000 |
| Rock Creek | 2,000 |
| Scott Creek | 2,000 |
| Illinois: | |
| Anna, Hudgens Creek | 400 |
| Moosehead, Mill Creek | 800 |
| Indiana: | |
| Michigan City, Palmer Creek | 3,000 |
| Spring Brook | 4,000 |
| Valparaiso, Willow Creek | †10,000 |
| Iowa: | |
| Calmar, Protivin Creek | 1,200 |
| Trout Creek | 800 |
| Pansing, State fish commission | *50,000 |
| Spring Creek | 800 |
| Kentucky: | |
| Harlan, Cumberland River, Martin Fork | 600 |
| Maine: | |
| Attean, Attean Lake | †7,500 |
| Bog Pond | †2,500 |
| Clearwater Pond | †5,000 |
| Hatchery Brook | †2,500 |
| Moose Pond | †2,500 |
| Slackers Pond | †2,500 |
| Thompson Brook | †2,500 |
| Williams Brook | †2,500 |
| Augusta, Lake Cobbosseecontee | †24,000 |
| Bar Mills, Silver Brook | 500 |
| Belgrade, Great Lake | †18,000 |
| Long Lake | †18,000 |
| Bigelow, Big Island Pond | †6,000 |
| Ell Pond | †4,800 |
| Jim Pond | †4,800 |
| Little Tee Pond | †2,400 |
| Mount Bigelow Pond | †2,400 |
| Rock Pond | †2,400 |
| Shallow Pond | †2,400 |
| Spring Lake | †2,400 |
| West Carry Pond | †2,400 |
| Bingham, Pleasant Pond | †8,000 |
| Bluehill, Mill Brook | †9,000 |
| Bridgton, Keyes Pond | †4,000 |
| Brownfield, Little Saco River | †3,600 |
| Shapards River | †3,600 |
| Bryants Pond, Lake Christopher | 3,000 |
| Camden, State fish commission | *100,000 |
| Corinna, Alder Brook | †5,000 |
| Craig Brook, Partridge Pond | †10,000 |
| Dedham, Branch Pond | †50,000 |
| Phillips Lake | †60,000 |
| Dexter, Goulds Pond | †5,000 |
| Howard Brook | †5,000 |
| Jimmie Brook | †5,000 |
| Lake Wassookeag | †7,500 |
| Puffers Pond | †5,000 |
| Eagle Lake, Eagle Lake | †12,000 |
| Square Lake | †12,000 |
| Maine—Continued. | |
| East Orland, Craig Pond | †50,000 |
| | 400 |
| Gully Brook | 400 |
| Hearts Pond | 500 |
| Patten Brook | †4,000 |
| Patten Pond | †10,000 |
| Rocky Pond | 600 |
| Wardswell Brook | 200 |
| Ellsworth, Branch Pond | †50,000 |
| Pattens Pond | †93,000 |
| Farmington, North Pond | †7,200 |
| Wilson Lake | †5,400 |
| Fryeburg, Clays Pond | †3,600 |
| Elkins Brook | †3,600 |
| Little Saco River | †3,600 |
| Wards Pond | †3,600 |
| Greenville Junction, Arnold Pond | †12,000 |
| Crosby Pond | †12,000 |
| Echo Pond | †18,000 |
| Hathorn Bog Pond | †12,000 |
| Horseshoe Pond | †12,000 |
| Mass Bog Pond | †12,000 |
| Rum Pond | †18,000 |
| Squaw Pond | †24,000 |
| West Cove Brook | †24,000 |
| Harrison, Crystal Lake | †5,000 |
| Long Lake | †5,000 |
| Holeb, Barrett Pond | †2,500 |
| Big Fish Pond | †5,000 |
| Bog Brook | †5,000 |
| Cedar Pond | †2,500 |
| Fish Pond | †5,000 |
| Gulf Brook | †2,500 |
| Holen Lake | †5,000 |
| Indian Pond | †5,000 |
| Long Pond | †5,000 |
| Lowell Pond | †5,000 |
| Moose River | †10,000 |
| Round Pond | †2,500 |
| Sherman Pond | †5,000 |
| Turner Pond | †10,000 |
| Twin Island Pond | †2,500 |
| Island Falls, Mattawamkeag Lake | †10,000 |
| Jackman, Alder Brook Pond | †7,500 |
| Benjamin Pond | †2,500 |
| Fish Pond | †7,500 |
| Gilbert Brook | †5,000 |
| Heald Pond | †7,500 |
| Horseshoe Pond | †2,500 |
| Luther Pond | †7,500 |
| Mud Pond | †2,500 |
| Sandy Brook | †7,500 |
| Kineo Station, Carry Brook | †8,000 |
| Scotean Brook | †4,000 |
| Tomhegan Brook | †6,000 |
| Lincoln Mills, Alder Brook | †5,000 |
| McGeorges, Cathance Lake | †2,500 |
| Monmouth, Cochnewagan Lake | †7,200 |
| Purgatory Pond | 500 |
| Sand Pond | 300 |
| Norcross, Henderson Pond | †7,500 |
| North Anson, Embden Pond | †6,000 |
| North Belgrade, Messalonskee Lake | †10,800 |
| North Sedgewick, Friend Brook | †5,000 |
| Oquossoc, Rangeley Chain of Lakes | 4,000 |
| Otis, Great Brook | †267,200 |
| Portage, Portage Lake | †8,000 |
| Presque Isle, Arnold Brook | †7,500 |
| Presque Isle River | †17,500 |
| Rangeley, Gull Pond | †4,500 |
| Orbeton Brook | †4,500 |
| Saddleback Lake | †9,000 |
| Trout Pond | †3,000 |
| Saco, Boothby Brook | 200 |
| Burham Brook | 200 |
| Buzzell Brook | 200 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Maine—Continued. | |
| Saco, Cold Spring Brook | 100 |
| Davis Brook | 200 |
| Diamond Spring Brook | 200 |
| Foss Brook | 100 |
| Hill Brook | 200 |
| Redwater Brook | 200 |
| Ricker Brook | 100 |
| Runnells Brook | 300 |
| Smith Brook | 300 |
| South Windham, Black Brook | †3,600 |
| Doles Brook | †3,600 |
| Steep Falls, Horn Pond | †4,000 |
| Waterville, Patties Pond | †8,000 |
| West Sebago, Hancock Lake | †4,000 |
| Winthrop, Lake Maranocook | †7,200 |
| Maryland: | |
| Arlington, Butler Branch | 1,000 |
| Baltimore, Baisman Run | 2,000 |
| Bee Tree Run | 2,000 |
| Dippingpond Run | 2,000 |
| Severn Run | 2,500 |
| Boring, Hollingsworth Run | 5,000 |
| McGills Run | 9,000 |
| Ellicott City, Oakland Branch | 1,000 |
| Frederick, Braddock Creek | 2,000 |
| Fishing Creek | 8,000 |
| Glencoe, Stony Run | 4,000 |
| Harman, Clarks Brook | 750 |
| Highfield, Cascade Creek | 500 |
| Relay, Bull Branch | 1,000 |
| Riderwood, Unknown Branch | 1,500 |
| Overshot Branch | 1,500 |
| Roland Branch | 2,500 |
| Rocks, Hollow Rock Creek | 1,000 |
| Lagrange Creek | 1,000 |
| Rock Vale Creek | 1,500 |
| Ruxton, Poe's pond | 1,000 |
| Turnpike, Green Branch | 4,000 |
| Massachusetts: | |
| Athol, Carter Brook | 200 |
| Fever Brook | 500 |
| Moccasin Brook | 400 |
| Rand Brook | 300 |
| Swift River, East Branch | 300 |
| Cushman, Long Plain Brook | 400 |
| Gardner, Popple Camp Brook | 8,000 |
| Sanders Pond | 5,000 |
| Greenfield, Mountain Pond | 200 |
| Stone Creek | 1,600 |
| Hartsville, Konkapot Creek | 1,000 |
| Swann Brook | 800 |
| Holyoke, Bachelder Brook | 1,600 |
| Crosby Brook | 400 |
| Spruce Corner Brook | 400 |
| Stony Brook | 1,600 |
| Kingston, Soule Pond | 200 |
| Lee, Beartown Mountain Brook | †4,000 |
| East Lee Brook | †4,000 |
| Hop Brook | †4,000 |
| Peggy Brook | †4,000 |
| Tyringham Brook | †5,000 |
| Washington Mountain Brook | †4,000 |
| New Bedford, Doggett Brook | 4,000 |
| Parker Brook | 4,000 |
| Wood Brook | 3,500 |
| Northampton, Shaw Brook, Westfield Branch | 1,600 |
| Walker Pond | 1,000 |
| North Dana, Silver Brook | 5,000 |
| Pittsfield, Clark Brook | †1,000 |
| Shaker Brook | †2,000 |
| Tyngsboro, Butterfield Pond | 1,000 |
| Michigan: | |
| Baldwin, Baldwin Creek | †16,000 |
| Bessemer, Myers Creek | †1,000 |
| Beulah, Platte River | †17,500 |
| Black River, Black River | †25,000 |
| Boon, Wharler Creek | †7,000 |
| Brand, Weldon Creek | †32,000 |
| Michigan—Continued. | |
| Bruce Crossing, Johnson Creek | †2,000 |
| Cement City, Wheaton Pond | †1,000 |
| Clare, Tobacco River | †7,500 |
| Copemish, Little Bear Creek | †10,500 |
| Covington, Case Creek | †1,000 |
| Dreher Creek | †1,000 |
| Kelsey Creek | †1,000 |
| Rock River | †1,000 |
| Watson Creek | †1,000 |
| East Tawas, Cold Creek | †50,000 |
| Silver Creek | †20,000 |
| Elmwood, Thirty Three Creek | †1,000 |
| Emery Junction, Au Gres River, East Branch | †25,000 |
| Farwell, Chippewa River | †16,000 |
| Gaylord, Au Sable River and tributaries | †100,000 |
| Pigeon River | 2,500 |
| Hale, Hale Creek | 5,000 |
| Smith Creek | †6,000 |
| Vaughn Creek | †8,000 |
| Hartford, Hart Creek, East and West Branches | †6,000 |
| Hillman, Bullock Creek | 3,000 |
| Pike Creek | 5,000 |
| Smith Creek | 5,000 |
| Indian River, Spring Brook River | 5,000 |
| Iron River, Cook Run | †10,000 |
| Iron River, Branch of | †2,000 |
| Paint River | †1,000 |
| Ironwood, Black River | †7,000 |
| Montreal River | †1,000 |
| Jackson, Crouches Brook | †1,000 |
| Kenton, Maggie Walton Lake | †5,000 |
| Little Manistee, Little Manistee River | †3,000 |
| Marenisco, Alder Creek | †20,000 |
| Barrs Brook | †2,000 |
| Bradys Brook | †1,000 |
| Brush Creek | †1,000 |
| Clover Creek | †1,000 |
| Fisher Creek | †2,000 |
| Fox Creek | †2,000 |
| Honey Creek | †1,000 |
| Jimmie Thomas Brook | †1,000 |
| Jones Brook | †2,000 |
| Kimble Creek | †1,000 |
| Lamon Creek | †1,000 |
| McDonald Creek | †2,000 |
| McKinney Creek | †2,000 |
| Pigeon Creek | †2,000 |
| Rileys Brook | †2,000 |
| Ryans Brook | †2,000 |
| Willow Creek | †2,000 |
| Marion, Ghost Creek | †17,500 |
| Norvana, Sanburn River | †16,000 |
| Paynesville, Ontonagon River, Middle Fork | †4,000 |
| Perch Siding, Perch Creek | †1,000 |
| Reed City, Johnson Hewett Brooks | †6,000 |
| Roscommon, Au Sable River, South Branch | †20,000 |
| Stager, Stager Creek | †2,000 |
| Stager Junction, Naults Creek | †2,000 |
| Thomaston, Spring Creek | †3,000 |
| Thompsonville, Betsey River | †10,000 |
| Tioga Siding, Hickey Creek | †1,000 |
| Tioga Creek | †1,000 |
| Wingleton, Kinney Creek | 5,000 |
| Pere Marquette River | 5,250 |
| Yuma, Slagle Creek | †20,000 |
| Minnesota: | |
| Clearbrook, Clearbrook Creek | †4,000 |
| Falk Lake | †3,000 |
| Ruffy Brook | †3,000 |
| Cold Spring, Cold Spring Creek | 3,000 |
| Dakota, Dakota Creek | 3,000 |
| Richmond Creek | 3,000 |
| Dover, Bateman Creek | 1,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Minnesota—Continued. | |
| Dover, Drake Creek | |
| Holdridge Creek | 3,000 |
| Kammer Creek | 1,000 |
| Landon Creek | 1,000 |
| Duluth, Woodland Creek | 1,000 |
| Woodland Creek, West Branch | †4,000 |
| Ely, Burntside River | †2,000 |
| Lonstrof Creek, East and West Branches | †4,000 |
| Highland, Little Gooseberry River | †5,000 |
| Knife River, Nepissiquit Lake | †4,000 |
| Lewiston, Enterprise Creek | †3,000 |
| Ferguson Creek | 1,500 |
| Hemingway Creek | 1,500 |
| Johns Valley Creek | 1,500 |
| Pine Creek | 1,500 |
| Rush Creek | 1,500 |
| Whitewater Creek and branches | 500 |
| Minnesota City, Bear Valley Creek | 4,500 |
| Middle Valley Creek | 1,500 |
| Rollingstone Creek | 1,500 |
| Rupprecht Creek | 1,500 |
| Speltz Valley Creek | 1,500 |
| Straight Valley Creek | 1,500 |
| Rushford, Axness Creek | 1,500 |
| Cooledge Creek | 1,000 |
| Crains Creek | 1,000 |
| Daley Creek | 2,000 |
| Ferguson Creek | 1,000 |
| Gaffney Creek | 1,000 |
| Hemingway Creek | 1,000 |
| Meade Creek | 2,000 |
| Onstine Creek | 1,000 |
| Opheim Creek | 1,000 |
| Overland Creek | 1,000 |
| Rupprecht Creek | 1,000 |
| Torkelson Creek | 2,000 |
| St. Cloud, Mill Creek | 1,000 |
| Spring Valley, Cold Spring Creek | 4,000 |
| Elva Creek | 1,000 |
| Hamilton Creek | 1,000 |
| Iredel Creek | 1,000 |
| Kingsley Creek | 2,000 |
| Mahood Creek | 3,000 |
| Root River, North Branch | 3,000 |
| Spring Valley Creek | 625 |
| Two Harbors, Big Gooseberry River | 3,000 |
| Big Stewart River | †3,000 |
| Crow Creek | †3,000 |
| Encampment Creek | †3,000 |
| Knife River | †3,000 |
| Little Stewart River | †3,000 |
| Silver Creek | †3,000 |
| Split Rock River | †3,000 |
| Stony Creek | †3,000 |
| Whalan, Diamond Creek | †3,000 |
| Gribbin Creek | 3,000 |
| Winona, Cedar Creek | 2,000 |
| East Burns Valley Creek | 1,000 |
| Gilmore Valley Creek | 1,000 |
| Pleasant Valley Creek | 1,000 |
| West Burns Valley Creek | 1,000 |
| Wiscoy Creek | 1,000 |
| Montana: | 1,000 |
| Alder, Ruby Creek | 2,500 |
| Armstrong, Spring Creek | 750 |
| Avon, Little Blackfoot River | 3,000 |
| Baker, Little Beaver Creek | 2,250 |
| Belgrade, Benhart Creek | 4,500 |
| Bull Run | 6,000 |
| Cowan Creek | 6,000 |
| Kennedy Creek | 7,500 |
| Middle Creek | 12,000 |
| Big Timber, Boulder Creek | 1,500 |
| Four Mile Spring Pond | 6,000 |
| Simmons Creek | 8,400 |
| Billings, Danford Run | 4,800 |

| Disposition. | Number. |
|---|---|
| Montana—Continued. | |
| Bozeman, Baker Creek | 3,000 |
| Batin Creek | 1,000 |
| Bostwick Creek | 3,000 |
| Bridge Creek | 3,000 |
| Camp Creek | 3,000 |
| Carlin Creek | 1,000 |
| Cockrell Creek | 1,000 |
| Curtis Creek | 1,000 |
| Dry Creek | 10,200 |
| Fish Creek | 1,000 |
| Heeb Creek | 1,000 |
| Jackel Creek | 1,000 |
| Lansing Creek | 1,000 |
| McDonnell Creek | 1,000 |
| Martin Creek | 1,000 |
| Miner Creek | 6,000 |
| Nixon Creek | 3,000 |
| Pasha Creek | 1,000 |
| Smith Creek | 1,000 |
| Story Creek | 3,000 |
| Stuckey Creek | 2,000 |
| Thompson Creek | 1,000 |
| Tice Creek | 1,000 |
| Bruno, Musselshell River | 625 |
| Butte, Bison Creek | 3,000 |
| Carabella, Green Lake | 2,100 |
| Corwin Springs, Cedar Creek | 500 |
| Cutler Creek | 250 |
| Dell, Sage Creek | 1,250 |
| Dillon, French Creek Pond | 500 |
| Rattlesnake Lake | 1,000 |
| Dixon, Ninepipes Lake | 900 |
| Pablo Lake | 900 |
| Drummond, Flint River | 1,500 |
| Fergus, Brush Creek | 1,800 |
| Gardner, Glen Creek | 9,000 |
| Park Branch | 8,400 |
| Glacier Park, Grinnell Lake | 3,000 |
| Josephine Lake | 3,000 |
| St. Marys River, North Fork | 3,850 |
| St. Marys River, West Fork | 4,400 |
| Two Medicine Lake | 4,000 |
| Upper Cut Bank Creek | 8,000 |
| Hamilton, Spring Creek | 200 |
| Harlem, Lodge Pole Creek | 2,400 |
| Peoples Creek | 2,400 |
| Harlowton, Agnes Creek | 6,000 |
| American Fork Creek | 1,050 |
| Careless Creek | 8,000 |
| Fish Creek | 6,000 |
| Hopley Creek and tributaries | 11,175 |
| Lebo Creek | 1,050 |
| Lebo Lake | 900 |
| McVey Creek | 4,000 |
| Spring Creek | 4,000 |
| Swimming Woman Creek | 8,000 |
| Havre, Beaver Creek | 2,400 |
| Big Sandy Creek | 1,500 |
| Box Elder Creek | 2,400 |
| Hedgesville, Swimming Woman Creek | 6,000 |
| Hobson, Yogo Creek | 6,000 |
| Joliet, Red Lodge Creek | 1,250 |
| Joplin, Big Sage Creek | 600 |
| Josephine, Sixteen Mile Creek | 1,000 |
| Judith Gap, Reservoir Lake | 4,000 |
| Lewistown, Beaver Creek | 450 |
| Judith River | 600 |
| Pike Creek | 4,000 |
| Spring Creek, East Fork | 6,000 |
| Lima, Little Sheep Creek | 400 |
| Livingston, Brisbin Creek | 1,650 |
| Fleshman Creek | 2,750 |
| Pine Creek | 2,750 |
| Spring Creek | 3,300 |
| Summerland Creek | 1,650 |
| Trail Creek | 2,750 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Montana—Continued. | |
| Lodge Grass, Lodge Grass Creek | 12,000 |
| Malta, Nelson Lake | 6,600 |
| Manhattan, Heeb Creek | 750 |
| McLellen Creek | 1,650 |
| Ridgley Creek | 1,650 |
| Martindale, Daisy Creek | 1,000 |
| Whitetail Creek | 600 |
| Medicine Lake, Brush Lake | 1,600 |
| Missoula, Belmont Creek | 400 |
| Bitter Root River | 8,000 |
| Blackfoot River | 600 |
| Browns Lake | 800 |
| Clearwater River | 600 |
| Cyrs Creek | 3,200 |
| Deer Creek | 400 |
| Dick Creek | 800 |
| Kleinschmidt Lake | 800 |
| Lake Inez | 800 |
| Lo Lo Creek | 1,500 |
| Long Lake | 800 |
| Placid Lake | 400 |
| Salmon Lake (A) | 400 |
| Salmon Lake (B) | 800 |
| Seeley Lake | 400 |
| Three Mile Creek | 9,600 |
| Norris, Meadow Creek | 51,750 |
| Noxon, Bull River | 750 |
| Park City, Yellowstone River | 6,000 |
| Plains, Dog Lake | 1,500 |
| Pony, Watt Lake | 2,200 |
| Red Lodge, Red Lodge Creek | 1,125 |
| Ringling, Battle Creek | 4,880 |
| Beaver Creek | 5,000 |
| Big Birch Creek | 5,000 |
| Big Spring Creek | 2,400 |
| Cammas Creek | 4,000 |
| Lake Creek | 1,600 |
| Newlan Creek | 6,000 |
| Smith River, North Fork | 5,000 |
| Whitetail Creek | 4,000 |
| Roberts, Red Lodge Creek | 625 |
| Sappington, Jefferson Creek | 450 |
| Shawmut, Tony Creek | 8,000 |
| Sixteen, Indian Creek | 300 |
| Straw, Russell Creek | 200 |
| Three Forks, Jefferson River, Lower Fork | 6,000 |
| Toston, Crow Creek | 30,000 |
| Muddy Creek | 12,000 |
| Swamp Creek | 10,000 |
| Townsend, Deep Creek | 400 |
| Duck Creek | 24,000 |
| Missouri River | 400 |
| Trout Creek, Trout Creek | 1,200 |
| Twin Bridges, Wisconsin Lake | 500 |
| Twodot, Big Elk Creek | 900 |
| Mexican John Creek | 6,400 |
| Whitefish, Beaver Lake | 900 |
| Swift Creek | 4,500 |
| Whitefish Lake | 1,500 |
| White Sulphur Spring, Sheep Creek | 750 |
| Smith River, North Fork | 750 |
| Yellowstone, Cougar Creek | 2,337 |
| Duck Creek | 2,337 |
| Tepee Creek | 2,338 |
| Trapper Creek | 2,200 |
| Watkins Creek | 4,538 |
| Nebraska: | |
| Andrews, White Clay Creek | 5,250 |
| Angora, Indian Creek | 1,200 |
| Chadron, Chadron Creek | 2,500 |
| Deadlouse Creek | 2,500 |
| Little Bordeaux Creek | 2,500 |
| Gordon, Antelope Creek | 10,000 |
| Larabie Creek | 6,000 |
| Snake Creek | 10,000 |
| White Clay Creek | 10,000 |
| Lewellen, Otter Creek | 1,200 |

| Disposition. | Number. |
|---|---|
| New Hampshire: | |
| Bennington, Lake George | 10,000 |
| Moose Brook | 2,000 |
| Rearing Pond | 2,000 |
| Russell Brook | 3,000 |
| Salmon Brook | 3,000 |
| Bristol, Coalarch Brook | 2,000 |
| Cockermouth River | 3,000 |
| Danforth Brook | 1,000 |
| Dick Brown Brook | 1,000 |
| Fowler River | 3,000 |
| Horicon Brook | 1,500 |
| Newfound Lake | 3,000 |
| Patten Brook | 2,000 |
| Pemigewassett River | 8,000 |
| Smith River | 5,000 |
| Taylor Brook | 2,000 |
| Ten Mile Brook | 1,000 |
| Welton Falls Brook | 3,000 |
| Canaan, Allendale Pond | 500 |
| Blodgett Pond | 4,800 |
| Bog Brook | 800 |
| Bryant Pond | 1,500 |
| Chase Brook | 800 |
| Chellis Brook | 800 |
| Clark Pond | 4,800 |
| Conrow Brook | 800 |
| Cumming Pond | 6,400 |
| Currier Brook | 800 |
| Davis Brook | 800 |
| Decelle Pond | 1,000 |
| Fairweather Brook | 2,800 |
| Ford Brook | 800 |
| French Brook | 800 |
| Gulf Brook | 800 |
| Hames Brook | 800 |
| Hart Pond | 2,300 |
| Indian River | 3,200 |
| Kennedy Pond | 1,000 |
| Kilton Brook | 800 |
| Kimball Hill Brook | 1,600 |
| Kimball Hill Pond | 1,000 |
| Lowell Pond | 750 |
| Mascoma River | 3,200 |
| Mill Brook | 800 |
| Morse Brook | 800 |
| Mudget Brook | 750 |
| Murch Brook | 800 |
| Orange Brook | 1,600 |
| Orange Pond | 6,400 |
| Powers Pond | 2,000 |
| Range Brook | 800 |
| Rocky Branch | 800 |
| Rogers Brook | 500 |
| Sargent Brook | 800 |
| Spectacle Pond | 2,000 |
| Spring Brook | 800 |
| Summit Brook | 800 |
| Thompson Brook | 1,600 |
| Charlestown, Benware Brook | 2,000 |
| Great Brook | 5,000 |
| Reservoir Brook | 3,000 |
| Cherry Mountain, Appleby Brook | 14,500 |
| Cherry Mountain Brook | 14,500 |
| Mill Brook | 16,000 |
| Fabyans, Abenaki Brook | 14,000 |
| Ammonoosuc River | 14,000 |
| Black Brook | 14,000 |
| Clay Brook | 14,000 |
| Clinton Brook | 14,000 |
| Crawford Brook | 14,000 |
| Deception Brook | 14,000 |
| Jefferson Brook | 14,000 |
| Lake Anderson | 14,000 |
| Lake Carolyn | 13,000 |
| Mountain Echo Brook | 14,000 |
| Sebossis Brook | 14,000 |
| Twin Rivers | 13,000 |
| Franklin, Call Brook | 5,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| New Hampshire—Continued. | |
| Franklin, Hill Brook | 3,000 |
| Mountain Brook | 5,000 |
| Putney Brook | 4,000 |
| Gorham, Blue Brook | †3,000 |
| Cedar Brook | †6,000 |
| Chickwolnepy Brook | 500 |
| Wild River | †6,000 |
| Grafton, Hoyt Brook | 2,000 |
| South Grafton Brook | 4,000 |
| Stockwell Brook | 4,000 |
| Tuttle Brook | 2,000 |
| Hancock, Half Moon Pond | 2,000 |
| Hillsboro, Village Brook | 3,000 |
| Keene, Boyce Brook | 2,500 |
| Fall Brook | 1,500 |
| Great Brook | 5,000 |
| Holbrook Brook | 1,000 |
| Miry Brook | 1,500 |
| Perry Brook | 1,000 |
| Lebanon, Blood Brook | 3,000 |
| Great Brook | 1,500 |
| Hibbard Brook | 3,000 |
| Mink Brook | 8,000 |
| Manchester, Bog Brook | 2,000 |
| Bowman Brook | 2,000 |
| Brickyard Brook | 2,000 |
| Cold Stream Brook | 2,000 |
| Dan Little Brook | 2,000 |
| Darrah Brook | 1,000 |
| Harry Brook | 2,000 |
| Leach Brook | 2,000 |
| Little Cohas Brook | 2,000 |
| Long Meadow Brook | 2,000 |
| McNeil Brook | 1,000 |
| McQuade Brook | 2,000 |
| Manter Brook | 2,000 |
| Merrill Brook | 2,000 |
| Patten Brook | 7,000 |
| Peters Brook | 2,000 |
| Pierce Brook | 2,000 |
| Pulpit Brook | 2,000 |
| Ray Brook | 5,000 |
| Riddle Brook | 2,000 |
| Whittle Brook | 2,000 |
| Nashau, Bartemus Brook | 2,000 |
| Beaver Brook | 8,000 |
| Budro Brook | 2,000 |
| Doctor Hill Brook | 2,000 |
| Duval Brook | 1,000 |
| Flint Brook | 2,000 |
| Ford Brook | 1,000 |
| Glover Brook | 1,000 |
| Greenleaf Brook | 2,000 |
| Hardy Brook | 2,000 |
| Little Nesenkeag Brook | 8,000 |
| Lyd Reed Brook | 2,000 |
| Muddy Brook | 2,000 |
| Naticook Brook | 2,000 |
| Nesenkeag Brook | 4,000 |
| Norman Howe Brook | 2,000 |
| Old Maids Brook | 1,000 |
| Peacock Brook | 2,000 |
| Pegleg Brook | 1,000 |
| Second Brook | 3,000 |
| Silver Spring Brook | 2,000 |
| Smalls Brook | 2,000 |
| Third Brook | 1,000 |
| Willow Bridge Brook | 2,000 |
| Witch Brook | 8,000 |
| Newport, Cutts Brook | 5,000 |
| Long Pond Brook | 4,000 |
| Sawyer Brook | 4,000 |
| Shedd Brook | 4,000 |
| Sugar River, North Branch | 7,000 |
| Pike, Oliverian River | 2,000 |
| Potter Place, Cold Pond | 8,000 |
| Powwow River, Evans Brook | 6,000 |
| Humes Brook | 6,000 |
| New Hampshire—Continued. | |
| Suncook, Goss Brook | 2,500 |
| Pease Brook | 3,000 |
| Woodsville, Ammonoosuc River | 2,400 |
| New Jersey: | |
| Burlington, Assiscunk Creek | 10,000 |
| Englewood, Cemetery Brook | 4,000 |
| Closter Brook | 4,000 |
| Cresskill Brook | 4,000 |
| Denarest Brook | 4,000 |
| Metzler Brook | 4,000 |
| Northvale Brook | 4,000 |
| Oak Ridge, Stony Brook Lake | 6,000 |
| New Mexico: | |
| Chama, Brazos River, South Fork | 14,000 |
| Canjilon Creek | 12,000 |
| Cannones River | 10,000 |
| Gavilon Creek | 18,000 |
| Cimarron, Ponil River | 20,000 |
| Embudo, Angostura Creek | 7,500 |
| La Junta Creek | 7,500 |
| Folsom, Dry Cimarron River | 20,000 |
| Glorietta, Pecos River | 30,000 |
| Lamy, Santa Fe River | 10,000 |
| Las Vegas, Gallinas River | 22,000 |
| Mora River | 10,000 |
| Trout Springs Brook | 6,000 |
| Tularosa, Tularosa River | 4,000 |
| New York: | |
| Albany, Cox's pond | 3,000 |
| Beacon, Trout Brook | 2,400 |
| Benson Mines, Little River | †20,000 |
| Cambridge, Camden Brook | 4,000 |
| Coulter Brook | 3,000 |
| Duel Hollow Brook | 3,000 |
| Loweries Brook | 3,000 |
| Mannard Brook | 2,000 |
| Muncy Hollow Brook | 2,000 |
| Terry Brook | 5,000 |
| Catskill, Cauterskill Creek | †6,000 |
| Divasskill Creek | †3,500 |
| | 500 |
| Kirkstown Creek | †5,000 |
| Saxes Brook | †2,000 |
| Shinglekill Creek | †4,000 |
| Whippoorwill Brook | †2,000 |
| Cobleskill, Bark River | 4,000 |
| Beddy Brook | 3,000 |
| Cole Hollow Brook | 2,000 |
| Dibble Hollow Brook | 2,000 |
| Heddon Creek | 2,000 |
| Karker Brook | 1,000 |
| Lime Kiln Brook | 2,000 |
| Vintonton Brook | 2,000 |
| West Middleburgh Brook | 3,000 |
| West Richmondville Brook | 3,000 |
| Deposit, Oquaga Creek | †20,000 |
| Elmira, Baldwin Creek | †4,000 |
| Banfield Creek | †2,000 |
| Beaver Brook | †2,000 |
| Catherine Creek | †8,000 |
| Cornish Creek | †4,000 |
| Cranberry Creek | †3,000 |
| Goldsmith Creek | †4,000 |
| Jackson Creek | †3,000 |
| Miller Brook | †1,000 |
| Newtown Creek | †8,000 |
| Seeley Creek | †7,000 |
| Smith Creek | †4,000 |
| South Creek | †6,000 |
| Texas Creek | †4,000 |
| Wynkoop Creek | †8,000 |
| Gabriels, Lake Meacham | †10,000 |
| Genoa, Fred Green Creek | †4,000 |
| Gamel Creek | †5,000 |
| Pine Hollow Creek | †6,000 |
| Greene, Geneganstlet Brook | †10,000 |
| Wheeler Brook | †5,000 |
| Hamburg, Gates's pond | †8,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| New York—Continued. | |
| Harrisville, Big Hill Pond | †8,000 |
| Hinckley, West Canada Creek, East Branch | †14,000 |
| Hopewell Junction, Nortlekill Creek | 5,000 |
| Hornell, Seeley Creek | 3,000 |
| Hunter, Bataviakill Creek | 10,000 |
| Ithica, applicant | *8,175 |
| Kings, Cole Brook | 2,000 |
| Lake Placid, Chub River | †10,000 |
| Liberty, Robertson Brook | †5,000 |
| Long Lake West, Bear Pond | †5,000 |
| Charley Pond | †5,000 |
| Loon Pond | †5,000 |
| Lower Bettner Pond | †5,000 |
| Otter Pond | †5,000 |
| Upper Bettner Pond | †5,000 |
| Malone Junction, Duane Creek | †10,000 |
| Trout River | †10,000 |
| Millbrook, Beverly Creek | 800 |
| Canoe Creek | 6,000 |
| Montour Falls, Havan Glen Creek | †3,000 |
| Spring Brook | †2,000 |
| Texas Hollow Brook | †5,000 |
| Newark, Trout Run | †8,000 |
| Van Valkenburg Brook | †2,000 |
| New Lebanon, Reynolds Brook | 3,000 |
| Schell Brook | 1,000 |
| Shaker Brook | 2,000 |
| Newton Falls, Grasse River | †15,000 |
| North Creek, Chatiemac Lake | 2,000 |
| Clear Pond | †8,000 |
| North Ilion, Steeles Creek | †16,000 |
| North Lansing, Teeter Creek | †5,000 |
| Oneonta, Ouleout Creek | †24,000 |
| Oswego, Black Creek | †8,000 |
| Pawling, Swamp River | 6,000 |
| Port Henry, Wolf Pond | †3,000 |
| Port Jervis, Bushkill Creek | 5,000 |
| Mongaup River | 8,000 |
| Shinglekill Brook | 4,000 |
| Steinykill Creek | 3,000 |
| Vandemark Brook | 4,000 |
| Rome, Fish Creek | 4,000 |
| Roscoe, Beaverkill River | †20,000 |
| Horse Brook | †2,000 |
| St. Regis Falls, Guide Board Brook | 600 |
| St. Regis River and branches | †10,000<br>2,200 |
| Stanley Brook | 800 |
| Stony Brook | 3,600 |
| Santa Clara, Deep Pond | †4,000 |
| Deer Pond | †4,000 |
| Dimmerick Brook | †5,000 |
| Dimmock Brook | †2,000 |
| Guide Board Brook | †4,000 |
| Spring Pond | †2,000 |
| Schenectady, Alyslaus Creek | 3,000 |
| Hungerkill Creek | 3,000 |
| Sherburne, Cole Brook | †2,000 |
| Four Corners Brook | †2,000 |
| North Norwich Brook | †3,000 |
| Sherburne Lake | †8,000 |
| Swamp Brook | †2,000 |
| South Lansing, Ernst Teeter Creek | †4,000 |
| Steinberg Creek | †6,000 |
| Syracuse, Bear Trap Brook | 2,000 |
| Bishop Brook | 2,000 |
| Carpenter Brook | †8,000 |
| Dunlap Brook | 1,000 |
| Evansward Trout Pond | 500 |
| Geddes Brook | †8,000<br>300 |
| Hitchcock Brook | 1,000 |
| Klein Brook | 1,000 |
| LaFayette Creek | 6,000<br>800 |
| Mont Freda Brook | †8,000 |
| Peck Brook | 1,000 |
| Pools Brook | 2,500 |
| New York—Continued. | |
| Syracuse, Redhead Brook | 1,000 |
| South Hollow Brook | 3,000<br>300 |
| Stony Brook | 300 |
| Stone Quarry Falls Brook | 2,500 |
| Swamp Brook | †3,000<br>300 |
| Troop "D" Farm Brook | 1,000 |
| Van Bergen Brook | 1,000 |
| Unadilla, Bennet Creek | †10,000 |
| Westport, Birch Pond | †4,000 |
| Finch Pond | †4,000 |
| Lake Nokomis | †4,000 |
| Ledge Brook | †3,000 |
| Lower Moss Pond | †3,000 |
| Schroon River | †4,000 |
| Secret Pond | †4,000 |
| Underwood Brook | †3,000 |
| Upper Moss Pond | †3,000 |
| Wawonaissa Brook | †3,000 |
| Whitehall, Cold Brook | †3,000 |
| Pike Brook | †3,000 |
| Willsboro, Little Sky Pond | 1,000 |
| North Carolina: | |
| Asheville, Bent Creek | 5,000 |
| Cane Creek, Rocky Fork | 1,000 |
| Brevard, Grassy Creek | 3,000 |
| Canton, Crawford Creek | 3,000 |
| Daniels Creek | 2,000 |
| Lenoir Creek | 2,000 |
| Cherryfield, Cherryfield Creek | 1,000 |
| Edgemont, Sassafras Creek | 3,000 |
| Etowah, Big Willow Creek | 5,000 |
| Highland, Cullasaja River | 2,000 |
| Horseshoe, Mills River | 10,000 |
| Hot Springs, Lance Creek | 1,000 |
| Lake Toxaway, Chattooga River | 6,000 |
| Fowler Creek | 1,000 |
| Jeams Creek | 2,000 |
| Pine Creek | 1,000 |
| Linville, Big Grassy Creek | 3,000 |
| Grandmother Creek | 4,000 |
| Kawana Lake | 5,000 |
| Linville River | 4,000 |
| Linville River, West Fork | 3,000 |
| Little Grassy Creek | 3,000 |
| Micaville, South Toe River | 5,000 |
| North Wilkesboro, Boone Highway Lake | 3,000 |
| Mulberry Creek, Branch of | 4,000 |
| Saw Mill Creek | 3,000 |
| Old Fort, Curtis Creek | 13,500 |
| Laurel Jog Creek | 4,500 |
| Pisgah Forest, Davidson River | 15,000 |
| Laurel Fork Creek | 2,000 |
| Little River | 6,000 |
| Mills River, South Fork | 10,000 |
| Poplar, Pigeon Fork Creek | 4,000 |
| Rosman, French Broad River, Middle Fork | 4,000 |
| Laurel Creek | 2,000 |
| Little Creek | 1,000 |
| Old Toxaway Creek | 3,000 |
| Rock Creek | 2,000 |
| Toxaway Creek | 500 |
| Selica, Mason Creek | 1,000 |
| Patterson Creek | 1,000 |
| Shulls Mills, Cane Creek, Laurel Fork | 3,000 |
| Cane Creek, North Fork | 3,000 |
| Laurel Creek | 5,000 |
| New River, Doe Fork | 3,000 |
| Shups Creek | 3,000 |
| Valle Creek | 2,000 |
| Thurmond, Headles Creek | 500 |
| Waynesville, Arrington Creek | 2,000 |
| Ohio: | |
| Bellefontaine, Spring Branch | †5,000 |
| Canton, Nimishillen Creek, West Branch | †10,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Ohio—Continued. | |
| Chagrin Falls, Bliss Creek | †4,000 |
| | 3,000 |
| Hudson, Sullivan Creek | †3,000 |
| Sugar Grove, Bowers Run | †8,000 |
| Clear Creek | †20,000 |
| Urbana, Cedar Creek | †6,000 |
| Oregon: | |
| Clackamas, Clackamas River | 570 |
| Parrot Creek | 10,000 |
| State fish commission | 36,000 |
| Grants Pass, Moorland Pond | 500 |
| Lindsey, Lindsey Creek | 8,000 |
| Viento Creek | 10,000 |
| Warren Creek | 6,000 |
| Pennsylvania: | |
| Altoona, Canoe Creek | 6,000 |
| Piney Creek | 6,000 |
| Sinking Run | 6,000 |
| Ashland, Blases Run | 1,800 |
| Buck Horn Run | 1,200 |
| Kulps Run | 1,200 |
| Roaring Creek | 2,400 |
| Bedford, Breast Work Run | 2,000 |
| Fyan Run | 2,000 |
| Laurel Run | 2,000 |
| Benton, Fishing Creek | 2,400 |
| Berwick, Briar Creek | 3,000 |
| Birdell, Two Log Run | 1,500 |
| Cammal, Browns Run | †3,000 |
| Mill Run | †2,000 |
| Miller Run | †3,000 |
| Trout Run | †4,000 |
| Truman Run | †2,000 |
| Cherry Run, Penns Creek | 5,000 |
| Christiana, Smyrna Run | 1,000 |
| Coatesville, Broad Run | 5,000 |
| Pequea Creek | 2,000 |
| Columbia, Jones Creek | 3,000 |
| Cresco, Bushkill Creek | 4,200 |
| Downington, Beaver Run | 4,000 |
| Broad Run | 900 |
| Easton, Bushkill Creek | 5,000 |
| Martins Creek | 5,000 |
| Ebensburg, Chest Creek | 1,000 |
| Conemaugh Creek | 2,000 |
| Gallaher Run | 1,000 |
| Howells Creek | 1,000 |
| Jacks Run | 1,000 |
| James Creek | 1,000 |
| James Run | 1,000 |
| Jonathan Creek | 1,000 |
| Kemler Run | 1,000 |
| Laurel Lick Run | 1,000 |
| Moore Run | 1,000 |
| Noel Run | 1,000 |
| Roaring Run | 1,000 |
| Robbs Run | 1,000 |
| Skelleys Run | 1,000 |
| Smiths Run | 1,000 |
| Tin Mill Run | 1,000 |
| Tudor Run | 1,000 |
| Watters Run | 1,000 |
| Ephrata, Rudys Run | 1,500 |
| Sahlox Creek | 1,500 |
| Shimps Run | 1,000 |
| Trout Creek | 3,000 |
| Fairview, Tent Woods Brook | †2,000 |
| Forks, Fishing Creek | †2,400 |
| Gaines Junction, Big Spring Creek | †2,000 |
| Bloody Run | †2,000 |
| Chaffee Run | †2,000 |
| Cowbarn Branch | †3,000 |
| Deer Lick Run | †2,000 |
| Dewey Hollow Run | †2,000 |
| Elk Run | †2,000 |
| Elk Run, West Branch | †3,000 |
| Knowlton Run | †2,000 |
| Maynard Branch | †2,000 |
| Phoenix Run | †2,000 |

| Disposition. | Number. |
|---|---|
| Pennsylvania—Continued. | |
| Gaines Junction, Remington Brook | †2,000 |
| Shin Hollow Run | †2,000 |
| Water Trough Hollow Run | †2,000 |
| Wetmore Run | †2,000 |
| Gap, Birch Run | 1,500 |
| Livingston Run | 3,000 |
| Slaymakertown Run | 1,500 |
| Hale Eddy, Shad Pound Brook, Thomas Branch | †6,000 |
| Hatboro, Pennypack Creek | 1,500 |
| Headleys, Middle Creek | 2,400 |
| Wangum Creek | 1,800 |
| Howard, Big Hayes Run | †2,000 |
| Brickly Run | †2,000 |
| Butler Run | †2,000 |
| Counsil Run | †2,000 |
| Fishing Creek | †2,000 |
| Laurel Run | †2,000 |
| Lick Run | †2,000 |
| Little Hayes Run | †2,000 |
| Lucas Run | †2,000 |
| McNanny Run | †2,000 |
| Marsh Creek | †4,000 |
| Marsh Creek, North Branch | †2,000 |
| Singer Creek | †2,000 |
| Hulls, Birch Run | †3,000 |
| Borea Branch | †2,000 |
| Camp Run | †3,000 |
| East Fork Creek | †4,000 |
| Horton Run | †3,000 |
| Jamison Run | †2,000 |
| Prouty Creek | †2,000 |
| Stone Lick Run | †3,000 |
| Wharton Run | †3,000 |
| Wild Bear Run | †3,000 |
| Indiana, Stake Run | 2,000 |
| Jersey Shore, Big Run | 2,000 |
| Browns Run | 2,000 |
| Fishing Creek | 3,000 |
| Gamble Run | 2,000 |
| Larrys Creek, Left Fork | 2,000 |
| Larrys Creek, Right Fork | 2,000 |
| McMerns Run | 2,000 |
| Miller Run | 1,000 |
| Pine Bottom Creek | 4,000 |
| Rouch Creek | 2,000 |
| Trout Run | 2,000 |
| White Deer Creek | 2,000 |
| Johnstown, Bens Creek, North Fork | 4,000 |
| Dalton Run | 4,000 |
| Mill Creek | 4,000 |
| Salt Lick Run | 100 |
| Kelton, White Clay Creek, West Branch | 2,000 |
| Kinzers, Keneagy Run | 2,000 |
| Londonland Creek | 1,500 |
| Lake Ariel, Five Mile Creek | 3,000 |
| Lamar, Bear Run | †2,000 |
| Cherry Run | †2,000 |
| Fishing Creek | †4,000 |
| Huston Gap Run | †2,000 |
| Kettle Creek | †2,000 |
| Little Kettle Creek | †2,000 |
| McCaleb Run | †2,000 |
| Nittany Creek | †4,000 |
| Roaring Run | †6,000 |
| Ruhl Pond | †2,000 |
| Lancaster, Big Springs Run | 1,000 |
| Culler Run | 2,000 |
| Eckert Run | 1,000 |
| Spring Run | 2,000 |
| Steinmans Run | 2,000 |
| Landisville, Baer Spring Run | 1,000 |
| Laporte, Deer Hollow Run | 2,000 |
| Dutchman Run | 2,000 |
| Elk Run | 2,000 |
| Floodwood Run | 2,000 |
| Pole Bridge Run | 2,000 |
| Shaner Burg Run | 2,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Pennsylvania—Continued. | |
| Lemont, Buffalo Run | †3,000 |
| Cedar Creek | †2,000 |
| Centre Furnace Branch | †2,000 |
| Collier Run | †2,000 |
| Laurel Run | †3,000 |
| Mackey Run | †2,000 |
| Rock Spring Run | †2,000 |
| Shaffer Creek | †3,000 |
| Shingletown Run | †2,000 |
| Sinking Creek | †2,000 |
| Slab Canin Creek | †2,000 |
| Spring Creek | †3,000 |
| Lewisburg, Lick Run | 2,000 |
| Welker Run | 3,000 |
| Lewistown Junction, Fishers Meadow Run | 600 |
| Honey Creek | 900 |
| Treister Valley Creek | 1,500 |
| Lititz, Kettle Run | 1,000 |
| Popular Run, East Branch | 1,000 |
| McElhattan, Chathams Run | 4,000 |
| Lick Run | 2,000 |
| Little Chathams Run | 1,500 |
| McElhattan Run | 2,000 |
| Plum Run | 3,500 |
| Queens Run | 2,000 |
| McKnightstown, Marsh Creek | 1,500 |
| Milford, Mandermark Creek | 4,000 |
| Mill Hall, Fishing Creek | 2,500 |
| Moslem, Moslem Creek | 2,000 |
| Narvon, Beartown Run | 2,000 |
| Spring Brook | 1,000 |
| New Germantown, Fowlers Run | 900 |
| Sheaffer Run | 900 |
| Oak Hall, Bear Meadow Run | †2,000 |
| Corner Run | †2,000 |
| Galbraith Run | †4,000 |
| Laurel Run | †4,000 |
| McFarlane Run | †2,000 |
| Meyers Run | †2,000 |
| Shingletown Gap Run | †2,000 |
| Spring Creek | †4,000 |
| Spring Gap Run | †2,000 |
| Orviston, Big Run and branches | †10,000 |
| Council Run | †2,000 |
| Eddy Lick Run | †2,000 |
| Hayes Run | †2,000 |
| Marsh Creek | †2,000 |
| Rock Run | †2,000 |
| Two Runs | †2,000 |
| Peach Bottom, Blackburn Spring Run | 6,000 |
| Pen Argyl, Altemus Creek | 2,000 |
| Bushkill Creek | 2,000 |
| Cherry Valley Creek | 2,000 |
| Green Valley Creek | 2,000 |
| Pleasant Valley Creek | 3,000 |
| Renolds Creek | 2,000 |
| Ross Common Creek | 2,000 |
| Ross Valley Creek | 2,000 |
| Spruce Run | 2,000 |
| Petersburg, Bells Run | 1,000 |
| Garners Run | 3,000 |
| Globe Run | 3,000 |
| Henry Run | 1,000 |
| Laurel Run | 1,000 |
| Roaring Run | 3,000 |
| Stone Creek | 3,000 |
| Phoenixville, Mashalmac Creek | 12,000 |
| Picture Rocks, Muncy Creek | 4,800 |
| Port Clinton, Ketner Run | 3,000 |
| Rattling Run | 3,000 |
| Pottsville, Black Creek | 7,000 |
| Robertstown, Shenks Run | 1,000 |
| Shickshinny, Arnolds Creek | 1,800 |
| Huntingdon Creek | 2,400 |
| Lick Branch | 1,800 |
| Phillips Creek | 2,400 |
| Shingle Run | 2,400 |
| Pennsylvania—Continued. | |
| Sinnemahoning, Cooks Run | †2,000 |
| Slatington, Benningers Creek | 3,000 |
| Friedens Creek | 1,000 |
| Jorden Creek | 1,000 |
| Smiths Gap Creek | 6,000 |
| Stillwater, Fishing Creek | 3,000 |
| Sunbury, Limestone Run | 3,000 |
| Susquehanna, Egypt Creek | †7,000 |
| Hemlock Creek | †7,000 |
| Swarthmore, Little Crim Creek | 4,000 |
| Tamaqua, Beaver Creek | 3,000 |
| Bushy Run | 1,000 |
| Owl Creek | 4,000 |
| Rabbit Run | 3,000 |
| Still Creek | 3,000 |
| Trout Run, Bear Run | 1,000 |
| Blacks Creek | 1,000 |
| Blackhouse Creek | 1,000 |
| Bunnell Run | 1,000 |
| English Run | 1,000 |
| Flocks Run | 1,000 |
| Four Mile Run | 1,000 |
| Otter Run | 1,000 |
| Pack Horse Creek | 1,000 |
| Rock Run | 1,000 |
| Smith Run | 1,000 |
| Texas Creek | 1,000 |
| Trout Run | 1,000 |
| Wolf Run | 1,000 |
| Troy, Brandy Run | 1,000 |
| Bullard Creek | 1,000 |
| Cease Run | 1,000 |
| Chase Creek | 1,000 |
| Covert Creek | 1,000 |
| Dobbins Creek | 1,000 |
| Dry Run | 1,000 |
| Fall Brook Creek | 1,000 |
| Fellows Creek | 1,000 |
| Holmes Creek | 1,000 |
| Hunts Creek | 1,000 |
| Kiff Run | 1,000 |
| Leona Creek | 1,000 |
| Little Falls Creek | 1,000 |
| Lyons Run | 1,000 |
| Maynard Run | 1,000 |
| Morgan Creek | 1,000 |
| Morris Run | 1,000 |
| Palmer Run | 1,000 |
| Porter Creek | 1,000 |
| Sam Miller Run | 1,000 |
| Smith Run | 1,000 |
| Spring Run | 1,000 |
| Tioga River | 1,000 |
| Waterville, Carson Hollow Run | †3,000 |
| Dam Run | †3,000 |
| English Run | †3,000 |
| School House Run | †3,000 |
| Thompson Hollow Run | †2,000 |
| Weatherly, Deneys Creek | 2,000 |
| West Chester, Chester Creek | 4,000 |
| Lady Bren Run, tributary of | 3,000 |
| Radley Run | 4,000 |
| Sharpless Run | 5,000 |
| West Grove, Doe Run Creek, Left Branch | 1,000 |
| White Clay Creek, branch of | 1,500 |
| Westtown, Waln Brook | 4,000 |
| Williamsport, Bender Run | 2,000 |
| Big Bear Creek | 10,800 |
| Big Run | 2,000 |
| Days Run | 1,000 |
| Johnson Run | 1,000 |
| Laurel Run | 1,000 |
| Long Run | 1,000 |
| Loyalsock Creek | 8,000 |
| Pleasant Creek | 1,000 |
| Plunkett Creek | 2,000 |
| Shingle Run | 1,000 |
| Windber, Biscuit Spring Run | 1,800 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Pennsylvania—Continued. | |
| Windber, Cub Run | 1,500 |
| Piney Run | 1,500 |
| Rhode Island: | |
| East Greenwich, Wood River, branch of | 8,000 |
| Providence, Aldrich Brook | 4,000 |
| Bucks Horn Brook | 4,000 |
| Harmony Brook | 4,000 |
| Huntinghouse Brook | 4,000 |
| Rice City Brook | 4,000 |
| State fish commission | *50,000 |
| South Dakota: | |
| Custer, French Creek | 16,000 |
| Elmore, Nursery Pond | 2,750 |
| Spearfish Creek | 3,000 |
| Englewood, Elk Creek | 9,000 |
| Englewood Creek | 4,500 |
| Whitewood Creek | 2,000 |
| Hill City, Spring Creek | 22,000 |
| Hot Springs, Fall River | 6,000 |
| Hat Creek | 6,300 |
| Hyseqa, Prairie Creek | 6,000 |
| Interior, Bear Creek | 14,000 |
| Corn Creek | 4,000 |
| Hay Creek | 6,000 |
| Pine Creek | 8,000 |
| Iron Creek, Beaver Creek | 6,000 |
| Kadoka, Pass Creek | 12,000 |
| Mystic, Castle Creek | 9,000 |
| Johnson Lake | 4,000 |
| Nugget Creek | 10,000 |
| Rapid Creek | 8,000 |
| Slate Creek | 3,000 |
| Pactola, Lower Deer Creek | 5,000 |
| Spring Creek | 6,000 |
| Pine Ridge, Porcupine Creek | 10,000 |
| Spring Creek | 10,000 |
| Wounded Knee Creek | 10,000 |
| Pluma, Bear Butte Creek | 1,350 |
| Rapid City, Antler Lake | 3,000 |
| Canyon Lake | 4,000 |
| Electric Light Pond | 6,000 |
| Fair Ground Lake | 3,000 |
| Indian School Lake | 1,500 |
| Jim Creek | 9,000 |
| Lime Creek | 7,500 |
| Platt Pond | 6,000 |
| Rapid Creek | 28,375 |
| Slate Creek | 21,000 |
| Spring Creek | 22,500 |
| Rochford, Rapid Creek | 5,700 |
| Rosebud, Rosebud Creek | 14,000 |
| St. Onge, False Bottom Creek | 2,400 |
| Savoy, Bear Creek | 8,000 |
| Beaver Creek | 3,000 |
| Little Spearfish Creek | 7,600 |
| Spearfish Creek | 33,000 |
| Spearfish, Bill Cook Creek | 2,000 |
| Chicken Creek | 5,000 |
| City Creek | 3,000 |
| Coxes Lake Creek | 3,000 |
| Crow Creek | 6,300 |
| Driskill Creek | 1,000 |
| Ernest Branch | 5,000 |
| Hemler Creek | 4,000 |
| Hilton Gulch Creek | 3,000 |
| Hull Creek | 3,000 |
| McGill Creek | 1,000 |
| McGregor Creek | 8,000 |
| Park Creek | 1,000 |
| Pettigrew Creek | 5,000 |
| Ranch Creek | 1,500 |
| Redwater Creek | 13,000 |
| Schmidt Creek | 7,500 |
| Sinking Spring Creek | 1,500 |
| Spearfish Creek and branches | 39,650 |
| Stucco Creek | 5,000 |
| Sunderland Creek | 1,000 |
| South Dakota—Continued. | |
| Spearfish, Toomey Creek | 5,000 |
| Willow Creek | 2,000 |
| Tilford, Elk Creek | 2,000 |
| Tennessee: | |
| Bristol, Rippling Creek | 1,000 |
| Elkmont, Bear Wallow Creek | 2,000 |
| Rough Creek | 3,000 |
| Erwin, State fish commission | *25,000 |
| Hampton, Spring Lake | 1,000 |
| Utah: Richfield, Fish Lake | 4,500 |
| Vermont: | |
| Arlington, Battenkill River | 1,500 |
| Butternut Brook | †5,000 |
| Duck Pond Brook | †5,000 |
| Fayville Brook | 1,000 |
| Roaring Branch | 1,400 |
| Warm Brook | 350 |
| Barre, Imerson Brook | †3,000 |
| Labrador Brook | †5,000 |
| Ladds Brook | †5,000 |
| Lords Brook | †4,000 |
| Smith Brook | †5,000 |
| Spicer Brook | †5,000 |
| Barton, May Brook | †3,000 |
| May Pond | †5,000 |
| Bellows Falls, Parmalee Brook | 1,600 |
| Wright Brook | †5,000 |
| Bennington, Bickford Hollow Brook | 1,000 |
| Dunville Brook | 1,000 |
| Furnace Brook | 1,000 |
| Roaring Branch | 2,000 |
| South Brook | 1,500 |
| Walloomsac River | 2,000 |
| Woodford City Brook | 1,500 |
| Brattleboro, Cold Brook | 200 |
| Moss Hollow Brook | 1,000 |
| Murder Hollow Brook | 1,000 |
| Newton Brook | 1,200 |
| Pleasant Valley Brook | 1,000 |
| Pond Brook | 1,000 |
| Slab Hollow Brook | 1,000 |
| Slate Rock Brook | 1,000 |
| Stickney Brook | 1,000 |
| Town Brook | 1,200 |
| Weatherhead Hollow Brook | 1,000 |
| Whetstone Brook | 1,000 |
| Canaan, Big Averill Lake | 500 |
| Forest Lake | 300 |
| Little Averill Lake | 243 |
| Morrill Brook | 100 |
| Norton Brook | 500 |
| Second Black Branch | 100 |
| Yellow Branch | 100 |
| Cuttingsville, Spring Lake | 600 |
| Danville, Keeser Pond | 500 |
| Mud Pond | 500 |
| East Berkshire, Nelson Pond | 2,000 |
| East Hardwick, Bell Brook | †2,500 |
| Edgewater, Bill Young Brook | †2,000 |
| Kelley Brook | †2,000 |
| Niggerhead Ledge Brook | †3,000 |
| Niggerhead Pond Brook | †5,000 |
| Greensboro, East Greensboro Brook | †2,500 |
| Groton, Darling Pond | †50,000<br>40,000 |
| Hardwick, Abutment Brook | †1,500 |
| Bailey Brook | †1,000 |
| Collier Brook | †2,000 |
| Cooper Brook | †4,000 |
| Currier Brook | †1,000 |
| Eaden Brook | †2,000 |
| Hardwick Brook | 5,600 |
| High Trestle Brook | †3,000 |
| Lamoille River | †5,000 |
| Laundry Brook | †1,000 |
| Norris Brook | †2,000 |
| Paine Brook | †5,000 |
| Porter Brook | †5,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Vermont—Continued. | |
| Hardwick, Stannard Brook | †5,000 |
| Holden, Bassett Brook | †3,500 |
| Chittenden Pond | †10,000 |
| Clover Vale Brook | †5,000 |
| Coburn Brook | †5,000 |
| Eddy-Brewer Brooks | 1,000 |
| Elliott Brook | †5,000 |
| Furnace Brook and Branches | †45,000 |
| | 2,604 |
| Hewitt Brook | †10,000 |
| Lafferts Brook | †10,000 |
| Ore Bed Brook | †5,000 |
| Picnic Brook | †10,0000 |
| Randall Brook | †5,000 |
| Rogers Pond | 1,500 |
| Sand Spring Brook | †5,000 |
| | 1,100 |
| Valley View Brook | †5,000 |
| Hyde Park, Hyde Pond | †3,000 |
| Mud Pond | 500 |
| Johnson, Waterman Branch | 500 |
| Manchester, Battenkill River | 1,000 |
| Cold Spring Brook | †5,000 |
| Mad Tom Brook | †5,000 |
| Manchester Depot, Battenkill River | 1,500 |
| Battenkill River, West Branch | 1,000 |
| Bowen Brook | 1,000 |
| Bowen Brook, North Branch | 400 |
| Lye Brook | 425 |
| Middlebury, Poor Farm Brook | †12,000 |
| Ripton River | †8,000 |
| Steam Mill Brook | †8,000 |
| Morrisville, Billings Brook | †7,000 |
| Bugbee Brook | †2,000 |
| Copper Brook | †3,000 |
| Darling Brook | †3,000 |
| Green River Brook | †6,000 |
| Hatch Brook | †2,000 |
| Hazen Brook | †2,000 |
| McNall Brook | †4,000 |
| Potash Brook | †6,000 |
| Ryder Brook | †6,000 |
| Shippy Brook | †2,000 |
| Terrell Brook | †6,000 |
| New Haven Junction, Dike Brook | †3,000 |
| Hubbard Brook | †4,000 |
| Newport, Black River | †6,000 |
| | 1,500 |
| Buck Brook (A) | †3,000 |
| Buck Brook (B) | †2,000 |
| Center Brook | †4,000 |
| Day Brook | †2,500 |
| Holland Pond | †3,000 |
| | 1,000 |
| Holton Brook | †2,000 |
| Jay Branch | †6,000 |
| Jud Brook | †3,000 |
| Kidder Pond | †5,000 |
| Lang Brook | †5,000 |
| Larabee Brook | †3,000 |
| Orcutt Brook | †2,500 |
| Papenaw Brook | †2,000 |
| Tice Brook | †3,500 |
| Turtle Pond | †5,000 |
| Ware Brook | †3,000 |
| Watson Brook | †2,500 |
| Norton Mills, Averill Brook | 700 |
| Black Branch | 200 |
| Cole Brook | 300 |
| Forest Brook | 200 |
| Little Averill Brook | 200 |
| Nulhegan River | 300 |
| Nulhegan River, East Branch | 300 |
| Number Six Brook | 300 |
| Roaring Brook | 200 |
| Swanson Brook | 300 |
| Northfield, Houston Pond | †2,500 |
| Whetstone Brook | †2,500 |
| North Montpelier, applicant | *25,000 |

| Disposition. | Number. |
|---|---|
| Vermont—Continued. | |
| Norwich, Lake Mitchell | †50,000 |
| Orleans, Dewey Brook | †2,500 |
| Dunham Brook | †3,000 |
| | 400 |
| Dutton Brook | †4,000 |
| | 400 |
| Gallup Brook | †7,000 |
| Hannant Brook | †2,500 |
| | 400 |
| Higgins Brook | 2,500 |
| Hog Trough Brook | †3,000 |
| | 500 |
| Long Pond | †5,000 |
| | 2,000 |
| Matthews Brook | †1,500 |
| | 400 |
| Nigger Pond | 5,000 |
| | 1,500 |
| Parlin Brook | †3,000 |
| Wiggins Brook | 400 |
| Willoughby River | †10,000 |
| | 1,500 |
| Wyman Brook | 5,000 |
| Plainfield, Fifield Brook | †2,000 |
| Gurnsey Brook | †4,000 |
| Kingsbury Branch | †3,000 |
| Winooski River | †8,000 |
| Proctorville, Williams River | †15,000 |
| Randolph, Adams Brook | †4,500 |
| Annis Brook | †2,500 |
| | 120 |
| Bass Brook | †2,000 |
| Bear Hill Brook | †3,000 |
| Blanchard Brook | †2,500 |
| Bowman Brook | †2,500 |
| | 120 |
| Chandler Brook | †5,000 |
| Clough Brook | †3,500 |
| Cushman Brook | †2,500 |
| Fisher Brook | †2,000 |
| Guild Brook | †2,500 |
| | 120 |
| Gulf Brook | †1,000 |
| Holman Brook | †2,500 |
| Howard Hill Brook | †3,500 |
| Mann Brook | †3,000 |
| Meadow Brook | †4,000 |
| | 120 |
| Mud Pond | †5,000 |
| Morse Brook | †1,500 |
| Peth Brook | †4,000 |
| Poverty Lane Brook | †3,500 |
| Riford Brook | †2,500 |
| Roaring Brook | †2,000 |
| Roods Brook | †1,500 |
| Roxbury Brook | †3,500 |
| | 120 |
| Soper Brook | †2,000 |
| Upper Ayers Brook | †3,000 |
| Upper Meadow Brook | †4,000 |
| St. Johnsbury, Bacon Brook | †5,000 |
| | 326 |
| Bennett Brook | 300 |
| Blodgett Brook | 300 |
| Carpenter Brook | †2,000 |
| Cold Brook | †3,000 |
| | 300 |
| Gage Brook (A) | †8,000 |
| | 300 |
| Gage Brook (B) | 300 |
| Hastings Brook | †8,000 |
| Hawkins Brook | †10,000 |
| Hemingway Brook | 300 |
| Joes Brook and tributaries | †25,000 |
| Lawrence Brook | 300 |
| Lyster Brook | 300 |
| Meadow Brook | †5,000 |
| Miles Brook | 300 |
| Parker Brook | †5,000 |
| | 258 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Vermont—Continued. | |
| St. Johnsbury, Pierce Brook | †5,000 |
| | 300 |
| Roberts Brook | †2,000 |
| | 300 |
| Sleepers River | †52,000 |
| Spauldings Brook | †5,000 |
| Sutton Brook | 182 |
| Walter Andrie Brook | †15,000 |
| West Brook | 300 |
| Wright Brook | †3,000 |
| Sharon, Lake Mitchell | †29,000 |
| | 102,250 |
| Sheldon Junction, Adams Pond | †3,500 |
| Bakersfield Branch | †7,000 |
| Bogue Brook | †3,500 |
| Cold Hollow Brook | †6,000 |
| Cramton Trout Brook | †1,000 |
| Ladd Trout Brook | †3,500 |
| McAllister Brook | †3,500 |
| Mineral Spring Brook | †3,500 |
| St. Johns Brook | †1,000 |
| Stoneville Brook | †2,500 |
| South Royalton, Alco Pond | †5,000 |
| South Ryegate, Bailey Pond | †3,000 |
| Long Pond | †12,000 |
| Mud Pond | †6,000 |
| Peach Brook | †7,000 |
| Scott Brook | †5,000 |
| Springfield, Aldrich Brook | †5,000 |
| Commissary Brook | †5,000 |
| Garrett Brook | †10,000 |
| Joe Boss Brook | †5,000 |
| Scrabble Brook | †5,000 |
| West Springfield Brook | †5,000 |
| Sunderland, Lathrop Brook | †5,000 |
| Walden, Lyford Pond | 750 |
| Waterbury, Alder Brook | †2,000 |
| Alder Meadow Brook | †3,000 |
| Barrett Brook | †2,000 |
| Brown Brook | †2,000 |
| Camels Hump Brook | †3,000 |
| Devine Brook | †3,000 |
| Gillette Brook | †2,000 |
| Hayden Hill Brook | †2,000 |
| High Brook | †3,000 |
| Hill Brook | †3,000 |
| Joe Wheeler Brook | †2,000 |
| Melvin Greene Brook | †2,000 |
| Little River | †2,000 |
| Merriam Brook | †2,000 |
| North Fayston Brook | †2,000 |
| Parry Hill Brook | †2,000 |
| Randall Brook | †2,000 |
| Ricker Mountain Brook | †5,000 |
| Ring Brook | †2,000 |
| Roberts Brook | †3,000 |
| Robinson Brook | †2,000 |
| Rood Brook | †2,000 |
| Scrabble Hill Brook | †3,000 |
| Sevene Brook | †3,000 |
| Shaw Brook | †2,000 |
| Spruce Mountain Brook | †2,000 |
| State Farm Brook | †2,000 |
| Stevens Brook | †2,000 |
| Stony Brook | †2,000 |
| Swasey Brook | †2,000 |
| Thatcher Brook | †5,000 |
| Williams Brook | †2,000 |
| Wood Brook | †2,000 |
| Wells River, Club Ponds | †20,765 |
| Halls Brook, branch of | 475 |
| Lang Pond | 950 |
| Maple Pond | 950 |
| Miller Brook Brook | 475 |
| Miller Brook Pond | 950 |
| West Burke, Beaver Brook | †1,000 |
| West Hartford, Rockland Brook | †3,000 |
| Woodland Brook | †2,000 |
| Westminster, Pecks Pond | 400 |

| Disposition. | Number. |
|---|---|
| Vermont—Continued. | |
| Wilmington, Alvord Brook | 500 |
| Beaver Brook | 1,000 |
| Boyd Brook | 1,000 |
| Burr Brook | 1,000 |
| Cold Brook | 1,500 |
| Corse Brook | 500 |
| Graves Brook | 1,000 |
| Haystack Brook | 1,000 |
| Johnson Brook | 500 |
| Meadow Brook | 1,500 |
| Pike Brook | 1,500 |
| Ware Brook | 500 |
| Windsor, Ascutneyville Brook | 600 |
| Bailey Brook | 200 |
| Blood Brook | 800 |
| Felchville Brook | 800 |
| Lull Brook | 200 |
| Mill Brook | 1,200 |
| West Brook | 200 |
| Virginia: | |
| Ashburne, Goose Creek | 160 |
| Barbours Creek, Fall Branch | 500 |
| Big Island, Hunting Creek | 1,000 |
| Goshen, Grattons Run | 1,500 |
| Hunters, Little Difficult Run | 8,000 |
| Marion, Staley Creek | 5,000 |
| Orange, Rose River | 500 |
| Saltpetre, Allens Branch | 640 |
| Staunton, Ramsey Run | 2,100 |
| Straight Creek | 500 |
| Stuarts Draft, Dodge's pond | 600 |
| Washington: | |
| Boyds, Sherwood Creek | 750 |
| Chewelah, Jump off Joe Lake | 5,000 |
| Lind, York Lake | 450 |
| Marcus, Deep Creek Lake | 750 |
| North Yakima, Ahtanum Creek | 5,550 |
| Republic, Copper Lake | 450 |
| Deep Lake | 600 |
| Long Lake | 900 |
| Stevenson, Blue Creek | 20,000 |
| Blue Lakes | 5,000 |
| Spring Creek | 2,000 |
| Tacoma, Golden Lake | 5,000 |
| Lake Ethel | 5,000 |
| Lake James | 5,000 |
| Ranger Creek | 3,000 |
| South Mowich River | 4,000 |
| Spokwash Creek | 3,000 |
| Vancouver, Salmon Creek | 30,000 |
| Wall Walla, Spring Branch | 2,000 |
| West Virginia: | |
| Capon Springs, Capon Run | 3,000 |
| Cass, Cheat River | 1,260 |
| Elkins, Valley River | 500 |
| Horton, Gandy Creek | 800 |
| Midvale, Tygarts River, Middle Fork | 800 |
| Prince, Fat Creek | 500 |
| Rainelle, Big Clear Creek | 4,000 |
| Little Clear Creek | 4,000 |
| Richwood, Cherry River, North Fork | 1,500 |
| Sandstone, Lick Creek | 800 |
| Sewell, Glade Creek | 600 |
| Manns Creek | 500 |
| Slab Fork, Slab Fork Creek | 1,800 |
| Tunnelton, Lick Run | 800 |
| Wisconsin: | |
| Abbotsford, Big Eau Plaine River | 1,200 |
| Parkey Creek | 800 |
| Alma, Beef Valley Creek | 800 |
| Big Waumandee Creek | 800 |
| Johns Valley Creek | 800 |
| Little Waumandee Creek | 800 |
| Norwegian Valley Creek | 800 |
| Trout Valley Creek | 800 |
| Argyle, Apple Branch Creek | 400 |
| Brenna Creek | 800 |
| Bangor, Adams Valley Creek | 2,000 |
| Big Creek | 1,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Bangor, Burns Creek | 2,000 |
| Dutch Creek | 2,000 |
| East Branch | 2,000 |
| Fish Creek | 2,000 |
| Holberg Creek | 1,000 |
| Kalkman Creek | 1,000 |
| Robinson Creek | 3,000 |
| Sand Creek | 2,000 |
| Whites Creek | 1,000 |
| Wilcs Creek | 2,000 |
| Bloomer, Hay Creek | 400 |
| McCanns Creek | 400 |
| Stevens Creek | 400 |
| Upper Duncan Creek | 600 |
| Blue Mounds, Camp Creek | 200 |
| Dolontry Creek | 200 |
| Frames Creek | 200 |
| Garfoot Creek | 200 |
| Ryans Creek | 200 |
| Topper Creek | 200 |
| Walnut Hollow Creek | 200 |
| Cashton, Aarnes Creek | 1,000 |
| Baglien Creek | 1,000 |
| Timber Coulie Creek | 1,000 |
| Chippewa Falls, Little Dry Wood Creek | 600 |
| Paint Creek | 1,000 |
| Stilson Creek | 600 |
| Cylon, Hutton Creek | 4,000 |
| Spring Creek | 2,000 |
| Willow, River, South Fork | 2,000 |
| Deer Park, Willow River, South Fork | 5,000 |
| Dodgeville, Berg Creek | 200 |
| Berryman Creek | 200 |
| Davis Creek | 200 |
| Flint Creek | 200 |
| Fox Hollow Creek | 200 |
| Harker Creek | 200 |
| Lores Creek | 200 |
| Mendt Creek | 200 |
| Symons Branch | 200 |
| Wedlake Creek | 200 |
| Yager Creek | 200 |
| Eau Claire, Alder Creek | 200 |
| Balsam Creek | 200 |
| Beaver Creek, North Fork | 200 |
| Clear Creek | 200 |
| Cress Creek | 200 |
| Dean Creek | 200 |
| Five Mile Creek | 200 |
| Graham Creek | 200 |
| Hansen Creek | 200 |
| Hay Creek | 200 |
| Jackson Creek | 200 |
| Little Rock Creek | 200 |
| Louis Creek | 400 |
| Minnow Creek | 200 |
| Nine Mile Creek | 400 |
| North Creek | 200 |
| Pine Creek | 200 |
| Rock Creek | 400 |
| Sandy Creek | 200 |
| Sherman Creek | 400 |
| Spring Creek | 200 |
| Stone Creek | 200 |
| Thorson Creek | 200 |
| Trout Creek | 400 |
| Wrights Creek | 400 |
| Eleva, Adams Creek | 200 |
| Anderson Creek | 200 |
| Bennett Valley Creek | 400 |
| Big Creek | 400 |
| Bollinger Creek | 200 |
| Haakens Valley Creek | 200 |
| Hoven Creek | 200 |
| Lindsey Creek | 200 |
| Rosman Creek | 200 |
| Serum Creek | 200 |
| Trout Creek | 200 |

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Elmwood, Cave Creek | 800 |
| Mosouri Creek | 800 |
| Mosouri Creek, South Fork | 400 |
| Plum Creek | 1,000 |
| Plum Creek, East Fork | 400 |
| Porter Creek | 400 |
| Fountain City, Bohris Valley Creek | 800 |
| Cooks Valley Creek | 800 |
| Eagle Valley Creek | 800 |
| Freid Valley Creek | 800 |
| Glencoe Valley Creek | 800 |
| Mentor Valley Creek | 800 |
| Pipers Valley Creek | 800 |
| Schaffner Valley Creek | 800 |
| Schneider Valley Creek | 800 |
| Schultz Valley Creek | 800 |
| Galesville, Bear Creek | 1,000 |
| Beaver Creek, North Fork | 2,000 |
| Beaver Creek, South Fork | 2,000 |
| Big Tamarack Creek | 2,000 |
| Corrigan Creek | 1,000 |
| Fox Cooley Creek | 1,000 |
| French Creek | 2,000 |
| Grants Creek | 1,000 |
| Hardies Creek | 1,000 |
| Norway Cooley Creek | 1,000 |
| Oakum Cooley Creek | 1,000 |
| Silver Creek | 1,000 |
| Hayward, Hannili Creek | 2,000 |
| Hayward Creek | 2,000 |
| Meadow Creek | 2,000 |
| Potato Creek | 2,000 |
| Hudson, Green Race Creek | 1,000 |
| Willow River | 4,000 |
| Koshkonong, Spring Creek | 400 |
| La Crosse, Chipmunk Cooley Creek | 4,000 |
| Coon River, North Branch | 4,300 |
| Troutdale Creek | 3,000 |
| Mellen, Camp Four Creek | †2,000 |
| Camp Ten Creek | †2,000 |
| Camp Twenty-Three Creek | †2,000 |
| Devils Creek | †3,000 |
| Little Beaver Creek | †2,000 |
| McCartier Creek | †1,000 |
| Montreal Creek | †3,000 |
| Mosquito Creek | †2,000 |
| Skunk Creek | †3,000 |
| Snake Creek | †2,000 |
| Mondovi, Armor Creek | 200 |
| Brown Creek | 200 |
| Carrol Creek | 400 |
| Harvey Creek | 200 |
| Dutch Creek | 200 |
| Fifteen Creek | 200 |
| Ford Creek | 400 |
| Merriett Creek | 200 |
| Rossman Creek | 200 |
| Whelan Creek | 400 |
| Muscoda, Bloyer Branch | 200 |
| Bohn Branch | 200 |
| Coen Branch | 200 |
| Elston Trout Pond | 400 |
| Hoosier Creek | 200 |
| Indian Creek | 200 |
| Jones Branch | 200 |
| Lempke Branch | 200 |
| Ludwig Branch | 200 |
| Sand Branch | 200 |
| Shemaks Creek | 800 |
| Six-Mile Branch | 600 |
| Studnickka Branch | 200 |
| New Auburn, Beaver Creek | 400 |
| Hay Creek | 400 |
| Sand Creek | 400 |
| Norwalk, Bergman Creek | 1,600 |
| Brieske Creek | 800 |
| Brunner Creek | 800 |
| Cook Creek | 2,400 |
| Cramer Creek | 800 |
| Drier Creek | 800 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Norwalk, Hertzberg Creek | 1,600 |
| Hulls Valley Creek | 800 |
| Mitchell Creek | 800 |
| Nolan Creek | 800 |
| Seekamp Creek | 800 |
| Spring Valley Creek | 1,600 |
| Stecker Creek | 800 |
| Sullivan Creek | 1,600 |
| Summit Creek | 800 |
| Walz Creek | 800 |
| Owens, Meadow Creek | 400 |
| Meeks Creek | 400 |
| Mangus Creek | 400 |
| Rock Creek | 400 |
| Skinner Creek | 400 |
| Park Falls, Camp Creek | †2,000 |
| Clear Creek | †2,000 |
| Grinsell Creek | †2,000 |
| Murray Creek | †1,000 |
| Pinkerton Creek | †1,000 |
| Rapid Creek | †2,000 |
| Rice Lake, Cobb Creek | 3,000 |
| Long Lake Creek | 2,000 |
| Tuscobia Creek | 2,000 |
| River Falls, Kinnickinick River | 6,000 |
| Salmo, Bark Creek | †2,000 |
| Brickyard Creek | †1,000 |
| Lost Creek | †2,000 |
| Onion Creek | †1,000 |
| Pikes Creek | †1,000 |
| Racket River | †1,000 |
| Ravine Park Creek | †1,000 |
| Sand River | †2,000 |
| Siskiwit Creek | †2,000 |
| Spring Creek | †1,000 |
| Sauk City, Bear Creek | 600 |
| Blumes Creek | 200 |
| Boyles Creek | 200 |
| Denzer Creek | 200 |
| Dunlap Creek | 200 |
| Honey Creek | 1,400 |
| Leland Creek | 200 |
| Otter Creek | 600 |
| Sparta, Angelo Creek | 1,000 |
| Angelo Pond | 1,000 |
| Ash Creek | 1,000 |
| Bailey Creek | 1,000 |
| Beaver Creek | 2,000 |
| Benson Creek | 1,000 |
| Big Creek | 2,000 |
| Big Creek Pond | 1,000 |
| Bruder Creek | 1,000 |
| Bush Creek | 1,000 |
| Farmer Valley Creek | 1,000 |
| Farr Creek | 1,000 |
| La Crosse Creek | 1,000 |
| Little Creek | 1,000 |
| Little Bailey Creek | 1,000 |
| Little Busby Creek | 1,000 |
| Little La Crosse Creek | 1,000 |
| Little Range Creek | 1,000 |
| Little Silver Creek | 1,000 |
| Little Swamp Creek | 1,000 |
| Morse Creek | 1,000 |
| Pauls Valley Creek | 1,000 |
| Sand Creek | 1,000 |
| Sias Creek | 1,000 |
| Silver Creek | 1,000 |
| Smith Creek | 1,000 |
| Soper Creek | 1,000 |
| South Big Creek | 1,000 |
| Sparta Creek | 1,000 |
| Swamp Creek | 1,000 |
| Tar Creek | 4,000 |
| Thorbies Creek | 1,000 |
| Welch Creek | 1,000 |
| Spring Brook, Godfrey Creek | 3,000 |
| Little Creek | 2,000 |
| Spring Green, Jones Creek | 400 |
| Sugar Grove Creek | 400 |
| Wilson Creek | 800 |
| Stanley, Scovin Creek | 600 |
| Trempealeau, Beaver Creek | 1,000 |
| Crystal Creek | 1,000 |
| Dutch Creek | 1,000 |
| Fox Cooley Creek | 1,000 |
| French Creek | 1,000 |
| Holcomb Cooley Creek | 1,000 |
| Little Tamarack Creek | 1,000 |
| Norwegian Valley Creek | 1,000 |
| Pine Creek | 1,000 |
| Tamarack Creek | 1,000 |
| Turtle Lake, Beaver Creek | 3,000 |
| Hay River | 4,000 |
| Lightning Creek | 2,000 |
| Silver Creek | 1,000 |
| Smith Creek | 2,000 |
| Turtle Creek | 3,000 |
| Waukesha, Baldwin Creek | 200 |
| Bidwell Creek | 400 |
| Blackwell Creek | 200 |
| Chamberlain Creek | 200 |
| Coleton Creek | 200 |
| Cramer Creek | 200 |
| Eagle Creek | 200 |
| Garrett Creek | 200 |
| Genesee Creek | 200 |
| Holcolm Creek | 200 |
| Jones Creek | 200 |
| Keppen Creek | 200 |
| Loves Creek | 200 |
| Minick Creek | 200 |
| Price Creek | 200 |
| Sailsville Creek | 200 |
| Scuppernong Creek | 200 |
| Thomas Creek | 200 |
| Waterville Creek | 200 |
| Wilkinson Creek | 200 |
| Williams Creek | 200 |
| Wrights Creek | 200 |
| Westby, Bad Ax Creek | 1,000 |
| Berge Creek | 1,000 |
| Carlson Creek | 1,000 |
| Clackmaker Creek | 1,000 |
| Debing Creek | 1,000 |
| Hall Creek | 1,000 |
| Hanson Creek | 1,000 |
| Holte Creek | 1,000 |
| Jenson Creek | 1,000 |
| Knapp Creek | 1,000 |
| Larson Creek | 1,000 |
| Nelson Creek | 1,000 |
| Olum Creek | 1,000 |
| Olum Spring Creek | 1,000 |
| Olsen Creek | 1,000 |
| Overhagen Creek | 1,000 |
| Pederson Creek | 1,000 |
| Peterson Creek | 1,000 |
| Seas Creek | 1,000 |
| Sherve Creek | 1,000 |
| Skaug Creek | 1,000 |
| Skorsmoen Creek | 1,000 |
| Steenson Creek | 1,000 |
| Swenson Creek | 1,000 |
| Twin Bluff Creek | 1,000 |
| Wilton, Gerkes Creek | 1,600 |
| Lenahamis Creek | 800 |
| Noths Creek | 2,400 |
| Wyoming: | |
| Basin, Solitude Lake | 1,600 |
| Beulah, Sand Creek | 9,000 |
| Spring Creek | 2,000 |
| Clearmont, Clear Creek, Middle Fork | 1,200 |
| Clear Creek, North Fork | 1,200 |
| Cody, Aldrich Creek | 1,200 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

BROOK TROUT—Continued.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Wyoming—Continued. | | Wyoming—Continued. | |
| Cody, Bear Creek | 1,200 | Laramie, Rock Creek | 34,000 |
| Bellknap Creek | 1,600 | Simpson Creek | 15,000 |
| Bobcat Creek | 1,200 | Lusk, Clark-Metzger Lake | 1,500 |
| Bowlder Creek | 1,600 | Rawhide Creek | 1,500 |
| Bull Creek | 1,600 | Meads Siding, Pass Creek | 18,000 |
| Cabin Creek | 1,200 | Newcastle, Bear Creek | 3,000 |
| Clear Water Creek | 1,200 | Beaver Creek | 10,500 |
| East Fork Creek | 1,600 | Spring Creek | 3,000 |
| Gooseberry Creek | 1,600 | Stockade Beaver Creek | 31,500 |
| Grinnell Creek | 1,200 | Upper Beaver Creek | 4,200 |
| Hardpan Creek | 1,600 | Parkman, Lake Creek | 1,800 |
| Holly Creek | 800 | Lick Creek | 1,800 |
| Jack Creek | 1,600 | Little Horn River, North Fork | 900 |
| Jordan Creek | 2,000 | Ranchester, Black Canon Creek | 5,000 |
| Little Rocky Creek | 1,200 | Little Tongue River | 12,000 |
| Morrison Fork Creek | 1,600 | McLaughlin Creek | 3,000 |
| Moss Creek | 1,200 | Red Canon Creek | 2,000 |
| Newton Creek | 1,200 | Sucker Creek | 5,000 |
| Post Creek | 1,200 | Tongue River, South Fork | 1,500 |
| Rattlesnake Creek | 1,600 | Wolf Creek | 38,000 |
| Red Creek | 1,600 | Riverton, Big Wind River | 3,000 |
| Rock Creek | 1,600 | DuNoir River | 3,000 |
| Sage Creek | 2,800 | Rock River, Boylan Lake | 10,000 |
| Trout Creek | 1,200 | Rock Springs, Sweeney Creek | 3,000 |
| Valley Spring Creek | 800 | Saratoga, Araster Lake | 20,000 |
| Encampment, Encampment Creek | 15,000 | Bow Lake | 20,000 |
| Grand Encampment Creek | 20,000 | Cedar Creek | 20,000 |
| Evanston, Snowden's pond | 2,900 | Cow Creek | 20,000 |
| Fox Park, Pinedale Pond | 16,000 | Dipper Lake | 15,000 |
| Greybull, Shell Creek | 2,000 | Jacks Creek | 70,000 |
| Laner, Baldwin Creek | 6,000 | North Platte River | 25,000 |
| Beaver Creek | 3,000 | Rose Creek | 15,000 |
| Blue Hole Creek | 1,400 | Section Lake No. 9 | 10,000 |
| Buffalo Creek | 3,500 | Spring Creek | 100,000 |
| Crooks Creek | 1,750 | Twin Lakes | 20,000 |
| Dickinson Creek | 3,000 | Sheridan, Beaverdam Lake | 2,400 |
| Little Popo Agie River | 3,000 | Little Goose Lake | 3,000 |
| Little Popo Agie River, North Fork | 3,000 | Little Rapid Creek | 4,800 |
| Long Creek | 3,500 | P. K. Lake | 8,000 |
| McKinney Creek | 1,500 | Rapid Creek | 9,600 |
| Pacific Creek | 3,500 | Soldier Creek | 5,700 |
| Popo Agie River | 6,000 | Soldier Creek Lake | 2,400 |
| Popo Agie River, Middle Fork | 3,000 | Spear's pond | 1,500 |
| Rock Creek | 3,000 | Sundance, Houston Creek | 10,000 |
| Squaw Creek | 3,000 | | |
| Laramie, Bear Creek | 26,000 | Total [a] | *878,175<br>†3,876,265<br>7,882,668 |

SUNAPEE TROUT.

| | |
|---|---|
| Vermont: | |
| Brattleboro, South Pond | 7,372 |

SMELT.

| | |
|---|---|
| Maine: Otis, Green Lake | †304,750 |
| New York: Willsboro, Warm Pond | †914,000 |
| Total | †1,218,750 |

PIKE AND PICKEREL.

| | | | |
|---|---|---|---|
| Arkansas: | | Illinois—Continued. | |
| Black Rock, Black River | [b] 226 | Blanding, Mississippi River | [b] 1,000 |
| Browns Lake, Black River | [b] 18 | Freeport, waters of Illinois | 360 |
| Manson, Black River | [b] 915 | Galena Junction, Mississippi River | [b] 1,700 |
| Illinois: | | Hanover, Mississippi River | [b] 1,046 |
| Apple River, Apple River, North Branch | 38 | Lena, Mammosser Lake | 20 |
| | | New Boston, Mississippi River | [b] 219 |

[a] Exclusive of 79,200 fry and 62,000 fingerlings lost in transit.
[b] Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

PIKE AND PICKEREL—Continued.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Illinois—Continued. | | Minnesota: | |
| Nora, Apple River, East Branch | 18 | Homer, Mississippi River | a 46,266 |
| Scales Mound, Mill Creek | 20 | Lake Pepin, Mississippi River | a 260 |
| Warren, Apple River, East Branch | 112 | Red Wing, Mississippi River | a 235 |
| Iowa: | | Wisconsin: | |
| Bellevue, Mississippi River | a 7,648 | Bagley, Mississippi River | a 75 |
| Clayton, Mississippi River | a 250 | Bay City, Mississippi River | a 40 |
| Fairport, Mississippi River | a 301 | Genoa, Mississippi River | a 1,100 |
| Green Island, Mississippi River | a 19,560 | Glenhaven, Mississippi River | a 100 |
| Guttenburg, Mississippi River | a 50 | La Crosse, Mississippi River | a 16,505 |
| Iowa Falls, Iowa River | 190 | Prairie du Chien, Mississippi River | a 1,200 |
| Manchester, Maquoketa River | 90 | Woodyard, Mississippi River | a 800 |
| North McGregor, Mississippi River | a 4,195 | Wyalusing, Mississippi River | a 750 |
| Pleasant Creek, Mississippi River | a 100 | | |
| Quarry, Iowa River | 126 | Total | 106,408 |
| Sny Magill, Mississippi River | a 875 | | |

FRESH-WATER DRUM.

| | | | |
|---|---|---|---|
| Illinois: | | Iowa—Continued. | |
| Blanding, Mississippi River | a 31 | Sny Magill, Mississippi River | a 11,000 |
| Galena Junction, Mississippi River | a 85 | Louisiana: | |
| Hanover, Mississippi River | a 22 | Atchafalaya, Mississippi River | a 3,175 |
| Meredosia, Illinois River | a 16,200 | Wisconsin: | |
| New Boston, Mississippi River | a 726 | Genoa, Mississippi River | a 100 |
| Iowa: | | Glenhaven, Mississippi River | a 30,000 |
| Bellevue, Mississippi River | a 937 | La Crosse, Mississippi River | a 1,150 |
| Clayton, Mississippi River | a 5,000 | | |
| Fairport, Mississippi River | a 47 | Total | 83,473 |
| Guttenburg, Mississippi River | a 15,000 | | |

CRAPPIE.

| | | | |
|---|---|---|---|
| Alabama: | | Connecticut: | |
| Athens, Anderson Creek | 90 | East Haddam, Joshua Pond | 1,500 |
| First Creek | 135 | Winsted, Laurel Heath Lake | 200 |
| Birmingham, Scott Branch Pond | 300 | Delaware: Delaware City, Scotch Lake | 600 |
| Blanche, Yellow Creek | 75 | Georgia: | |
| Bristow, Spring Creek | 75 | Cave Springs, Woodstock Lake | 90 |
| Guin, Ford's mill pond | 350 | Dewyrose, Beaverdam Pond | 50 |
| Hartford, Choctawhatchie River | 385 | Forestville, Elner Lake | 180 |
| Hurricane Creek | 75 | Maysville, Martin's pond | 25 |
| Helena, Lake Zuldonia | 300 | Raymond, Raymond Lake | 230 |
| Jemison, Cobb's pond | 300 | Rome, Hillcrest Lake | 360 |
| La Pine, Ensor's pond | 50 | Illinois: | |
| Letohatchie, Dickson's pond | 125 | Apple River, Apple River, North Branch | 200 |
| Loop, North Spring Creek | 75 | Belleville, Fern Glen Lake | 750 |
| Luverne, Kendrick & Ruff Pond | 50 | Glendale Lake | 600 |
| Minooka, Watson Creek | 300 | Brighton, Northern Star | 450 |
| Mobile, Junction Pond | 105 | Freeport, Waters of Illinois | 20,350 |
| Newton, Atkinson's pond | 90 | Galena Junction, Mississippi River | a 4,000 |
| Pleasant Gap, Frog Creek | 75 | Hanover, Mississippi River | a 14,500 |
| Hurricane Creek | 75 | Lena, Mammooser Lake | 300 |
| Prattville, Cotton Mill Pond | 75 | Meredosia, Illinois River | a 83,075 |
| Goodson Pond | 75 | New Boston, Mississippi River | a 61,487 |
| Arkansas: | | Panama, Clover Leaf Lake | 300 |
| Bellefonte, Crooked Creek | 160 | Scales Mound, Mill Creek | 200 |
| Phifer's pond | 70 | Warren, Apple River, East Branch | 800 |
| Black Rock, Black River | a 2,210 | Waterloo, Bollinger's pond | 750 |
| Browns Lake, Black River | a 1,245 | Indiana: | |
| Crossett, North Lake | 95 | Culver, Lake Maxinkuckee | 600 |
| Fayetteville, Mirror Lake | 105 | Edinburg, Sugar Creek | 225 |
| Harrison, Crooked Creek | 130 | Indianapolis, Sugar Creek | 600 |
| Hot Springs, Fordyce's pond | 120 | Lena, Blue Pond | 75 |
| Gulpha Pond | 120 | New Albany, Creeks of Floyd County | 700 |
| Little Rock, Spring Lake | 200 | Perrysville, Volkel's pond | 200 |
| Manson, Black River | a 6,730 | Richmond, Crescent Lake | 600 |
| Monticello, Hillcrest Pond | 120 | Sellersburg, Belknap Lake | 825 |
| Rogers, Meadow Pond | 70 | Worthington, Eel River | 225 |
| St. Joe, Blackberry Pond | 70 | Iowa: | |
| Cedar Pond | 65 | Bellevue, Mississippi River | a 562,125 |
| Colorado: | | Cincinnati, Euwer's pond | 200 |
| Lamar, Two Buttes Lake | 500 | Clayton, Mississippi River | a 2,135 |
| Las Animas, Adobe Creek Lake | 500 | Cresco, Turkey River | 50 |
| Wray, Robbs Lake | 200 | | |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

CRAPPIE—Continued.

| Disposition. | Number. |
|---|---|
| Iowa—Continued. | |
| Earlville, Penn Creek | 400 |
| Fairport, Mississippi River | a 82,375 |
| Green Island, Mississippi River | a 17,000 |
| Guttenburg, Mississippi River | a 5,100 |
| Iowa Falls, Iowa River | 2,550 |
| McClellan, Glen Pond | 150 |
| Manchester, Maquoketa River | 3,850 |
| North McGregor, Mississippi River | a 152,550 |
| Perry, Raccoon River | 1,200 |
| Quarry, Iowa River | 3,000 |
| Soy Magill, Mississippi River | a 25,000 |
| Kansas: | |
| Edwardsville, Cement Lake | 300 |
| Lake of the Forest | 400 |
| Mission Creek | 200 |
| Fort Scott, Sheeler Lake | 400 |
| Kansas City, Forest Lake | 300 |
| Topeka, Deer Creek | 250 |
| Wakarusa Creek | 200 |
| Kentucky: | |
| Catawba, Berger's pond | 100 |
| Chilesburg, Graves's pond | 100 |
| Franklin, Douglas Pond | 75 |
| Lewis Pond | 75 |
| Fredonia, Young's pond | 150 |
| Georgetown, Elkhorn River | 300 |
| Hall's pond (A) | 100 |
| Hall's pond (B) | 100 |
| Hawesville, Indian Lake | 300 |
| Hopkinsville, Little River | 500 |
| Lancaster, Bratton's pond | 100 |
| Lawrenceburg, Carroll's pond | 200 |
| Giffy's pond | 100 |
| J. C. Lake | 100 |
| Lake Mary Elizabeth | 200 |
| Wash's pond | 100 |
| Lexington, Lake View Pond | 200 |
| Louisville, Hikes Pond | 100 |
| Lake Lansdowne | 825 |
| Parkview Lake | 200 |
| Mayfield, Grant's pond | 75 |
| Paris, Lindsay Pond | 200 |
| Big Sandy River, Russell Fork | 300 |
| Riceville, Fish Hook Pond | 100 |
| Shelby, Big Sandy River | 300 |
| Shelbyville, Hoke's pond | 100 |
| Vandyke's pond | 100 |
| Sherman, Smith's pond | 100 |
| Versailles, Fox Spring Lake | 200 |
| Newman's pond | 100 |
| Waddy, Martin's pond | 100 |
| Whitesburg, North Fork Lake | 200 |
| Winchester, Carroll's pond | 100 |
| Duvall's pond | 100 |
| Louisiana: | |
| Baton Rouge, Amite River | a 500 |
| Mississippi River | a 27,900 |
| University Lake | a 2,200 |
| Church Point, Dangereau's pond | 50 |
| Guidry's pond | 25 |
| Natchitoches, Cane River Lake | 500 |
| Norwood, Pepper Pond | 150 |
| Ramsay, Lake Catalpa | 50 |
| Rayville, Clear Lake | 200 |
| South Mansfield, Sweet Bay Pond | 50 |
| Winnfield, Crawford Pond | 25 |
| Maryland: | |
| Baltimore, State ponds | 200 |
| Charlotte Hall, Spring Dale Pond | 100 |
| Massachusetts: | |
| Lynn, Lower Pond | 400 |
| Montville, Sandisfield Lake | 100 |
| Michigan: | |
| Barron Lake, Barron Lake | 200 |
| Crystal Falls, Anderson Lake | 150 |
| Fortune Lake | 300 |
| Gaylord, Dry Dam Ranch Lakes | 200 |
| Michigan—Continued. | |
| Holton, Acker Lake | 200 |
| Hemlock Lake | 200 |
| Horseshoe Lake | 200 |
| Jackson, Wolf Lake | 300 |
| Mandan, Beaver Lake | 150 |
| Orion, Lake Orion | 500 |
| Twin Lake, North Lake | 200 |
| West Lake | 200 |
| Minnesota: | |
| Homer, Mississippi River | a 1,206,845 |
| Mentor, Maple Lake | 800 |
| Odessa, Abelone Johnson Lake | 400 |
| Red Wing, Mississippi River | a 9,425 |
| Rochester, Mill Pond | 630 |
| Virginia, Sand Lake | 1,200 |
| Mississippi: | |
| Amory, Cullens's pond | 300 |
| Booneville, Cochran's lake | 100 |
| Cedar Bluff, Peden's pond | 90 |
| Clinton, Johnston's pond | 120 |
| Lake Wilson | 200 |
| Corinth, Clear Lake | 50 |
| Crystal Springs, Palmer's pond | 50 |
| Friar Point, Moon Lake | 220 |
| Gulf Port, Lakeview Pond | 50 |
| Tuxechena Creek | 105 |
| Wolf River | 105 |
| Hamburg, Fisher's pond | 250 |
| Hazlehurst, Plantation Lake | 50 |
| Jackson, Bailey Lake | 125 |
| Warner's pond | 155 |
| Long Beach, Sunnybrook Pond | 50 |
| Louisville, Steves Pond | 60 |
| McCool, Stevenson's pond | 150 |
| Mantee, Valley Pond | 50 |
| Mathiston, Pinnix's pond | 50 |
| Meridian, Queen City Club Pond | 140 |
| South Lake | 70 |
| Waterworks Lake | 175 |
| Natchez, Vaughan's pond | 250 |
| Pachuta, Morgan Lake | 105 |
| Port Gibson, Magnolia Pond | 100 |
| Rienzi, Michael Lake | 100 |
| Ecooba, Trammell's pond | 120 |
| Shuqualak, Rogers Pond | 120 |
| Starkville, Bunton's pond | 90 |
| Reynolds Lake (A) | 60 |
| Reynolds Lake (B) | 60 |
| Saunders Pond | 90 |
| Steens, Taggart Branch | 60 |
| Stratton, Willow Pond | 60 |
| Terry, Jones's pond | 310 |
| Tillman, Sedgeland Pond | 155 |
| Waynesboro, Cochran's pond | 250 |
| Wheelers, Bennet's lake | 50 |
| Woodville, Roland Pond | 125 |
| Missouri: | |
| Aurora, Flat Creek | 500 |
| Blackburn, Logsdon's pond | 100 |
| Columbia, Brushwood Lake | 300 |
| Diamond, Cedar Lake | 300 |
| Gashland, Eaden Lake | 100 |
| Horine, Country Club Lake | 1,050 |
| Kansas City, Silver Lake | 300 |
| Swope Park Lake | 100 |
| Liberty, Pryor Lake | 400 |
| Neosho, Indian Creek | 500 |
| Odessa, Lake Vinita | 400 |
| Phillipsburg, Bateman's pond | 200 |
| Pleasant Hill, Lake Leonard | 600 |
| Quail, Lancaster Lake | 300 |
| Rocheport, Chinn Lake | 300 |
| St. Louis, Poupennys Pond | 1,050 |
| Slater, Ellwood Lake | 100 |
| Springfield, Ouichita Lakes | 400 |
| Nebraska: Sutton, Pleasant View Pond | 30 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

CRAPPIE—Continued.

| Disposition. | Number. |
|---|---|
| New Jersey: | |
| Burlington, Delaware River | 450 |
| Morris Plains, Hospital Ponds | 500 |
| Penns Grove, Layton Lake | 450 |
| New Mexico: Estancia, Cox's pond | 375 |
| New York: | |
| Altamont, Warner Lake | 300 |
| Clayton, St. Lawrence River | 100 |
| Greene, Echo Lake | 100 |
| Jewettville, Reuther Pond | 100 |
| Lockport, Red Creek | 200 |
| Mount Marion, Highwood Pond | 100 |
| Newburgh, Orange Lake | 100 |
| Stittville, Lawton's pond | 100 |
| Tivoli, Livingston's pond | 100 |
| Troy, Snyder Lake | 500 |
| North Dakota: | |
| Binford, Red Willow Lake | 500 |
| Lisbon, Sheyenne River | 500 |
| Petrel, Lemmon Lake | 500 |
| St. John, Lakes of Rolette County | 1,600 |
| Ohio: | |
| Lake View, Indian Lake | 200 |
| Newton Falls, Milton Lake | 800 |
| Sayre, San Toy Lake | 200 |
| Oklahoma: | |
| Ada, Bird Mill Creek | 150 |
| Country Club Lake | 150 |
| Jack Fork Creek | 225 |
| Sandy Creek | 150 |
| Anadarko, Sunnyside Pond | 150 |
| Ardmore, Ardmore Lake | 200 |
| Hyden's pond | 100 |
| Lone Grove Lake | 100 |
| Pennington Creek | 100 |
| Rod and Gun Club Lake | 300 |
| Simpson Lake | 100 |
| Three-mile Creek | 100 |
| Whitehurst's pond | 100 |
| Byars, Railroad Pond | 100 |
| Sunnybrook Pond | 100 |
| Crowder, Lake Octapocta | 150 |
| Mountain Lake | 150 |
| Depew, Bennett Lake | 75 |
| Eufaula, Mirror Lake | 75 |
| Featherstone, Cunningham's pond | 75 |
| Elm Farm Pond | 75 |
| Gage, Buzzard Roost Pond | 300 |
| Gotebo, Hinton's pond | 150 |
| Guthrie, Farm Pond (A) | 100 |
| Farm Pond (B) | 100 |
| Woodland Lake | 100 |
| Hickory, Armstrong Lake | 150 |
| Big Blue Creek | 225 |
| Blue Creek | 150 |
| Lake Winona | 75 |
| Hugo, Outing Lake | 350 |
| Roebuck Lake | 300 |
| Upton Lake | 275 |
| Kingfisher, Glade End Pond | 150 |
| Krebs, Manitou Lake | 75 |
| Lookeba, Willow Lake | 150 |
| McAlester, Lake Talawanda | 300 |
| Mangum, Caldwell's pond | 100 |
| Moss Spring Pond | 300 |
| Sells's pond | 100 |
| Medford, Lew Weld Pond | 150 |
| School Land Pond | 150 |
| Tennant's pond | 300 |
| Moore, Cowan's pond | 100 |
| Mooreland, Crystal Lake | 200 |
| Willow Springs Lake | 100 |
| Mountain View, Big Sandy Creek | 150 |
| Foutch's pond | 300 |
| Haley's lake | 300 |
| Jones Lake | 300 |
| Magness Lake | 300 |
| Vankirk Lake | 300 |
| Washita River | 300 |
| Wynn Creek | 300 |
| Oklahoma—Continued. | |
| Oklahoma City, Lake Oliver | 100 |
| New Country Club Lake | 100 |
| Oak Lake | 100 |
| Old Country Club Lake | 100 |
| Pauls Valley, Roquemore's pond | 100 |
| Pawhuska, Birch Creek | 450 |
| Cedar Creek | 150 |
| Clear Creek | 150 |
| Gray Horse Creek | 150 |
| North Bird Creek | 225 |
| Rock Creek | 150 |
| Sand Creek | 450 |
| Perry, Country Club Lake | 100 |
| Dixon's pond | 100 |
| Dolezal's pond | 100 |
| Doyle's pond | 75 |
| Enright's pond | 100 |
| Hoover's pond | 75 |
| Johnson's pond | 100 |
| King's pond | 75 |
| Lawrence's pond | 100 |
| McDaniel's pond | 100 |
| Pagel's pond | 100 |
| Pennington's pond | 75 |
| Robinson's pond | 100 |
| Sykora Pond | 100 |
| Wollard Lake | 100 |
| Young's ponds | 100 |
| Pittsburg, Lake Austin | 300 |
| Pond Creek, Buffalow's pond | 300 |
| La Force's pond | 150 |
| McClelland Lake | 150 |
| Seifert's pond | 300 |
| Purcell, Bandy's ponds | 300 |
| Bourquin's pond | 100 |
| Crawford's ponds | 200 |
| Kirk's pond | 100 |
| Rackley's pond | 100 |
| Wantland's pond | 100 |
| Quinton, Starr Lake | 150 |
| Red Rock, Swallow's pond | 100 |
| Rosedale, Bryant's pond | 100 |
| Miser's pond | 100 |
| Sapulpa, Henry's pond | 150 |
| King's pond | 75 |
| Meyer's pond | 150 |
| Sharon, Healey Lake | 200 |
| Stillwater, Karentz's pond | 150 |
| Kerntke's pond | 150 |
| Supply, Irwin's pond | 200 |
| Thackerville, Blue Lake | 100 |
| Tulsa, Schenfield Ponds | 450 |
| Union City, Knapp's pond | 150 |
| Vici, South Persimmon Pond | 100 |
| Welch, Cow Creek | 150 |
| Weleetka, Crystal Lake | 150 |
| Woodward, Appleget Lake | 100 |
| Beatte Lake | 100 |
| Bubb Lake | 100 |
| Cline Lake | 100 |
| Elm Lake | 100 |
| Hopkins Lake | 100 |
| Kline Lake | 100 |
| Larkin Lake | 100 |
| Sand Lake | 100 |
| Stiller Lake | 100 |
| Swarts Lake | 100 |
| Turnbull Lake | 100 |
| Wegner Lake | 100 |
| Willow Lake | 100 |
| Workman Lake | 100 |
| Zahman Lake | 100 |
| Pennsylvania: | |
| Altoona, Juniata River | 800 |
| Williamsport, Loyalsock Creek | 300 |
| Wyalusing, Susquehanna River | 1,500 |
| South Dakota: | |
| Hartford, Wall Lake | 400 |
| Huron, Lake Byron | 500 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

CRAPPIE—Continued.

| Disposition. | Number. |
|---|---|
| South Dakota—Continued. | |
| Sioux Falls, Lake Simpson | 1,200 |
| Sioux City, Waters of South Dakota | 2,200 |
| Volga, Lake Tatonkaha | 400 |
| Tennessee: | |
| Atoka, Glen Spring Lake | 175 |
| McRee's pond | 75 |
| Templeton's pond | 150 |
| Brighton, Sunnyside Lake | 100 |
| Franklin, Murphy Fork Creek | 150 |
| Gallatin, Hogin's pond | 60 |
| Halls, Tucker's pond | 50 |
| Henning, Sanford's pond | 50 |
| Huntingdon, Dill's pond | 50 |
| Kerrville, Miller's pond | 50 |
| Manchester, Garrett Mill Pond | 375 |
| Murfressboro, Hickory Grove Pond | 75 |
| Nashville, Little Harpeth River | 240 |
| Springfield, Sycamore Creek | 175 |
| Tullahoma, Lake Calanthe | 300 |
| Virginia: | |
| Ashland, Luck's pond | 300 |
| Beaver Dam, Beaverdam Lake | 600 |
| Burkeville, Mallory Pond | 150 |
| Byllesby, Meadow Creek | 300 |
| New River | 300 |
| Charlottesville, University Pond | 150 |
| Church Road, Hobbs Run | 150 |
| Clifton Forge, Cow Pasture River | 150 |
| Dillwyn, Mary Bell Pond | 150 |
| Edinburg, Passage Ceek | 150 |
| Shenandoah River, North Fork | 150 |
| Stony Creek | 150 |
| Emporia, Emporia Pond | 300 |
| Meherrin Pond | 600 |
| Slagle's pond | 300 |
| Esmont, Lake Nydrie | 300 |
| Fredericksburg, Dowman's pond | 150 |
| Glen Allen, Chickahominy River | 300 |
| Lorton, Occoquan Creek | 300 |
| Lynchburg, James River | 900 |
| Maiden, Hening's pond | 600 |
| Manassas, Broad Run | 450 |
| Bull Run | 300 |
| Kettle Run | 300 |
| Mount Jackson, Shenandoah River, North Fork | 300 |
| New Market, Shenandoah River, North Fork | 150 |
| Olinger, Slemp Pond | 150 |
| Purdy, Batte's pond | 150 |
| Rectortown, Rawlings's pond | 600 |
| Richmond, Bryan Park Pond | 600 |
| Club Pond | 600 |
| Shields Lake | 600 |
| Woodlawn Park Lake | 150 |
| Spencer, McBride's pond | 150 |
| Stuart, Akers's pond | 150 |
| Suffolk, Lake Cahoon | 750 |
| West Virginia: | |
| Berkeley Springs, Johnson's mill pond | 300 |
| Charleston, Blue Creek | 300 |
| Elk River | 600 |
| Williamson, Big Sandy River, Tug Fork | 300 |
| Wisconsin: | |
| Alma, State fish commission | 1,200 |
| Amery, Pike Lake | 400 |
| Bay City, Mississippi River | a 565 |
| Brokaw, Wisconsin River | 500 |
| Centuria, Deer Lake | 300 |
| Donaldson, Anderson Lake | 50 |
| Big Portage Lake | 100 |
| Deer Lake | 50 |
| Donahue Lake | 50 |
| Goose Lake | 50 |

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Donaldson, Landing Lake | 50 |
| Little Bass Lake | 50 |
| Little Donohue Lake | 50 |
| Pickerel Lake | 50 |
| Spring Lake | 50 |
| Elkhart Lake, Crystal Lake | 200 |
| Genoa, Mississippi River | a 1,205 |
| Glenhaven, Mississippi River | a 300 |
| Gordon, Bass Lake | 75 |
| Blue Gill Lake | 75 |
| Clear Lake | 75 |
| Leader Lake | 75 |
| Ox Lake | 75 |
| Spider Lake | 75 |
| Whitefish Lake | 75 |
| Grand Rapids, Wisconsin River | 200 |
| Hayward, Lake Willard | 250 |
| Heafford Junction, Bass Lake | 100 |
| Prairie Lake | 100 |
| Rice Lake | 100 |
| Hillsboro, Baraboo Pond | 700 |
| La Crosse, Mississippi River | a 124,050 |
| Ladysmith, Flambeau Pond | 200 |
| Lake Millicent, Bingo Lake | 50 |
| Boscoe Bay Lake | 50 |
| Bubar Lake | 50 |
| Crow Lake | 50 |
| Five Island Lake | 50 |
| Heart Lake | 100 |
| Huber Lake | 50 |
| Lake Millicent | 50 |
| Lost Lake | 50 |
| Pike Lake | 50 |
| Twin Lake | 50 |
| Lake Nebagamon, Lake Nebagamon | 400 |
| Manson, Manson Lake | 300 |
| Norrie, Cedar Lake | 10 |
| Halfway Lake | 10 |
| Kelley Pond | 10 |
| Lake Wausau | 10 |
| Plowman Lake | 10 |
| Smith Lake | 10 |
| Stony Lake | 10 |
| Nye, Round Lake | 400 |
| Prairie du Chien, Mississippi River | a 50 |
| Reedsburg, Mirror Lake | 400 |
| Rice Lake, Hemlock Lake | 600 |
| Cazenovia Mill Pond | 75 |
| Richland Centre, Neptune Mill Pond | 75 |
| Postel Lake | 75 |
| Rodolph Mill Pond | 75 |
| Sextonville Mill Pond | 75 |
| Schultz Spur, Lake Ackerman | 300 |
| Stone Lake, Snag Lake | 100 |
| Superior, Amnicon Lake | 300 |
| Tomahawk, Bass Lake | 100 |
| Road Lake | 100 |
| Round Lake | 300 |
| Somo Lake | 100 |
| Somo River | 100 |
| Spirit Lake | 100 |
| Swamp Lake | 100 |
| Tomahawk River | 100 |
| Wisconsin River | 100 |
| Wausau, Brokaw Pond | 50 |
| Eau Claire River | 50 |
| Gilmore Creek | 75 |
| Lake Mayflower | 100 |
| Lake Wausau | 75 |
| Rib River | 50 |
| Silver Creek | 50 |
| Wisconsin River | 50 |
| Woodyard, Mississippi River | a 14,000 |
| Wyalusing, Mississippi River | a 200 |
| Total b | 2,905,812 |

a Rescued from overflowed lands and restored to original waters.
b Exclusive of 6,250 lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS.

| Disposition. | Number. |
|---|---|
| Alabama: | |
| Abbeville, Abbey Creek | 1,050 |
| Choctawhatchee River | 1,400 |
| Cold Lake | 700 |
| Hutto's pond | 700 |
| Ada, Bell's pond | 1,500 |
| Alexander City, Herzfeld's pond | †1,000 |
| Anniston, Allen Pond | 3,000 |
| Francis Mill Pond | 4,000 |
| Lloyd's pond | 3,000 |
| Bayou La Batre, Little River | 2,400 |
| Bear Creek, Liberty Pond | 100 |
| Belle Mina, Walton Pond | †2,000 |
| Birmingham, East Giles Pond | 70 |
| Ketona Pond | 80 |
| Lake Purdy | †5,000 |
| Silver Lake | 1,000 |
| Brockton, Sawyer Mill Pond | 1,750 |
| Calcis, Kellys Creek | 2,500 |
| Capps, Choctawhatchee River | 1,050 |
| Pine Log Lake | 1,050 |
| Carpenter, Hunnicut Creek | 200 |
| Castleberry, Etheridge's pond | †3,000 |
| Centerville, Cahaba River | 300 |
| Chickasaw, Chickasaw Creek | 1,500 |
| Eight Mile Creek | 1,500 |
| Greenwood Bayou | 1,500 |
| Shell Bayou | 1,500 |
| Clanton, Mims's pond | †2,000 |
| Coleanor, Alligator Creek | 55 |
| Little Cahaba River | 440 |
| Shoal Creek | 90 |
| Six Mile Creek | 200 |
| Comer, Conlkee Creek | 1,500 |
| Courtland, Big Nance Creek | †3,000 |
| Swoope Pond | †2,000 |
| Cuba, Jones Pond | 50 |
| Wilson's pond | †2,000 |
| Cullman, Eight Mile Creek | †3,000 |
| Decatur, Dobbin Pond | 500 |
| Dunavant, Lake Leora | 3,000 |
| Epes, Hawkins Pond | †1,000 |
| Fayette, Lindsey Mill Pond | 135 |
| Wallace Mill Pond | 180 |
| Florala, Lake Jackson | 1,400 |
| Parker Pond | 700 |
| Fort Payne, Town Creek | 4,000 |
| Fowl River, Fowl River | 150 |
| Geneva, Hand's mill pond | 1,400 |
| Gurley, Flint River | †3,000 |
| Hackleburg, Tyra's pond | 50 |
| Headland, Blue Pond | 1,050 |
| Davis Pond | 1,050 |
| Helena, Buck Creek | 1,800 |
| Huntsville, Broham Lake | 200 |
| Flint River | 2,000 |
| Ida, Coosa River Lake | 20 |
| Kelleyton, Corley's pond | 4,000 |
| Socopatoy Creek | 3,000 |
| Kushla, Chickasaw Bogue Creek | 1,200 |
| Lapine, Russell's pond | 600 |
| Letohatchee, Caffey's pond | 500 |
| McLean's pond | 1,000 |
| Williams Lake | 1,500 |
| Lineville, Smith's lake | 750 |
| Loxley, Corn Branch | †3,000 |
| Luverne, Kendrick's pond | 4,000 |
| Ruff's pond | †2,000 |
| Madison, Bronaugh Pond | †4,000 |
| Mobile, Alligator Creek | 2,000 |
| Big Creek | 900 |
| Dog River, Eslora Prong | 2,000 |
| Dog River, Halls Prong | 2,000 |
| Lake Hurleosco | 500 |
| Little Deer River | 2,000 |
| Rabbit Creek | 2,000 |
| Spring Lake | 225 |
| Three Mile Creek | 225 |
| Monroe, Bohannon Mill Creek | †2,000 |
| Brushy Creek | 150 |
| Alabama—Continued. | |
| Monroe, Flat Creek | 400 |
| Lake Park | 1,600 |
| Limestone Creek | 300 |
| Little Mill Creek | 400 |
| Mineral Branch | 400 |
| Randon Creek | 150 |
| Slaughter's pond | 300 |
| Montgomery, Candler's pond | †2,000 |
| Cobbs Ford Lake | †4,000 |
| Mill Creek | †3,000 |
| Mill Creek Lake | †3,000 |
| Samples Pond | †2,000 |
| Murphys Siding, Johnston's mill pond | 1,400 |
| Poor Creek | 1,050 |
| Spring Lake | 1,050 |
| Oneonta, Little Warrior River | 3,000 |
| Paint Rock, Paint Rock River | †4,000 |
| Panola, Lake Holah | †8,000 |
| Pelham, Palmetto Mill Lake | †4,000 |
| Pine Apple, Welch's pond | 200 |
| Pine Hill, Baggett's pond | †1,000 |
| Sheffield's pond | †3,000 |
| Piper, Alligator Creek Pond | †4,000 |
| Brown's pond | 50 |
| Island Ford Pond | †3,000 |
| McGuire Creek | 75 |
| Six Mile Creek | †3,000 |
| Prattville, Cotton Mill Pond | 225 |
| Ragland, Trout Creek | 600 |
| Ramer, Holmes's pond | 1,050 |
| Reform, Gum Pond | †1,000 |
| Speed's pond | 1,000 |
| Riderwood, Lake Carezel | †3,000 |
| Russellville, Lake Gayley | †3,000 |
| Sellers, Huffman's pond | 300 |
| Selma, Brickyard Pond | †2,000 |
| Burn Brae Pond | †3,000 |
| Hill Lake | †2,000 |
| Hunters Pond | †2,000 |
| Jones Creek | 120 |
| Oak Pond | †4,000 |
| Snowdoun, Davis's pond | 1,000 |
| Snow Hill, Speir's pond | 300 |
| Speigner, Speigner Mill Pond | †5,000 |
| Sprague, Norman's pond | 900 |
| Spruce Pine, Smith's lake | 200 |
| Sulligent, Priddy's lake | 20 |
| Sweetwater, Horse Creek | †6,000 |
| Shell Creek | †3,000 |
| Sweetwater Creek | 565 |
| Tanner, Peck's pond | 100 |
| Troy, Boatner's pond | 700 |
| Boswell's pond | 1,050 |
| Henderson's pond | 1,400 |
| Tuscumbia, Big Nance Creek | 240 |
| Tyson, Streely Place Pond | †3,000 |
| Uniontown, Coffee Creek | 130 |
| Vance, Vance Pond | 1,500 |
| Village Springs, Massey Lake | 1,000 |
| Welch, Chicksanoxsee Pond | 1,000 |
| Wetumpka, Weoka Creek | †7,000 |
| Whistler, Chickasabougue Creek | 1,500 |
| Winfield, Pearce Mill Pond | 900 |
| Wegworth Pond | 20 |
| Woodstock, East Giles Lake | 2,000 |
| Houston Lake | 1,500 |
| Arizona: | |
| Bowie, Lyday's pond | 150 |
| Flagstaff, Mormon Lake | 200 |
| Globe, Roosevelt Lake | 1,950 |
| Holbrook, Ortega Lake | 120 |
| Woodruff Pond | 120 |
| Tucson, Amado's pond | 150 |
| Vail, La Cienega Ranch Pond | 150 |
| Williams, Coleman Lake | 280 |
| Arkansas: | |
| Alma, Big Clear Creek | 150 |
| Arkadelphia, Ouachita River | 210 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Arkansas—Continued. | |
| Ashdown, Blue Hole Lake | 70 |
| Black Rock, Black River | a 766 |
| Bradford, White Lake | 65 |
| Browns Lake, Black River | a 73 |
| Crossett, North Lake | 60 |
| Edgemont, Red River, South Fork | 271 |
| Gilbert, Bear Creek | 270 |
| Buffalo River | 270 |
| Tomahawk Creek | 271 |
| Greenwood, Vache Grasse Creek | 300 |
| Vineyard Creek | 250 |
| Gurdon, Willow Dell Lake | 65 |
| Hardy, Forty Island Creek | 115 |
| South Fork River | 115 |
| Spring River | 230 |
| Harrison, Crooked Creek | 271 |
| Little Buffalo Creek | 271 |
| Hope, Wilson's pond | 70 |
| Jefferson, Big Pasture Pond | 70 |
| Spring Pond | 70 |
| Joiner, Shawnee Lake | 100 |
| Leslie, Little Red River | 271 |
| Long Creek | 271 |
| Mill Creek | 271 |
| Payton Creek | 271 |
| Little Rock, Spring Lake | 90 |
| Manson, Black River | a 1,075 |
| Mulberry, Big Mulberry Creek | 200 |
| Pine Bluff, Fluker Lake | 70 |
| Hurricane Creek | 70 |
| McAllister Pond | 140 |
| Rumley, Little Red River | 271 |
| Shirley, Weaver Creek | 271 |
| Stamps, Bodcaw Creek | 82 |
| Stamps Lake | 70 |
| Texarkana, Club Lake | 570 |
| Kniffin's pond | 70 |
| Reeves Lake | 400 |
| Spring Lake | 300 |
| Willow Lake | 70 |
| Waldo, Jackson Pond | 70 |
| Colorado: | |
| Boulder, Hygiene Lake | 125 |
| Maxwell Lake | 125 |
| Ni Wot Lake | 125 |
| Younglove Lake | 125 |
| Denver, Windermere Lake | 125 |
| Eastonville, Ayer's pond | 75 |
| Grand Junction, Ternahan Lake | 200 |
| Lamar, Two Butte Lake | 120 |
| Las Animas, Horse Creek Lake | 120 |
| Littleton, Wyldermere Lake | 125 |
| Longs Spur, Murray Lake | 300 |
| Louviers, Louviers Lake | 125 |
| Loveland, Mariana Lake | 125 |
| Nutch Lake | 125 |
| Miramonte, Carter Lake | 100 |
| Pueblo, Teller Lake | 85 |
| Connecticut: | |
| East Haddam, Joshua Pond | 515 |
| Meriden, Quannipaug Lake | 80 |
| West Pond | 80 |
| Still River, Emerald Lake | 150 |
| Winsted, Farmington River | 80 |
| Laurel Heath Lake | 80 |
| Delaware: | |
| Kirkwood, Lump Pond | 10 |
| Lincoln City, Cedar Creek Pond | 10 |
| Middletown, Noxontown Pond | 10 |
| Wilmington, Folly Woods Pond | 8 |
| Florida: | |
| Cottondale, Cole Pond | 200 |
| DeFuniak Springs, Brown Branch Pond | 2,100 |
| Highland Pond | 1,400 |
| Eustis, Lake Johanna | 1,400 |
| Lake Geneva, Geneva Lake | 2,800 |
| Lucerne Park, Lake Lucerne | 200 |
| Lake Hamilton | 400 |

| Disposition. | Number. |
|---|---|
| Florida—Continued. | |
| Orlando, Lake Ivanhoe | 1,750 |
| Paxton, Brown Branch Pond | 1,750 |
| Pensacola, Querarity Lake | 400 |
| Quincy, Bruce's pond | 100 |
| River Junction, Mosquito Creek | 2,450 |
| Sebring, Hares Lake | 4,000 |
| Springside, Silver Lake | 1,750 |
| Sorrento, Lake Ruth | 1,225 |
| Sutherland, St. George Lake | 2,100 |
| Tyler, Fielding Farm Lake | 2,100 |
| Windemere, Lake Butler | 400 |
| Winter Haven, Lake Martha | 1,400 |
| Lake Silver | 1,400 |
| Suring's pond | 1,050 |
| Georgia: | |
| Adbeville, Poor Robin Lake | 1,050 |
| Acworth, City Reservoir | 12 |
| Adel, Futch Mill Creek | 2,100 |
| Andersonville, Aycock's pond | 750 |
| Athens, Lakeside Lake | 2,000 |
| Lyons Pond | 2,000 |
| Waterworks Pond | 100 |
| Atlanta, Brookhaven Lake | 5,000 |
| Capital City Club Lake | 5,000 |
| Howard Mill Pond | 3,000 |
| Augusta, Spout Creek Pond | 5,000 |
| Bainbridge, Lake Douglas | 1,050 |
| Blairsville, Butternut Creek | 2,100 |
| Bowman, Beaverdam Creek | 3,000 |
| Cairo, Akridge's pond | 1,050 |
| Canon, Meadowview Bass Pond | 1,000 |
| Chula, Whiddon's pond | 1,400 |
| Clermont, Chestatee Lake | 8,000 |
| Cordele, Brady's pond | 1,500 |
| Cornelia, Nancytown Creek | 760 |
| Covena, Phillips's pond | 300 |
| Covington, Sprindale Pond | 1,250 |
| Cuthbert, Harris Pond | 100 |
| Tripps Pond | 100 |
| Dexter, Malone's pond | 100 |
| Ellijay, Rodgers's pond | 500 |
| Fort Valley, Myrtle Pond | 1,000 |
| Good Hope, South Lake | 100 |
| Greensboro, Beaverdam Pond | 100 |
| Hartwell, Big Cedar Creek | 5,100 |
| Cleveland's pond | 1,000 |
| Savannah River | 47,960 |
| Hawkinsville, Fountain's mill pond | 300 |
| Heardmont, Savannah River | 100 |
| Hogansville, Lazylands Lake | 4,000 |
| Lakemont, Lake Rabun | 2,500 |
| Lavonia, Roberts's pond | 175 |
| Leary, Lake Marcella | 2,750 |
| Lexington, Long Creek | 5,750 |
| Lookout Lake, Lookout Lake | 500 |
| Lumpkin, Clear Pond | 2,250 |
| Geeslin's pond | 1,000 |
| Liddy's pond | 2,250 |
| Worthington Pond | 2,250 |
| McDonough, South River | 2,000 |
| Macon, Easterland Lake | 850 |
| Nelson Mill Pond | 3,000 |
| Riggins Mill Pond | 3,000 |
| Madison, Barnett's pond | 4,000 |
| Poplar Pond | 100 |
| Marietta, Golf Club Lake | 100 |
| Mauk, Montgomery's pond | 450 |
| Maysville, Holland's pond | 1,140 |
| Montezuma, Lewis Mill Pond | 100 |
| Travelers Rest Pond | 100 |
| Nacoochee, Duke Creek | 3,000 |
| Newman, Lazylands Lake | 3,000 |
| Nunez, Phillips's pond | 200 |
| Piney Prong Pond | 300 |
| Ocilla, Brushy Creek Pond | 3,000 |
| Omega, Hawkins's pond | 3,000 |
| Perry, Lakeside Pond | 350 |
| Plains, Kidds Mill Pond | 2,250 |
| Quitman, Fernside Lake | 1,050 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Georgia—Continued. | |
| Quitman, Okopilco Creek | 1,050 |
| Spence Lake | 1,050 |
| Raymond Lake | 5,000 |
| Reidsville, Pounding Mill Lake | 1,050 |
| Reynolds, Horse Creek Pond | 4,000 |
| Robinson, North River | 4,000 |
| Rock Mart, Blue Pond | 400 |
| Harris Pond | 2,000 |
| Rutledge, Rocky Creek Pond | 1,000 |
| Sandersville, Gladdin's pond | 4,000 |
| Savannah, Greenwich Lake | 1,050 |
| Soperton, Courson's pond | 300 |
| Thompson's pond | 700 |
| Sparta, Bryan Pond | 2,000 |
| Statesboro, Beasly Mill Pond | 300 |
| Temple, Little Tallapoosa River | 7,000 |
| Tifton, New River Pond | 1,050 |
| Trion, Chatooga Pond | 3,750 |
| Tusculum, Kamataska Pond | 1,400 |
| Valdosta, Long Pond | 1,050 |
| Shadow Lake | 1,750 |
| Sunshine Lake | 1,750 |
| Wisenbaker's pond | 1,400 |
| Welch, Brasstown Creek | 1,600 |
| Wellston, Sandy Run Pond | 4,000 |
| Winchester, Felton Mill Pond | 1,100 |
| Woodbury, Powers-Sims Pond | 3,000 |
| Wray, Harper's pond | 1,000 |
| Illinois: | |
| Anna, Hess Lake | 30 |
| Ashley, St. Francis Lake | 45 |
| Belvidere, Coon Creek | 225 |
| Kishwaukee River | 750 |
| Blanding, Mississippi River | a 3,170 |
| Carbondale, Thompson Lake | 75 |
| Carrollton, Minnow Lake | 300 |
| Walnut Hall Lake | 450 |
| Colona, Hennepin Canal | 900 |
| DuQuoin, Lake Rutledge | 60 |
| Franklin, Burlington Lake | 300 |
| Freeport, Waters of Illinois | 825 |
| Galena Junction, Mississippi River | a 8,180 |
| Galesburg, Lake Rice | 450 |
| Grays Lake, Druse Lake | 525 |
| Hannibal, Sni River | 450 |
| Hanover, Mississippi River | a 3,660 |
| Irving, Wilson's pond | 200 |
| Joliet, Hickory Creek | 300 |
| Kankakee, Kankakee River | 600 |
| Laclede, Lloyd's pond | 30 |
| Lake Forest, Kelley's pond | 300 |
| Lake Villa, Deep Lake | 300 |
| Lake Zurich, Lake Zurich | 300 |
| Lanark, Carroll Creek | 225 |
| Meredosia, Illinois River | a 326 |
| Mooseheart, Moose Lake | 950 |
| Moro, Rockbridge Lake | 200 |
| Naperville, DuPage River, West Branch | 156 |
| North Quarry Pond | 78 |
| West Quarry Pond | 156 |
| New Boston, Mississippi River | a 26,286 |
| Oakland, Embarrass River | 12 |
| Olney, City Lake | 75 |
| Peoria, Show Lake | 200 |
| Pleasant Hill, Emmert Lake | 300 |
| Tow Head Lake | 300 |
| Polo, Pine Creek | 600 |
| Sesser, Keller Lake | 60 |
| Sparta, Country Club Lake | 75 |
| Springfield, Reiger's pond | 200 |
| Thornton, Thornton Lake | 170 |
| Tonti, Cottonwood Lake | 45 |
| Davidson's pond | 15 |
| Waltonville, C. B. & Q. Pond | 60 |
| Wilmington, Kankakee River | 600 |
| Indiana: | |
| Angola, Crooked Lake | 180 |
| Fox Lake | 180 |
| Indiana—Continued. | |
| Beeson Station, Beeson Pond | 160 |
| Bicknell, Phillippe's pond | 140 |
| Bluffton, Wabash River | 265 |
| Borden, Blue River, Mutton Fork | 300 |
| Brazil, Sewer Pipe Pond | 70 |
| Cedar Lake, Cedar Lake | 160 |
| Columbus, Flat Rock River | 500 |
| Danville, Big Raccoon Creek | 225 |
| Edinburg, Sugar Creek | 210 |
| Fairland, Sugar Creek | 210 |
| Greenfield, Brandywine Creek | 120 |
| Huntingburg, Waterworks Lake | 500 |
| Indianapolis, White River | 160 |
| Jeffersonville, Eagle Lake | 500 |
| Kewanna, Collins's pond | 60 |
| Lake Maxinkuckee | 240 |
| Leesburg, Tippecanoe Lake | 72 |
| Liberty, Whitewater River, East Fork | 40 |
| Manilla, Little Blue River | 210 |
| Michigan City, Clear Lake | 180 |
| Fish Lake | 180 |
| Saguney Lake | 180 |
| Tee Lake | 180 |
| Valls Mill Pond | 180 |
| Mill Creek, Fish Lake | 240 |
| New Albany, creeks of Floyd County | 650 |
| Orleans, Hudleson's pond | 100 |
| Pierceton, Barber Lake | 80 |
| Webster Lake | 120 |
| Ramsey, Crystal Pond | 100 |
| Rome City, Lower Lake | 180 |
| Sylvan Lake | 300 |
| Saratoga, Shaw Lake | 8 |
| Sellersburg, Belknap Lake | 1,000 |
| Shelbyville, Flat Rock River | 210 |
| Star City, Tippecanoe River | 120 |
| Sullivan, Union Pond | 210 |
| Summitville, McLain's pond | 75 |
| Roseboom's pond | 75 |
| Valparaiso, Wahob Lake | 180 |
| Veedersburg, Coal Creek | 225 |
| Nelson's pond | 150 |
| Vincennes, Wabash Lake | 210 |
| Wilder, Kankakee River | 120 |
| Williamsburg, Greensfork Creek | 225 |
| Worthington, Eel River | 400 |
| White River | 400 |
| Iowa: | |
| Anamosa, Wapsipinicon River | 100 |
| Bellevue, Mississippi River | a 50,870 |
| Blanchard, Crystal Lake | 100 |
| Burlington, West Burlington Pond | 240 |
| Clear Lake, Clear Lake | 800 |
| Cresco, Iowa River | 3,600 |
| Turkey River | 3,600 |
| Decorah, Upper Iowa River | 300 |
| Dewitt, Spring Brook Lake | 160 |
| Emmetsburg, Medium Lake | 500 |
| Exira, Nishnabotna River | 400 |
| Fairport, Mississippi River | a 12,097 |
| Garden City, Muscatine Creek | 120 |
| Vails Creek | 120 |
| Greene, Shell Rock River | 200 |
| Green Island, Mississippi River | a 350 |
| Guttenburg, Mississippi River | a 500 |
| Hazleton, Otter Creek | 80 |
| Humeston, Waterworks Pond | 120 |
| Iowa Falls, Iowa River | 660 |
| Lenox, Lenox Lake | 300 |
| Manchester, Maquoketa River | 540 |
| Mason City, Clear Lake | 500 |
| Lime Creek | 500 |
| Ottumwa, Lake Loch Burn | 240 |
| Perry, Raccoon River | 12,000 |
| Pleasant Creek, Mississippi River | a 100 |
| Quarry, Iowa River | 240 |
| Sny Magill, Mississippi River | a 350 |
| Udell, Jones's pond | 60 |
| Walford, Knapp Pond | 80 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Kansas: | |
| Ellis, Saline River | 300 |
| Fort Scott, Sheeler Lake | 300 |
| Jetmore, Pawnee River | 195 |
| Olathe, Country Club Lake | 500 |
| Topeka, Lynn Creek | 200 |
| Mission Creek | 200 |
| Wakarusa Creek | 230 |
| Kentucky: | |
| Banklick, Summit Lake | 65 |
| Bowling Green, Briggs's pond | 70 |
| Chelf's pond | 70 |
| Garvin's pond | 70 |
| Goodrum's pond | 70 |
| Harris's pond | 70 |
| Hendrick's pond (A) | 70 |
| Hendrick's pond (B) | 70 |
| Jenkin's pond | 70 |
| Kister's pond | 70 |
| Logan's pond | 70 |
| Mitchell's pond | 70 |
| Cadiz, Little River | 600 |
| Covington, Elmhurst Lake | 65 |
| Danville, Stout's pond | 195 |
| Elkhorn City, Big Sandy River, Russell Fork | 195 |
| Erlanger, Culbertson's pond | 65 |
| Fords Branch, Big Sandy River | 130 |
| Franklin, Dixon's pond | 70 |
| Drakes Creek | 70 |
| Drakes Creek, Middle Fork | 210 |
| Edwards Pond | 70 |
| Finns Pond | 70 |
| Gaines Pond | 70 |
| Hobdy Pond | 70 |
| Merriman Pond | 70 |
| Red River | 70 |
| Fredonia, Bailey's pond | 100 |
| Barn Field Pond | 100 |
| Butler's pond | 100 |
| Clift's pond | 100 |
| Factory Lot Pond | 100 |
| Neel Pond | 200 |
| Oliver's pond | 100 |
| Satterfield's pond | 200 |
| Wilson Pond | 100 |
| Georgetown, Elkhorn Creek | 65 |
| Hall's pond (A) | 65 |
| Hall's pond (B) | 65 |
| Hall's pond (C) | 65 |
| Glasgow, Skeegs Pond | 210 |
| Greenup, Little Sandy River | 130 |
| Tygart River | 195 |
| Hopkinsville, Glass's pond | 400 |
| Lake Tandy | 600 |
| Little River | 1,000 |
| Wallace Pond | 400 |
| Lancaster, Bratton's pond | 130 |
| Lawrenceburg, Dowling Lake | 65 |
| John Lake | 65 |
| Lake Cartinhour | 65 |
| Lake Mary Elizabeth | 130 |
| Leather's pond | 65 |
| Lebanon, Bottoms Pond | 65 |
| Buckhorn Creek | 130 |
| Clear Creek | 130 |
| Indian Creek | 130 |
| Johnes Fork Creek | 130 |
| Medlock Creek | 130 |
| North Fork Creek | 130 |
| Pittman Creek | 195 |
| Pottinger Creek | 130 |
| Rolling Fork Creek | 195 |
| Salt River, Beech Fork | 195 |
| South Fork Creek | 130 |
| Waterworks Lake | 65 |
| Lexington, Waterworks Lake | 195 |
| Louisville, Bernheim's pond | 500 |
| Nicholasville, Clifton Pond | 65 |
| Hooverhurst Pond | 65 |
| Kentucky—Continued. | |
| Paducah, Wallace Park Lake | 200 |
| Pewee Valley, Blue Lake | 65 |
| Pikeville, Big Sandy River | 65 |
| Big Sandy River, Levisa Fork | 195 |
| Johns Creek | 195 |
| Rowlett, Green River | 280 |
| Samuels, Sherman's pond | 130 |
| Shelbyville, Lake of the Maples | 65 |
| Ravenwood Pond | 130 |
| South Park, South Park Lake | 1,000 |
| Springfield, Forest Hill Lake | 65 |
| Stanton, Hall's pond | 65 |
| Stephensburg, Dutsche's pond | 100 |
| The Forks, Big Sandy River, Russell Fork | 195 |
| Louisiana: | |
| Abita Springs, Morgan's pond | 300 |
| Baton Rouge, Amite River | a75 |
| Mississippi River | a6,525 |
| University Lake | a550 |
| Bayou Sara, Hereford Lake | 1,000 |
| Bernice, Johnson's pond | 40 |
| Cade, Boudreaux's pond | 250 |
| Pharr's pond | 130 |
| Church Point, Latiolois's pond | 40 |
| Clinton, Clear Creek | 2,500 |
| Leesville, L'Anacoco Bayou | 250 |
| Natchitoches, Cane River Lake | 260 |
| New Orleans, City Park Lake | †5,000 |
| Opelousas, Caldwell's pond | 80 |
| Orange, Conway's Bayou | 250 |
| Rayville, Clear Lake | 50 |
| Stonewall, Moseley's pond | 25 |
| Winnfield, Lake Joyce | 180 |
| Zona, Sanford's pond | †2,000 |
| Maine: Poland, Lake Tripp | 30 |
| Maryland: | |
| Baltimore, Deep Creek | 210 |
| Charlotte Hall, Lillie Pond | 140 |
| Cowenton, Fox Brook | 80 |
| Cumberland, Evits Creek | 105 |
| Fifteen Mile Creek | 150 |
| Potomac River | 455 |
| Potomac River, North Branch | 105 |
| Town Creek | 300 |
| Wills Creek | 105 |
| Easton, Peach Blossom Creek | 20 |
| Eccleston, Cave Pond | 70 |
| Elkton, Back Creek Mill Pond | 80 |
| Ellicott City, Dorsey Run | 40 |
| Little Patuxent River | 120 |
| Ellwood, Beulah Pond | 6 |
| Frederick, Monocacy River | 360 |
| Gaithersburg, Irvington Lake | 70 |
| Geices, Youghiogheny River | 150 |
| Hagerstown, Antietam Creek | 160 |
| Conococheague Creek | 160 |
| Hughesville, Burch Pond | 140 |
| Owings Mills, Red Run | 120 |
| Passadena Station, Woole's pond | 140 |
| Port Deposit, Herring Run, tributaries of | 625 |
| Preston, Beulah Mill Pond | 6 |
| Fowler Creek Pond | 6 |
| Linchester Mill Pond | 6 |
| Williston Mill Pond | 6 |
| Seneca, Potomac River | a50 |
| Snow Hill, Nassawango Creek | 20 |
| Union Bridge, Pipe Creek | 120 |
| Woodbine, Oakdale Pond | 40 |
| Massachusetts: | |
| Falmouth, Maier Pond | 60 |
| Marblehead, Oliver's pond | 30 |
| State Line, Sandisfield Lake | 90 |
| Michigan: | |
| Alpena, Long Lake | 500 |
| Ann Harbor, Three Sisters Lake, Middle | 300 |
| Caspian, Chicagoan Lake | 200 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Michigan—Continued. | |
| Crystal Falls, Dawson Lake | 175 |
| Fortune Lake | 400 |
| Glidden Lake | 150 |
| Hager Lake | 75 |
| Heart Lake | 150 |
| Mud Lake | 75 |
| Delaware, Bete Gris Bayou | 200 |
| Gratiot Lake | 200 |
| Lac La Belle | 200 |
| Lake Upson | 75 |
| Iron River, Indian Lake | 75 |
| Lake Fifteen | 75 |
| Ishpeming, Birch Hill Lake | 75 |
| Jackson, Browns Lake | 120 |
| Grass Lake | 180 |
| Portage Lake | 120 |
| Wolf Lake | 180 |
| Keweenaw Bay, Mud Lake | 80 |
| Lake Ann, Lake Ann | 400 |
| Lake Roland, Lake Roland | 100 |
| McCollum, McCollum Lake | 300 |
| Mandan, Breakfast Lake | 75 |
| Copper Creek | 75 |
| Deer Lake | 75 |
| Lake Addie | 225 |
| Thayer Lake | 75 |
| Marquette, Marguanee Lake | 150 |
| Pelissier Lake | 75 |
| St. Johns Lake | 75 |
| Metropolitan, Six-Mile Lake | 150 |
| Michigamme, Gibson Lake | 75 |
| Petticoat Lake | 75 |
| Negaunee, Horseshoe Lake | 120 |
| Park Siding, Silver Lake | 205 |
| Pentoga, Chicagoan Lake | 120 |
| Indian Lake | 100 |
| Sagola, Mitchell Lake | 150 |
| Stager, Big Tobin Lake | 75 |
| Round Lake | 75 |
| Stager Lake | 150 |
| Walled Lake, Walled Lake | 360 |
| Watersmeet, Lake Marian | 75 |
| Witch Lake, Twin Lakes | 75 |
| Minnesota: | |
| Big Lake, Secret Lake | 150 |
| Fairmont, Amber Lake | 350 |
| Bud Lake | 350 |
| George Lake | 350 |
| Hall Lake | 350 |
| Sisseton Lake | 350 |
| Grand Meadow, Pine Lawn Lake | 400 |
| Hackensack, Little Whitefish Lake | 600 |
| Homer, Mississippi River | a6,247 |
| Kimball, Arrowood Lake | 400 |
| La Crosse, Mississippi River | 610 |
| Lindstrom, Chisago Lakes | 500 |
| Litchfield, Minnebelle Lake | 400 |
| Minneapolis, Bush Lake | 500 |
| Preston, Root River | 525 |
| Root River, North Branch | 350 |
| Root River, South Branch | 350 |
| Sherburn, Fox Lake | 350 |
| Sleepy Eye, Big Cottonwood River | 500 |
| Tamarack, Turtle Lake | 500 |
| Mississippi: | |
| Amory, Hatley Pond | 100 |
| Artesia, Grassmire Pond | †2,000 |
| Bay Springs, Brown's pond | 80 |
| Bryant, Stokes's pond | 1,000 |
| Calyx, Daniel's pond | †2,000 |
| Green Lake | †2,000 |
| Hyde Pond | †1,000 |
| Woodlawn Lake | †2,000 |
| Canton, Alligator Lake | 300 |
| Big Lake | 1,500 |
| Blackston's pond | 1,500 |
| Blue Lake | 300 |
| Garbarino Lake | 200 |
| McDowell Pocket Lake | 200 |

| Disposition. | Number. |
|---|---|
| Mississippi—Continued. | |
| Canton, Ray's pond | 500 |
| Trollo's pond (A) | 200 |
| Trollo's pond (B) | 300 |
| Vics Pond | 1,000 |
| Waverly Lake | 300 |
| Will Smith Lake | 400 |
| Wood Lake | 500 |
| Centerville, Ford's pond | 202 |
| Clarksdale, Moon Lake | 2,110 |
| Clinton, Phillips's pond | 50 |
| Columbus, Clear Pond | 2,000 |
| Hatchett's pond | 2,000 |
| Lily Lake | 2,500 |
| Wades Lake | 2,000 |
| Corinth, Crescent Lake | 1,500 |
| Nichols Lake | †5,000 |
| Courtland, Lake Charles | 500 |
| Durant, Dodd's pond | 600 |
| Ethel, Belk's pond | 1,000 |
| Fayette, Cooper's pond | 1,500 |
| Darden's pond | 100 |
| Georgetown, Catching's pond | 1,000 |
| Gulfport, Bayou Bernard | 420 |
| Biloxi River | 180 |
| Little Biloxi River | 350 |
| Tchouticabouffa Creek | 300 |
| Guntown, Elk View Lake | †2,000 |
| Epting's pond | †1,000 |
| McCarley's pond | †3,000 |
| Hazlehurst, Ellis's pond | †1,000 |
| Lake Hazel | 160 |
| Lake Catherine | †1,000 |
| Marchetti Lake | † 500 |
| Tally Lake | †1,500 |
| Hernando, Banks's pond | 50 |
| Holcomb, Staten Pond | 1,000 |
| Houston, Houston Pond | †3,000 |
| Jackson, Hendricks's pond | 35 |
| Jones's ponds | 1,000 |
| Williams's pond | 1,000 |
| Willow Pond | 1,000 |
| Kosciusko, Bailey Lake | 2,000 |
| Sunnyside Valley Pond | 1,000 |
| Laurel, Vinson's pond | 100 |
| Learned, Gibbes's pond | †1,000 |
| Lucedale, Sunset Lake | 100 |
| Lucien, Lofton's pond | 125 |
| Lyman, Day's Pond | 1,000 |
| Maben, Turner's pond | 1,000 |
| Macon, Bryson Pond | 45 |
| McHenry Lake | 45 |
| McIntosh Lake | 45 |
| Oil Mill Pond | 25 |
| Patty Lake | 45 |
| Raney Pond | 45 |
| Robbins Pond | 45 |
| Scott Lake | 70 |
| Mayhew, Finkles Pond | 25 |
| Gaiths Reese Pond | 50 |
| McCollum's pond | 45 |
| Warren Pond | 25 |
| Meridian, Reed Breakwater Pond | 1,000 |
| Wagner Pond | 1,500 |
| Muldrow, Muldrow Pond | 1,000 |
| Neshoba, Livingston's pond | 500 |
| Newton, Doolittle's pond | 1,000 |
| Okolona, Lake Carrie Miller | 200 |
| Oxford, Hudleton Pond | 1,500 |
| Pass Christian, Arcadian Bayou | †5,000 |
| Patterson, Beautiful Pond | †1,000 |
| Pheba, Jordan's pond | 300 |
| Prentiss, Herron's pond | 500 |
| Raymond, Newman's pond | 500 |
| Richton, Smith's pond | 100 |
| Ripley, Jefferies Pond | 80 |
| Yancy's pond | 40 |
| Selma, Big Pond | †1,500 |
| Little Pond | 1,000 |
| Senatobia, Koff Pond | 50 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Mississippi—Continued. | |
| Shuqualak, Whitfield Pond | †3,000 |
| Silver City, Atchafalaya Bayou | 125 |
| Fish Lake | 100 |
| Silver Creek Lake | 125 |
| Soso, Sumrall's pond | 1,000 |
| Starkville, Pearson's pond | 50 |
| Pine Ridge Pond | 25 |
| Sumrall, Hemba's pond | 1,000 |
| Torrance, McCormack's pond | 100 |
| Tupelo, Bakers Lake | 300 |
| Utica, Lake John Sharp Williams | 1,500 |
| Valden, Rural Glade Pond | 1,000 |
| Vardaman, Inmon's pond | 50 |
| Waynesboro, Easterling's pond | 80 |
| Limestone Pond | †5,000 |
| Tatums Pond | 80 |
| Wenasoga, Hammon's pond | †2,000 |
| West, Maple Leaf Lake | 1,000 |
| Woodland, Bermuda Pond | 80 |
| Lake Maurice | 500 |
| Sissons's pond | 1,000 |
| Yazoo City, Open Lake | 150 |
| Missouri: | |
| Baring, Santa Fe Lake | 450 |
| Birch Tree, Current River, Jacks Fork | 720 |
| Chula, Medicine Creek | 625 |
| Clayton, Chaminade Lake | 75 |
| Hogan's pond | 75 |
| Columbia, Adenhill Lake | 170 |
| Gordon Lake | 510 |
| Grindstone Creek | 510 |
| Johnson's pond | 170 |
| Perche River | 510 |
| DeSoto, Murphy Lake | 60 |
| Excelsior Springs, Crescent Lake | 300 |
| Wale's pond | 300 |
| Gilliam, Alton Slater Lake | 200 |
| Waterworks Pond | 200 |
| Higginsville, Confederate Ponds | 400 |
| High Hill, Wabash Lake | 120 |
| Independence, Swinney's pond | 400 |
| Woods Lake | 500 |
| Ironton, Lake Killarney | 75 |
| Joplin, Coalbrook Lake | 300 |
| Jones Creek | 300 |
| Muennig Lake | 200 |
| Kansas City, Julian's pond | 200 |
| Lamar, Spring River, North Fork | 300 |
| Lathrop, Lake Benson | 300 |
| Macon, Osteopathic Lake | 60 |
| Martin, Merryvale Lake | 400 |
| Mindenmines, Bunce's pond | 150 |
| Nevada, Marmaduke Park Pond | 340 |
| New London, Salt River | 375 |
| Oasis, Fish Slough Lake | 520 |
| Otterville, Bryans Run | 300 |
| La Mine River | 300 |
| Pleasant Hill, Baldwin Lake | 300 |
| Rocheport, Maniteau Creek | 510 |
| Rolla, Big Piney River | 100 |
| St. Clair, Hagebusch's pond | 75 |
| St. Louis, Ackerman's pond | 180 |
| Shelbina, Salt River | 90 |
| Washington, Busch's pond | 75 |
| Montana: | |
| Cascade, Squaw Lake | 300 |
| Malta, Horseshoe Lake | 500 |
| Wilson's pond | 200 |
| Miles City, Yellowstone River | 1,400 |
| Plentywood, Brush Lake | 300 |
| Nebraska: | |
| Fort Robinson, Cass Lake | 390 |
| Prague, Wagner's pond | 195 |
| Ruskin, Goldbeck's pond | 175 |
| St. Paul, Gans's pond | 175 |
| Sutton, Pleasant View Pond | 350 |
| Wayside, Baird's pond | 585 |
| Farview Lake | 390 |
| Willow Pond | 338 |
| New Hampshire: Chesham, Russell's pond | 60 |
| New Jersey: | |
| Burlington, Delaware River | 4 |
| Chatsworth, Reeves Branch | 4 |
| Crawford, Bloodgood Pond | 80 |
| Rahway River | 80 |
| Gibbstown, Third Ditch Creek | 20 |
| Hackettstown, State fish commission | 200 |
| Mountain Lake, Hillcrest Lake | 160 |
| Mountain Lakes | 120 |
| Wildwood Lake | 120 |
| Newfoundland, Green Pond | 120 |
| Oakland, Ramapo Lake | 120 |
| Penns Grove, Layton Lake | 10 |
| Phillipsburg, Delaware River | 160 |
| Salem, Woodmere Camp Lake | 20 |
| South Dennis, Beaverdam Pond | 8 |
| Westwood, Adjustina Lake | 40 |
| New Mexico: | |
| Clayton, Eklund's pond | 120 |
| Pawley Pond | 120 |
| Des Moines, Corrumpa Creek | 120 |
| Engle, Lake B. M. Hall | 200 |
| Kenna, Jones's pond | 75 |
| Maxwell, Holkeo Creek | 80 |
| Onava, Deep Lake | 120 |
| La Jara Lake | 120 |
| Lower Armstrong Lake | 80 |
| Tip Lake | 80 |
| Roswell, Mule Shoe Lake | 75 |
| Springer, Village Storage Lake | 80 |
| New York: | |
| Cambridge, Hedges Lake | 225 |
| Cattaraugus, Conewango Creek | 450 |
| Spring Pond | 150 |
| Clayton, St. Lawrence River | 600 |
| Collins, Hospital Pond | 300 |
| Conewango, Conewango Creek | 450 |
| Elmira, Chemung River | 375 |
| Fishkill, Brinckerhoff Pond | 60 |
| Fulton, Paddy Lake | 750 |
| Goshen, Sunnydale Lake | 30 |
| Gouverneur, Pleasant Lake | 450 |
| Holley, Beebe's pond | 150 |
| Kennedy, Conewango Creek | 450 |
| Lake Mahopac, Kirk Lake | 30 |
| Livingston Manor, Hunter Lake | 150 |
| Lockport, Tonawanda Creek | 750 |
| Locust Valley, Factory Pond | 120 |
| Lyons, Canandaigua Creek | 300 |
| Ganargua Creek | 300 |
| Lime Lake | 1,050 |
| Newark, Coffey Lake | 500 |
| Newburgh, Northview Lake | 90 |
| Niskayuna, Mohawk River | 375 |
| Oswego, Oswego River | 600 |
| Palmyra, Barge Canal | 600 |
| Mud Creek | 100 |
| Red Creek | 300 |
| Pine Bush, Hillcrest Pond | 30 |
| Port Henry, Lake Champlain | 375 |
| Richfield, Canadargo Lake | 200 |
| Salisbury Center, Cranberry Marsh Lake | 200 |
| Spruce Lake | 500 |
| Salisbury Mills, Ransdell Pond | 225 |
| Water Mill, Lake Nowedma | 120 |
| North Carolina: | |
| Aulander, Lightwood Knot Mill Pond | †1,200 |
| Bryson City, Deep Creek | 1,500 |
| Tudkaseigee River | 2,000 |
| Burlington, Bellmont Lake | 800 |
| Big Alamance Pond | 800 |
| Richards Mill Pond | 800 |
| West Piedmont Pond | 125 |
| Canton, Pigeon River | 3,500 |
| Cary, Holleman's pond | 300 |
| Charlotte, Collins's pond | 1,200 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| North Carolina—Continued. | |
| Clinton, Big Coharie Creek | †1,200 |
| Six Runs | †1,200 |
| Concord, Crowell's pond | 1,500 |
| Richie Pond | 1,000 |
| Edenton, Little Creek | 1,300 |
| Pembroke Creek | †1,500 |
| | 2,000 |
| Elkin, Darnall Pond | 125 |
| Elkton, Smith Mill Pond | 1,500 |
| Fayetteville, Buckhead Pond | 2,500 |
| Victory Lake | 2,000 |
| Flat Rock, Highland Lake | 675 |
| Greensboro, Shady Doll Pond | 400 |
| Hartford, Skinners Creek | †1,500 |
| High Point, Marsh Branch Pond | 75 |
| Spring Branch Pond | 150 |
| Jacksonville, New River | †1,200 |
| Kannapolis, Lee's pond | 1,000 |
| Lake Junaluska, Lake Junaluska | 2,500 |
| Lexington, Brushy Fork Creek | 750 |
| Littleton, Warrens Pond | †1,200 |
| Marshville, Williams's pond | 1,350 |
| Mayworth, Mays Mill Pond | 1,300 |
| Monroe, Helms's pond | 40 |
| Murphy, Cane Creek | 1,000 |
| Hiawassee River | 1,500 |
| Notla River | 1,500 |
| Valley River | 1,500 |
| Newport, Lake Oxley | †1,200 |
| North Wilkesboro, Whittington's pond | 125 |
| Oakboro, Running Branch Lake | 600 |
| Pisgah Forest, Engadine Pond | 125 |
| Raleigh, Hood Mill Pond | †1,500 |
| Red Springs, Browns Lake | 1,500 |
| Ridgeway, Hecht's pond | †600 |
| Rockingham, Marks Creek | 2,025 |
| Silver Run Pond | 2,700 |
| Rutherfordton, Rocky Broad River | 1,200 |
| Selma, Little River | †1,200 |
| | 300 |
| Skyland, Ray's pond | 1,000 |
| Smithfield, Holts Pond | †1,500 |
| Sylva, Tuckaseigee River | 2,500 |
| Tarboro, Bridgers's pond | †900 |
| Lake Parks | †900 |
| Nobles Mill Pond | †900 |
| Shock's pond | †900 |
| Tar River | †900 |
| Troy, Little River | 1,000 |
| Wagram, Shoe Hell Creek Pond | 100 |
| Warren Plains, Largo Pond | †1,200 |
| Lees Branch Pond | †1,200 |
| North Dakota: | |
| Dazey, Ensign Lake | 420 |
| Marston, Lake Williams | 350 |
| Petrel, Lemmon Lake | 500 |
| St John, Lakes of Rolette County | 4,060 |
| Ohio: | |
| Akron, Rex Lake | 300 |
| Alliance, Country Club Lake | 300 |
| Bridgeport, Deep Run | 140 |
| Fairpoint Pond | 100 |
| Glens Run | 100 |
| Wheeling Creek | 140 |
| Brokaw, Muskingum River | 200 |
| Caledonia, Whetstone Creek | 225 |
| Cambridge, Waterworks Lake | 100 |
| Canton, Isler Pond | 150 |
| Timken Lake | 150 |
| Carey, Tymochtee Creek | 225 |
| Chillicothe, Paint Creek | 750 |
| Paint Creek, North Fork | 250 |
| Cleveland, Bass Lake | 500 |
| Creston, Mud Lake | 200 |
| Dayton, Stillwater River | 200 |
| Earlville, Boettler's pond | 300 |
| Easton, Davidson Lake | 300 |
| Galion, Sandusky River | 300 |

| Disposition. | Number. |
|---|---|
| Ohio—Continued. | |
| Greenfield, Maple Grove Pond | 100 |
| Houston, Evergreen Lake | 100 |
| Lancaster, Crook's pond | 100 |
| Lemert, Sycamore Creek | 225 |
| Ludlow Falls, Stillwater Creek | 150 |
| Mount Oreb, White Oak Creek | 150 |
| Newton Falls, Milton Lake | 8,800 |
| Paulding, Miller Gravel Pond | 200 |
| Sugar Factory Pond | 200 |
| Powell, Willow Lake | 225 |
| Salem, Beaver Creek, Middle Fork | 225 |
| Mahoning Lake | 225 |
| Sylvan Brook | 100 |
| Swifts, Muskingum River | 200 |
| Tiffin, King Lake | 225 |
| Wapakoneta, Dixon Pond | 50 |
| Waterford, Muskingum River | 300 |
| Wellington, Waterworks Pond | 400 |
| West Mansfield, Mill Creek | 150 |
| Van Cleve Pond | 150 |
| West Milton, Stillwater River | 200 |
| White Sulphur, Lake Bird | 150 |
| Woodfield, Little Muskingum River | 150 |
| Oklahoma: | |
| Altus, Clay Lake | 130 |
| Ardmore, Ardmore Lake | 40 |
| Brushy Creek | 80 |
| City Lake | 80 |
| Club Lake | 120 |
| Dunlap's pond | 40 |
| Flood Creek | 40 |
| Lone Grove Lake | 40 |
| Mill Creek | 40 |
| Byars, Byars Lake | 80 |
| Cherokee, Allen Lake | 35 |
| Cheyenne, Willow Pond | 430 |
| Cordell, Ogle Lake | 24 |
| Rose's pond | 24 |
| Shepard Lake | 12 |
| Cog, Fish Hole Creek | 300 |
| Gage, Buzzard Roost Lake | 325 |
| Pasture Lake | 130 |
| Spring Lake | 195 |
| Goteba, Grigsby's pond | 35 |
| Grandfield, Porters Pond | 280 |
| Guthrie, Wiggins Pond | 40 |
| Hillsdale, Cox's pond | 35 |
| Hugo, Cut Off Lake | 550 |
| Inola, Scaley Bark Pond | 50 |
| Kingfisher, Big Kingfisher Lake | 105 |
| Kosoma, Miller Lake | 275 |
| Lookeba, Wilson Creek | 12 |
| McAlester, Bevo Lake | 150 |
| Lake Talawanda | 200 |
| Medford, Falkenberg's pond | 24 |
| Mooreland, Ruttman Lake | 130 |
| Mountain View, Buffalo Creek | 8 |
| Cottonwood Creek | 4 |
| Fisher Lake | 4 |
| Goom-do Creek | 8 |
| Medicine Creek | 8 |
| Oak Creek | 4 |
| Otter Creek | 8 |
| Pecan Creek | 8 |
| Rainy Mountain Creek | 4 |
| Saddle Mountain Creek | 4 |
| Stinking Creek | 8 |
| Sugar Creek | 4 |
| Taylor Creek | 8 |
| Muskogee, Sondheimer's pond | 150 |
| Oklahoma City, Belle Isle Lake | 80 |
| Phillips Lake | 12 |
| Waldon Lake | 40 |
| Orlando, Johnson's pond | 40 |
| Owasso, Owasso Lake | 150 |
| Pawhuska, Mission Creek | 100 |
| Perry, City Lake | 40 |
| Country Club Lake | 40 |
| McCinstry Lake | 40 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Oklahoma—Continued. | |
| Perry, Mullnix Lake | 40 |
| Perry Creek | 40 |
| Perry Lake | 40 |
| Pittsburg, Allen Lake | 50 |
| Pond Creek, Manning Creek | 70 |
| Poteau, Clear Lake | 300 |
| Stalcup Lake | 300 |
| Robbins, Illinois River, Barren Fork | 1,250 |
| Roosevelt, Cooperton Lake | 72 |
| Otter Creek | 24 |
| Sugar Creek | 24 |
| Stillwater, Parks's pond | 6 |
| Spring Valley Lake | 6 |
| Thatcher's pond | 12 |
| Strong City, Lake George | 130 |
| Spring Creek Pond | 65 |
| Tulsa, Glenn Lake | 50 |
| Vinita, Clear Lake | 100 |
| Jones Creek | 100 |
| Little Cabin Creek | 100 |
| Mustang Creek | 50 |
| Paw Paw Creek | 50 |
| Rock Creek | 200 |
| West Cabin Creek | 100 |
| White Oak Creek | 50 |
| Waurika, Stewart Lake | 18 |
| Welch, Little Cabin Creek | 150 |
| Weatherford, Cedar Creek | 120 |
| Spring Branch | 120 |
| Woodward, Dripping Spring Run | 65 |
| Ellington Lake | 65 |
| Fithen Lake | 130 |
| Hastings Lake | 130 |
| Jones Lake | 65 |
| Kollar's pond | 130 |
| Pitt Lake | 130 |
| Roundup Pond | 65 |
| Scates Lake | 130 |
| Soring Lake | 130 |
| Stiller Lake | 130 |
| Wyatt Lake | 130 |
| Wyatt Pond | 65 |
| Zahner Lake | 65 |
| Yost, Stillwater Lake | 12 |
| Yost Lake | 12 |
| Pennsylvania: | |
| Alderson, Harvey Lake | 300 |
| Altoona, Juniata River | 4,400 |
| Beaver, Big Beaver Creek | 200 |
| Little Beaver Creek | 150 |
| Raccoon Creek | 100 |
| Beaver Falls, Little Beaver Creek | 150 |
| Bellefonte, Bald Eagle Creek | 400 |
| Birdell, Brandywine Creek, West Branch | 100 |
| Bryn Athyn Station, Pennypack Creek | 375 |
| Cambridge Springs, Edinboro Lake | 12 |
| Canton, Lake Nepahwin | 900 |
| Carlisle, Conodoguinit Creek | 500 |
| Cessna, Dunning Creek | 100 |
| Chadds Ford, Patterson's pond | 100 |
| Christiana, Octoraro Creek | 1,000 |
| Columbia, Susquehanna River | 500 |
| Denver, Cocalico Creek | 200 |
| Denver Park Pond | 100 |
| Leeds Run | 100 |
| Lesher-Raig Pond | 100 |
| Swamp Creek | 100 |
| Dudley, Siding Hill Creek | 20 |
| East Berlin, Beaver Creek | 250 |
| Conewago Creek | 250 |
| Easton, Delaware River | 400 |
| Everett, Juniata River, Raystown Branch | 680 |
| Fallen Timber, Slate Run | 420 |
| Falls, Island Eddy Pond | 300 |
| Norris Lake | 200 |
| Susquehanna River | 300 |
| Swartwood Eddy Pond | 300 |
| Pennsylvania—Continued. | |
| Franklin, Allegheny River | 280 |
| French Creek | 300 |
| Hanover, Big Conewago Creek | 375 |
| Little Conewago Creek | 500 |
| Holidaysburg, Juniata River | 150 |
| Hosensack, Hosensack Creek (Dam No. 5) | 550 |
| Hosensack Creek (Dam No. 6) | 450 |
| Leibert Creek Pond | 200 |
| Huntingdon, Juniata River, Raystown Branch | 1,300 |
| Hyndman, Wills Creek | 40 |
| Johnstown, Dubstalts Pond | 140 |
| Hinckson Pond | 140 |
| Laurel Run Pond | 140 |
| Quemahoning Pond | 210 |
| Stony Creek | 210 |
| Lancaster, Conestoga Creek | 375 |
| Little Conestoga Creek | 250 |
| Lewisburg, Buffalo Creek | 750 |
| Chillisquaque Creek | 375 |
| Kratzerville Pond | 375 |
| Sampsell Pond | 375 |
| Lititz, Bricker's pond | 100 |
| Bucher Run | 100 |
| Conestoga Creek | 400 |
| Hammer Creek | 200 |
| Hammer Creek Pond | 100 |
| Rudy Run | 100 |
| McKeesport, Long Run | 300 |
| Mechanicsburg, Conodoguinet Creek | 500 |
| Mifflinburg, Penns Creek | 375 |
| Montrose, Bigsbee Pond | 200 |
| Forest Lake | 200 |
| Lake Mt. Rose | 200 |
| Muncy, Muncy Creek | 500 |
| Nanty Glo, Rager Run | 100 |
| New Bloomfield, Sherman Creek | 150 |
| New Brighton, Little Beaver Creek | 150 |
| Newport, Big Buffalo Creek | 300 |
| Nuangola, Lake Nuangola | 300 |
| Peach Bottom, Susquehanna River | 750 |
| Pen Argyl, Johnsonville Pond | 200 |
| Saylor Lake | 200 |
| Susquehanna River | 375 |
| Perkasie, Branch Creek | 100 |
| Phoenixville, French Creek | 625 |
| Pickering Creek | 375 |
| Pittston, Susquehanna River | 1,300 |
| Quakertown, Swamp Creek | 200 |
| Quarryville, Conowingo Creek | 375 |
| Octoraro Creek | 375 |
| Ransom, Susquehanna River | 200 |
| Rauschs, Rauschs Pond | 375 |
| Reading, Beaver Creek | 100 |
| Rock Forest, Susquehanna River | 500 |
| Rohrestown, Little Conestoga Creek | 375 |
| Royersford, French Creek | 250 |
| Kimberton Pond | 125 |
| Mill Dam Pond | 125 |
| Stony Run | 500 |
| St. Clair, Kaufman Pond | 250 |
| South Danville, Susquehanna River | 600 |
| Standing Stone, Spring Lake | 400 |
| Thompson, Wrighter Lake | 500 |
| Towanda, Susquehanna River | 500 |
| West Grove, Mitchell's Lake | 100 |
| White Clay Creek | 200 |
| Wind Ridge, Crow Creek | 200 |
| Wheeling Creek | 200 |
| Woodlawn, Racoon Creek | 150 |
| Wyalusing, Susquehanna River | 24 |
| Wyoanna, Susquehanna River | 300 |
| South Carolina: | |
| Aiken, Franklin's pond | 24 |
| Hendrix's pond | 500 |
| Angelus, Rocky Branch Pond | 2,700 |
| Rocky Creek | 2,700 |
| Barnwell, Cheat Cave Pond | 450 |
| Belton, Spring Pond | 200 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| South Carolina—Continued. | |
| Bennettsville, David's pond | 3,000 |
| Calhoun, Rocky River | 2,000 |
| Camden, Hermitage Pond | 88 |
| Cameron, Fogle Pond | 750 |
| Groner's pond | 1,000 |
| Columbia, Goodwill Pond | 2,500 |
| Florence, Muldrow Mill Pond | 3,000 |
| Pee Dee Lake | 600 |
| Gaffney, Cash's pond | 300 |
| Gilbert, Black Creek | 1,500 |
| Keisler's pond | 500 |
| Shumbert's pond | 1,500 |
| Greenville, Croft-Stone Lake | 1,500 |
| Saluda River | 1,500 |
| Stone's pond | 1,500 |
| Lexington, Clemens Creek Pond | 2,500 |
| Livingston, Turkey Branch Pond | 1,000 |
| Mars Bluff, Black Creek | 2,500 |
| Monetta, Mill Creek Pond | 400 |
| Montmorenci, Corliss's pond | 3,900 |
| Mount Croghan, Short's pond | 1,000 |
| Newberry, Cannon Creek | 400 |
| North, Jones's pond | 300 |
| Orangeburg, Edisto River | 1,900 |
| Fishery Branch | 4,440 |
| Wannamaker's pond | 1,200 |
| Zeigler's pond (A) | 3,300 |
| Zeigler's pond (B) | 2,700 |
| Pageland, Sand Hill Pond | 1,000 |
| Pickens, Keowee River | 500 |
| St. Matthews, Warley Creek | 1,000 |
| Sharon, Thomson's pond | 600 |
| Sumter, Brickyard Ponds | 3,000 |
| Wells Pond | 300 |
| Trenton, Asparagus Pond | 3,000 |
| Beaverdam Pond | 4,500 |
| Bettis's mill pond | 2,250 |
| Brunts Pond | 3,750 |
| Leonck's pond | 2,250 |
| Moss's mill pond | 3,750 |
| Union, George Sims Pond | 300 |
| Wagener, Big Branch Pond | 400 |
| Walhalla, Whitewater River | 1,800 |
| Ward, Watson's pond | 2,000 |
| Warrenville, Horse Pen Creek | 2,500 |
| Wedgefield, Dwight's pond | 2,100 |
| Singleton's pond | 3,000 |
| South Dakota: | |
| Blunt, Farmers Lake | 300 |
| Colome, Dog Ear Lake | 350 |
| Herreid, Spring Creek | 400 |
| Hot Springs, Ice Company Pond | 350 |
| Mansfield, Willowmere Lake | 200 |
| Martin, Lake Creek | 390 |
| North Cody Lake | 390 |
| Midland, Sunny Lake | 300 |
| Milbank, Whetstone River | 500 |
| Parkston, Wahl's pond | 200 |
| Sioux City, Waters of South Dakota | 1,050 |
| Tyndall, Marys Lake | 200 |
| Tennessee: | |
| Arlington, Cunningham's pond | 72 |
| Ashland City, Sycamore Creek | 150 |
| Atoka, Kimbrough's pond | 400 |
| Bolivar, Emerson Pond | 30 |
| Bristol, Holston River | 225 |
| Cedar Hill, Ravenswold Pond | 500 |
| Chattanooga, Lake View | 300 |
| Lookout Lake | †500 |
| Rock Creek | †500 |
| Chesterfield, Manness's pond | 900 |
| Coal Creek, Coal Creek | †2,000 |
| East Chattanooga, Bauxite Lake | 500 |
| Etowah, Cane Creek Pond | †2,000 |
| Fayetteville, Cane Pond | †3,000 |
| Elk River | †3,000 |
| Norris Creek | †4,000 |
| Franklin, Harpeth River | †4,000 |
| West Harpeth River | †3,000 |
| Tennessee—Continued. | |
| Gallatin, De Sha Creek | †7,000 |
| Hickory Valley, Avent's pond | †3,000 |
| Lexington, Hare's pond | 20 |
| Lone Mountain, Big Sycamore Creek | †2,000 |
| McKenzie, Clear Lake | 2,000 |
| McMinnville, Red Road Lake | 1,000 |
| Mayland, Mountain Lake | 3,500 |
| Normandy, Isom's pond | †2,000 |
| Oneida, Cumberland River, South Fork | †4,000 |
| White Oak Creek | †5,000 |
| Pulaski, Egnew Creek | †2,000 |
| Weakley Creek | †2,000 |
| Rogersville, Beech Creek | †2,000 |
| Caney Creek | †2,000 |
| Sale Creek, Sale Creek | 300 |
| Selmer, Sunnyside Lake | 150 |
| Shelbyville, Duck River | 500 |
| Springfield, Powell's pond | †2,000 |
| Sweetwater, Fork Creek | †500 |
| Pond Creek | †500 |
| Sweetwater Creek | †500 |
| Tullahoma, Hurricane Creek | †3,000 |
| Mulberry Creek | †3,000 |
| Walling, Robertson's pond | †2,000 |
| Wartrace, Duck River, Garrison Fork | †3,000 |
| Wartrace River | †3,000 |
| Watertown, Fall Creek | †3,000 |
| Wetmore, McLendon's pond | †1,000 |
| Winchester, Collins Pond | †1,500 |
| Utah: Ogden, Winter's pond | 100 |
| Virginia: | |
| Abert, James River | 170 |
| Appomattox, Appomattox River | 500 |
| Barboursville, Woodroof's pond | 150 |
| Blacksburg, Dobson's pond | 300 |
| Blackwood, Powder House Pond | 50 |
| Blaine, Blackwater Creek | 225 |
| Buffalo Forge, Bunker Hill Mill Pond | 55 |
| Camp Stephens, Chestnut Creek | 200 |
| Cripple Creek | 200 |
| Crooked Creek | 300 |
| New River, Knox Fork | 200 |
| Poplar Camp Creek | 200 |
| Castlewood, Clinch River | 300 |
| Cedar Bluff, Clinch River | 300 |
| Little River | 200 |
| Cohoke, Cohoke Pond | 400 |
| Pollard Pond | 230 |
| Danville, County Line Creek | 825 |
| Harper's pond | 1,200 |
| Delvale, Coxes Creek | 300 |
| Dixondale, Burk Mill Pond | †5,000 |
| Dundas, Great Creek Pond | 1,300 |
| Neblett Pond | 900 |
| Elkton, Shenandoah River | 60 |
| Emporia, Meherrin River | 525 |
| Yarrell Mill Pond | 300 |
| Ewing, Indian Creek | 120 |
| Fredericks Hall, Sherman Pond | 300 |
| Fremont, Cranes Nest River | †2,000 |
| McCleery River | †2,000 |
| Fries, New River | 300 |
| Goodview, Virginia Railway Lake | 250 |
| Gretna, Fitzgerald's pond | 150 |
| Hays, Pound River | †2,000 |
| Hot Springs, Jackson River | 55 |
| Keezletown, Shenandoah River | 110 |
| Kiser, Clinch River | 300 |
| Koehler, Smith River | 400 |
| Lexington, Big Buffalo Creek | 5 |
| Lodge, Willowdale Pond | 140 |
| Maplewood, Cedar Pond | 300 |
| Mount Jackson, Shenandoah River, North Fork | 40 |
| New Castle, Craig Creek | 115 |
| Norfolk, City Lake | 420 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Virginia—Continued. | |
| Norfolk, Elizabeth River | 975 |
| Little Creek Pond | †2,100<br>1,000 |
| Norton, Guest River | 100 |
| Powell River, Middle Fork | 750 |
| Powell River, South Fork | 400 |
| Paint Bank, Potts Creek | 300 |
| Pamplin, Almond Mill Pond | 400 |
| Pemberton, Trice Pond | 375 |
| Pembroke, Mountain Lake | 650 |
| Penn Laird, Cub Run | 55 |
| Penola, Dublin Mill Pond | 300 |
| Gwathmay's pond | 200 |
| Philpot, Smith River | 225 |
| Pisgah, Clinch River | 100 |
| Port Royal, Walsingham Pond | 110 |
| Remlik, Dragon Creek | 120 |
| Richmond, Association Pond | 1,200 |
| Belle Isle Road Pond | 400 |
| Broad Rock Pond | 560 |
| Bryan Park Pond | 625 |
| Captain Joes Pond | 1,300 |
| Carters Pond | 200 |
| Goyne's pond | 200 |
| Lakeside Lake | 1,000 |
| Licking Creek Pond | 400 |
| Northside Lake | 400 |
| Reddy Creek Pond | 600 |
| Spring Brook Pond | 600 |
| Woodson's pond | 300 |
| Riverside, South River | 55 |
| Rocky Mount, Pigg River | 225 |
| Salem, Roanoke River | 115 |
| Scottsville, Payne Pond | 225 |
| Shawsville, Roanoke River, South Fork | 300 |
| South Boston, Bruce's pond | 975 |
| Cedar Heights Pond | 50 |
| Speedwell, Elk Creek | 300 |
| Stanley, Back Creek | 225 |
| Staunton, Middle River | 120 |
| Stuart, Rockcastle Creek | 300 |
| Suffolk, Box Elder Pond | 225 |
| Norfleet Mill Pond | 225 |
| Sweet Hall, Custis Lake | 500 |
| Swords Creek, Clinch River, Maiden Spring Fork | 800 |
| Tappahannock, Croxton Mill Pond | 120 |
| Tazewell, Clinch River, East Fork | 300 |
| Timber Ridge, North River | 5 |
| Troutdale, Fox Creek | 300 |
| Wilson Creek | 300 |
| Walker Ford, James River | 225 |
| Warren, Tapscott's pond | 225 |
| Wellville, Crows Pond | 300 |
| Wheeler, Butchers Branch | 60 |
| Indian Creek | 60 |
| Windsor, Horne's pond | 225 |
| Wytheville, Cove Creek | 100 |
| West Virginia: | |
| Berkeley Springs, Sleepy Creek | 700 |
| Clarksburg, Oral Lake | 1,000 |
| Clay, Elk River | 28 |
| Little Laurel Creek | 21 |
| Great Cacapon, Cacapon River | 120 |
| Hurricane, Big Hurricane Creek | 40 |
| Moorefield, Potomac, South Fork | 35 |
| New Martinsville, Fishing Creek | 150 |
| Pax, Paint Creek Pond | 110 |
| Phillipi, Whitman Run Pond | 100 |
| Wisconsin: | |
| Alma, State fish commission | 3,425 |
| Aniwa, Pleasant Lake | 100 |
| Resch Lake | 100 |
| Spring Lake | 100 |
| Bagley, Mississippi River | a 1,000 |
| Baraboo, Dell Creek | 150 |
| Ellendale Lake | 50 |
| Wisconsin—Continued. | |
| Baraboo, Fern Dell Lake | 50 |
| Gray Lake | 75 |
| Mirror Lake | 150 |
| Narrows Lake | 275 |
| Pickerel Lake | 75 |
| Ringling Lake | 100 |
| Smith's pond | 75 |
| South Slew Lake | 50 |
| Spring Brook Lake | 200 |
| Timmes Mill Lake | 75 |
| Twin Lake | 150 |
| Beaver Dam, Beaverdam Lake | 550 |
| Black River Falls, Black River | 350 |
| Douglas Lake | 350 |
| Mud Lake | 175 |
| Rock Lake | 175 |
| Steblin Lake | 175 |
| Bloomer, Axe Handle Lake | 100 |
| Booth Lake | 100 |
| Carnell Lake | 50 |
| Chain Lake | 50 |
| Clear Lake | 50 |
| Lake Como | 50 |
| Little Rice Lake | 50 |
| Long Lake | 100 |
| Potato Lake | 100 |
| Round Lake | 50 |
| Shattuck Lake | 100 |
| Bowler, Kolpeck Lake | 100 |
| Brokaw, Wisconsin River | 300 |
| Centuria, Deer Lake | 300 |
| Chippewa Falls, Davis Lake | 200 |
| O'Neil Creek | 125 |
| Popple Lake | 150 |
| Wissota Lake | 125 |
| Conover, Portage Lake | 160 |
| Stormy Lake | 80 |
| Cumberland, Wildcat Lake | 150 |
| Darlington, Pecatonica River | 170 |
| Donaldson, Landing Lake | 100 |
| Little Portage Lake | 100 |
| Moon Lake | 200 |
| Round Lake | 100 |
| Durand, Bear Lake | 375 |
| Tompson Lake | 375 |
| Eggleston Crossing, Waits Lake | 150 |
| Eland, Mayflower Lake | 100 |
| Elkhart Lake, Crystal Lake | 300 |
| Elkhart Lake | 400 |
| Elk Mound, Colfax Lake | 700 |
| Fall Creek, Fall Creek | 350 |
| Fond du Lac, Fifteen Lake | 120 |
| Lake DeNeveu | 120 |
| Long Lake | 120 |
| Mullet Lake | 120 |
| Round Lake | 120 |
| Twin Lake | 120 |
| Fredonia, Milwaukee River | 500 |
| Galesville, Lake Marinuka | 500 |
| Gordon, Bond Lake | 225 |
| Bony Lake | 150 |
| Ox Lake | 50 |
| Spider Lake | 50 |
| Swensen Lake | 50 |
| Grand Rapids, Wisconsin River | 1,831 |
| Hartford, Mud Lake | 300 |
| Murphy Lake | 300 |
| Pike Lake | 300 |
| Hawthorne, Minnesung Lake | 200 |
| Hayward, Alexander Lake | 100 |
| Barber Lake | 50 |
| Bass Lake | 100 |
| Belille Lake | 50 |
| Blanche Lake | 50 |
| Chief Lake | 100 |
| Clear Lake | 50 |
| Como Lake | 50 |
| Fischer Lake | 100 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Hayward, Fulton Lake | 100 |
| Glover Lake | 100 |
| Gordon Lake | 50 |
| Hammond Lake | 100 |
| Harriet Lake | 50 |
| Jirrard Lake | 50 |
| Lake George | 100 |
| Moore Lake | 50 |
| Pike Lake | 100 |
| Shue Lake | 50 |
| Oneida Lake | 50 |
| Wilson Lake | 100 |
| Hazelhurst, Wind Pudding Lake | 100 |
| Heafford, Rice Lake (A) | 100 |
| Rice Lake (B) | 200 |
| Independence, Bugle Lake | 255 |
| Elk Lake | 170 |
| Iron River, Crystal Lake | 200 |
| Kilbourn, Wisconsin River | 300 |
| La Crosse, Mississippi River | a 1,415 |
| Ladysmith, Flambeau Pond | 300 |
| Mud Lake | 100 |
| Park Lake | 200 |
| Lake Geneva, Lake Geneva | 340 |
| Manitowoc, English Lake | 25 |
| Gass Lake | 25 |
| Gateman Lake | 25 |
| Glombsky Lake | 50 |
| Harp Lake | 50 |
| Hartlaub Lake | 50 |
| Hempton Lake | 25 |
| Kastbaum Lake | 25 |
| Pigeon Lake | 50 |
| Schisel Lake | 25 |
| Silver Lake | 50 |
| Vetting Lake | 50 |
| Mattoon, Baker Lake | 75 |
| Heiberlein Lake | 75 |
| Johnson Lake | 75 |
| Mauston, Lemonweir River | 200 |
| Mellen, Bass Lake (A) | 50 |
| Bass Lake (B) | 50 |
| Beaver Lake (A) | 100 |
| Beaver Lake (B) | 50 |
| Birch Lake | 100 |
| Bladder Lake | 100 |
| Clear Lake (A) | 50 |
| Clear Lake (B) | 50 |
| Duck Lake | 50 |
| English Lake | 50 |
| French Lake | 100 |
| Graham Lake | 50 |
| Hoist Lake | 50 |
| Lake Eighteen | 50 |
| Lost Lake | 50 |
| McCarty Lake | 100 |
| Miller Lake | 50 |
| Mineral Lake | 100 |
| Munson Lake | 50 |
| Murphy Lake | 50 |
| Potter Lake | 50 |
| Rice Lake | 50 |
| Spider Lake | 50 |
| Spring Lake | 100 |
| Summit Lake (A) | 100 |
| Summit Lake (B) | 50 |
| Menomonie, Caryville Lake | 100 |
| Cedar Falls Lake | 200 |
| Doyle Lake | 100 |
| Eighteen Mile Lake | 100 |
| Goose Lake | 100 |
| Hay River | 250 |
| Lake Menomonie | 100 |
| Miller Lake | 100 |
| Moore Farm Lake | 100 |
| Mud Lake | 100 |
| Pitt Lake | 100 |
| Red Cedar River | 200 |
| Rowe Lake | 100 |

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Menomonie, Stump Lake | 100 |
| Waubeek Lake | 100 |
| Wilson Lake | 100 |
| Merrill, Ackerman Lake | 25 |
| Bass Lake | 25 |
| Black Alder Lake | 25 |
| Daniels Lake | 50 |
| Hitchlee Lake | 25 |
| Lake Pesobic | 50 |
| Lost Lake | 25 |
| Pine Lake | 25 |
| Silver Lake | 25 |
| Tug Lake | 25 |
| Winkleman Lake | 25 |
| Wisconsin River | 75 |
| Neshkoro, Turtle Lake | 200 |
| New Auburn, Chain Lake | 200 |
| Norrie, Cancer Lake | 75 |
| Horsehead Lake | 75 |
| Lake Go To It | 75 |
| Long Rice Lake | 75 |
| Mayflower Lake | 75 |
| Mud Lake | 75 |
| Norrie Lake | 75 |
| Pike Lake | 75 |
| Range Line Lake | 75 |
| Rice Lake | 75 |
| Road Lake | 75 |
| Short Portage Lake | 75 |
| Small Bass Lake | 75 |
| Small Mayflower Lake | 75 |
| Turtle Lake | 75 |
| Twin Lake | 75 |
| Wild Rose Lake | 75 |
| Yellow Banks Lake | 75 |
| Pembine, Lost Lake | 110 |
| Rock Lake | 100 |
| Smith Lake | 100 |
| Phillips, Big Elk River | 100 |
| Cranberry Lake | 50 |
| Dardis Lake | 100 |
| Deer Lake | 50 |
| Elk Lake | 50 |
| Flambeau River, South Fork | 100 |
| Grassy Lake | 100 |
| Lake Duray | 50 |
| Little Daris Lake | 50 |
| Little Elk Creek | 100 |
| Long Lake | 50 |
| Poynette, Hinckson Creek | 200 |
| Poynette Mill Pond | 100 |
| Rowan Creek | 150 |
| Reserve, Grindstone Lake | 200 |
| Lac Court Oreilles | 300 |
| Rhinelander, Bass Lake | 100 |
| Ben Sweet Lake | 100 |
| Boom Lake | 100 |
| Faust Lake | 100 |
| Lake George | 100 |
| Lake Julia | 100 |
| Lake Thompson | 100 |
| North Pelican Lake | 150 |
| Pearl Curran Lake | 50 |
| Pine Lake | 100 |
| Shepard Lake | 100 |
| Town Line Lake | 100 |
| Wisconsin River | 100 |
| Rib Lake, North Spirit Lake | 300 |
| Richland Center, Bowen Mill Pond | 250 |
| Brown Lake | 125 |
| Cazenovia Mill Pond | 125 |
| Crueson Pond | 250 |
| Excelsior Mill Pond | 125 |
| Ithica Mill Pond | 125 |
| Lone Rock Mill Pond | 250 |
| Neptune Mill Pond | 250 |
| Postol Lake | 250 |
| Richland Center Mill Pond | 250 |
| Shawano, Keshena Lake | 100 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LARGEMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Wisconsin—Continued. | |
| Sheboygan, Lake Seven | 100 |
| Pigeon River | 100 |
| Sheboygan Falls, Lake Ellen | 100 |
| Pigeon Lake | 200 |
| Solon Springs, Beauregard Lake | 100 |
| Lake of the Woods | 50 |
| Rocky Lake | 200 |
| Stone Lake, Hungry Lake | 400 |
| Snag Lake | 100 |
| Superior, Amnicon Lake | 70 |
| Bingo Lake | 40 |
| Boscoe Bay Lake | 40 |
| Bubar Lake | 40 |
| Clubine Lake | 40 |
| Crow Lake | 40 |
| Eagle Lake | 40 |
| Five Island Lake | 40 |
| Heart Lake | 40 |
| Huber Lake | 40 |
| Lake Millicent | 40 |
| Lost Lake | 40 |
| Lower Pike Lake | 40 |
| Mary Lake | 40 |
| Pike Lake | 40 |
| Twin Lakes | 40 |
| Three Lakes, Butternut Lake | 100 |
| Franklin Lake | 100 |
| Tomahawk, Bass Lake | 50 |
| Clear Lake | 100 |
| Deer Lake | 100 |
| Half Moon Lake | 100 |
| Tomahawk, Lake Clara | 50 |
| Manson Lake | 50 |
| Mirror Lake | 50 |
| Mud Lake | 50 |
| Muscalonge Lake | 100 |
| Road Lake | 50 |
| Round Lake | 50 |
| Somo Lake | 50 |
| Somo River | 50 |
| Spirit River | 50 |
| Tomahawk River | 50 |
| Wisconsin River | 50 |
| Wabeno, Ada Lake | 300 |
| Waldo, Lake Ellen | 300 |
| Watertown, Richwood Quarry Pond | 300 |
| Wausau, Big Rib River | 150 |
| Lake Go To It | 165 |
| Lake Wausau | 54 |
| Mud Lake | 100 |
| Webster, Yellow Lake | 200 |
| Winegar, Crab Lake | 200 |
| Wyoming: | |
| Cheyenne, Lake Minnehaha | 175 |
| Sloans Lake | 350 |
| Worland, Worland's pond | 175 |
| Canal Zone: Gatun Lake, Gatun Lake | 1,000 |
| Mexico: Parral, Lake Conchos | 750 |
| Total *a* | †283,500<br>970,020 |

SMALLMOUTH BLACK BASS.

| | |
|---|---|
| Arkansas: | |
| Abbott, Petit Jane Creek | 250 |
| Cauthron, Poteau River | 236 |
| Harrison, Bear Creek | 229 |
| Crooked Creek and Branches | 686 |
| Huzzah Creek | 229 |
| Shain, Little Red River | 228 |
| Shirley, Red River | 228 |
| Waldron, Dutch Creek | 413 |
| Fourche Creek | 236 |
| Van Buren, Cotton Lake | 300 |
| Colorado: Wray, Club Lakes | 250 |
| Connecticut: | |
| Niantic, Cedar Lake | 83 |
| Norfolk, Doolittle Pond | 50 |
| Smith Pond | 50 |
| Norwich, Ashland Pond | 150 |
| Beach Pond | 75 |
| Billings Lake | 75 |
| Gardner Lake | 75 |
| Hayward Lake | 75 |
| Long Pond | 75 |
| Oxoboxo Lake | 75 |
| Pachaug Pond | 75 |
| Rogers Lake | 75 |
| Wilisted, Highland Lake | 100 |
| Indiana: | |
| Angola, Lake James | †4,000 |
| Loon Lake | 1,000 |
| Brazil, Cooper's pond | †1,500 |
| Columbia City, Shriner Lake | 1,000 |
| Culver, Bess Lake | 1,500 |
| Lake Maxinkuckee | 2,500 |
| Howe, Pigeon River | †4,000 |
| Huntington, Clear Creek | †2,000 |
| Little River | †3,000 |
| Rock Creek | †2,000 |
| Salamonie River | †3,000 |
| Wabash River | †4,000 |
| Indianapolis, Eagle Creek | 1,500 |
| White River | 1,500 |
| Kendallville, Adams Lake | 1,000 |
| Fish Lake | †3,000 |
| Indiana—Continued. | |
| Kendallville, Pretty Lake | †3,000 |
| Knox, Bass Lake | †5,000 |
| Kokomo, Leach's pond | †1,500 |
| Logansport, Eel River | †4,000 |
| Orland, Wall Lake | 1,000 |
| Richmond, Durley's pond | 500 |
| Rolling Prairie, Saguaay Lake | 1,000 |
| Iowa: | |
| Earlville, Plum Creek | 300 |
| Independence, Wapsipinicon River | 300 |
| Jessup, Wapsipinicon River | 200 |
| Kentucky: | |
| Cadiz, Little River | 350 |
| Erlanger, Lake Park | 200 |
| Georgetown, Elkhorn Creek | 2,100 |
| Flemingsburg, Fleming Creek | 900 |
| Hopkinsville, Little River and branches | 1,050 |
| Oak Grove Pond | 150 |
| Pond River | 375 |
| Red River, West Fork | 375 |
| Sinking Fork Creek | 250 |
| Maine: | |
| Ayers Junction, Meddybemps Lake | 50 |
| Eliot, Great Works River | †2,000 |
| York Pond | †2,000 |
| Oakland, Little Pond | 40 |
| North Pond | 50 |
| Salmon Lake | 40 |
| Maryland: | |
| Baltimore, State Ponds | 88 |
| Cockeysville, Old Beaverdam Pond | 1,800 |
| Dickerson, Potomac River | 925 |
| Gaithersburg, Potomac River | †10,000 |
| Glen Echo, Potomac River | 850 |
| Havre de Grace, Susquehanna River | 400 |
| Hollins, Lake Roland | 1,500 |
| Massachusetts: | |
| Ashburnham, Naukeag Lake | †3,000 |
| Dover, Pegan Hill Pond | †3,000 |
| Great Barrington, Lake Mansfield | 30 |
| Prospect Lake | 30 |

*a* Exclusive of 8,445 fingerlings lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SMALLMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| Massachusetts—Continued. | |
| Harvard, Farm Pond | †1,000 |
| Hudson, Lake Boon | 325 |
| Lenoxville, Laurel Lake | 90 |
| Lowell, Tyngs Pond | †2,000 |
| Plymouth, Rabbit Pond | 200 |
| Shelburne Falls, Ashfield Pond | 30 |
| Deerfield River | 30 |
| Gardner Falls Lake | 30 |
| Reservoir No. 2 | 30 |
| Reservoir No. 4 | 30 |
| Southbridge, Greenwood Farm Pond | †2,000 |
| West Barnstable, Indian Pond | 200 |
| Long Pond | 200 |
| Wequaquet Lake | 200 |
| West Medway, Medway Park Pond | †2,000 |
| Michigan: | |
| Atlanta, Dishaw Lake | 1,500 |
| Rush Lake | 1,500 |
| Valentine Lake | 1,400 |
| Beechwood, Lake Five | 280 |
| Benton Harbor, St. Joseph River | 400 |
| Brighton, Maltby Lake | †3,000 |
| Butternut, Crystal Lake | 800 |
| Clyde, Irving Lake | †4,000 |
| Round Lake | †3,000 |
| Summers Lake | †4,000 |
| Town Line Lake | †3,000 |
| Wheeler Lake | †3,000 |
| Crystal Falls, Armstrong Lake | 280 |
| Lower Holmes Lake | 280 |
| Paint River | 280 |
| Swan Lake | 280 |
| Edwardsburg, Bull Lake | 400 |
| Elba, Hasler Lake | 400 |
| Engadine, Millecougin Lake | 300 |
| Escanaba, Lake Florence | 600 |
| Hamburg, Pleasant Lake | 1,000 |
| Hancock, Lake Gerald | 280 |
| Howell, Greenaway Lake | †3,000 |
| Ishpeming, Grass Lake | 600 |
| Island Lake, Island Lake | †4,000 |
| Jackson, Big Portage Lake | †4,000 |
| Browns Lake | †3,000 |
| Wolf Lake | †4,000 |
| Lake George, Lake George | 1,200 |
| Lakeland, Huron River | 800 |
| Leonard, Echo Lake | 1,000 |
| Little Lake, Horseshoe Lake | 600 |
| Princess Lake | 600 |
| Long Lake, Au Sable Lakes | 800 |
| Marenisco, Lake Gogebic | 280 |
| Marquette, Au Train Lake | 300 |
| Gorge Lake | 250 |
| Pickerel Lake | 300 |
| Section Ten Pond | 300 |
| Werner Pond | 250 |
| Middleville, Thornapple River | 400 |
| Mitchell Spur, Spring Lake | 280 |
| Newaygo, Emerald Lake | 750 |
| Sylvan Lake | 750 |
| Northville, D. I. G. Lake | 200 |
| Orchard Lake | 1,000 |
| Pine Lake | 1,000 |
| Round Lake | 1,000 |
| Osseo, Bird Lake | 400 |
| Port, Bob Lake | 280 |
| Republic, Michigamme River | 600 |
| Rockland, Michigan Pond | 280 |
| Rose Center, Long Lake | †4,000 |
| Mallett Lake | †4,000 |
| North Buckhorn Lake | †4,000 |
| South Lyon, Sandy Bottom Lake | †3,000 |
| South Range, Lake Eva | 420 |
| Stanton, Clifford Lake | †1,500 |
| Traverse City, Long Lake | 400 |
| Twin Lake, Stevens Lake | 1,200 |
| Wixon, Proud Lake | †3,000 |
| Minnesota: | |
| Detroit, Big Detroit Lake | 200 |
| Big Floyd Lake | 200 |
| Detroit, Big Pelican Lake | 200 |
| Buffalo Lake | 200 |
| Cotton Lake | 200 |
| Cushman Lake | 200 |
| Eunice Lake | 200 |
| Fox Lake | 200 |
| Little Floyd Lake | 200 |
| Little Pelican Lake | 200 |
| Long Lake | 200 |
| Maud Lake | 200 |
| Meadow Lake | 200 |
| Melesia Lake | 200 |
| Munson Lake | 200 |
| Muskrat Lake | 200 |
| Pearl Lake | 200 |
| Rock Lake | 200 |
| Sally Lake | 200 |
| Twin Lakes | 200 |
| Elysian, Lake Francis | 300 |
| Litchfield, Clear Lake | 200 |
| Dunn Lake | 200 |
| Greenleaf Lake | 200 |
| Lake Manuella | 200 |
| Lake Minniebelle | 400 |
| Lake Richardson | 200 |
| Lake Ripley | 200 |
| Lake Stella | 200 |
| Lake Willie | 200 |
| Star Lake | 200 |
| Washington Lake | 200 |
| Red Wing, Mississippi River | a2,075 |
| Waverly, Waverly Lake | 300 |
| Missouri: Rolla, Big Piney River | 100 |
| New Hampshire: | |
| Antrim, Gregg Lake | †3,000 |
| | 600 |
| Ashland, Asquam Lake | 600 |
| Concord, Contoocook River | †3,000 |
| Dover, Bellemy River | 250 |
| Durham, Wheelwright Pond | 250 |
| Enfield, Mascoma Lake | 500 |
| Gale, Kalelemook Lake | 400 |
| Milford, Baboosic Lake | †3,000 |
| Nashua, Baboosic Lake | 600 |
| South Hampton, Pow Wow River | †2,000 |
| Tuxbury Pond | †2,000 |
| New York: | |
| Altamont, Summit Club Lake | 1,000 |
| Amenia, Mill Pond | 400 |
| Amsterdam, Lake Galaway | 400 |
| Schoharie River | 600 |
| Cambridge, Lake Lauderdale | 300 |
| Cobleskill, Bears Gulf Lake | 300 |
| Hudson Lake | 200 |
| Schuyler Lake | 300 |
| Summit Lake | 300 |
| Cohoes, Mohawk River | 400 |
| Davenport, Sexsmith Lake | 125 |
| Fishkill, Bennywater Pond | 75 |
| Glens Falls, Glen Lake | 300 |
| Gloversville, Canada Lake | 400 |
| Highland Falls, Po Po Lo Lake | 300 |
| Roe Lake | 300 |
| Katonah, Pea Pond | 300 |
| Kerhonkson, Lake Awosting | 400 |
| Kingston, Wallkill Creek | 300 |
| Kyserike, Rondout Creek | 300 |
| Lake Clear Junction, Osgood Lake | 50 |
| Lake Katrine, Esopus Creek | 300 |
| Lockport, Tonawanda Creek | 600 |
| Millbrook, Thorne's pond | 250 |
| Newark, Canarquea River | 600 |
| Coffey Lake | 600 |
| Niagara Falls, Niagara River | 400 |
| Norwich, Chenango Lake | 400 |
| Chenango River | 500 |
| Mead Pond | 400 |
| Plymouth Lake | 400 |
| Ruggs Pond | 500 |
| Steers Pond | 500 |

a Rescued from overflowed lands and restored to original owners.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SMALLMOUTH BLACK BASS—Continued.

| Disposition. | Number. |
|---|---|
| New York—Continued. | |
| Ossining, Dream Lake | 300 |
| Pleasant Lake, Pleasant Lake | 50 |
| Port Jervis, Delaware River | 400 |
| Riverside, Brant Lake | 400 |
| Schroon Lake | 600 |
| St. Johnsville, West Canada Lake | 400 |
| Saratoga Springs, Saratoga Lake | 1,800 |
| Schnectady, Ballson Lake | 900 |
| Mohawk River | 900 |
| Sharon Station, Round Pond | 60 |
| White Plains, Rye Lake | 600 |
| North Carolina: | |
| Elizabethtown, White Lake | 190 |
| Fayetteville, Lakewood Lake | 150 |
| Texas Lake | 150 |
| St. Pauls, Great Marsh Pond | 190 |
| Ohio: | |
| Berea, Duck Pond | 300 |
| Canal Fulton, Ohio Canal | 450 |
| Cardington, Olentangy Creek | 1,500 |
| Chillicothe, Lake Rena | 450 |
| Lake Rowena | 1,000 |
| Columbus, Alum Creek | 1,000 |
| Crestline, Sandusky River | 1,500 |
| Loveland, Little Miami River | 2,000 |
| Minerva, Big Sandy Creek | 450 |
| Newark, Licking River | 1,500 |
| Raccoon Creek | 1,000 |
| Ravenna, Lake Hodgson | 450 |
| Sandy Lake | 300 |
| Sycamore, Sycamore Creek | 1,500 |
| Urbana, Nettle Creek | 1,500 |
| Utica, Sycamore Creek | 500 |
| Woodsfield, Alum Creek | 450 |
| Clear Fork Creek | 450 |
| Crane Nest Creek | 450 |
| Jennings-Davis Pond | 300 |
| Licking River | 300 |
| Muskingum River and branches | 2,700 |
| Nettle Creek | 300 |
| Rocky Fork Creek | 300 |
| Sunfish Creek | 450 |
| Youngstown, Coalburg Pond | 300 |
| Pennsylvania: | |
| Doylestown, Mill Creek | 400 |
| Neshaminy Creek | 400 |
| Pine Run | 800 |
| Tohickon Creek | 400 |
| Indiana, Crooked Creek | 1,200 |
| Quakertown, Gimbel Creek | 1,200 |
| Sterner Pond | 1,200 |
| Swamp Creek | 1,200 |
| Reading, Tulpehocken Creek | 800 |
| Royersford, Swamp Creek | 400 |
| Saegertown, French Creek | 2,400 |
| Sharpsville, Pymatuning Creek | 450 |
| Shenango River | 450 |
| Rhode Island: | |
| Providence, Gorton Pond | 33 |
| Herring Pond | 25 |
| Moscow Pond | 150 |
| Moswansicut Pond | 25 |
| Pascoag Pond | 25 |
| Quidnick Pond | 33 |
| Sand Pond | 34 |
| Tucker Pond | 150 |
| Wallum Pond | 25 |
| Watchaug Pond | 40 |
| Yawcoog Pond | 150 |
| Wakefield, White Pond | 200 |
| Tennessee: | |
| Bristol, Holston River | 175 |
| Etowah, Camponey Lake | †1,000<br>250 |
| Rock Island, Caney Fork River | 3,500 |
| Vermont: | |
| Brattleboro, Hunts Meadow Lake | 40 |
| Sunset Lake | 40 |
| Vermont—Continued. | |
| Burlington, Lake Champlain | 100 |
| Canaan, Wallis Pond | 53 |
| Castleton, Lake Bomoseen | 80 |
| Fairlee, Lake Morey | 75 |
| Ferrisburg, Little Otter Creek | 100 |
| Hardwick, Valley Lake | 125 |
| Montpelier, Curtis Pond | 50 |
| Morrisville, Lake Lamoille | 225 |
| North Ferrisburg, Cedar Lake | 100 |
| Richmond, Winooski River | 50 |
| Rutland, Burr Pond | 200 |
| East Pittsford Pond | 150 |
| Springfield, Black River | 75 |
| Walden, West Hill Pond | 50 |
| Wilmington, Lake Raponda | 50 |
| Windsor, Kanadie Mill Pond | 75 |
| Runnemede Pond | 75 |
| Wolcott, Wolcott Pond | 100 |
| Virginia: | |
| Ashburn, Goose Creek | 800 |
| Ashland, Little Clear Lake | 300 |
| Fredericksburg, Ni River | †3,000 |
| Po River | †3,000 |
| Kinsale, Cat Point Creek | 195 |
| West Point, Marston's pond | †4,000 |
| West Virginia: | |
| Berkeley Springs, Sleepy Creek | 1,200 |
| Bluestone, Bluestone River | 420 |
| Brown, Ten Mile Run | 200 |
| Harpers Ferry, Potomac River | 9,800 |
| Marlinton, Knapp Creek | †5,000 |
| New Martinsville, Fishing Creek | 1,200 |
| Paw Paw, Great Cacapon River | 1,200 |
| Petersburg, Potomac River, South Branch | 1,200 |
| Romney, Potomac River, South Branch | †10,000 |
| Springfield, Patterson Creek | †4,000 |
| Potomac River, South Branch | †5,000 |
| Wisconsin: | |
| Athelstane, Elbow Lake | 600 |
| Bay City, Mississippi River | [a] 270 |
| Boyd, Cornell Lake | 200 |
| Wolf River, North Fork | 200 |
| Yellow River | 200 |
| Donaldson, Bear Lake | 300 |
| Little Bass Lake | 300 |
| Ellis Junction, Eagle Lake | 300 |
| Frying Pan Lake | 300 |
| High Falls Lake | 300 |
| Lake Noquebay | 300 |
| Left Foot Lake | 300 |
| Perch Lake | 300 |
| Peshtigo River | 300 |
| Woods Lake | 300 |
| Hayward, Big Spider Lake | 400 |
| Grindstone Lake | 400 |
| Little Spider Lake | 200 |
| Lost Land Lake | 200 |
| Smith Lake | 200 |
| Spring Lake | 200 |
| Iron River, Island Lake | 1,400 |
| Pike Lake (A) | 400 |
| Pike Lake (B) | 1,000 |
| Sandbar Lake | 400 |
| Park Falls, Round Lake | 280 |
| Schnurs Lake | 280 |
| Phillips, Bass Lake | 280 |
| Ringle, Spring Lake | 200 |
| Sheboygan Falls, Long Lake | 100 |
| Stone Lake, Ham Lake | 400 |
| Waupaca, Big Lake | 100 |
| Hat Factory Pond | 100 |
| McCrossen Lake | 100 |
| Total [b] | †172,500<br>155,674 |

[a] Rescued from overflowed lands and restored to original waters.
[b] Exclusive of 1,500 fry and 9,515 fingerlings lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

ROCK BASS.

| Disposition. | Number. |
|---|---|
| Alabama: | |
| Bayou Labatre, Little River | 500 |
| Birmingham, Ketona Pond | 250 |
| Jasper, Sims-Long Pond | 125 |
| Montgomery, Mill Creek | 1,800 |
| Pine Hill, Sheffield's pond | 250 |
| Spring Branch | 500 |
| Russellville, Lake Galey | 375 |
| Lake Rockwood | 250 |
| Arkansas: | |
| Elba, Mill Hollow Creek | 273 |
| Gilbert, Calf Creek | 273 |
| Dry Creek | 273 |
| Mill Creek | 273 |
| Mammoth Spring, Warm Fork Creek | 916 |
| Poe, Little Red River | 274 |
| Shirley, Little Red River, Archys Fork | 274 |
| Texarkana, Country Club Lake | 800 |
| Connecticut: Bridgeport, Busser's pond | 200 |
| Delaware: Wilmington, Barnett Lake | 300 |
| Georgia: | |
| Bellville, Briarwood Pond | 400 |
| Cartersville, Clear Creek | 800 |
| Cave Springs, Tallalah Lake | 400 |
| Winder, Eastview Lake | 400 |
| Illinois: | |
| Aurora, Deitrich's pond | 114 |
| New Boston, Mississippi River | a 167 |
| Villa Ridge, Aldrich's pond | 300 |
| Indiana: | |
| Huntington, Clear Creek | 300 |
| Little River | 300 |
| Rock Creek | 300 |
| Salamonie River | 300 |
| Wabash River | 300 |
| Ingle Station, Volkmann's pond | 200 |
| Winemac, Huddleston's pond | 100 |
| Iowa: | |
| Allerton, Rock Island Reservoir | 300 |
| Bellevue, Mississippi River | 2,500 |
| Kansas: | |
| Fort Scott, Sheeler Lake | 800 |
| Parsons, Labette Creek | 800 |
| Kentucky: | |
| Cadiz, Donaldson Creek | 1,500 |
| Campbellsburg, Spring Lake | 500 |
| Central City, Roll's pond | 500 |
| Cynthiana, Duck Pond | 200 |
| Georgetown, Elkhorn Creek | 150 |
| Hopkinsville, Lake Tandy | 1,200 |
| Little River | 1,200 |
| Little River, East Fork | 1,200 |
| Pond River, West Fork | 1,200 |
| Lexington, Spring Bank Pond | 100 |
| Louisville, Lake Idlewylde | 400 |
| Lake Lansdowne | 1,000 |
| Tip Top, Forest Home Pond | 700 |
| Walton, Boone Lake | 100 |
| Louisiana: | |
| Cade Station, Pharr's pond | 200 |
| Natchitoches, Cane River Lake | 750 |
| Maryland: Sparks, Pearce's pond | 50 |
| Michigan: | |
| Iron River, Fifteen Lake | 300 |
| Twin Lake, Middle Lake | 200 |
| Twin Lake | 200 |
| Minnesota: Homer, Mississippi River | a 218 |
| Mississippi: | |
| Aberdeen, Baker Lake | 500 |
| Black Pond | 84 |
| Bogan Pond | 100 |
| Carter Pond | 200 |
| Deer Lake | 625 |
| Glenn Lake | 200 |
| Greer's pond | 200 |
| Jones Lake | 200 |
| Kinnie Lake | 400 |
| Mississippi—Continued. | |
| Aberdeen, Rinney Creek | 200 |
| Smith Lake | 100 |
| Baldwin, McDonald Lake | 250 |
| Bovina, Clear Creek | 500 |
| Corinth, Skillman's pond | 500 |
| Crystal Springs, Batton's pond | 150 |
| Friar Point, Moon Lake | 980 |
| Gulfport, Bayou Barnard | 2,900 |
| Learned, Lowry's pond | 225 |
| Meridian, Oak Pond | 500 |
| Mize, Robertson's pond | 150 |
| Natchez, College House Pond | 150 |
| Pontotoc, Highland Pond | 250 |
| Johnston's pond | 625 |
| Taylor, Tatum's pond | 250 |
| Toomsuba, King's pond | 250 |
| West Point, La Rue's pond | 250 |
| Nangle Pond | 250 |
| Prairie Lake | 100 |
| Woodville, Poland's pond | 100 |
| Missouri: | |
| Aurora, Flat Creek | 800 |
| Fanning, Elk Springs Lake | 1,000 |
| Gilliam, Waterworks Pond | 150 |
| Lebanon, Kneedler's pond | 400 |
| McNeill's pond | 600 |
| Passaic, Limestone Lake | 200 |
| Phillipsburg, Shaffer's pond | 200 |
| Rolla, Barnitz Lake | 200 |
| Little Piney River, Lower | 400 |
| New Mexico: | |
| Estancia, Clubb's pond | 200 |
| Roswell, Chain Lake | 200 |
| Guajalote Lake | 150 |
| Summer Lake | 100 |
| Sunset Lake | 200 |
| Sutherland Lake | 200 |
| North Carolina: | |
| Asheville, Barber's pond | 200 |
| Beechwood Lake | 800 |
| White Flint Pond | 1,000 |
| Concord, Gibson's pond | 800 |
| Pemberton Pond | 800 |
| Petrea's pond | 1,000 |
| Elkin, Cobb Creek | 1,000 |
| Flat Rock, Draper Pond | 1,000 |
| Lumberton, Leonard Mill Pond | 1,000 |
| Matthews, Martin's pond | 800 |
| Monroe, Maple Spring Pond | 1,000 |
| Newton, Sigman's pond | 1,000 |
| Pee Dee, Blewett Falls Pond | 2,500 |
| Raleigh, Neuseoco Club Lake | 1,000 |
| Wake Forest, Powell's pond | 200 |
| North Dakota: Lisbon, Ash Grove Pond | 100 |
| Ohio: | |
| Amsden, Pankhurst's pond | 100 |
| Columbus, Scioto River | 100 |
| Newton Falls, Milton Lake | 200 |
| Outville, Lickling River, South Fork | 100 |
| Pemberville, Rice's pond | 100 |
| Oklahoma: | |
| Armstrong, State Ponds | 1,550 |
| Goteba, Branson's pond | 300 |
| Mangum, Thomason's pond | 37 |
| Pauls Valley, Perkins's pond | 300 |
| Vici, South Persimmon Pond | 38 |
| Pennsylvania: | |
| Brookville, Arthurs's pond | 50 |
| Brownsville, Cleaver's pond | 50 |
| Hollidaysburg, Leighty's pond | 100 |
| Washington, Borcher's pond | 100 |
| South Carolina: Clover, Adams's pond | 1,000 |
| Tennessee: | |
| Athens, Big Mouse Creek | 1,000 |
| Bolivar, Ferguson's pond | 150 |
| Chattanooga, Pan Gap Lake | 300 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

ROCK BASS—Continued.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Tennessee—Continued. | | Virginia—Continued. | |
| Cleveland, Maple Lake | 1,000 | Mount Holly, Weston Place Pond | 50 |
| Cumberland Gap, Indian Creek | 1,000 | Peakes, Reformatory Mill Pond | 300 |
| Doyle, Terry's pond | 100 | Richmond, Valden Club Pond | 800 |
| Farmer, Barney Creek | 1,000 | Williams Pond | 400 |
| Franklin, Big Harpeth River | 150 | Roanoke, Roanoke River | 400 |
| McDaniel Pond | 150 | Salem, Roanoke River | 400 |
| West Harpeth River | 300 | Singer, Roanoke River | 400 |
| Harriman, Gallaher's pond | 1,000 | Scottsville, Chester Pond | 200 |
| Jefferson City, Dumpan Creek | 1,500 | Starkey, Back Creek | 400 |
| Johnson City, Limestone Creek | 1,000 | Suffolk, Nansemond River | 300 |
| Lancing, Rock Creek | 1,500 | Tunstall, Garlick Pond | 500 |
| McMinnville, Charles Creek Pond | 400 | West Virginia: | |
| Watertown, Fall Creek Pond | 1,000 | Cloverlick, Thorny Creek | 325 |
| Virginia: | | Elkins, Tygarts Valley River | 400 |
| Ashland, Decarseau Pond | 200 | Philippi, Whitman Pond | 400 |
| Atlee, Wheat's pond | 300 | Wisconsin: Stone Lake, Little Sissabagama Lake | 136 |
| Bedford, Thomas's pond | 200 | | |
| Haysi, Russell Fork | 2,000 | Total[a] | 83,055 |
| Hot Springs, Jackson River | 325 | | |

WARMOUTH BASS.

| | | | |
|---|---|---|---|
| Alabama: Florence, Holiway's pond | 450 | Mississippi: Aberdeen, Jones Creek | 800 |
| Iowa: | | | |
| Bellevue, Mississippi River | [b] 7,710 | Total | 9,220 |
| North McGregor, Mississippi River | [b] 260 | | |

SUNFISH (BREAM).

| | | | |
|---|---|---|---|
| Alabama: | | Alabama—Continued. | |
| Alberta, Henley's pond | 400 | Greenville, Beeland Mill Pond | 400 |
| Ashby, Blue Spring Pond | 800 | Boutwell's pond | 400 |
| Atmore, Boone's pond | 400 | Four Mile Pond | 1,200 |
| Hurricane Pond | 800 | McKenzie's pond | 600 |
| Bankston, Clear Creek Pond | 800 | Mill Pond | 1,000 |
| Bayou Labatre, Little River | 375 | Pigeon Creek | 1,200 |
| Bessemer, Shoal Creek | 800 | Pine Barron Creek | 400 |
| West Lake | 800 | Rouse Mill Pond | 600 |
| Birmingham, Black Creek | 800 | Thagard Mill Pond | 1,400 |
| Blount Springs, Blount Springs Creek | 400 | Guin, Markham's pond | 400 |
| Boaz, Brown's pond | 400 | Hackleburg, Green's pond | 200 |
| Brantley, Johnson's pond | 400 | Haleyville, Bear Creek | 400 |
| Powell's pond | 200 | Hamburg, Tarry Pond | 200 |
| Bridgeport, Valley View Pond | 400 | Vaughan Lake | 1,000 |
| Calera, Newala Pond | 200 | Hartford, Leddon's pond | 300 |
| Camden, Bonner's ponds | 1,000 | Headland, Blue Pond | 400 |
| Castleberry, L. Pond | 250 | Hodge, Hodge Reservoir | 600 |
| Clanton, Headley's pond | 800 | Inverness, Cogdell's pond | 400 |
| Cuba, Culpepper's pond (A) | 400 | Jasper, Black Warrior River | 1,600 |
| Culpepper's pond (B) | 400 | Blackwater Creek | 1,200 |
| Delaine's pond | 400 | Long's pond (A) | 200 |
| Cullman, Baier's pond | 400 | Long's pond (B) | 1,000 |
| Loyd's pond | 400 | Sunlight Pond | 800 |
| Cusseta, Davis Creek | 400 | Keener, Brandon's pond | 200 |
| Dozier, Frazier's pond | 400 | La Pine, Perdue's pond | 300 |
| Thomason's pond | 400 | Letohatchie, McPherson's pond | 400 |
| Evergreen, Braxton's pond | 400 | Pine Lake | 400 |
| Brooks's pond | 400 | Whitley's pond | 200 |
| Coleman's pond | 600 | Lineville, Carroll's pond | 400 |
| Lundy's pond | 400 | Livingston, McCain's pond | 600 |
| McGraw's pond | 600 | Loachapoke, Robertson's pond | 400 |
| Moorer's pond | 400 | Lowndesboro, McCurdy's pond | 800 |
| Satter's pond | 600 | Reese Pond | 800 |
| Fayette, Beard's pond | 200 | Luverne, Bozeman's pond | 400 |
| Jones Mill Creek | 800 | Cody's pond | 200 |
| Musgrove Mill Pond | 600 | Horn's pond | 300 |
| Fort Deposit, Davis's pond | 400 | Hudgens's pond | 400 |
| Gadsden, Big Canoe Creek | 200 | Kendrick's ponds | 500 |
| Gordo, Mullican's pond | 600 | Welch's pond | 400 |
| Goshen, Hill's pond | 200 | Wolfe's pond | 850 |
| Greensboro, Sherwood Pond | 200 | McGehees, Crenshaw's pond | 400 |
| Stickney's pond | 200 | McWilliams, Lamkin's pond | 200 |
| | | Madison, Fairdale Lake | 800 |

[a] Exclusive of 1,800 lost in transit.
[b] Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SUNFISH—Continued.

| Disposition. | Number. |
|---|---|
| Alabama—Continued. | |
| Madison, Fletcher's pond | 800 |
| Marion, Grantham's pond | 200 |
| Midland, Echo Pond | 150 |
| Sewell Lake | 150 |
| Midway, Seay's pond | 200 |
| Monroe, Double Branches | 600 |
| Montgomery, Big Whitewater Lake | 400 |
| Club Lake | 1,200 |
| Little Whitewater Lake | 600 |
| Mill Creek | 600 |
| Murphy Siding, Horseshoe Lake | 400 |
| Newbern, Allen's pond | 400 |
| Oak Grove, Davis Mill Pond | 800 |
| Oneonta, Burnett's pond | 200 |
| Kent's pond | 200 |
| Opelika, Cress View Lake | 600 |
| Lake Condy | 400 |
| Opp, Bermuda Pond | 600 |
| Edgar Spring Pond | 650 |
| Frazier's pond | 400 |
| Gardner's pond | 600 |
| Owassa, Ward Pond | 400 |
| Phil Campbell, Dismal Pond | 800 |
| Peters's pond | 200 |
| Pike Road, Barnett's pond | 800 |
| Pine Apple, Melton-Hale Pond | 200 |
| Pine Hill, Sheffield's pond | 800 |
| Pyriton, Shadix's pond | 200 |
| Ramer, Brick Mill Pond | 200 |
| Riderwood, Lake Cavezel | 600 |
| Roanoke, Taylor's pond | 400 |
| Ussery's pond | 400 |
| Russellville, Hester's pond | 400 |
| Scottsboro, Blacks Creek | 800 |
| Seale, Anderson's lake | 400 |
| Sellers, Beck's pond | 400 |
| Selma, Elkdale Lake | 2,000 |
| Harrison's pond | 400 |
| Shellhorn, Belser-Cochran Pond | 400 |
| Snowhill, Powell's pond | 200 |
| Sprague, Esdraelon's pond | 200 |
| Walter's pond | 400 |
| Sulligent, Brown's pond | 400 |
| Buckelew's pond | 400 |
| Sweetwater, Hatch's pond | 200 |
| Sweetwater Pond | 200 |
| Sylacauga, Bryant's pond | 200 |
| Talladega, Chambers Lake | 600 |
| Troy, Anderson's pond | 200 |
| Blair Pond | 400 |
| Bower's pond | 200 |
| Henderson's pond | 900 |
| Jones's pond (A) | 200 |
| Jones's pond (B) | 200 |
| Lee's pond | 400 |
| Leslie's pond | 400 |
| Northcut Lake | 400 |
| Sanders's pond | 400 |
| Troy Pond | 600 |
| Winslett Pond | 200 |
| Tyson, Dead Lake | 400 |
| Garrett Pond | 400 |
| Jones Lake | 1,200 |
| Smith Lake | 400 |
| Tyson Lake | 400 |
| Union Springs, Fenn's pond | 200 |
| Wetumpka, Ensign Pond | 400 |
| Silver Lake | 400 |
| Winfield, Musgrove Lake | 400 |
| Whitney, Chrystal Springs Pond | 400 |
| York, Altman's pond | 1,000 |
| Youngblood, Howard's pond | 200 |
| Arizona: | |
| Benson, Kiper's pond | 100 |
| Willow Ponds | 200 |
| Holbrook, Cast Iron Creek | 450 |
| Nogales, Guevave Pond | 200 |
| Pinto, Henning Lake | 150 |

| Disposition. | Number. |
|---|---|
| Arkansas: | |
| Biscoe, Gold Medal Lake | 1,200 |
| Black Rock, Black River | a 2,320 |
| Browns Lake, Black River | a 495 |
| Charleston, McDonald's pond | 300 |
| Forest City, Trapp's pond | 1,500 |
| Manson, Black River | a 5,075 |
| Okolona, Farm Pond | 300 |
| Ozan, Smisson Farm Pond | 300 |
| Ozark, Dean's pond | 300 |
| Colorado: | |
| Lamar, Two Buttes Lake | 450 |
| Loveland, Bestle Lake | 400 |
| Lake Loveland | 250 |
| Miramonte, Carter Lake | 250 |
| Wray, Olive Lake | 250 |
| Robbs Lake | 250 |
| Zepp Lake | 250 |
| Connecticut: | |
| Deep River, Crystal Pond | 150 |
| East Haddam, Joshua Pond | 2,400 |
| Rockville, Poehnert Pond | 150 |
| Florida: | |
| Bascom, Bonnett Pond | 600 |
| Cottondale, Cole Pond | 900 |
| Palmore, Palmore Pond | 300 |
| Quincy, Bruce's pond | 600 |
| Windermere, Lake Besssie | 900 |
| Georgia: | |
| Adrian, Flanders's pond | 200 |
| Albany, Tift's pond | 200 |
| Amboy, Haman's pond | 400 |
| Americus, Council Mill Pond | 600 |
| Mill Pond | 600 |
| Ranew's pond | 300 |
| Ashburn, Raney's pond | 200 |
| Shivers's pond | 200 |
| Avera, Hudson Pond | 400 |
| Athens, Jones's pond | 200 |
| Waterworks Pond | 400 |
| Atlanta, Dodson's pond | 150 |
| Johns Pond | 200 |
| Meadow Lake | 400 |
| Augusta, Millner Pond | 1,000 |
| Osceola Lake | 200 |
| Booneville, Wilson's pond | 200 |
| Boston, Miller's pond | 400 |
| Bowman, Hewell's pond | 100 |
| Buchanan, Bush's pond | 100 |
| Butler, Bartlett Mill Pond | 400 |
| Byron, Upper Pond | 600 |
| Carrollton, Stalling's pond | 200 |
| Cave Springs, Little Cedar Creek | 400 |
| Chalker, Hattaway's pond | 200 |
| Colbert, Carithers's pond | 400 |
| College Park, Davis's pond | 100 |
| Conyers, Gailey's pond | 200 |
| Granade's pond | 200 |
| Yellow River | 600 |
| Crest, Butts's pond | 200 |
| Mountain Pond | 200 |
| Culverton, Waller's pond (A) | 200 |
| Waller's pond (B) | 200 |
| Cusseta, Harp's pond | 200 |
| Cuthbert, Martin's pond | 600 |
| Peak's pond | 200 |
| Dacula, Frachiseur's pond | 200 |
| Damascus, Haddock's pond | 400 |
| Dawson, Brown Mill Pond | 600 |
| Douglasville, Elm View Pond | 200 |
| Dover, Oliver's pond | 1,000 |
| Duluth, Martin's pond | 200 |
| Shirley's pond | 150 |
| Edison, Rambo's pond | 200 |
| Ellaville, Hanner's pond | 200 |
| Folkston, Bakers Branch | 200 |
| Dixie Lake | 400 |
| Forestville, Elner Lake | 200 |
| Fort Gaines, Foster's pond | 200 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SUNFISH—Continued.

| Disposition. | Number. |
|---|---|
| Georgia—Continued. | |
| Gainesville, Waters's pond | 150 |
| Glenwood, Morrison's pond | 400 |
| Good Hope, East Lake | 200 |
| East Pond | 600 |
| Horn Lake | 600 |
| North Pond | 400 |
| West Lake | 200 |
| Gough, Shaver Creek Pond | 400 |
| Grantville, Lambert Pond | 200 |
| Greensboro, Sanders Mill Pond | 800 |
| Helena, Martin's pond | 200 |
| Higgston, Morris's pond | 600 |
| Kingston, Harris's pond | 200 |
| Kite, Townsend's pond | 400 |
| Lizella, McElmurry Pond | 200 |
| Lumpkin, Mercer Pond | 400 |
| Pitts Pond | 300 |
| McIntyre, Jackson's pond | 200 |
| Mableton, Glore's pond | 200 |
| Mansfield, Adams Pond | 200 |
| Marietta, Old Waterworks Lake | 600 |
| Matthews, Goodin Mill Pond | 400 |
| Smith's pond | 400 |
| Monroe, Club Pond | 600 |
| Poplar Pond | 200 |
| Montezuma, Minor Pond | 200 |
| Shiloh Pond | 200 |
| Moultrie, Clear Branch | 600 |
| Willow Spring Pond | 400 |
| Nacoochee, Nacoochee River | 800 |
| Omega, Powell Pond | 100 |
| Pelham, Pelham Pond | 200 |
| Perkins, Jackson Pond | 1,000 |
| Putnam, Johnson Lake | 600 |
| Quitman, Black Gum Pond | 1,000 |
| Raymond, Raymond Lake | 800 |
| Rebecca, Nosworthy's pond | 600 |
| Red Oak, Woodrow Pond | 150 |
| Renfroes, Smith's pond | 200 |
| Richland, Mill Pond | 400 |
| Rockmart, County Line Pond | 100 |
| Rome, Floyd's pond | 200 |
| Shellman, Crittenden's pond | 200 |
| East Lake | 400 |
| Social Circle, Sluder Pond | 400 |
| Smith's pond | 400 |
| Springvale, Hill's pond | 200 |
| Statesboro, Williams's pond | 600 |
| Silesboro, Cannon's pond | 800 |
| Swainsboro, McKinney Pond | 400 |
| Ohoopee River | 400 |
| Youmans Pond | 600 |
| Sylvester, Bowen's pond | 400 |
| Bozeman's pond | 200 |
| Tallapoosa, Pope's pond | 100 |
| Thomasville, Rehberg's pond | 50 |
| Roddenby's pond | 50 |
| Smith's pond | 50 |
| Smith-Moreland Pond | 50 |
| Wheeler's pond | 100 |
| Thomson, Big Branch Pond | 600 |
| Gibson's pond (A) | 400 |
| Gibson's pond (B) | 400 |
| Upatoie, Sizemore's pond | 400 |
| Vanna, Tucker's pond | 200 |
| Vidalia, Rountree's pond | 200 |
| Wadley, Caldwell's pond | 200 |
| Warrenton, Cason's pond | 400 |
| Whitesburg, Chatham's pond | 150 |
| Winder, Junior Pond | 400 |
| Sunnybrook Pond | 200 |
| Woodbury, Sims Spring Pond | 180 |
| Illinois: | |
| Apple River, Apple River, North Branch | 400 |
| Belleville, Dewey Lake | 1,200 |
| Blanding, Mississippi River | a 21,500 |
| Carrollton, Lake of the Woods | 800 |
| Freeport, Waters of Illinois | 7,150 |
| Illinois—Continued. | |
| Galena Junction, Mississippi River | a 55,500 |
| Hanover, Mississippi River | a 20,900 |
| Joliet, Hickory Creek | 300 |
| Lena, Mammooser Lake | 800 |
| Meredosia, Illinois River | a 79,550 |
| Naperville, South Quarry Pond | 200 |
| New Boston, Mississippi River | a 60,044 |
| Nora, Apple River, East Branch | 400 |
| Pana, Sidner's pond | 1,200 |
| Philadelphia, Homestead Pond | 300 |
| Scales Mound, Mill Creek | 400 |
| Tunnel Hill, Beauman's pond | 150 |
| Warren, Apple River, East Branch | 220 |
| Indiana: | |
| Angola, Crooked Lake | 40 |
| Cedar Grove, Wedding's pond | 10 |
| Cloverdale, McKamey's pond | 100 |
| Edinburg, Sugar Creek | 400 |
| Elkhart, St. Joe River | 40 |
| Greensburg, Grays Lake | 100 |
| McCoy Lake | 1,000 |
| Marion, Gards Pond | 400 |
| Plymouth, Dixon Lake | 800 |
| Pretty Lake | 800 |
| Ramsey, Smith's pond | 200 |
| Sharpsville, Becker's pond | 400 |
| Spencer, Ludlow Lake | 400 |
| Whiteland, Waterloo Pond | 100 |
| Wilkinson, Perry Lake | 400 |
| Williamsburg, Elm Lake | 400 |
| Winchester, Funk's lake | 400 |
| Iowa: | |
| Albia, Stason's pond | 100 |
| Wild Goose Ridge Pond | 100 |
| Ames, Springdale Pond | 250 |
| Bellevue, Mississippi River | a 91,450 |
| Clayton, Mississippi River | a 200 |
| Cresco, Iowa River | 150 |
| Turkey River | 150 |
| Fairport, Mississippi River | a 34,602 |
| Green Island, Mississippi River | a 12,500 |
| Guttenburg, Mississippi River | a 300 |
| Hesper, Oakland Cottage Pond | 100 |
| Iowa Falls, Iowa River | 1,500 |
| Manchester, Maquoketa River | 2,000 |
| North McGregor, Mississippi River | a 19,495 |
| Perry, Raccoon River | 300 |
| Pleasant Creek, Mississippi River | a 10,000 |
| Sny Magill, Mississippi River | a 4,500 |
| Yellow River, Mississippi River | a 1,000 |
| Kansas: | |
| Chanute, Hurt's pond | 200 |
| Fort Scott, Sheeler Lake | 400 |
| Parsons, Labette Creek | 300 |
| Winona, Felts-Jackson Pond | 100 |
| Kentucky: | |
| Boston Station, Burlew's pond | 100 |
| Corbin, King's pond | 200 |
| Covington, Willow Springs Pond | 200 |
| Crab Orchard, Livingston's pond | 200 |
| Devong, Spring Lake | 500 |
| Edgeton, Anderson's pond | 200 |
| Given's pond | 400 |
| McKenzie Lake | 500 |
| Sallee Pond | 400 |
| Steep Hill Pond | 600 |
| Tandy's pond | 200 |
| Eubank, Maple Pond | 200 |
| Florence, Hanaker's pond | 200 |
| Glasgow, Whitehead's pond | 100 |
| Horse Cave, Hall's pond | 400 |
| Hardy's pond | 400 |
| Louisville, Beargrass Creek | 3,300 |
| Harrods Creek | 1,300 |
| Lake Lansdowne | 1,000 |
| Madisonville, Pritchett's pond | 100 |
| Salome Pond | 100 |
| Morehead, Triplett Creek | 400 |
| Morning View, Carlisle's pond | 200 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SUNFISH—Continued.

| Disposition. | Number. |
|---|---|
| Kentucky—Continued. | |
| Murray, Parker's pond | 100 |
| Nebo, Herron's ponds | 200 |
| Nicholasville, Vince's pond | 200 |
| Pewee Valley, Confederate Home Pond | 200 |
| Pikesville, Big Sandy River | 200 |
| Riney, Clear Pond | 600 |
| Davis Pond | 600 |
| Shelbyville, Clear Creek | 400 |
| Guthrie's pond | 100 |
| Smiths Grove, Moon's pond | 200 |
| Springfield, Spaulding's pond | 600 |
| Whitesburg, Clay's pond | 100 |
| Louisiana: | |
| Alexandria, Carter's pond | 900 |
| Baton Rouge, Amite River | a 4,000 |
| Mississippi River | a106,950 |
| University Lake | a 2,650 |
| Cades, Fremin's pond | 750 |
| Choudrant, Crescent Lake | 1,200 |
| Church Point, Daigle's pond | 600 |
| Dubach, Lake Dubach | 1,200 |
| Ethel, Schutzmann's pond | 800 |
| Hackley, Thomas's pond | 600 |
| Haynesville, Braselton's pond | 500 |
| Homer, Fortson's pond | 500 |
| Johnson's pond | 500 |
| McElwee's pond | 500 |
| Natchitoches, Cane River Lake | 4,300 |
| Shreveport, Clear Lake | 1,200 |
| Whitman, Woodville Pond | 375 |
| Maryland: | |
| Branchville, McKinley's pond | 150 |
| Hagerstown, Antietam Creek | 450 |
| Conococheague Creek | 300 |
| Millers, Hoover's pond | 150 |
| Roslyn, Klohr's pond | 150 |
| Seneca, Potomac River | a 150 |
| Woodensburg, Wooden's pond | 150 |
| Massachusetts: | |
| Clinton, Wauschacum Lake | 300 |
| Falmouth, Bournes Pond | 150 |
| Plymouth, Moreys Pond | 150 |
| Michigan: | |
| Alpena, Hubbard Lake | 60 |
| Long Lake | 40 |
| Belleville, Susterka Lake | 20 |
| Cassopolis, Stone Lake | 20 |
| Lake, Crooked Lake | 20 |
| Marquette, Wittler's lake | 500 |
| Rose Center, South Buckhorn Lake | 20 |
| Warren, Harwood's pond | 20 |
| White Cloud, Big Robinson Lake | 20 |
| Long Lake | 20 |
| Lost Lake | 20 |
| Minnesota: | |
| Clearbrook, Olson Lake | 400 |
| Homer, Mississippi River | a 433,002 |
| Pelican Rapids, Lake Lizzie | a1,250 |
| Red Wing, Mississippi River | a9,015 |
| Windom, Fish Lake | 400 |
| Worthington, Lake Okabena | 600 |
| Mississippi: | |
| Aberdeen, Baker Lake | 300 |
| Amory, Coudrey's pond | 250 |
| Belmont, Spencer's pond | 200 |
| Bentonia, Plainview Plantation Pond | 300 |
| Booneville, Mason's pond | 800 |
| Mill Branch | 400 |
| Canton, Bourgeois's pond | 300 |
| Caldwell Lake | 300 |
| Jones Pond | 300 |
| Ray Pond | 600 |
| Troutman Pond | 500 |
| Twin Sisters Lake | 1,500 |
| Caplevile, Evans's pond | 1,200 |
| Como, Wallace's pond | 600 |
| Mississippi—Continued. | |
| Corinth, McClintock's pond | 400 |
| Sandy Lake | 400 |
| Decatur, Hollingsworth's pond | 300 |
| Ecru, Spencer's pond | 250 |
| Enterprise, Phillips's pond | 200 |
| Fayette, Carradine Pond | 100 |
| Dixie Hope Lake | 200 |
| Flora, Collum's pond | 100 |
| Goodloe's pond | 100 |
| Jones Pond | 100 |
| Simpson's pond | 100 |
| Forest, Gay Lark Pond | 250 |
| Young's pond | 250 |
| Friar Point, Mississippi River | a 43,900 |
| Moon Lake | 200 |
| Fulcher, Snow's pond | 600 |
| Gattman, Arnold's pond | 200 |
| Harriston, Freeman's pond | 100 |
| Hickory, Deavitt's pond | 900 |
| McCary's pond | 250 |
| Hickory Flat, Brownlee's pond | 800 |
| Holcomb, Staten's pond | 300 |
| Jackson, Bailey Pond | 600 |
| Country Club Pond | 900 |
| Davidson Lake | 600 |
| Pearl River | 600 |
| Spring Lake | 1,500 |
| Kilmichael, Thompson Pond | 300 |
| Lawrence, Nelson's pond | 250 |
| Stephen's pond | 250 |
| Learned, McNair's pond | 100 |
| Lorman, China Grove Lake | 250 |
| McAdams, Gilbert's pond | 800 |
| McAdams Lake | 400 |
| McCall Creek, Coward's pond | 250 |
| McCool, Rook's pond | 400 |
| Veal Lake | 400 |
| Macon, Cedar Grove Lake | 300 |
| Cline Pond | 300 |
| Eiland Pond | 900 |
| Goodwin Lake | 300 |
| Helm's pond | 300 |
| Holberg Pond | 300 |
| Howard Lake | 900 |
| Paulette Lake | 900 |
| Magnolia, Minnehaha Creek | 900 |
| Mathiston, Blythes Pond | 300 |
| Ray's pond | 600 |
| Meridian, Bailey's pond | 600 |
| Ethridge's pond | 900 |
| Fairchild Lake | 800 |
| Lakeview Lake | 500 |
| Lyle's pond | 600 |
| Queen City Lake | 800 |
| Rushe Mill Pond | 800 |
| South Lake | 600 |
| Weems's pond | 800 |
| Natchez, Elgin Pond | 100 |
| Fowler's pond | 250 |
| New Albany, Phyfer's pond | 200 |
| Newton, Chapman's pond | 250 |
| Kennedy's pond | 500 |
| Ocean Springs, Simmons's pond | 150 |
| Pattison, Gilston's pond | 250 |
| Penn, Blue Lake | 300 |
| Pheba, Bennett's pond | 300 |
| Reid's pond | 300 |
| Philadelphia, Boguechito Lake | 250 |
| Lofton's pond | 250 |
| Lundy's pond | 750 |
| Mitchell's pond | 500 |
| Williams's pond | 500 |
| Wilson's pond | 250 |
| Picayune, Tate's pond | 300 |
| Pickens, Ellendale Pond | 600 |
| Pontotoc, Watson Pond | 250 |
| Reform, Kellum's pond | 250 |
| Ripley, Pearce's pond | 500 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SUNFISH—Continued.

| Disposition. | Number. |
|---|---|
| Mississippi—Continued. | |
| Selma, Miller's pond | 250 |
| Sessums, Castle's pond (A) | 300 |
| Castle's pond (B) | 300 |
| Castle's pond (C) | 300 |
| Shannon, Crubaugh's pond | 300 |
| Shuqualak, Bell's pond | 400 |
| Fleming's pond | 400 |
| McLeod's pond | 400 |
| Mack's pond | 400 |
| Silver Creek, Allen Lake | 600 |
| Soso, Powell's pond | 600 |
| Starkville, Bell's pond (A) | 400 |
| Bell's pond (B) | 400 |
| Bell's pond (C) | 400 |
| Bell's pond (D) | 400 |
| Kennard's pond (A) | 600 |
| Kennard's pond (B) | 300 |
| Lewis's pond | 300 |
| Meadowview Pond | 600 |
| Norris's pond | 300 |
| Old Scout Club Lake | 600 |
| Rice's pond | 300 |
| Smith's pond (A) | 300 |
| Smith's pond (B) | 300 |
| Smith's pond (C) | 300 |
| Wellborn Pond | 300 |
| Steens, Nickles's pond | 300 |
| Sturgis, Shady Grove Pond | 800 |
| Summerland, Grissom's pond | 600 |
| Tupelo, Clover Hill Pond | 200 |
| Fulton Pond | 400 |
| Lake View | 200 |
| Locust Pond | 200 |
| Locust Hill Pond | 200 |
| Union, Rock Pond | 250 |
| Smith's pond | 250 |
| Utica, Broome's pond (A) | 200 |
| Broome's pond (B) | 300 |
| Valden, Samek's pond | 600 |
| Vardaman, Cable's pond | 400 |
| Vicksburg, Bell View Pond | 100 |
| Cemetery Lake | 200 |
| Gesell's pond | 100 |
| Hibler Lake | 100 |
| Waveland, Anderson's pond | 150 |
| Woodville, Roland's pond | 375 |
| Missouri: | |
| Hallsville, Mitchell's pond | 200 |
| Independence, Swinney's pond | 400 |
| Walnut Grove Pond | 200 |
| Joplin, Sloan's pond | 98 |
| Kansas City, Lake of the Woods | 150 |
| Silver Lake | 500 |
| Lamar, Jackson's pond | 3,000 |
| Lebanon, Kneedler's pond | 600 |
| Neosho, Hickory Creek | 26,000 |
| Indian Creek | 3,000 |
| Nevada, Katy Allen Lake | 600 |
| Phillipsburg, Warner's pond | 200 |
| Pierce City, Shipman's pond | 300 |
| Saginaw, Morsman's pond | 500 |
| Seligman, Roller's pond | 500 |
| Sweet Springs, Hulse's pond | 400 |
| Thayer, Olbricht's pond | 500 |
| West Plains, Summers's pond | 1,000 |
| Twin Ponds | 500 |
| Montana: Miles City, Yellowstone River | 100 |
| New Hampshire: Concord, Contoocook River | 150 |
| New Jersey: | |
| Burlington, Delaware River | 300 |
| Dunnellen, Tuttle's pond | 100 |
| Flemington, Fauss's pond | 100 |
| Hopewell, Moore's pond | 100 |
| Penns Grove, Layton Lake | 200 |
| New Mexico: | |
| Capitan, Dean's pond | 100 |
| Des Moines, Edmonson's pond | 150 |
| New Mexico—Continued. | |
| Elida, Locust Pond | 50 |
| Engle, Lake B. M. Hall | 1,200 |
| Estancia, Alamos Pond | 150 |
| Folsom, Howey's pond | 150 |
| Kenna, Carmichael's pond | 100 |
| Cato's pond | 50 |
| Chavers's pond | 50 |
| China Grove Pond | 100 |
| Cooper's pond | 50 |
| Cullin's pond | 50 |
| Deweese's pond | 50 |
| Fry's pond | 50 |
| Good's pond | 100 |
| Hill's pond | 50 |
| Hunter's pond | 50 |
| Littlefield's pond (A) | 50 |
| Littlefield's pond (B) | 50 |
| Rochard's pond | 50 |
| Rogers's pond | 50 |
| Savage's pond | 50 |
| Slack's pond | 50 |
| Stroud's pond | 50 |
| Roswell, Club Lake | 200 |
| Cottonwood Lake | 200 |
| Figure Eight Lake | 100 |
| Lake Dimmit | 100 |
| Lake Esther | 100 |
| Lake Julia | 200 |
| Lea Lake | 100 |
| Rainbow Lake | 100 |
| Socorro, Chambon's pond | 300 |
| New York: Hartsdale, Fishers Pond | 150 |
| North Carolina: | |
| Auburn, Ferrill's pond | 200 |
| Brevard, Lake Elvira | 300 |
| Catawba, Setzer's pond | 100 |
| Charlotte, Grandy's pond | 800 |
| Lakewood Pond | 600 |
| Cliffside, Fairview Pond | 100 |
| Concord, Big Bear Creek | 285 |
| Dunn, Baggett's pond | 200 |
| Elkin, Cobb Creek | 800 |
| Elk Park, Little Elk River | 400 |
| Eufola, Academy Pond | 600 |
| Greensboro, Lake Summit | 200 |
| Lake Wilpong | 200 |
| Hendersonville, Lily Pond | 200 |
| Hickory, Hop Creek Pond | 500 |
| High Point, Coe Branch Pond | 200 |
| Walnut Pond | 200 |
| Lake Junaluska, Lake Junaluska | 300 |
| Lattimore, Hughey's pond | 100 |
| Marshville, Fairview Pond | 200 |
| Marsh's pond | 200 |
| Meadowland Pond | 200 |
| Sells's pond | 200 |
| Simpson's pond | 200 |
| Monroe, Griffin's pond | 200 |
| Hargett's pond | 200 |
| Lick Branch | 400 |
| North Wilkesboro, Curtis Pond | 400 |
| Frazier-Jennings Pond | 300 |
| Hall Mills Pond | 200 |
| Henren Pond | 400 |
| Pee Dee, Blewett Falls Pond | 300 |
| Raleigh, Dowtors Lake | 400 |
| Fountain's pond | 200 |
| Milburnie Pond | 400 |
| Myatt's pond | 200 |
| Neuseoco Pond | 400 |
| Richardson Lake | 200 |
| Rutherfordton, Holland's pond | 200 |
| Selica, Spring Field Lake | 200 |
| Shoals, Scott's pond | 400 |
| Wake Forest, Bailey's pond | 200 |
| Davis's pond (A) | 100 |
| Davis's pond (B) | 200 |
| Washington, Broad Creek | 400 |
| Broad Creek Mill Pond | 400 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SUNFISH—Continued.

| Disposition. | Number. |
|---|---|
| North Carolina—Continued. | |
| Washington, Upper Broad Creek | 400 |
| Wilkesboro, Hall's pond | 200 |
| Hall Mills Pond | 200 |
| North Dakota: | |
| Petrel, Lemmon Lake | 60 |
| St. John, Lakes of Rolette County | 1,800 |
| Ohio: | |
| Akron, East Lake | 20 |
| Long Lake | 20 |
| Nesmith Lake | 20 |
| Turkeyfoot Lake | 20 |
| West Lake | 20 |
| Barton, Shady Pond | 20 |
| Batavia, Great Meadows Pond | 20 |
| Cleveland, Owczarek's pond | 10 |
| Robinwood Pond | 10 |
| Gilbert, Lake Roeland | 10 |
| Lake View, Indian Lake | 40 |
| Millersburg, Yoder's pond | 20 |
| Newark, Licking River, North Fork | 20 |
| Newton Falls, Milton Lake | 1,900 |
| Woodsfield, Rich Fork Creek | 60 |
| Storage Pond | 40 |
| Oklahoma: | |
| Ardmore, Buckhorn Creek | 150 |
| Chilly Creek | 150 |
| Lone Grove Lake | 450 |
| Oil Creek | 300 |
| Armstrong, State Hatchery Ponds | 1,550 |
| Britton, Albright Pond | 150 |
| Covington, Doak Lake | 150 |
| Kingfisher, Box Springs Pond | 300 |
| Lone Grove, Anderson's pond | 150 |
| Scrivner's pond | 150 |
| Lula, Turrentine's pond | 200 |
| Lyons, Mattox's pond | 400 |
| Mangum, Reeves's pond | 200 |
| Mooreland, Meadowbrook Lake | 100 |
| Mountain View, Oak Creek | 150 |
| Muskogee, Buell's pond | 400 |
| Norman, Morrison's pond | 150 |
| Rucker Pond | 150 |
| Orlando, Beaver Valley Pond | 150 |
| Brase's pond | 150 |
| Perry, Hageman's pond | 150 |
| Marshbank's pond | 150 |
| Pagel's pond | 150 |
| Pittsburg, Lake Austin | 200 |
| Poteau, Perse Lake | 200 |
| Purcell, Camden's pond | 150 |
| Chapel Hill Pond | 150 |
| Robbins, Illinois River, Barren Fork | 200 |
| Sallisaw, Bald Knob Pond | 400 |
| Stillwater, Johnson's pond | 300 |
| Rifle Range Pond | 150 |
| Strong City, Spring Creek Pond | 100 |
| Vici, South Persimmon Pond | 100 |
| Waurika, Stewart Lake | 150 |
| Woodward, Bass Lake | 100 |
| Davis's pond | 100 |
| East Persimmon Pond | 100 |
| Geismar's pond | 200 |
| Gregg's pond | 100 |
| Lohr's pond | 100 |
| Pleasant Grove Pond | 100 |
| Salz Lake | 100 |
| Sand Creek Lake | 100 |
| West Persimmon Pond | 100 |
| Yeager Lake | 100 |
| Wynnewood, Thrasher's pond | 150 |
| Pennsylvania: | |
| Altoona, Juniata River | 900 |
| Bellefonte, Bald Eagle Creek | 20 |
| Dowingtown, Brandywine Creek | 300 |
| East Petersburg, Gingrich Pond | 150 |
| Groff Run | 150 |
| Miller Pond | 300 |
| Snipe Creek | 150 |
| Pennsylvania—Continued. | |
| Everett, Juniata River, Raystown Branch | 300 |
| Hyndman, Wills Creek | 300 |
| Lancaster, Pequea Creek | 300 |
| Lititz, Bricker's pond | 160 |
| Doe Run Pond | 160 |
| Pennebecker Pond | 320 |
| Malvern, Peace's pond | 150 |
| Paxinos, Littel Pond | 150 |
| Pittsburgh, Gerstbrein's pond | 100 |
| Hinkel's pond | 100 |
| Jacks Run | 100 |
| Safe Harbor, Meadow Valley Run | 150 |
| Somerfield, Bridgeport Pond | 40 |
| Whiteland, Valley Creek | 300 |
| South Carolina: | |
| Aiken, Glover's pond | 1,400 |
| Wilson's pond | 400 |
| Alcott, Stuckey's pond | 400 |
| Blythewood, Cannon's pond | 100 |
| Branchville, Smoak's pond | 200 |
| Camden, Hermitage Pond | 525 |
| Columbia, Bay Pond | 300 |
| Cobb's pond | 450 |
| Conder's pond | 450 |
| Messers Lake | 450 |
| Snow Hill Pond | 700 |
| Whites Creek | 300 |
| Cope, Smoak Creek | 500 |
| Darlington, Edwood's pond | 200 |
| Easley, Duke's pond | 600 |
| Nally's pond | 500 |
| Edgefield, Bryan's pond | 200 |
| Johnson's pond | 200 |
| Jones's pond | 400 |
| Log Creek Pond | 400 |
| Florence, Great Pee Dee Lake | 400 |
| Greenville, Dilsey Pond | 525 |
| Ellis's pond | 175 |
| Harris's pond | 350 |
| Woods Pond | 350 |
| Greenwood, Cuffeetown Creek | 350 |
| Kathwood, Hollow Creek | 800 |
| Kershaw, Hilton's pond | 150 |
| Lane, Paker Pond | 800 |
| Montmorenci, Jones's pond | 200 |
| Ninety Six, Cotton Mill Pond | 175 |
| Orangeburg, Caw Caw Pond | 300 |
| Dukes's pond | 800 |
| Hughes's pond | 600 |
| Jamison's pond | 400 |
| Pine Creek Pond | 800 |
| Riddle's pond | 200 |
| Scott's pond | 400 |
| Ulmer's pond | 400 |
| Pelion, Cedar Creek Pond | 600 |
| Rock Hill, Fennell's pond | 150 |
| Mill pond | 150 |
| St. Mathews, Millwood Pond | 450 |
| Riley Pond | 450 |
| Scivern, Juniper Pond | 800 |
| Sumter, Cain's mill pond | 200 |
| Pocalla Lake | 400 |
| Rose Hill Mill Pond | 400 |
| Swansea, Rhird Pond | 900 |
| Trenton, Padgett's pond | 200 |
| Wedgefield, McRae Mill Pond | 400 |
| Westminster, Dickerson's pond | 350 |
| Windsor, Spring Branch | 200 |
| Winnsboro, Little River | 400 |
| South Dakota: | |
| Hermosa, Cold Spring Lake | 37 |
| Sioux City, Waters of South Dakota | 5,100 |
| Tennessee: | |
| Ashland City, Sycamore Creek | 1,500 |
| Bolivar, Ferguson's pond | 800 |
| Brunswick, Jones's pond | 200 |
| Cedar Hill, Red River, Sulphur Fork | 2,000 |

*Distribution of fish and eggs, fiscal year 1918*—Continued.

SUNFISH—Continued.

| Disposition. | Number. |
|---|---|
| Tennessee—Continued. | |
| Collierville, Grass View Pond | 400 |
| Roper's pond | 400 |
| Covington, Roane's pond | 400 |
| Davidson, Highland Lake | 400 |
| Erwin, Banner's pond | 300 |
| Ethridge, Tinsley's pond | 1,000 |
| Farner, Ironsburg Lake | 400 |
| Fulton, Glade Pond | 600 |
| Gadsden, Willow Pond | 600 |
| Germantown, Klein's pond | 400 |
| Kerrville, Cannon's pond | 400 |
| Leoma, Ferguson's pond | 400 |
| Lexington, Davis's pond | 750 |
| Manchester, Duck River, Barren Fork | 1,200 |
| Memphis, Goat Lake | 600 |
| Mont Eagle, Scruggs's pond | 600 |
| Nashville, Woodward's pond | 200 |
| Oakland, Mewborn's mill pond | 400 |
| Puryear, Atkins's pond | 600 |
| Selmer, Sunnyside Lake | 600 |
| Somerville, Walside Lake | 800 |
| Summitville, Big Meadow Pond | 600 |
| Tazewell, Sutton's pond | 100 |
| Virginia: | |
| Ashland, McCarsear Pond | 200 |
| Beaver Dam, Beaver Dam Lake | 600 |
| Harris's pond | 150 |
| Bedford, Thomas's pond | 100 |
| Wildman's pond | 200 |
| Wingfield's pond | 200 |
| Bland, Helveys Mill Creek Pond | 200 |
| Walkers Pond | 300 |
| Walkers Big Creek | 400 |
| Chase City, Lilly Pond | 100 |
| Terry's pond | 100 |
| Concord, Stratton's pond | 200 |
| Delvale, Coxes Creek | 100 |
| Stewart Pond | 100 |
| Dry Fork, Harper's pond | 150 |
| Emporia, Goodwyn's pond | 300 |
| Jones Pond | 500 |
| Turner Pond | 400 |
| Hayst, Russell Fork | 100 |
| Houston, Stony Branch Pond | 100 |
| Irwin, East Leake Pond | 125 |
| Lawrenceville, Great Creek | 800 |
| Midlothian, Morrissette's pond | 100 |
| Mila, Ice Pond | 150 |
| Mount Holly, Mount Holly Pond | 150 |
| Peake, Mill Pond | 600 |
| Petersburg, Dibbell Lake | 400 |
| Iveys Pond | 400 |
| Kutchan's pond | 100 |
| Wyatt's pond | 200 |
| Randolph, Devin's pond | 100 |
| Raphine, Hays Creek | 400 |
| Rectortown, Rawlings's pond | 200 |
| Rice, Meador's pond | 200 |
| Richmond, Altamont Farm Pond | 200 |
| Johnson's pond | 200 |
| Neuman's pond | 100 |
| Yahley's pond | 300 |
| Ridgeway, Jones's pond | 100 |
| Rose Hill, Shelburne Lake | 100 |
| Shadwell, Hemley's pond | 100 |
| Suffolk, Lake George | 300 |
| Lake Savage | 300 |
| Lake Tranquil | 300 |
| Norfleet Pond | 600 |
| Riddick's pond | 300 |
| Sutherlin, Baptist Pond | 100 |
| Birch Creek Pond | 400 |
| Sweet Hall, Custis Club Lake | 500 |
| Vinita, Vinita Pond | 125 |
| Waverly, Drewery Pond | 500 |
| Harrell-Gray Pond | 400 |
| Shady Grove Lake | 400 |
| Wellville, Beville's pond | 100 |
| Crows Pond | 300 |
| West Point, Marston's pond | 400 |
| Wytheville, Reed Creek | 500 |
| Yale, Spring View Pond | 500 |
| West Virginia: | |
| Dundon, Elk River | 800 |
| Holiday's Cove, Liberty Pond | 20 |
| Martinsburg, Patterson's pond | 150 |
| Morgantown, Cobun's Creek | 1,200 |
| Philippi, Lantz's pond | 400 |
| West Alexander, Blayney's pond | 100 |
| Wisconsin: | |
| Bagley, Mississippi River | a 1,000 |
| Bay City, Mississippi River | a 475 |
| Clear Lake, Poplar Grove Pond | 200 |
| Cross Plains, Stoppleworth's pond | 300 |
| Galesville, Lake Marinuka | 500 |
| Genoe, Mississippi River | a 1,740 |
| Glenhaven, Mississippi River | a 300 |
| La Crosse, Crooked Creek | 1,000 |
| Holmen Mill Pond | 500 |
| Mississippi River | a 226,300 |
| Neshonoc Mill Pond | 500 |
| Ladysmith, Bog Lake | 400 |
| Superior, Amnicon Lake | 2,100 |
| Tunnel City, Idlewild Pond | 400 |
| West Bend, Silver Brook Pond | 700 |
| Woodyard, Mississippi River | a 200 |
| Wyalusing, Mississippi River | a 800 |
| Canal Zone: Gatun Lake, Gatun Lake | 2,000 |
| Total b | 1,644,558 |

PIKE PERCH.

| | |
|---|---|
| Connecticut: | |
| New Milford, Emerald Lake | †300,000 |
| Wauregan, Woodchuck Hill Pond | †200,000 |
| Illinois: New Boston, Mississippi River | a 84 |
| Indiana: | |
| Leesburg, Oswego Lake | †300,000 |
| Logansport, Eel River | †300,000 |
| Fletcher Lake | †200,000 |
| Wabash River | †300,000 |
| Iowa: Fairport, Mississippi River | a 270 |
| Kentucky: | |
| Burnside, Cumberland River | †1,200,000 |
| Livingston, Rock Castle River | †1,200,000 |
| Louisville, Ohio River | †400,000 |
| Massachusetts: | |
| Lowell, Knopps Pond | †200,000 |
| Newfield Pond | †300,000 |
| Milford, St. Marys Lake | †100,000 |
| Palmer, State fish commission | *5,000,000 |
| Pittsfield, Onota Lake | †500,000 |
| Michigan: | |
| Jones, Birch Lake | †300,000 |
| Orchard Lake, Orchard Lake | †500,000 |
| South Lyon, Crooked Lake | †300,000 |
| Minnesota: | |
| Ely, Burntside Lake | †200,000 |
| White Iron Lake | †150,000 |
| Wolf Lake | †100,000 |

a Rescued from overflowed lands and restored to original waters.
b Exclusive of 2,985 lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

PIKE PERCH—Continued.

| Disposition. | Number. |
|---|---|
| Minnesota—Continued. | |
| Homer, Mississippi River | a 1,360 |
| Red Wing, Mississippi River | a 40 |
| New Hampshire: | |
| Nashua, Old Pennichuch Pond | †400,000 |
| Newport, Spectacle Pond | †300,000 |
| Warren, State fish commission | *2,000,000 |
| New York: | |
| Altamont, Normanskill Creek | †300,000 |
| Au Sable Forks, Silver Lake | †400,000 |
| New York, Aquarium | *504,000 |
| Port Henry, Lake Champlain | †700,000 |
| Riverside, Paradox Lake | †400,000 |
| Schroon Lake | †400,000 |
| Schenectady, Mariaville Pond | †200,000 |
| Ohio: | |
| Berea, Kinney Lake | †300,000 |
| Defiance, Maumee River | †400,000 |
| Isle St. George, Lake Erie | †10,000,000 |
| Kellys Island, Lake Erie | †5,000,000 |
| Middle Bass, Lake Erie | †5,000,000 |
| Millersburg, Martins Creek | †300,000 |
| Salt Creek | †300,000 |
| Wolf Creek | †300,000 |
| Napoleon, Maumee River | †400,000 |
| Port Clinton, Lake Erie | †5,000,000 |
| Rhode Island: Georgiaville, Georgiaville Pond | †100,000 |
| Vermont: | |
| Brandon, Lake Hortonia | †200,000 |
| Burlington, State fish commission | *7,056,000 |
| St. Catherine Lake, St. Catherine Lake | †300,000 |
| Vermont—Continued. | |
| Swanton, Lake Champlain | †14,700,000 |
| Wisconsin: | |
| Genoa, Mississippi River | a 200 |
| Gordon, Bass Lake | †100,000 |
| Blue Gill Lake | †100,000 |
| Ox Lake | †200,000 |
| Hawthorne, Poplar Lake | †100,000 |
| Hayward, Bear Lake | †50,000 |
| Como Lake | †100,000 |
| Foster Lake | †100,000 |
| Frazer Lake | †100,000 |
| George Lake | †100,000 |
| Moon Lake | †100,000 |
| Namakagon Lake | †100,000 |
| Silver Lake | †100,000 |
| Iron River, Pike Lake | †300,000 |
| Katinka, Murphy Lake | †150,000 |
| Lake Millicent, Crystal Lake | †150,000 |
| Pine Tree Lake | †100,000 |
| Lake Nebagamon, Lake Minnesung | †100,000 |
| Lake Nebagamon | †100,000 |
| Laona, Birch Lake | †100,000 |
| Long Lake, Stevens Lake | †750,000 |
| Solon Springs, Island Lake | †100,000 |
| Long Lake | †100,000 |
| Superior, Amnicon Lake | †150,000 |
| Three Lakes, Medicine Lake | †200,000 |
| Total | *14,560,000<br>†56,000,000<br>1,954 |

YELLOW PERCH.

| | |
|---|---|
| Arizona: Globe, Roosevelt Lake | 500 |
| Arkansas: | |
| Black Rock, Black River | a 17 |
| Manson, Black River | a 65 |
| Colorado: Wray, Olive Lake | 225 |
| Connecticut: | |
| Bristol, Jacklin Pond | †200,000 |
| Forestville, Birge Pond | †300,000 |
| Waterbury, Lake Winnemaug | †300,000 |
| Illinois: | |
| Apple River, Apple River, North Branch | 100 |
| Blanding, Mississippi River | a 550 |
| Freeport, waters of Illinois | 2,075 |
| Galena Junction, Mississippi River | a 2,550 |
| Hanover, Mississippi River | a 1,490 |
| Lena, Mammooser Lake | 100 |
| Meredosia, Illinois River | a 22,000 |
| Mount Olive, Mount Olive Lake | 750 |
| New Boston, Mississippi River | a 83 |
| Nora, Apple River, North Branch | 50 |
| Scales Mound, Mill Creek | 100 |
| Warren, Apple River, East Branch | 150 |
| Indiana: | |
| Columbus, Clifty Creek | 225 |
| Haw Creek | 225 |
| Little Sand Creek | 225 |
| White River | 225 |
| Marion, Gards Pond | 250 |
| Noblesville, White River | 750 |
| Vincennes, Wabash Lake | 75 |
| Iowa: | |
| Bellevue, Mississippi River | a 4,000 |
| Cresco, Iowa River | 600 |
| Turkey River | 600 |
| Fairport, Mississippi River | a 50 |
| Gravity, Dunkin's pond | 100 |
| Green Island, Mississippi River | a 2,700 |
| Iowa Falls, Iowa River | 975 |
| Iowa—Continued. | |
| North McGregor, Mississippi River | a 3,950 |
| Perry, Raccoon River | 2,325 |
| Pleasant Creek, Mississippi River | a 50 |
| Rolfe, Sunset Hill Pond | 200 |
| Soy Magill, Mississippi River | a 200 |
| Kentucky: Pikesville, Big Sandy River | 100 |
| Maine: | |
| Ellsworth, Jackson's pond | 75 |
| Hermon Pond, Hermon Pond | 225 |
| Maryland: | |
| Accokeek, Potomac River | †49,179,200 |
| Annapolis, Hammond Pond | 150 |
| Severn River | 375 |
| Severn River Pond | 75 |
| Broad Creek, Potomac River | †7,900,000 |
| McDaniel, Hemmersley Creek | 100 |
| Lovers Cove Creek | 200 |
| Miles River, Branch of | 700 |
| Pasadena, Nolen's pond | 75 |
| Piscataway, Potomac River | †51,431,300 |
| Swan Creek, Potomac River | †4,618,000 |
| Massachusetts: | |
| Athol, Pautaupaug Pond | †300,000 |
| Concord, Punkatasset Pond | †300,000 |
| Gardner, Burnside Pond | †200,000 |
| Lee, Laurel Lake | †200,000 |
| Lower Goose Pond | †200,000 |
| Stockbridge Lake | †200,000 |
| Upper Goose Pond | †200,000 |
| Lowell, Keyes Pond | †200,000 |
| Knapps Pond | †200,000 |
| Long Pond | †200,000 |
| Round Pond | †200,000 |
| Westboro, Hockamocka Pond | †400,000 |
| Sandra Pond | †500,000 |
| Mexico: Parral, Lake Conchos | 200 |
| Michigan: Iron River, Sunset Lake | 300 |

a Rescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

YELLOW PERCH—Continued.

| Disposition. | Number. |
|---|---|
| Minnesota: | |
| Homer, Mississippi River | a348,618 |
| Red Wing, Mississippi River | a 2,350 |
| Missouri: | |
| Neosho, Hickory Creek | †10,000 |
| Joplin, Sloan's pond | 32 |
| Saginaw, Morsman's pond | 32 |
| New Jersey: Flemington, Fauss's pond | 100 |
| New York: | |
| Altamont, Normanskill Creek | †300,000 |
| Cape Vincent, St. Lawrence River | †20,750,000 |
| Cortland, Little York Lake | 200 |
| Tully Lake | 200 |
| Davenport Center, Sherman Lake | 100 |
| Grass Bay, St. Lawrence River | †10,000,000 |
| Poplar Tree Bay, St. Lawrence River | †7,000,000 |
| Round Lake, Round Lake | †200,000 |
| Saratoga Springs, Artist Lake | †300,000 |
| North Carolina: Raleigh, Neuseoco Pond | 50 |
| North Dakota: St. John, Lakes of Rolette County | 1,040 |
| Ohio: Lake View, Indian Lake | 500 |
| Oklahoma: | |
| Armstrong, Hatchery Ponds | †10,000 |
| | 100 |
| Pawhuska, Buck Creek | 400 |
| Clear Creek | 200 |
| Pond Creek | 200 |
| Pennsylvania: | |
| Altoona, Juniata River | 1,300 |
| Canton, Lake Nepahwin | 400 |
| Ebensburg, Lake Rowena | 300 |
| Lloyd's pond | 200 |
| Everett, Juniata River, Raystown Branch | 200 |
| Mance, Bauman Pond | 200 |
| Whiteland, Valley Creek | 450 |
| Yardley, White's pond | 450 |
| South Dakota: Sioux City, Waters of South Dakota | 1,400 |
| Vermont: Swanton, Lake Champlain | †900,000 |
| Virginia: | |
| Bedford, Rucker's pond | 200 |
| Dogue Creek, Potomac River | †11,200,500 |
| Little Hunting Creek, Potomac River | †8,300,000 |
| Mount Vernon, Potomac River | †2,600,000 |
| Pohick, Potomac River | †4,100,000 |
| Richmond, Northside Pond | 180 |
| Wytheville, Reed Creek, South Fork | 100 |
| Wisconsin: | |
| Bay City, Mississippi River | a 150 |
| Elkhart Lake, Elkhart Lake | 500 |
| Genoa, Mississippi River | a 3,800 |
| La Crosse, Mississippi River | a 43,725 |
| Prairie du Chien, Mississippi River | a 500 |
| Total b | †182,899,000 |
| | 459,282 |

WHITE PERCH.

| | |
|---|---|
| Maine: | |
| Compass Lake, Compass Lake | †2,300,000 |
| Hermon Pond, Hermon Pond | †600,000 |
| Total | †2,900,000 |

WHITE BASS.

| | |
|---|---|
| Arkansas: | |
| Black Rock, Black River | a 120 |
| Browns Lake, Black River | a 6 |
| Manson, Black River | a 155 |
| Illinois: | |
| Apple River, Apple River, North Fork | 130 |
| Blanding, Mississippi River | a 4,900 |
| Freeport, Waters of Illinois | 1,625 |
| Galena Junction, Mississippi River | a 4,850 |
| Hanover, Mississippi River | a 3,050 |
| Lena, Mammosser Lake | 130 |
| New Boston, Mississippi River | a17,494 |
| Nora, Apple River, East Fork | 130 |
| Warren, Apple River, East Fork | 650 |
| Iowa: | |
| Bellevue, Mississippi River | a 35 |
| Clayton, Mississippi River | a 25 |
| Fairport, Mississippi River | a 211 |
| Green Island, Mississippi River | a 2,500 |
| Pleasant Creek, Mississippi River | a 500 |
| Louisiana: Atchafalaya, Mississippi River | a 2,700 |
| Minnesota: Homer, Mississippi River | a 7,320 |
| Wisconsin: | |
| Genoa, Mississippi River | a 350 |
| La Crosse, Mississippi River | 380 |
| Total | 47,261 |

STRIPED BASS.

| | |
|---|---|
| North Carolina: Weldon, Roanoke River | †14,349,000 |

a Rescued from overflowed lands and restored to original waters.
b Exclusive of 35 fingerlings lost in transit.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

MACKEREL.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Massachusetts: | | Massachusetts—Continued. | |
| Falmouth, Great Harbor | †1,770,000 | Gosnold, Buzzards Bay | †1,869,000 |
| Vineyard Sound | †1,009,000 | Total | †4,648,000 |

COD.

| | | | |
|---|---|---|---|
| Massachusetts: | | Massachusetts—Continued. | |
| Beverly, Massachusetts Bay | †11,220,000 | Woods Hole, Great Harbor | †3,817,000 |
| Gloucester, Atlantic Ocean | †34,570,000 | Little Harbor | †902,000 |
| Rockport, Atlantic Ocean | †21,750,000 | Total | †77,659,000 |
| Ipswich Bay | †5,400,000 | | |

POLLOCK.

| | | | |
|---|---|---|---|
| Massachusetts: | | Massachusetts—Continued. | |
| Beverly, Massachusetts Bay | †35,570,000 | Rockport, Atlantic Ocean | †37,570,000 |
| Gloucester, Atlantic Ocean | †124,410,000 | Total | †233,700,000 |
| Manchester, Massachusetts Bay | †36,150,000 | | |

HADDOCK.

| | | | |
|---|---|---|---|
| Massachusetts: | | Massachusetts—Continued. | |
| Gloucester, Atlantic Ocean | †16,280,000 | Rockport, Atlantic Ocean | †1,150,000 |
| Ipswich Bay | †400,000 | Total | †17,830,000 |

FLOUNDER.

| | | | |
|---|---|---|---|
| Maine: | | Massachusetts—Continued. | |
| Boothbay Harbor, Boothbay Harbor | †62,077,000 | Falmouth, Waquoit Bay | †95,213,000 |
| Linekins Bay | †459,382,000 | West Falmouth Harbor | †31,213,000 |
| Mill Cove | †9,745,000 | Gloucester, Anisquam River | †12,000,000 |
| West Boothbay Harbor | †453,493,000 | Atlantic Ocean | †7,730,000 |
| East Boothbay, Linekins Bay | †39,723,000 | Gloucester Harbor | †75,610,000 |
| Southport, Ebencook Harbor | †11,461,000 | Ipswich Bay | †32,530,000 |
| Pig Cove | †11,459,000 | Gosnold, Buzzards Bay | †30,517,000 |
| Townsend Gut | †50,485,000 | Hadley Harbor | †192,421,000 |
| Thomaston, Owls Head Bay | †15,280,000 | Lagoon Pond | †79,485,000 |
| Seal Harbor | †66,232,000 | Vineyard Sound | †102,606,000 |
| Massachusetts: | | Manchester, Massachusetts Bay | †12,200,000 |
| Beverly, Massachusetts Bay | †31,690,000 | Provincetown, Provincetown Harbor | †19,737,000 |
| Chilmark, Menemsha Pond | †45,342,000 | Rockport, Atlantic Ocean | †8,770,000 |
| Cundy Harbor, Hen Cove | †26,111,000 | Seapit River, Waquoit Bay | †18,151,000 |
| Ridleys Cove | †26,111,000 | New York: Arverne, Jamaica Bay | †29,220,000 |
| Falmouth, Deacons Pond Harbor | †49,728,000 | Rhode Island: | |
| Eel Pond | †64,963,000 | Wickford, Narragansett Bay | †20,426,000 |
| Great Harbor | †88,760,000 | Wickford Harbor | †92,328,000 |
| Little Harbor | †23,501,000 | Total | †2,455,371,000 |
| Quissett Harbor | †59,671,000 | | |

MISCELLANEOUS FISHES.

| | | | |
|---|---|---|---|
| Arkansas: | | Minnesota: | |
| Black Rock, Black River | a 378 | Lake Pepin, Mississippi River | a140 |
| Browns Lake, Black River | a 62 | Red Wing, Mississippi River | a1,600 |
| Manson, Black River | a 555 | New Jersey: Hackensack, Zoo Park | 300 |
| Illinois: New Boston, Mississippi River | a 29,005 | Wisconsin: Bay City, Mississippi River | a460 |
| Iowa: | | Total | 100,200 |
| Bellevue, Mississippi River | a 17,100 | | |
| Fairport, Mississippi River | a175 | | |
| Louisiana: Atchafalaya, Mississippi River | a 50,425 | | |

aRescued from overflowed lands and restored to original waters.

*Distribution of fish and eggs, fiscal year 1918*—Continued.

LOBSTER.

| Disposition. | Number. | Disposition. | Number. |
|---|---|---|---|
| Maine: | | Maine—continued. | |
| Bass Harbor, Bass Harbor | †1,000,000 | Phippsburg, Burnt Court Harbor | †1,000,000 |
| Biddeford, Biddeford Pool | †1,000,000 | The Basin | †1,000,000 |
| Boothbay, Birch Isle Cove | †1,500,000 | Port Clyde, Port Clyde Harbor | †2,000,000 |
| Boothbay Harbor, Bayville Cove | †1,500,000 | Portland, Peaks Isle Roads | †2,000,000 |
| Boothbay Harbor | †680,000 | Rockland, Rockland Harbor | †3,000,000 |
| Murray Hill Cove | †2,500,000 | Round Pond, Round Pond | †500,000 |
| Sweets Cove | †1,000,000 | St. George, Pleasant Point Gut | †4,000,000 |
| Camden, Camden Harbor | †1,500,000 | Sevan Isle, Mackerel Cove | †1,000,000 |
| Cape Porpoise, Cape Porpoise | †1,500,000 | Southport, Ebencook Harbor | †1,500,000 |
| Castine, Hatches Cove | †2,000,000 | South Thomaston, Owls Head Bay | †1,500,000 |
| Cranberry Isle, Cranberry Isle Harbor | †1,000,000 | Seal Harbor | †2,500,000 |
| Cundy Harbor, Ridleys Cove | †2,000,000 | Stockton Springs, Stockton Harbor | †2,000,000 |
| Freeport, Mare Island Bay | †1,000,000 | Stonington, Deer Isle Thoroughfare | †1,000,000 |
| Friendship, Friendship Harbor | †1,000,000 | Tennants Harbor, Tennants Harbor | †1,500,000 |
| Gouldsboro, Prospect Harbor | †1,000,000 | Vinal Haven, Carvers Harbor | †9,000,000 |
| Isleboro, Turtle Head Cove | †1,000,000 | West Bath, Hen Cove | †1,000,000 |
| Kennebunk, Kennebunk Point Harbor | †1,500,000 | Ridleys Cove | †1,000,000 |
| Kittery, Kittery Harbor | †1,500,000 | Yarmouth, Northeast Cove | †1,000,000 |
| Lawry, Delanos Cove | †500,000 | York Harbor, York Harbor | †1,500,000 |
| Orrs Isle, Quohog Bay | †2,000,000 | Washington: Rosario, Puget Sound | 5,700 adults. |
| Pemaquid, Johns Bay | †2,000,000 | Total[a] | †86,680,000<br>5,700 adults. |

[a] Exclusive of 200 adults lost in transit.

SUMMARY OF THE DISPOSITION OF FISH RESCUED, FISCAL YEAR 1918.

| Species. | Restored to original waters. | Delivered to applicants. |
|---|---|---|
| Black bass | 123,275 | 242,149 |
| Buffalofish | 2,416,107 | 945 |
| Carp | 1,658,801 | 1,975 |
| Catfish | 12,580,634 | 138,296 |
| Crappie | 2,768,197 | 131,265 |
| Drum | 83,473 | ..... |
| Pike | 105,434 | 974 |
| Pike perch | 1,954 | ..... |
| River herring | 3,700,000 | ..... |
| Rock bass | 385 | 5,555 |
| Smallmouth bass | ..... | 2,433 |
| Sunfish | 1,249,623 | 143,912 |
| Warmouth bass | 7,970 | ..... |
| White bass | 44,598 | 2,663 |
| Yellow perch | 436,358 | 22,565 |
| Miscellaneous | 100,200 | ..... |
| Total | 25,277,309 | 692,732 |

## DISTRIBUTION COSTS.

Statistics compiled from information given by car captains and messengers on the coupons of their mileage reports for the calendar year 1917 show that 22,880,148 fish were carried by the Bureau's cars during that period, 8,862,656 of which were distributed by messengers on detached trips from the cars; 206,984,057 fish were distributed by messengers direct from stations. In making the distribution, 102,867 miles were traveled by cars and 408,715 miles by messengers. The total cost of distributing 229,864,205 fish was $37,585.72, of which amount $27,457.44 was paid for transportation, $1,380.91 for incidentals, $4,628.72 for subsistence, and $4,118.65

for help. The average cost for distribution was a little over 16 cents per thousand fish.

The following table shows the average cost per 1,000 for distributing fry, fingerlings, and adult fishes for the calendar year 1917, not including the salaries of messengers:

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS.

DISTRIBUTION BY CAR MESSENGERS.[a]

| Name of station. | Species. | Number of fish. | Size. | Total cost. | Average cost per thousand. | Miles paid. | Miles free. |
|---|---|---|---|---|---|---|---|
| Bozeman, Mont... | Trout..... | 274,500 | Fingerlings, 1-inch..... | $75.65 | $0.275 | 1,142 | ..... |
| Do..... | .....do..... | 205,000 | Fingerlings, 1 to 3 inch.. | 244.58 | 1.193 | 3,890 | 1,347 |
| Do..... | .....do..... | 116,550 | Fingerlings, 3-inch..... | 148.08 | 1.269 | 2,182 | ..... |
| Craig Brook, Me... | Salmon..... | 673,600 | Fry..... | 114.62 | .17 | 1,202 | ..... |
| Do..... | .....do..... | 77,200 | Fingerlings, 1-inch..... | 57.99 | .751 | 744 | ..... |
| Do..... | Trout..... | 845,200 | Fry..... | 171.38 | .202 | 2,565 | ..... |
| Do..... | .....do..... | 2,000 | Fingerlings, 1-inch..... | 3.50 | 1.75 | 28 | ..... |
| Do..... | .....do..... | 1,319 | Fingerlings, 4-inch..... | 11.53 | 8.741 | 241 | ..... |
| Erwin, Tenn..... | .....do..... | 48,000 | Fingerlings, 1-inch..... | 55.01 | 1.146 | 885 | ..... |
| Do..... | .....do..... | 4,000 | Fingerlings, 1¼-inch..... | 3.65 | .91 | 76 | ..... |
| Do..... | .....do..... | 34,000 | Fingerlings, 1 to 2 inch.. | 19.90 | .586 | 416 | ..... |
| Do..... | .....do..... | 94,000 | Fingerlings, 2½-inch..... | 15.20 | .161 | 276 | ..... |
| Homer, Minn..... | Pond fishes.... | 690 | Fingerlings, 1-inch..... | 1.75 | 2.536 | ..... | ..... |
| Do..... | .....do..... | 5,052 | Fingerlings, 1 to 2 inch.. | 112.41 | 22.25 | 2,256 | ..... |
| Do..... | .....do..... | 30,613 | Fingerlings, 2-inch..... | 200.96 | 6.564 | 3,674 | ..... |
| Do..... | .....do..... | 45,512 | Fingerlings, 3-inch..... | 280.76 | 6.168 | 5,799 | ..... |
| Do..... | .....do..... | 7,804 | Fingerlings, 4-inch..... | 138.68 | 17.77 | 3,547 | ..... |
| Do..... | .....do..... | 3,070 | Fingerlings, 5-inch..... | 96.11 | 31.306 | 2,348 | ..... |
| Do..... | .....do..... | 1,680 | Fingerlings, 6-inch..... | 41.29 | 24.577 | 828 | ..... |
| Do..... | .....do..... | 70 | Adults..... | 13.06 | 186.571 | 377 | ..... |
| Do..... | .....do..... | 5,735 | Fingerlings, 1 to 6 inch.. | 52.01 | 9.068 | 1,115 | ..... |
| Leadville, Colo.... | Trout..... | 694,000 | Fingerlings, 1-inch..... | 130.50 | .188 | 752 | 3,747 |
| Do..... | .....do..... | 624,500 | Fingerlings, 1 to 1½ inch. | 141.85 | .227 | 452 | 6,029 |
| Do..... | .....do..... | 188,575 | Fingerlings, 1 to 2½ inch. | 67.30 | .356 | 728 | 1,009 |
| Mammoth Spring, Ark. | Pond fishes.... | 11,350 | Fingerlings, 1-inch..... | 72.89 | 6.422 | 1,157 | ..... |
| Do..... | .....do..... | 6,600 | Fingerlings, 2-inch..... | 72.42 | 10.972 | 1,344 | ..... |
| Do..... | .....do..... | 3,825 | Fingerlings, 2 to 2½ inch. | 30.14 | 7.879 | 591 | ..... |
| Manchester, Iowa.. | Trout..... | 37,400 | Fingerlings, 1-inch..... | 24.30 | .649 | 305 | ..... |
| Do..... | .....do..... | 49,400 | Fingerlings, 1 to 2 inch.. | 6.20 | .125 | 76 | ..... |
| Do..... | .....do..... | 36,500 | Fingerlings, 1 to 2½ inch. | 43.25 | 1.184 | 930 | ..... |
| Do..... | .....do..... | 8,500 | Fingerlings, 1½ inch..... | 10.07 | 1.184 | 140 | ..... |
| Do..... | .....do..... | 65,400 | Fingerlings, 1½ to 3 inch. | 88.52 | 1.353 | 1,506 | ..... |
| Do..... | .....do..... | 18,800 | Fingerlings, 2-inch..... | 17.54 | .932 | 300 | ..... |
| Do..... | .....do..... | 19,900 | Fingerlings, 2½-inch..... | 47.84 | 2.404 | 1,201 | ..... |
| Do..... | .....do..... | 32,000 | Fingerlings, 3-inch..... | 76.58 | 2.393 | 1,387 | ..... |
| Do..... | .....do..... | 400 | Fingerlings, 4-inch..... | 11.67 | 29.175 | 362 | ..... |
| Nashua, N. H..... | .....do..... | 11,600 | Fingerlings, 1 to 2 inch.. | 11.15 | .961 | 157 | ..... |
| Do..... | .....do..... | 90,000 | Fingerlings, 1½-inch..... | 127.75 | 1.419 | 2,459 | ..... |
| Do..... | .....do..... | 16,400 | Fingerlings, 2-inch..... | 31.36 | 1.912 | 591 | ..... |
| Northville, Mich... | Pond fishes.... | 37,160 | Fingerlings, 1-inch..... | 272.82 | 7.341 | 5,930 | 45 |
| Do..... | Whitefish..... | 3,600,000 | Fry..... | 23.10 | .006 | ..... | 1,352 |
| Do..... | Trout..... | 105,000 | .....do..... | 4.65 | .044 | 102 | ..... |
| Quincy, Ill..... | Pond fishes.... | 3,500 | Fingerlings, 1½-inch..... | 36.67 | 10.477 | 780 | ..... |
| Do..... | .....do..... | 6,780 | Fingerlings, 1½ to 5 inch. | 54.18 | 7.991 | 973 | ..... |
| Do..... | .....do..... | 7,397 | Fingerlings, 1½-inch..... / Adult..... | 76.18 | 10.298 | 1,569 | ..... |
| Do..... | .....do..... | 13,116 | Fingerlings, 2 to 2½ inch. | 92.78 | 7.073 | 1,480 | 179 |
| Do..... | .....do..... | 13,656 | Fingerlings, 2½-inch..... / Adult..... | 197.29 | 14.447 | 4,348 | ..... |
| Do..... | .....do..... | 5,330 | Fingerlings, 3-inch..... | 88.89 | 16.583 | 1,848 | ..... |
| Do..... | .....do..... | 4,758 | Fingerlings, 3-inch..... / Adult..... | 90.72 | 19.066 | 1,649 | ..... |
| Do..... | .....do..... | 2,190 | Fingerlings, 4-inch..... | 88.23 | 17.456 | 807 | ..... |
| Do..... | .....do..... | 1,085 | Fingerlings, 4½ to 5 inch. | 27.55 | 25.391 | 506 | ..... |
| Spearfish, S. Dak.. | Trout..... | 20,900 | Fingerlings, 1 to 3 inch.. | 25.90 | 1.239 | 370 | ..... |
| Tupelo, Miss..... | Pond fishes.... | 900 | Fingerlings, 3-inch..... | 32.15 | 35.722 | 878 | ..... |
| Upper Mississippi[b] | .....do..... | 5,000 | Fingerlings, 1-inch..... | 1.92 | .384 | 46 | ..... |
| Do..... | .....do..... | 400 | Fingerlings, 1 to 4 inch.. | 13.97 | 34.925 | 248 | ..... |
| Do..... | .....do..... | 1,972 | Fingerlings, 1 to 5 inch.. | 18.74 | 9.503 | 388 | ..... |
| Do..... | .....do..... | 9,850 | Fingerlings, 1 to 2½ inch. | 49.25 | 5.00 | 833 | ..... |

[a] Detached messenger shipments from cars. Cost in addition to "Distribution by car."
[b] La Crosse, Bellevue, and North McGregor.

METHOD AND DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY CAR MESSENGERS—Continued.

| Name of station. | Species. | Number of fish. | Size. | Total cost. | Average cost per thousand. | Miles paid. | Miles free. |
|---|---|---|---|---|---|---|---|
| Upper Mississippi —Continued. | Pond fishes.... | 20,710 | Fingerlings, 1 to 3 inch.. | 143.83 | 6.944 | 2,770 | ..... |
| Do..... | .....do..... | 36,230 | Fingerlings, 2-inch..... | 244.84 | 6.757 | 4,237 | ..... |
| Do..... | .....do..... | 10,730 | Fingerlings, 2 to 3 inch.. | 113.93 | 10.617 | 2,052 | ..... |
| Do..... | .....do..... | 2,250 | Fingerlings, 2 to 4 inch.. | 44.86 | 19.937 | 572 | 18 |
| Do..... | .....do..... | 13,298 | Fingerlings, 2 to 5 inch.. | 171.71 | 12.912 | 3,084 | 28 |
| Do..... | .....do..... | 6,325 | Fingerlings, 2½-inch..... | 61.97 | 9.797 | 1,183 | 104 |
| Do..... | .....do..... | 52,061 | Fingerlings, 3-inch..... | 623.81 | 11.982 | 11,273 | 396 |
| Do..... | .....do..... | 31,235 | Fingerlings, 3 to 4 inch.. | 339.19 | 10.859 | 6,209 | 1,546 |
| Do..... | .....do..... | 9,766 | Fingerlings, 3 to 5 inch.. | 164.92 | 16.887 | 3,106 | ..... |
| Do..... | .....do..... | 2,830 | Fingerlings, 4-inch..... | 74.17 | 26.208 | 1,496 | ..... |
| Do..... | .....do..... | 1,320 | Fingerlings, 4 to 5 inch.. | 34.44 | 26.09 | 868 | ..... |
| Do..... | .....do..... | 1,460 | Fingerlings, 5-inch..... | 10.69 | 7.321 | 138 | ..... |
| Do..... | .....do..... | 1,102 | Adults..... | 29.80 | 27.041 | 502 | ..... |
| Do..... | .....do..... | 91,600 | Fingerlings, 1½-inch..... | 40.54 | .442 | 610 | ..... |
| White Sulphur, W. Va. | Trout..... | 212,900 | Fingerlings, 2-inch..... | 253.54 | 1.190 | 4,104 | ..... |
| Do..... | .....do..... | 75,900 | Fingerlings, 1 to 1½ inch. | 105.90 | 1.395 | 1,650 | 88 |
| Wytheville, Va.... | .....do..... | 22,800 | Fingerlings, 2-inch..... | 107.30 | 4.508 | 2,226 | ..... |
| Do..... | .....do..... | 34,800 | Fingerlings, 2½-inch..... | 53.32 | 1.532 | 882 | ..... |
| Do..... | .....do..... | 4,500 | Fingerlings, 3-inch..... | 59.19 | 13.153 | 1,286 | 21 |

DISTRIBUTION BY STATION MESSENGERS.[a]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Baird, Calif..... | Trout..... | 16,000 | Fry..... | $97.20 | $6.075 | 2,205 | ..... |
| Birdsview, Wash.. | .....do..... | 9,000 | Fingerlings, 1 to 1½ inch. | 36.65 | 4.06 | 380 | ..... |
| Bozeman, Mont... | Grayling..... | 208,000 | Fry..... | 38.40 | .184 | 456 | 939 |
| Do..... | Trout..... | 199,500 | Fingerlings, 1-inch..... | 88.20 | .417 | 935 | 1,020 |
| Do..... | .....do..... | 183,750 | Fingerlings, 1½-inch..... | 97.85 | .532 | 2,106 | 321 |
| Do..... | .....do..... | 224,200 | Fingerlings, 1 to 2½ inch. | 198.50 | .886 | 3,157 | 1,626 |
| Do..... | .....do..... | 43,000 | Fingerlings, 1 to 3 inch.. | 19.90 | .462 | 98 | 709 |
| Do..... | .....do..... | 28,150 | Fingerlings, 3-inch..... | 86.70 | 3.079 | 700 | 2,848 |
| Do..... | .....do..... | 20,000,000 | Fry..... | 64.40 | .003 | 880 | ..... |
| Cape Vincent, N.Y. | Lake Herring.. | 3,775,000 | .....do..... | 69.03 | .018 | 1,770 | ..... |
| Do..... | Pike perch..... | 4,970 | .....do..... | 1.20 | .241 | ..... | ..... |
| Do..... | Salmon..... | 1,101,000 | .....do..... | 357.92 | .325 | 9,218 | ..... |
| Do..... | Trout..... | 7,000,000 | .....do..... | 142.98 | .020 | 3,092 | ..... |
| Do..... | Whitefish..... | 50 | Adults..... | 24.85 | 497.00 | 620 | ..... |
| Central Station.... | Trout..... | 272 | Fingerlings, 4-inch..... | 8.72 | 13.676 | 22 | ..... |
| Do..... | .....do..... | 2,000 | Fingerlings, 1½-inch..... | 2.20 | 1.10 | 36 | ..... |
| Do..... | .....do..... | 36 | Adults..... | 40.29 | 1,119.16 | 965 | ..... |
| Do..... | Landlocked salmon. | 80 | Fingerlings, 4½ to 5 inch. | 9.48 | 118.50 | 111 | ..... |
| Do..... | Pearl roach..... | 1,500,000 | Fry..... | 41.93 | .027 | 869 | ..... |
| Do..... | Pike perch..... | 530,000 | .....do..... | 23.59 | .037 | 628 | ..... |
| Do..... | Whitefish..... | 179,000 | Fingerlings, 1½-inch..... | 137.20 | .766 | 3,125 | 22 |
| Clackamas, Oreg.. | Trout..... | 59,500 | Fingerlings, 3-inch..... | 150.25 | 2.525 | 3,600 | 33 |
| Do..... | .....do..... | 6,000 | Fingerlings, 3½-inch..... | 25.20 | 4.20 | 635 | ..... |
| Do..... | .....do..... | 161,262 | Fingerlings, 1-inch..... | 253.24 | 1.57 | 4,843 | ..... |
| Cold Springs, Ga.. | Pond fishes.... | 102,950 | Fingerlings, 1½-inch..... | 339.19 | 8.294 | 6,256 | ..... |
| Do..... | .....do..... | 31,075 | Fingerlings, 1 to 2 inch.. | 119.80 | 3.855 | 2,318 | ..... |
| Do..... | .....do..... | 5,687 | Fingerlings, 1 to 2½ inch. | 50.36 | 8.855 | 1,133 | ..... |
| Do..... | .....do..... | 15,146 | Fingerlings, 1½ to 2 inch. | 81.19 | 5.36 | 1,691 | ..... |
| Do..... | .....do..... | 19,078 | Fingerlings, 1½ to 3 inch. | 104.62 | 5.485 | 2,021 | ..... |
| Do..... | .....do..... | 9,072 | Fingerlings, 1½ to 5 inch. | 62.89 | 6.932 | 1,087 | ..... |
| Duluth, Minn..... | Trout..... | 5,784,000 | Fry..... | 18.40 | .002 | ..... | ..... |
| Do..... | .....do..... | 2,718,000 | Fingerlings, 1-inch..... | 78.10 | .028 | ..... | ..... |
| Craig Brook, Me... | Salmon..... | 1,979,000 | Fry..... | 159.05 | .08 | 520 | ..... |
| Edenton, N. C..... | Pond fishes.... | 16,100 | .....do..... | 38.15 | 2.369 | 872 | ..... |
| Do..... | .....do..... | 16,900 | Fingerlings, 1-inch..... | 111.10 | 6.573 | 2,393 | ..... |
| Do..... | .....do..... | 9,200 | Fingerlings, 2-inch..... | 65.90 | 7.163 | 1,755 | ..... |
| Do..... | .....do..... | 8,000 | Fingerlings, 3-inch..... | 111.23 | 13.903 | 1,887 | ..... |
| Erwin, Tenn..... | Trout..... | 62,000 | Fingerlings, 1-inch..... | 34.86 | .562 | 496 | ..... |
| Do..... | .....do..... | 19,000 | Fingerlings, 1½ to 2 inch. | 9.44 | .496 | 128 | ..... |
| Do..... | .....do..... | 13,000 | Fingerlings, 2-inch..... | 10.79 | .83 | 243 | ..... |
| Do..... | .....do..... | 6,000 | Fingerlings, 2½-inch..... | 9.94 | 1.656 | 128 | ..... |
| Do..... | .....do..... | 24 | Adults..... | 5.35 | 222.916 | 98 | ..... |
| Do..... | Pond fishes.... | 39,250 | Fry..... | 177.92 | 4.532 | 4,068 | ..... |

[a] Distribution by station messengers includes cost of making distribution direct from the station without a car. This distribution is usually to nearby points.

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY STATION MESSENGERS—Continued.

| Name of station. | Species. | Number of fish. | Size. | Total cost. | Average cost per thousand. | Miles paid. | Miles free. |
|---|---|---|---|---|---|---|---|
| Erwin, Tenn.—Con. | Pond fishes | 1,000 | Fingerlings, 1-inch | $25.80 | $25.80 | 604 | ..... |
| Do | ....do | 4,000 | Fingerlings, 1½-inch | 46.94 | 11.735 | 1,081 | 57 |
| Do | ....do | 19,000 | Fingerlings, 1 to 2 inch | 143.03 | 7.527 | 3,310 | ..... |
| Do | ....do | 13,265 | Fingerlings, 1½ to 2 inch | 97.84 | 7.375 | 2,058 | ..... |
| Do | ....do | 1,070 | Fingerlings, 3 to 4 inch | 51.52 | 48.084 | 1,105 | ..... |
| Do | ....do | 400 | Adults | 5.64 | 14.10 | 92 | ..... |
| Green Lake, Me | Landlocked salmon. | 855,000 | Fry | 33.75 | .095 | 466 | ..... |
| Do | ....do | 30,000 | Fingerlings, 1-inch | 37.40 | 1.246 | 413 | ..... |
| Do | Smelt | 20,000,000 | Fry | 25.25 | .001 | 458 | ..... |
| Do | Trout | 228,500 | ....do | 8.00 | .034 | 70 | ..... |
| Homer, Minn | Pike perch | 9,720,000 | ....do | 155.97 | .016 | 3,177 | ..... |
| Do | Pond fishes | 2,000 | Fingerlings, 1-inch | (a) | ..... | ..... | ..... |
| Do | ....do | 1,200 | Fingerlings, 2-inch | 26.55 | 22.125 | 579 | ..... |
| Do | ....do | 1,500 | Fingerlings, 2½-inch | 18.76 | 11.725 | 260 | ..... |
| Do | ....do | 2,700 | Fingerlings, 3-inch | 17.16 | 6.255 | 204 | ..... |
| Do | ....do | 3,770 | Fingerlings, 2 to 4 inch | 28.68 | 7.594 | 522 | ..... |
| Do | ....do | 1,450 | Fingerlings, 3 to 4 inch | (a) | ..... | ..... | ..... |
| Do | ....do | 1,000 | Fingerlings, 1 to 5 inch | 7.17 | 7.17 | 54 | ..... |
| Do | ....do | 2,175 | Fingerlings, 3 to 5 inch | (a) | ..... | ..... | ..... |
| Do | ....do | 1,404 | Fingerlings, 1½-inch<br>Adults | 44.77 | 31.887 | 1,109 | ..... |
| Do | Trout | 144,530 | Fingerlings, 1-inch | 132.20 | .914 | 1,973 | ..... |
| Leadville, Colo | Grayling | 80,000 | Fry | 16.95 | .211 | 120 | 479 |
| Do | Pond fishes | 1,500 | Fingerlings, 2½ to 3 inch | 25.60 | 17.066 | 404 | 309 |
| Do | ....do | 1,468 | Fingerlings, 2½-inch<br>Yearlings | 15.50 | 10.558 | ..... | 872 |
| Do | Trout | 2,238,000 | Fingerlings, 1-inch | 187.05 | .083 | 10 | 8,359 |
| Do | ....do | 696,400 | Fingerlings, 1½-inch | 169.80 | .243 | 134 | 6,602 |
| Do | ....do | 98,000 | Fingerlings, 1 to 2½ inch | 8.40 | .085 | ..... | 440 |
| Do | ....do | 58,500 | Fingerlings, 2-inch | 6.90 | .117 | ..... | 391 |
| Do | ....do | 10,000 | Fingerlings, 2½-inch | 8.00 | .80 | ..... | 460 |
| Do | ....do | 31,500 | Fingerlings, 1½ to 3 inch | 3.50 | .111 | ..... | 142 |
| Do | ....do | 28 | Adults | 4.25 | 151.785 | ..... | 304 |
| Louisville, Ky | Pond fishes | 2,400 | Fingerlings, 1 to 2 inch | 37.92 | 15.80 | 928 | ..... |
| Do | ....do | 1,800 | Fingerlings, 2-inch | 9.64 | 5.355 | 200 | ..... |
| Mammoth Spring, Ark. | ....do | 5,400 | Fingerlings, 1-inch | 25.52 | .472 | 558 | ..... |
| Do | ....do | 15,384 | Fingerlings, 2-inch | 194.67 | 12.654 | 3,998 | ..... |
| Do | ....do | 640 | Fingerlings, 3-inch | 44.26 | 69.15 | 980 | ..... |
| Do | ....do | 1,272 | Fingerlings, 2 to 5 inch | 40.56 | 31.88 | 690 | ..... |
| Do | ....do | 158 | Adults | 42.63 | 276.139 | 973 | ..... |
| Manchester, Iowa | ....do | 1,250 | Fingerlings, 1 to 2 inch | 3.03 | 2.42 | 94 | ..... |
| Do | ....do | 1,015 | Fingerlings, 3 to 5 inch | 12.90 | 12.70 | 332 | ..... |
| Do | Trout | 2,000 | Fingerlings, 1½-inch | 5.97 | 2.985 | 194 | ..... |
| Do | ....do | 2,000 | Fingerlings, 2-inch | 7.55 | 3.775 | 192 | ..... |
| Do | ....do | 1,900 | Fingerlings, 3-inch | (b) | ..... | ..... | 150 |
| Nashua, N. H | Pond fishes | 3,000 | Fry | 6.09 | 2.03 | 144 | ..... |
| Do | ....do | 1,500 | Fingerlings, 1-inch | 10.34 | 6.893 | 258 | ..... |
| Do | ....do | 1,100 | Fingerlings, 1½-inch | 12.83 | 11.663 | 286 | ..... |
| Do | Trout | 566,000 | Fingerlings, 1-inch | 144.09 | .254 | 3,135 | ..... |
| Do | ....do | 265,500 | Fingerlings, 1½-inch | 178.75 | .673 | 4,741 | ..... |
| Do | ....do | 24 | Adults | 6.67 | 277.916 | 136 | ..... |
| Neosho, Mo | Pond fishes | 21,420 | Fingerlings, 1 to 3 inch | 92.72 | 4.328 | 2,496 | ..... |
| Do | ....do | 7,285 | Fingerlings, 2-inch | 77.14 | 10.588 | 2,478 | ..... |
| Do | ....do | 11,656 | Fingerlings, 2 to 3 inch | 66.01 | 5.663 | 2,145 | ..... |
| Do | ....do | 2,220 | Fingerlings, 3-inch | 42.75 | 19.256 | 1,158 | ..... |
| Do | ....do | 1,606 | Fingerlings, 2 to 4 inch | 12.00 | 7.471 | 348 | ..... |
| Do | ....do | 248 | Fingerlings, 5-inch | 15.61 | 62.943 | 372 | ..... |
| Do | Trout | 42,850 | Fingerlings, 2-inch | 96.13 | 2.243 | 2,022 | ..... |
| Do | ....do | 5,000 | Fingerlings, 3 to 4 inch | 14.31 | 2.862 | 288 | ..... |
| Do | ....do | 4,585 | Fingerlings, 4-inch | 22.82 | 4.977 | 389 | ..... |
| Do | ....do | 2,506 | Fingerlings, 5 to 6 inch | 78.80 | 31.444 | 734 | ..... |
| Northville, Mich | Pike perch | 7,350,000 | Fry | 37.75 | .005 | 2,567 | ..... |
| Do | Whitefish | 1,200,000 | ....do | 6.65 | .005 | 194 | ..... |
| Do | Pond fishes | 107,000 | ....do | 59.53 | .556 | 150 | 2,353 |
| Do | ....do | 30,400 | Fingerlings, 1-inch | 134.23 | 4.415 | 2,470 | 650 |
| Do | ....do | 1,500 | Fingerlings, 2-inch | 3.95 | 2.633 | ..... | 326 |
| Do | ....do | 450 | Fingerlings, 2½-inch | 18.33 | 40.733 | 604 | ..... |
| Do | Trout | 644,000 | Fry | 141.54 | .219 | 2,081 | 3,125 |
| Do | ....do | 122,000 | Fingerlings, 1-inch | 28.90 | .236 | ..... | 1,797 |

a Station delivery.

b No costs.

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY STATION MESSENGERS—Continued.

| Name of station. | Species. | Number of fish. | Size. | Total cost. | Average cost per thousand. | Miles paid. | Miles free. |
|---|---|---|---|---|---|---|---|
| Orangeburg, S. C. | Pond fishes | 6,175 | Fingerling, 1-inch | $42.40 | $6.866 | 753 | ..... |
| Do | ..do | 4,985 | Fingerlings, 1 to 3 inch. | 42.05 | 8.435 | 929 | ..... |
| Do | ..do | 6,650 | Fingerlings, 2-inch | 21.60 | 3.248 | 362 | ..... |
| Do | ..do | 1,475 | Fingerlings, 2 to 3 inch. | 12.60 | 8.542 | 249 | ..... |
| Put in Bay | Pike perch | 4,500,000 | Fry | 120.71 | .026 | 2,007 | ..... |
| Quincy, Ill | ..do | 1,390,000 | ..do | 77.33 | .055 | 2,040 | ..... |
| Do | Pond fishes | 2,300 | Fingerlings, 1½-inch | 26.29 | 11.43 | 450 | ..... |
| Do | ..do | 5,245 | Fingerlings, 2-inch | 41.96 | 8.00 | 803 | ..... |
| Do | ..do | 4,250 | Fingerlings, 1 to 3½ inch. | 60.26 | 14.178 | 1,071 | ..... |
| Saratoga, Wyo | ..do | 33,000 | Fingerlings, 1 to 3 inch. | 6.00 | .181 | 20 | 300 |
| Do | ..do | 64,000 | Fingerlings, 1½ to 2 inch. | 20.90 | .326 | 64 | 876 |
| Do | ..do | 56,500 | Fingerlings, 2-inch | 15.30 | .270 | 232 | 232 |
| Do | ..do | 6,000 | Fingerlings, 1½ to 3 inch. | 9.10 | 1.516 | 20 | 530 |
| St. Johnsbury, Vt. | Pike perch | 1,700,000 | Fry | 39.06 | .022 | 920 | ..... |
| Do | Yellow and pike perches. | 18,899,000 | ..do | 259.32 | .013 | 5,096 | ..... |
| Do | Pond fishes | 2,000 | Fingerlings, 1 to 2 inch. | 39.32 | 19.66 | 660 | ..... |
| Do | ..do | 12,508 | Fingerlings, 1 to 3 inch. | 101.49 | 8.114 | 1,910 | ..... |
| Do | ..do | 8,910 | Fingerlings, 2 to 3 inch. | 116.48 | 13.072 | 2,142 | ..... |
| Do | ..do | 2,178 | Fingerlings, 3-inch | 99.58 | 45.72 | 1,926 | ..... |
| Do | Trout | 1,709,250 | Fry | 263.62 | .154 | 4,329 | 15 |
| Do | ..do | 325,772 | Fingerlings, 1-inch | 105.51 | .323 | 2,111 | ..... |
| Do | ..do | 51,775 | Fingerlings, 2-inch | 106.81 | 2.062 | 1,434 | ..... |
| Do | ..do | 8,869 | Fingerlings, 2 to 3 inch. | 31.87 | 3.593 | 677 | ..... |
| Do | ..do | 4,684 | Fingerlings, 3-inch | 11.87 | 2.534 | 317 | ..... |
| Do | ..do | 500 | Fingerlings, 4-inch<br>Adults | 6.98 | 13.96 | 330 | ..... |
| Spearfish S. Dak. | ..do | 777,800 | Fry | 327.78 | .421 | 6,307 | 34 |
| Do | ..do | 150,000 | Fry to fingerlings, 1-inch | 54.44 | .361 | 930 | ..... |
| Do | ..do | 493,935 | Fingerlings, 1-inch | 4.75 | .009 | ..... | ..... |
| Do | ..do | 157,500 | Fingerlings, 1 to 1½ inch. | 125.39 | .796 | 2,279 | ..... |
| Do | ..do | 18,000 | Fingerlings, 1 to 2½ inch. | 5.50 | .305 | 78 | ..... |
| Do | ..do | 5,500 | Fingerlings, 1½-inch | (a) | ..... | ..... | ..... |
| Do | ..do | 19,500 | ..do | 14.71 | .754 | 154 | ..... |
| Do | ..do | 10,950 | Fingerlings, 2-inch | 17.13 | 1.564 | 264 | ..... |
| Do | ..do | 39,150 | Fingerlings, 2½-inch | 19.94 | .509 | 358 | ..... |
| Do | ..do | 9,625 | Fingerlings, 3-inch | 12.91 | 1.341 | 154 | ..... |
| Tupelo, Miss | Pond fishes | 153,000 | Fry | 136.90 | .894 | 4,106 | ..... |
| Do | ..do | 105,500 | Fry to fingerlings, 1-inch | 207.12 | 1.963 | 4,548 | ..... |
| Do | ..do | 51,200 | Fingerlings, 1-inch | 230.98 | 4.511 | 4,998 | ..... |
| Do | ..do | 13,600 | Fingerlings, 1 to 1½ inch. | 110.16 | 8.10 | 2,235 | ..... |
| Do | ..do | 14,795 | Fingerlings, 1 to 3 inch. | 105.55 | 7.134 | 2,260 | ..... |
| Do | ..do | 16,405 | Fingerlings, 1 to 4 inch. | 163.07 | 9.94 | 2,621 | ..... |
| Do | ..do | 6,115 | Fingerlings, 1 to 5 inch. | 71.77 | 11.736 | 1,637 | ..... |
| Do | ..do | 8,265 | Fingerlings, 1-inch<br>Yearlings | 107.50 | 13.006 | 1,853 | ..... |
| Do | ..do | 42,369 | Fingerlings, 2-inch | 294.21 | 6.944 | 5,969 | ..... |
| Do | ..do | 22,665 | Fingerlings, 2 to 3 inch. | 375.41 | 16.563 | 7,050 | ..... |
| Do | ..do | 7,269 | Fingerlings, 3 to 5 inch. | 199.89 | 27.498 | 4,033 | ..... |
| Do | ..do | 2,087 | Fingerlings, 4 to 7 inch. | 131.48 | 62.999 | 2,705 | ..... |
| Do | ..do | 1,950 | Fingerlings, 5-inch | 136.97 | 70.241 | 2,729 | ..... |
| Do | ..do | 950 | Fingerlings, 6-inch | 52.87 | 55.652 | 1,224 | ..... |
| Do | ..do | 310 | Adults | 58.82 | 189.741 | 1,405 | ..... |
| White Sulphur, W. Va. | ..do | 70,000 | Fry | 63.15 | .902 | 1,364 | ..... |
| Do | ..do | 2,200 | Fingerlings, 2-inch | 24.70 | 11.227 | 658 | ..... |
| Do | Trout | 20,000 | Fingerlings, 1½-inch | 16.10 | .805 | 282 | ..... |
| Do | ..do | 43,500 | Fingerlings, 1½ to 2 inch. | 13.75 | .316 | 224 | ..... |
| Do | ..do | 1,811 | Fingerlings, 1½-inch<br>Adults | 20.21 | 11.159 | 562 | ..... |
| Do | ..do | 25,000 | Fingerlings, 2-inch | 50.70 | 2.028 | 1,038 | ..... |
| Do | ..do | 13,650 | Fingerlings, 2 to 2½ inch. | 94.72 | 6.939 | 2,142 | ..... |
| Do | ..do | 10,125 | Fingerlings, 2½-inch | 92.49 | 9.134 | 2,218 | ..... |
| Do | ..do | 7,550 | Fingerlings, 2 to 4 inch. | 92.91 | 12.305 | 2,134 | ..... |
| Do | ..do | 4,800 | Fingerlings, 4-inch | 40.45 | 8.427 | 804 | ..... |
| Do | ..do | 1,260 | Yearlings | 7.90 | 6.269 | 190 | ..... |
| Woods Hole, Mass. | Flatfish | 85,438,000 | Fry | 75.68 | .001 | 900 | ..... |
| Wytheville, Va. | Pond fishes | 42,099 | Fingerlings, 1 to 5 inch. | 298.38 | 7.087 | 7,525 | ..... |
| Do | ..do | 8,220 | Fingerlings, 2 to 3 inch. | 91.36 | 11.114 | 1,994 | ..... |
| Do | Trout | 100,500 | Fingerlings, 1 to 3 inch. | 74.56 | .741 | 1,068 | ..... |

a Station delivery.

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY CARS.[a]

| Name of station. | Species. | Number of fish. | Size. | Total cost. | Average cost per thousand. | Miles paid. | Miles free. |
|---|---|---|---|---|---|---|---|
| Bozeman, Mont... | Trout..... | 1,092,376 | Fingerlings, 1 to 3 inch.. | $788.60 | $0.721 | 3,110 | 2,380 |
| Craig Brook, Me... | Salmon..... | 3,242,000 | Fry..... | 260.60 | .08 | 1,766 | ..... |
| Do..... | Trout..... | 1,766,100 | Fry to fingerlings, 1 to 4 inch..... | 623.49 | .353 | 2,164 | ..... |
| Erwin, Tenn..... | .....do..... | 416,000 | Fingerlings, 1 to 2½ inch. | 459.91 | 1.105 | 1,744 | ..... |
| Green Lake, Me... | Salmon..... | 3,936,765 | Fry..... | 329.75 | .083 | 1,552 | ..... |
| Homer, Minn..... | Pond fishes.... | 30,168 | Fingerlings, 1 to 6 inch.. | 300.05 | 9.945 | 1,469 | ..... |
| Leadville, Colo.... | Trout..... | 1,703,078 | Fingerlings, 1 to 3½ inch. | 232.47 | .136 | 809 | 6,948 |
| Mammoth Spring., Ark. | Pond fishes.... | 37,475 | Fingerlings, 1 to 2½ inch. | 649.80 | 17.312 | 2,356 | ..... |
| Manchester, Iowa.. | Trout..... | 623,400 | Fingerlings, 1 to 3 inch.. | 615.59 | .987 | 4,236 | ..... |
| Nashua, N. H..... | .....do..... | 179,300 | Fingerlings, 1½ to 2 inch. | 822.23 | 4.585 | 3,643 | ..... |
| Northville, Mich... | Pond fishes.... | 48,850 | Fingerlings, 1 to 3 inch.. | 532.00 | 10.890 | 2,743 | ..... |
| Do..... | Trout..... | 1,787,000 | Fry..... | 455.52 | .254 | 1,662 | 146 |
| Do..... | Whitefish..... | 6,000,000 | .....do..... | 163.75 | .027 | 282 | ..... |
| Quincy, Ill..... | Pond fishes.... | 84,175 | Fingerlings, 1-inch..... / Adults..... | 1,346.45 | 15.995 | 7,242 | ..... |
| Spearfish, S. Dak.. | Trout..... | 249,375 | Fingerlings, 2½ to 3 inch. | 572.47 | 2.295 | 3,524 | ..... |
| Tupelo, Miss..... | Pond fishes.... | 3,915 | Fingerlings, 3-inch..... / Adults..... | 237.95 | 60.779 | 1,071 | ..... |
| Upper Mississippi [b] | .....do..... | 395,739 | Fingerlings, 1 to 6 inch.. | 6,849.63 | 17.308 | 38,206 | 544 |
| Do..... | .....do..... | 232 | Adults..... | 174.65 | 752.801 | 1,023 | ..... |
| White Sulphur, W. Va. | Trout..... | 856,300 | Fingerlings, 1½ to 2 inch. | 1,956.11 | 2.284 | 9,283 | 140 |
| Wytheville, Va.... | .....do..... | 427,900 | Fingerlings, 1 to 3 inch.. | 1,143.01 | 2.671 | 4,762 | 62 |

[a] Distribution by cars shows cost of transporting fish to destination or until delivered to car messenger.
[b] La Crosse, Bellevue, and North McGregor.

A COMPARATIVE STATEMENT OF COSTS OF DISTRIBUTION BY MESSENGERS FOR CALENDAR YEARS 1916 AND 1917.

[NOTE.—Items that would afford no comparison have been omitted.]

DISTRIBUTION BY CAR MESSENGERS.[a]

| Name of station. | Species. | Size. | Average cost per thousand. | | Mileage, 1916. | | Mileage, 1917. | |
|---|---|---|---|---|---|---|---|---|
| | | | 1916 | 1917 | Paid. | Free. | Paid. | Free. |
| Bozeman, Mont..... | Trout..... | Fingerlings, 1-inch..... | $1.197 | $0.275 | 5,596 | 830 | 1,142 | ..... |
| Do..... | .....do..... | Fingerlings, 3-inch..... | 4.69 | 1,269 | 2,013 | ..... | 2,182 | ..... |
| Craig Brook, Me..... | .....do..... | Fry..... | .262 | .202 | 1,008 | ..... | 2,565 | ..... |
| Do..... | Salmon..... | .....do..... | .58 | .17 | 43 | ..... | 1,202 | ..... |
| Leadville, Colo..... | Trout..... | Fingerlings, 1 to 3 inch.. | .339 | .225 | 2,634 | 15,843 | 1,932 | 10,785 |
| Manchester, Iowa..... | .....do..... | Fingerlings, 1 to 4 inch.. | 1.01 | 1.214 | 7,234 | ..... | 6,207 | ..... |
| Morthville, Mich..... | .....do..... | Fry..... | .253 | .044 | 1,271 | 5,343 | 102 | ..... |
| Do..... | Pond fishes.. | Fingerlings, 1 to 2 inch.. | 7.12 | 7.341 | 10,742 | 72 | 5,930 | 45 |
| Quincy, Ill..... | .....do..... | Fingerlings, 1 to 6 inch.. | 18.285 | 12.142 | 31,921 | ..... | 13,960 | 179 |
| Spearfish, S. Dak..... | Trout..... | Fingerlings, 1 to 3 inch.. | 2.16 | 1.239 | 1,510 | ..... | 370 | ..... |
| Upper Mississippi River. | Pond fishes.. | Fingerlings, 1 to 6 inch.. | 10.432 | 10.276 | 27,475 | 442 | 38,003 | 2,092 |
| Do..... | .....do..... | Adults..... | 28.94 | 27.041 | 1,777 | ..... | 502 | ..... |
| White Sulphur, W.Va. | Trout..... | Fingerlings, 1 to 4 inch.. | 1.116 | .965 | 6,904 | ..... | 4,714 | ..... |
| Wytheville, Va..... | .....do..... | Fingerlings, 1 to 3 inch.. | 1.03 | 2.343 | 4,018 | 92 | 6,044 | 109 |

[a] Detached messenger shipments from cars.

A COMPARATIVE STATEMENT OF COSTS OF DISTRIBUTION BY MESSENGERS FOR CALENDAR YEARS 1916 AND 1917—Continued.

DISTRIBUTION BY STATION MESSENGERS.[a]

| Name of station. | Species. | Size. | Average cost per thousand. | | Mileage, 1916. | | Mileage, 1917. | |
|---|---|---|---|---|---|---|---|---|
| | | | 1916 | 1917 | Paid. | Free. | Paid. | Free. |
| Baird, Calif. | Trout | Fry | $4.578 | $6.075 | 1,403 | ..... | 2,205 | ..... |
| Birdsview, Wash. | ....do | ....do | 1.99 | 4.06 | 2,016 | ..... | 380 | ..... |
| Bozeman, Mont. | ....do | Fingerlings, 1-inch | 1.069 | .417 | 1,162 | ..... | 935 | 1,020 |
| Do. | ....do | Fingerlings, 1¼-inch | .608 | .532 | 3,134 | 3,712 | 2,106 | 321 |
| Do. | ....do | Fingerlings, 2-inch | .889 | .885 | 615 | ..... | 3,157 | 1,629 |
| Do. | ....do | Fingerlings, 2½-inch | 3.72 | .462 | 137 | ..... | 98 | 709 |
| Do. | Grayling | Fry | .107 | .184 | ..... | ..... | 456 | 939 |
| Cape Vincent, N. Y. | Whitefish | ....do | .009 | .020 | 2,278 | ..... | 3,092 | ..... |
| Do. | Pike perch | ....do | .012 | .018 | 2,530 | ..... | 1,870 | ..... |
| Do. | Trout | ....do | .397 | .325 | 8,426 | 31 | 9,218 | ..... |
| Central Station. | Pike perch | ....do | .027 | .027 | 2,197 | ..... | 869 | ..... |
| Clackamas, Oreg. | Trout | Fingerlings, 1½ to 3 inch. | .995 | 1.205 | 2,544 | 50 | 3,600 | 55 |
| Duluth, Minn. | ....do | Fry | .057 | .002 | ..... | ..... | ..... | ..... |
| Edenton, N. C. | Pond fishes | ....do | 7.142 | 2.369 | 2,785 | ..... | 872 | ..... |
| Do. | ....do | ....do | 9.896 | 6.573 | 5,507 | 31 | 2,393 | ..... |
| Erwin, Tenn. | Trout | Fingerlings, 1 to 3 inch. | 1.67 | .650 | 15,413 | ..... | 995 | ..... |
| Do. | Pond fishes | Fingerlings, 1 to 4 inch. | 10.97 | 6.999 | 7,051 | ..... | 12,226 | ..... |
| Green Lake, Me. | Smelt | Fry | .308 | .001 | 2,248 | ..... | 458 | ..... |
| Do. | Salmon | ....do | .484 | .095 | 804 | ..... | 466 | ..... |
| Do. | Trout | ....do | .034 | .034 | 56 | ..... | 70 | ..... |
| Homer, Minn. | Pike perch | ....do | .212 | .016 | 1,114 | ..... | 3,177 | ..... |
| Do. | Pond fishes | Fingerlings, 1 to 5 inch. | 15.91 | 6.182 | 12,362 | ..... | 1,619 | ..... |
| Leadville, Colo. | Trout | Fingerlings, 1 to 3 inch. | .111 | .122 | ..... | 8,804 | 144 | 6,394 |
| Louisville, Ky. | Pond fishes | Fingerlings, 1 to 2 inch. | 8.49 | 11.323 | 6,090 | ..... | 1,128 | ..... |
| Nashua, N. H. | Trout | Fingerlings, 1-inch | 4.238 | .254 | 647 | ..... | 3,135 | ..... |
| Do. | ....do | Adults | 247.00 | 277.92 | 136 | ..... | 136 | ..... |
| Do. | Pond fishes | Fry | .70 | 2.03 | 28 | ..... | 144 | ..... |
| Mammoth Springs, Ark. | ....do | Fingerlings, 1 to 2 inch. | 13.13 | 10.594 | 12,235 | ..... | 4,556 | ..... |
| Do. | ....do | Adults | 403.05 | 276.14 | 1,770 | ..... | 973 | ..... |
| Neosho, Mo. | ....do | Fingerlings, 1 to 6 inch. | 7.23 | 5.215 | 15,095 | ..... | 12,430 | ..... |
| Northville, Mich. | Pike perch | Fry | .005 | .005 | 25 | 366 | ..... | 2,567 |
| Do. | Whitefish | ....do | .008 | .006 | ..... | 458 | ..... | 194 |
| Do. | Pond fishes | ....do | .953 | .556 | 3,641 | 3,594 | 150 | 2,353 |
| Do. | ....do | Fingerlings, 1 to 2 inch. | 7.54 | 4.331 | 371 | 1,995 | 2,470 | 976 |
| Do. | Trout | Fingerlings, 1-inch | 1.13 | .236 | 532 | 2,707 | ..... | 1,796 |
| Quincy, Ill. | Pike perch | Fry | .021 | .055 | 825 | ..... | 2,040 | ..... |
| Saratoga, Wyo. | Trout | Fingerlings, 1 to 2 inch. | .624 | .274 | 4,463 | 1,324 | 316 | 1,408 |
| St. Johnsbury, Vt. | Pike perch | Fry | .006 | .022 | 5,936 | ..... | 920 | ..... |
| Do. | Pond fishes | ....do | .61 | .013 | 264 | ..... | 5,096 | ..... |
| Do. | ....do | Fingerlings, 1 to 3 inch. | 24.392 | 13.903 | 1,206 | ..... | 6,628 | ..... |
| Do. | Trout | Fry | .213 | .154 | 5,435 | ..... | 4,329 | 15 |
| Do. | ....do | Fingerlings, 1 to 3 inch. | .972 | .654 | 7,390 | 58 | 4,539 | 15 |
| Spearfish, S. Dak. | ....do | Fingerlings, 1 to 2 inch. | .363 | .218 | 8,252 | ..... | 2,511 | ..... |
| Tupelo, Miss. | Pond fishes | Fry | .759 | .894 | 1,918 | ..... | 4,106 | ..... |
| Do. | ....do | Fingerlings, 1 to 6 inch. | 4.852 | 10.436 | 13,335 | 44 | 37,361 | ..... |
| White Sulphur, W. Va. | ....do | Fry | 1.298 | .902 | 1,049 | ..... | 1,364 | ..... |
| Do. | Trout | Fingerlings, 1 to 2 inch. | 1.674 | .910 | 5,718 | ..... | 1,544 | ..... |
| Woods Hole, Mass. | Flatfish | Fry | .001 | .001 | 859 | 72 | 900 | ..... |
| Wytheville, Va. | Pond fishes | Fingerlings, 1 to 6 inch. | 7.265 | 7.745 | 7,395 | ..... | 9,513 | ..... |
| Do. | Trout | Fingerlings, 1 to 3 inch. | 1.95 | 1.068 | 3,531 | ..... | 1,068 | ..... |

[a] Distribution direct from the station without a car.

# FISH LAWS OF STATES BORDERING ON MISSISSIPPI AND OHIO RIVERS

## A DIGEST OF STATUTES RELATING TO THE PROTECTION OF FISHES AND OTHER COLD-BLOODED AQUATIC ANIMALS

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Appendix II to the Report of the U. S. Commissioner of Fisheries for 1918

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# FISH LAWS OF STATES BORDERING ON MISSISSIPPI AND OHIO RIVERS: A DIGEST OF STATUTES RELATING TO THE PROTECTION OF FISHES AND OTHER COLD-BLOODED AQUATIC ANIMALS.

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## INTRODUCTION.

In 1917 there was issued a digest of laws of Mississippi River States.[a] This is now revised to January 1, 1919, and extended to cover all States touching the Ohio River, thus taking in Indiana, Ohio, West Virginia, and Pennsylvania. Some additional information has been inserted because of repeated inquiries received during the past two years.

In order to keep the pamphlet within reasonable bounds certain subjects have usually been omitted. These are:

(*a*) Declarations that the title to fish and other wild animals is in the State.

(*b*) Prohibitions against contamination of waters. The subject of pollution has been covered in a comprehensive manner by Public Health Bulletin No. 87 of the United States Public Health Service, entitled "Stream Pollution," prepared by Stanley D. Montgomery and Earle B. Phelps

(*c*) Special provisions for counties and other subdivisions, except in some cases where they are evidently of interest to a considerable number of people.

(*d*) Complicated details of restrictions on commercial fishing in some cases, though an effort has been made to indicate all laws on commercial fresh-water fishing.

(*e*) Laws for salt-water fishing.

(*f*) Penalties, administration, and procedure, including authority to arrest, seize unlawful implements, rewards for information as to violations, forgery of licenses, provisions for witnesses, limitations on times within which actions may be commenced, sale or destruction of things confiscated, and disposition of fines, fees, or other payments to officials.

(*g*) Requirement that licenses be available for exhibition to wardens at the time of fishing.

(*h*) Laws against having prohibited tackle in possession and against having fish in possession smaller than the legal limit, or during closed seasons, or in excess of bag limit, or if caught unlawfully. These provisions are of the greatest importance as aids to enforcement, but ordinarily they do not interest the law-abiding citizen.

[a] Emerson Stringham: Fish Laws of Mississippi River States. Report, U. S. Commissioner of Fisheries for 1916, Appendix IV, document No. 840, 16 p. 1917.

(*i*) Authorization for State officials to propagate and rescue fish or assist in stocking waters, or to take fish for scientific purposes.

(*j*) Provisions declaring it a crime to remove fish from the nets of another.

The omission of provisions as to administration is not due to a belief that these are of minor importance. Probably they are as well worth attention as the provisions for size limits and other matters. In most fields of legislation efficient administration is now recognized to be at least of equal importance with wise substantive provisions. But the question of administration is so different that it seems better not to attempt to combine it with this brief treatment of closed seasons and such matters. Of the 14 States under consideration only Illinois (25, 46), Minnesota (4761), and Pennsylvania (1903, act 92) have statutory provision for officials concerned exclusively with fisheries.

For subjects not covered in this digest, for amendments made after 1918, and for the texts of the laws that are digested herein, the statutes, or the pamphlet copies thereof, may be consulted. Pamphlets are prepared in each of these 14 States, except Mississippi. It is understood that they may be obtained from the following sources:

*Arkansas.*—The game and fish commission, Little Rock.
*Illinois.*—The chief game and fish warden, Springfield.
*Indiana.*—The commissioner of fisheries and game, Indianapolis.
*Iowa.*—The State fish and game warden, Spirit Lake.
*Kentucky.*—The fish and game commission, Frankfort.
*Louisiana.*—The department of conservation, New Orleans.
*Minnesota.*—The State game and fish commissioner, St. Paul.
*Missouri.*—The State fish commission, 3311 Chippewa Street, St. Louis.
*Ohio.*—The chief warden, secretary of agriculture, Columbus.
*Pennsylvania.*—The commissioner of fisheries, Harrisburg.
*Tennessee.*—The department of game and fish, Nashville.
*West Virginia.*—The forest, game, and fish warden, Philippi.
*Wisconsin.*—The State conservation commission, Madison.

This digest is based upon an examination of session laws and official or semiofficial compilations thereof. While the examination went to these sources in all cases, the references made by numbers in parentheses are to sections of the pamphlet copies of the laws issued by the State game departments, except in some cases where the year of enactment is given, and excepting Indiana and Mississippi; these numbers are the same as those given in the sources mentioned, except for Iowa and West Virginia. In the Indiana pamphlet most of the sections are without numbers, and references herein not otherwise indicated are to Burns's Annotated Statutes (1914). Mississippi has no pamphlet edition of its game and fish laws, and references are to Hemingway's Annotated Code (1917); the 1918 session of the Legislature of Mississippi did not make any amendments.

## I. STATE AUTHORITY IN INTERSTATE WATERS.

It is a common belief among Mississippi River fishermen, in some localities, that the States have no authority to protect fish on that river because, in their expression, it is "a Government water." The belief is wholly without legal basis, and in those regions where the

State wardens have diligently enforced the law the fishermen do not seriously entertain this opinion. It arises chiefly from laxity, past or present, on the part of State officials.

The Mississippi River is a "Government" river in the sense that questions of navigation are subject to the jurisdiction of the Federal Government. But it was long ago settled by the United States Supreme Court that the States may protect the fisheries of navigable waters. In the case of *Smith* v. *Maryland* (18 Howard, 71 (1855)) that court decided an appeal from a conviction for dredging oysters in violation of the law of Maryland. The accused, Isaac R. Smith, owner of the sloop *Volant*, contended that the law of the State of Maryland was repugnant to that part of the United States Constitution which grants to Congress the power to regulate commerce among the States. In that case not only were the operations carried on in the navigable waters of Chesapeake Bay, but the ship was enrolled and licensed by the United States to be employed in the coasting trade and fisheries. The court affirmed the conviction, maintaining that the State holds the property in the soil under the waters for the conservation of the public rights of fishery therein, and may regulate the modes of that enjoyment so as to prevent the destruction of the fishery. "In other words, it may forbid all such acts as would render the public right less valuable or destroy it altogether."

A later Supreme Court case, *Manchester* v. *Massachusetts* (139 U. S., 240 (1890)), was argued for the fisherman by one of the leaders of the bar—Joseph H. Choate. This eminent counselor said: "We do not question the right of the State to regulate its own fisheries within its own soil or tidewaters." He acknowledged that within the tidewaters there has been no grant of power over the fisheries to the United States; but he argued that the State had no jurisdiction upon the ocean, even within 3 miles offshore. The court, however, decided in favor of the State of Massachusetts, holding that the State possessed authority to prohibit the use of various kinds of nets in the navigable waters of Buzzard's Bay. Quoting the language of the same court in an earlier opinion, it said:

> The title thus held is subject to the paramount right of navigation, the regulation of which, in respect to foreign and interstate commerce, has been granted to the United States. There has been, however, no such grant of power over the fisheries. These remain under the exclusive control of the State, which has consequently the right, in its discretion, to appropriate its tidewaters and their beds to be used by its people as a common for taking and cultivating fish, so far as it may be done without obstructing navigation.

Whether the United States could make laws for the protection of fish in navigable waters is not settled by these cases. In the *Manchester* v. *Massachusetts* case the court said:

> We do not consider the question whether or not Congress would have the right to control the menhaden fisheries which the statute of Massachusetts assumes to control; but we mean to say only that, as the right of control exists in the State in the absence of the affirmative action of Congress taking such control, the fact that Congress has never assumed the control of such fisheries is persuasive evidence that the right to control then remains in the State.

The Supreme Court of Iowa has held that its fish laws extend from bank to bank of the Mississippi. *State* v. *Moyers* (155 Iowa, 678 (1912)). The Supreme Court of Wisconsin, on the contrary, has held that the laws of Minnesota for the protection of fish, control only to the main channel of that river. *Roberts* v. *Fullerton* (117 Wis., 222

(1903)). Whatever rule may finally prevail as to the right of a State to enforce its fish laws beyond the State line in rivers subject to concurrent jurisdiction, there is no conflict as to its right to enforce these laws on that part of the river within its own boundary.

It is clear from these decisions that, in the absence of legislation by Congress, the States have a complete right to provide fish protective legislation for navigable waters. But it is not to be concluded from this that the National Government is wholly uninterested. The central authority is concerned with any question which affects the general welfare, and the food supply is certainly of this character. The United States Government is, moreover, specifically concerned with fishery resources for the reason that the Bureau of Fisheries plants millions of fishes and mussels in the waters of the different States. Because of this interest the Bureau endeavors to assist in the task of securing both adequate development of aquatic products and their effective protection.

As a war measure the Food Administration has licensed and regulated salt-water fishermen; but the State laws not in conflict with these regulations remained in effect.

## II. NAMES OF FISHES.

As the same species or genus is given different names in different statutes, and even in the same statute, the names by which the fishes will be distinguished herein are listed, together with cross references from other names that are in common use or are found in the statutes. When a genus includes more than one species, all the species are often, perhaps usually, included under one English name, so that such names are commonly generic rather than specific, at least on the Mississippi River. Because of the infinite confusion in the use of these popular names it can not always be determined with certainty to what species or genus a statute refers. Care has been taken to be as accurate as possible under these circumstances.

**Alewife.** *Pomolobus* Rafinesque, all American species.

**Barfish.** See Bass, striped.

**Bass.** Sometimes means black bass and striped bass, and sometimes appears to include other species also.

**Bass, black.** *Micropterus* Lacépède, both species.

**Bass, calico.** See Crappie.

**Bass, gray.** See Bass, black.

**Bass, green.** See Bass, black.

**Bass, largemouth.** *Micropterus salmoides* (Lacépède). See Bass, black.

**Bass, Oswego.** See Bass, black.

**Bass, rock.** *Ambloplites rupestris* (Rafinesque), and probably *Chænobryttus gulosus* (Cuvier and Valenciennes).

**Bass, silver.** See Bass, striped; Crappie.

**Bass, smallmouth.** *Micropterus dolomieu* Lacépède. See Bass, black.

**Bass, strawberry.** See Crappie.

**Bass, striped.** *Roccus chrysops* (Rafinesque) and *Morone interrupta* Gill.

**Bass, white.** See Bass, striped; Crappie.

**Bass, willow.** See Bass, black.

**Bass, yellow.** See Bass, striped; also Bass, black.

**Billfish.** See Gar.

**Black-fin.** See Cisco.

**Bluegill.** See Sunfish.

**Bowfin.** *Amiatus calvus* (Linnæus).

**Buffalofish.** *Ictiobus* Rafinesque, all species, and probably *Carpiodes* Rafinesque, all species.

**Bullhead.** *Ameiurus* Rafinesque, all species, doubtless excepting *lacustris* (Walbaum), if there be such a species.

**Burbot.** *Lota maculosa* (Le Sueur).

**Carp.** *Cyprinus carpio* Linnæus, and probably (but not in Illinois) *Carpiodes* Rafinesque, all species.

**Carp.** German. See Carp.

**Cat, shovel-nose.** See Paddlefish.

**Cat, spoonbill.** See Paddlefish.

**Catfish.** *Ictalurus* Rafinesque, all species; *Leptops olivaris* (Rafinesque); and in some cases all species of *Ameiurus*, the bullheads.

**Catfish, stone.** *Noturus* Rafinesque and *Schilbeodes* Bleeker, all species.

**Char.** See Trout.
**Chub.** See Minnow. The "chub" of Illinois (Lake Michigan) is herein called cisco.
**Cisco.** *Leucichthys* Dybowski, or *Argyrosomus* Agassiz, all species. See also Tullibee.
**Crappie.** *Pomoxis* Rafinesque, both species.
**Dace.** See Minnow.
**Dogfish.** See Bowfin.
**Drum, fresh-water.** *Aplodinotus grunniens* Rafinesque.
**Eel.** *Anguilla rostrata* (Le Sueur).
**Eel-pout.** See Burbot.
**Fallfish.** *Semotilus bullaris* Rafinesque (in Pennsylvania). The species is more generally known as chub; it is in the minnow family.
**Gar.** *Lepisosteus* Lacépède, all species.
**Gaspergou.** See Drum, fresh-water.
**Goggle-eye.** See Bass, rock.
**Grayling.** *Thymallus* Cuvier, all species.
**Grinnel (Grindle).** See Bowfin.
**Hackleback.** See Sturgeon.
**Herring.** See Alewife; also Cisco.
**Herring, lake.** See Cisco.
**Jackfish.** See Perch, pike.
**Killifish.** *Fundulus* Lacépède, all species, and possibly other species of the family Pœciliidæ.
**Lawyer.** See Burbot; also Bowfin.
**Longjaw.** See Cisco.
**Minnow.** Cyprinidæ, except *Cyprinus carpio* Linnæus, the carp. The word "minnow" is sometimes used loosely for all small fishes except game fish.
**Mullet.** See Redhorse.
**Muskellunge.** *Esox masquinongy* Mitchill.
**Paddlefish.** *Polyodon spathula* (Walbaum).
**Perch.** As used in Louisiana this name appears to mean sunfish and rock bass.
**Perch, black.** See Bass, rock.
**Perch, lake.** See Perch, yellow.
**Perch, pike.** *Stizostedion* Rafinesque, both species.
**Perch, ring.** See Perch, yellow.
**Perch, silver.** Undetermined (West Virginia).
**Perch, white.** See Drum, fresh-water; also Crappie.
**Perch, yellow.** *Perca flavescens* (Mitchill).
**Pickerel.** *Esox* Linnæus, all species except *masquinongy*, the muskellunge.
**Pike.** See Pickerel. The "pike" of Wisconsin and Iowa is herein called pike perch.
**Pike, blue.** See Perch, pike.
**Pike, grass.** See Pickerel.
**Pike, sand.** See Perch, pike.
**Pike, wall-eyed.** See Perch, pike.
**Pike, western.** See Muskellunge.
**Quillback.** *Carpiodes* Rafinesque, all species. In some States it may be intended to include these under the terms carp or buffalofish.
**Red-eye.** See Bass, rock.
**Redhorse.** *Moxostoma* Rafinesque, all species, and *Placopharynx duquesnii* (Le Sueur).
**Rock.** See Bass, striped.
**Sac-a-lait.** See Crappie.
**Salmon.** Usually means landlocked salmon, but may also include pike perch in some cases.
**Salmon, jack.** See Perch, pike.
**Salmon, landlocked.** *Salmo sebago* Girard.
**Salmon, Susquehanna.** See Perch, pike.
**Salmon, wall-eye.** See Perch, pike.
**Salmon, white.** See Perch, pike.
**Salmon, yellow.** See Perch, pike.
**Sauger.** *Stizostedion canadense* (Smith). See Perch, pike.
**Shad.** *Alosa sapidissima* (Wilson).
**Shad, gizzard.** *Dorosoma cepedianum* (Le Sueur).
**Shad, hickory.** See Shad, gizzard.
**Sheepshead.** See Drum, fresh-water.
**Spoonbill.** See Paddlefish.
**Sturgeon.** Acipenseridæ, and possibly in some States *Polyodon spathula* (Walbaum), the paddlefish.
**Sucker.** Catosomidæ, except, usually or always, the genera *Ictiobus, Carpiodes, Moxostoma*, and *Placopharynx*.
**Sunfish.** *Lepomis* Rafinesque, all species.
**Trelipie.** See Tullibee.
**Trout.** *Salvelinus* (Nilsson) Richardson, all species except *Salvelinus namaycush* (Walbaum), the lake trout, and its subspecies; also *Salmo* (Artedi) Linnæus, all species of the region except *Salmo sebago* Girard, the landlocked salmon. See also Trout, lake. In the South black bass are sometimes called trout.
**Trout, brook.** *Salvelinus fontinalis* (Mitchill). See Trout.
**Trout, brown.** See Trout.
**Trout, green.** See bass, black.
**Trout, lake.** *Cristivomer*, or *Salvelinus namaycush* (Walbaum).
**Trout, rainbow.** See Trout.
**Trout, salmon.** Name used on Great Lakes for Trout, lake.
**Tullibee.** *Leucichthys tullibee* (Richardson), and probably other species of the same genus; name used in Minnesota. See also Cisco.
**Wall-eye.** *Stizostedion vitreum* (Mitchill). See Perch, pike.
**Whitefish.** *Coregonus* (Artedi) Linnæus, all species.

## III. TIME, PLACE, AND MANNER, OF CAPTURE.

**Arkansas.**—Bag limit on "trout," black bass, striped bass, rock bass, and crappie is 25 fish (55). Explosives and drugs shall not be used to take or injure fish (45, 46). Shooting fish is forbidden (47). Nets may be used only as follows: Hoop nets without wings, or with wings not over 50 feet long, the mesh of net and wings to be at least 3 inches square; a minnow seine not exceeding 16 feet in length used by a person licensed to fish with artificial bait; a seine not more than 60 feet long with mesh at least 1½ inches square, used by picnic parties to catch fish for their own use, June 15 to September 1 (49). The fish and game commission may issue permits for taking with nets fish for distribution and propagation in the State (50). Except with line and not over three hooks, fish shall not be taken during the spawning season; until otherwise determined by the commission this is declared to be March 15 to May 15 (48, 53, 54). It is unlawful to take fish from an inclosed or artificial pond which has been posted by the owner. (Act approved Feb. 16, 1875.)

**Illinois.**—No fish may be taken within 100 feet of any dam (25). A seine not over 20 feet long with mesh not less than ¼ of an inch square may be used to take minnows for bait only (37). Hoop, fyke, dip nets, or baskets with mesh not less than 1½ inches square, may be used July 1 to April 15 and seine with same mesh September 1 to April 15, except for black bass, pickerel, pike perch, whitefish, trout, cisco, and yellow perch (35). Gill and pound nets with mesh not less than 2¼ inches square may be used for whitefish and lake trout December 1 to November 1 (36). Gill, dip, and pound nets with mesh not less than 1¼ inches square may be used for cisco, or with mesh not less than $1\frac{7}{8}$ inches square for yellow perch, provided not over 10 per cent of catch at any lift consists of lake trout of a less weight than 1¼ pounds dressed each, and such lake trout may be sold only locally and not shipped (36). Maximum lengths for nets are: Hoop, fyke, or pound 200 yards and seine 1,000 yards; they shall not obstruct more than half the width of a watercourse (39).

The commission may set aside fish preserves in which fishing with other devices than hooks and lines, or minnow seine for bait, may be practiced only by special permit (25, 37).

Drugs, explosives, firearms, artificial lights, snare spears, gig graines, and trammel nets shall not be used to catch fish (40, 40b).

It is unlawful to fish in private ponds without the owner's consent (40b).

Persons authorized by the United States may take fish for propagation or distribution and may destroy gizzard shad and gar; the University of Illinois and its agents may take fish for scientific purposes (38, 51).

Mussel fishing may be practiced commercially with one boat only or an additional boat for towing, and with only two crowfoot bars not over 16 feet long each, and only one dredge not over 3 feet long; such fishing is permitted from only April 15 to November 30 (55). The commission may close areas to mussel fishing for periods not exceeding five years (57).

Frogs over one-fourth pound shall not be taken in May or June (34).

Structures excluding daylight or used for concealment in ice fishing are prohibited (40a).

**Indiana.**—Shallow waters designated by the commissioner of fisheries as breeding grounds shall not be fished between March 20 and July 1 (2533a). Closed season for trout (except in boundary waters) is September 1 to April 1, and trout waters (except boundary waters) may be closed for three years by the commission. (1917, ch. 42.) Bag limits (not applicable to private ponds) are 50 sunfish or crappie, and 12 bass, or 20 bass in one boat (2543), or 20 trout, possibly excepting trout from boundary waters. (1917, ch. 42.) It is unlawful to fish in private ponds without the owner's permission, or to enter upon inclosed land for the purpose of setting a trot line (2549–2551).

In interior waters (and as to net, seine, or traps within 100 yards of Indiana tributaries to boundary rivers) the following kinds of tackle are prohibited: Trot line with hooks smaller than five-sixteenths of an inch from point to shank, hook and line attached to floating device, gig, spear, seine, net, or trap of any kind. (2533b, as amended by 1915, chs. 16 and 2541.) Exceptions are made in favor of owners of private ponds, and persons catching minnows for bait in minnow traps and minnow seines not more than 12 feet long, 4 feet deep, "and the meshes of which shall not be larger than one-fourth of an inch" (2532, 2541); but minnows may not be taken in State breeding grounds for trout. (1917, ch. 42.) Except in boundary waters trout may be caught by hook and line only. (1917, ch. 42.) Fish other than carp, gar, bowfin, and sucker shall not be shocked by electricity nor caught by unaided hand or gaff (2548a). Fish shall not be shot (2539), nor taken or injured by means of stupifying or poisonous substances (2541, 2547) or explosives (2548).

Fishing by other means than hook and line is prohibited on or near fish ladders (2534, 7446).

In Lake Michigan and its bays and harbors gill and pound nets may be used for taking whitefish, lake trout, yellow perch, cisco, and rough fish; complicated restrictions are made as to size of mesh; gill nets must have flags attached. (1917, ch. 40.)

**Iowa.**—Closed seasons are as follows: Salmon and trout between October 1 and April 15; bass, pike perch, crappie, pickerel, catfish, and other game fish between December 1 and May 15 (2); in interstate waters pike perch, bass, and crappie, March 31 to June 1, inclusive (13). Bag limits for interior waters are 40 of the species first named, and not over 20 of them shall be bass, pike perch, or pickerel (2, 10).

Fishing is prohibited in streams stocked with breeding trout over 2 years old within one year from the date of stocking, if notice be posted (2). In ice fishing on interior waters no structure for protection against the weather or means for creating artificial heat may be used (2, 10). Except as stated in the following paragraphs fishing is limited, in interior waters, to two lines with one hook each, or three united hooks used in trolling (2, 5, 10).

A seine not exceeding 5 yards in length with three-eighths inch mesh may be used for taking minnows for bait (4).

One trot line may be used, May 15 to December 1, in streams including the Big Sioux River and the boundary portion of the Des Moines River, but it shall not extend more than halfway across (2, 11). Spears may be used to take carp, sucker, redhorse, and buffalofish in waters on the bottom lands and islands of Mississippi River (2).

From certain lakes, buffalofish, carp, quillback, redhorse, suckers, and gar may be taken in nets under special permit and supervision of warden, but no seine shall be used December 1 to June 15 (9). Nets may be used by licensees in Mississippi and Missouri Rivers, and shall have mesh not less than 2½ inches stretch measure (2, 11). It is unlawful to net food fishes in interstate waters and not use them (14).

Tackle other than rod, line, and hook may not be used within 300 feet of a fishway or dam (2). Drugs, explosives, and electricity shall not be used to take fish (3).

Fish in private ponds may be taken by the owner by any means; other persons shall not take fish from such ponds without the consent of the owner (8).

**Kentucky.**—In boundary streams all fish except black bass may be taken in seines and hoop nets without wings, having mesh not less than 1½ inches square. In navigable streams improved with locks and dams the same may be done, but the mesh must be not less than 2 inches square. Nets shall not be used nearer than 200 yards from the mouth of any stream, nor from a lock or dam, and shall not be used above the last lock and dam, and shall not be used during May. (1918, ch. 67.)

Except as stated in the preceding paragraph and except in private ponds, it is forbidden to take fish by other means than lines and set lines (1, 2, 5), or dynamite or drugs (3), or to shoot fish (4), or to kill or stun fish by striking upon the rocks or ice (6). Minnows may be taken for bait (7). Entering without consent upon the lands of another for the purpose of fishing is unlawful (1252, 1259).

**Louisiana.**—Bag limit is 25 black bass, striped bass, or crappie, and 100 "perch" and sunfish (resolution of conservation commission, now department of conservation, adopted Sept. 10, 1912). Black bass, striped bass, crappie, "perch," and sunfish shall be caught only with line having not more than five sets of hooks or with trolling line and artificial bait (40). Seines may be used for taking minnows or shrimp for bait (33).

Hoop nets are prohibited in bayous, lagoons, and streams less than 40 yards wide and seining in fresh water is prohibited, except in certain waters for common species, such as buffalofish and catfish under permit by the department (33); letter of the president of the commission, now department, to Dr. H. M. Smith, United States Commissioner of Fisheries, dated October 25, 1915, includes paddlefish and "gaspergou" (fresh-water drum) as such common species. Seines shall not be used within 100 feet of the shore and shall not exceed 900 feet in length; splashing of water or pounding of boat to drive fish into seine is not permitted; vegetation hauled out with seine must be returned to the water; gars taken in seine must be killed. (Rules on permits issued by department pursuant to sec. 42.) Permits may be revoked if shown to be detrimental to game and fish resources (33). Hoop nets must be made of twine and be at least 3-inch mesh on bar between knots (64). Seine, hoop net, or set line shall not be used for buffalofish between February 15 and April 15, nor for paddlefish between January 1 and July 15, nor for catfish between May 15 and July 15; no paddlefish shall be had in possession which does not contain roe suitable to be made into caviar (37). Puddling water to catch fish and using lights, fyke, gill, or trammel nets or other permanent set means are prohibited (44, 45, 55); hoop nets are probably not intended to be included in this prohibition, for they are regulated as hereinbefore noted. Explosives and drugs shall not be put into public waters (57).

The department may prohibit the taking of any kind of fresh-water fish in any part of the State for not over three years (52).

The department may grant written permits to take fish for the purposes of science, cultivation, or distribution (47).

The department may adopt regulations for the protection and propagation of frogs and alligators; and fix the season during which and the size at which they may be taken or sold; but such regulations shall not prevent the killing of alligators found damaging levees or canals. (1918, house bills Nos. 118 and 120.)

Diamond-back terrapin, unless artificially propagated, shall not be taken between April 15 and June 15 (60, 61). Nest or eggs of terrapin must not be molested. (1910, act 50.)

Salt-water operations for fish, shrimp, and oysters are regulated by several acts.

**Minnesota.**—Closed season for trout or salmon, except lake trout caught in international waters, is September 1 to May 1 in northern part of State, and September 1 to April 15 in southern part; for black bass, March 1 to June 15 in northern part of State, and March 1 to May 29 in southern part; other varieties of fish March 1 to May 1 (4807). In interstate waters the closed season for black bass is the same, and for other game fish it is March 1 to May 1 (4830).

Bag limits are 25 crappie or trout, 15 pike perch, 15 bass, except rock bass, and no person shall have in possession more than 25 bass, except rock bass (4808), and the taking of over 25 fish in one day is prohibited, with exceptions (4896). Crappie, trout, pike perch, and bass (except rock bass) shall be taken only with hook and line, and not more than one line shall be used, and it shall have not more than one bait, except that three artificial flies may be used in trout fishing (4808). Provision is made for closing trout streams to all fishing except during season for trout (4857–4859). And there are provisions for the more thickly populated localities (4885–4895).

Fishing in a lake or stream within 50 feet of a fishway is forbidden (4864).

Fishing on Sundays is unlawful. (Gen. Stat. of 1913, sec. 8753.)

Fishing in certain waters by means of set lines (4835, 1917, ch. 333, sec. 4), fish house (4866, 1917, ch. 96, sec. 10), and tip-ups (4867–4868) is regulated. Spears may be used for specified food fish, subject to numerous restrictions (4808).

Netting in inland lakes for whitefish and tullibee for domestic use is permitted with numerous restrictions (4808), likewise gill netting for herring for domestic use and not for sale. (1917, ch. 176.) The taking of fish from shallow waters is provided for. (1917, ch. 84.) The game and fish commissioner may catch and sell specified rough fish where it appears that they are detrimental to game fish. (1913, ch. 477.) In the Mississippi River within the State (from Falls of St. Anthony to 1,000 feet above the mouth of the St. Croix River) pound net, seine, or dip nets may be used to take sturgeon, redhorse, bowfin, buffalofish, catfish, pickerel, carp, and suckers, as follows: Not within 1,000 feet of mouth of a stream; pound net not over 75 feet long; seine not over 150 feet long; mesh in all cases not less than 2½ inches on bar (4819). Netting in certain waters is allowed for specified rough fish, under supervision of warden and subject to exceptions and to provisions as to mesh, bond, and reports, except for most waters, April 1 to October 1. (1915, chs. 261 and 348; and 1917, ch. 386.)

In international waters nets and set lines may be used by United States citizens resident in Minnesota, under restrictions as to size, mesh, number of nets, leads, position, and seasons. (1917, chs. 96 and 333.)

In the St. Croix River and the interstate portion of the Mississippi River, fish, except catfish under 15 inches rough, 12 inches dressed, pike perch, pickerel, bass, sunfish, yellow perch, and crappie, may be taken by residents of Minnesota and, provisionally, of Wisconsin (4845) with nets, set lines, and spears, except April 15 to June 15 (4826–4835); no license is required for spearing (4833); the mesh is limited for each kind of net and for different parts of the same kind (4834); set lines may have not more than 300 hooks, shall not be baited with live bait, and no person may have more than one (4835); nets must bear license number above water; and seines shall not be longer than 4,000 feet and shall not be raised at night (4840); fyke nets must be raised at least weekly (4841).

Drugs or explosives shall not be used to take fish (4865).

The accredited representative of any incorporated society of natural history or college may collect fish for scientific purposes under permit of the game and fish commissioner (4771).

Mussel fishing may be practiced commercially with one boat only, or an additional boat for towing, and with only two crowfoot bars not over 20 feet long each, and only one dredge not over 3 feet long with prongs or forks nor more than 4 inches long, and it is lawful to use a pitchfork; the commission may close areas to mussel fishing for periods not exceeding five years. (1917, ch. 471.)

Commission may prescribe a "closed season" permanently or for a number of years for frogs (and game birds and animals protected by law) in certain districts. (1915, ch. 288.)

**Mississippi.**—Boards of supervisors have authority to regulate the time and the places in which and the circumstances under which fish may be taken (4700–4703); they may entirely prohibit the catching of fish for one or more years or seasons when they believe that the supply is about to be exhausted (4704); they may prohibit the use of seines, barrel nets, gill nets, and other like contrivances, or any of them, or may restrict the use of the same to places which annually go dry, and may prohibit or regulate the use of the same in particular waters, and may prescribe what kinds of seines or nets may be used and when and where (4707). The use of fish traps may be prohibited or regulated by boards, and every fish trap which wholly obstructs the passage of fish shall be unlawful (4708). Fish shall not be taken by means of explosives (902), and shall not be poisoned (1062). Fishing on Sunday (1105) or on the premises where the owner has posted a notice forbidding it is unlawful (1135).

**Missouri.**—Gigging and spearing are prohibited from December to April, inclusive; all fishing except hook and line and gigging are prohibited during April and May; not more than 50 pounds of fish, in addition to one individual fish, shall be gigged or speared in one day, and that for domestic use only (6548). Fishing through ice is prohibited (6549).

A glass or wire minnow trap, or a seine not more than 20 feet long and 4 feet wide may be used to take minnows and small sunfish for bait; residents may net fish for food, but not for commerce, from temporary overflows; the owner of the land, or other person by his permission, may use a 2-inch-mesh seine to take fish from unnavigable streams during July, August, and September, for consumption, but not for sale; bowfin, paddlefish, and gars may be taken at any time and in any manner, except by explosives (6548).

Seines, trammel, and hoop nets with mesh at least 2 inches square may be used in the Mississippi and Missouri Rivers from June to March, inclusive, but not within 300 yards of the mouth of any stream or slough. With the exceptions just stated, and excepting also fish taken in private pond or reservoir wholly upon the premises of the owner or occupant and by his consent, it is unlawful to take fish by any means other than hook and line, gig, spear, trot line, or artificial bait (6548). Fishing devices shall not obstruct the free passage of fish through watercourses (6535). Within 200 feet of a fishway fish may be taken only by means of pole, line, single hook, and natural bait (6549).

Fish shall not be taken by means of explosives or drugs (6537, 6538).

Under permit by the game and fish commissioner fish may be taken for scientific or propagating purposes (6568).

Pearl fishing is prohibited from March to June, inclusive (6551).

**Ohio.**—For black bass the closed season in inland district is the month of May, and in Lake Erie district May 25 to July 15, inclusive (1428). Trout and salmon may be caught only from April 15 to September 15, inclusive (1431). Bag limits are 12 black bass or 40 sunfish; black bass, crappie, and rock bass may be taken only with hook and line (1428). Trespassing on a private fishery is unlawful. (1912, Gen. Code, secs. 10174 and 12525.) Fishing on Sunday is forbidden. (1912, Gen. Code, sec. 13048.) Fishing in inland district is permitted only with hook and line, and in streams, by the owner of the adjoining land or under his consent, with trot line, bob line, or spear (1426). Ice fishing in inland district is permitted only through two holes not more than 2½ feet each in diameter; not more than two hooks shall be used on one line (1427). Minnows may be taken only for bait; in inland waters they may be caught with a seine not exceeding 4 feet by 8 feet, and in the Lake Erie district by a seine not exceeding 30 feet in length (1433). Explosives, poisonous substances, and electricity shall not be used to take fish (1446).

Fish in pools left by receding waters may be taken in any manner (1456).

Closed season for netting in the Lake Erie district is December 16 to March 14, inclusive (1434, 1442). In this district the following kinds of tackle may be used: Pound, gill, fyke, trap, and devil net, seine, trot line, and hook and line limited to three hooks; no fish shall be driven into any net by noise or other disturbance (1438). The mesh of gill nets shall not be less than 3 inches, stretched factory measure; pound and fyke nets shall have a specified portion with not less than 2¼-inch mesh, and that portion shall not be puckered (1441). Netting is prohibited in parts of the district (1439, 1440, 1450, 1452). Carp may be taken at any time in waters connected with Lake Erie by a seine having mesh not less than 4 inches stretch, or by other nets authorized by the secretary of agriculture (1453).

Turtles may be netted only with "single seine or net" with mesh 4 inches square (1432).

**Pennsylvania.**—Closed seasons on fish are as follows: Trout, August 1 to April 14, inclusive; lake trout, September 30 to June 30, inclusive; black bass, rock bass, striped bass (fresh-water), crappie, pike perch, pickerel, muskellunge, and yellow perch, December 31 to June 30 (15). In boundary lakes the closed season on black bass.

rock bass, crappie, muskellunge, and pickerel is November 1 to May 20, inclusive. (1913, act 71, sec. 4.) Bag limits are 25 trout; 25 striped bass, rock bass, and crappie; 12 black bass; 25 pike perch; 25 pickerel; 4 muskellunge; 50 yellow perch; 50 sunfish (35). In boundary lakes the limits are 25 rock bass or crappie and 12 black bass, muskellunge, or pickerel. (1913, act 71, sec. 4.)

Only a single rod and line, or one hand line with not more than three hooks, may be used to take trout, pike perch, pickerel, muskellunge, fall fish, black bass, crappie, striped bass (fresh-water), and rock bass; other fish may be taken only by rods and lines or one hand line with not more than three hooks attached, all to be under the immediate control of the person using them (4, 6, 45).

Minnows, killifishes, and stone catfish may be taken in dip net or minnow seine not over 4 feet in diameter, or a minnow trap with not more than one opening, which shall not exceed 1 inch in diameter (5, 45).

The commissioner may promulgate rules for catching fish (121), and may set aside small streams and lakes as nurseries, and, after publishing and posting notice, prohibit fishing therein (124).

Sunday fishing is prohibited (10). Within 100 feet of the lower end of any fishway or dam, or within any other distance specified in a notice posted by the commissioner, only rod, hook, and line fishing is permitted (92).

Electricity, explosives, and poisonous substances shall not be used to take fish. (100; 1913, act 71, secs. 5 and 6.)

Fishing for scientific research, or propagation, or stocking may be carried on under permit from the commissioner (120).

In boundary lakes black bass, rock bass, crappie, muskellunge, and pickerel may be caught only with "rod and line having not more than three hooks, or with a hand line having not more than three hooks, or a spear used for catching carp and suckers only or with a trolling line with spoon hooks attached;" in bays or waters on any peninsula of boundary lakes any kind of fish may be taken only by means of rod and line or hand line, either to have not more than three hooks attached, or with a trolling line with spoon hooks attached; exceptions are made in favor of minnow nets. (1913, act 71, secs. 1-3.)

In boundary lakes, subject to the limitations just stated and at distances from bays, streams, and the shore varying for different kinds of nets, licensees may use gill nets with mesh at least 3 inches stretch measure and not more than 30 meshes deep, or if for lake trout with mesh at least 5½ inches stretch measure; also pound nets with crib having mesh at least 2½ inches stretch measure, trap nets with mesh at least 2½ inches stretch measure, and set lines called "night" lines. (1913, act 71, secs. 9 and 11, as amended by 1915, act 226.) Nets, except gill and pound nets, must be tagged (1913, act 71, sec. 15.).

Sturgeon fishing in Lake Erie shall be stopped for five years when the same provisions is made by Ontario, New York, and Ohio. (1917, act 32.)

For shad, alewife, catfish, suckers, eel, and carp, licensees may use from March 1 to June 20 in the Susquehanna River from McCall's Ferry Dam to the Maryland State line, and within the limits of tidewater, the following kinds of tackle: Haul seine or shore seine, dip net, or hold-in net, sometimes called a moon rake, "with diameter of not more than 3 feet at the widest point and a length of not more than 7 feet from heel of the bow, being the point of jointure of the sides of the bow at the handle." The mesh must be not less than 1¼ inches, knot to knot, while being fished (55–58).

Fishing on the Delaware River is regulated by special acts. (1889, act 240, and 1909, acts 201 and 269, and amendments.)

Fishing by unnaturalized foreign-born residents is forbidden. (1915, act 84.)

The closed season on bullfrogs and tadpoles is from November 1 to July 1, inclusive, and on terrapin from March 15 to November 1; limits on catches are 25 bullfrogs or tadpoles in a day, 50 bullfrogs in a season, 5 terrapin in a day, and 50 terrapin in a season; bullfrogs shall not be taken by the use of a light at night. (1917, act 180.)

**Tennessee.**—Closed season on trout, black bass, landlocked salmon, crappie, and rock bass is from May 1 to June 15 (47).

Trammel nets, baskets, dip nets, and set nets with mesh at least 2 inches in width may be used by licensees in Cumberland, Mississippi, Tennessee, Big Sandy, Obion, and Forked Deer Rivers, but not within 200 feet of any inlet nor within 300 feet of any lock or dam (49). With this exception, and also excepting the taking of fish from private ponds, and the seining of minnows for bait, fish shall not be captured by nets, traps, gun, gig, grabhook, poison, explosives, or any means other than rod and line and trot line (45). Minnows so taken must be under a length of 4½ inches, and the net must not be over 10 feet long (46).

**West Virginia.**—Closed season on pike perch, black bass, rock bass, pickerel, suckers, carp, and redhorse is April 1 to July 1, and on trout and landlocked salmon from August 1 to July 1 (42). Fishing on Sundays is prohibited (26). Small fishes,

except salmon, bass, shad, and trout may be taken for bait or scientific purposes by means of hand or cast nets (42). The only tackle permitted is hook and line and trot line having hooks not less than 2 feet apart, and hand or cast nets to take minnows for bait; other tackle may be used by the owner to take fish from private springs or ponds, and persons other than the owner shall not take fish from such waters (42). Drugs, explosives, and electricity shall not be used to take fish (46, 47). Fishing on lands of another person without permission is forbidden (48).

Wisconsin.—The conservation commission may determine, after petition and hearing, in what manner, in what numbers, in what places, and at what time wild animals (includes fish) may be taken (29.21).

Closed seasons (omitting provisions for special counties or bodies of water) are as follows, all dates being inclusive: Black bass from March 2 to June 14; "Oswego bass, green bass, and yellow bass," from March 2 to May 28 (as these names are popular synonyms for black bass it is impossible to know certainly what the closed season is, in this State, for black bass); yellow perch and sunfish in counties bordering on the Mississippi River, and rock bass, white bass, catfish, muskellunge, pike perch, and pickerel in the State generally, from March 2 to May 28; trout, from September 1 to April 30; sturgeon, all year (29.19). The season for hook and line fishing in the Mississippi River, except for black bass, opens May 1 (29.19).

Bag limits are 10 black bass, 30 rock bass, 35 trout, 10 pike perch, 15 pickerel, 2 muskellunge, 10 catfish, but no catfish limit on Mississippi River, 30 pounds of bullhead (29.19).

All fishing is prohibited in streams and creeks containing trout, during the close season for trout; or at any time in any spring hole or artificial well connected with any of the waters of the State; or by means of shutting or drawing off water for that purpose; or within 200 feet (more in some localities) of any fishway, lock, or dam except with hook and line (29.26).

Not more than three lines may be used, each having not more than two hooks or one spoon or artificial bait each. Spearing for rough fish is prohibited in unnavigable waters containing trout, in navigable waters containing trout, during the closed season for trout, also in certain specified waters, and at night time in inland waters. The use of snag line or snag pole is prohibited (29.27).

Fishing through ice is prohibited in certain waters; spearing of pickerel through the ice is permitted in the Mississippi River and its lakes, bays, bayous, and sloughs; fish shelters may be used on the Mississippi River and certain other waters (29.28).

Explosives, poisonous substances, and other substances deleterious to fish life, or which might attract fish in unusual numbers shall not be used for taking fish, except that cisco may be baited with oatmeal for the purpose of catching them with hook and line through the ice (29.29).

Minnow seines not over 40 feet long (100 feet in Great Lakes waters) and 5 feet deep, and dip nets not exceeding 6 feet in diameter, may be used for taking rough fish minnows for bait; but in trout streams they must be used only under the supervision of a deputy warden (29.32).

Net and set-line fishing is regulated as follows: No apron or other device to catch small fish shall be used in pound net; no net shall shut off more than one-half the channel or passageway of any stream, or be set within 1,000 feet of any other net; no licensee shall join his net to that of any other licensee; flags bearing the license number must be maintained over nets and lines; licensees in Great Lakes waters must permit State officials to accompany them and the officials may at any time raise set lines; except in specified Great Lakes waters, no net shall be drawn or lifted from one hour after sunset until sunrise; all rough fish taken in nets in inland waters shall be brought to shore and disposed of, but not returned to the water; sizes of nets specified mean the size, stretch measure, at the time of use (29.30).

Set lines may be used in certain waters with hooks not smaller than 5–0, and with not over 25 or 300 hooks, depending on locality (29.37).

Elaborate and complicated regulations are provided for net and set-line fishing in Great Lakes waters (29.33). Net fishing is prohibited in the Mississippi River and Lakes Pepin and St. Croix from April 16 to June 14, also at all times in specified waters, and for catfish under 15 inches rough, 12 inches dressed, pike perch, bass of any variety, crappie, sunfish, pickerel, sturgeon, and yellow perch; in said waters seines shall not exceed 4,000 feet, and mesh shall be not less than 5 inches on the wings or 4 inches in the center of the pot, the pot not exceeding 150 feet, and gill nets shall have mesh not less than 7 inches, and pound or hoop nets not less than 6 inches in the leaders, 5 inches in the hearts, or 3 inches in the hoops, and bait nets shall be used without leads, have mesh not less than 3 inches and front hoop not over 4 feet (29.34).

Dip netting is allowed in specified inland waters (29.31). Provision is made for netting whitefish and cisco in inland lakes (29.35) and for netting rough fish in Winnebago waters (29.36).

The commission is authorized to net from inland waters (with exceptions) rough fish found to be detrimental to game fish, and to dispose of them to the best interest of the State (29.62).

The commission may authorize the taking of fish for scientific purposes or propagation (29.17, 29.01, 29.51).

The operation of private hatcheries is provided for (29.50, 29.52).

Crawfish and crabs shall not be taken between March 1 and July 1, nor frogs from March 1 to May 1, except that frogs may be had in possession by a person in the business of propagating them, or when used for scientific purposes (29.20). Frogs shall not be taken from lands owned by another without his consent (sec. 4565dm).

Nonresident mussel fishermen may use one boat only. Mussels shall not be taken with a dredge (29.38).

## IV. SIZE LIMITS FOR AQUATIC ANIMALS.

MINIMUM SIZES OF FISHES AND OTHER AQUATIC ANIMALS, WITH REFERENCES TO THE LAWS IN EACH STATE.

| State and citation of statute. | Bass, black. | Bass, rock. | Bass, striped. | Buffalofish. | Bullhead. | Carp. | Catfish. | Crappie. | Drum (freshwater). | Muskellunge. | Perch, pike. | Perch, yellow. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* |
| Arkansas,[a] sec. 21 | 11 | ..... | 8 | (a) | ..... | (a) | (a) | 8 | (a) | ..... | 11 | ..... |
| Illinois,[b] secs. 41, 42, 42A, 56 | 10 | 6 | 8 | 18 | 7 | 15 | [b]13 | 8 | 10 | ..... | 13 | 7 |
| Indiana[c] | 10 | 6 | ..... | ..... | ..... | ..... | ..... | 6 | ..... | ..... | 12 | ..... |
| Iowa, interstate waters, [d] sec. 13 | 11 | ..... | 8 | 15 | ..... | 15 | 13 | 8 | ..... | ..... | 15 | ..... |
| Iowa, interior waters, sec. 2 | 10 | ..... | 10 | ..... | ..... | ..... | 10 | 8 | ..... | ..... | 12 | ..... |
| Louisiana,[e] secs. 37, 40, 60 | 8 | ..... | 8 | 12 | ..... | ..... | 12 | ..... | ..... | ..... | ..... | ..... |
| Minnesota [f] | 9 | ..... | ..... | ..... | ..... | ..... | (f) | ..... | ..... | (f) | (f) | ..... |
| Missouri, [g] sec. 6550 | 11 | ..... | 8 | ..... | ..... | ..... | [g]13 | 8 | 10 | ..... | 11 | ..... |
| Ohio, [h] secs. 1428, 1442 | 10 | 5 | [h]10 | [h]16 | [h]9 | [h]14 | [h]15 | 5 | ..... | ..... | [h]9 | [h]9 |
| Pennsylvania, [i] sec. 25 | 9 | 6 | 6 | ..... | ..... | ..... | ..... | 6 | ..... | 24 | 12 | 6 |
| Tennessee, sec. 50 | 7 | 6 | ..... | ..... | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... |
| West Virginia, [j] sec. 42 | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 | ..... |
| Wisconsin, certain Great Lakes waters, secs. 29, 33 | ..... | ..... | ..... | ..... | ..... | 12 | 15 | ..... | ..... | ..... | 13 | 8 |
| Wisconsin, State generally,[k] secs. 19, 29 | 10 | 6 | 7 | ..... | ..... | ..... | 15 | ..... | ..... | 24 | 13 | ..... |

[a] Measurements to be from end of nose to fork of tail. Limits on sale only, and do not apply to minnows used for bait. Limits given by weight are as follows: Blue or channel catfish and drum, 2 pounds; carp and buffalofish, 3 pounds.

[b] Fish measurements are taken for "the length of the entire fish from the extreme tip of the snout to the extreme end of the tail fin," and turtle and terrapin for the extreme ends of the upper shell. Restrictions do not apply to pole and line fishing. The limit on lake trout and whitefish is 1½ pounds, dressed. The catfish restriction is confined to "blue and channel catfish."

[c] Section 2542 and ch. 42 of 1917. The size limit on trout does not apply to boundary waters.

[d] A different size limit (in interstate waters) is set for the species of sturgeon, being 1 pound for the sand sturgeon, shovel-nose sturgeon, or hackleback *Scaphirhynchus platorhynchus* (Rafinesque), and 3 pounds for the rock sturgeon or lake sturgeon *Acipenser rubicundus* Le Sueur; the former would perhaps include the white sturgeon *Parascaphirhyncus albus* Forbes and Richardson. The restrictions as to interstate waters do not apply to hook and line or spear fishing.

[e] The terrapin restriction is only on the diamond-back. Size limits for salt-water species are fixed by other acts.

[f] Sections 4827 and 4873 and ch. 471 of 1917. Measurements are taken from tip of snout to fork of tail; a different size limit is set for the two species of pike perch, being 14 inches, or 1 pound dressed, for the wall-eye, and 10 inches for the sauger. The limit on lake trout and salmon from inland waters is 16 inches. Catfish under 15 inches tip to tip rough, or 12 inches dressed, shall not be taken in nets in interstate waters. The limits for international waters are: Sturgeon, 15 pounds dressed; lake trout, 2 pounds round, or undressed, and 1½ pounds dressed; whitefish, 16 inches; wall-eye, 14 inches, or 1 pound round; muskellunge, 30 inches; sauger, 10 inches. The language of the statute is not perfectly clear, but these restrictions seem to be limited to international waters. Mussels, except "pigtoes," shall not be taken smaller than 1¾ inches.

[g] Measurements are taken from end of nose to fork of tail. The restrictions are applicable only to fish sold. The catfish restriction is limited to "blue and channel catfish."

[h] Measurements are made from end of nose to longest tip of tail (1449). Restrictions on striped bass, buffalofish, bullhead, carp, catfish, "pike," yellow perch, sturgeon, and whitefish apply only to commercial fishing in the Lake Erie district, and even here it is lawful to retain 3 per cent, by weight, of undersized fish, or 10 per cent of "pike"; the whitefish limit is 1½ pounds. Catfish and sturgeon shall not be brought ashore in such condition that the length can not be measured.

[i] The limit on sturgeon applies only to boundary lakes (1913, act 71, sec. 10).

[j] Measurements are taken from end of snout to center of fork of tail.

[k] Measurements are taken from tip of snout to tip of tail. The restrictions as to Great Lakes fish limit only licensees in those waters; any such licensee taking undersized fish shall bring them ashore and notify the conservation commission or its deputy and the latter shall dispose of them.

MINIMUM SIZES OF FISHES AND OTHER AQUATIC ANIMALS, WITH REFERENCES TO THE LAWS IN EACH STATE—Continued.

| State and citation of statute. | Pickerel. | Salmon, land-locked. | Sturgeon. | Sucker. | Sunfish. | Trout. | Trout, lake. | Whitefish. | Mussels. | Turtle or terrapin. | Fishes, except yellow perch and bullhead. | Fishes other than specified. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* | *In.* |
| Arkansas, [a] sec. 21 | 11 | ..... | ..... | ..... | 6 | 8 | ..... | ..... | ..... | ..... | ..... | ..... |
| Illinois, [b] secs. 41, 42, 42A, 56 | 18 | ..... | ..... | ..... | 4 | ..... | (b) | (b) | 2 | ..... | ..... | ..... |
| Indiana [c] | 12 | ..... | ..... | ..... | ..... | c7 | ..... | ..... | ..... | ..... | ..... | ..... |
| Iowa, interstate waters, [d] sec. 13 | 18 | ..... | (d) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Iowa, interior waters, sec. 2 | 12 | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... |
| Louisiana, [e] secs. 37, 40, 60 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | e5½ | ..... | ..... |
| Minnesota [f] | ..... | (f) | (f) | ..... | ..... | ..... | (f) | (f) | (f) | ..... | 6 | ..... |
| Missouri, [g] sec. 6550 | 11 | ..... | ..... | ..... | 6 | 8 | ..... | ..... | ..... | ..... | ..... | ..... |
| Ohio, [h] secs. 1428, 1442 | ..... | ..... | h48 | ..... | ..... | ..... | ..... | (h) | ..... | ..... | ..... | ..... |
| Pennsylvania, [i] sec. 25 | 12 | ..... | i36 | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... |
| Tennessee, sec. 50 | ..... | 7 | ..... | ..... | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... |
| West Virginia, [j] sec. 42 | 10 | ..... | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... |
| Wisconsin, certain Great Lakes waters, secs. 29, 33 | 16 | ..... | ..... | 10 | ..... | ..... | 12 | 13 | ..... | ..... | ..... | 7 |
| Wisconsin, State generally, [k] secs. 19, 29 | 16 | ..... | ..... | ..... | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... |

For footnotes see page 16.

## V. LICENSES REQUIRED AND FEES THEREFOR.

**Arkansas.**—Licenses are issued by the game and fish commission and by the circuit clerk of the State (10, 11); fees are payable to the State treasurer or circuit clerk of the county (23). The fee for a resident for fishing with artificial bait is $1.10; for a nonresident for fishing, $5, or for a single 15-day trip in the year (not including the right to take fish out of the State), $1.25 (17). Fishermen catching fish to sell must pay $25 if using hoop nets, $10 if using lines or set lines, and for each helper, $5 (19). Dealers must pay to the State treasurer one-sixteenth of a cent for each pound of fish purchased in the State, this amount to be collected but one time, and from the first dealer purchasing (20).

**Illinois.**—Licenses are issued by city, village, and county clerks (23). Fees for net fishing are as follows, the amounts in parentheses being for nonresidents: Each 100 yards of seine, $5 ($10); dip or fyke net, $1 ($2); hoop net, 50 cents ($2); basket or trap net, 50 cents (?); in operation of gill or pound nets, steam tug, $25 ($200), gasoline launch, $15 ($50), sail or row boat, $10 ($30) (22). Clerk's fee is 25 cents extra (23). Owners of property, their children and tenants, may do net fishing, without license, from waters wholly within their property and not connected with any open stream (22). Gill and pound nets shall be operated from only a boat, as listed hereinbefore (39). The fee for conducting a wholesale-fish business is $10.50 (24). The commercial mussel fishing fee is $1.25 for residents and $25.50 for nonresidents, plus in either case $25 if a dredge is used (55).

**Indiana.**—Resident licenses to fish (and hunt) are issued by the commissioner of fisheries, or his agents, in Marion County, and elsewhere by clerks of the circuit courts; the fee is $1; owners of farm lands, their children living with them, and tenants may fish upon their lands without license; any person may fish in the county in which he resides and adjacent counties without license; children under 18 and wives of licensees may fish without license (2529). Nonresident licenses to fish are issued by clerks of the circuit court of the counties, and the commissioner, and persons appointed by him for that purpose; the fee is $1; children under 18, wives of licensees, and persons having hunting licenses are not required to have licenses (9366a).

Licenses for netting in Lake Michigan are issued by the commissioner; the amounts range from $1 to $300, depending upon the kind of boat used, if any, and upon whether the fisherman is resident or nonresident. (1917, ch. 40.)

**Iowa.**—Nonresident licenses for males over 16 years old to fish are issued by county auditors; the fee is $2. (1917, ch. 168.)

Licenses for net fishing in the Mississippi and Missouri Rivers are issued by the State fish and game warden. The fees are as follows: Each 500 feet of seine, $10; pound net having more than 100 feet of lead on each side, $4; pound net with less lead, $1; each bait, dip, hoop, and fyke net, 50 cents; each 300 feet of trammel net used

for floating fishing, $5. Metal tags at 10 cents each are required to be used and nonresidents must give bond (11).

**Kentucky.**—Netting licenses are issued by the county clerks. The fees for residents are $1.25 for one net, and $1 for each additional net; for nonresidents the fees are doubled. (1918, house bill, 181.)

**Louisiana.**—Licenses are issued by the department of conservation. Fees for seines are as follows: Less than 300 feet, $25; 300 to 600 feet, $50; 600 to 900 feet, $100 (33). Fees for wholesale dealing in fresh-water fish are $5 to $150, depending on the amount of business and whether the dealer is a resident or nonresident (34, 35). Fees for vessels purchasing fresh-water fish to make a cargo are $5 to $40, depending on tonnage of boat (36). The resident fee for buying and selling diamond-back terrapin is $25, and for buying, selling, and shipping, $100; the fee for nonresident or unnaturalized foreign-born resident for buying, selling, or shipping is $200 (63).

The fees for salt-water operations are fixed by several acts.

**Minnesota.**—Nonresident pole and line licenses are issued by the county auditor (4880) and other licenses by the State game and fish commissioner and deputies (4881). Licenses of Wisconsin are accepted if it reciprocates. (4845 and ch. 471 of 1917.)

Fees for fish house (4866), tip-up license (4868), nonresident pole and line license if fisherman is over 21 years old (4879), and for netting in inland lakes for whitefish and tullibee (4808), or for herring (1917, ch. 176) are $1.

The fee for seine, pound, or dip nets in the Mississippi River within the State is $5 for each net (4819). In international waters the fees are based upon the vessel used in Lake Superior, and upon the tackle used in other lakes. (1917, chs. 96 and 333.) In interstate waters the fees are: For seine, $1 a hundred feet up to 500 feet, then $2 a hundred to 1,000 feet, then $3 a hundred to 1,500 feet, then $4 a hundred to 2,000 feet, then $5 a hundred to 2,500 feet, then $6 a hundred to 4,000 feet; for gill nets, $5 for 2,000 feet, and $5 for each additional thousand; for pound net with leader not exceeding 700 feet, $5, and for each pound net in excess of one used with one leader, $5; each fyke or hoop net, $5; each bait or turtle net or set line, $1; metal tags are 25 cents each (4836). Fee for inland commercial fishing is 10 per cent or more of gross receipts plus expenses and compensation of warden. (1917, ch. 386.)

The commercial mussel-fishing fee is $5 for residents and $50 for nonresidents, plus in either case $25 if a dredge is used. (1917, ch. 471.)

**Ohio.**—Licenses are required for fishing with devices other than hook and line in the Lake Erie district, and are issued by the secretary of agriculture (1435). The fees for fishing with gill nets are as follows: Rowboat, $4; sailboat, $6; gasoline boat, $12.50; and steamboat, $20. The fee for fishing trot lines is $1.50 for each rowboat; for each seine, $4; for each pound net, $3; and for each device of any other kind, $1.50 (1436). Metal tags must be used on devices other than gill net and hook and line, but are issued without charge (1438).

**Pennsylvania.**—Licenses are issued by the department of fisheries. The fee for using a net in the lower Susquehanna or in tide waters is $2 (55). The fee for artificial propagation is $10 (70). Fees for fishing in boundary lakes are as follows: For row or sail boat used in fishing with gill net, $5; other boat under 10 tons gross burden so used, $10, of 10 to 20 tons $15, of over 20 tons $20; for each pound net, $10; for other net or device (except lines having not more than 3 hooks, a spear for taking carp and suckers and trolling spoons) 50 cents to $5 as determined by the department. (1915, act 226.) Licenses for boundary waters shall not be issued to residents of a State or county (country?) whose laws prohibit the issuance of a license to residents of Pennsylvania. (1913, act 71, sec. 14.)

**Tennessee.**—Licenses are issued by clerks of the county courts; the fee is $2 for each net or basket (49).

**West Virginia.**—Licenses for foreigners and nonresidents (angling and trot lining) are issued by county clerks; the fee is $5, but no license is required from nonresident owners or their children for fishing on their own land (42).

**Wisconsin.**—Licenses are issued by the State conservation commission, through agents in the case of hook and line licenses and through the county clerks in other cases (29.09, 29.15). Fishing licenses of Minnesota and Iowa are accepted if those States reciprocate (29.16). Licenses are issued only to persons (29.09).

Fees for nonresidents are as follows: Mussel fishing, $50 (29.38); hook and line fishing in inland waters for male fisherman over 16 years old, $1 (29.14); operating gill net in Great Lakes waters with steam vessel having steam lifter, $200, or, without steam lifter, $100, or with any other vessel not propelled by oars, paddle, or pole, $50, or a boat so propelled, $2 (29.33).

Fees for residents or nonresidents in Great Lakes waters are as follows: Gill net or nets, or each pound net and leader (except as noted for nonresidents), $2; trap, fyke, drop net, or nets with leaders, or each seine, $5; each trammel net or set hooks, $1 (29.33).

Fees for fishing in the Mississippi River and Lakes Pepin and St. Croix are as follows: Seines for first 500 feet, $1 a hundred, second 500 feet, $2 a hundred, third at $3, fourth at $4, fifth at $5, and 2,500 to 4,000 feet at $6 a hundred; gill nets for first 2,000 feet, $5, and for each additional thousand feet $5; pound or hoop nets with 700-foot leader and one pound, $5, and for each additional pound $5; bait nets, $1 each. For these waters fishermen must give bonds (29.34).

Fees for netting whitefish and cisco in inland waters is 50 cents (29.35); for taking rough fish in Winnebago waters, $5 to $50 (29.36); for using set lines, $1 (29.37).

Metal tags are required for nets and set lines, a fee of 25 or 50 cents each being charged for most kinds of nets (29.33–29.37).

## VI. SHIPPING AND SELLING FISHERY PRODUCTS.

**Arkansas.**—The transportation of game fish beyond the State is limited to one day's catch, and requires the filing of an affidavit with a notary, justice, or other authorized officer (58, 59). The game and fish commission may permit fish to be shipped from the State for propagation purposes (7), and may permit fish to be sold and exported if privately propagated (8).

**Illinois.**—Black bass shall not be sold nor, if taken within the State, pickerel or pike perch (41). These fish shall not be shipped, except not over 25 fish in one lot as baggage (43). Fish, except whitefish, lake trout, cisco, and yellow perch, shall not be shipped from April 20 to July 1, inclusive, nor frogs over a quarter of a pound from April 15 to July 1, inclusive (44). Shipments of fish must be marked to show contents and other facts (43, 45). Carriers are forbidden to receive from unlicensed dealers fish caught in the State (24).

**Indiana.**—The transportation beyond the State, or the sale of pickerel, pike perch, yellow perch, sunfish, black bass, rock bass, or other species of bass, is forbidden, unless taken from private ponds, and except that a person may carry beyond the State 24 fish caught by himself (2533c, 2535).

**Iowa.**—Game fish shall not be shipped from inland waters for the purpose of sale and any person shipping game fish must deliver to the carrier a sworn statement (2).

**Louisiana.**—Black bass, striped bass, crappie, and sunfish shall not be sold (38). All shipments of fish and shipments without the State of diamond-back terrapin must be marked to show contents and other facts (41, 62). Diamond-back terrapin artificially propagated may be sold, but not for food, during the closed season (61). Fish packed in the State must not be labeled as produced outside the State. (1906, act 112.)

**Minnesota.**—The sale or shipment of pike perch from stocked waters (4871), or of trout or salmon from inland waters, or of black bass (4870), or of fish caught in lakes in Hennepin, Ramsey, or St. Louis Counties (4876), is prohibited. The commission may prohibit the sale of crappie, yellow perch, or sunfish caught in stocked lakes (4877). Fish shall not be shipped beyond the State except specified rough fish and except not over 50 pounds taken by a nonresident for personal use; packages shall be marked to show contents and other facts. (4875, 1917, ch. 333.)

**Mississippi.**—Boards of supervisors have authority to regulate by whom and in what quantities and to what extent fish may be marketed (4701).

**Ohio.**—Black bass shall not be shipped out of the State or sold; rock bass, crappie, and sunfish shall not be sold (1429, 1430). Fish caught through ice shall not be sold (1427). "White bait" may be shipped out of the State only if alive; minnows may be sold only for bait (1433). Shipments of fish must be labeled (1444).

**Pennsylvania.**—The sale of trout or black bass, whether caught in the State or elsewhere, is forbidden (110).

**West Virginia.**—The sale or serving at licensed eating places of trout, salmon, pickerel, bass, and "silver perch" is prohibited, also the shipment out of the State of these species, or the commercial shipment within the State (20, 45).

**Wisconsin.**—Shipments of wild animals, including fish, must be marked to show the contents and other facts, and the consignor must be the owner and must deliver to the carrier a statement that he is (29.34, 29.36, 29.43). The shipment of living young carp or bowfin is forbidden, and complicated regulations are made for the shipment of game fish (29.47). Transportation of fish into this State is forbidden if made from another State in violation of its laws (29.44).

The sale of black bass, muskellunge, or trout is forbidden, also the sale of any other game fish taken from public inland waters during the period extending from the 1st day of January to the next succeeding 29th day of May (29.48). Game fish taken from public inland waters from January 1 to May 29 and trout shall not be served at eating places, nor frog during the closed season (29.49).

## VII. DEFINITIONS AND MISCELLANEOUS PROVISIONS.

**Arkansas.**—The term "waters" is defined to include those wholly or partly within the State (56). Milldam owners must provide a fish chute, and owners of other obstructions must make an opening to allow the passage of fish from March 1 to June 1. (1899, act 188.)

Dealers must keep records of their transactions (20); they have five days after the end of the open season in which to dispose of fish (48). The game and fish commission may regulate private propagation (8).

**Illinois.**—"Objectionable" fish is defined to mean gar and gizzard shad (51). Dam owners shall erect and maintain fishways (49). Licensees to take mussels must report annually (58).

**Indiana.**—Private pond is defined to include any body of water not greater than 20 acres in area lying wholly within the land of the owner (2533c). Except dams, obstructions to fish movements shall not be placed across streams (2544, 2545). Owners of dams 4 feet or more high must construct and maintain fishways as directed by the commissioner of fisheries (7442–7449).

**Iowa.**—"Game" fish is defined by the department of fish and game to include any food fish that takes a live bait. Cities and towns may prevent the escape of fish from boundary lakes (17). Dams or obstructions shall not be erected or maintained without a fishway constructed according to plans furnished by the State warden; nor shall pumping stations, other than sand pumps or dredging machines, be operated without guard screens constructed according to plans so furnished (16).

**Kentucky.**—Dam owners must maintain fish ladders during April, May and June, except where the "annual tides" are sufficiently high to admit the passage of fish over the dams (1392a).

**Louisiana.**—Intake pipes for irrigation must be screened to prevent the entrance of fish, except on the Mississippi River (56). No person shall obstruct by means of rack, screen, or other device the passage of fish protected by law (53).

Fish may be had in possession five days after the end of the open season (39). Dealers must report to the department (35, 36). The department may adopt regulations for the comprehensive control of fish, and shall assist in protecting private ponds (1912, act 127, sec. 2); it may prescribe regulations for stocked streams (51) and may regulate seines, hoop nets, and set lines (42). No spawn, fish, reptile, or amphibian except turtles from without the State shall be liberated without permission from the department. (50; 1918, house bill 120.)

Game and fish preserves are established. (1910, act 273, and 1912, act 172.)

**Minnesota.**—Persons owning or controlling dams or other obstructions must construct and maintain fishways (4772). Counties may screen navigable lakes that have been stocked by the United States. (1913, ch. 87.) For the purpose of commercial trout culture the game and fish commission may authorize the maintenance of fish screens (4861).

It is unlawful to have fish in possession if unlawfully taken without the State (4785). Fish taken in international waters may be retained one week after the end of the fishing season. (1917, chs. 96 and 333.)

Reports must be made to the commission by fishermen netting in international waters (1917, ch. 96), clammers (1917, ch. 471), and seiners in certain waters (1915, ch. 261).

Obstructing seiners is prohibited. (1917, ch. 452.)

Chapter 505 of 1917 provides for warden supervision of net fishing in interstate waters, but does not go into effect until a similar act is passed by Wisconsin.

**Missouri.**—Fish may be had in possession five days after the end of the open season (6522). Persons owning or using dams shall construct fish ladders as prescribed by the game and fish commissioner, and shall keep them open March, April, May, and June if there is waste water available (6552).

**Ohio.**—Lake Erie and inland fishing districts are respectively defined (1425).

On petition of 500 or more freeholders the county commissioners shall erect or maintain fishways over dams; on State dams this shall be done by the board of public works. (1910, Gen. Code, sec. 2496.) Except in Lake Erie, wardens may remove obstructions other than milldams (1448).

Private ponds are excepted from the restrictions on the manner of capture (1456).

Fishermen must allow State spawn takers on board and permit the taking of spawn (1455). Licensees must make annual reports (1437–1).

Except shad, mackerel, and herring, all fish sold in barrels or casks must be inspected and branded; regulations are made as to size of barrel and other matters (5987, 6010–6019). Possibly these regulations relate to preserved fish only.

**Pennsylvania.**—"Game" fish, "bait" fish and "food" fish are defined. (4–6; 1913, act 71, sec. 1.) Trout and black bass may be retained in possession six days after the end of the open season (17). When required by the board of fishery commissioners dam owners shall erect and maintain fishways (85–90). Dam owners must not strand fish (91). When required by the commissioners proprietors must install a bar rack to exclude fish from water wheels, pumps or canals (93–94). No person shall place obstructions to the passage of fish (95).

Artificial propagation is regulated (19, 28, 38, 48, 62, 70–81, 114). Dealers may be required by the commissioner to make reports (112). Representatives of the State must be permitted to accompany licensees on boundary lakes for the purpose of taking spawn. (1915, act 226.) Fish from boundary lakes shall not be used for fertilizer without the consent of the department of fisheries. (1913, act 71, sec. 8.)

**Tennessee.**—Obstructions shall not be placed in streams for the purpose of capturing fish (48). Certain counties are excepted from the operation of the general law, and special provisions of various sorts are made for more than half the counties of the State, as well as for Reelfoot Lake and the Appalachian Game Preserve. County courts may provide for fish traps. (Thompson's Shannon's Code, 1918, sec. 1721.)

**West Virginia.**—Owners of dams and other obstructions must build and maintain fishways in a manner satisfactory to the State warden (43). Fish may be had in possession 20 days after the end of the open season (20).

**Wisconsin.**—Great Lakes waters are defined as "outlying" and all other waters as "inland" (29.01). Until the conservation commission otherwise determines, rough fish are: Minnows, suckers, carp, redhorse, drum, burbot, bowfin, gar, buffalofish, and, in certain waters, pickerel; game fish are all other kinds (29.01).

Screens set in public waters to prevent the free passage of fish, or set in streams stocked by the State, are declared to be nuisances (29.03). Old and abandoned dams may be removed, and dams on State land may be repaired by the commission (29.04).

Licensees for the Mississippi River and Winnebago waters are permitted to retain fish in temporary ponds (29.34, 29.36). Reports are required from licensees for the Great Lakes and the Mississippi River (29.33, 29.34).

# HABITS OF THE BLACK CRAPPIE IN INLAND LAKES OF WISCONSIN

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Appendix III to the Report of the U. S. Commissioner of Fisheries for 1918

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# HABITS OF THE BLACK CRAPPIE[a] IN INLAND LAKES OF WISCONSIN.

By A. S. PEARSE,
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## I. INTRODUCTION.

The black crappie, *Pomoxis sparoides* (Lacépède), is particularly common in the Great Lakes region and the upper Mississippi Valley, and ranges from the Lake of the Woods and Ottawa south to Texas and east to New Jersey. It was selected for careful investigation on account of its ability to thrive in shallow, dirty water, which is subject to wide variations in temperature. Such qualities make the

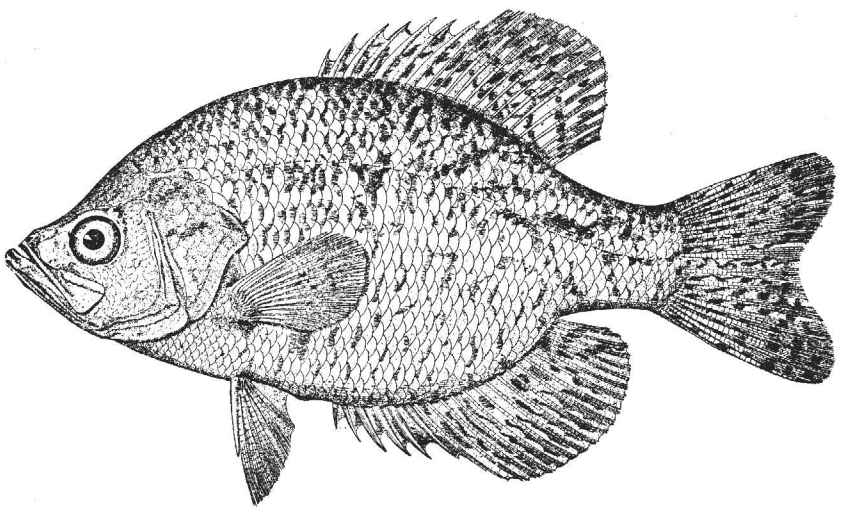

FIG. 1.—The black crappie, *Pomoxis sparoides.*

crappie particularly desirable for propagation in ponds. It was hoped that a careful study of its habits in certain Wisconsin lakes might furnish material for a comparison with the perch, which had been previously studied in the same localities (Pearse and Achtenberg, forthcoming report), and which is at its best in deep lakes. Stated in general terms, the object of this paper is to describe the habits of a fish which flourishes in shallow, muddy lakes, so as to furnish a basis for comparison with those of the fishes characteristic of deep, clear lakes.

[a] This fish is also known as the silver bass, strawberry bass, grass bass, barfish, and calico bass.

Judged by its structure, the crappie is rather specialized. The body is strongly compressed, indicating adaptation to movement through the narrow spaces between aquatic plants; the large, strongly upturned mouth suggests habits of feeding toward the surface rather than toward the bottom; the gill rakers are remarkable among those of sunfishes for their length and fineness, hinting at proficiency in straining plankton from the water; the unusually large median fins are well adopted for sudden rushes or for sustained swimming. The beautifully mottled colors suggest a habitat in the changing shadows among water plants.

Little has been published concerning the general habits of the black crappie. Forbes and Richardson (1908) believe that it shows a slight preference for hard bottoms when compared with its close relative, the white crappie, *Pomoxis annularis*. They state that "its hardy endurance of both heat and cold, and also of foul water, is especially favorable to its transportation and acclimatization." It is said by various writers to be carnivorous, subsisting largely on insects, crustaceans, and fish. Richardson (1913) has published some notes on its breeding habits.

The studies described in this paper deal mostly with crappies in Lake Wingra, but at intervals those from neighboring lakes were investigated. As far as possible, observations were made each week from February, 1916, to January, 1917. Lake Wingra is an admirable habitat for crappies, and they are among its dominant species. The lake's characteristics are as follows: Length, 1.6 miles; breadth, 0.8 mile; shore line, 4.5 miles; area, 0.79 square mile; maximum depth, 14 feet; mean depth, 5.5 feet.

In the preparation of this paper Miss Henrietta Achtenberg has helped materially by computing all the averages. Thanks are also due to Chancey Juday, who read the manuscript.

## II. FOOD.

### QUANTITATIVE AND QUALITATIVE DETERMINATIONS.

Forbes and Richardson (1908) state that the crappies are strictly carnivorous and that the dietaries of the two species in the United States are much alike. They believe, however, that *Pomoxis sparoides* depends more upon plankton than *P. annularis*. The observations made during the present investigations agree with their statements concerning the former. The food of the 140 black crappies from Lake Wingra (Table 1), during the nine months when observations were made, consisted of:

| | Per cent. | | Per cent. |
|---|---|---|---|
| Cladocerans | 33.0 | Adult Hemiptera | 0.5 |
| Chironomid larvæ | 14.5 | Plants | .4 |
| Amphipods | 10.9 | Caddis-fly larvæ | .4 |
| Chironomid pupæ | 9.0 | Grasshoppers | .2 |
| Fish | 8.8 | Beetles | .2 |
| Ephemerid nymphs | 5.6 | Calcium-carbonate crystals | .2 |
| Copepods | 5.0 | Ostracods | .1 |
| Adult chironomids | 3.9 | Algæ | .1 |
| Odonate nymphs | 2.3 | Unidentified insects | .1 |
| Corethra larvæ | 2.1 | Traces of moths, mites, snails, and leeches. | |
| Hemiptera nymphs | .6 | | |
| Silt and débris | .6 | | |

TABLE 1.—FOOD OF ADULT CRAPPIES IN LAKE WINGRA, BY MONTHS, FROM FEBRUARY TO OCTOBER, 1916.

[No adults were examined from November to January, because none were caught. All figures referring to food indicate percentage by volume; + means a trace. Boldface type shows maximum for each month.]

| Month. | Number examined. | Average length. | Fish. | Chironomid larvæ. | Corethra larvæ. | Ephemerid nymphs. | Caddis-fly larvæ. | Odonata nymphs. | Coleoptera larvæ. | Hemiptera nymphs. | Chironomid pupæ. | Chironomid adults. | Grasshopper adults. | Coleoptera adults. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Mm.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| February | 9 | 167.2 | ..... | 0.6 | 0.1 | 10.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| March | 4 | 202.0 | ..... | 10.0 | ..... | 1.9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| April | 12 | 147.5 | ..... | 24.4 | ..... | **26.1** | ..... | 15.2 | 1.0 | ..... | 7.5 | ..... | ..... | 1.7 |
| May | 19 | 174.1 | 2.5 | 21.3 | ..... | 6.8 | ..... | 1.8 | ..... | 4.5 | ..... | **34.5** | ..... | ..... |
| June | 37 | 165.2 | .8 | 29.9 | .3 | 2.6 | ..... | 1.7 | ..... | .7 | 11.0 | ..... | ..... | ..... |
| July | 35 | 166.0 | 18.8 | 22.6 | 4.2 | 1.3 | ..... | .5 | ..... | ..... | **36.4** | ..... | ..... | ..... |
| August | 12 | 173.3 | **39.0** | 6.2 | .7 | 1.6 | 3.8 | 1.6 | ..... | ..... | 23.9 | .4 | 2.0 | ..... |
| September | 8 | 177.0 | 5.0 | .1 | 2.0 | + | ..... | ..... | ..... | ..... | 2.3 | ..... | ..... | ..... |
| October | 4 | 170.4 | 13.5 | 15.0 | 11.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Average. | 15.6 | 171.4 | 8.8 | 14.5 | 2.1 | 5.6 | .4 | 2.3 | .1 | .6 | 9.0 | 3.9 | .2 | .2 |

| Month. | Hemiptera adults. | Moth. | Unidentified adult insects. | Mites. | Amphipods. | Ostracods. | Copepods. | Cladocera. | Gastropods. | Leeches. | Alga. | Plants. | Silt and débris. | $CaCO_3$ crystals. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| February | ..... | ..... | ..... | ..... | **51.1** | ..... | 18.3 | 19.3 | ..... | ..... | 0.2 | ..... | ..... | ..... |
| March | 2.7 | ..... | ..... | ..... | **40.5** | ..... | 7.5 | 35.0 | 0.1 | ..... | ..... | 0.1 | ..... | 2.2 |
| April | ..... | ..... | ..... | ..... | 3.6 | 0.4 | 16.3 | 2.0 | ..... | ..... | ..... | 1.2 | 0.5 | .1 |
| May | ..... | 0.2 | ..... | 0.1 | 3.0 | ..... | .2 | 18.8 | ..... | ..... | .1 | ..... | 3.1 | ..... |
| June | ..... | ..... | 0.5 | ..... | .1 | .1 | 2.0 | **44.3** | ..... | ..... | ..... | 1.6 | .1 | ..... |
| July | .7 | ..... | ..... | + | .2 | .1 | .2 | 12.0 | ..... | ..... | ..... | + | ..... | ..... |
| August | .8 | ..... | ..... | ..... | + | + | .1 | 15.7 | ..... | 0.1 | ..... | .4 | 2.0 | ..... |
| September | ..... | ..... | ..... | ..... | + | ..... | .1 | **90.2** | ..... | .1 | ..... | ..... | ..... | ..... |
| October | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **59.9** | ..... | ..... | .2 | ..... | ..... | ..... |
| Average.. | .5 | + | .1 | + | 10.9 | .1 | 5.0 | **33.0** | + | + | .1 | .4 | .6 | .2 |

The following list gives in more detail the exact constituents of the food of all the crappies examined from Lakes Wingra, Mendota, and Monona, 1915–1917, with periods of seasonal occurrence and the percentage which each item forms of the total food.[a]

[a] The methods used for making food examinations were the same as those previously employed for the perch and have been described in a paper by Pearse and Achtenberg, which is expected to be published shortly by this Bureau.

LIST OF CONSTITUENTS OF THE FOOD OF 276 CRAPPIES OF ALL SIZES.

The first figure indicates the number of crappies in which the food was found; when the item formed 1 per cent or more of the volume of the total food, this percentage is written in parentheses:

FISH, 39 (6.4), all year.
  Fish eggs, 1, May.
INSECT LARVÆ, 195 (24), all year.
  Unidentified larvæ, 5, February–October.
  Diptera larvæ, 170 (14.5), all year.
    Unidentified chironomid, 77 (7.5), all year.
INSECT LARVÆ—Continued.
  Diptera larvæ—Continued.
    Chironomus decorus, 12, April–August.
    C. digitatus, 11, May–November.
    C. fulviventris, 12 (1), April–November.
    C. lobiferus, 8, February–August.

INSECT LARVÆ—Continued.
Diptera larvæ—Continued.
C. nigricans, 1, April.
C. tentans, 2, November, December.
C. viridis, 5, August.
Corethra punctipennis, 20, all year.
Cricotopus trifasciatus, 1, May.
Orthocladius, sp.?, 3, February.
Palpomyia longipennis, 6, June–August.
Probezzia glaber, 7, May.
P. pallida, 18, May–July.
Protenthes culiciformis, 1, May.
Tanypus, sp.?, 11, June, July.
T. carneus, 1, August.
T. decoloratus, 6, November, February.
T. monilis, 3, July, August.
Tanytarsus gregarius, 14 (1.1), October.
Coleoptera larvæ, 2, August.
Dytiscid larvæ, 2, August.
Ephemerid nymphs, 54 (3.8), April–October.
May-fly nymphs, unidentified, 9, April–October.
Bætis, sp.?, 1 April.
Bætisca, sp.?, 15 (2.1), February–October.
Cænis diminuta, 16, May–August.
Callibætis, sp.?, 10, April–August.
Ephemerella, sp.?, 8, April–July.
Ephemerid, sp.?, 1, May.
Heptagenia, sp.?, 1, July.
Siphlurus, sp.?, 1, April.
Hemiptera nymphs, 12, May–August.
Corixa nymphs, 10, May–August.
Notonecta nymphs, 2, May.
Lepidoptera larvæ, 1, June.
Odonata nymphs, 28 (2), March–November.
Damsel-fly nymphs, 4, August–November.
Celethemis eponina, 1, April.
Enallagma, sp.?, 2, July.
E. antennatum, 2, June.
E. Hageni, 10, April–August.
Ischneura verticalis, 8, March-November.
Trichoptera larvæ, 3, April, August.
Caddis fly, sp.?, 1, August.
Hydrophilus, sp.?, 1, August.
Setodis grandis, 1, April.
INSECT PUPÆ, 126 (12.2), April–October.
Unidentified chironomid, 72 (9.5), April–September.
Chironomus decorus, 11, May–August.
C. fulviventris, 3, May, June.
C. lobiferus, 3, August, October.
Leptocerus, sp.?, 1, June.
Palpomyia, sp.?, 1, June.
Tanypus, sp.?, 9, May, June.
ADULT INSECTS, 21 (2.4), May-September.
Unidentified insects, 1, June.
Beetle, sp.?, 1, May.
ADULT INSECTS—Continued.
Corixa, sp.?, 15, March–September.
Heptagenia, sp.?, 1, August.
Melanoplus bivittatus, 2, August.
M. femur rubrum, 1, August.
Moth, sp.?, 1, May.
Probezzia pallida, 5, October.
Protenthes, sp.?, 1, August.
Sminthurus, sp.?, 3, April, October.
Cordylura, sp.?, October.
ARACHNIDA, 12, May–July.
Unidentified mites, 7, May, June.
Limnesia histrionica, 5, July.
AMPHIPODA, 88 (7.4), all year.
Dikerogammarus fasciatus, 8 (1.4), February, June, August.
Gammarus limnæus, 6 (1.2), February, March.
Hyalella, 54 (4.8), all year.
ENTOMOSTRACA, 209 (43.7), all year.
Cladocera, 171 (21.2), April–November.
Bosmina longirostris cornuta, 3, April–August.
Ceriodaphnia quadrangula, 5, May, August.
Chydorus sphæricus, 28, August–December.
Daphnia, sp.?, 73 (10.1), April–November.
D. hyalina, 19 (3.5), June–October.
D. pulex, 17 (2.4), June, July.
Eurycercus lamellatus, 29 (1.4), April–November.
Leptodora hyalina, 30 (2.5), June–November.
Pleuroxus procurvatus, 3, July, October.
Simocephalus vetulus, 4, July, August, December.
Copepoda, 119 (19.4), all year.
Canthocamptus, 19 (3.1), October.
Cyclops, sp.?, 48 (13.3), all year.
C. bicuspidatus, 54 (2.3), all year.
C. fuscus, 2, February.
C. serrulatus, 5, February, March, April.
Diaptomus oregonensis, 1, October.
Ostracoda, 48 (3.1), all year.
MOLLUSCA, 1, March.
Planorbis, 1, March.
GORDIUS, 2, August, September.
PLANTS, 31, February–October.
Unidentified remains, 7, April–September.
Algæ, 21, February–October.
Filamentous algæ, 17, February–October.
Nostoc?, 1, October.
Spirogyra, 1, April.
Volvox, 1, August.
Ceratophyllum, 1, August.
Wolffia, 3, April, August.
DÉBRIS, 13, April–October.
$CaCO_3$ CRYSTALS, 4, February, March.

The constituents of the food clearly indicate the food preferences and feeding habits of the crappie. The following generalizations appear to be justified:

1. The most important foods are insects (38.6 per cent), particularly immature stages; cladocerans (21.2 per cent); copepods (19.4 per cent); amphipods (7.4 per cent); and fish (6.4 per cent).

2. Crappies do not feed much on the bottom. This is indicated by the scarcity of such foods as bottom mud, ostracods, oligochætes, and insect larvæ like *Chironomus tentans*, which typically live on or near the bottom and are abundant in Lake Wingra. The crappie differs from the perch in this respect (Pearse and Achtenberg, forthcoming report).

3. Crappies feed among aquatic vegetation in the open water and to some extent even at the surface. The chironomid larvæ occurring

in the food are largely those which live in the vegetation alongshore, and the same applies to a considerable degree to the cladocerans. The dragon-fly, may-fly, and damsel-fly nymphs eaten are those which are found among aquatic plants. The occasional high percentages of adult midges and midge pupæ, with the presence of grasshoppers and moths, indicate that feeding often takes place at the surface.

## VARIATION IN FOOD.

Seasonal variation in the food of the crappies in Lake Wingra is shown in Table 1 and in figure 2. In the spring the food is made

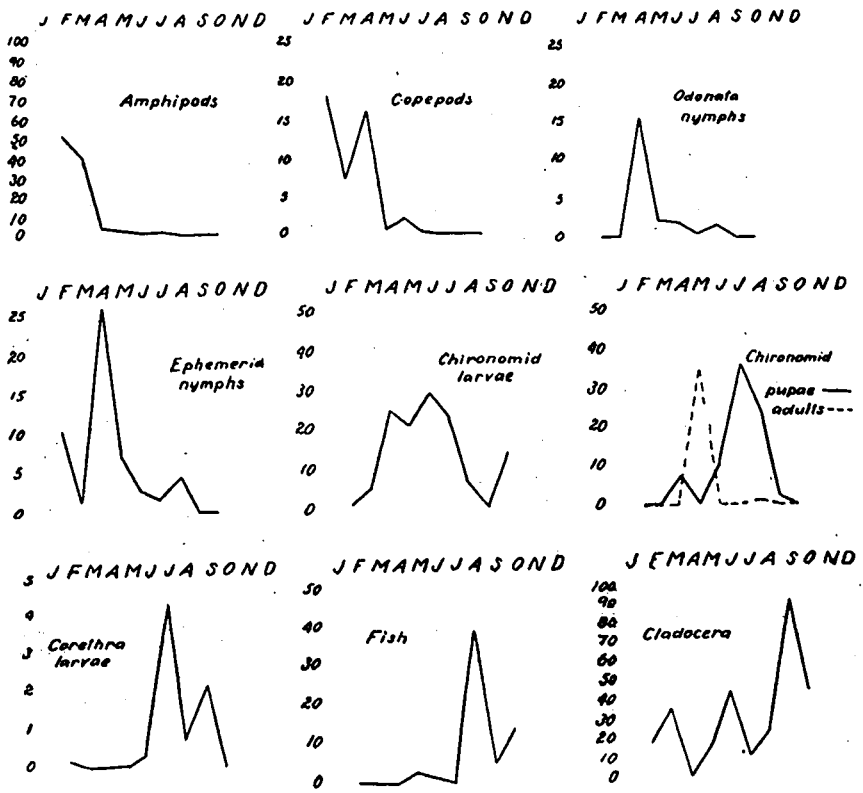


FIG. 2.—Percentage by volume of nine of the chief constituents of crappie food, so arranged as to show sequence throughout the year, from amphipods, with their maximum in February, to cladocerans, which attain their maximum volume in September.

up, for the most part, of amphipods, copepods, and cladocerans. During the summer larvæ, pupæ, and adults of insects are eaten in large quantities, but cladocerans continue to be utilized. In the autumn, cladocerans, small fishes, and chironomid larvæ are the chief foods. Adult crappies do not appear to feed in the winter. Though fishing was carried on each week with gill nets, or with hooks and lines, none was caught from October 14, 1916, until February 14, 1917 (Pearse and Achtenberg, forthcoming report).

On November 27, 1915, 13 crappies were caught in a commercial seine in Lake Monona. Six of these were empty and the other seven had eaten: 54.7 per cent Daphnia, 27.3 per cent Leptodora, 8.5 per cent *Chironomus viridis* larvæ, 4.3 per cent *C. tentans* larvæ, 2.1 per cent Bætisca nymphs, 2.1 per cent *Ischneura verticalis* nymphs, 0.8 per cent unidentified insect larvæ. These observations supplement those in Lake Wingra and indicate that the autumn food consists mostly of Cladocera and that little or no food is taken in winter.

In Lake Wingra the best catches are made in the spring after a day or two of warm weather. Apparently the crappies do not feed during cold weather, but begin in the spring with the first rise in temperature. Knauthe (1907) has noted that carp usually do not begin feeding in spring until the temperature has reached 6 to 8° C., but after a hard winter will begin at 3 to 4° C. During the present investigations no crappies were caught in Lake Wingra in the autumn after the temperature of the water reached about 10° C.

Though the variety in the food is rather limited, the crappie generally feeds at various seasons on the most abundant foods. Individuals caught at the same time and place had, as a rule, fed largely on the same items, and these were usually those most readily obtainable.

A number of observations indicate that crappies feed mostly at night or during the early morning and evening hours. For example, on July 15, 1916, 10 individuals were caught in Lake Wingra between 4 p. m. and 8 p. m. In 8 of these the stomachs were empty, and the other 2 contained small amounts of Leptodora. The intestines of all contained Leptodora in the anterior portion and chironomid larvæ, many chironomid pupæ, and Corixa in the posterior part. The inference in this case would be that as the midge pupæ migrated toward the surface during the early part of the night they were captured by the crappies; later the Leptodoras rose and were eaten.

TABLE 2.—FOOD AND GROWTH OF SMALL CRAPPIES IN LAKE WINGRA, 1916–17.

| Date. | Number examined. | Average length. | Chironomid larvæ. | May-fly nymphs. | Dytiscoid larvæ. | Damsel-fly nymphs. | Amphipoda. | Copepoda. | Cladocera. | Oligochætes. | $CaCO_3$ crystals. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Mm.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* |
| July 31 | 6 | 30.8 | 11.2 | 26.6 | ..... | ..... | ..... | 40.4 | 20.8 | 1.3 | ..... |
| Aug. 29 | 10 | 37.8 | 2.6 | 4.8 | 1.5 | 11.4 | 2.5 | 53.1 | 23.5 | ..... | ..... |
| Nov. 18 | 10 | 47.1 | 5.5 | ..... | ..... | ..... | 15.0 | 43.6 | 35.2 | ..... | ..... |
| Nov. 25 | 10 | 47.2 | 9.5 | ..... | ..... | 1.5 | 11.5 | 56.5 | 20.0 | ..... | ..... |
| Dec. 2 | 10 | 47.2 | 7.8 | ..... | ..... | ..... | 18.5 | 3.3 | 70.4 | ..... | ..... |
| Jan. 19 | 5 | 48.1 | 7.0 | ..... | ..... | ..... | ..... | 92.0 | 1.0 | ..... | ..... |
| Jan. 27 | 3 | 47.3 | ..... | ..... | ..... | ..... | ..... | 93.3 | 6.6 | ..... | ..... |
| Feb. 17 | 7 | 44.5 | 22.1 | ..... | ..... | ..... | ..... | 73.1 | ..... | ..... | 5.0 |
| Average. | 8 | 43.7 | 8.2 | 4.0 | .2 | 1.6 | 6.0 | 56.9 | 22.2 | .2 | .6 |

During the latter part of the year 1916 and in the beginning of 1917, there was an opportunity to study the food and growth of young crappies which were captured in a small stream on the north side of Lake Wingra, near the west end. The results of these observations are shown in Table 2. There was rapid growth until the middle of November, but no appreciable increase after that time. On one very cold day in the winter, January 27, 1917, 8 of the 11

small crappies captured were empty, which indicates that the young, as well as adults, may cease to eat at times during the winter. The most important foods for the young crappies were Cyclops, cladocerans, and small insect larvæ. The young fishes eat the same general classes of foods as the adults, but depend more upon Cyclops and cladocerans than upon insect larvæ.

During the winter of 1917 two young crappies were kept in the laboratory in order to make observations on feeding, amount of food consumed, and rate of digestion, for comparison with young perch kept under the same conditions and simultaneously fed the same foods. The crappies each measured 58.5 millimeters in length (without tail) and had a volume of 4 cubic centimeters. The length of each of the perch was 62 millimeters and the volume 3 cubic centimeters. At the temperatures indicated the rate of digestion in the crappies, as judged by the first appearance of the foods in the feces, was as follows: Chironomid larvæ, 15.2° C., 24 hours; *Corethra* larvæ, 18° C., 24 hours; earthworms, 16.5° C., 21.3 hours. Amphipods, minnows, and snails were not eaten. Under the same conditions the record of the perch was: Chironomid larvæ, 18° C., 22 hours; *Corethra* larvæ, 18° C., 23 hours; earthworms, 17.5° C., 18.3 hours; minnows, 16.8° C., 18.7 hours. In proportion to their own volume the crappies ate as follows: Chironomid larvæ, 12 per cent in 6 hours; earthworms, 5 per cent in 1 hour. The perch ate chironomid larvæ amounting to 23 per cent of their own volume in 6 hours, and 20 per cent minnows in 2¼ hours. From these observations it is concluded that the rate of digestion is about the same in the two species, or perhaps slightly more rapid in the perch. The crappies were less aggressive in their feeding reactions, and ate less at a time than the perch. The two perch ate 31 chironomid larvæ in 6.3 hours; the crappies ate 20 of the same size in 6.3 hours. A comparison of the food of the adult perch and crappie is made in another paper (Pearse and Achtenberg, forthcoming report). The crappie feeds more on pelagic crustaceans and less on the small animals associated with the bottom than the perch.

## III. REPRODUCTION.

Richardson (1913) describes a nest of the black crappie, found May 2, 1911, in a pond near Havana, Ill., after the temperature of the water had reached about 19° C., as follows:

> It was hollowed out under the leaves of a water parsnip and surrounded by smartweed and bog rush (*Junctus*). Some of the eggs were adhering to fine roots in the bottom of the nest, but most of them were on the leaves of the water parsnip at a level of 2 to 4 inches above the bottom of the nest. The nest was guarded by a male 6 inches long, who was so gentle that we could reach out a hand to within 3 feet of him before he moved away. Eggs taken to the laboratory hatched May 3 and 4. Both eggs and newly hatched fry are even smaller than those of the bluegill sunfish; and the great transparency of the new fry, along with their small size, make it difficult to see them in an aquarium.

In the spring of 1916 the ice left Lake Wingra March 26. On April 25 the temperature of the lake was 10.6° C.; May 13, 16°; May 27, 26°; June 11, 20.5°; July 20, 30°. On May 20 about a dozen male crappies were observed in nests along the base of a clay bank in one of the lagoons in Vilas Park, at the northeast corner of the

lake. Although careful observation was made with a water glass, no eggs could be seen. These nests were bare places on the bottom, adjacent to aquatic vegetation (fig. 3), and about 65 centimeters (2 feet) below the surface. Four of the males were caught on hooks baited with minnows. None of them was shedding milt, though all were nearly ripe. On the same day crappies were seen standing over nests at three places along the shore of the lake.

Nine males, but no females, were caught on that date. All were examined for food and were found to be well filled. The data for the nine individuals were as follows: Length, maximum, 225 millimeters; minimum, 158 millimeters; average, 193 millimeters. Food: Unidentified chironomid larvæ, 21 per cent; *Tanypus carneus* larvæ, 1.6 per cent; *Probezzia pallida* larvæ, 0.9 per cent; ephemerid nymph, 0.9 per cent; *Ephemerella* nymph, 0.5 per cent; *Cœnis diminuta* nymph, 1.7 per cent; Callibætis nymph, 0.6 per cent; *Corixa* nymph, 0.2 per cent; *Tanypus*, sp. ? pupæ, 0.5 per cent; unidentified chironomid pupæ, 25.2 per cent; *Chironomus decorus* pupæ, 9.2 per cent; mites, 0.1 per cent; *Hyalella azteca*, 0.7 per cent; ostracods, trace; *Eurycercus lamellatus*, 29.9 per cent; *Ceriodaphnia*, 0.1 per cent; fine débris, 6.6 per cent. Summarizing the foods, they are: Insect larvæ, 27.4 per cent; insect pupæ, 34.9 per cent; amphipods, 0.1 per cent; entomostracans, 30.7 per cent; fine sediment, 6.6 per cent.

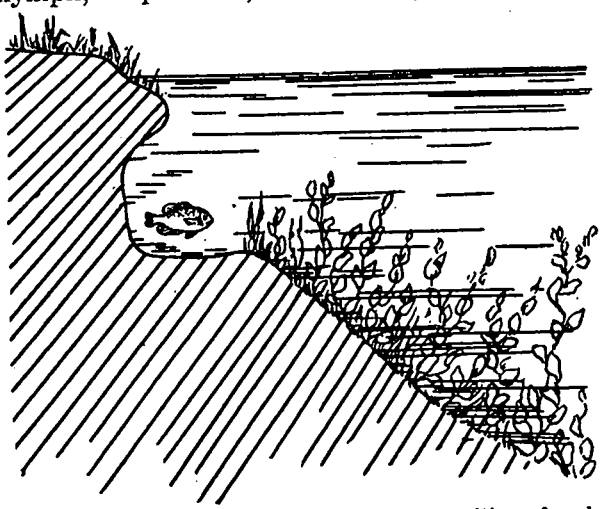

FIG. 3.—Section of bank of lagoon showing position of male crappie observed on May 20, 1916.

The abundance and variety of the food indicates that the males had fed actively among the shore vegetation, and this condition continued throughout the spawning season. In this respect crappies appear to differ from perch, which commonly neglect to feed during their active breeding period.

On May 27, 6 males, but no females, were caught. All had mature testes, but none was shedding milt. The gonads of the 2 females and 4 males captured on June 3 were all mature, but not quite ripe. On June 10 the catch was as follows: 3 mature females, 3 ripe females shedding eggs, 3 mature males, 3 ripe males shedding sperm. On June 17, 1 mature male was captured; on June 19, 4 mature males, 1 ripe male, 1 mature female, 1 ripe female, 1 female partly spent; June 26, 2 mature males; June 27, 3 mature males, 3 ripe males, 3 ripe females; July 1, 1 ripe male, 1 ripe female; July 3, 2 immature males, 1 ripe male, 1 immature female, 1 ripe

female; July 8, 2 ripe males, 5 spent females; July 15, 5 ripe males, 5 spent females.

The observations show that, in Lake Wingra, the most active spawning period came later in the season than at Havana, Ill., which is more than 200 miles farther south. It is also apparent that, in the present observations, spawning took place at somewhat higher temperature than those reported by Richardson (1913). Compared to the perch, the crappie breeds in warmer water. Perch begin spawning when the temperature is 8 to 9° C.; crappies when it is 19 to 20° C.

No observations were made on eggs or young in Lake Wingra until the latter part of July, in part on account of the turbidity of the water. After that, small crappies were captured at intervals until midwinter (Table 2). During the autumn and winter they were quite common in the aquatic vegetation alongshore, and after the lake froze over they were to be found in the mouths of the small streams, where the water was somewhat warmer than in the lake itself. In the latter habitat they were associated with other small fishes in the following proportions, as judged by catches with a dip net: *Pomoxis sparoides*, 34; *Pimephales notatus*, 27; *Eucalia inconstans*, 13; *Lepomis incisor*, 11; *Fundulus diaphanus menona*, 11; *Labidesthes sicculus*, 5; *Micropterus salmoides*, 2; *Ameiurus nubulosus*. In the mouth of the particular stream where observations were made crappies were the most abundant fishes.

## IV. MIGRATIONS.

Judging from the catches in gill nets and on hooks[a] the crappies are active in Lake Wingra from the middle of February until the middle of October. In autumn, after the water temperature had fallen to about 10° C., they were no longer captured by either method of fishing in places where they had been more or less common throughout the warmer months. This may have been because the crappies did not move about, because they collected in one or more schools which did not happen to be encountered, or because they remained in places where no fishing was done.

Twice during the winter (Dec. 30 and Jan. 20) an adult crappie was seen in the shallow mouth of a stream (7.5° C.) at the northwest corner of the lake. These were the only adult individuals observed in Lake Wingra from October 14, 1916, to February 10, 1917, though fishing was carried on each week. When crappies began to bite in the spring, they were caught in only one locality for the first two weeks—over a hole about 30 feet deep, where a hydraulic dredge had worked during the preceding summer. Despite the occasional individuals observed in shallow water, the evidence appears to indicate that the majority of the crappies descend into the deepest regions of the lake in the autumn, and that they remain there in comparative inactivity throughout the winter. In the spring they return to shallower water, where they remain during the summer.

Apparently crappies often swim in small schools during the summer, particularly just before the spawning season. June 10, 1916, between 5 and 7.15 a. m., on the south shore of Lake Wingra, a man,

[a] For details of these catches, see Tables V and XXXII in a paper by Pearse and Achtenberg soon to be published by this Bureau.

fishing from a drifting rowboat with three hooks baited with minnows and whitebait, caught 52 *Pomoxis sparoides*, 1 *Lepomis incisor*, 1 *Lepisosteus osseus*, in an area about 100 meters wide and 400 meters long, where the depth was 2 to 3 meters. At the same time only four crappies were caught with similar equipment 300 meters west. At other times the catches on those areas under similar circumstances never exceeded five crappies. On May 20, 1916, four male crappies were caught in a few minutes; they were all on the same side of the gill net, within an area of 4 feet square. Apparently they had been swimming along together. There were other occasions when crappies seemingly swam in schools, but there were also many times when they were caught singly.

## V. ENEMIES AND PARASITES.

Compared with the perch, the crappie is relatively free from parasites (Pearse and Achtenberg, forthcoming report). Though the perch in the Wisconsin lakes are heavily infested with proteocephalid larvæ, distomes, nematodes, and acanthocephalans, the crappies are generally free from such parasites. Of the 276 crappies examined, only 11 carried parasites, and the occurrence of all is given in the following list:

September 17, 1915; southeast corner of Lake Monona; crappie, 116 millimeters long; nematodes in the intestine.

October 27, 1915; Lake Wingra; two crappies, 48 and 38 millimeters long, respectively, both with nematodes in the intestine.

May 13, 1916; Lake Wingra; ripe female, 146 millimeters long with nematodes in intestine; young male, 112 millimeters long with cysts along whole length of intestinal wall.

May 13, 1916; University Bay, in Lake Mendota; male, 200 millimeters long; a trematode in intestine.

June 10, 1916; Lake Wingra; female, 160 millimeters long; cysts along intestine.

July 3, 1916; Lake Wingra; immature male, 112 millimeters long; tapeworm cysts on intestine.

August 20, 1916; male, 170 millimeters long; nematodes in intestine.

November 26, 1916; crappie, 44 millimeters long; proteocephalid [a] tapeworm cysts along intestine.

January 1, 1917; open stream west of University of Wisconsin; crappie, 58.5 millimeters long, a leech, *Piscola punctulata* attached to body.

Summary: Intestinal nematodes, 5; intestinal trematode, 1; cysts in peritoneum along intestine, 4; leech, 1.

## VI. GENERAL DISCUSSION.

Though perch exceed crappies in numbers in Lake Wingra, they do not attain maximum growth.[b] The crappies are large and, in proportion to their greater sizes, abundant. Evidently the small, shallow lake is not a favorable habitat for the perch, but is satisfactory for the crappie. The differences between the two species may be summarized by stating that: (1) The perch feeds more by day and eats less of pelagic crustaceans than the crappie; (2) the perch

[a] Thanks are due to Dr. George R. La Rue, who identified these.

[b] The complete data for line and gill net catches have been given in a previous paper by Pearse and Achtenberg, which is expected to be published shortly by this Bureau. Judged by the catch per hour on hooks baited with minnows, the larger fishes are present in Lake Wingra in the following ratios: Perch, 145; crappie, 94; bluegill sunfish, 79; largemouth black bass, 8; pumpkinseed, 3; gar, 1. From the catch per hour in gill nets the following ratios were obtained: Perch, 307; bream, 32; crappie, 20; bluegill sunfish, 17; dogfish, 16; pumpkinseed, 12; pickerel, 9; carp, 7; smallmouth black bass, 5; largemouth black bass, 4; black bullhead, 2; gar, 1.

feeds on or near the bottom; the crappie finds its food among the shore vegetation or in the open lake; (3) the perch fasts more or less during the hot weather and while spawning; the crappie apparently eats throughout the summer, but takes little or no food during the winter; (4) the crappie spawns later in the season, when the water is warmer; (5) the perch has many parasites; the crappie, few.

The crappie is better suited to shallow lakes than the perch, because its normal activities are not interfered with by high temperatures, and it is thus able to breed and feed when food is most abundant. Its habits of feeding at twilight or during the night help in avoiding the unfavorable conditions associated with the warmth of midsummer. Its greater immunity to parasitic infections also enables it to live in the shore vegetation with less danger.

## VII. SUMMARY.

1. This paper attempts to compare the habits of the black crappie with those of the perch, with the purpose of ascertaining why the former is better suited to shallow lakes and the latter to deep lakes.

2. The food of the crappie consists chiefly of insects, particularly immature stages, entomostracans, amphipods, and fishes.

3. In spring amphipods and entomostracans are the chief items in the dietary. During the warmer months crappies feed largely on insect larvæ, pupæ, and adults, and on cladocerans. In winter adult crappies take little or no food in Wisconsin lakes.

4. Feeding is most active at night, or in early morning and evening.

5. Young crappies feed for the most part on copepods, cladocerans, insect larvæ, and amphipods. During their first season they increase rapidly in size until the temperature of the water falls to about 4° C., but grow very little during the winter.

6. The rate of digestion in the crappie is about the same as in the perch, but less food is eaten at a time and feeding is more deliberate.

7. In southern Wisconsin lakes crappies spawn after the water temperature has reached 19 to 20° C., or more; while the perch spawn earlier, when the temperature is 8 to 9° C.

8. During the winter crappies remain in deep water and are comparatively inactive. In spring they come inshore and remain in shallow water throughout the summer.

9. Crappies have few parasites when compared with perch.

10. Though perch are more abundant than crappies in the shallow lake investigated, they do not attain large sizes. Crappies are large, and, considering their larger sizes, relatively abundant.

11. Crappies are better suited to shallow lakes than perch, because: (1) They can better endure high temperatures; (2) their feeding habits enable them to secure food more easily; and (3) they are less subject to infection by parasites.

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# CRAB INDUSTRY OF CHESAPEAKE BAY

By E. P. CHURCHILL, Jr.
*Assistant, U. S. Bureau of Fisheries*

**Appendix IV to the Report of the U. S. Commissioner of Fisheries for 1918**

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# CRAB INDUSTRY OF CHESAPEAKE BAY.

By E. P. CHURCHILL, Jr., *Assistant, U. S. Bureau of Fisheries.*

## GROWTH AND SIZE OF THE INDUSTRY.

The blue crab (*Callinectes sapidus*) is the only species of crab found in Chesapeake Bay which has so far proved to be of commercial importance. The catching and preparing for market of this crustacean has given rise to an industry which, at the present time, embraces almost the entire bay in its scope. The crab of Chesapeake Bay was first put on the market in the year 1873 or 1874, shipments of soft crabs being made by Capt. John H. Landon, from Crisfield, Md., to the firm of John Martin, of Philadelphia. The hard-crabbing industry was initiated in 1878 by James McMenamin, who opened a plant at Hampton, Va., for canning the meat of the hard crab. The firm which he founded is still in operation, constituting the oldest existing crabbing firm in Virginia, if not in the whole bay.

Some trouble was at first experienced in finding a market for the crabs and the meat. Crabs were, to most persons, an unknown form of food and were even considered by many to be poisonous. Express agents and railroad employees, whose daily run took them through Crisfield, became familiar with the edible qualities of the soft crab and assisted in arousing the interest of fish and game dealers of the larger cities, such as Baltimore, Philadelphia, and New York. The Hampton firm carried on a very extensive advertising campaign. By these means the use of the crab as a food gradually spread until crabs and crab meat are now found in most of the important markets.

At first the soft crabs were shipped in heavy boxes which made the express charges high. No ice was used and consequently at least one-half of the crabs died en route. Mr. Martin, mentioned above, suggested that ice be packed about the crabs. A method of placing the crabs in trays in the boxes was devised, in order that those in any part of the box might be examined without disturbing the remainder. The present style of trays and boxes was introduced in 1884 by Isaac Tawes, of Crisfield.

Soft crabs were first caught by the use of hand or dip nets. Old oyster dredges then began to be employed, in a manner similar to that used in dredging for oysters. Next a special form of scrape without teeth was invented. The iron-mesh bag was replaced by one of cotton mesh, the patent for which was held by L. Cooper Dize, of Crisfield. This form of apparatus came into general use and is one of the chief means of taking soft crabs at present. The haul seine was formerly often employed in catching crabs but its use now is confined to a few localities in the northern part of the bay. No licenses were issued for its use in 1916. The shedding of crabs in floats began very shortly after the beginning of commercial catching. The style of

floats used was about the same as that in vogue at present. Attempts were made to confine immature hard crabs in pounds of various sorts until they became peelers and then to allow them to shed. This method was found to be impracticable, as it was necessary to handle the crabs too often.[a]

The use of the trot-line, principally in taking hard crabs, has been practiced since the inception of the industry. The dredge began to be employed in taking hard crabs at some time between 1900 and 1905.

Since its inception in the early seventies until 1901, the expansion of the crab industry in size and importance proceeded steadily. During the seven-year period from 1901 to 1908, the volume of the industry more than doubled, the catch increasing from 21,530,076 pounds of crabs in 1901, to 45,456,000 in 1908. No further figures relative to the size of the catch are available until 1915 is reached. In that year, at the close of this seven-year period, the catch amounted to 50,343,268 pounds, an increase of only about 5,000,000 pounds in comparison with an increase of about 24,000,000 pounds between 1901 and 1908. These facts and other data relative to the development of the crab industry are presented in concise form in the following table:[b]

COMPARATIVE STATISTICS OF THE CRAB PRODUCT OF MARYLAND AND VIRGINIA FOR VARIOUS YEARS FROM 1880 TO 1915.

| Years. | Maryland. | | | | | | Virginia. | | | | | | Grand total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Crabs, hard. | | Crabs, soft. | | Total. | | Crabs, hard. | | Crabs, soft. | | Total. | | | |
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| 1880 | 1,166,667 | $46,850 | (c) | (c) | 1,166,667 | $46,850 | 2,139,200 | $32,088 | (c) | (c) | 2,139,200 | $32,088 | 3,305,867 | $78,938 |
| 1887 | 2,757,638 | 36,969 | 1,636,530 | $133,788 | 4,394,168 | 170,757 | 626,820 | 15,479 | (c) | (c) | 626,820 | 15,479 | 5,020,988 | 186,236 |
| 1888 | 2,674,675 | 37,438 | 2,208,829 | 161,331 | 4,883,504 | 198,769 | 956,843 | 24,669 | (c) | (c) | 956,843 | 24,669 | 5,840,347 | 223,438 |
| 1890 | 2,388,099 | 31,723 | 4,056,110 | 228,690 | 6,444,209 | 260,413 | 2,584,794 | 28,210 | 440,310 | $26,054 | 3,025,104 | 54,264 | 9,469,313 | 314,677 |
| 1891 | 2,776,898 | 37,460 | 4,828,872 | 266,256 | 7,605,770 | 303,716 | 2,208,071 | 32,683 | 585,956 | 29,379 | 2,794,027 | 62,062 | 10,399,797 | 365,778 |
| 1897 | 5,333,316 | 39,949 | 4,115,879 | 177,637 | 9,449,195 | 217,586 | 5,331,398 | 28,331 | 1,068,116 | 39,914 | 6,399,514 | 68,245 | 15,848,709 | 285,831 |
| 1901 | 9,824,793 | 85,884 | 4,303,582 | 202,563 | 14,128,375 | 288,447 | 6,113,277 | 52,863 | 1,288,424 | 65,972 | 7,401,701 | 118,835 | 21,530,076 | 407,282 |
| 1904 | 12,665,282 | 168,996 | 5,732,865 | 189,851 | 18,398,147 | 358,847 | 10,356,052 | 179,575 | 1,910,654 | 92,909 | 12,266,706 | 272,484 | 30,664,853 | 631,331 |
| 1908 d | 12,786,000 | 124,000 | 7,587,000 | 195,000 | 20,373,000 | 319,000 | 23,001,000 | 239,000 | 2,082,000 | 87,000 | 25,083,000 | 326,000 | 45,456,000 | 645,000 |
| 1915 | 22,491,675 | 335,375 | 7,602,207 | 329,276 | 30,093,882 | 664,651 | 18,765,148 | 242,754 | 1,484,238 | 74,402 | 20,249,386 | 317,156 | 50,343,268 | 981,807 |

a The facts cited concerning the early history of the soft-crab industry were obtained from "The Crab Industry of Maryland," W. A. Roberts, Report of the Bureau of Fisheries, 1904, pp. 423 and 424.
b From Annual Report of the Commissioner of Fisheries for Fiscal Year Ended June 30, 1916, p. 64.
c Statistics not available.
d The statistics for 1908 are from data published by the Bureau of the Census.

The Annual Report of the Commissioner of Fisheries for the fiscal year ended June 30, 1916, shows that, in 1915, there were 10,290 persons engaged in the industry, the invested capital amounted to $852,777, and the value of the catch was $981,807.

The statistics collected during the course of the present investigation, and quoted below, present certain details of interest concerning the size of the crab industry in 1916.

| States. | Licensed crabbers. | | Dealers. | Catch. | | |
|---|---|---|---|---|---|---|
| | Dip net, trot-line, and scrape. | Dredge. | | Hard. | Soft. | Total. |
| | *Number.* | *Number.* | *Number.* | *Pounds.* | *Pounds.* | *Pounds.* |
| Maryland | [a] 3,618 | ..... | 221 | 21,334,500 | 6,637,610 | [c] 27,972,110 |
| Virginia | [b] 1,055 | 83 | 49 | 16,343,010 | 1,234,140 | 17,577,150 |
| Total | 4,673 | 83 | 270 | 37,677,510 | 7,871,750 | 45,549,260 |

[a] These figures represent 894 dip net, 1,661 trot-line, and 1,063 scrape licenses.
[b] Dip net, trot-line, and scrape crabbers are not licensed separately in Virginia.
[c] The figures for the catch in Maryland are based in part on estimation, as it was found to be impossible for the author to visit all the smaller crab dealers, owing to the demands made upon his time by the more important features of the investigation.

Although the figures given in the preceding table for Maryland are based in part on estimation, it is felt that they represent the true conditions fairly accurately. The entire number of crab houses was known and the catch handled by the smaller houses, which were not visited, was estimated from that handled by houses of about the same capacity which were visited. It is safe to say that the catch in 1916 was smaller than that secured during 1915.

## CRABBING GROUNDS AND LOCATION OF DEALERS.

The number of crabbers found at the different grounds furnishes something of an index of the relative abundance of crabs existing at that place and of the general adaptability of the region to their capture. For that reason, data showing the number of crabbers and crab dealers licensed during 1916–17 in the several tidewater counties of Maryland and Virginia are presented in the following table. The counties in the respective States are arranged in the order of the number of crabbers in each, those having the most being placed first.

LICENSED CRABBERS AND DEALERS IN MARYLAND AND VIRGINIA, 1916–17.

MARYLAND.

| Counties. | Licensed crabbers. | | | | Dealers. |
|---|---|---|---|---|---|
| | Dip net. | Trot-line. | Scrape. | Total. | |
| | *Number.* | *Number.* | *Number.* | *Number.* | *Number.* |
| Somerset | 375 | 97 | 829 | 1,301 | 97 |
| Dorchester | 126 | 423 | 180 | 729 | 21 |
| Anne Arundel | 116 | 452 | 53 | 421 | 9 |
| Talbot | 1 | 310 | 1 | 312 | 20 |
| St. Marys | 138 | 132 | ..... | 270 | 12 |
| Queen Anne | ..... | 195 | ..... | 195 | 8 |
| Kent | 47 | 113 | ..... | 160 | 3 |
| Calvert | 89 | 3 | ..... | 92 | 10 |
| Baltimore | ..... | 63 | ..... | 63 | ..... |
| Baltimore City | ..... | 33 | ..... | 33 | 33 |
| Worcester | ..... | 24 | ..... | 24 | 2 |
| Charles | 2 | 10 | ..... | 12 | 1 |
| Wicomico | ..... | 6 | ..... | 6 | ..... |
| Total | 894 | 1,661 | 1,063 | 3,618 | 221 |

LICENSED CRABBERS AND DEALERS IN MARYLAND AND VIRGINIA, 1916–17—Contd.

VIRGINIA.

| Counties. | Licensed crabbers. | | | Dealers. |
|---|---|---|---|---|
| | Dip net, trot-line, and scrape. | Dredge. | Total. | |
| | *Number.* | *Number.* | *Number.* | *Number.* |
| Accomac | 409 | ..... | 409 | [a] 13 |
| Northumberland | 200 | ..... | 200 | ..... |
| Elizabeth City | 59 | 57 | 116 | 16 |
| York | 78 | 18 | 96 | ..... |
| Norfolk | 59 | 1 | 60 | 11 |
| Lancaster | 53 | ..... | 53 | ..... |
| Mathews | 40 | 6 | 46 | ..... |
| Westmoreland | 44 | ..... | 44 | ..... |
| Middlesex | 39 | ..... | 39 | ..... |
| Northampton | 37 | 1 | 38 | [b] 2 |
| Gloucester | 29 | ..... | 29 | ..... |
| King and Queen | 19 | ..... | 19 | [c] 2 |
| Princess Anne | 8 | ..... | 8 | ..... |
| Isle of Wight | 1 | ..... | 1 | ..... |
| Total | 1,055 | 83 | 1,138 | 49 |

[a] Also one at Franklin City, on the ocean side.
[b] There is 1 crab house at Willis Wharf, Va., on the ocean side, outside the scope of this report.
[c] Both are located at Westpoint, just over the line in King William County.

The relative importance of the different regions of the bay to the crabbing industry is worthy of discussion in some detail. For the sake of convenience, the county will be taken as the geographical unit. The tidewater counties of the Eastern Shore, beginning with the most southerly, will be considered first. The treatment of the counties of the western shore, beginning at the north, will then follow. It must be borne in mind that all figures showing the number of crabbers and crab houses are for the years 1916–17.

### NORTHAMPTON COUNTY, VA.

There are in this county 37 crabbers, 1 dredge boat, and 2 crab houses, both located at Cape Charles City. No meat is picked out at these houses, but about 10,000 barrels of crabs are bought and shipped each year. During the winter they handle a portion of the dredge-boat catch of the southern part of the bay, shipping largely to Crisfield by the New York, Philadelphia & Norfolk Railroad. In this way the dealers of Crisfield are brought into competition with those of Norfolk and Hampton for the dredge-boat catch. Dredging is carried on during the winter months throughout the whole of the lower part of the bay, from the capes to about the latitude of the northern end of this county on the Eastern Shore, and the northern extremity of Mathews County, Va., on the western shore. The deeper waters of this part of the bay afford a fine field for dredging operations during the winter, since the crabs migrate in great numbers to this region in the fall and lie on the bottoms until spring.

The trot-line crabbers of the county work largely in the coves and creeks of the western side and sell to the firms at Cape Charles or haul their catch inland to stations on the New York, Philadelphia & Norfolk Railroad and ship directly to northerly points. There is no soft-

crabbing industry in the county, as immature crabs are not found in sufficient quantities. Most of them go farther north to shed.

### ACCOMAC COUNTY, VA.

This county has 409 crabbers and 13 crab houses, the latter being located at points along the western side, at Deep Creek, Chesconnessex and Saxis, and on Tangier Island. No meat is picked out, but some hard crabs are shipped alive. The bulk of the effort is directed to the soft-crabbing industry.

### SOMERSET COUNTY, MD.

This county has 1,301 crabbers, 829 of whom use the scrape, and 97 crab houses, 52 of which are located at Crisfield, the remainder sending their product either to Crisfield or to Deal Island, in this county. Part of the houses located in this county handle only hard crabs; 5 at Crisfield remain open all winter, using crabs which have been dredged in Virginia waters. Some handle only soft crabs; many handle both hard and soft. While immense numbers of hard crabs are shipped from this county, it is the home of the soft-crab industry. The best crabbing bottoms of the bay include those underlying the waters extending from the vicinity of Onancock, Va., situated at the southern extremity of Pocomoke Sound, northwest to Tar Bay, which is about midway of the western side of Dorchester County, Md. This expanse includes Pocomoke Sound, Tangier Sound, the mouths of the Wicomico and the Nanticoke Rivers, Fishing Bay, Honga River, and Tar Bay. The waters of these bodies include scores of the mouths of rivers, small bays, coves, and inlets of Accomac County, Va., Somerset County, Md., a small portion of Wicomico County, Md., and the southern part of Dorchester County, Md., on the east and north; and of Tangier Island, Va., Smiths, South Marsh, Hollands, Billy, and Hoopers Islands, Md., on the west. On the grassy bottoms underlying these waters young crabs congregate in vast numbers to shed, and a remarkably fertile crabbing field is afforded. The bottoms of this locality are those on which the scrape may be used to best advantage, because of their comparative smoothness. Eight hundred and twenty-nine of the 1,063 crabbers using scrapes are located in Somerset County.

Crisfield, located in the southern part of this county, on the little Annemessex River, is the center of the soft-crab industry of the world. It receives most of the soft-crab catch from Pocomoke and Tangier Sounds, and practically all the soft-crab catch from the western shore of Virginia. It also receives the hard-crab catch from a large part of Pocomoke and Tangier Sounds, in addition to quantities shipped in from a distance. Its shipping facilities consist of a daily boat to Baltimore and good train service.

Deal Island, at the northern end of Tangier Sound, is the second shipping point in importance in Somerset County. It has only 9 crab houses, however, 4 of which pick out the meat. Its only outlet to market is a daily boat to Baltimore. It receives a large part of the catch from the southern part of Dorchester County, which lies to the north.

### WICOMICO COUNTY, MD.

This county has 6 crabbers, but no crab houses. The crabbing grounds are the mouths of the Wicomico and the Nanticoke Rivers and the catch goes to Deal Island.

### DORCHESTER COUNTY, MD.

There are in this county 729 crabbers and 21 crab houses, the proprietors of the most of which are engaged in shedding out soft crabs. Those in the southern part send most of their product to Deal Island, though a few ship from Wingate, on the Honga River, as the Baltimore boat touches there. Those at the north, on the Little Choptank and the Choptank Rivers, ship to Cambridge, in Dorchester County, and to Oxford and Bellevue, in Talbot County. There is one picking house, which closes in the winter.

### TALBOT COUNTY, MD.

This county has 312 crabbers and 20 crab houses. The crabbing grounds are in the coves of the mouth of the Choptank River at the south and Eastern Bay and its tributaries on the north. The houses are located on these waters; on the south the shipping points are Oxford, Bellevue, Neavitt, and Tilghman. Five packing houses are located at Oxford and one at Bellevue. None of these operate during the winter. The town of Oxford stands second in Maryland in the amount of crab meat picked out, being exceeded in this respect only by Crisfield. The shipping points on Eastern Bay are Claiborne and St. Michaels, 3 picking houses being located at the latter point, none of which operate during the winter. The Baltimore, Chesapeake & Atlantic Railroad from these points connects by ferry with Baltimore. One crabber in this county was using the scrape in 1916.

### QUEEN ANNE COUNTY, MD.

There are in this county 195 crabbers and 8 crab houses. The crabbing grounds are in the northern part of Eastern Bay on the south and in Chester River on the north; the principal shipping center is Queenstown on the Chester River, its shipping facilities being a Baltimore boat three days a week and the Maryland, Delaware & Virginia Railroad, connecting by ferry with Baltimore. Other small shipping points are found up the Chester River. There are no picking houses, hard and soft crabs being shipped alive.

### KENT COUNTY, MD.

There are here 160 crabbers and 3 crab houses. These houses ship hard and soft crabs alive, but no meat. The crabbing grounds are in the Chester River, the main shipping point being Rock Hall, which has service by the Baltimore boat three times a week.

There is no commercial crabbing carried on north of Kent County on the east and Baltimore on the west. Pooles Island, at the southern extremity of Harford County, is practically the northern limit of the crabbing industry of Chesapeake Bay.

### BALTIMORE COUNTY, MD.

This county has 63 crabbers, but no crab houses; most of the persons licensed crab for pleasure or are the proprietors of resorts or "shores" in the vicinity of Baltimore.

### BALTIMORE CITY, MD.

Baltimore has 33 crabbers, practically all of whom are crabbing for sport. There are 38 crab houses which obtain their crabs from shipping points down the bay; most of these sell soft and hard crabs and meat prepared at points below, Baltimore being the final market for a certain proportion of the crabs obtained in the bay. There are a few picking houses, some of which remain in operation all winter, using crabs which have been dredged in Virginia waters.

### ANNE ARUNDEL COUNTY, MD.

This county has 421 crabbers and 9 crab houses, 3 of which pick out the meat, closing in the winter. The crabbing grounds are in the South and the Severn Rivers and the inlets of the eastern side of the county. The scrape is used to some extent here, this being the only county on the western shore in which this implement is used. The 3 picking houses and 1 soft-crab house are located at Annapolis. The other 5 crab houses are engaged in shedding crabs and shipping living hard crabs, and are located at various small places along the eastern side of the county, 1 being at Fairhaven at the southern extremity.

### CALVERT COUNTY, MD.

There are here 92 crabbers and 10 crab houses, 4 or 5 of the latter being located at Solomons Island, at the mouth of the Patuxent River. There are no picking houses. The main crabbing grounds are in the Patuxent River, as the eastern shore of the county has few inlets. The main shipping points are Solomons Island and Broomes Island, farther up the river, living hard and soft crabs being shipped. A very few crabs are shipped from Coves Point on the eastern side of the county.

### CHARLES COUNTY, MD.

This county has 12 crabbers and 1 crab house from which are shipped live hard and soft crabs. The crabbing grounds are the Potomac River.

### ST. MARYS COUNTY, MD.

There are in this county 270 crabbers and 12 crab houses. Only live hard and soft crabs are shipped. The crabbing grounds are Patuxent River on the north and the Potomac on the south. Some of the persons licensed to operate crab houses in this county reside in Crisfield and send run boats to St. Georges Island, on the southern side of this county, to take the catch to Crisfield. Some crabs are shed out at Millers Wharf on St. Marys Bay and shipped to Baltimore by boat.

The crabbing industry in this county and that of Westmoreland, Northumberland, Lancaster, Middlesex, and Mathews Counties, Va., is greatly hampered by the entire lack of railroad facilities in any of the counties and by the very inadequate boat service. The Baltimore boats touch at points in these counties only three times a week. The bulk of the crabs have to be taken to Crisfield by run boats. If transportation facilities could be improved, the size of the industry could doubtless be much increased in this region.

### WESTMORELAND COUNTY, VA.

There are here 44 crabbers and no crab houses. The crabbing grounds are the Potomac River, most of the catch going to Crisfield.

### NORTHUMBERLAND COUNTY, VA.

There are in this county 200 crabbers, but no crab houses. The crabbing grounds are the Potomac, the Great Wicomico, and smaller rivers. Nearly all the catch goes to Crisfield. This is one of the important counties in the crab industry, the catch of soft crabs being quite large.

### LANCASTER COUNTY, VA.

This county has 53 crabbers. There are no crab houses. The crabbing grounds are the Rappahannock River, on the south. The catch is sent to Crisfield.

### MIDDLESEX COUNTY, VA.

There are here 39 crabbers, but no crab houses. The crabbing grounds are the Rappahannock on the north and the Piankatank River on the south, the catch being sold to Crisfield.

### MATHEWS COUNTY, VA.

This county has 46 crabbers and 6 dredge boats. There are no crab houses. The main crabbing grounds are the Piankatank River on the north, the coves and inlets of the bay on the east, and Mob Jack Bay on the south. The dredge boats operate in the entire lower part of the bay. Their catch is taken directly to Hampton, Norfolk, or Cape Charles. The soft-crab catch, mostly taken from the Piankatank, goes to Crisfield; the trot-line catch of hard crabs from Mob Jack Bay is taken by run boats to Hampton.

### GLOUCESTER COUNTY, VA.

There are here 29 crabbers, but no crab houses. The main crabbing grounds are the Mob Jack Bay on the east and the York River on the southwest. No soft crabs are handled. The trot-line catch is sold to run boats from Hampton.

### KING AND QUEEN COUNTY, VA.

This county has 19 crabbers, but no crab houses, the catch going to 2 crab houses at Westpoint in King William County, Va. The crabbing ground is the York River.

### YORK COUNTY, VA.

There are here 78 crabbers and 18 dredge boats. There are no crab houses. The main crabbing grounds are the York River and Poquoson Bay on the northeast and Back River on the south, the dredge boats operating in the lower part of the bay. No soft crabs are handled, the entire catch of hard crabs going to Hampton, Norfolk, and Cape Charles.

### ELIZABETH CITY COUNTY, VA.

This county has 116 crabbers, 57 dredge boats, and 16 crab houses. The main crabbing grounds are the Hampton Roads on the southeast and Back River on the north, the dredge boats operating in the lower part of the bay. This county leads by far in the number of dredge boats, which operate during the winter months and sell to Hampton, Norfolk, and Cape Charles. One crab house is located at Phoebus and the rest at Hampton. All are picking houses and remain open for the most part throughout the year. A few close during a part of the summer when the season is slack, owing to the falling off in the supply of crabs during the month of August especially. This has been emphasized by the institution of a closed season on sponge-bearing crabs during July and August. There is no soft-crab industry in this county, since the bulk of the crabs caught here are adults. Hampton is the center of the hard-crab industry. More crab meat is picked out and shipped from this city than from any other on the bay. The adult crabs, especially the females, migrate in great numbers to the lower part of the bay in the fall. By the use of the trot-line in the summer and the dredge in the winter, hard crabs are obtained in sufficient quantities to enable the houses to operate throughout most of the year.

### ISLE OF WIGHT COUNTY, VA.

This county has 1 crabber, the crabbing grounds being the James River.

### NORFOLK COUNTY, VA.

There are here 60 crabbers, 1 dredge boat, and 11 crab houses. The last are located at Norfolk and Portsmouth, but only 3 or 4 are of any importance, and these remain open throughout the year; all are picking houses. There is little local soft-crab trade. The crabbing grounds are the James River, Hampton Roads, and Lynnhaven Roads, all on the north.

### PRINCESS ANNE COUNTY, VA.

This county has 8 crabbers, but no crab houses. The crabbing grounds are Lynnhaven Roads on the north. The catch goes to Norfolk.

### SUMMARY.

Hard crabs are caught and sold, in general, throughout the extent of the bay from the Capes to Baltimore. About as many are handled in Maryland as in Virginia. The center of the hard-crab industry in Maryland is at Crisfield, although the trade in hard crabs in Maryland is more evenly distributed among the different towns than in Virginia.

In the latter State, Hampton stands by far in the lead, handling more hard crabs than any other one point on the bay and at least three-fourths of the hard crabs shipped from Virginia. The congregation of the adult crabs upon the bottoms of the lower bay, during the winter, furnishes sufficient material to enable the houses at Hampton, Norfolk, Portsmouth, and Cape Charles to operate during most of the year.

The soft-crab industry is engaged in from Accomac County, Va., on the Eastern Shore, and the Piankatank River on the western, northward as far as Baltimore. Crisfield is the center of this industry, being favored with very adequate shipping facilities, and located on the best soft-crabbing grounds of the bay, viz, Tangier and Pocomoke Sounds.

## SEASONS.

### SOFT CRABS.

Since soft crabs are obtained only as a result of the molting of the young at the successive stages of growth and since this process takes place only during the warmer months, the soft-crab season occurs during the late spring, summer, and the early fall. In Virginia waters the season usually opens about the first of May or a little earlier, depending on the state of advancement of the spring. Crisfield firms begin taking the catch of the western shore of Virginia and of Tangier Island two or three weeks before soft crabbing is begun in Maryland waters. Soft crabbing usually ceases about the last of July or the middle of August in these Virginia counties, owing to the heat and the poor transportation facilities. During very hot weather, the soft crabs and peelers will not stand being kept until the day for the Baltimore boat, or the extra day involved in carrying them to Crisfield. The season usually closes in the latitude of Crisfield about the first or the middle of October. In the more northerly latitude of Annapolis and Baltimore, the season opens somewhat later than at Crisfield and closes earlier, extending from about the first of June to the middle of September or the first of October.

### HARD CRABS.

The catching of hard crabs in Maryland waters is limited by law to the period between May 1 and November 1. This practically coincides with the natural trot-line season in this latitude. As the use of the trot-line depends on the seizing of the bait by the crab, this method of catching can not be practiced during the winter months, when the crab is numb and inactive from the cold. The law does not forbid the Maryland firms handling crabs which have been taken from the waters of Virginia. Five picking houses at Crisfield and a few at Baltimore remained opened during the winter of 1916–17, depending almost entirely upon the catch taken in Virginia waters by the dredge boats. A few crabs are taken in Maryland waters when dredging for oysters. These are allowed to be sold; as it is thought by those engaged in the industry that crabs so taken during the cold weather would die if thrown back into the water and would thus be wasted. Most of the crabs, however, migrate toward the lower part of the bay during the fall, and consequently not many are found in Maryland waters during the winter.

In Virginia the hard-crab season extends throughout the entire year, with the exception of a closed season during July and August on sponge-bearing crabs. The weather is of sufficient mildness to admit of trot-line catching being engaged in from about the first of April until the middle or last of November. In 1916 there were no crabs of any consequence taken by the trot-line at Hampton after December 1. The temperature of the water at that time was about 48° F. Catching by this method had ceased two or three weeks earlier farther up the bay. No crabbers were found using the trot-line in Mob Jack Bay after November 10 during the year under discussion. Catching with the trot-line began during the first week in April in 1917. During the remaining months of the year hard crabs are taken by the use of the dredge. The dredging season is limited by law to the period between November 1 and May 1 of the succeeding year. As the dredging season opens legally on November 1 and extends to May 1, there is some rivalry between the crabbers using this method and those working with the trot-line during the months of November and April. The trot-line men, operating at less expense than the dredge-boat owners, can sell their catch more cheaply. For that reason, and also because the crabs have not moved in sufficient numbers to deep water, dredging does not begin in earnest until nearly December.

## LEGAL REGULATIONS.

### MARYLAND.

Nonresidents are not permitted to take crabs in the waters of the State. Residents are required to pay a license fee of $1 for the privilege of taking crabs by any of the various methods used. Any person or firm desiring to pick, can, or ship cooked hard or soft crabs or crab meat must pay a license fee of $10. A fee of $5 is necessary for selling or marketing living hard or soft crabs.

It is unlawful to take or have in possession any hard crab, other than one in the peeler state, measuring less than 5 inches across the shell from tip to tip of spike, or a hard crab with eggs visible upon the apron; that is, a sponge crab. It is also unlawful to take or have in possession a soft crab measuring less than 3 inches from tip to tip of spike, or a peeler measuring less than 3 inches. No crabs of any sort may be taken between November 1 of any year and May 1 of the succeeding year.

For the enforcement of these regulations the State has provided as follows:

Licenses are obtained from the clerk of the court of the county in which the crabber resides and are good for the year of issuance and only in the county in which issued. Residents in Baltimore City obtain licenses from the clerk of the court of common pleas and may crab in Baltimore and Anne Arundel Counties.

At the opening of each crabbing season the State Conservation Commission appoints, at its discretion, a certain number of inspectors for each county in which crabbing is engaged in. These are stationed by the commission in the respective counties at the points where their presence is required. They report to the commissioners and are also under the direction of the deputy commanders of the State fishery force.

### VIRGINIA.

Nonresidents are not allowed to take crabs from Virginia waters. Residents are required to pay a fee of $2 for taking crabs by any means other than by the dredge. The fee for the use of the latter is $25. For each boat used in buying crabs a fee of $5 is required, for each picking and crating house $10, and each canning and packing house $25.

No hard crab measuring less than 5 inches from tip to tip of spike may be taken. It is unlawful to take sponge-bearing crabs between July 1 and August 1 of each year. Dredging for crabs can be engaged in only between November 1 and May 1. Crabs may not be taken at night or on Sunday.

For the enforcement of the preceding regulations the following provisions have been made by the State:

Licenses are obtained from the oyster and crab inspector of the district in which the crabber resides and are good for the year of issuance in any part of the State.

For the purpose of the enforcement of both the oyster and the crab laws, the State is permanently divided by the State commissioner of fisheries into 49 districts. To each of these, with the exception of 3, an inspector, appointed for two years by the commissioner, is assigned. In 3 cases 1 inspector has charge of 2 districts. Each inspector attends to the enforcement of the laws relating to all sea foods in his district, issues the licenses, and is responsible to the commissioner.

## METHODS OF CATCHING.

### SOFT CRABS.

Soft crabs and peelers are caught by the use of the dip net, scrape, and trot-line.

Soft crabs are obtained from two sources. One of these is the crabs caught while in the soft condition, shortly after having shed; the other is the crabs which will shed within a few days if kept in captivity, the resulting soft crabs being marketed. The crabs which are soon to shed are known as "peelers." When a crab approaches the shedding state, a narrow line appears on the outer margin of the next to the outer segment of the fourth pair of legs, or "back fins." This line is white at first. A crab in which such a line is present is known as a "fat," "green," or "snot" crab, and is not saved as it will be apt to die in captivity before shedding. If left upon the bottom, the line within a few days becomes pink in color and the crab is then a peeler. It will usually shed within a few days. Crabs bearing such a pink "sign," or "ring," are saved and kept in live boxes and floats until they shed. The bulk of the soft crabs handled are obtained by the "shedding out" of peelers.

A certain percentage, however, of the soft crabs are taken when already in that condition. This practice is especially prevalent on the western shores of Virginia. The great majority of the crabs taken when soft are caught by the use of the dip net.

DIP NET (Pl. I, fig. 1).—This consists of a one-fourth-inch iron rod bent into the form of a hoop about 1 foot across and carrying a cotton-mesh bag with openings about 1 inch square; the whole attached to

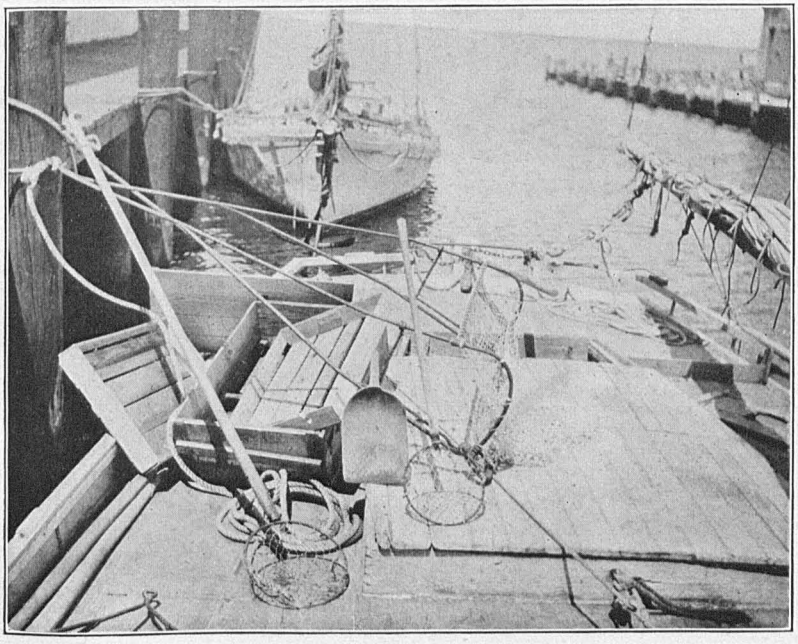

FIG. 1.—VIEW ON SCRAPE BOAT.

Showing a scrape (the triangular iron frame with the mesh bag), a crate with trays (for shipping soft crabs); a short-handled net for "fishing out" the soft crabs from a float, a long-handled net for catching crabs on the bottom, and a wooden bailing scoop.

FIG. 2.—SCRAPE BOATS, CRISFIELD, MD.

The crabs are culled in the shallow boxes secured to the inside of the gunwale.

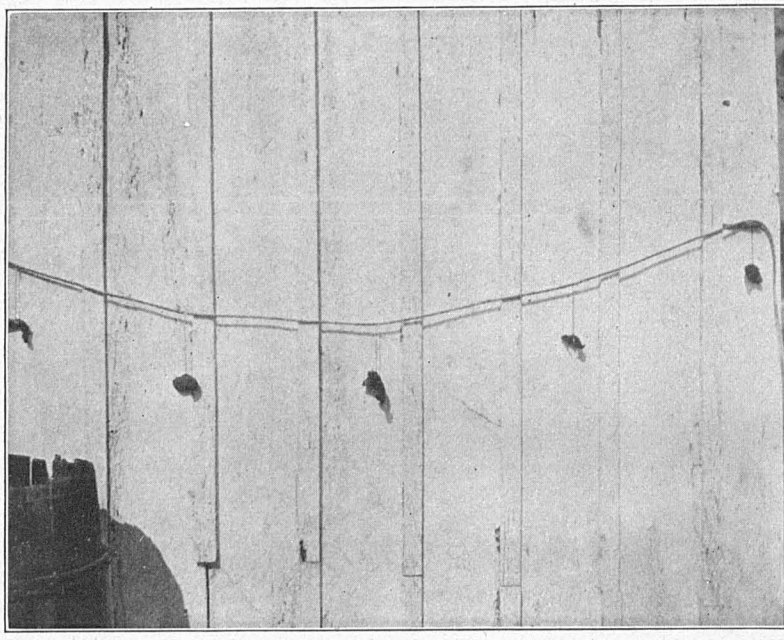

FIG. 1.—PORTION OF TROT-LINE, SHOWING METHOD OF BAITING ON SNOODS.

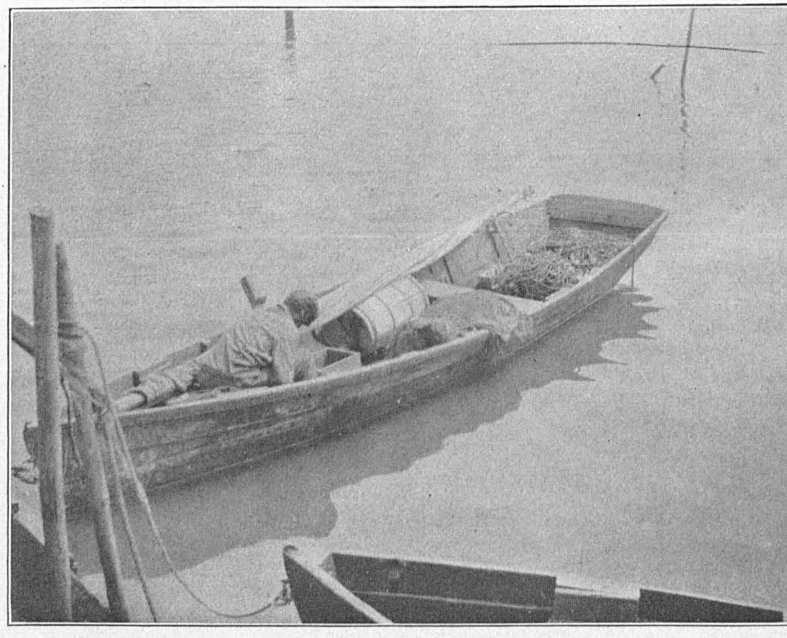

FIG. 2.—TROT-LINE BOAT.

This is the style which is run by hand, the sail being used in going to and from the crabbing grounds.

a straight wooden handle 6 or 7 feet in length. It is used in shallow water and is carried in the hands, the crabber reaching into the water from a boat and scooping up the crab. This instrument is used especially in taking soft crabs, though some peelers are taken with it. It is used in the mouths of creeks and in the shallow waters of coves and inlets and in other places where the bottoms are not suitable for the use of the scrape.

SCRAPE (Pl. I, fig. 1).—This consists essentially of a triangular iron frame with a base varying in width from 2 to 5 feet. A cotton-mesh bag is attached to the upper side and extends about 6 feet behind the scrape. The scrape is dragged by a rope fastened to the apex, the base, which bears no teeth, coming in contact with the ground. Two scrapes are usually operated from a sailboat (Pl. I, fig. 2), varying in length from 20 to 60 feet. One scrape is dragged on each side of the boat, each being hauled in alternately by hand, and the contents dumped into shallow boxes attached to the side of the boat (Pl. I., fig. 2). Here the crabs are sorted out from the mass of seaweed, toadfish, oyster shells, etc., which is brought up by the scrape. The hard crabs are put into barrels and the soft crabs and peelers kept in boxes of various sorts while being brought ashore.

Although all sorts of crabs are taken with the scrape, the bulk of the catch so taken consists of peelers, the reason being that scraping is practiced only in the Crisfield region where the immature crabs predominate in numbers, and is carried on in fairly deep water. Crabs are apt to move inshore immediately before shedding, consequently soft crabs are more numerous in the shallower waters.

The crabber usually reaches the crabbing grounds at 3 or 4 o'clock in the morning and returns with his catch about 11 or 12 o'clock. Thus the crabs reach the dealer before the heat of the day, which is injurious to crabs confined in the live boxes.

TROT-LINE.—This apparatus is used at all seasons when the water is warm enough for the crab to move sufficiently to seize the bait. It is especially adapted to the catching of hard crabs, since a soft crab can not seize the bait and a peeler does not bite readily, as a crab does not eat much for a few days before it sheds.

The trot-line (Pl. II, fig. 1) consists of a line varying in diameter from three-sixteenths to three-eighths inch, and in length from 800 to 2,000 or more feet. A weight is secured to each end to hold the line in place while on the bottom, and a buoy to mark the spot is attached near the weight by a short drop line. In some cases the baits are suspended to the line by snoods 6 or 8 inches in length (Pl. II, fig. 1). This is the usual practice where no power or sail boat is used, the lines being "run" by hand—that is, the boat (Pl. II, fig. 2) is pulled along the line by hand. In other cases, the baits are secured in bights in the main line. This is done when the line is run by a power or sailboat. In this case the line passes over a spool or an oarlock set on an arm projecting about 1 foot from the side of the boat. As the boat is moved along, either by hand or by the engine or sails, the line is lifted and the crabber catches the crabs in a short-handled dip net, as they are brought to the surface while clinging to the bait. At Phoebus, Va., a patent net is used by some crabbers. This is attached to the side of the boat by an arm and secures the crabs as the line passes through it. When not in use the arm may be raised and the net thus suspended over the boat.

In hot weather the crabber often reaches the crabbing grounds at 3 or 4 o'clock in the morning. Crabs are thought to bite more readily in the early hours and the catch can be delivered to the dealer before the heat of the day, and consequently less risk of the crabs being killed by the heat is incurred. The line is set each morning and lifted when the catch is completed. It is coiled temporarily in the boat until the crabs are unloaded at the crab house. Then it is gone over and any empty snoods or bights are rebaited and the line carefully coiled in the stern of the boat, some salt is sprinkled over it to preserve the bait, and the whole covered with a rubber sheet, old blanket, or the like for the night. The bait commonly used is inedible beef or sheep tripe, some horsemeat, eels, skates, etc., being used in the spring when the crabs are not so active and consequently do not tear the bait to pieces so readily. A good day's catch with the trot-line is three to four barrels when the line is run by hand and twice that when run by power or sailboat.

Most of the soft crabs obtained by the use of the trot-line are those resulting from the "shedding out" of the female peelers of the pairs of mating crabs, or "doublers." The male, carrying the female, seizes the bait and is drawn up, and both are caught. At nearly all points outside of the region where the scrape is used, it was found that more than three-fourths of the peelers being kept to shed were females obtained in this way.

All crabs, caught by any of the methods described above, may be culled in compliance with the laws, as they are brought aboard the boat. Many crabbers carry a gauge with which to measure the crabs as they are caught. This consists of a flat piece of wood, something on the order of a ruler. A shallow notch, about one-half inch deep, is cut in one side. This notch is 3 or 5 inches long, depending on whether designed to measure soft crabs and peelers or hard crabs. The former are compared with the 3-inch notch, the latter with the 5. In some cases, those fishing for hard crabs fasten a similar gauge in the bottom of the net used in taking the crabs off the trot-line. Thus, at a glance, a crab may be measured fairly accurately as it lies in the net while being transferred to the barrel in the boat.

### HARD CRABS.

Hard crabs are taken by the use of the scrape, the trot-line, and the dredge. The former two instruments were described above and no further discussion of their use seems necessary at this point.

DREDGE.—The boats (Pl. III, fig. 1) used in dredging crabs during the winter season are about 50 to 60 feet in length and equipped with both engine and sail. The dredge (Pl. III, fig. 2) varies from 5 to 7 feet in width and is constructed on much the same plan as the scrape. It has, however, a row of teeth about 4 inches long on the side which drags on the bottom. The bag is only about 2 feet in length. The lower part of it is constructed of iron meshing, the upper of cotton. Two dredges are operated at a time, one being worked from each side of the boat. A chain a little over 1 inch in diameter is used to drag each dredge. The chain passes over a roller on the side of the boat, a little forward of the center, and around a pulley attached to a stout post placed upright in the mid line of the boat. Thence the chain passes down and around a windlass in the hold. For each dredge there

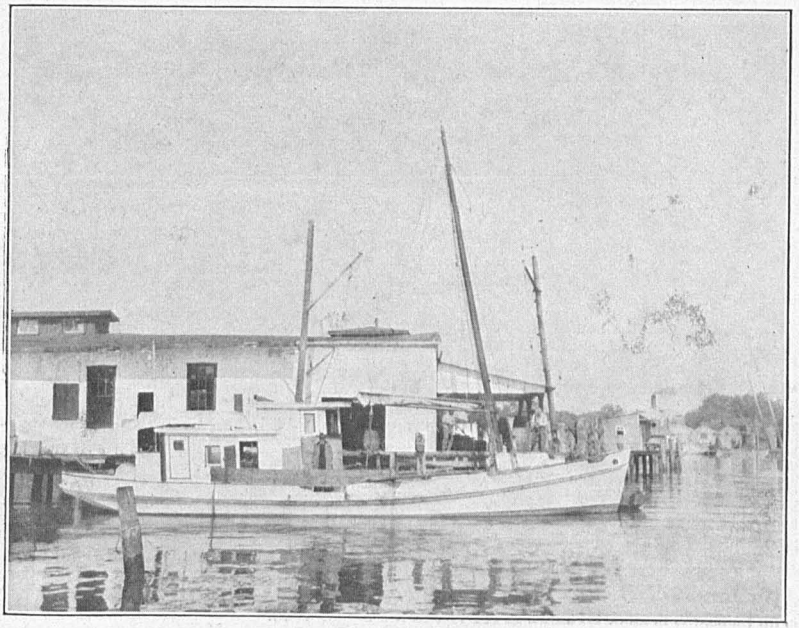

FIG. 1.—A DREDGE BOAT.

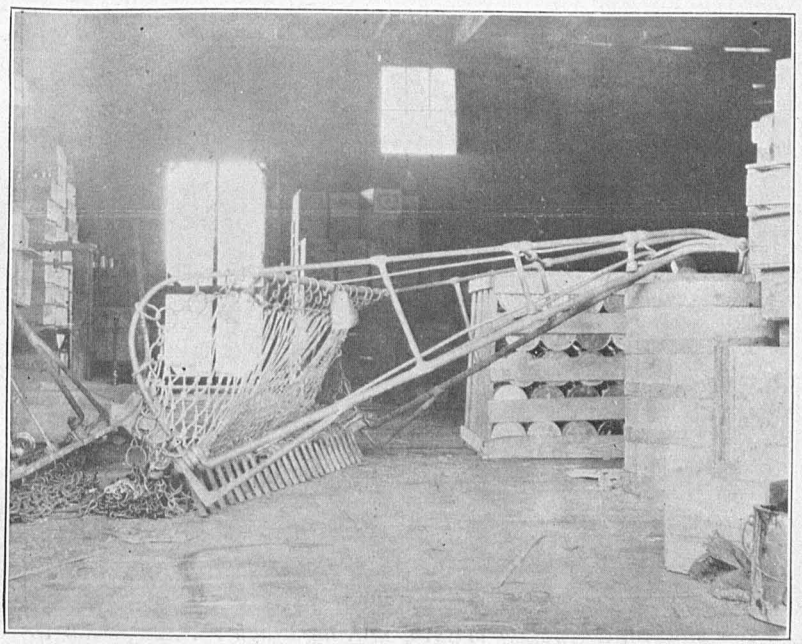

FIG. 2.—A DREDGE USED IN VIRGINIA FOR TAKING HARD CRABS DURING THE WINTER.

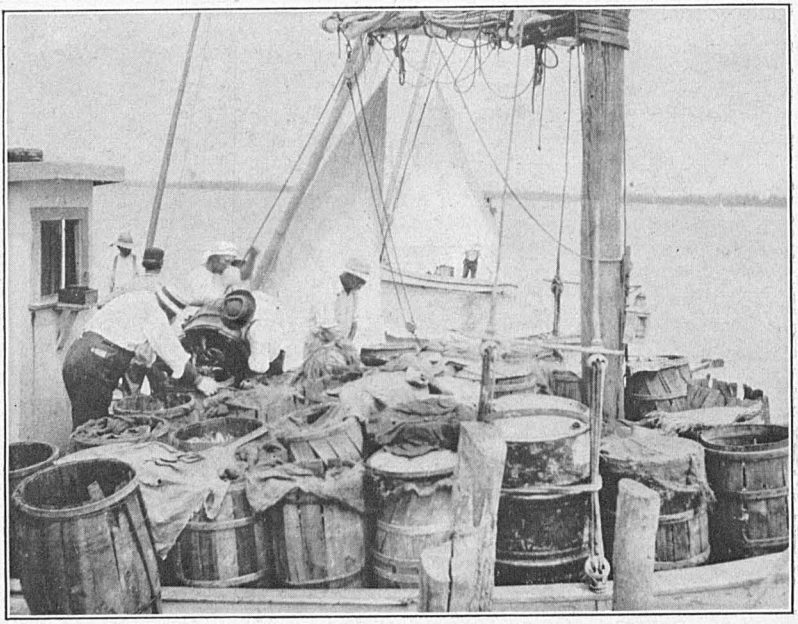

FIG. 1.—INSPECTING CRABS AS THEY ARE DELIVERED TO A RUN BOAT.

The inspector is seen standing at the left of the barrel, holding a gauge in the right hand. It is unlawful to catch or market hard crabs less than 5 inches in width. In the background is seen a trot-line boat "run" by sails.

FIG. 2.—"SHEDDING HOUSE," FLOATS, AND "POUND," OR INCLOSURE IN WHICH THE FLOATS ARE TIED, CRISFIELD, MD.

is a windlass operated by the engine and controlled from the pilot house. The dredges are hauled in alternately and their contents dumped on deck by two men, one working forward and one aft of the dredge. The dredge is then dropped overboard again. The crabs are raked from the débris by small hooks or the hands and shoveled into barrels, any dead individuals or any so badly crushed as to be unserviceable for cooking being thrown back. As there are no sponge crabs at this season of the year and since very few of less than 5 inches in length are caught in the dredges, culling to comply with the law is a short task. The débris is shoveled overboard. Dredging may be carried on in water varying in depth from a few feet to upward of 100 feet.

Ten barrels of crabs a day constituted about an average catch of a dredge boat during the years just previous to the issuance of this report. From day to day the catch may vary widely, from 1 barrel or 2 to 50 or more in exceptional cases. A buoy is sometimes left to mark a spot where the crabs are fairly abundant. They often move to another region, however, in the course of a few hours.

## RUN BOATS AND BUY BOATS.

Scrape boats and dredge boats deliver their own catch directly to the crab house. They are enabled to do this as they are fairly large and equipped with sails or power or both. Much of the crabbing, however, which is done with the dip net and the trot-line, is carried on in regions so far from any dealer that it is inconvenient or impossible for the crabber, with his relatively small and often unequipped boat, to deliver his catch. To meet this difficulty, what are known as "run boats" or "buy boats" buy up the catch at these distant points and convey it to the crab house. When the boat is owned by a dealer and its captain is working on a commission, it is referred to as a "run boat." When the captain is buying crabs on his own responsibility and selling them where he chooses, it is styled a "buy boat." These boats are from 40 to 60 feet long and usually are equipped with both sails and engine. In many cases owners of dredge boats use their craft as run boats during the summer season. The run-boat operator usually is allowed 25 cents profit per barrel. Seventy-five to 100 barrels may be carried on such a boat. Trips are usually made each day to the desired region, where the boat is anchored in a cove or the mouth of a river, and the crabbers gather about and sell their catch from their boats (Pl. IV, fig. 1). A supply of bait is kept upon the run boat and this is sold by the pound to the trot-line crabbers.

As stated above, much of the catch of the western shore of Virginia is sold to run boats operating from Crisfield or Hampton. There are very few run boats or buy boats running from any other than these two places.

## PREPARATION FOR MARKET.

A few of the hard crabs are shipped alive in barrels to the large markets by the individual crabbers. Nearly all of the catch, however, whether hard or soft, is sold directly or indirectly through the medium of run boats to crab shippers, "shedders," or packers. These

dealers maintain, at points as conveniently located to the crabbers and to transportation facilities as possible, what are referred to in general as "crab houses."

## SOFT CRABS.

SOFT-CRAB HOUSES AND FLOATS.—If soft crabs and peelers are handled, the crab house is known as a "shanty," a "shedding house," or a "soft-crab house." It usually consists of a small wooden building supported on pilings over the water (Pl. IV, fig. 2). The floats in which the peelers are kept are tied to stakes in the water near-by. A wooden fence or breakwater is often built around the area in which the floats are tied (Pl. IV, fig. 2). At one side of this is erected a sloping platform on which the floats may be dried. The soft crabs which are brought in by the crabbers are bought for from 1 to 5 cents apiece and packed for shipment in the house. The peelers are put into the floats and left until molting occurs, when the resulting soft crabs are removed and packed for market in the house. The floats commonly employed (Pl. V, fig. 1) are made of pine or cypress and measure about 4 by 12 feet by 15 inches in depth. The sides are constructed of laths, placed vertically, with one-fourth inch spaces between them. The bottoms are made of 6-inch boards and are continuous. An 8-inch wing, also of wood, extends around the outside of the float halfway from the top. This supports the structure evenly on the water. This style of float is used throughout the Crisfield region and seems the best adapted to the purpose of any which were observed. At Oxford, Md., the floats are constructed in a similar manner, but are longer and are 2 feet in depth. Various other styles of floats are used at other points on the bay but in no great numbers.

The floats are hauled up on the sloping platform (Pl. IV, fig. 2) at intervals to allow their drying out and the cleaning off of débris and the sea growths which rapidly form upon them in the warm water of the summer season. Other floats take their place during this time.

The crabs are sorted into various lots before being put into the floats. Some floats will contain "green" peelers, which will not shed for several days; others, those in more advanced stages; and still others, the "shedding floats," will be filled with "rank" peelers, that is, crabs which are actually shedding or almost ready to do so. A crab in which the "back shell" has cracked loose from the apron is called a "buster" and will usually complete the process of shedding within an hour or so. No food is given the crabs while being kept in the floats, it not being considered practical to feed them for the short period during which they are kept there. Many crabs die while being kept in the floats, probably about one-third. The mortality is highest during hot weather. It has been suggested that the floats be shaded, but this has never been tried, as far as could be learned.

A crab when first molted is so soft that it would die very quickly if shipped. Therefore a few hours are allowed to elapse before it is removed from the float. If not removed for about 48 hours the crab will have become too hard for commercial use as a soft crab, a tough leathery shell having formed. Such a crab is called a "buckram." Buckrams which are found while crabbing are brought in by the crabber and sold to be cooked. They are, however, of little value for such a purpose as their tissues are watery and yield little meat.

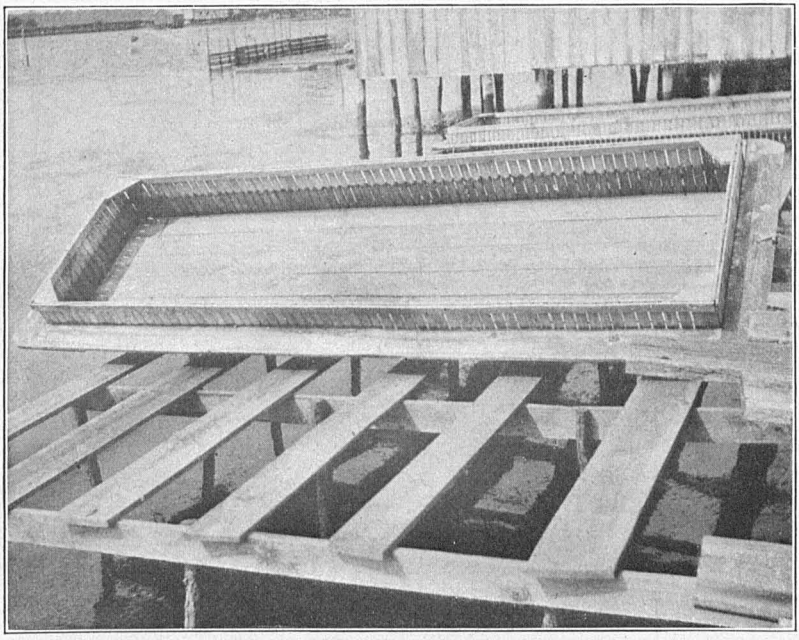

FIG. 1.—FLOAT IN WHICH "PEELER" CRABS (THOSE ABOUT TO SHED) ARE KEPT UNTIL SHEDDING OCCURS.

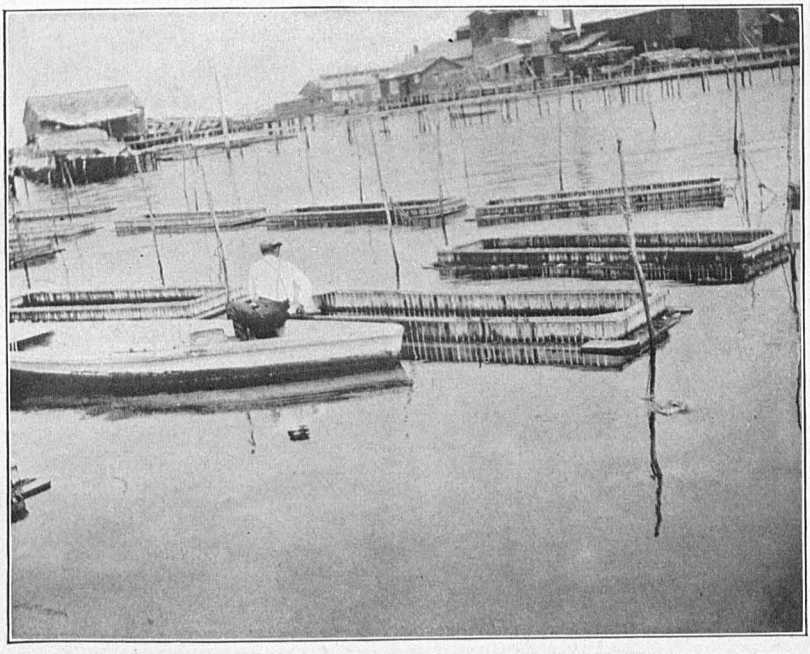

FIG. 2.—"FISHING OUT" THE SOFT CRABS FROM A FLOAT. THIS IS DONE ABOUT THREE TIMES A DAY.

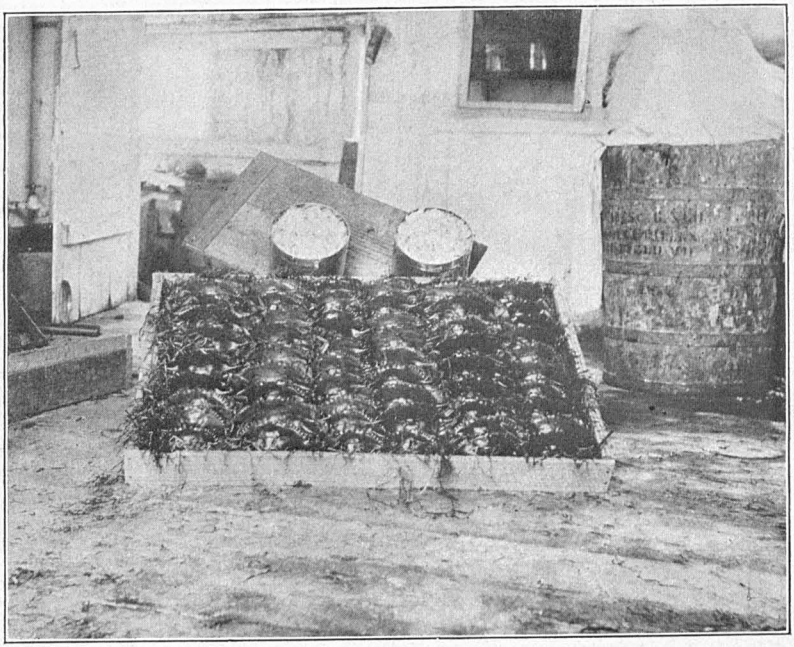

FIG. 1.—ABOVE—TWO 5-GALLON CANS OF "LUMP" MEAT READY TO BE COVERED AND SHIPPED, ICED. BELOW—TRAY OF "PRIME" (BEST GRADE) SOFT CRABS.

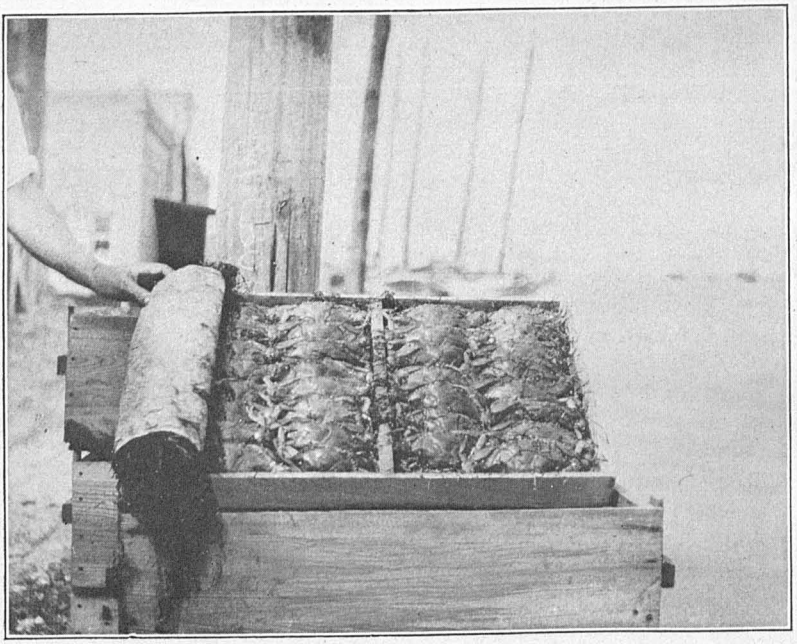

FIG. 2.—TRAY OF "JUMBO" (LARGEST SIZE) SOFT CRABS.

Compare with man's hand. Covering of parchment paper and seaweed rolled to the side.

Crab dealers buy to keep the good will of the crabber, who might otherwise take his catch elsewhere. A direct waste is involved in the use of buckrams.

The marketable crabs are removed from the floats by the use of a small hand net (Pl. I, fig. 1). As the soft crabs are relatively inactive, the bag of the net is very shallow, the mesh being often stretched tightly across the hoop. The crab can then be gently slid from the net into the box without the crabber being obliged to reach into the net and remove it with the hand. The floats are examined three or four times a day and the soft crabs removed, "fished out" (Pl. V, fig. 2), and packed for market.

GRADING AND SHIPPING.—Soft crabs are always shipped in the living state. At the present time none are canned before shipping. The unit of quotation is the dozen. Four grades are distinguished, depending on the size. These range from "culls," averaging about 3½ inches in width, through "medium," 4 to 4½ inches, and "primes," 5 to 5½ inches (Pl. VI, fig. 1), to "jumbos," 6 to 7 inches (Pl. VI, fig. 2). The primes are the best grade and command the best prices. The size limits of these grades are not fixed, but vary somewhat with the personality of the dealer, the exigencies of the catch and the state of the market. In shipping to some of the markets no separate class of jumbos is recognized, the large crabs being included in the primes. This is especially true in the early part of the season when few large crabs are yet obtainable.

Shallow wooden trays (Pl. VII, fig. 1) are used for packing the soft crabs for market. These vary considerably in size, being usually about 3 or 4 inches deep and 20 by 40 inches in the other dimensions. Each tray is of sufficient depth to accommodate one layer of crabs. Seaweed is spread over the bottom of the tray and the crabs are placed on it in rows in almost a vertical position (Pl. VI, fig. 1), each crab resting on its apron and lapping over the individual before it. This method of packing conserves space and the crabs live longer than if lying flat, since the water does not run out of their gills as readily. A sheet of parchment paper is placed over them and seaweed and crushed ice put over this. The paper and the seaweed on it may be rolled back, as shown in Plate VI, figure 2, to allow the crabs to be examined. Two or three trays are placed in a crate, the latter being of such a size that the trays fit neatly one above another without having room to slip about. There are sometimes strips on the inside of the crate to support the trays; sometimes each tray rests on the one beneath it. The crates are of various sizes, the one most commonly used weighing 80 pounds when packed with crabs, ice, etc. Such a crate holds on an average 15 dozen prime crabs. The crates are shipped by express. The percentage of crabs reaching their destination while alive is very good except in quite hot weather, when a number die.

## HARD CRABS.

HARD-CRAB HOUSES.—If the crab house is one at which hard crabs are handled, it is known as a "hard-crab house," or if the meat is picked out, as a "picking house" in Maryland and a "crab factory" in the lower part of the bay. These vary from small wooden structures to permanent buildings of wood or brick (Pl. VII, fig. 2), and are often well equipped with electricity, plumbing, and office

rooms. They are placed on a water front and have a wharf at which the crabs are unloaded from the boats. The apparatus for cooking the crabs is located either on the wharf or immediately within the house. Next the cooking room is the largest room in the building, where the picking is done. Smaller rooms where the meat is packed, office rooms, etc., usually adjoin.

In case a dealer handles both soft and hard crabs, the packing is done in a house devoted to both cooking hard crabs and the buying of soft crabs and peelers. The floats are tied to stakes in the water near by, in an inclosure such as is shown in Plate IV, figure 8. A board walk is usually built from the house out over the water to the float pound. To this are tied the small boats used in fishing out the crabs from the floats.

SHIPPING.—Hard crabs are to some extent shipped alive, packed with or without ice, in barrels. The large male crabs, called "Jimmies," are selected especially for such shipments. Sometimes, for shipments going only a short distance, twigs or branches with the leaves still fresh on them are packed about the crabs in the barrel and no ice used. Peach or fruit baskets are sometimes used in such cases. The great bulk of the hard-crab catch is steamed or cooked, the meat picked out and shipped on ice or after canning. Some cooked crabs are shipped whole on ice, the meat being picked out at the market.

METHODS OF COOKING.—For cooking, the crabs are usually placed in circular iron baskets about 3 feet in diameter and 16 inches in depth (Pl. VIII, fig. 1). The basket is lifted by a hand-operated crane and lowered into a circular metal tank or "cooker" (Pl. VIII, fig. 1). This is just large enough in diameter to accommodate the basket and deep enough to allow two or three baskets at once to be placed therein. A heavy iron lid is clamped on the cooker and steam passed through it, usually for about 25 minutes. The crabs are thereby killed and cooked, their shells being bright red in color when removed.

One firm at Hampton, Va., places the crabs in iron cars about 7 feet long by 2 in width and depth, and rolls these cars on a track into rectangular, horizontally placed cookers which will hold two cars at once (Pl. VIII, fig. 2). The cars are made basket fashion of iron strips.

Various forms of wooden cookers are used also, especially at points in Maryland (Pl. IX, fig. 1). One of the commonest sorts is simply a box made of pine boards from 1 to 2 inches thick. The box is usually about 8 feet in length by 4 in width and depth. A grating made of wooden slats is placed about 4 inches from the bottom of the box. This holds the crabs up off the bottom and allows the steam to have free access to them. No baskets are used, the crabs being dumped directly into the box. Steam is admitted through a pipe from the boiler, the pipe entering the box near the bottom at one end. A lid of planks covers the box during the cooking. Small holes in the bottom allow the escape of the water from the condensed steam. After the cooking is completed, the box is turned upon one side by lifting on a wooden bar running along the side, and the crabs dumped out upon the floor of the cooking house. In some cases there is a door along one side of the box near the bottom to allow the crabs to be removed without having to turn the entire box over (Pl. IX, fig. 1). In other cases there are two large

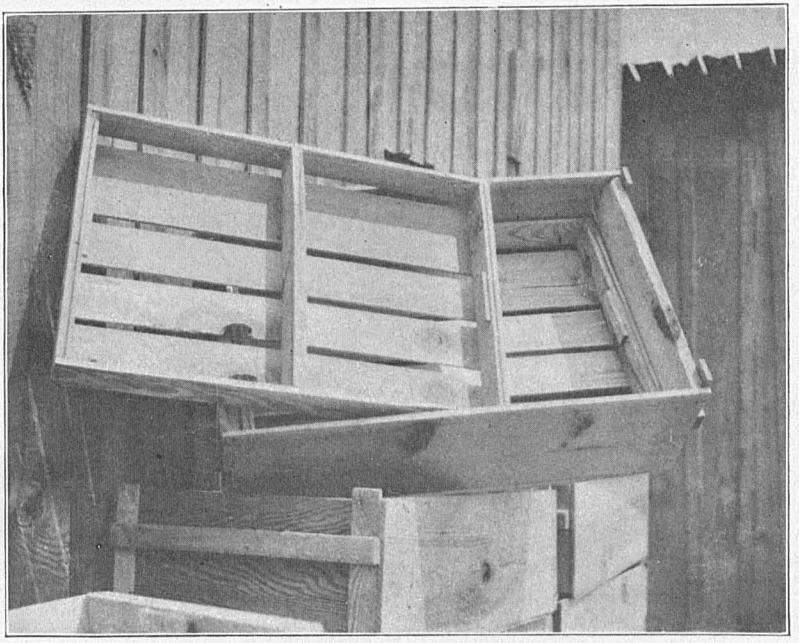

FIG. 1.—CRATE AND TRAYS IN WHICH SOFT CRABS ARE SHIPPED.

FIG. 2.—A CRAB PACKING AND SHIPPING PLANT ("FACTORY") AT HAMPTON, VA.

Under the shed are boilers, cookers, iron baskets, etc.; cart removing scrap on the right; run boat in the center; trot-line boats on left.

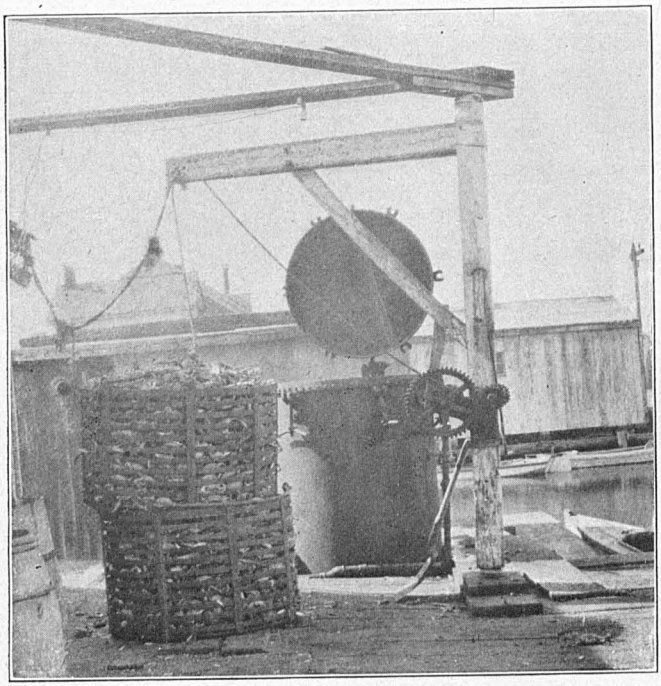

FIG. 1.—IRON COOKER OR "KETTLE," THE USUAL APPARATUS EMPLOYED IN STEAMING HARD CRABS.

The baskets of crabs are hoisted in and out of the cooker by means of the crane. The tongs hanging on the upright post are used in picking out individual living crabs in case any sorting of the catch is desired.

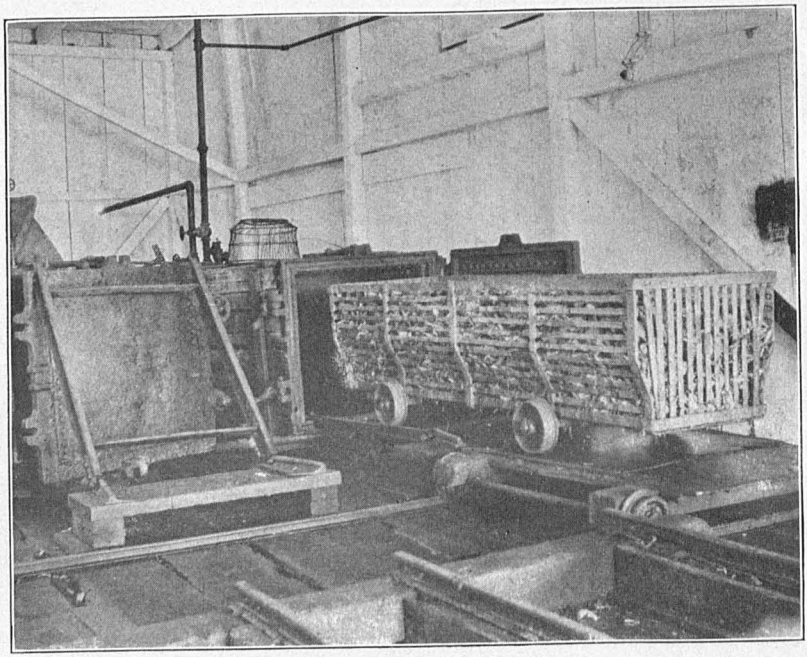

FIG. 2.—CAR OF CRABS READY TO BE RUN INTO A HORIZONTAL IRON COOKER.

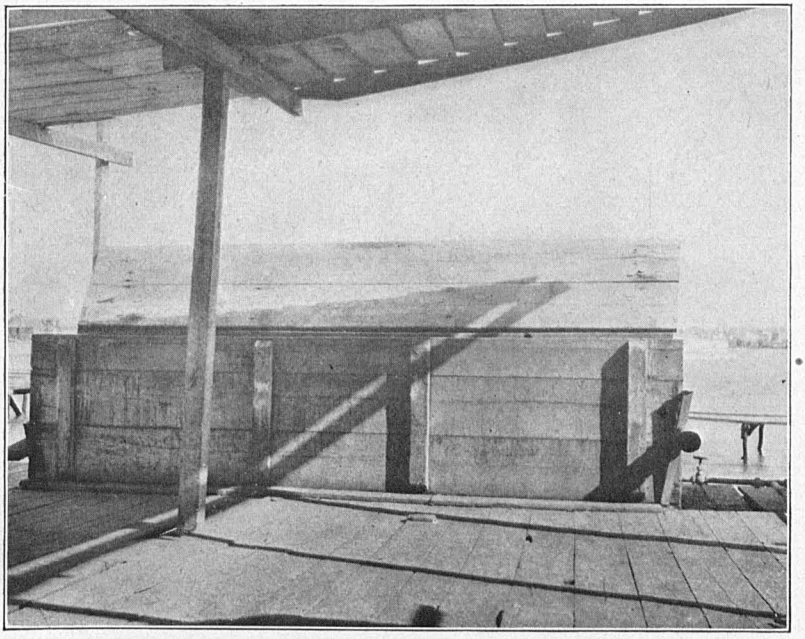

FIG. 1.—ONE FORM OF BOX OR WOODEN COOKER, USED AT POINTS IN MARYLAND.

The crabs are removed by taking out the wedges shown at the ends and thus allowing the front side of the box to drop forward.

FIG. 2.—A BARREL COOKER USED AT ANNAPOLIS.

After cooking, the barrels are lifted by the rope and pulley and swung on a crane over the picking tables.

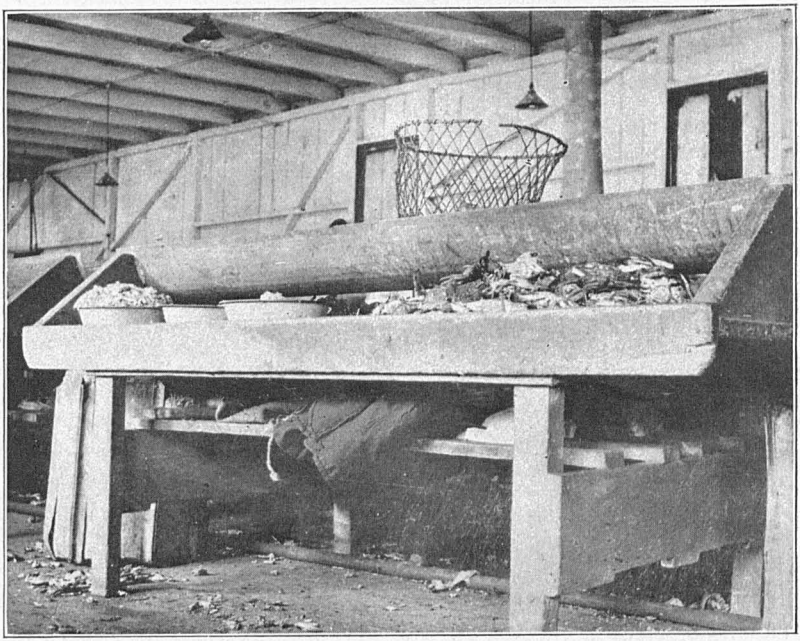

FIG. 1.—ONE FORM OF PICKING TABLE, SHOWING COOKED CRABS, PANS OF MEAT, AND BASKET IN WHICH CRABS ARE CARRIED IN FROM THE COOKER.

The waste is thrown into the trough at the top and thence pushed out the ends into large metal cans and dumped onto a barge outside.

FIG. 2.—"KNOCKING OUT," OR MAKING THE PRELIMINARY CLEANING OF THE SHELLS.

wooden rockers under the box and two on the side. During the steaming the box is kept steady by blocks placed under the ends of the rockers. When these are removed the entire cooker may easily be rolled over on to the rockers on the side and propped in a sloping position with the top lower than the bottom. The crabs can then be removed readily.

Two firms at Annapolis, Md., use cookers made from wooden barrels (Pl. IX, fig. 2). Two or more barrels are connected with the steam pipes in such a way that each may be operated independently. The pipe enters the side of the barrel (which stands upright) near the bottom and branches into the form of a U. Numerous openings along the U permit the exit of the steam. There are small holes in the bottom of the barrel to allow the water from the condensed steam to drain out. The crabs are placed directly in the barrels, no baskets being used. A gunny sack is placed over the top and on this the barrel lid. A bail and a hand-operated crane admit of the barrels being lifted independently and swung over the picking tables, where the crabs are dumped.

PICKING CRAB MEAT.—When the other kinds of cookers are used, however, the cooked crabs are carried, usually in wire baskets, to the picking tables. These are of various sorts, one being represented in Plate X, figure 1. Others consist of a mere flat-topped table of pine boards or a shelf extending along the wall. The back shells are first removed and preserved separately. The meat is then "picked" out from the body of the crab, a sharp-pointed knife being used in the process. The picking is usually done by women or girls, though boys and occasionally men are employed. At Virginia points the pickers are Negroes. In Maryland white pickers as well as colored are employed, the two races sometimes working together in the same house. The amount picked out by each person is weighed or measured at intervals and an individual score kept, payment usually being made each Saturday. Payment is made according to the gallons or pounds of meat prepared. An experienced picker can prepare from 60 to 70 pounds of meat a day.

The crab meat is divided into three grades, depending on the region of the body from which it is taken. The three are usually kept separate by the pickers and quoted separately on the market. The "lump" meat is considered to be the best and commands the highest price. It consists of the meat from the muscles which operate the swimming legs, or back fins. The "white" or "flake" meat ranks next in value and is made up from the remaining muscles of the body with the exception of the claws. The "claw," as the meat from the last is known, ranks lowest in price because of its dark color, though it is considered by many to have the best flavor of the three grades.

The three kinds of meat are packed separately in tin cans (Pl. VI, fig. 1), with perforations in the bottom, and varying in capacity from 1 pound to 5. The cans of meat are packed in barrels with ice and shipped by express.

One gallon of meat weighs 5 pounds. From 3 to 4 gallons of meat may be picked from 1 barrel of crabs. This depends largely on the condition of the crabs, whether they are "fat" or "poor." In the spring and summer, crabs are usually poor; that is, the muscles

are shrunken and the tissues watery and not as much meat will be yielded. In late summer, fall, and early winter the crabs are fat, the muscles being full and yielding the best returns.

SHELLS.—The back shells, "shells" being the trade name, are first "knocked out" (Pl. X, fig. 2); that is, the portions of the reproductive organs and liver (both together popularly called "fat") which adhere to the shells are removed, usually by boys. The shells are then placed in large wire crates or baskets and washed by methods varying from a mere dip in sea water to a careful cleansing in vats of hot water (Pl. XI). For drying they are in some cases spread on shallow trays about 10 feet long by 4 feet wide (Pl. XII, fig. 1), consisting of a frame of narrow boards with a bottom of chicken-wire fencing. The trays are arranged in tiers in a shed with open sides (Pl. XII, fig. 1). In other cases the shells are spread, after washing, on a floor or on a wharf until dry. The shells are used in the preparation of deviled crabs, a certain number being sent in cartons or barrels with the shipments of meat.

CANNING.—The canning of the meat is practiced by only two firms, both located at Hampton. In the case of one of these it is a very small feature of the business, but in the other case it is the main part of their trade, the shipping of fresh iced meat being a side issue. For the purpose of canning, the methods of cooking and picking described above obtain. This firm uses the cars for cooking (Pl. VIII, fig. 2). All three grades of meat are canned together, the sizes of the cans ranging from a capacity of from 4 to 16 ounces. The meat keeps indefinitely, as in the case of other canned products. The actual methods employed in the canning process are kept secret.

SCRAP.—The "scrap" or waste remnants of shell, left after the meat has been extracted, is sold to fertilizer factories. It is removed on barges by water (Pl. XII, fig. 2) or by carts on land (Pl. VII, fig. 2). There are several factories, one being located at Bellevue, Md., one at Crisfield, Md., and one on Back River, Va., and others at various points.

## PRICES AND WAGES.

### SOFT CRABS.

The prices paid the crabbers and received by shippers vary with the seasons of the year. The average price received by shippers at Crisfield, in 1916, was, for primes 80 cents per dozen, highest $1.15 to $1.25; mediums 55 cents, highest 75 cents; culls 30 cents, highest 40 cents. In the season of 1917 the crabbers were paid from 2 to 3 cents apiece for soft crabs and peelers.

### HARD CRABS.

The prices paid by the packers vary from about $1 per barrel during July and August to $4 and even $5 or $6 during February and March. The barrels, however, are of two sizes, the trot-line men using slat barrels and the dredgers sugar barrels, the former holding two-thirds as much as the latter. At Hampton some dealers buy the crabs by weight, paying the crabbers from 1 to 3 cents a pound. A slat barrel will hold about 110 pounds of crabs,

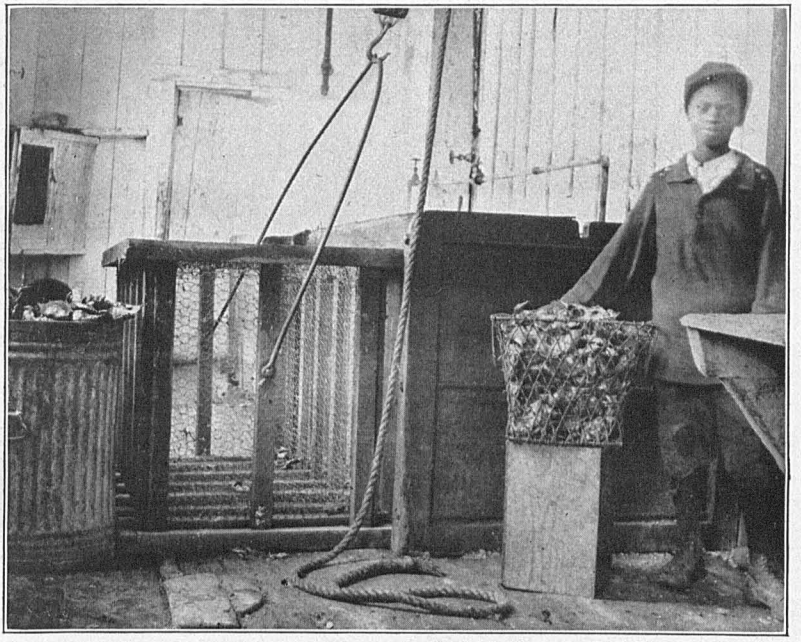

FIG. 1.—ONE METHOD OF WASHING SHELLS.

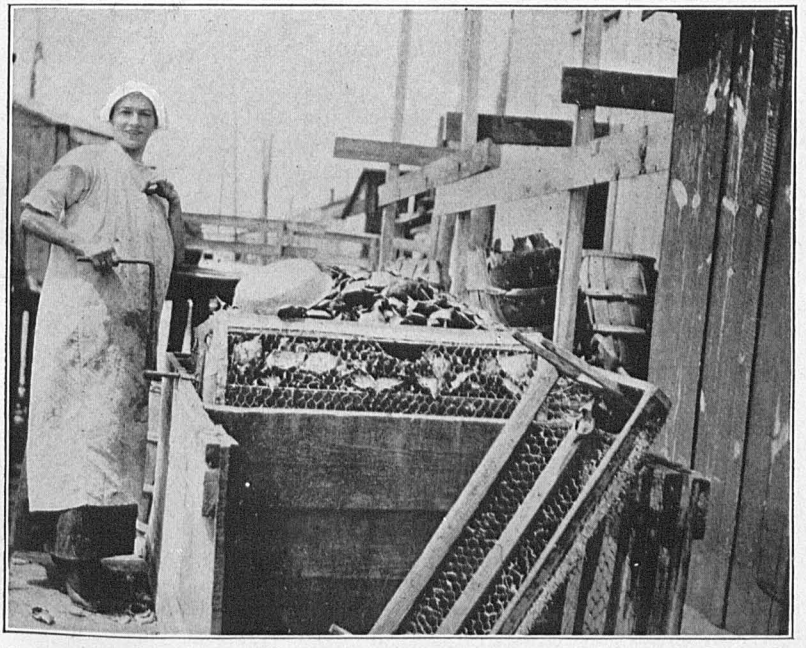

FIG. 2.—A METHOD OF WASHING SHELLS.

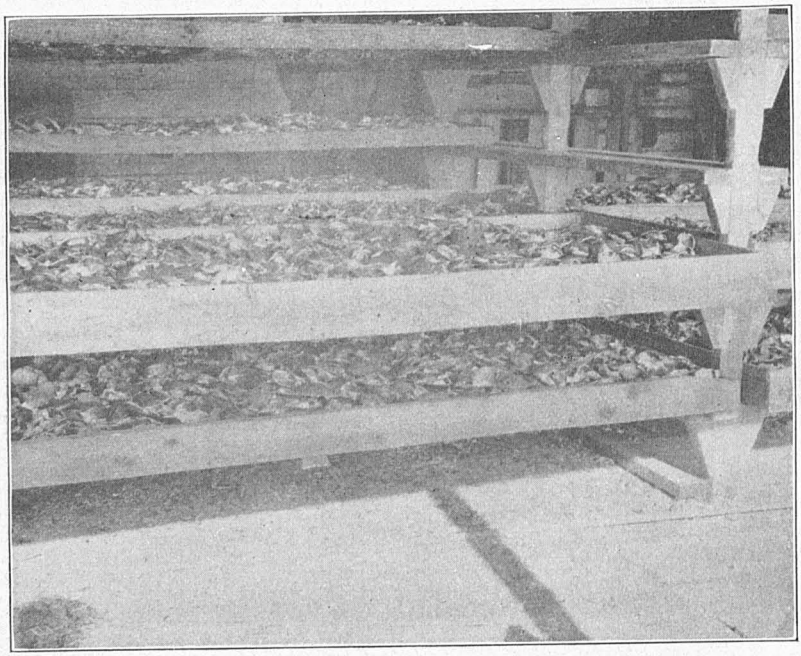

FIG. 1.—TRAYS OF SHELLS IN THE DRYING SHED, WHICH IS OPEN TO THE AIR.

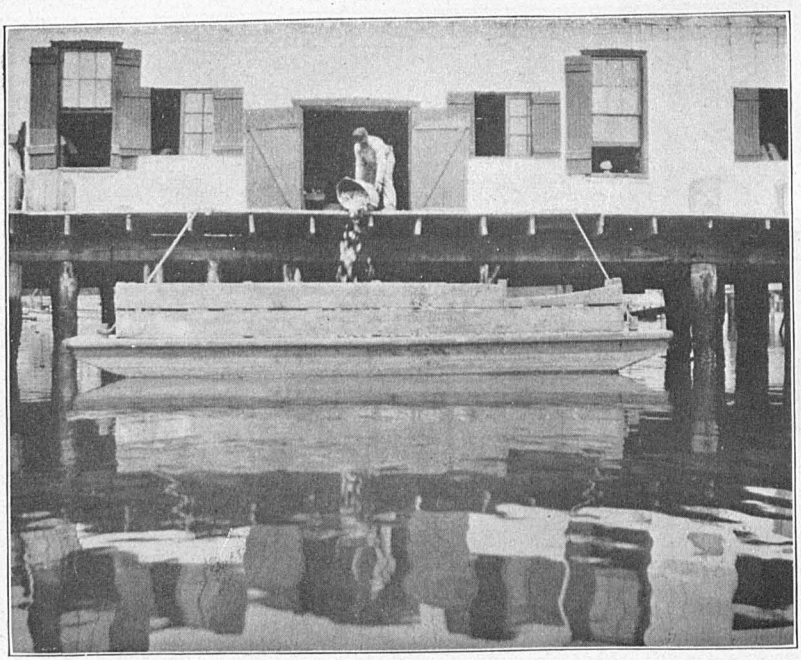

FIG. 2.—EMPTYING "SCRAP" OR WASTE UPON A BARGE TO BE TOWED TO THE FERTILIZER FACTORY.

a sugar barrel about 165. Crabs are cheaper during the summer months because of their greater abundance, the greater number of crabbers, the slackening of the demand for the meat, and the fact that the trot-line men operate at a much lower expense than do the dredgers. During the hot weather the fresh meat spoils more readily and is not handled by as many customers as during the winter. The heaviest demand for fresh meat is at about the winter holidays. The demand for the canned meat is not subject to this peril of decay and is sold wholesale to jobbers at fixed prices throughout the year.

The prices received for the three grades of iced meat vary, then, with the seasons, being lowest in the summer and highest in the winter. A fair average for the year is lump meat $2 per gallon, white $1, and claw 65 cents. During the winter lump meat sells as high as $4 a gallon.

Scrap is sold to the fertilizer factories at $1 per ton at Hampton. At Crisfield it is sold at 3 cents per barrow load, this being a unit rather too elastic to suit the seller in many cases.

Pickers receive from 3 to 4 cents per pound. Experienced workers often make as high as $12 to $15 per week, which involves picking out 60 to 70 pounds of meat a day.

Laborers about the plants receive from $8 to $12 per week. Hands on the dredge boats receive $7 to $12 per week. Boys are employed to clean shells at 10 cents per 100 shells.

# THE FLATWORM AS AN ENEMY OF FLORIDA OYSTERS

By ERNEST DANGLADE
*Formerly Field Assistant, U. S. Bureau of Fisheries*

**Appendix V to the Report of the U. S. Commissioner of Fisheries for 1918**

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# THE FLATWORM AS AN ENEMY OF FLORIDA OYSTERS.

By ERNEST DANGLADE, *Formerly Field Assistant, U. S. Bureau of Fisheries.*

## INTRODUCTION.

During February, 1917, the Bureau of Fisheries and the Florida Shell Fish Commission made an investigation of a series of oyster areas on both the east and west coasts of Florida with regard to a reported destruction of oysters by a parasite, which later proved to be a polyclad turbellarian, or flatworm. As early as March, 1916, Dr. R. E. Coker stated, in unpublished field notes, that a worm, known locally as the "leech," was reported to occur occasionally on some of the oyster bars in the vicinity of Tampa, and sometimes to cause within a very short time an enormous mortality among the planted oysters, and that the fear of the pest served to deter the oyster planters from extending the cultivated areas. In the latter part of December of the same year T. R. Hodges, State shell fish commissioner of Florida, submitted to the Bureau a number of oysters, taken from the beds near Cedar Keys, affected with the so-called "leech." The oysters, which had been packed in ice, were alive when received in Washington, and contained from 2 to 3 flatworms each; however, the worms were dead, probably having been frozen in transit. The attacks of this parasite on oysters in these two localities, Tampa and Cedar Keys, are the only ones that had ever come to the attention of the Bureau.

The writer was informed by R. E. Gibson, an oyster dealer and planter of Tampa, Fla., that the worms, or so-called "leeches," had been observed attacking the oysters on some of the oyster bars in the Tampa Bay region at more or less regular intervals during the past 20 years, and particularly during the oyster season 10 years ago. The worms would disappear entirely from the beds for a period of 2 or 3 years and then reappear, the reoccurrences apparently running in cycles. Compared with the attack of the season 1916–17, the previous infestations and mortality were said to have been less extensive and harmful.

On the east coast of Florida a similar outbreak of the worms was observed 10 years ago at three or four points on Indian River. The principal infected localities in that body of water were Indian River Inlet, Bethel Creek, and Orchid. After a very serious and damaging attack, from which some oyster bars were practically depleted or greatly reduced in productivity, the trouble ceased and has not occurred there since. The oyster bars in the meantime have recovered their normal condition.[a] It is interesting to note that the destruction of oysters by turbellarians was reported by David G. Stead

[a] This information was furnished by E. F. McDonald, a practical fisherman of Port Orange, Fla.

from New South Wales in 1907.[a] His notes regarding the discovery of their injurious effect upon oysters are of interest:

A few years ago I found that this worm was known to a few of the oyster farmers of Georges River, who had repeatedly observed it amongst oysters on various leases, and that they distinguished it under the name of "wafer." As this name appears to be fairly suitable, I propose for the future to use it in speaking of this worm. Though, as I say, the wafer has been known to certain lessees, no definite connection between the oyster and this worm has been shown to exist, and no satisfactory evidence has been brought forward to show that the latter was to be added to the already long list of oyster pests. However, in the light of recent evidence, I think it will be found that this is a pest; that it is at times to be seriously reckoned with, and that it will be found to be fairly widespread in our oyster-producing waters.

At the end of July this year [1907], J. W. Swainson, of Georges River, handed to me for determination a number of examples of the wafer, which, he said, was very plentiful on his leases at that time. No visit was made by me for the purpose of investigating the matter. During the early part of September Fisheries Inspector Latta brought in a specimen of an oyster (from a lease in the Hawkesbury River) which was in the last stage of destruction by one of these flatworms, and which contained the worm itself. This specimen had been handed to Mr. Latta by J. Izzard, who had stated that the worm was very plentiful on his leases at Bar Island and Pelican Island, and that apparently it was destroying the oysters. Upon this it was so arranged that I made a short visit to the locality in question, for the purpose of obtaining more definite information. At Bar Island I found the wafer present in large numbers, and some were found actually at work between the valves of the oysters. Large numbers of gaping shells of oysters only recently killed were to be seen on all hands, while the same was apparent on Pelican Island (which is submerged at high water). In view of the very positive evidence obtained at the time, it is only fair to assume that at least a part of these—if not all, probably a very large percentage—had succumbed to the attacks of the wafer. I must here point out that although the common oyster worm (Polydora or Leucodore) was only too abundant on portions of these leases, none of the recently dead and gaping shells which I examined showed the least sign of its attacks or of the attacks of the common "Drill" or "Borer" (Urosalpinx), although I found the latter (previously unrecognized from this locality) to be fairly plentiful.

It is of interest to mention that at the time of my visit the oysters were all "opening very badly"; that is, they were in poor condition and were likely to remain so until the advent of a freshet in the river.

## OCCURRENCE OF THE TURBELLARIAN IN 1916-17.

The distribution of this turbellarian in sufficient abundance to attract attention from oystermen, during the oyster season, 1916–17, appears to have been confined to the western coast of Florida, between Cedar Keys on the north and Tampa Bay on the south, a distance of about 110 miles. It was stated that the southern limits had probably extended, at some of the earlier periods, as far south as Cape Sable, making an approximate range of 300 miles.

In the vicinity of Cedar Keys, Port Inglis, and Tampa the greater number of the oyster bars, especially in the more saline districts, were infested and had suffered to a greater or less extent. The conditions were so bad that, for a time, the industry appeared to be seriously threatened. The loss, as reported, ranged from 10 to 20 per cent of the stock on some beds to the destruction of one entire bar. A planted bed of 35 acres in Tampa Bay was attacked by this worm and the mature and young oysters alike were said to have been completely annihilated. The bed had been planted just two years and had given promise of excellent returns.

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a David G. Stead: Preliminary Note on the Wafer (*Leptoplana australis*), a Species of Dendrocoelous Turbellarian Worm, Destructive to Oysters. Department of Fisheries, New South Wales, November, 1907; pp. 1-6. (No other references to turbellarians attacking oysters have come to the writer's attention.)

At Port Inglis and Cedar Keys the destruction during the season was estimated to be about 30 per cent. One or two localities, however, revealed a mortality as great as 90 per cent, but the excess should not be attributed to the turbellarian, since many of the empty shells or "boxes" contained spat which had set before the depredations of the worms had occurred, the mortality of these oysters being due evidently to other causes. When the devastation was at its height the affected oysters, as a rule, contained from 1 to 3 worms, although as many as 8 or 10 are said to have been taken from a single oyster. During the early part of the season about 100 oysters per barrel contained worms, but by February, the time of the examination, the trouble had abated to such an extent that not more than 1 or 2 worms were taken in 20 barrels of stock. It is worthy of remark that on the Port Inglis and Cedar Keys bars no small oysters were found or reported containing worms, nor did any of the empty shells of the small sizes show any malformations indicating that a defensive struggle had taken place.

## DESCRIPTION OF THE FLATWORM.

Although this pest is known to the oyster dealers, planters, and shuckers of Florida as the "leech," it is an animal of very different type, belonging to the branch of wormlike animals called platyhelminthes, class turbellaria, and order polycladida.[a] Since the general character and habits of this turbellarian compare closely with the similar pest found in New South Wales, and described by Dr. Stead, the name "wafer" would be a more suitable and less misleading one for common use.

The worm is almost flat, more or less circular in outline, and measures from about one-half to three-quarters inch in diameter. It has occasionally been observed, when feeding, to be so distended that it would cover half the body of the oyster. When disturbed it usually rolls up into a sort of a tube, the margins then becoming curled and very irregular. The upper surface is drab to dark-brown in color, sometimes nearly black, and at times finely stippled with darker spots; the central portion, posterior to the eyes, is, as a general thing, of a lighter shade than the remainder of the surface; when taken from an alcoholic solution and allowed to dry, a whitish mucus coating is observed. The lower surface is whitish to cream color. The worm, when removed from the oyster, is soft and slimy, and on very moderate pressure breaks up or runs into a jellylike mass, apparently without much structure. When placed in alcohol of about 75 per cent strength it becomes firm and somewhat leathery.

## PHYSICAL CONDITIONS.

The turbellarians were found to thrive in only those localities where the salinity of the water remained comparatively high, and not in areas where decided changes in density caused by freshets occur at certain seasons. The temperature is also an important factor in their activity and even their existence. If the water is chilled considerably below the normal it may cause their complete disappearance or

[a] Harry K. Harring, of the Bureau of Standards and custodian of Rotatoria, U. S. National Museum, is engaged in a study of the turbellarian, which will probably prove to be a representative of a new genus.

perhaps death. During the early part of February, 1917, there was a decided fall in the temperature throughout the greater portion of the State and many orange trees, early gardens, and much vegetation in general were killed; also many small fishes, crabs, and oysters on the shallower reefs were destroyed. Following this extreme, the worms practically disappeared from the oyster beds, and relief was expressed by those engaged in the oyster industry. Just about this time local rains reduced somewhat the salinity of the water, which was also an unfavorable condition for the worms.

Speaking of the turbellarian in New South Wales, Stead says: "Judging by my present data, they appear to be most plentiful during dry weather (and particularly while mild or high temperatures prevail), when the water of our estuaries is of greater density."

Dry, warm weather appears to be the most favorable condition for this enemy. The months of their greatest activity on the oyster bars are stated to be August and September, and if the weather continues warm, October, November, and December may be included.

The character of the oyster bottoms and the depth of water on the bars or reefs do not appear to have any direct influence on the depredations committed by the worms, since they were found active and damaging at all depths and on all kinds of bottoms, such as sand, firm mud, or shells.

## THE ATTACK AND RESULT.

It is not known how the worm gains admission within the valves of the living oyster, and we were not fortunate enough, while examining the beds, to obtain any data along this line. It is probable that the soft, velvety creature may flatten itself into a very thin wafer-like form and slowly work its way between the partially opened valves without producing a reaction on the part of the oyster. Some oystermen, who have observed the habits of the parasite, are of the opinion that the entrance is made along the ventral margin or gill side, about halfway between the hinge and tips rather than at the tips themselves, since this is near the point where the worm is usually found. The first reaction of the mantle of an infected oyster takes place at this mid-portion of the shell. (See figs. 1 and 2.) It is possible that entrance is made during the larval or immature stage of the worm, at a time when admission could be more easily gained, and development completed within the oyster.

Regarding the method of attack the following remarks are made by Stead:

> METHOD OF ATTACK.—After gaining an entrance between the valves of the oyster, the wafer proceeds to wrap itself round the upper part of the oyster, as close to the great adductor muscle (which so powerfully keeps the two shells shut) as it can get. It then proceeds to pour out a great amount of thick, stringy, slimy mucus, which perhaps has the effect of partly digesting the body of the oyster, so as to prepare it for absorption by the wafer. Certainly in those which have come under my notice, the adductor muscle, usually the hardest part of the body of the oyster, is, after being attacked by the wafer, quite soft, although smelling quite fresh.
>
> One aspect of the case which is very puzzling is, as to how the worm gains entry between the shells of the oyster without the latter "closing down" on it; as, if it did, the wafer would surely be nipped in two.

The worm is usually found on the right side of the body of the oyster, near the heart, between the adductor muscle and the anterior

end or hinge. By carefully opening an infested oyster and removing the right valve, the worm may be observed as a thin sheet, closely adherent to the meat, and more or less covered with a slimy mucus. (See fig. 3.) It was stated by the oyster dealer,[a] who was interested in this subject, that he had found the worms in about the same relative position mentioned above, but on the reverse side or between the meat and lower valve, so that it was necessary after taking off the upper valve to turn the oyster over in order to see the worm.

It was not determined how long the oyster can successfully withstand an attack or whether it is able to recover after an invasion. It is the opinion of some dealers that the oysters are killed within two or three days, but this is evidently too brief a period, at least for the majority of cases. An examination of many of the oysters showed plainly, both in the meats and shells, that a hard, continuous, and defensive struggle for existence had taken place. The oysters, which were alive when opened, were poor, watery, and shriveled, to a degree depending upon the duration of the plague. Being robbed of its juices and its vitality probably reduced by secretions of the worm, starvation and death would ultimately follow. Up to this time no odor of decomposition was observed.

When carefully examined, the meat and shell often reveal the successive stages of the battle between the feasting turbellarian and the helpless oyster. With a slow but continued loss of its life juices and consequently contracting meat, the mantle gradually withdraws from the margins, particularly along the ventral side, and leaves a dark or blackened border or band of shell substance. (See fig. 4.) As the struggle continues, a thin ridgelike deposit of the shell substance may form along the gill side about one-half inch from the edge of the shell, and extend from the hinge to the tips. (See fig. 5.) At times a second or inner ridge is secreted. (See fig. 6.) The oyster, now being reduced to a smaller space by additional loss of its juices, has thus accommodated itself to a still smaller shell cavity. These ridges are doubtless a mechanical consequence of the shrinkage of the oyster; they indicate that the attack is persisted in and that considerable time elapses before death ensues. The ridges and other deposits are composed of regular shell material—calcium carbonate, and conchiolin; nacreous and crystalline layers are both present. (See figs. 7 and 8.)

## CONCLUSIONS AND RECOMMENDATIONS.

1. Although oysters may be able to resist a brief invasion of the turbellarian, it does not appear that they possess the means to ward off an assault in harassing numbers, if long continued.

2. After the turbellarian has once gained admission within the oyster, there appears to be no method of combating the enemy. The defensive ridges deposited by the oyster afford only a temporary relief.

3. It is recommended that a careful working or cultivation of the beds in the infested district be carried on systematically, and that new, air-dried cultch and fresh seed stock be used when possible. All marine grasses and other objects under which the turbellarian

[a] Mr. Williams, Cedar Keys, Fla.

may secrete itself or deposit its eggs should be removed from the vicinity of the bars.

4. When it is desired to select a new area for planting and cultivation, it is advisable, other things being equal, to choose those localities where the water has sufficient depth to prevent overheating in summer, and also where the salinity may not attain too great a degree, as off affluents.

## EXPLANATION OF THE FIGURES.

[All figures are two-thirds natural size.]

Fig. 1. Left valve, showing a thin deposit of shell substance along the ventral margin from hinge to tips, and covering nearly one-half of the inner surface of the shell. The deposit had curled and peeled somewhat before the photograph was taken. The shell is empty. (Taken from Cedar Keys, Fla., Feb. 10, 1917.)

Fig. 2. Both valves, showing the results of the struggle between the oyster and the worm. Notice the shell deposits, particularly along the ventral margins. Parts of the meat are still clinging to the shell at the muscle scar. The worm had escaped. (Taken from Cedar Keys, Fla., Black Point Bars, Feb. 12, 1917.)

Fig. 3. Left valve with the meat, and the turbellarian *in position* near the adductor muscle. Notice the shriveled condition of the oyster, and the retreat of the mantle from the edges of the shell. The worm had contracted to about one-half of its spreading capacity. (Taken from Port Inglis, Fla., Feb. 10, 1917.)

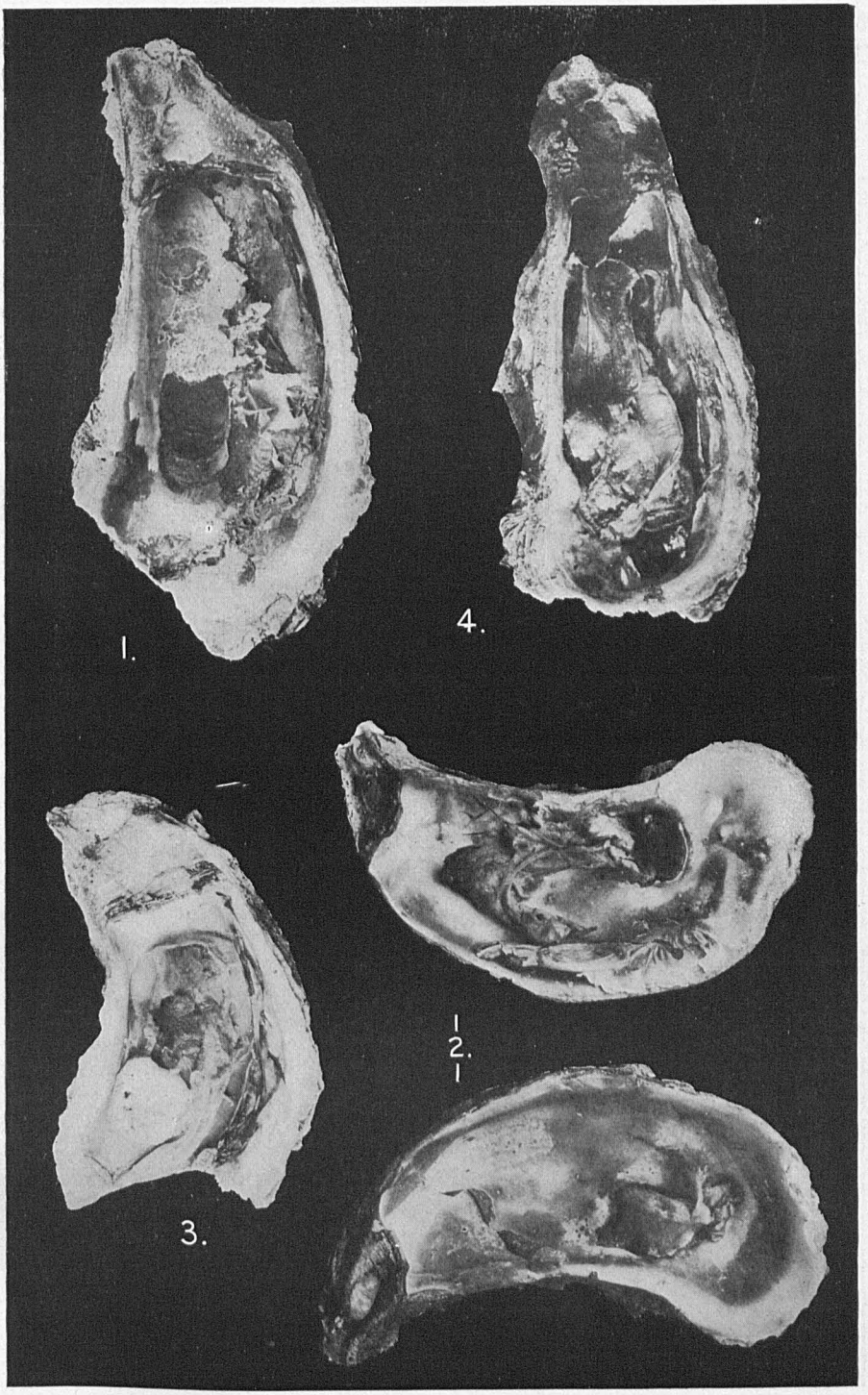
Fig. 4. Left valve with oyster showing the gills. Notice the "ridges" near the hinge and along the ventral margin. The oyster was shriveled and dead. The worm had escaped. (Taken from Port Inglis, Fla., Feb. 10, 1917.)

Fig. 5. Left valve, showing that the space occupied by the oyster was reduced, before death, about one-half. Notice the "ridge," beginning at the dorsal margin, then crossing adjacent to the hinge to the opposite side and extending to the tips. (Taken from Cedar Keys, Fla., Feb. 10, 1917.)

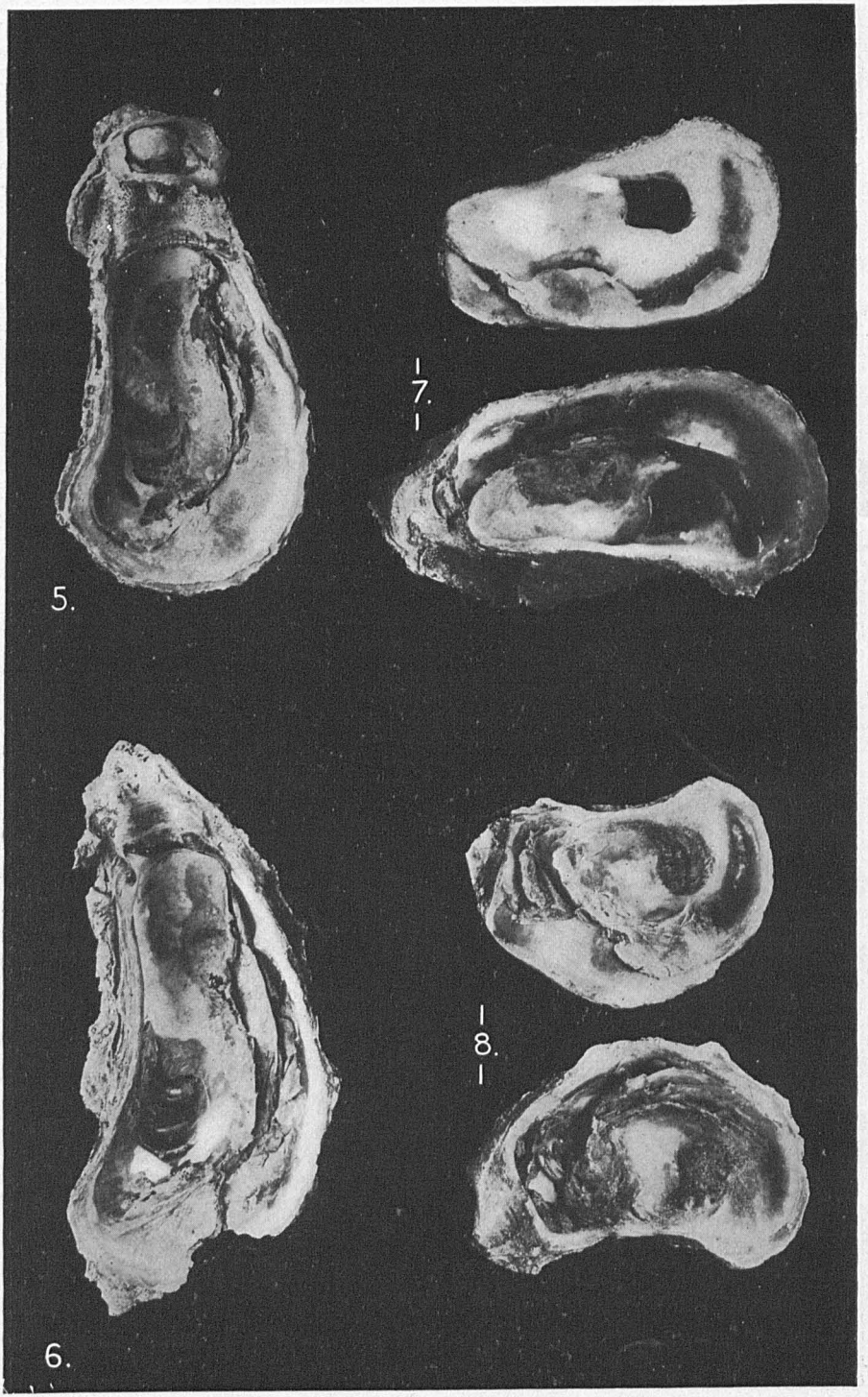
Fig. 6. Left valve, showing the reduced space occupied by the oyster just previous to death. Notice the two "ridges" or successive stages of retreat along the ventral margin, and the spreading out or fan-like condition at the tips. (Taken from Cedar Keys, Fla., Feb. 10, 1917.)

Fig. 7. Both valves, showing shell deposits of conchiolin and calcium carbonate. (Taken from Cedar Keys, Fla., Black Point Bars, Feb. 12, 1917.)

Fig. 8. Both valves, showing deposits of conchiolin and calcium carbonate. (Taken from Cedar Keys, Fla., Black Point Bars, Feb. 12, 1917.)




OYSTERS AND SHELLS, SHOWING THE RESULTS OF ATTACK BY FLATWORMS.




EMPTY SHELLS OF OYSTERS, SHOWING MALFORMATIONS RESULTING FROM ATTACKS BY FLATWORMS UPON THE LIVING OYSTER.

# TWO SPECIES OF MENHADEN OCCURRING ON THE COAST OF NORTH CAROLINA

By SAMUEL F. HILDEBRAND
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*Key West, Fla.*

**Appendix VI to the Report of the U. S. Commissioner of Fisheries for 1918**

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# TWO SPECIES OF MENHADEN OCCURRING ON THE COAST OF NORTH CAROLINA.

By SAMUEL F. HILDEBRAND,
*Superintendent, U. S. Fisheries Biological Station, Key West, Fla.*

The relationship of the species or varieties of menhaden occurring on the Atlantic coast of America has been for many years a subject of conjecture among ichthyologists. The most accurate account yet available appears to be the one published in the fifth annual report of the U. S. Commissioner of Fish and Fisheries.[a] Subsequent writers contribute little to our knowledge of the affinities of the various forms which have been noticed. In order to definitely determine their true relationship, the study of a very large series of specimens from various localities throughout the range of the genus will be necessary. Such a study, augmented by field observations, would be very helpful.

The purpose of the present paper is to contribute in a small way to our knowledge of the menhaden by showing the affinities, as revealed by structural characters and habits, of two forms which have been noticed at Beaufort, N. C., but which have not been distinguished by writers.[b] One of the these forms is doubtless the typical *Brevoortia tyrannus* (Latrobe), as understood by recent writers. The other form differs from the typical one so essentially, both in form and in habits, that it should be regarded as a distinct species. The writer refers this species somewhat doubtfully to *Brevoortia aureus* (Agassiz), for, as already indicated, we can not be certain of the true relationship of the several forms, variously regarded as species, subspecies, or varieties, until a more thorough study is made of the genus. The addition of another name at this time would probably only add to the confusion.

The description of the "fatback" is based on a very large series of specimens collected at various seasons in the vicinity of Beaufort, N. C. The "yellow-fin shad" is described from mature specimens only, since the young have not been observed.

### BREVOORTIA TYRANNUS (Latrobe).

Head, 2.98 to 3.3 in length of body to base of caudal fin; depth, 2.6 to 2.95; dorsal rays, 18 to 20; anal rays, 20 to 23; scales, in 47 to 54 oblique series along middle of side from posterior margin of opercle to base of caudal fin; vertebræ, 18+30.

[a] The natural and economical history of the American menhaden, by G. Brown Goode. Appendix to Report of U. S. Commission of Fish and Fisheries, pp. 1–529, 31 pls. Washington, 1879.

[b] I am indebted to Ed. Simpson and Arthur Newkirk, local fishermen, for first calling my attention to the different habits of the two species discussed in the present paper.

Body, oblong, compressed, rather robust; the back, moderately elevated, rather broad; the ventral outline, anteriorly slightly more convex than the dorsal profile; head, large, rather low, its depth at margin of preopercle less than its length; snout, rather short, 3.86 to 5.14 in head; eye, 3.25 to 5.27; mouth, large, oblique; maxillary, broad, reaching vertical from posterior margin of pupil, 2.12 to 2.44 in head; opercle and preopercle, with prominent radiating striations; gill-rakers, very long and slender, numerous, close-set; teeth, absent; scales, large, broad, rather regularly placed, not greatly reduced on caudal peduncle, strongly pectinate in adult, less so in young, the serrations very long and sharply pointed, with evident grooves between them at base; ventral scutes, prominent, 31 to 33 in number.

Dorsal fin, somewhat elevated anteriorly, with a low sheath of scales at base; caudal fin, deeply forked, the lobes a little shorter than head; anal fin, low, its base slightly longer than that of dorsal; ventral fins, small, scarcely longer than snout; pectoral fins, moderate, 1.62 to 2.17 in head.

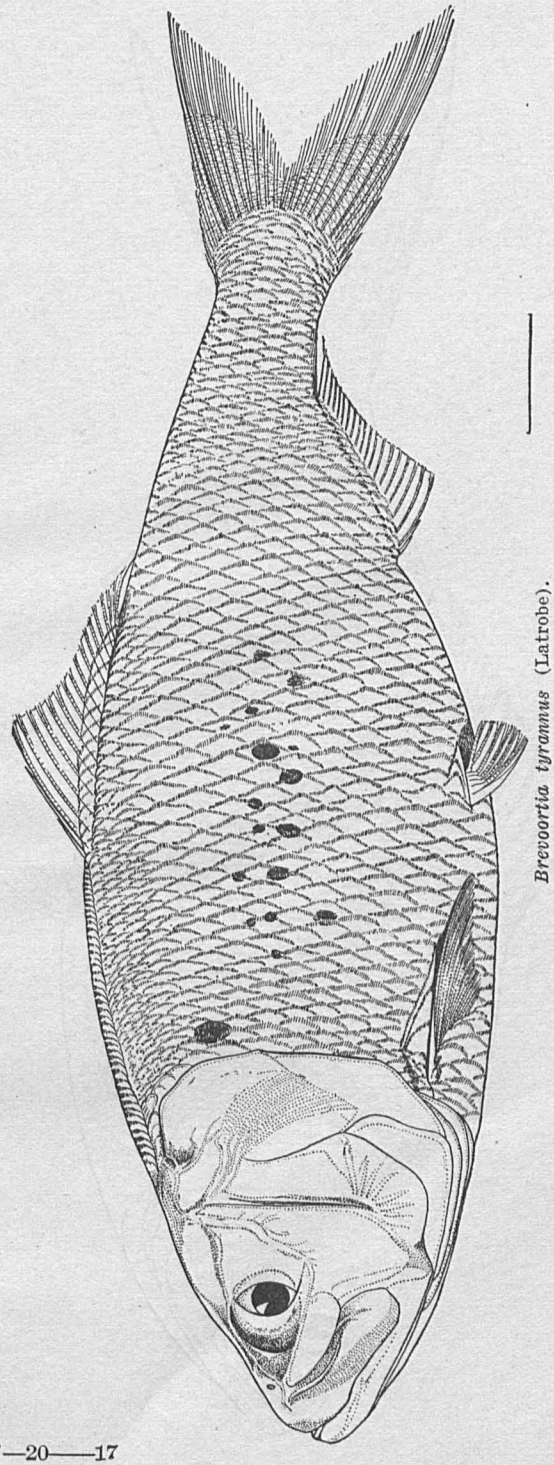
Color of back, dark green to bluish; sides, brassy; a round black humeral spot present, a variable number of smaller black spots behind it; fins mostly pale yellow, some of them often more or less punctulate with dusky.

This is the most abundant fish in the vicinity of Beaufort, where it is taken in large quantities, supplying eight factories which reduce it to oil and fertilizer (fish scrap). It is a migratory species, running in schools. Single schools ample to load a large fishing schooner are not infrequent. Large schools seldom enter the harbor, but small schools are common within the harbor. The species occurs at Beaufort throughout the warmer part of the year, but it is not always equally abundant. There is usually a period late in the spring, one in midsummer, and another late in the fall when large schools pass by. It is during these "runs," generally known as the spring, summer, and fall runs, that the fish are taken in large quantities. The fall run is, however, by far the most important one, as at this time the fish are not only much more abundant than during the other runs, but they are also usually bigger and fatter, therefore yielding more oil. Large, fat fish occasionally yield as much as 16 gallons of oil per 1,000 fish, the average for the fall fish being about 8 gallons per 1,000.[a]

This fish has long been used to a limited extent as food by the people of Beaufort and vicinity, but it is only within recent years that its use has become quite general. It is now the custom with a considerable proportion of the population to salt a quantity of menhaden each fall for winter use. It is, however, not yet marketable for other than local consumption. Since the fish is thoroughly wholesome, either in the fresh, salted, or smoked state, it is hoped that people of other communities, and particularly those living inland, will also soon learn to eat it and avail themselves of an abundant food supply. Experiments conducted by the writer show that the species when properly processed makes a palatable canned product.

The spawning habits of this fish are still imperfectly known. Menhaden heavy with roe are taken at Beaufort during the latter part of October and during November, and it is altogether probable that the eggs are pelagic and are deposited while the fish is on its southward migration. The smallest juveniles observed by the writer during several years collecting measured 50 mm. in length. Fish of this size are not infrequent in the harbor during May and June. They grow rapidly, reaching a length of about 95 mm. by the 1st of October. The full-sized menhaden is 300 to 350 mm. in length and is seen at Beaufort only during the fall.

[a] This information was offered by Charles P. Dey, a fertilizer manufacturer of intelligence and large experience.



*Brevoortia tyrannus* (Latrobe).

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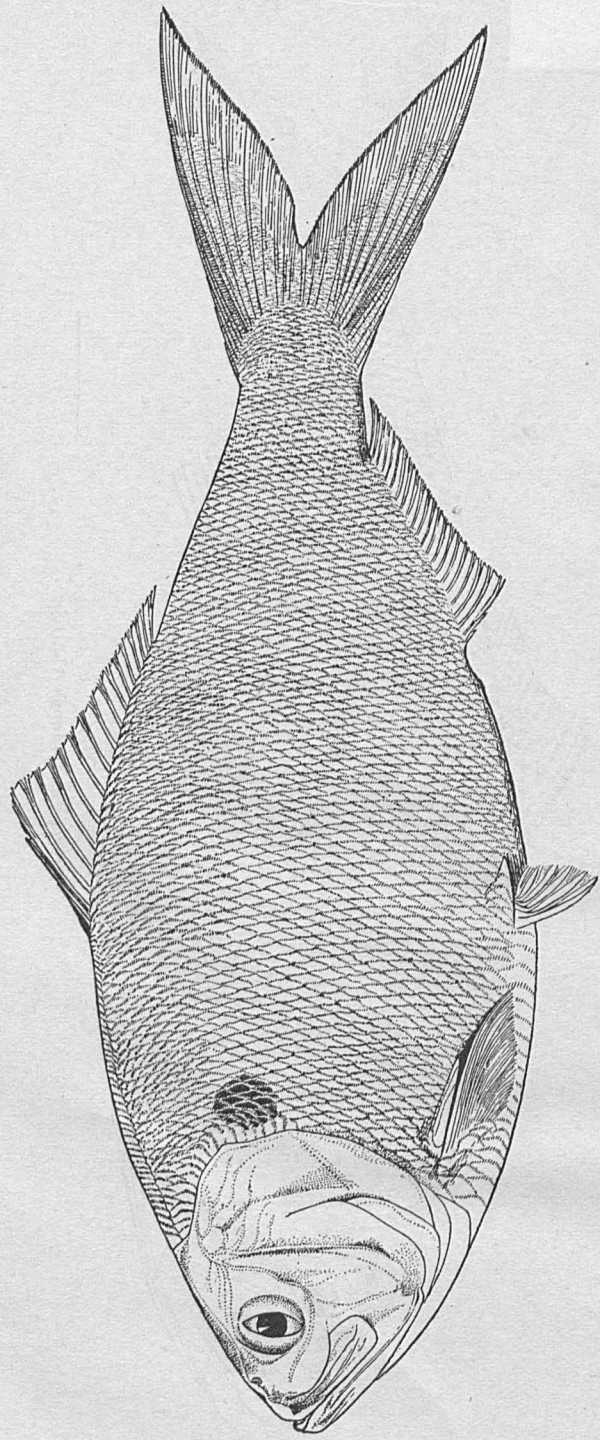

*Brevoortia aureus* (Agassiz).

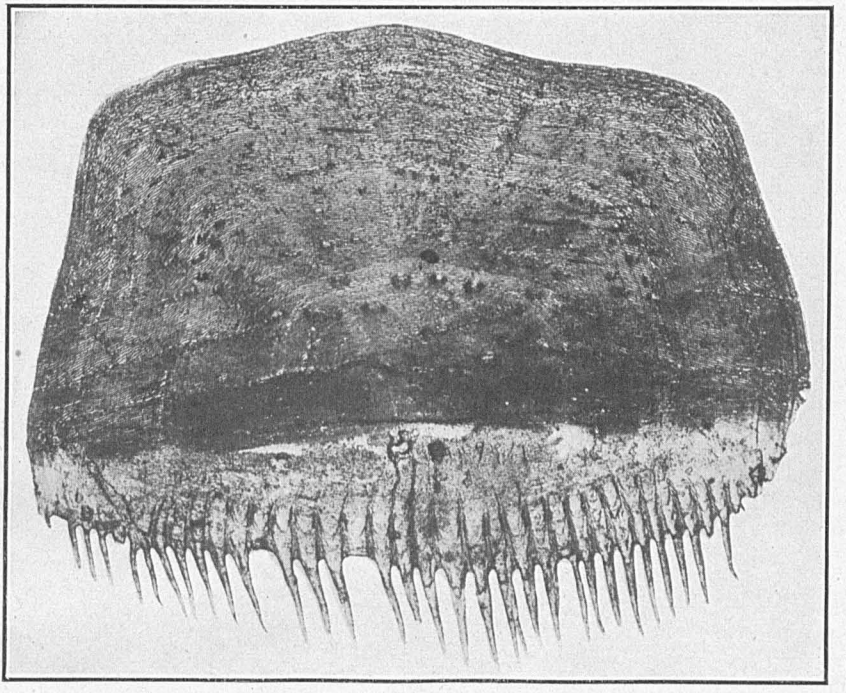

FIG. 1.—SCALE OF B. TYRANNUS, TAKEN FROM BELOW ORIGIN OF DORSAL AND A LITTLE ABOVE THE MEDIAN LINE OF THE SIDE. × 10.4.

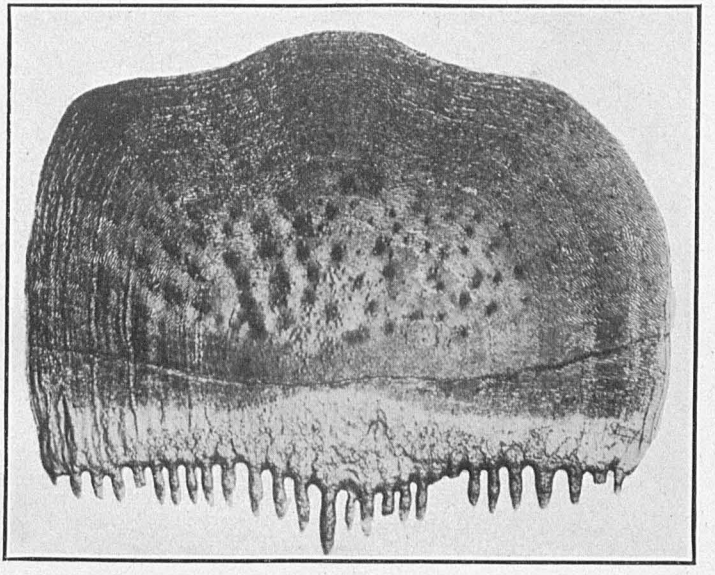

FIG. 2.—SCALE OF B. AUREUS, TAKEN FROM IDENTICAL POSITION ON FISH AS IN FIG. 1, AND FROM A SPECIMEN OF THE SAME LENGTH. × 10.4.

The menhaden feeds on floating plankton, which it is well able to obtain from the water through the mouth with its highly specialized gill-rakers. While the fish are feeding they perform characteristic whirling movements by means of which the fishermen are able to sight the schools.

This species is known by many names, viz, menhaden, bugfish, shad, oldwife, alewife, yellowtail, fatback, etc. Menhaden is the name most widely used throughout the range of the species, but at Beaufort it is nearly always called fatback. This name is in allusion to the broad back and the layer of fat which lies underneath the skin along the dorsal region.

### BREVOORTIA AUREUS (Agassiz).

Head, 3.1 to 3.5 in length of body to base of caudal fin; depth, 2.25 to 2.7; dorsal rays, 17 or 18; anal rays, 21 to 22; scales, in 63 to 73 oblique series along middle of side from posterior margin of opercle to base of caudal fin; vertebræ, 7+39.

Body, deep, strongly compressed; the back rather strongly elevated; the ventral outline, anteriorly notably more strongly convex than the dorsal profile; head, short and deep, its depth at margin of preopercle equal to its length; snout, short, 3.45 to 4.23 in head; eye, 3.75 to 4.85; mouth, large, oblique; maxillary, broad, reaching slightly past vertical from middle of eye, 2.15 to 2.22 in head; opercle and preopercle, with very feeble striations; gill-rakers, very long and slender, numerous, close-set; teeth, absent; scales, small, ctenoid, very irregularly placed, at least along the back, much reduced on caudal peduncle, the serrations blunt, finger-shaped, without evident grooves at base; ventral scutes, well developed, about 32 in number.

Dorsal fin, somewhat elevated anteriorly, with a low sheath of scales at base; caudal fin, deeply forked, the lobes of about equal length, longer than head; anal fin, low, its base a little longer than that of the dorsal; ventral fins, small, a little longer than snout; pectoral fins, moderate, 1.47 to 1.62 in head.

Color of back, bluish-green; sides, silvery; a large black humeral spot present, no smaller black spots behind it; fins, all golden.

The "yellow-fin shad" is much less abundant than the fatback. It is not known to school, but is taken within the harbor throughout the summer, usually only a few at a time. It inhabits the deeper waters and, unlike the fatback, is a vigorous swimmer and fights bravely when captured. When taken in a net it runs here and there, striking the net with great force, and if an avenue for escape is anywhere open it is almost sure to find it. By this habit it may at once be distinguished from the fatback, which is a sluggish species, offering feeble resistence when captured, usually striking the net a single time and remaining where it comes in contact with the web while it is being hauled in.

This fish, although not taken in sufficient quantity to be of much economic importance, has been marketable at Beaufort for many years. The fishermen call it the "yellow-fin shad" and say that it has a better flavor and fewer bones than the fatback. The only difference the writer was able to detect, however, is that the meat of the present species appears to be a little less oily.

The spawning habits of this fish are unknown. Only adult fish, ranging from 250 to 330 mm. in length, have been observed. The writer during nearly three years of persistent efforts was unable to find the young or any definite clue to the spawning habits. Large fish, 300 mm. and more in length, may be obtained within the harbor throughout the summer, but fatbacks of this size, as already stated, are obtainable only during the fall.

The yellow-fin shad feeds on microscopic organisms, but it does not appear to feed at the surface as does the fatback.

The following comparison of the two species described above, based on specimens of like size, will aid in showing their relationship:

| BREVOORTIA TYRANNUS. | BREVOORTIA AUREUS. |
|---|---|
| Body, elongate, robust; depth in length for 10 specimens, 2.6 to 3; average 2.85. | Body, deeper, less robust; sides less convex; depth in length for 10 specimens, 2.45 to 2.7; average 2.55. |
| Vertebræ, 18+30. | Vertebræ, 7+39. |
| Head, long and low, its depth at margin of preopercle less than its total length; head in body for 10 specimens, 2.89 to 3.3; average 3.07. | Head, short and deep, its depth at margin of preopercle equal to its total length; head in body for 10 specimens, 3.1 to 3.4; average 3.3. |
| Radiating striations on opercle and preopercle strongly developed. Scales larger, with long, slender, finely-pointed serrations in adult, evident grooves on margin of scale between the bases of serrations (Pl. I, fig. 1); rows of scales rather regularly placed, 47 to 54 oblique series along middle of side from margin of opercle to base of caudal; scales not greatly reduced on caudal peduncle. | Radiating striations on opercle and preopercle feebly developed. Scales smaller, with rather short and blunt serrations, no evident grooves on margin of scales between the bases of serrations (Pl. I, fig. 2); rows of scales very irregularly placed, 63 to 73 oblique series from margin of opercle to base of caudal; scales much reduced on caudal peduncle. |
| Caudal fin of moderate length, the lobes shorter than head. | Caudal fin long, the lobes longer than head. |
| A variable number of small black spots on side behind humeral spot; fins mostly pale yellow, more or less punctulate with dusky. | No small black spots on side behind humeral spot; fins all bright golden. |
| Body constantly with a dense coat of mucus. | Body almost wholly void of mucus. |

# ALASKA FISHERIES AND FUR INDUSTRIES IN 1918

By WARD T. BOWER
*Agent, Alaska Service*

Appendix VII to the Report of the U. S. Commissioner of Fisheries for 1918

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## INTRODUCTION.



## FISHERY INDUSTRIES.

MINOR FUR-BEARING ANIMALS.



FUR-SEAL INDUSTRY.

## FUR-SEAL CENSUS, PRIBILOF ISLANDS, 1918.

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SALMON CANNERY, CENTRAL ALASKA.

# ALASKA FISHERIES AND FUR INDUSTRIES IN 1918.

By WARD T. BOWER, *Agent, Alaska Service.*

## INTRODUCTION.

The work of the Bureau of Fisheries in Alaska falls under certain main heads, which may be stated as follows: Enforcement of the laws and regulations for the protection of the fisheries and fur-bearing animals; administration of the Pribilof Islands Reservation, and matters incidental thereto; the collection of statistics and the dissemination of information regarding the fisheries; the making of certain scientific investigations, chiefly in regard to the life history of the salmon and in connection with the fur-seal herd; and the conduct of fish-cultural operations.

The work of the Alaska service in regard to the fisheries and fur-bearing animals has been devoted in considerable measure to the enforcement of the laws and regulations. The patrol of the fishing districts was extended by the charter of several small power boats and the employment of a number of men temporarily as stream watchmen in the central and southeastern sections. The census of red salmon ascending Wood River was again taken, and the private hatcheries were inspected. Work was continued in the opening up of streams for the spawning of salmon.

Three formal hearings were held at Seattle in regard to fishery operations in the streams of southeastern Alaska, in the Copper River, and in the Yukon River, and as a result formal orders were issued imposing restrictions on operations. Detailed statistics were assembled covering practically all features of the varied fishery industries of the Territory. Statistics of the shipments of furs were also compiled.

The work in connection with the Pribilof Islands expanded greatly in 1918 with the resumption of commercial killing of seals. A number of natives were secured from Unalaska to aid in the work, and temporary assistants were employed for sealing operations and general construction and repair work on the islands. Necessary transportation of supplies and products was furnished by the Bureau's steamer *Roosevelt,* together with some cooperative assistance by the Navy Department. Fur-seal skins and fox skins were taken and preserved as usual. A by-products plant was erected on St. Paul Island for the conversion of seal carcasses into oil and fertilizer. Cold-storage facilities were planned, and the general administration of the natives' affairs was carried on. A census of the fur-seal herd was taken as heretofore. Two sales of fur-seal skins and one of fox skins were held during the year at St. Louis, Mo.

Acknowledgement is made of valuable aid in the preparation of this report by Assistant Agent E. M. Ball, who compiled the statistics of the fisheries and prepared much of the accompanying text. Dr. G. Dallas Hanna assisted in the preparation of items regarding the Pribilof Islands.

## REGULAR EMPLOYEES, ALASKA SERVICE.

During the year 1918, the following regular employees have been identified with the Alaska service of the Bureau:

REGULAR EMPLOYEES IDENTIFIED WITH THE ALASKA SERVICE IN 1918.

| Name. | Position. | Headquarters or chief place of duty. |
|---|---|---|
| Ward T. Bower | Chief agent | Washington, D. C. |
| Edward M. Ball | Assistant agent | Kodiak. |
| Harry J. Christoffers | do | Seattle. |
| Ernest P. Walker | Inspector | Wrangell. |
| James H. Lyman | Assistant agent | Cordova. (Resigned Jan. 9, 1918, for military duty.) |
| Calvin F. Townsend | do | Fairbanks. (Promoted Dec. 16, 1918, from warden.) |
| Harry C. Fassett | Agent and caretaker | St. Paul Island. |
| A. H. Proctor | do | St. George Island. |
| Henry D. Aller | Storekeeper | Washington, D. C., and St. George Island. (Transferred July 10, 1918, from assistant.) |
| G. Dallas Hanna | do | St. Paul Island. |
| William T. Miles | Physician | St. George Island. (Resigned July 20, 1918.) |
| William B. Hunter | do | St. Paul Island. (Resigned Aug. 31, 1918.) |
| Charles E. Johnson | do | St. George Island. (Appointed July 21, 1918.) |
| Henry H. Stromberger | do | St. Paul Island. (Appointed Sept. 1, 1918.) |
| Arnold C. Reynolds | Assistant agent | St. Paul Island. (Promoted Mar. 1, 1918, from school teacher, St. George Island. Died Nov. 9, 1919.) |
| George Haley | School teacher | St. Paul Island. |
| Cora Giles Haley | do | Do. |
| Charles E. Crompton | do | St. George Island. (Promoted Mar. 1, 1918, from warden.) |
| Fred H. Gray | Warden | Wrangell. |
| Shirley A. Baker | do | Dillingham. (Resigned Oct. 14, 1918, for military duty.) |
| Christian L. Larson | do | Chicken. |
| Henry C. Scudder | do | Wrangell. (Resigned July 8, 1918, for military duty.) |
| Jesse L. Nevill | do | Wrangell. (Resigned Dec. 31, 1917.) |
| Lemuel G. Wingard | do | Cordova. (Appointed May 5, 1918.) |
| Elmer B. Mitchell | do | Wrangell. (Appointed July 25, 1918. Resigned Nov. 30, 1918.) |
| Michael J. O'Connor | do | Haines. (Appointed Sept. 1, 1918.) |
| Hans Bierd | Master steamer Roosevelt | Seattle. |
| Edwin Hofstad | Master steamer Osprey | Wrangell. |
| Albert K. Brown | Clerk | Washington, D. C. |
| Mary S. Haines | do | Do. |
| William P. Rasin | do | Do. |
| Marguerite McBride | do | Washington, D. C. (Appointed Jan. 17, 1918.) |
| E. Elaine Bell | do | Seattle. |
| Gladys M. Gamlen | do | Seattle. (Appointed Oct. 4, 1918.) |

REGULAR EMPLOYEES AT GOVERNMENT HATCHERIES IN ALASKA IN 1918.

| Name and location. | Position. |
|---|---|
| Afognak: | |
| Edwin Wentworth | Superintendent. |
| G. C. Robertson | Foreman. (Transferred July 31, 1918, to foreman, Clackamas, Oreg.) |
| Harry J. Heuver | Foreman. (Promoted Aug. 1, 1918, from fish-culturist, Nashua, N. H.) |
| Russell Noyes | Fish-culturist. (Promoted Jan. 16, 1918, from apprentice fish-culturist, same station.) |
| W. E. Sullivan | Fish-culturist. (Transferred Oct. 31, 1918, to fish-culturist, Baker Lake, Wash.) |
| Fred R. Lucas | Fish-culturist. (Promoted Jan. 1, 1918, from apprentice fish-culturist, Puget Sound stations. Promoted Nov. 16, 1918, from apprentice fish-culturist, same station.) |
| Albert L. Carlton | Apprentice fish-culturist. (Promoted Jan. 16, 1918, from apprentice fish-culturist, Puget Sound stations.) |
| Alfred Nelson | Apprentice fish-culturist. |
| F. J. Stewart | Cook. |
| McDonald Lake: | |
| Charles B. Grater | Superintendent. (Transferred Oct. 15, 1918, to superintendent, Leadville, Colo.) |
| C. H. Van Atta | Superintendent. (Promoted Oct. 16, 1918, from foreman, same station.) |
| Calvin D. Ryan | Foreman. (Promoted Oct. 16, 1918, from fish-culturist, Baker Lake, Wash.) |

REGULAR EMPLOYEES AT GOVERNMENT HATCHERIES IN ALASKA—Continued.

| Name and location. | Position. |
|---|---|
| McDonald Lake—Continued. | |
| Kenneth P. Hutton | Fish-culturist. (Transferred June 30, 1918, to assistant car messenger.) |
| C. N. Blystad | Fish-culturist. (Promoted Aug. 16, 1918, from apprentice fish-culturist, same station.) |
| J. H. Tierney | Fish-culturist. |
| Harry E. Leuenberger | Apprentice fish-culturist. (Promoted Feb. 16, 1918, from apprentice fish-culturist, Baker Lake, Wash. Resigned May 31, 1918, for military duty.) |
| William A. Cagle | Apprentice fish-culturist. (Promoted Aug. 1, 1918, from apprentice fish-culturist, Manchester, Iowa.) |
| Clarence B. Rivers | Apprentice fish-culturist. (Resigned May 31, 1918, for military service.) |
| Clive L. Henry | Apprentice fish-culturist. (Promoted Aug. 1, 1918, from apprentice fish-culturist, Claokamas, Oreg. Resigned Sept. 30, 1918, for military duty.) |
| Edwin F. Anderson | Apprentice fish-culturist. (Appointed Oct. 1, 1918. Resigned Nov. 20, 1918.) |
| M. T. Tierney | Cook. |

Record is hereby made of the regular employees of the Alaska service who entered upon military duty during the year.

James H. Lyman, formerly assistant agent in the Alaska service, resigned January 9, 1918, to enlist in the aeronautical service. After several months at Kelly Field, San Antonio, Tex., Mr. Lyman was transferred to the Three hundred and twelfth Aero Squadron at Bolling Field, near Washington. He was later transferred to the Motor Transport Corps and on September 24 was commissioned as a second lieutenant.

Henry C. Scudder, warden in the Alaska service, resigned July 8 to enter military service. He was first stationed at Camp Lewis, Wash., and was subsequently sent to the officers' artillery training camp at Camp Taylor, Ky., where he had about completed the course when the armistice was signed November 11. Soon thereafter he was discharged from the Army, and on January 1, 1919, was reinstated in the position of warden at an increased salary.

Shirley A. Baker, warden in the Alaska service, resigned October 14 to enter military service. He was sent to Camp Lewis, Wash., where he was in training at the cessation of hostilities. He was later discharged from the Army and reentered the service of the Bureau on February 20, 1919, resuming his former position as warden in charge of the work in the Bristol Bay district.

## FISHERY INDUSTRIES.

The Territory of Alaska is divided for the purposes of this report into three coastal geographic sections generally recognized as follows: Southeast Alaska, embracing all that narrow strip of mainland and the numerous adjacent islands from Portland Canal northwestward to and including Yakutat Bay; central Alaska, the region on the Pacific from Yakutat Bay westward, including Prince William Sound, Cook Inlet, Chignik, and Ikatan Bay; and western Alaska, the shores of Bering Sea and Kotzebue Sound, and the territory drained by rivers tributary thereto.

Detailed reports and statistical tables dealing with the various fishery industries are presented herewith, and there are also given the important features of certain subjects which were the object of special investigation or inquiry.

### WATERS CLOSED TO COMMERCIAL FISHING.

Section 6 of the act approved June 26, 1906, for the protection and regulation of the fisheries of Alaska, is as follows:

SEC. 6. That the Secretary of Commerce may, in his discretion, set aside any streams or lakes as preserves for spawning grounds, in which fishing may be limited or entirely prohibited; and when, in his judgment, the results of fishing operations in any stream, or off the mouth thereof, indicate that the number of salmon taken is larger than the natural production of salmon in such stream, he is authorized to establish close seasons or to limit or prohibit fishing entirely for one year or more within such stream or within five hundred yards of the mouth thereof, so as to permit salmon to increase: *Provided, however*, That such power shall be exercised only after all persons interested shall be given a hearing, of which due notice must be given by publication; and where the interested parties are known to the Department they shall be personally notified by a notice mailed not less than thirty days previous to such hearing. No order made under this section shall be effective before the next calendar year after same is made: *And provided further*, That such limitations and prohibitions shall not apply to those engaged in catching salmon who keep such streams fully stocked with salmon by artificial propagation.

Pursuant to the provisions of this section, action was taken in 1918 in regard to the waters of southeastern Alaska, the Copper and Yukon Rivers.

Under date of June 12, 1918, announcement was made of a hearing to be held in respect to the Yukon River. The text of the announcement was as follows:

It having been recommended that the Secretary of Commerce limit or prohibit commercial fishing for salmon, or other commercial fishing in the prosecution of which salmon are taken or injured, in the Yukon River and its delta, and in all tributary waters in Alaska, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An Act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting or prohibiting fishing operations in the above-named waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 20, 1918, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 20, 1918, the Department under date of December 14, 1918, promulgated the following order:

A hearing having been given at Seattle, Wash., November 20, 1918, after due notice in accordance with law, for the purpose of determining the advisability of establishing a salmon-breeding reserve of certain waters in Alaska, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An Act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, in the Yukon River and all tributary waters, and in all waters of its delta to and including the area 500 yards outside each mouth or slough of the delta at mean high tide, be and is hereby made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. That in 1919, and in each year thereafter unless otherwise ordered in the manner prescribed by law, not to exceed 30,000 cases (forty-eight 1-pound cans per case, or the equivalent thereof) of canned salmon, 1,000 barrels (200 pounds net weight each) of pickled or hard-salted salmon, and 200 tierces (800 pounds net weight each) of mild-cured salmon, of all species, shall be prepared for commercial purposes or export; these quantities to be apportioned, after a conference with the local representative of the Bureau of Fisheries, as equitably as practicable among the persons or companies with established plants. Promptly at the end of each calendar week each individual or company shall submit a statement to the said representative of the Bureau of Fisheries showing the number of cases, barrels, and tierces of salmon thus prepared to date, and shall submit also a record of the number of salmon of each species taken daily.

2. That no salmon to be prepared by canning, pickling, or mild curing for shipment from Alaska shall be caught above the junction of the Clear River with the Yukon River near Andreafski.

3. That commercial fishing in the waters of the Yukon delta shall be limited to Kwikluak Pass, commonly known as the south mouth or channel.

4. That the use of traps or pound nets in the Yukon River and its delta is prohibited.

5. That no gill net, seine, or other net used in the Yukon River and its delta shall exceed 700 feet in length.

6. That all commercial fishing, except for local requirements, is prohibited after August 31 of each year.

This order becomes effective January 1, 1919.

Under date of September 16, 1918, announcement was made of a hearing to be held in respect to Copper River. The text of the announcement was as follows:

Whereas it has been recommended that the Secretary of Commerce amend the order of December 29, 1917, effective January 1, 1918, limiting fishing in the Copper River, Alaska, its delta, and its tributary waters, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An Act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of further limiting fishery operations or of modifying the existing limitations on such operations in the aforesaid waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 22, 1918, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 22, 1918, the Department, under date of December 20, 1918, promulgated the following order:

A hearing having been given at Seattle, Wash., November 22, 1918, after due notice in accordance with law, for the purpose of determining the advisability of amending the order of December 29, 1917, effective January 1, 1918, establishing a salmon-breeding reserve and limiting fishing in the Copper River, Alaska, its delta and its tributary waters, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An Act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, in the Copper River and its delta and all tributary waters, Alaska, be and is hereby made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. Commercial fishing is prohibited in waters of the Copper River delta from 6 a. m. on January 1 to 6 a. m. on June 10 of each year, and in the waters of Miles Lake and Abercrombie Canyon from 6 a. m. on January 1 to 6 a. m. on June 15 of each year.

2. Commercial fishing in the waters of the delta shall be limited to set nets and drift gill nets. No such net shall exceed 800 feet in length. The lateral distance interval between all such nets in the waters of the delta herein referred to shall be not less than 600 feet.

3. All fishing is prohibited from the head of the delta to the foot of Miles Lake at all times.

4. All fishing in Miles Lake shall be limited to set nets. No such net shall exceed 800 feet in length, and only one such net shall be extended out from shore from one location. No offshore nets will be permitted in the lake. Throughout the fishing season the shore of the lake shall be considered as it was on June 15. The lateral distance interval between all nets in Miles Lake shall be not less than 600 feet. No fishing will be permitted along the west and north shores of Miles Lake from the north end of Mile 49 bridge to the north end of Miles Glacier, nor along the islands and sand bars between the bridge and the head of the lake.

5. Fishing in Abercrombie Canyon shall be restricted to the use of dip nets operated by hand, such nets not to exceed 16 inches in greatest diameter. No fishing will be permitted at any point on the east side of the canyon or river above the head of the lake.

6. No fishing will be permitted at any time in the waters of the Copper River above Abercrombie Canyon, or in any of the waters tributary thereto, except in the case of local residents, who may take limited numbers of salmon for domestic use: *Provided*, That such fishing shall at no time be upon the spawning grounds of any salmon.

7. No net shall be placed in any other than substantially a straight line.

8. For the purposes herein considered, the delta of the Copper River shall be regarded as including all waters south of an east and west line passing through Mile 27 on the Copper River & Northwestern Railway, as at present established, and inside of a line 500 yards off the mouth of each slough and outlet of the Copper River, beginning with Alaganik Slough on the west and ending with Gus Wilson Slough on the east, including Pete Dahl, Walhalla, Gus Stevenson, Little King Salmon, Castle, Storey, Big King Salmon (or Copper River proper), Duck, Russian, and all unnamed sloughs between. For the purposes of this order, the mouth of each slough will be regarded as at the edge of the grass banks at the line of mean high tide.

9. The lower end of Miles Lake shall be considered as at the bridge of the Copper River & Northwestern Railway at Mile 49. The head of Miles Lake shall be considered as at the point where the river enters the lake, this point to be as indicated by notices posted by duly authorized representatives of the Bureau of Fisheries.

10. Abercrombie Canyon shall be considered as extending from the head of Miles Lake to Tunnel Point on the Copper River & Northwestern Railway.

11. For the purposes of this order the following definitions are adopted: "Stake net," a gill net attached or affixed to piles or stakes. "Set net," an anchored gill net, one end of which may, if desirable, be fastened to a stake or other object on shore.

This order becomes effective January 1, 1919, and supersedes the order of December 29, 1917.

Under date of September 18, 1918, announcement was made of a hearing to be held in respect to the waters of southeastern Alaska. The announcement was as follows:

It having been recommended that the Secretary of Commerce limit or prohibit commercial fishing for salmon and other commercial fishing in the prosecution of which salmon are taken or injured, in all streams less than 500 feet in width in southeastern Alaska, east of the longitude of Cape Spencer, and in all lakes and other waters tributary to such streams and within 500 yards of the mouths of such streams, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An Act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting or prohibiting fishing operations in the above-described waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 25, 1918, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 25, 1918, the Department, under date of December 21, 1918, promulgated the following order:

A hearing having been given at Seattle, Wash., November 25, 1918, after due notice in accordance with law, for the purpose of determining the advisability of making salmon-breeding reserves of certain waters in Alaska, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An Act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, in all hereinafter-described waters of southeastern Alaska east of the longitude of Cape Spencer, be and is hereby made subject to the following limitations and prohibitions, in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. That fishing with all forms of apparatus is prohibited in all streams less than 500 feet in width at the mouth at mean low tide and in all lakes and other waters tributary to such streams.

2. That all fishing with purse seines and drift gill nets and all other movable fishing appliances, other than set nets and beach seines, is prohibited within 200 yards outside the mouth at mean low tide of all streams less than 500 feet in width at their mouth, except at the mouths of the Chilkat and Chilkoot Rivers, where the prohibited distance for all fishing appliances shall be 500 yards.

3. That all fishing with traps, stake nets, and other fixed fishing appliances, and set nets and beach seines is prohibited within 500 yards outside of the mouth at mean low tide of all streams less than 500 feet in width at their mouth. No exceptions will be made in favor of any fixed fishing appliances heretofore operated within the prohibited areas.

4. That the driving of salmon downstream and the causing of salmon to move outside the protected area at the mouth of any stream are expressly prohibited.

5. That this order does not supersede but supplements sections 3 and 4 of the order promulgated by the Secretary of Commerce on November 18, 1912, which, respectively, prohibit all commercial fishing for salmon or other fishing in the prosecution of which salmon are taken or injured "in Anan or Humpback Creek, its lagoon, lakes, and tributary waters, together with the region within 500 yards of the mouth of said creek," and "in Naha stream, its lagoon, lakes, and tributary waters, above a line connecting the points known, respectively, as Loring Point and House Point." Likewise this order does not supersede but supplements the order promulgated by the Secretary of Commerce on October 25, 1915, which similarly prohibits fishing (*a*) "in all waters tributary to Barnes Lake, Prince of Wales Island," (*b*) "in Hetta Creek, its tributary waters, and the region within 500 yards of the mouth of said creek," and (c) "in Sockeye Creek, its tributary Boca de Quadra hatchery waters, and the region within 500 yards of the mouth of said creek."

This order becomes effective January 1, 1919.

Limitations and prohibitions upon fishing in the following waters are applicable by virtue of previous orders of the Secretary of Commerce: In western Alaska, Wood and Nushagak Rivers; and in central Alaska, all streams flowing into Cook Inlet, Eyak Lake, and a limitation upon fishing in Eyak River. Limitations have been placed upon fishing by Executive order and proclamation in the following additional waters: Afognak Reservation, Aleutian Islands Reservation, Yes Bay and Stream, and the Annette Island Fishery Reserve.

## STREAM IMPROVEMENT.

The work inaugurated a few years ago of removing obstructions in salmon streams received some attention in 1918 in southeastern Alaska. The streams which were opened were Anan and Whitney Creeks on Wrangell Island and Olive Creek on Etolin Island. Some log jams were removed from the upper Chilkoot River and the falls in Mill Creek near Wrangell were reduced sufficiently for salmon to ascend. It is reported that beneficial results have already been noted.

The importance of this work is obvious, and it is planned that in time, as funds and facilities permit, all streams in Alaska which were once open to salmon will be cleared of débris and log jams and be

restored to their former condition. The scope of these operations will be extended to include the opening of streams which, because of falls or other natural obstructions, have never been accessible to salmon. The possibilities of the work are most important in providing additional spawning grounds, thus materially aiding in restoring and maintaining the supply of salmon. Normally, the greater the spawning areas of a given section the greater will be the run of salmon.

### STREAM WATCHMEN.

The Bureau has given consideration from time to time to the need of a closer patrol of the fisheries of Alaska to prevent destructive fishing, encroachment upon streams, and the continuance of operations during close seasons. In the past, this work has been seriously hampered by a lack of funds and personnel, but in 1918 additional assistance was secured by the temporary employment of 10 men as stream watchmen, most of whom were connected with the University of Washington, either in a professorial capacity or as students. Five of these men were assigned to duty in southeastern Alaska, while the other five were detailed to localities in central Alaska.

Specific assignments for duty were as follows: Central Alaska—Kenneth Cole, at Katalla; Claude V. O'Callaghan, at Latouche, to cover the western part of Prince William Sound; Edward G. Cox, at Cordova, to patrol the eastern part of Prince William Sound and Copper River delta; Jason J. Perry and Francis W. Perry, at Miles Lake and Abercrombie Canyon; and southeastern Alaska—Ernest F. Goodner, at Anan Bay; Clifford J. Mattox, at Karta Bay; James M. Hay, at Lake Bay; E. O. Eckelman, on patrol duty on the Bureau's steamer *Osprey;* and M. J. O'Connor, at Chilkoot. Mr. O'Connor was later transferred to the regular service as a warden.

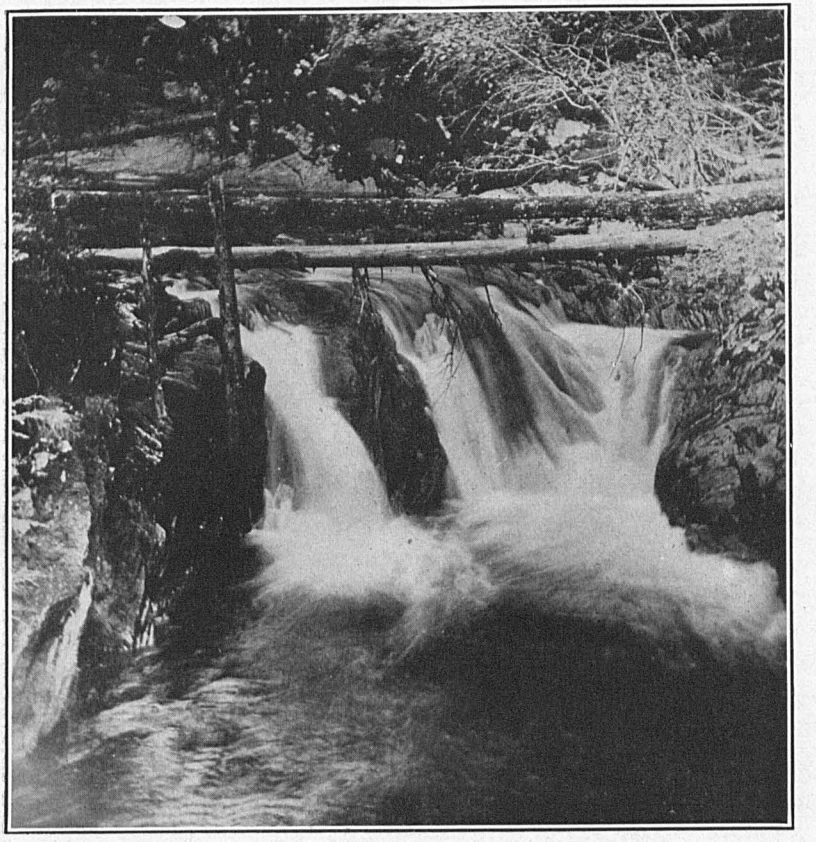
Much good resulted from this increase of the patrol force in the enforcement of the laws and regulations as well as in the prevention of unlawful acts in connection with the fisheries. Further benefits were obtained in the collection of data for the information and use of the Bureau. It is contemplated that this work will be extended from year to year, as funds permit, until an adequate patrol force is secured.

### ALASKA FISHERY INTELLIGENCE SERVICE.

In 1917 there was put into effect jointly by the Bureau of Fisheries and the Washington-Alaska Military Cable & Telegraph System an intelligence service to communicate by telegraph to various coastal towns in Alaska the daily prices of certain species of fish offered at Seattle and Ketchikan, thus giving fishermen an opportunity of marketing their product under the most favorable conditions.

This service has been continued through 1918 and has no doubt been of genuine benefit. Prices are not necessarily telegraphed each day, as it frequently happens that there are no quotations. The figures, as received at Juneau, Petersburg, Wrangell, Ketchikan, Sitka, Skagway, Valdez, Seward, and Cordova, are posted at the telegraph offices. In some instances local papers have given these figures a place in their regular news columns.

The figures are secured by representatives of the Bureau. It is the desire to continue the service.



SALMON STREAM, KUPREANOF ISLAND, SOUTHEAST ALASKA, SHOWING WORK OF STREAM IMPROVEMENT. THE STEP AT RIGHT WAS BLASTED OUT IN ORDER TO PERMIT ASCENT OF SALMON.

FISHERY PATROL BOAT, SOUTHEAST ALASKA.

## PATROL BOATS.

The enforcement of the fisheries laws and regulations of Alaska is contingent upon the ability of those charged with such duties to cover the territory regularly during the fishing season. This can be done most effectively by furnishing each man with a boat. Since the Bureau has but three vessels of its own for this work, it is necessary to hire each season several small boats for limited use in certain important localities. This was done to a greater extent in 1918 than ever before, owing to the employment of several men as stream watchmen.

In southeastern Alaska the Bureau's steamer *Osprey* and the motor vessels *Murre* and *Auklet* were regularly engaged in patrol work during the season. In addition, four small launches, namely, *My Fancy*, *Kitty*, *Bee*, and *May*, were chartered at various times. In central Alaska the motor boats *Prospector* (7 tons net), *Ellona*, and five small unnamed power boats were chartered at different times, some being used continuously for several weeks while others were used for single trips of but a few days. They were engaged chiefly in the Copper River and Prince William Sound districts.

The packing companies furnished free transportation to representatives of the Bureau on several occasions when other facilities were not available.

The installation of hot-water heating plants on the *Murre* and *Auklet* was completed at Juneau in February, 1918, at a cost of $1,044 for both vessels. In the fall of 1918 the galleys on these boats were enlarged. This adds greatly to the comfort of persons whose duties take them aboard these boats.

On September 12, the *Auklet* was struck by the Canadian Pacific liner *Princess Sophia* while at the dock at Juneau. The house was considerably damaged, although the hull was not injured. Repairs were made without expense to the Bureau.

The *Osprey*, *Murre*, and *Auklet* were engaged for several weeks the latter part of October and most of November in searching for bodies from the *Princess Sophia*, which vessel was wrecked October 25, on Vanderbilt Reef with a loss of 343 lives, no one on board being saved.

In July, the launch *Swan* was put in commission on the Yukon River. This boat was built in the previous winter at Fairbanks. It is of a type specially adapted to river use. It is 36 feet in length by 6 feet in beam, and is equipped with a 20-horsepower motor. On trial tests, a speed of 6 miles per hour was developed upstream against a current 4½ miles an hour, and 13 miles per hour downstream. Fuel consumption was 2½ gallons per hour. Arrangements have been made with the War Department to secure fuel at military posts. There are sleeping accommodations for two persons on the *Swan*.

In a report submitted in the fall of 1918 by Warden Shirley A. Baker, attention was drawn to the need of a staunch, seaworthy, patrol vessel, to be at the disposal of the Bureau's representatives covering the Bering Sea cannery district. It was recommended that this vessel should be at least 50 feet in length and equipped with nothing less than a 40-horsepower Pacific coast make of heavy-duty engine. Cannery operations are being extended every year and to cover the different regions and to make any inspection of real conse-

quence requires the use of a strong, comfortable vessel with a cruising radius of several hundred miles. Warden Baker has also directed attention to the need of a strong, seaworthy launch, about 32 or 35 feet long, with a medium heavy-duty engine of 10 horsepower or more. This launch should not draw more than 2½ feet of water, as it is needed primarily for the patrol maintained in connection with the Nushagak and Wood Rivers, which are closed to commercial fishing.

In connection with the matter of patrol boats, it is of interest to quote the following from a recent general report by Assistant Agent Ball:

> The great need of the service is boats and men in sufficient number to permit the placing of one at each important fishing district. As the patrol is increased, the size of the district given to each man will be reduced until it reaches a point where very good control of fishing activities can be maintained. To give anything like adequate protection to the fisheries of the Copper River and the enforcement of the law in that district, the Bureau should have three boats of the size and type of the one it now has on the Yukon. Such boats would have the requisite speed and also be sufficiently seaworthy, as it would never be necessary to take them into open waters. While storms may occur occasionally it is always possible for small boats to find shelter in any one of the many sloughs and outlets of the river.
>
> Proper patrol and protection of the Cook Inlet district would require three similar boats for use north of Ninilchik, where the water is very muddy and the shores are strewn with numerous bowlders. The advantage in having shallow draft boats in these waters would be that they could enter practically any of the streams flowing into the inlet in event of a storm, whereas boats drawing 3 or 4 feet of water could find no safe anchorage north of Kachemak Bay except in the Kasilof and Kenai Rivers. Full-powered seagoing launches would be required for the lower inlet, Prince William Sound, Kodiak, and all other localities in the central district as in them the waters are deep, more exposed, and visited by frequent wind storms. With the constantly increasing development of the fisheries, this need becomes more urgent, for with the demand for fish becoming greater and commerical competition becoming keener there will also grow a tendency to disregard the laws until permanent injury to the fisheries will result.

## VIOLATIONS OF LAWS AND REGULATIONS.

On December 9, 1918, the Supreme Court of the United States delivered an opinion confirming the opinion of the circuit court of appeals for the ninth circuit enjoining the Alaska Pacific Fisheries from maintaining, and compelling it to remove, a fish trap erected by it in Annette Island waters, Alaska.

A case of interest to packers in general was brought on May 23, 1918, by the United States attorney at Valdez against the Pioneer Packing Co. for the nonpayment of a license tax, an information being filed in the district court at Valdez alleging that the Pioneer Packing Co. did prosecute unlawfully the business of manufacturing without first having obtained a license from the clerk of the district court. Counsel for the defendant interposed a demurrer, which was overruled by Judge Fred M. Brown on May 28, 1918. At the October, 1918, term of the district court the case was again taken up, when the defendant refused to plead further. On October 16 a fine of $500 was imposed. The company has one year from that date in which to appeal. Under the law a license tax of $500 was assessed against the Pioneer Packing Co. for the operation of a clam cannery at Cordova, Alaska, as a manufactory doing a certain volume of business. The law further provides that if the tax is not paid when due, the company upon conviction shall pay a fine equal to the amount of the tax,

which in this case was $500, or a total of $1,000 that must be paid. This action is final, unless the circuit court of appeals, to which the case may be taken, reverses the judgment of the lower court.

The Abercrombie Packing Co. was tried in the United States commissioner's court at Cordova on July 1 for having fished at six places in Miles Lake in June, 1918, with gill nets set less than 600 feet apart, and for fishing in Abercrombie Canyon at two points on the east bank of the Copper River at intervals of less than 300 feet, all in violation of the regulations of December 29, 1917. A plea of guilty was entered on all complaints and a fine of $500 was paid. In October the grand jury at Valdez returned a true bill against the Abercrombie Packing Co. on four counts involving violations of the order of December 29, 1917, by the use of set nets in Miles Lake in June, 1918, at less than 600 feet apart. The Northwestern Fisheries Co. and the Canoe Pass Packing Co. were also indicted jointly on four counts for similar offenses.

The Carlisle Packing Co. was indicted in October on three counts for the operation between Mountain Slough and Cape Whitshed of three fishing appliances, each consisting of two distinct traps having their complement of parts, the lead of one being attached to the pot of the other, in total disregard of the endwise distance interval of 100 yards required by law. The Canoe Pass Packing Co. was indicted for the operation of a similar appliance.

On July 10 the Northwestern Fisheries Co. and the Canoe Pass Packing Co. were tried for wanton waste of salmon at Miles Lake on June 20. Pleas of guilty were entered, and each company was fined $200 and costs. Tom Teets was tried for a similar offense, but was acquitted.

The Valdez Packing Co. was tried and convicted on August 14 before the United States commissioner at Cordova, on a charge of having permitted two traps in Fidalgo Bay to fish during the weekly close period of July 13 and 14. A fine of $500 was imposed for each trap. The watchman at each trap was also tried and fined $100. The cases were appealed. Settlement was finally effected at Valdez on September 27, when the case was heard informally by Judge Bunnell. The company, after being convicted of the offense charged in the United States commissioner's court at Cordova, now pleaded guilty and secured a reduction of the fine from $500 to $100 for each trap. The fines imposed by the lower court against the watchmen were waived, and the case against them was dismissed.

On August 22 the Copper River Packing Co. was tried before the United States commissioner at Valdez for failure to close two of its traps in Fidalgo Bay on Sunday, July 28. The case was prosecuted before a jury which returned a verdict of guilty, whereupon a fine of $400 for both traps was imposed. The complaint also named the trap watchmen as codefendants, but prosecutions were not made.

On September 3 three complaints were filed before the United States commissioner at Kodiak against the Alitak Packing Co., charging it with (1) wanton waste of salmon, (2) canning salmon that had been killed more than 48 hours, and (3) constructing and operating a trap in Moser Bay within 600 yards laterally of another trap. On the same day warrants were served on F. A. Davidson, superintendent of the Alitak Packing Co.'s cannery at Lazy Bay, who upon

being arraigned pleaded guilty to the first two complaints, while a plea of not guilty was entered in respect to the third complaint. Two cases were disposed of at this time by the imposition of a fine of $200 for each and the costs, which amounted to $57. The third case was called for trial on September 20 at Alitak, and resulted in a conviction of the company, which was fined $1,000 and assessed the costs of the prosecution, amounting to more than $500. The case was appealed to the district court.

On September 21 a complaint was filed before the United States commissioner at Alitak against the Alaska Packers Association for the construction of a fish trap in Moser Bay within the prohibited distance of another trap. The case was tried immediately and resulted in a conviction. A fine of $1,000 and costs was imposed. An appeal was taken.

In February, 1918, the grand jury at Juneau returned a true bill against R. E. Voeth for fishing the latter part of August, 1917, with nets covering more than one-third the width of the principal stream entering Anita Bay, Etolin Island. The grand jury also returned a true bill against Sergis Williams, Charles Daniels, Nicholas Keene, John Cameron, and John Williams, all natives, for the wanton waste of herring at Sitka in April, 1917. An instructed verdict of not guilty was returned in the case against Cameron and Williams, while a similar verdict was found after due trial for the other defendants.

On July 9, 1918, Peter Iverson, Ole Skaaner, J. Hesnes, Olaf Olson, and John Mjiord were discovered in the act of laying a purse seine in the waters of the Anan Reservation. Complaints were filed against them before the United States commissioner at Wrangell on September 22, and within two weeks all were apprehended. They pleaded guilty and each was fined $25.

On August 1 nine gill nets were found fishing in Chilkoot Inlet within less than 100 yards of each other. Action was brought against 16 natives for these offenses in the commissioner's court at Haines. Four of them, Harry Williams, Charlie Williams, Archie Watson, and Ben Watson, were operating for the Haines Packing Co. They pleaded guilty and were each fined $5 and costs. The remaining 12 men were fishing for the Alaska Pacific Fisheries. The cases against four of these men were dismissed. Five of them, George Jackson, Sam Andrews, David Perrin, Charley James, and Jim Willard, pleaded guilty and each paid a fine of $5 and costs. The other three, Patsy Davis, Ben Fox, and Fritz Willard, pleaded not guilty and their cases were continued until the district court convened at Juneau in September. At that time the matter was presented to the grand jury and true bills were returned against Fox and Davis. These men were arraigned on September 28 and pleaded guilty, whereupon each was fined $10 and costs. Fritz Willard was not indicted.

On Sunday, August 4, four traps, three in Tebenkoff Bay and one in Gedney Harbor, belonging to the Alaska Herring & Sardine Co., were found fishing. Complaint was entered before the United States commissioner at Juneau on August 7. The company pleaded guilty and was fined $500.

On August 8 complaint was filed against the Juneau Cold Storage Co. and Louis Carsten for fishing with a trap in Lynn Canal on Sunday, July 21. The company, upon pleading guilty, was fined $100, and the trap watchman was fined $50.

H. Bergman was tried on August 9 before the United States commissioner at Ketchikan for failure to close, in accordance with law, his trap at Seal Cove on August 4, during the weekly close period. He pleaded guilty and was fined $10.

James Willard, a native, was indicted for fishing in Chilkoot River on August 16 with a gill net covering more than one-third the width of the river. He was also indicted for improper conduct toward a civil officer of the Government in the discharge of his duties. On September 28 Willard pleaded guilty to the charge of illegal fishing and was fined $10 and costs amounting to more than $100. On account of the fine and heavy assessment of costs it was considered that this native was already sufficiently punished, and it was agreed by the Bureau's representative that the other charge be dismissed.

On September 4 the grand jury at Juneau indicted A. Rasmussen, Ben Larson, Nesle Running, Tom Carlson, and Arnold Sorsett for fishing in a stream tributary to Mole Harbor for a distance of more than one-third the width of the stream. On the 19th of the month Running and Sorsett appeared in court and pleaded guilty, being fined $25 each and the costs. The other three men had left Alaska and have not yet been brought to trial.

The grand jury returned a true bill against the Hoonah Packing Co. for failure to close its trap at Point Adolphus during the weekly close season on September 8. The case came to trial on September 18. The company pleaded guilty and explained that the watchman had stated he lost track of the days. A fine of $50 was imposed, this being the company's first offense.

The Thlinket Packing Co. was indicted at Juneau for the operation of a trap in Icy Strait west of Point Couverdeen during the weekly close season on Saturday, September 7. The case was called for trial on September 19, when the company pleaded guilty and was fined $50 and costs.

On Sunday, September 8, a trap belonging to the Alaska Pacific Fisheries in South Inian Pass was fishing during the weekly close period. Later in the month when the matter was presented to the grand jury it returned a true bill. The case came to trial on September 20, when a plea of guilty was entered and a fine of $50 and costs was imposed.

The grand jury at Juneau returned an indictment in October, 1918, against the Alaska Pacific Fisheries involving 15 counts for failure to properly close several of its fish traps during the weekly close season on various dates in July and August, 1918. This matter is still pending.

The case against the Alaska Pacific Fisheries, alleging that on or about August 15, 1917, the company installed a floating trap within less than 600 yards of a trap then in operation by the Thlinket Packing Co., near Village Point, has not been tried.

On Sunday, September 1, three traps of the Alaska Pacific Fisheries, located near Point Sherman, on the east shore of Lynn Canal, were found only partially closed, so that they were fishing at the lower stages of the water. The company was indicted and on September 19 pleaded guilty and paid a fine of $50 and costs.

Two prosecutions for stealing fish from traps occurred in southeastern Alaska. On September 6 an indictment for larceny was

returned at Juneau against Ike Weathers, Al Weathers, and F. C. Wright for robbing the Tee Harbor Packing Co.'s trap on Admiralty Island, south of Point Retreat, on the night of July 18, 1918. During the trial the charge against Wright, who was a trap watchman, was dismissed for lack of conclusive evidence connecting him with the crime, and he was used as a witness. It could not be clearly established that the men arrested were the persons who had robbed the trap, and a verdict of not guilty was returned. The second case was that against Herman Brandies and Louis Bolick, who were indicted on January 24, 1919, at Ketchikan for participating in the robbery of a trap of the J. L. Smiley Co., located at Bostwick Inlet, Gravina Island, on August 17, 1918. The charge was for embezzlement and fraudulent conversion of property. They were permitted to enter pleas of guilty of simple larceny and were sentenced to imprisonment for six months and one day.

On May 25 Anton Johanson was charged in a complaint filed before the United States commissioner at Franklin with fishing with gill nets in Eagle Creek, a stream less than 300 feet in width, between the hours of 6 p. m. and 6 a. m. of the following day, and also during the weekly close season. A plea of guilty was entered and a fine of $25 was paid. Subsequently the fine was remitted on account of the insufficiency of the complaint in stating the offense.

## TERRITORIAL LICENSE TAX.

The territorial revenue act of May 3, 1917, imposes a tax on salmon canneries of 4½ cents per case on kings and reds, 2½ cents per case on medium reds, and 2 cents per case on all others; salteries, 2½ cents per 100 pounds on all fish salted or mild-cured, except herring; fish traps, fixed or floating, $100 per annum; and on cold-storage plants a graduated tax, according to the amount of business transacted. The following statement shows the tax collections made by the Territory during the calendar year 1918:

TERRITORIAL FISHERY LICENSE TAXES COLLECTED FOR THE YEAR ENDING DEC. 31, 1918.

| Schedule. | Division No. 1. | Division No. 2. | Division No. 3. | Total. |
|---|---|---|---|---|
| Canneries | $73,823.86 | $487.23 | $123,239.45 | $197,550.54 |
| Salteries | 1,209.38 | .60 | 3,271.96 | 4,481.94 |
| Fish traps | 42,500.00 | 100.00 | 18,400.00 | 61,000.00 |
| Cold-storage plants | 1,550.00 | ..... | 500.00 | 2,050.00 |
| Total | 119,083.24 | 587.83 | 145,411.41 | 265,082.48 |

Information was received from the Territorial treasurer that in addition to the foregoing amount the sum of $6,730.35 was collected under the schedules imposing a tax upon fish-oil works and fertilizer and fish-meal plants using herring in whole or in part. This amount and $10,298 similarly collected for the year ending December 31, 1917, are being held on special deposit pending the settlement of litigation regarding these schedules.

## CANADIAN-AMERICAN FISHERY CONFERENCE.

Matters affecting the fisheries of Alaska were taken under advisement at sessions of the Canadian-American Fishery Conference. The members in behalf of Canada were Hon. J. Douglas Hazen, Chief Justice of New Brunswick and former Minister of Marine and Fisheries; George J. Desbarats, Deputy Minister of Naval Service; and William A. Found, Superintendent of Fisheries. The American members of the conference were Hon. William C. Redfield, Secretary of Commerce; Hon. Edwin F. Sweet, Assistant Secretary of Commerce; and Dr. Hugh M. Smith, Commissioner of Fisheries. Sessions were held at Seattle on April 24 and 25, at Prince Rupert on April 30, at Ketchikan on May 2, at Vancouver on May 7, at New Westminster on May 8, and at Seattle again on May 9 and 10.

Among the subjects considered were the Alaska-British Columbia halibut controversy, the protection of halibut on the Pacific coast, the mutual use of American and Canadian ports by the fishing vessels of both countries, and the regulation of the Pacific whale fishery. Subsequent sessions were held at Ottawa on May 20 and at Lake Champlain September 4 to 6. The findings and recommendations of the conference have been submitted to the respective governments for appropriate action on the questions under consideration.

A preliminary result of the action of the conference, as an emergency war measure and to avoid restrictions upon the production of food, was the granting to fishing vessels of each nation of reciprocal port privileges, which included the right of vessels to discharge fares and clear again direct for the high seas. A few Canadian fares of halibut have been landed at American ports, while there have been numerous fares caught on offshore Alaskan banks by American vessels and landed at Prince Rupert. Action also has been taken resulting in the abrogation of the requirement that Canadian fishing vessels passing through American waters en route to fishing grounds on the high seas shall enter and clear at an American port.

## UNITED STATES FOOD ADMINISTRATION.

By virtue of the act of Congress approved August 10, 1917, the United States Food Administration was created, its organization being extended to Alaska as well as to the several States. Under the terms of the presidential proclamation of January 10, 1918, all salt-water fishermen not previously licensed by the United States Food Administration, whether fishing independently or on shares or engaged at any period of the year in the commercial distribution, including catching and selling of any or all varieties of salt-water fish and all shellfish and crustaceans, were required to secure on or before February 15, 1918, a license to be issued under prescribed rules and regulations. Also those engaged in the business of canning salmon or sardines, not previously licensed, whose gross production was more than 500 cases per annum, except home canners and certain canning clubs recognized by the Department of Agriculture, were required to secure licenses. All licenses were issued by the United States Food Administration at Washington, D. C. Applicants for salmon-cannery licenses were required to show to the satisfaction of the Food Administration that there was a supply of fish in

excess of the quantity then being utilized by the plants in operation, and that production would be increased by the amount of their packs. It was contrary to the policy of the Food Administration to grant a license for the operation of additional canneries where it simply meant a division of the supply of salmon without probable increase of production. Important considerations in this connection also were the conservation of labor, material, and supplies, particularly of tinplate.

The representatives of the Food Administration in Alaska, Washington, Oregon, and California met in Portland and Seattle in February, 1918, to take up chiefly the matter of licensing canneries and fixing the prices of salmon. Subsequently the United States Food Administration, acting upon the recommendation of Pacific-coast administrators, fixed the prices to be paid fishermen for raw fish. These prices varied for the different districts of Alaska, being made to meet local conditions.

The fixing of prices governing the sale of canned salmon, and action in respect to withdrawals of most of the pack in 1918 for military uses, received attention at the hands of the Food Administration. Following the cessation of hostilities, licenses, restrictions, and other requirements of the Food Administration were removed early in 1919.

Among those interested in the canning industry in Alaska who were more prominently identified with the activities of the Food Administration and who were connected with it were Messrs. Frank M. Warren, of the Alaska-Portland Packers' Association, E. B. Deming, of the Pacific American Fisheries, Dan Campbell, of the Astoria and Puget Sound Canning Co., and August Buschmann, of the Deep Sea Salmon Co. The food administrator for Alaska was Judge Royal A. Gunnison, following whose death Mr. P. R. Bradley was appointed. All of these gentlemen rendered great and valuable service, ably handling the many arduous and troublesome duties requiring their attention.

## INQUIRY BY FEDERAL TRADE COMMISSION.

As part of a comprehensive investigation of food-producing industries undertaken by direction of the President, the Federal Trade Commission conducted an inquiry in 1918 in regard to the production and distribution of canned salmon. In December, 1918, the results of the inquiry were published by the commission.[a] It is stated that the report is based practically upon complete returns from all the salmon canners in the United States, including Alaska. Following a general description of the salmon-canning industry, including references to history, species of salmon, and methods of selling and distribution, general chapters are devoted to the consumption and production of canned salmon; the cost of packing and marketing; the prices of canned salmon, including particular reference to opening prices, and brokers' prices; capacity, investment, and profits; organization and control; legislation to protect the supply of salmon, and suggestions for the improvement of conditions in the salmon-canning industry.

[a] Report of the Federal Trade Commission on Canned Foods. Canned Salmon. December, 1918. Washington, 1919.

Among the recommendations made by the Federal Trade Commission are the following:

That the Bureau of Fisheries have control of the salmon fisheries of Alaska in the interest of good administration and for the prevention of any possible monopoly in the future.

That licenses to trap locations should not run for more than five years, but that renewal thereof should be allowed; and further, that a trap location should not be allowed to remain in the possession of anyone, unless he makes use of it for at least three years during such five-year term.

That some department of the Government should furnish information which would facilitate a more direct marketing by salmon canners, so as to limit the payment of sub-brokerage.

That the announcement of an opening price is dangerous, and, as at present conducted, should be discontinued.

That "S. A. P. sales" (sales subject to the opening price) should be restricted.

## WAIVING OF ALASKA EIGHT-HOUR LAW.

As a result of recommendations by the Bureau communicated through the Secretary of Commerce and the Secretary of the Interior, the Governor of Alaska, in exercise of the discretionary power conferred upon him by the legislature, issued a proclamation on December 15, 1917, suspending the restrictions of the eight-hour law as applying to salmon fisheries and canning or other preparation of salmon for food, and manufacturing industries whose products are necessary for the proper preparation of salmon as a food supply. The suspension became effective January 1, 1918.

On January 7, 1918, the governor issued another proclamation, immediately effective, suspending the operation of the Alaska eight-hour law so far as it affected the taking, preparing, and curing of halibut, herring, cod, and all other kinds of food fish in Alaskan waters, including the taking, preparing, and canning of clams and other shellfish.

A further waiving of the Alaska eight-hour law occurred on April 5, 1918, when the governor suspended its operation in respect to the manufacture of fertilizer, oil, and other by-products from the waste of the food fish industry in Alaska. The necessity of this action was not given consideration at the time of issuance of the previous proclamations.

The suspensions of law by virtue of these proclamations were intended to apply during the period of the war.

## SUSPENSION OF NAVIGATION LAWS.

In February, 1918, the Secretary of Commerce, with the President's approval, issued certain instructions to collectors of customs with the object of facilitating landings of fish at American ports by foreign vessels. This action, which had bearing on the fisheries of Alaska, was an emergency war measure which under normal conditions could not be effective without appropriate legislation. The instructions were as follows:

To promote the vigorous prosecution of the war and to make the utmost use jointly of all the resources of the nations now cooperating, you will permit, during the war, Canadian fishing vessels and those of other nations now acting with the United States to enter from and clear for the high seas and the fisheries, disposing of their catch and taking on supplies, stores, etc., under supervision as in the case of merchant vessels entering and clearing for foreign ports, except as to tonnage tax and other charges specifically imposed on entry from and clearance for foreign ports.

## WOOD RIVER CENSUS.

The usual count of red salmon entering Lake Aleknagik on Wood River, Alaska, was made in 1918. The work was under the direction of Warden Shirley A. Baker, assisted by Fred R. Lucas, who was temporarily detached from the Afognak fish-cultural station.

Continuing the custom of past seasons, a rack consisting of cotton trap webbing hung on piling and weighted with chains was placed across the lower end of the lake in the latter part of June. Counting of salmon began June 28 and was carried on daily until August 5, a period of 39 days.

The run of salmon began somewhat later than usual. This was attributed to the late breaking of winter, there being an ice gorge in the Bristol Bay region which could not be penetrated until almost the end of May. During the season, however, the weather was extraordinarily fine with little or no rain or wind. It is said that these conditions caused the salmon to linger in the waters of the bays until nearly ready to spawn, when heavy rushes were made up the rivers. The run of red salmon appears to have been the largest of record although the count into Lake Aleknagik was less by 138,306 than in 1917.

The first considerable count of salmon passing through the rack was made on July 10, when 28,302 were admitted to the lake. On the following day, July 11, the count increased to 131,156, which number was exceeded but once during the season, on July 18, when 235,700 passed into the lake. There were only six days which show a count of more than 50,000 salmon each, on four of which the count was in excess of 100,000. The tally for the season was 943,202, the details of which are given in the following table:

WOOD RIVER SALMON CENSUS IN 1918.

| Date. | Number. | Date. | Number. | Date. | Number. |
|---|---|---|---|---|---|
| June 28 | 14 | July 12 | 102,042 | July 26 | 1,258 |
| 29 | 9 | 13 | 55,478 | 27 | 646 |
| 30 | 33 | 14 | 35,159 | 28 | 868 |
| July 1 | 258 | 15 | 29,328 | 29 | 324 |
| 2 | 462 | 16 | 43,155 | 30 | 388 |
| 3 | 568 | 17 | 124,038 | 31 | 596 |
| 4 | 1,440 | 18 | 235,700 | Aug. 1 | 515 |
| 5 | 1,223 | 19 | 78,902 | 2 | 773 |
| 6 | 1,511 | 20 | 36,507 | 3 | 308 |
| 7 | 1,821 | 21 | 7,321 | 4 | 417 |
| 8 | 3,370 | 22 | 2,416 | 5 | 208 |
| 9 | 7,451 | 23 | 4,646 | | |
| 10 | 28,302 | 24 | 3,236 | Total | 943,202 |
| 11 | 131,156 | 25 | 1,355 | | |

It was reported that less than 20 king salmon entered Lake Aleknagik. Humpback salmon were also scarce, but there was an appreciable run of chum salmon.

Valuable assistance in the installation of the rack and in making the count of salmon was generously given by the Alaska Packers Association and the Alaska-Portland Packers' Association.

## ALEUTIAN ISLANDS RESERVATION.

The administration of the Aleutian Islands Reservation, which was created by Executive order of March 3, 1913, is under the joint control of the Department of Commerce and the Department of Agriculture. By the terms of the joint regulations issued by these two departments effective March 15, 1914, no one may carry on any line of business within the reservation without first securing a permit to do so.

In the exercise of its authority by virtue of the terms of the Executive order establishing the reservation, the Department of Commerce issued 11 fishery permits in 1918, 2 of which, granted to the Alaska Commercial Co. and O. K. Quean, respectively, expired December 31, 1918. There are also 12 permits of those issued prior to 1918 which remain effective, making a total of 21 permits outstanding at the end of the calendar year 1918. Informal permission was granted to Mark Morris, of Unalaska, on July 28, 1915, to engage in fishery operations for supplying local needs.

PERMITS FOR FISHERY OPERATIONS IN ALEUTIAN ISLANDS RESERVATION EFFECTIVE AT END OF CALENDAR YEAR 1918.

| No. | Date. | Grantee. | Location and scope of operations. |
|---|---|---|---|
| 4 | Mar. 5,1915 | A. B. Somerville | Attu Island. To take and sell red salmon either fresh or salted. Extended Sept. 7, 1915, to include atka mackerel. |
| 6 | Jan. 15,1916 | Pacific American Fisheries | Unalaska Island. Salmon cannery. |
| 7 | June 28,1916 | Union Fish Co | Tigalda Island. Cod station. |
| 10 | Dec. 9,1916 | Pacific American Fisheries | Unimak Island. Salmon cannery. |
| 11 | Dec. 11,1916 | Sockeye Salmon Co | Do. |
| 12 | Jan. 4,1917 | Paul Buckley | Akutan Island. Codfish station. |
| 18 | June 22,1917 | Andrew C. Smith | Chernofski Harbor and Kulliliak Bay, Unalaska Island. Salting cod and salmon. |
| 19 | Aug. 8,1917 | Alaska Commercial Co | Preserving cod and salmon within the reservation; erection of cannery prohibited. |
| 20 | Sept. 19,1917 | Umnak Livestock Co | Nikolski, Umnak Island. Preserving cod and salmon; erection of cannery prohibited. |
| 21 | ....do | Paul Buckley | Whaling in reservation. |
| 22 | Sept. 25,1917 | N. E. Bolshanin | Unalaska Island. Salting cod and salmon. |
| 23 | Nov. 1,1917 | Kuskokwim Fishing & Transportation Co. | Trident Bay, Akun Island. Preserving cod and salmon; erection of cannery prohibited. |
| 25 | Jan. 5,1918 | Northern Fisheries (Inc.) | Unalaska Island. Cod station. |
| 28 | Jan. 10,1918 | Edwin H. Larsen | Unalaska Island. Cod and salmon operations; erection of cannery prohibited. |
| 29 | Jan. 24,1918 | Northern Fisheries (Inc.) | Unalaska Island. Salmon, trout, atkafish, etc., pickling. |
| 30 | Feb. 11,1918 | Buckley Livestock, Fisheries & Transportation Co. | Unalaska Island. Cod station. |
| 31 | ....do | ....do | Unalaska Island. Plant for canning and salting salmon and other fishes. |
| 32 | June 5,1918 | Unalaska Atkafish Co | English Bay, Unalaska Island. Salting or mild curing atkafish, codfish, and salmon. |
| 33 | ....do | A. C. Goss | Attu Island and other points. Commercial fishery operations; erection of cannery prohibited. |
| 34 | June 29,1918 | Alaska Fishing Co | Unalaska Island. Commercial fishery operations; erection of cannery prohibited. |
| 35 | Nov. 6,1918 | S. Applegate | Umnak Island. Commercial fishery operations; erection of cannery prohibited. |

One joint permit for operations within the Aleutian Islands Reservation was issued by the Departments of Agriculture and Commerce in 1918, and three of those previously issued continued effective, making a total of four joint permits under which operations were being carried on at the close of the calendar year.

JOINT PERMITS IN ALEUTIAN ISLANDS RESERVATION EFFECTIVE AT END OF CALENDAR YEAR 1918.

| Date. | Grantee. | Location and purpose. |
|---|---|---|
| July 5, 1917 | Andrew C. Smith | To graze cattle, sheep, goats, and other domestic animals on Umnak Island. |
| Oct. 29, 1917 | Buckley Livestock, Fisheries & Transportation Co. | To graze cattle, sheep, and other domestic animals on the southwest end of Unalaska Island. |
| Dec. 8, 1917 | Andrew C. Smith | To graze sheep on Dutch Harbor Island. Term of permit limited to one year. |
| Mar. 16, 1918 | Emil Ittner | To graze hogs on Dutch Harbor( Amaknak) Island. |

## AFOGNAK RESERVATION.

The usual requirements in respect to commercial fishing in the Afognak Reservation were complied with by the issuance of fishing licenses to about 45 natives who desired to engage in such activities. Their work was placed under the immediate supervision of W. E. Baumann, of Afognak, who was temporarily employed as a patrolman.

The natives lost the usual May and June fishing on account of delays in securing licenses and were therefore unable to begin operations until July. Though a considerable part of the run of salmon had passed into the streams before that date, the natives made a fair catch and averaged a higher return for their season's work than ever before. This was due largely, if not wholly, to the fact that the Federal Food Administration fixed the price of salmon at a considerably higher rate than the natives had ever before received. The bulk of the catch was sold to the Kadiak Fisheries Co., at Kodiak, although Wasilie Necrassoff, a native of Afognak, pickled a few barrels of cohos, humpbacks, and reds, and the Northern Fisheries (Inc.), secured a few cohos from Litnik Bay.

No special close seasons were enforced at any of the localities fished, except that all commercial fishing was prohibited in Pauls Bay and Litnik Bay, at which places the salmon were desired for propagation. Just before the run of cohos began in Litnik Bay this prohibition was withdrawn to meet the recommendation of the superintendent of the fish-cultural station on Afognak Lake that the taking of cohos would be beneficial to the hatchery work by reducing the number of enemies of the red-salmon fry and fingerlings. Young coho salmon grow much more rapidly than red salmon, usually attaining a length of 6 to 8 inches in the two years they remain in fresh water, during which time, it is said, they feed largely upon the red-salmon fry. Considerable credence had been placed in the local report that the run of cohos in Litnik Bay attained proportions sufficient to attract and induce the natives to undertake commercial fishing for them. The results of fishing carried on during September seem to negative these reports, as the catch was less than 3,000 fish.

CATCH [a] OF SALMON BY SPECIES IN THE AFOGNAK RESERVATION IN 1918.

| Locality. | Species. | | | | | Total. |
|---|---|---|---|---|---|---|
| | Coho. | Chum. | Humpback. | King. | Red. | |
| Malina | | 3 | 7,247 | | 13,899 | 21,149 |
| Paramanoff | | 118 | 40,500 | | 22,335 | 62,953 |
| Seal Bay | 6 | | 2 | 1 | 6,544 | 6,553 |
| Little Afognak | 1,881 | | 23,042 | | 7,884 | 32,807 |
| Danger Bay | 1,012 | | | | | 1,012 |
| Litnik Bay | 2,252 | | | | | 2,252 |
| Total | 5,151 | 121 | 70,791 | 1 | 50,662 | 126,726 |

[a] Exclusive of a small number of coho salmon purchased by the Northern Fisheries (Inc.).

A system of apportioning the district among the fishermen so as to prevent overfishing and at the same time to enable all to enjoy an equal opportunity was tried in 1918 and seemed to be very satisfactory to the natives of Afognak. Under this plan the number of natives at any one fishery was limited; the various fields were assigned to natives from certain localities, who were to enjoy the privileges thus guaranteed without interference on the part of those whose object seemed to be to take the best at each place. This moving from place to place, just as the run of fish was good, benefited comparatively few of the fishermen and always the same ones. All fields on the west side of Afognak Island were reserved for the exclusive use of the natives of Afognak, while the Spruce Island natives could operate only at the fisheries on the east side of Afognak Island, but not exclusively. Within the prescribed limits as to the number of men who might fish at any given place, all the fishing grounds on the island were open to the Afognak natives as distinguished from those from Spruce Island.

Though no seasonal closings were observed in 1918, it does not seem advisable to discontinue such regulations at the chief points of operation. While the primary purpose of the Bureau is the conservation of the fisheries, in a general way its operations affect very closely the vocations of the natives for the reason that most of them are fishermen and trappers. In the Afognak Reservation everything possible is being done in the regulation of fishery operations for the greatest benefit to the natives without injury to the fisheries.

APPARATUS AND APPROXIMATE FISHING SEASON,[a] AFOGNAK RESERVATION, 1918.

| Locality. | Seined. | | | | | Gilled: Red. | Fishing season. | |
|---|---|---|---|---|---|---|---|---|
| | Coho. | Chum. | Humpback. | King. | Red. | | Began. | Ended. |
| Seal Bay | 6 | | 2 | 1 | 6,160 | 384 | June 17 | Aug. 2 |
| Little Afognak | 1,881 | | 23,042 | | 7,834 | 50 | June 15 | Sept. 20 |
| Danger Bay | 1,012 | | | | | | Sept. 3 | Sept. 10 |
| Litnik Bay | 2,252 | | | | | | do | Sept. 14 |
| Malina | | 3 | 7,247 | | 12,674 | 1,225 | June 18 | Aug. 3 |
| Paramanoff | | 118 | 40,500 | | 22,335 | | June 13 | Do. |
| Total | 5,151 | 121 | 70,791 | 1 | 49,003 | 1,659 | | |

[a] Exclusive of a small number of salmon purchased by the Northern Fisheries (Inc.).

## ANNETTE ISLAND FISHERY RESERVE.

On April 28, 1916, a presidential proclamation was made creating the Annette Island Fishery Reserve in southeastern Alaska, whereby Annette Island and certain smaller islands off its coast, together with the surrounding waters, were set apart for the exclusive benefit of the Metlakatla Indians and any other Alaskan natives who might associate themselves and live with them. The Bureau of Education, Department of the Interior, has charge of the administrative affairs within the reserve. The most valuable asset thus secured to the natives is the fishery wealth of the region. To derive the greatest benefit therefrom, a plan was adopted to lease fishing privileges in the reserve to the company making the most advantageous offer. The first lease was made with P. E. Harris & Co., of Seattle, Wash., but owing to the loss by fire of its cannery on the island, nothing was done by that company. A second lease was then made, with the Annette Island Packing Co. of Seattle, under the terms of which the company was authorized to erect a cannery on Annette Island. It was required to pay a permit fee of $100 per annum for each fish trap operated in the reserve, to pay a royalty of 1 cent per fish for each salmon caught in these waters, and to give a guarantee that not less than $6,000 would be paid to the natives annually during the five years of the continuance of the lease.

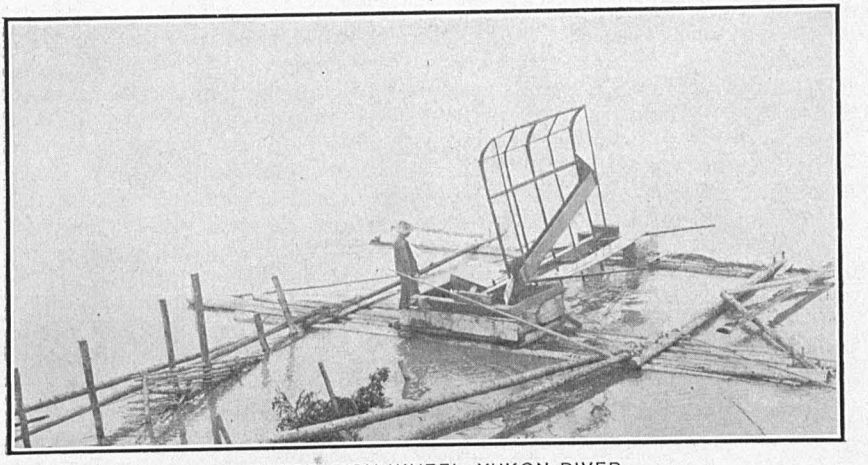
Six traps were operated in the reserve for which a permit fee of $600 was paid. A total of 1,196,669 salmon was taken by these appliances, for which the natives received a royalty of $11,966. In addition to this return, the natives were paid $12,023 for 196,012 salmon which they took with purse seines and sold to the packing company. The natives thus received as a direct return from the fisheries of the reserve a total of $24,589. Over and above this amount, further disbursements of several thousand dollars were made to them on account of labor in the cannery and during its construction.

## YUKON FISHERY.

When in the spring of 1918 it became generally known by various persons residing on the Yukon River and tributary streams that, as the result of preliminary arrangements made the previous season by the Carlisle Packing Company of Seattle, a salmon cannery was to begin operations on the lower Yukon, there arose a protest against the establishment of any such enterprise having for its object the commercial utilization of salmon from Yukon waters for exportation from the Territory.

As a result of this protest an informal public hearing was held by the Bureau at Seattle on May 17, 1918, to receive the views of interested person and invite discussion by those favoring the undertaking and by those opposing it. It was thought that this conference or hearing might develop information useful in determining the best method of conducting a practical inquiry into conditions on the Yukon. The hearing was participated in by representative canners-men and by a number of persons, including Bishop P. T. Rowe, prominently identified with the general welfare of Alaska and particularly in respect to the natives.

Those who opposed the operation of canneries on the Yukon stated that both the whites and natives are largely dependent upon salmon



A NATIVE FISH WHEEL, YUKON RIVER.

PIONEER SALMON CANNERY, YUKON RIVER, 1918.

for food for themselves and their dogs. The great need of dogs for winter transportation was mentioned. Consideration was also given to the effect of commercial fishery operations upon the general prosperity of the region drained by the Yukon and its tributaries. Those who favored the operation of canneries pointed out that a mighty stream like the Yukon ought to support a number of such establishments without detriment to the inhabitants or without injuring the future of the fishery. They spoke of the primitive methods and indifferent efforts by the natives and others to secure salmon. This, they alleged, had material bearing upon the light catch of 1917, which made it necessary to kill quite a number of dogs in the following winter because of a shortage of salmon for food. Those who opposed the cannery admitted that it was not so much a question of one cannery injuring the stream, but the fear, as expressed particularly by Bishop Rowe, that it might be the thin entering wedge for a large number of such establishments.

The preliminary hearing revealed the fact that there was a wide difference of opinion as to the necessity of limiting operations or taking any steps toward the greater protection of the Yukon fisheries. These opinions varied from the idea of absolute prohibition of all cannery operations on the Yukon and its tributaries to the view that any restrictions were both unnecessary and inexpedient, the Yukon being a river of such size and possessing such peculiarities as to render intensive and destructive fishing an impossibility.

As a result of the preliminary hearing the Bureau directed a special inquiry into conditions on the Yukon by Wardens C. F. Townsend and C. L. Larson, the former devoting attention to the lower river and the latter to the upper section. Cooperation was rendered by the Bureau of Education, United States attorneys and marshals, postmasters, commercial companies, and various persons living along the Yukon as to observations on the runs of salmon and reports regarding the number and species of fish taken, methods of capture, and disposition of catch; also expressions of opinion were given in respect to the effect of the operation of one or more canneries on the Yukon. To aid in securing uniform data, blanks prepared by the Bureau were widely distributed.

On June 12 announcement was made of a hearing to be given at Seattle on November 20, 1918, to consider the advisability of limiting or prohibiting commercial fishing for salmon in the Yukon and tributary waters.

The development of the Yukon salmon fisheries began in 1918 with the establishment of a floating cannery at Andreafski. The season's operations resulted in a pack of 13,463 cases of salmon, divided as follows: Cohos 2,661, chums 6,471, humpbacks 107, and kings 4,224 cases. In addition to this, 10,400 pounds of cohos and chums were dry-salted. The total catch of salmon for the cannery was 115,531, of which 26,144 were cohos, 73,921 chums, 3,227 humpbacks, and 12,239 kings. Fishing was carried on from the mouth of the Yukon to a point above the junction of Clear River, chiefly in that part of the Yukon delta known as Kwikluak Pass. The fishing seasons were as follows: Kings, June 26 to August 17; chums, June 28 to September 8; humpbacks, July 7 to July 29; and cohos, August 3 to September 8. Some of the cannerymen and others frequently refer to salmon of one kind by the name "Yukons" or "Yukon salmon." In so doing they mean bright or fresh-run chums.

An investment of $48,000 was made in the plant. One stern wheeler, the *Martha Clow* (65 tons net), one gas boat, the *Althea* (17 tons net), and three smaller power boats were operated in connection with the cannery. Salmon were taken with 124 gill nets aggregating 9,869 fathoms, and 6 wheels of the two-scoop pattern. Employment was given to 169 men, 55 being fishermen, 102 shoresmen, and 12 transporters. Of these 36 were natives, 13 of whom were listed as fishermen.

Stokes & Stokes operated a small saltery on the lower Yukon, packing 15 barrels of chum salmon. Their plant was valued at $1,500. Equipment consisted of one power boat and 300 fathoms of gill nets. They report having located too far up the river, but before another season will move to a point lower down.

Warden C. F. Townsend reported that one Sepella operated a saltery on the Yukon about 12 miles from salt water and that a pack of 110 barrels of chums and cohos was made. Salmon were taken with gill nets and one wheel. Mr. Townsend also advised that the Delta Fishing Co. was in the field in a small way.

Statistics compiled at the close of the season of 1918 indicate that exclusive of gear operated by the cannery and salteries near the mouth of the river, the whites and natives on the Yukon and tributary waters used 393 fish wheels, valued at $19,650, and 130 gill nets aggregating 3,250 fathoms, valued at $6,500. The estimated catch for local requirements was 1,400,000 salmon, which when dried represented approximately 700 tons of fish, valued at $140,000.

The total population of the Yukon region of Alaska, dependent in some measure on the fisheries, was estimated late in 1918 as being 10,907, of which number 6,638 were whites and 4,269 were natives. The number of dogs in the region was estimated at 6,183.

Prior to the season of 1918 the size of the run of salmon in the Yukon was an almost unknown quantity. The belief was expressed in some quarters that a comparatively small run ascended its waters, but others who were interested in the commercial exploitation of its fisheries held the opinion that a run aggregating many millions of salmon annually ascended the river. The necessity of maintaining the fisheries is paramount at all times, and if it is reasonable to suppose that a serious depletion of the supply by unrestricted fishing seems imminent, limitations must necessarily be imposed. This was done on December 14, 1918, by the promulgation of regulations affecting commercial fishing for salmon in the Yukon River. The closing order which is published in full on page 11 in this report became effective January 1, 1919.

## COPPER RIVER FISHERY.

Unusual interest was centered in the Copper River fisheries in 1918. The combined catch of red, coho, and king salmon was considerably in excess of 1,000,000 as against 890,000 in 1917. The catch undoubtedly would have been heavier had it not been for certain restrictions imposed upon fishing by the regulations of December 20, 1918, although as the result of misunderstandings and for other reasons the regulations were more or less disregarded. The regulations were unsatisfactory in some respects, chiefly because of the fact that areas in the delta were included apparently not technically within

the scope of the law authorizing the Secretary of Commerce to impose limitations or prohibitions upon fishing within streams and 500 yards outside the mouths thereof. In promulgating the regulations it was thought that limitations upon fishing on the flats were essential to the protection of the salmon. The idea also was to broadly distribute any burden of necessary limitations upon fishing.

Before the fishing season of 1918 opened a number of interested cannery men requested the Secretary of Commerce to modify the order. On May 18, 1918, an informal hearing took place at Seattle, at which time discussion occurred as to the best method of handling the matter. The results did not prove helpful.

As the season advanced it became obvious that the regulations were in need of revision, hence on September 16 announcement was made by the Secretary of Commerce of a formal hearing at Seattle on November 22 to take up the matter. As a result, the new regulations which appear on page 11 in this report were promulgated on December 20, 1918.

The Bureau's activities in the Copper River region were under the immediate supervision of Assistant Agent E. M. Ball. The following extracts from Mr. Ball's reports submitted at the close of the season appear of interest:

The Copper River is the largest salmon stream in central Alaska and the one of greatest commercial importance. It is a very muddy, glacial river several hundred miles in length. It is fed by a number of fair-sized rivers, nearly all of which are of glacial origin. The river carries at all seasons a considerable amount of silt, but particularly during the summer months, when the glaciers are most active. At times it may be almost liquid mud. In the course of years a large tract of land has been built up at the mouth of the river, which is approximately 40 miles in width from east to west and 10 miles in depth from north to south. This land is known as the delta of the Copper River. Through it the river has maintained one main outlet to the sea and seven or eight lesser channels, each of which bears a distinctive name. The main channel is broken by many gravel bars, which appear as barren islands at low water. Near this channel are several sand islands which have been built up by wind and water to an elevation of several feet above the surrounding country. The greatest deposit of mud occurs to the west of the main channel and it constitutes the marshlands of the delta, being covered with vegetation to the line of mean high tide. The several outlets of the river are connected by many small sloughs, which form a veritable network of waterways throughout the delta. Seaward from this higher marshland to the sand bars which parallel the shore some 3 or 4 miles distant is a large area known as the tide or mud flats of the Copper River, where the numerous channels converge and lead to the ocean through the breaks in the sand bars beyond. When the tide ebbs from the flats, these channels appear merely as continuations of those passing through the marshlands. The greater part of the flats is bare at low water. At such times very shallow draft boats may be operated about the delta, but their movements are limited perforce to the use of the main channels. The river from the head of the delta to Miles Lake, a distance of approximately 20 miles, is swift and shallow and flows through a bed of glacial gravel. Except for a bend or two just below Childs Glacier its course is straight and through an open country.

Miles Lake is simply a widening of the river where it strikes against the face of Miles Glacier. It is nearly 4 miles wide and 6 miles long. The lake is said to be very deep, especially along the face of the glacier, which fact is indicated by the time that large pieces of ice which fall from the glacier remain submerged, often for several seconds. The northern shore is very abrupt, as is also the southern except at one place where a small stream has deposited considerable sediment. The west shore is very flat and is strewn with many bowlders. Miles Glacier forms the eastern shore.

A mile or more above the lake the river emerges from Abercrombie Canyon, which is barely 2 miles in length and about 1,000 feet in width. There are two pronounced rapids in this part of the river where the width at the head of each may be not more than 600 feet. On the west side of the canyon are precipitous mountains; on the east side is a moraine which is still underlaid with ice. On the east side of the river at the northern end of the canyon pockets known locally as "bear holes" have been cut into this buried ice. The name probably arises from the fact that bears came to this

place to feed on salmon. As the ice recedes these places will increase in size, more water will flow through them, and eventually the river may widen its channel until no canyon remains. Even during the present year there was a marked change over the conditions existing in 1917. At least one-third of the river was flowing through the bear holes.

Within the last four years the Copper River as a salmon stream has attracted unusual interest. It has emerged from a position of more or less obscurity into a place of commanding prominence. This change may be due (1) to the superior quality of the Copper River salmon, and (2) to the apparent large escapement of salmon above the then field of operations. Fishing in the delta district, as it was carried on during 1914 and several years preceding, was limited to the activities of but one cannery, that of the Northwestern Fisheries Co., whose plant was and still is located at Orca. Commercial fishery enterprises above the delta were confined to the pickling and mild curing of salmon at Abercrombie by L. L. Mikkelson, who for a few seasons had operated a saltery there, taking salmon by dip-net and gill-net fishing along the west bank of the river in Abercrombie Canyon.

In 1914 the Copper River district was visited by salmon packers who were interested elsewhere in the Alaskan fisheries or those of the Pacific coast, and special attention was given by some of them to the possibilities of operating a cannery in the vicinity of Miles Lake or Abercrombie Canyon. It was evident from the operations of Mikkelson that a considerable number of salmon were escaping the nets at the delta and that profitable fishing could be had in the lake and canyon, and with comparatively little and inexpensive gear and equipment. In the fall of 1914 the Copper River Packing Co. built a cannery at Abercrombie just north of the Mikkelson saltery, but did not operate it until the following season. In the spring of 1915 the Canoe Pass Packing Co. also entered the Copper River field and established a small cannery adjacent to the ocean dock at Cordova. The former company operated only at the up-river fields, while the operations of the latter company were limited to gill netting in the waters of the delta in competition with the Northwestern Fisheries Co. Both new companies made satisfactory packs, even surpassing their own expectations. The apparent ease with which this was done was a sufficient inducement for other interests to enter the field in 1916. Chief of these was the Carlisle Packing Co., which ventured out on a more pretentious scale than any of the older concerns had done, or even those of contemporaneous origin.

This sudden and rapid expansion of operations in the Copper River in 1916 and 1917 was regarded as unjustified and out of all proportion to the size of the run of salmon in that stream. It was further regarded that if these operations continued to expand, or even remained at the magnitude then attained, the fate of the Copper River salmon fishery would be held in the balance. In the face of such a situation failure to provide simple and reasonable protection to the salmon at this critical time would be followed by destruction of the run, if any significance is to be attached to the large and increasing amount of gear required to maintain a supply of salmon sufficient for the profitable operation of the canneries. The establishment of six canneries in the district to draw upon the run of salmon in the Copper River resulted in intensified fishing, a fact clearly indicated by a comparison of the amount of gear and the catch made by the six companies then in the field with that of the one cannery and one saltery which were in operation in 1914 and prior thereto.

As illustrative of the amazing development of activities in this field, some statistics of the amount of gear employed and the catch of salmon made in certain years may be cited. In 1914 the Northwestern Fisheries Co. operated approximately 9,500 fathoms of gill nets in the delta district, while Mikkelson used 500 fathoms of gill nets and a few dip nets at the up-river fields, thus making a total of 10,000 fathoms of nets for the entire field. The catch in that year was approximately 300,000 salmon, or an average of 30 fish per fathom of gear. In 1916 four companies fished in the waters of the delta, using approximately 35,000 fathoms of gill nets, and taking 367,000 salmon, or an average of a fraction more than 10 fish per fathom of gear. During the same season approximately 300,000 salmon were taken in Miles Lake with 5,000 fathoms of gill nets, or an average of 60 salmon per fathom of gear. A catch of approximately 150,000 salmon was made in Abercrombie Canyon by means of 50 dip nets, or an average of 3,000 fish per net. In 1917 seven companies operated in the Copper River fields. Six of these companies used approximately 52,000 fathoms of gill nets in the delta district and took 521,000 salmon, an average of about 10 salmon per fathom of gear. There were also operated in the same season 5,000 fathoms of gill nets in Miles Lake, whereby approximately 265,000 salmon were taken, an average of 53 fish per fathom of gear. A total of 70 dip nets operated in the canyon took approximately 90,000 fish, or an average of 1,285 per net.

From 1914 to 1917 there was an increase in the delta district of about 450 per cent in the amount of gear used, while the increase in the catch of salmon was only about

120 per cent. At the up-river fields the catch in 1917 was 600 per cent greater than in 1914, while there was an increase of 1,000 per cent in gear for the same season. These statistics may tell convincingly the story of the over-fishing of the Copper River, but should they not, additional evidence of that fact may be obtained from the statements of natives and whites living along the Copper River. During the seasons of 1916 and 1917 these people complained bitterly against the continuance of unrestricted commercial fishing in the Copper River, on the ground that they were being deprived of a necessary food supply, and they contended that with the extension of activities on the lower river it became more difficult from year to year for them to secure a supply of salmon from those sections of the river to which they had access. These complaints, whether just or not, must have had some basis for their origin, and they, with the rapid expansion of operations on the river, gave rise to an apprehension that the run of salmon could not survive the growing demands which were being made upon it, if unlimited fishing were allowed to continue.

To further inform itself in respect to the depletion of this fishery the Bureau directed that special investigations be made by some of its agents to determine as far as possible the probable escapement of salmon to the spawning grounds. Upon the basis of the information thus obtained, and also upon the earnest solicitation of a number of the interested salmon packers, the Department announced a hearing to be given at Seattle, Wash., on December 14, 1917, for the purpose of considering the advisability of providing further protection to the salmon of the Copper River. The hearing was held at the appointed time, and was well attended. It resulted in a discussion of various suggestions and plans to acccomplish the end in view, all of which were given consideration by the Department before the promulgation of the order of December 29, 1917. The order became effective on January 1, 1918.

The run of salmon to the Copper River in 1918 began about the middle of May. During the early part of the season the run struck at Alaganik, Pete Dahl, and other sloughs in that vicinity, but as the summer advanced the main movement of the salmon into the Copper was through the channels to the eastward around Grass Island and Cottonwood Point. The run of kings and reds was exceptionally good during May and June.

In 1918 there were five companies taking salmon from the waters of the Copper River delta, operating approximately 130 fishing boats and 50,000 fathoms of gill nets, which is about 2,000 fathoms less than the quantity of gear used in the same waters in 1917. Four traps were operated near Cape Whitshed, each of which may have taken some Copper River salmon. Three were owned by the Carlisle Packing Co. and one by the Canoe Pass Packing Co.

It was fairly well understood before fishing began that the run of salmon to the Copper River in 1918 should be large, corresponding to the run in 1914. In comparison with other seasons, the appearance of salmon on the upper fishing grounds of the river in 1918 was somewhat later than usual, a fact that may be accounted for by the late breaking of winter and the consequent obstruction of many channels by ice which had a deterring effect on the movement of the salmon.

A total of 5,270 fathoms of gill-net web was used in Miles Lake, 4,150 fathoms of which belonged to the Abercrombie Packing Co., while the remaining 1,120 fathoms were owned by the Northwestern Fisheries and the Canoe Pass Packing companies. At Mile 46, R. L. Read operated 150 fathoms of gill nets. The total amount of gear in use above the delta was thus 5,420 fathoms of gill nets and 30 dip nets.

Accurate statistics of the catch of salmon in the delta region of the Copper River were not secured until after my arrival at Seattle, as the superintendents of the canneries concerned were averse to giving out such information except through their home offices. It may be that some of the companies fishing off the mouth of the Copper River did not make a complete segregation of the Copper River fish, but included therewith unavoidably some that should be credited to Eyak and Martin Rivers, but it is also likely that there was a corresponding error in the opposite direction which would offset any inaccuracy along that line. The fishermen were largely to blame in this matter because they moved from place to place over the delta, fishing where they chose without keeping a record of their catch at any point of operation. Probably all salmon taken in the offshore nets and those set from the outer sand bars are included with the Copper River catch, which vitiates to some slight extent these statistics.

In summarizing the observations of the season in regard to operations in the delta district of the Copper River in 1918, it may be said that approximately 50,000 fathoms of gill nets were used by the five companies fishing in those waters. The use of stake nets was generally followed on the tide flats; anchored nets were used chiefly in the sloughs, although some drift gill net fishing was carried on in the main channels. Near the mouth of the larger sloughs there was some congestion of nets, and also along the more important channels across the flats, such as Steamboat Slough. It was

noted that nets were not maintained in one position throughout the season; on the contrary there was a constant shifting of gear corresponding with the increase or decrease in the run of salmon at any given point. Fishermen who were fortunate in securing good locations near the outlets of the streams held those positions practically to the end of the season. Softuk Bar, which was reported as the scene of rather intensive fishing in 1917, figured but slightly in the operations of 1918.

During the first half of June ice interfered with fishing in the sloughs. Some observers thought this condition favored a larger escapement of salmon than would have been the case otherwise. Not all experienced fishermen accept this view as being correct for some maintain that a backward season invariably delays the movement of salmon into the streams. My conclusions are in accord with this view. Further proof of the correctness of this theory may be found in the fact that no appreciable number of salmon and made their appearance at Miles Lake and Abercrombie Canyon before June 10, as only a comparatively small catch was made at those localities during the first five days of the season, which was from June 5 to 10. Additional evidence that late seasons retard the movements of salmon may be gathered from the reports of conditions on Bristol Bay where the ice held later than ever before.

Red salmon were first noticed at the up-river fishing grounds early in June, but merely as stragglers. By the middle of the month the run was on in earnest, and during the remainder of the month fishing in both lake and canyon was good. There is reason to believe, however, that the number of salmon passing above the scene of commercial fishing before June 5, when the season opened, was very small. This conclusion is based primarily on the fact that very few salmon were taken in the lake or canyon before June 10.

R. L. Read operated approximately 150 fathoms of gill nets. His catch of salmon was hauled by wagon to the railroad at Mile 46 and shipped thence to the cannery of the Abercrombie Packing Co. at Abercrombie. The total number of salmon shipped from that point was in excess of 92,000.

Tom Teets had four dipping places between the canyon and the lake, two on each side of the river, and two men at each station. The catch from the stations on the east side was transferred across the river on an aerial tram to a point just south of Mile 52 on the railroad from where it was shipped to Cordova or Abercrombie by train. The other stations were on the west side of the river between Chinaman Slough and the lake. The catch at those places was hauled by a horse and cart to the lake and loaded into boats or scows and then transferred to the cars at one of the spur tracks near Mile 51 or 49. Mr. Teets began operations under a contract with the Northwestern Fisheries Co. and the Canoe Pass Packing Co. to sell his catch to them, but on June 16 he severed his contractual relations with these companies because of their failure, as he stated, to furnish him with adequate shipping facilities, and thereafter sold his fish to the Abercrombie Packing Co.

The Abercrombie Packing Co. had undisputed possession of the canyon field where dip-net fishing exclusively was carried on. Seven men operated on the east side of the river opposite snowsheds No. 1 and No. 2, where steel cables span the canyon. Fifteen men were employed in like manner on the west side of the river in the canyon. This company also operated four-fifths of the gear set in Miles Lake, or 4,150 fathoms of gill nets, in the handling of which 38 men were employed.

The Northwestern Fisheries Co. and the Canoe Pass Packing Co., working under an arrangement to divide the catch, stationed 15 men at Miles Lake who engaged in gill-net fishing, operating a total of 1,120 fathoms of nets.

The total amount of gear in use above the delta was 5,420 fathoms of gill nets and 30 dip nets.

Toward the end of the season, after the Northwestern Fisheries Co. and the Canoe Pass Packing Co. had discontinued fishing in the lake, L. T. Robbins, formerly employed by these companies, pickled 100 barrels of red salmon at the lake, using in this work part of the company gear.

TOTAL CATCH OF SALMON BY SPECIES IN THE COPPER RIVER IN 1918.

| Locality. | Species. | | | Total. |
|---|---|---|---|---|
| | Coho. | King. | Red. | |
| Delta | 43,419 | 5,646 | 1,098,057 | 1,147,122 |
| Above delta | 6,770 | 15,203 | 490,781 | 512,754 |
| Total | 50,189 | 20,849 | 1,588,838 | 1,659,876 |

The number of red salmon taken from the Copper River in 1918 equaled 95.72 per cent of the total catch; kings equaled 1.26 per cent; and cohos 3.02 per cent. Out of the total catch of red salmon, 69.11 per cent was taken in the waters of the delta, while 30.89 per cent came from the up-river fishing grounds. Twenty-five per cent of the total catch of kings was taken from delta waters, as against 75 per cent from the river above the delta.

At the close of the fishing season on the Copper River in 1917 it was conceded by those interested in the salmon fisheries of that region, and others who had intimate knowledge of conditions there, that alarming drains had been made on the supply of salmon and that unless greater protective measures were adopted than those afforded by the general fishery law a serious and permanent depletion was inevitable. This condition was the more acute for the reason that the season of 1916 also showed in proportion to the gear in use a falling off in catch from that of the two years immediately preceding. The fact that 10,000 fathoms of gill nets was sufficient to catch 400,000 salmon in the Copper River in 1914 and that in 1916 the use of 40,000 fathoms was required to take double that number, or 800,000, would seem to foreshadow depletion in direct ratio to the increase in gear. The simple logic of it all is that as the scale of one ascends the other naturally descends. Equilibrium could be restored only by a reduction in the amount of gear which automatically would make possible a greater escapement of salmon. This fact was brought out prominently at the hearing given in Seattle, Wash., December 14, 1917, when, as the record of that meeting seems to show, not a dissenting voice was heard in opposition to the well-founded opinion that the valuable salmon fisheries of the Copper River had suffered considerable depletion already and were then in danger of complete destruction by unrestrained commercialism. The time to act was therefore apparent to all.

While there may have been some disagreement with regard to details, there was a unanimity of opinion in respect to essentials—the run of salmon was being depleted and something should be done to stop it. Fishing activities were rapidly approaching the danger point and serious consequences were in sight if they continued unchecked much longer.

To understand thoroughly the peculiar conditions existing at the mouth of the river, and to know the extent of the delta, the entire region should be seen at low water. No published map or chart adequately portrays them. If observations are made at low water, it will be found that these several streams which are the outlets of the Copper River traverse the mud flats to the outer sand bars through channels having well-defined banks. Naturally, at high water, these streams are dispersed in all directions after they emerge from the grass banks, but even so, that is no reason for saying that the mud flats and sand bars are not as much a part of the delta as the grass-covered marshlands which are overflowed only at extreme high tide. The delta of the Copper River is a physical fact, and it must necessarily lie within the mouth of the river. That being so, it would seem that under the law the Secretary of Commerce had ample authority to limit or prohibit fishing in at least all of the waters inside of and within 500 yards outside of the several outlets through the sand bars.

## SALMON HATCHERIES.

### EXTENT OF OPERATIONS.

In 1918 the propagation of salmon in Alaska was carried on at four fish-cultural stations, two of which were operated by the Government and two by private interests. The capacity of these hatcheries is approximately 280,000,000 red-salmon eggs, the two Government stations being able to take care of 150,000,000.

In 1917 the total collection of red-salmon eggs in Alaska was 115,964,000. The number of salmon liberated in Alaskan waters in the season of 1917–18 was 90,390,200, which was 65,250,800 less than in 1916–17. The take of red-salmon eggs in 1918 was 142,001,000, or 26,037,000 more than in 1917. This increase was due to the fact that considerably larger takes were made at the McDonald Lake (formerly Yes Bay), Fortmann, and Quadra hatcheries. The collection of eggs at the Afognak station was also approximately 1,500,000 greater than in the previous year. Operations at the Uganik and Seal Bay substations of Afognak were not carried on in 1918.

OPERATIONS OF ALASKA HATCHERIES IN 1918.

| Stations. | Red or sock-eye salmon eggs taken 1917 | Red or sock-eye salmon liberated in 1917–18. | Red or sock-eye salmon eggs taken 1918. |
|---|---|---|---|
| McDonald Lake (Yes Bay) | 34,950,000 | 32,539,200 | [a] 47,300,000 |
| Afognak | [b] 53,036,000 | 31,427,000 | [c] 54,681,000 |
| Seal Bay | 2,712,000 | [d] 2,712,000 | ..... |
| Fortmann | 6,840,000 | 6,135,000 | [e] 19,620,000 |
| Quadra | 13,600,000 | 12,990,000 | 20,400,000 |
| Hetta | 4,826,000 | 4,587,000 | ..... |
| Total | 115,964,000 | 90,390,200 | 142,001,000 |

[a] 1,365,000 humpback-salmon eggs were also taken.
[b] 18,000,000 eyed eggs transferred to Oregon, Washington, and British Columbia.
[c] 8,697,000 humpback-salmon eggs were also taken.
[d] Eyed eggs.
[e] 3,660,000 humpback-salmon eggs were also taken.

## HATCHERY REBATES.

The Federal fishery law of Alaska provides that the catch and pack of salmon by the operators of private hatcheries shall be exempt from all license fees and taxation of every nature at the rate of 10 cases of canned salmon to every 1,000 red or king salmon fry liberated upon compliance with certain conditions, among which may be mentioned the filing of affidavits with the clerk of the district court of the division of Alaska wherein the hatchery is located and with the Secretary of Commerce, showing the number of red-salmon fry released during the fiscal year for which report is made. The following table gives the rebates due to private operators for the fiscal year ending June 30, 1918:

REBATES CREDITED TO PRIVATE SALMON HATCHERIES DURING THE FISCAL YEAR ENDED JUNE 30, 1918.

| Owners. | Location. | Red-salmon fry liberated. | Rebate due. |
|---|---|---|---|
| Alaska Packers Association | Naha Stream | 6,135,000 | $2,454.00 |
| Northwestern Fisheries Co. | Quadra Lake | 12,990,000 | 5,196.00 |
| Do | Hetta Lake | 4,587,000 | 1,834.80 |
| Total | ..... | 23,712,000 | 9,484.80 |

## HATCHERY INSPECTION.

The law provides that all private hatcheries shall be inspected by order of the Secretary of Commerce and that no rebate certificates shall be issued to the owners of such establishments until the efficiency of the hatcheries has first been approved by the Secretary of Commerce in the manner provided by law. The necessary inspections were made and the character of operations approved.

## HATCHERY OPERATIONS.

### MCDONALD LAKE.

The name Yes Bay, as applied to the hatchery on McDonald Lake, was obviously inappropriate, as the hatchery is not located on the bay. It has been decided, therefore, that henceforth this station

will be known as the McDonald Lake hatchery. In 1917 the egg-collecting season began on September 11 and ended September 26. In that time 34,950,000 red-salmon eggs were collected, out of which number 32,539,200 fry were liberated in McDonald Lake and tributaries. Losses aggregated 2,410,800 eggs and fry, or approximately 6⅞ per cent.

In 1918 spawning operations began August 29 and ended October 2 and resulted in a collection of 47,300,000 red-salmon eggs. A collection of 1,365,000 humpback-salmon eggs was also made.

### AFOGNAK.

During the spawning season of 1917 the Afognak station made a collection of 53,036,000 red-salmon eggs, operations beginning July 30 and ending September 11. Of that number, 18,000,000 eyed eggs were distributed among hatcheries in Oregon, Washington, and British Columbia. The remaining 35,036,000 were incubated at the Afognak hatchery. The loss of eggs was 2,221,000 and fry 1,388,000, a total of 3,609,000, or 6¾ per cent of the total take. The number of red-salmon fry planted in Litnik Lake and its tributaries was 31,427,000.

The spawning season of 1918 began July 30 and ended October 2, during which period 54,681,000 red-salmon eggs were taken. A collection of 8,697,000 humpback-salmon eggs was also made.

The substations at Seal Bay and Uganik were not operated in 1918.

### FORTMANN.

The Alaska Packers Association owns and operates the Fortmann hatchery on Heckman Lake, Revillagigedo Island, southeastern Alaska. This hatchery was built in 1901 and is now the largest plant of its kind in Alaska, having a capacity of 110,000,000 salmon eggs. It has been in continuous operation since the date of its construction, a period of more than 18 years. In that time 643,617,000 red salmon have been liberated therefrom.

Out of the 6,840,000 red-salmon eggs taken in 1917 between September 3 and October 20, there were hatched and planted 6,135,000 fry. The loss was 705,000, or approximately 10⅓ per cent. A collection of 2,400,000 humpback-salmon eggs was also made in 1917, from which 1,845,000 fry were produced and planted. Between August 28 and November 15, 1918, a total take of 19,620,000 red-salmon eggs was made. Humpback-salmon eggs to the number of 3,660,000 were taken between September 13 and November 15.

### QUADRA.

The Northwestern Fisheries Co. owns and operates the hatchery located near Quadra, in southeastern Alaska. This plant has a capacity of approximately 21,000,000 red-salmon eggs. The taking of eggs in 1917 began August 13 and ended November 3, during which period 13,600,000 were collected. Out of this number there were hatched and planted 12,990,000 red-salmon fry, the total loss being 610,000, or approximately 4½ per cent.

Spawn-taking at this hatchery in 1918 began August 14 and ended September 28. In that time a collection of 20,400,000 red-salmon eggs was made.

HETTA.

The Hetta hatchery is also owned and operated by the Northwestern Fisheries Co. and is located on Hetta Lake, in southeastern Alaska. It has a capacity of approximately 12,000,000 red-salmon eggs. In 1917 egg collecting began August 15 and ended December 14, resulting in a take of 4,826,000 eggs, from which 4,587,000 red-salmon fry were hatched and liberated. The loss was 239,000, or approximately 4.9 per cent.

This hatchery was closed on June 30, 1918. No eggs were taken during the spawning season of 1918.

## GENERAL STATISTICS OF THE FISHERIES IN 1918.

The total investment in the Alaska fisheries in 1918 was $73,750,789, an increase of $18,813,240 over 1917. Approximately 90 per cent of this investment was in the salmon industry. The number of persons engaged in 1918 was 31,213, an increase of 1,722 over 1917. The total value of the products in 1918 was $59,154,859, an increase of $7,677,879 over 1917. This is an increase of about 15 per cent over the value of the products in 1917.

SUMMARY OF INVESTMENTS IN THE FISHERIES OF ALASKA IN 1918.

| Industries. | Southeast Alaska. | Central Alaska. | Western Alaska. | Total. |
|---|---|---|---|---|
| Salmon canning | $28,971,126 | $11,960,681 | $22,969,590 | $63,901,397 |
| Salmon mild-curing | 786,342 | | | 786,342 |
| Salmon pickling | 278,306 | 492,160 | 592,491 | 1,362,957 |
| Salmon freezing | 124,172 | | | 124,172 |
| Salmon, fresh | 114,689 | | | 114,689 |
| Salmon dry-salting | | | 58,345 | 58,345 |
| Salmon drying and smoking | | | 26,150 | 26,150 |
| Salmon by-products | 109,782 | | | 109,782 |
| Herring fishery | 1,018,394 | 722,135 | 62,288 | 1,802,817 |
| Halibut fishery | 2,607,792 | | | 2,594,292 |
| Cod fishery | | 805,484 | 465,634 | 1,271,118 |
| Whale fishery | 393,037 | 22,914 | 935,020 | 1,350,971 |
| Clam fishery | 1,200 | 246,557 | | 247,757 |
| Crab fishery | 739 | | | |
| Total | 34,405,579 | 14,249,931 | 25,109,518 | 73,750,789 |

SUMMARY OF PERSONS ENGAGED IN THE FISHERIES OF ALASKA IN 1918.

| Races. | Southeast Alaska. | Central Alaska. | Western Alaska. | Total. |
|---|---|---|---|---|
| Whites | 7,862 | 3,717 | 6,114 | 17,693 |
| Natives | 3,157 | 1,030 | 1,064 | 5,251 |
| Japanese | 857 | 306 | 346 | 1,509 |
| Chinese | 1,374 | 562 | 798 | 2,734 |
| Filipinos | 731 | 279 | 328 | 1,338 |
| Mexicans | 276 | 229 | 1,204 | 1,709 |
| Miscellaneous | 400 | 96 | 483 | 979 |
| Total | 14,657 | 6,219 | 10,337 | 31,213 |

SUMMARY OF PRODUCTS OF THE ALASKAN FISHERIES IN 1918.

| Products. | | Quantity. | Value. |
|---|---|---|---|
| Salmon: | | | |
| Canned | cases | 6,605,835 | $51,041,949 |
| Mild-cured | pounds | 3,158,400 | 607,951 |
| Pickled | do | 11,378,000 | 1,079,881 |
| Frozen | do | 1,877,922 | 170,864 |
| Fresh (including local) | do | 4,760,915 | 386,576 |
| Dry-salted | do | 516,975 | 47,544 |
| Dried and smoked | do | 1,400,000 | 140,000 |
| By-products, oil | gallons | 4,624 | 4,624 |
| By-products, fertilizer | pounds | 1,368,000 | 35,423 |
| Herring: | | | |
| Canned | cases | 31,719 | 231,735 |
| Dry-salted | pounds | 100,000 | 1,500 |
| Fresh for food | do | 606,326 | 6,564 |
| Fresh for bait | do | 1,407,200 | 17,827 |
| Frozen for bait | do | 4,152,835 | 36,654 |
| Pickled, Scotch cure | do | 9,744,175 | 748,606 |
| Pickled, Norwegian cure | do | 8,958,515 | 632,402 |
| Oil | gallons | 138,012 | 97,000 |
| Fertilizer | pounds | 1,290,000 | 47,250 |
| Halibut: | | | |
| Fresh (including local consumption) | do | 10,491,777 | 1,315,985 |
| Frozen | do | 3,337,529 | 348,866 |
| Dry-salted | do | 40,400 | 2,835 |
| Cod: | | | |
| Canned | cases | 2,336 | 14,175 |
| Dry-salted | pounds | 10,902,507 | 778,737 |
| Pickled | do | 2,650,073 | 142,200 |
| Stockfish | do | 38,268 | 7,128 |
| Tongues | do | 18,800 | 1,840 |
| Frozen | do | 273,326 | 10,312 |
| Fresh | do | 67,458 | 2,742 |
| Oil | gallons | 50 | 50 |
| Whales: | | | |
| Oil | do | 672,989 | 421,942 |
| Sperm oil | do | 338,931 | 327,420 |
| Fertilizer | pounds | 2,059,600 | 74,255 |
| Bone | do | 8,223 | 1,644 |
| Ivory | do | 866 | 216 |
| Meat, frozen | do | 148,000 | 7,400 |
| Beluga hides | do | 2,500 | 1,250 |
| Clams | cases | 43,575 | 214,504 |
| Trout: | | | |
| Canned | do | 2,641 | 24,568 |
| Fresh | pounds | 60,218 | 6,575 |
| Frozen | do | 9,500 | 768 |
| Pickled | do | 21,000 | 1,773 |
| Sablefish, fresh, frozen, and pickled | do | 1,336,039 | 67,351 |
| Red rockfish | do | 338,669 | 12,186 |
| Crabs | dozens | 720 | 1,440 |
| Shrimps: | | | |
| Canned | cases | 524 | 3,200 |
| Fresh | pounds | 48,204 | 10,806 |
| Atkafish, pickled | do | 7,850 | 645 |
| Miscellaneous fresh fish | do | 246,968 | 7,696 |
| Total | | | 59,154,859 |

## SALMON INDUSTRY.

A very material increase occurred both in quantity and value of products in the salmon industry of Alaska in 1918. In view of the unprecedented returns for 1917, the results of operations during 1918 were very satisfactory. As will usually be the case, some sections produced smaller numbers of salmon than in the preceding season, while notable gains occurred in other places. This oscillating movement of the salmon runs does not affect all districts alike at the same time, for where one region produces only a light run another yielding in superabundance makes good the shortage. Such conditions are not the best for the packers, as they are unable to determine accurately the extent of preparations for operations each season, though some

conclusions of value may be reached by study and analysis of the records of past seasons, applying the four or five year cycle theory for red and king salmon and the shorter cycles for the other species.

The increased production may be due in part to the greater number of canneries in Alaska, but this is not necessarily true, as the productivity of any field has a limit which when once reached inevitably restricts the yield. This conclusion is borne out by results in southeastern Alaska in 1918 where 14 more canneries were operated than in 1917, but which yielded an increase of but 80,601 cases of salmon, an average of less than 6,000 cases. Double the number of canneries will not change the situation once the maximum productivity of the field has been reached. This condition is further controlled by two factors which in a way predetermine the correctness of the foregoing statement, i. e., (*a*) the escapement of salmon for reproductive purposes, and (*b*) the area of the spawning grounds.

There was no great change in the value of products, possibly for the reason that the Government, through the Food Administration, regulated prices upon all grades of salmon, thus preventing any notable rise in prices for canned salmon. A large part of the pack of canned salmon was commandeered for military uses by the United States and allied nations.

The production of canned salmon in southeastern Alaska exceeded that of 1917 by less than 81,000 cases, the only increase being that of chum salmon, which hardly more than equaled the falling off in the other species. The run of salmon seemed to be rather general and uniform throughout the district, in striking contrast to that of 1917, when the bulk of the catch was made in the Icy Strait district. Sixteen new canneries were operated in southeastern Alaska in 1918, while 2 of those operating in 1917 were dropped from the list, thus making a net gain of 14.

In central Alaska 3 new canneries were put into operation, while 1 was discontinued, the net gain being 2. Of the new plants, 2 are credited to the Prince William Sound district and 1 to the Kodiak section. Central Alaska shows a greater gain in the number of cases of canned salmon produced than either the southeastern or western districts, there being an increase of approximately 380,000 cases, or more than 35 per cent. This is due to a considerably better catch of cohos, chums, and humpbacks. There was a moderate decline in the number of cases of kings and reds packed, which as regards the latter was due to a falling off of nearly 50 per cent in the run of red salmon at Karluk and the south end of Kodiak Island.

The industry in western Alaska shows a gain of 1 cannery, 2 plants having been put in operation in 1918, while 1 was permanently dismantled and closed. There was a tremendous run of red salmon to Bristol Bay which struck with full force immediately after the rivers were free from ice. The canneries were almost swamped with fish at the beginning of the season. This condition prevented the largest use of the available supply of salmon and curtailed the pack somewhat. This, however, was not without some benefit to the run, as a much larger escapement of fish to the spawning grounds undoubtedly resulted.

For the first time in the history of the industry a salmon cannery was operated on the Yukon River and made a small pack of coho, chum, humpback, and king salmon. Expectations in respect to the probable pack were not realized, as fishing could not begin until the river was free from ice, which did not occur until late in June. It was reported by those interested in the commercial exploitation of the salmon fisheries of the Yukon that a very large run of coho, chum, and king salmon, especially the latter, ascended the river, there being countless millions of these fish; they further stated that no appreciable impression on the supply of salmon in that region could be made if a number of canneries were in operation.

This view seems to have been shared by a number of persons who have lived on the Yukon for years, as several of them have reported an almost inexhaustible supply of salmon annually ascending the Yukon. Contrary opinions, equally well supported, hold that the run of salmon was not large and that it would not be able to stand the drain of commercial fishing without seriously jeopardizing the continuing supply and depriving local inhabitants of an important and indispensable food article. Exact knowledge of the salmon runs in the Yukon River is limited, and until further investigations can be made the correctness of either contention is problematical. Realizing the great importance of the situation, the Bureau plans to have a thorough and comprehensive study made as soon as practicable by several of the best authorities on the habits and runs of salmon.

In western Alaska the increase in pack over that of 1917 was approximately 200,000 cases, more than half of which was red salmon. The next greatest increase was in the pack of chums, which was more than double that of 1917, when 51,000 cases were produced.

Approximately 24,500,000 red salmon were taken in western Alaska in 1918, of which number about 23,000,000 were utilized in the canning industry, while the remaining 1,500,000 were pickled.

### SALMON CATCH AND FORMS OF GEAR.

As heretofore, the apparatus employed in the salmon fisheries of Alaska consisted chiefly of gill nets, seines, and pound nets or traps. There were 838 seines in operation, the aggregate length of which was 131,127 fathoms. This is an increase of 239 over the number of seines used in 1917, southeast Alaska showing an increase of 175, central Alaska an increase of 59, and western Alaska a gain of 5.

In the salmon industry 4,367 gill nets, measuring 479,112 fathoms were used. They were divided among the three districts as follows: Southeast Alaska, 435 gill nets, a gain of 7 over the number reported in 1917; central Alaska, 1,158, an increase of 9; and western Alaska, 2,774, a decrease of 762. This is a net decrease of 746 gill nets from 1917.

There were in use in the salmon industry 79 floating and 473 driven pound nets, a total of 552. This is an increase of 82 over 1917. Of the number operated in 1918, southeast Alaska had 79 floating and 290 driven, gains of 7 and 47, respectively; central Alaska had 166 driven pound nets, a gain of 30 over 1917, the increase being largely due to the operations of two new canneries in the western part of the district and the introduction of this apparatus in Prince William Sound, where it had not formerly been used; and western Alaska had 17 driven pound nets, as against 19 in 1917, a decrease of 2.

Considering Alaska in its entirety, there was an increase over 1917 of 33 per cent in the number of fathoms of seines operated in the salmon industry; the number of fathoms of gill nets decreased 2.9 per cent; and pound nets increased 17 per cent in number.

Of the total catch of salmon in Alaska in 1918, 41 per cent were taken by pound nets, 30 per cent by seines, 28 per cent by gill nets, and 1 per cent by lines, dip nets, and wheels. In 1917 seines caught 32 per cent of the salmon taken in Alaska, pound nets 39 per cent, gill nets 28 per cent, while the other appliances caught the remaining 1 per cent. The catch by pound nets in 1918 increased 2 per cent, but the catch by gill nets remained the same as in 1917. The catch by seines decreased 2 per cent from that of 1917. The following table shows the proportionate catch by districts according to the principal kinds of apparatus used:

PERCENTAGE OF SALMON CAUGHT IN EACH DISTRICT BY PRINCIPAL FORMS OF GEAR.

| Apparatus. | Southeast Alaska. | | Central Alaska. | | Western Alaska. | |
|---|---|---|---|---|---|---|
| | 1917 | 1918 | 1917 | 1918 | 1917 | 1918 |
| | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* |
| Seines | 41 | 38 | 48 | 39 | 2 | 4 |
| Pound nets | 55 | 58 | 38 | 48 | 4 | 4 |
| Gill nets | 2 | 2 | 12 | 11 | 94 | 90 |

The total take of salmon in Alaska in 1918 was 101,454,688, as against 92,600,495 in 1917, an increase of 8,854,193. There was a decrease of 2,109,110 salmon in southeast Alaska, and an increase of 8,534,072 in central Alaska, and 2,429,231 in western Alaska. Further comparison of the catch of Alaska as a whole with that of 1917 shows that chums increased 5,633,240, humpbacks 3,441,091, cohos 807,428, and kings 131,416. Reds declined 1,158,982.

In this connection it appears of interest to record that a total of 838 seines used in the salmon fisheries of Alaska took 29,986,747 salmon, an average of 35,783 per seine; a total of 552 pound nets used in the same fisheries caught 41,725,505 salmon, an average of 75,589 per pound net. The relative efficiency of the two forms of gear was at the ratio of 7 to 15 in favor of pound nets.

SALMON TAKEN IN 1918, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA.

| Apparatus and species. | Southeast Alaska. | Central Alaska. | Western Alaska. | Total. |
|---|---|---|---|---|
| Seines: | *Number.* | *Number.* | *Number.* | *Number.* |
| Coho, or silver | 373,266 | 91,161 | 3,909 | 468,336 |
| Chum, or keta | 5,313,484 | 1,904,905 | 218,056 | 7,436,445 |
| Humpback, or pink | 13,443,548 | 4,903,845 | 110,876 | 18,458,269 |
| King, or spring | 16,765 | 1,468 | 5,439 | 23,672 |
| Red, or sockeye | 795,843 | 1,905,680 | 898,502 | 3,600,025 |
| Total | 19,942,906 | 8,807,059 | 1,236,782 | 29,986,747 |
| Gill nets: | | | | |
| Coho, or silver | 249,249 | 459,584 | 127,194 | 836,027 |
| Chum, or keta | 198,720 | 274,962 | 682,493 | 1,156,175 |
| Humpback, or pink | 91,385 | 29,597 | 221,498 | 342,480 |
| King, or spring | 20,935 | 90,145 | 92,764 | 203,844 |
| Red, or sockeye | 516,721 | 1,737,758 | 23,420,020 | 25,674,499 |
| Total | 1,077,010 | 2,592,046 | 24,543,969 | 28,213,025 |

SALMON TAKEN IN 1918, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA—Continued.

| Apparatus and species. | Southeast Alaska. | Central Alaska. | Western Alaska. | Total. |
|---|---|---|---|---|
| | *Number.* | *Number.* | *Number.* | *Number.* |
| Pound nets: | | | | |
| Coho, or silver | 699,726 | 338,432 | 10,000 | 1,048,158 |
| Chum, or keta | 3,645,567 | 1,409,411 | 210,195 | 5,265,173 |
| Humpback, or pink | 24,087,172 | 4,985,417 | 430,617 | 29,503,206 |
| King, or spring | 31,667 | 27,951 | 9,902 | 69,520 |
| Red, or sockeye | 1,422,786 | 4,038,379 | 378,583 | 5,839,748 |
| Total | 29,886,918 | 10,799,590 | 1,039,297 | 41,725,805 |
| Lines: | | | | |
| Coho, or silver | 300,395 | | | 300,395 |
| Chum, or keta | 29,500 | | | 29,500 |
| Humpback, or pink | 9,269 | | | 9,269 |
| King, or spring | 371,719 | | | 371,719 |
| Red, or sockeye | 21,108 | | | 21,108 |
| Total | 731,991 | | | 731,991 |
| Dip nets: | | | | |
| Coho, or silver | | 8,503 | | 8,503 |
| King, or spring | | 8,890 | | 8,890 |
| Red, or sockeye | | 202,685 | | 202,685 |
| Total | | 220,078 | | 220,078 |
| Wheels: | | | | |
| Coho, or silver | | | 250,262 | 250,262 |
| Chum, or keta | | | 273,525 | 273,525 |
| Humpback, or pink | | | 3,138 | 3,138 |
| King, or spring | | | 50,117 | 50,117 |
| Total | | | 577,042 | 577,042 |
| Total: | | | | |
| Coho, or silver | 1,622,636 | 897,680 | 391,365 | 2,911,681 |
| Chum, or keta | 9,187,271 | 3,589,278 | 1,384,269 | 14,160,818 |
| Humpback, or pink | 37,631,374 | 9,918,859 | 766,129 | 48,316,362 |
| King, or spring | 441,086 | 128,454 | 158,222 | 727,762 |
| Red, or sockeye | 2,756,458 | 7,884,502 | 24,697,105 | 35,338,065 |
| Grand total | 51,638,825 | 22,418,773 | 27,397,090 | 101,454,688 |

## SALMON CANNING.

### NEW CANNERIES.

The number of salmon canneries in Alaska was increased during 1918 by the addition of 17 over the number reported for 1917, making a total of 135 for the Territory.

In southeastern Alaska 16 new canneries were put in operation, but there was a net gain of only 14, one plant, that of Robert Scott, at Craig, having failed to resume operations in 1918, while the plant of the Sunny Point Packing Co. was destroyed by fire in 1917 and was not rebuilt. The new plants are as follows:

Alaska Clam Canning Co.....Petersburg.
Alaska Fisheries Co.....Washington Bay.
Alaska Packing & Navigation Co.....Pavlof Harbor.
American Packing Co.....Juneau.
Annette Island Packing Co.....Metlakatla.
Columbia Salmon Co.....Tenakee.
Deep Sea Salmon Co.....Port Althorp.
Hidden Inlet Canning Co.....Hood Bay.
T. E. P. Keegan.....Douglas.
Northern Packing Co. (Inc.).....Juneau.
Noyes Island Packing Co.....Steamboat Bay.
Pybus Bay Fish & Packing Co.....Pybus Bay.
Pyramid Packing Co.....Sitka.
Southern Alaska Canning Co.....Quadra Bay.
Todd Packing Co.....Peril Strait.
H. Van Vlack & Co.....Thomas Bay.

In central Alaska 3 new canneries were operated, making a net gain of 2 for the district, as the plant of the Deep Sea Salmon Co., at Knik Arm, was discontinued. The new canneries are as follows:

| | |
|---|---|
| Alaska Sea Food Co. | Cordova. |
| Alitak Packing Co. | Lazy Bay. |
| Kenai Packing Co. | Drier Bay. |

In western Alaska 2 new canneries were opened, but there was a net gain of only one as the canning of salmon at the plant of the Pacific American Fisheries, at Makushin Bay, was discontinued. The new canneries are as follows:

| | |
|---|---|
| Carlisle Packing Co. | Andreafski (floating). |
| Northwestern Fisheries Co. | Naknek River. |

CHANGES IN CANNERIES.

Important changes in the ownership of several canneries in Alaska were noted in 1918. It appears that there is a tendency toward consolidation of interests in the salmon-canning business of Alaska, due apparently in some measure to a movement toward more economical management and operation. A number of concerns which have been listed among Alaskan packers for several seasons do not appear in the list of operators in 1918. Among these may be mentioned the Taku Canning & Cold Storage Co., at Taku Harbor, which sold its cannery to Libby, McNeill & Libby; the Wiese Packing Co., which disposed of its cannery at Rose Inlet to the Southern Alaska Canning Co.; the Pillar Bay Packing Co., which sold its cannery at Point Ellis to the Fidalgo Island Packing Co. and ceased to be an operator in Alaska; the Sanborn-Cram Co. became the Burnett Inlet Packing Co.; the Sitka Packing Co. acquired the cannery partly constructed in 1917 by J. H. Long, at Sitka, and operated it during the season of 1918; the J. H. Long Packing Co., at Juneau, was succeeded by the American Packing Co., which acquired possession of the cannery of the former concern.

There were also a number of changes in the ownership or control of salmon canneries in Alaska, which, however, did not affect the name of the companies concerned. Mention may be made of the following acquisitions: The Wilson Fisheries Co. now controls the Alaska Herring & Sardine Co., at Port Walter, and the J. L. Smiley Co., at Ketchikan. Both of these plants were improved, the former by the installation of three lines of canning machines, and the latter by the addition of one line. The Northern Fisheries (Inc.), purchased the Alaska Salmon Co., but continued the operation of the cannery on Wood River in the name of the latter company.

The cannery at Abercrombie, Alaska, on the Copper River, formerly operated by the Copper River Packing Co., is now operated in the name of the Abercrombie Packing Co. The Bering Sea Packing Co., at Herendeen Bay, became the Everett Packing Co. The cannery of the Astoria & Puget Sound Canning Co., at Excursion Inlet, destroyed by fire in 1917, was rebuilt in time for operations in 1918.

Of the number of canneries in operation in 1917, each of the three districts of Alaska as subdivided by this report lost one, as follows: In southeastern Alaska the cannery of Robert Scott, at Craig, ceased to operate; in central Alaska, the Deep Sea Salmon Co. dismantled its cannery on Knik Arm, Cook Inlet; in western Alaska, the Pacific American Fisheries permanently closed its cannery at Makushin Bay, but stated its intention to continue cod-fishery operations in that region.

CANNERIES OPERATED IN 1918.

There were 135 salmon canneries in operation in Alaska in 1918, divided among the three districts as follows: Southeast Alaska, 76; central Alaska, 29; western Alaska, 30.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH.

| Name. | Canneries. | Location. | Pound nets. |
|---|---|---|---|
| Southeast Alaska: | | | |
| Alaska Clam Canning Co | 1 | Petersburg | |
| Alaska Fish Co | 1 | Waterfall | 2 |
| Alaska Fisheries Co | 1 | Washington Bay | |
| Alaska Herring & Sardine Co | 1 | Port Walter | |
| Alaska Pacific Fisheries | 3 | Chilkoot | 11 |
| | | Chomly | [a] 8 |
| | | Yes Bay | [b] 13 |
| Alaska Pacific Herring Co | 1 | Big Port Walter | |
| Alaska Packers Association | 2 | Loring | [c] 10 |
| | | Wrangell | [c] 6 |
| Alaska Packing & Navigation Co | 1 | Pavlof Harbor | |
| Alaska Sanitary Packing Co | 1 | Wrangell | 3 |
| American Packing Co | 1 | Juneau | |
| Anacortes Fisheries Co | 2 | Kasaan | 7 |
| | | Shakan | 3 |
| Annette Island Packing Co | 1 | Metlakatla | 5 |
| Astoria & Puget Sound Canning Co | 1 | Excursion Inlet | 10 |
| Auk Bay Salmon Canning Co | 1 | Auk Bay | 7 |
| Baranof Packing Co | 1 | Red Bluff Bay | [d] 1 |
| Barnes, F. C., Co | 1 | Lake Bay | 3 |
| Beegle Packing Co | 1 | Ketchikan | [c] 4 |
| Burnett Inlet Packing Co | 1 | Burnett Inlet | [d] 4 |
| Cole, R. L | 1 | Deweyville | 1 |
| Columbia Salmon Co | 2 | Craig | 1 |
| | | Tenakee | 4 |
| Deep Sea Salmon Co | 2 | Ford Arm | [d] 4 |
| | | Port Althorp | [d] 13 |
| Doyhof Fish Products Co | 1 | Scow Bay | [d] 1 |
| Fidalgo Island Packing Co | 2 | Ketchikan | 8 |
| | | Pillar Bay | 6 |
| George Inlet Packing Co | 1 | George Inlet | 1 |
| Haines Packing Co | 1 | Letinkof Cove | |
| Harris, P. E., & Co | 1 | Hawk Inlet | |
| Hidden Inlet Canning Co | 2 | Hidden Inlet | [f] 5 |
| | | Hood Bay | 4 |
| Hoonah Packing Co | 2 | Gambier Bay | 9 |
| | | Hoonah | [g] 16 |
| Hume Co., G. W | 1 | Nakat Harbor | [g] 8 |
| Karheen Packing Co | 1 | Karheen | 5 |
| Keegan, T. E. P | 1 | Douglas | |
| Ketchikan Packing Co | 1 | Ketchikan | |
| Lane & Williams | 1 | Moira Sound | |
| Libby, McNeill & Libby | 2 | Taku Harbor | 15 |
| | | Yakutat | |
| Marathon Fishing & Packing Co | 1 | Petersburg | |
| Myers & Co., Geo. T | 1 | Chatham | 9 |
| North Pacific Trading & Packing Co | 1 | Klawak | |
| Northern Packing Co. (Inc.) | 1 | Juneau | |
| Northwestern Fisheries Co | 5 | Dundas Bay | [f] 13 |
| | | Hunter Bay | [e] 1 |
| | | Quadra | 5 |
| | | Roe Point | [f] 7 |
| | | Santa Ana | |
| Noyes Island Packing Co | 1 | Steamboat Bay | |
| Pacific American Fisheries | 1 | Excursion Inlet | 16 |
| Petersburg Packing Co | 1 | Petersburg | 4 |
| Point Warde Packing Co | 1 | Point Warde | |
| Pure Food Fish Co | 1 | Ketchikan | [c] 4 |
| Pybus Bay Fish & Packing Co | 1 | Pybus Bay | |
| Pyramid Packing Co | 1 | Sitka | |
| Sanborn-Cutting Co | 1 | Kake | [d] 8 |
| Sitka Packing Co | 1 | Sitka | |
| Smiley, J. L., & Co | 1 | Ketchikan | 4 |
| Southern Alaska Canning Co | 2 | Quadra Bay | [c] 2 |
| | | Rose Inlet | 5 |
| Starr-Collinson Packing Co | 1 | Moira Sound | [d] 5 |
| Straits Packing Co | 1 | Skowl Arm | |
| Sunny Point Packing Co | 1 | Ketchikan | [c] 5 |

[a] 4 floating. [c] 5 floating. [e] 1 floating. [g] 2 floating.
[b] 9 floating. [d] All floating. [f] 3 floating.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH—Continued.

| Name. | Canneries. | Location. | Pound nets. |
|---|---|---|---|
| Southeast Alaska—Continued. | | | |
| Swift-Arthur-Crosby Co. | 1 | Heceta Island | 4 |
| Tee Harbor Packing Co. | 1 | Tee Harbor | |
| Tenakee Fisheries Co. | 1 | Tenakee Inlet | 6 |
| Thlinket Packing Co. | 1 | Funter | 23 |
| Todd Packing Co. | 1 | Peril Strait | 3 |
| Union Bay Fisheries Co. | 1 | Union Bay | 4 |
| Van Vlack, H., & Co. | 1 | Thomas Bay | |
| Ward's Cove Packing Co. | 1 | Ward Cove | 2 |
| Central Alaska: | | | |
| Abercrombie Packing Co. | 1 | Abercrombie | |
| Alaska Packers Association. | 4 | Alitak | 4 |
| | | Chignik | 3 |
| | | Kasilof | 13 |
| | | Larsen Bay | |
| Alaska Sea Food Co. | 1 | Cordova | |
| Alitak Packing Co. | 1 | Lazy Bay | 2 |
| Canoe Pass Packing Co. | 1 | Shepard Point | 4 |
| Carlisle Packing Co. | 1 | Cordova | 9 |
| Clark-Graham Co. | 1 | Eyak River | |
| Columbia River Packers' Association. | 1 | Chignik | 6 |
| Copper River Packing Co. | 1 | Port Nellie Juan | 4 |
| Fidalgo Island Packing Co. | 1 | Port Graham | 5 |
| Hoonah Packing Co. | 1 | Katalla | |
| Kadiak Fisheries Co. | 1 | Kodiak | 1 |
| Kenai Packing Co. | 1 | Drier Bay | |
| Libby, McNeill & Libby. | 1 | Kenai | 16 |
| Lighthouse Canning Co. | 1 | Cordova | |
| Moore Packing Co. | 1 | Orca Inlet | 1 |
| Northwestern Fisheries Co. | 5 | Chignik | 3 |
| | | Kenai | 16 |
| | | Orca | |
| | | Seldovia | 7 |
| | | Uyak | |
| Pacific American Fisheries. | 2 | Ikatan | 14 |
| | | King Cove | 15 |
| San Juan Fishing & Packing Co. (Inc.) | 1 | Seward | |
| Sockeye Salmon Co. | 1 | Morzhovoi Bay | 3 |
| Valdez Packing Co. | 1 | Valdez | 4 |
| Western Alaska: | | | |
| Alaska Packers Association. | 8 | Kvichak River (2) | |
| | | Naknek River (3) | |
| | | Nushagak Bay (2) | 4 |
| | | Ugaguk River | |
| Alaska-Portland Packers' Association | 1 | Nushagak Bay | |
| Alaska Salmon Co. | 1 | Wood River | |
| Bristol Bay Packing Co. | 1 | Kvichak River | |
| Carlisle Packing Co. | 1 | Andreafski | |
| Columbia River Packers' Association. | 1 | Nushagak Bay | |
| Everett Packing Co. | 1 | Herendeen Bay | |
| Fidalgo Island Packing Co. | 1 | ....do | |
| Libby, McNeill & Libby. | 6 | Ugaguk River | |
| | | Nushagak Bay (Ekuk) | |
| | | Kvichak Bay | |
| | | Libbyville (Kvichak Bay) | |
| | | Lockanok (Kvichak River) | |
| | | Nushagak | |
| Midnight Sun Packing Co. | 1 | Kotzebue | 1 |
| Naknek Packing Co. | 1 | Naknek River | |
| Nelson Lagoon Packing Co. | 1 | Nelson Lagoon | 5 |
| Northwestern Fisheries Co. | 2 | Naknek River | |
| | | Nushagak | |
| Pacific American Fisheries. | 1 | Port Moller | 3 |
| Phoenix Packing Co. | 1 | Herendeen Bay | |
| Red Salmon Canning Co. | 2 | Naknek River | |
| | | Ugashik River | |

STATISTICS.

The number of salmon canneries in operation in Alaska in 1918 was 135, which is an increase of 17 over 1917. The investment in the salmon-canning industry was $63,901,397, as compared with $46,865,271 in 1917. Of this increase, southeastern Alaska is credited with $9,042,071; central Alaska, $2,547,890; and western Alaska with $5,446,165.

The industry gave employment in 1918 to 26,502 persons, an increase of 3,152. Whites increased 2,312 and Chinese 460. Filipinos are classified separately, there being 1,338 employed in 1918. Natives decreased 90, Japanese 132, and Mexicans 105. The number of miscellaneous persons employed fell off 910, due to the segregation of the Filipinos.

The total pack of canned salmon in Alaska in 1918 was 6,605,835 cases, valued at $51,041,949, being an increase of 658,549 over the 5,947,286 cases packed in 1917 and $4,737,859 over the $46,304,090 value of the pack in 1917. The 1918 pack surpasses all records, in respect to both quantity and value, and shows a gain of 11¼ per cent in production and 10¼ per cent in value. Comparing the pack of 1918 in each district with that of 1917, the following changes are noted: Southeastern Alaska advanced from 3,294,845 to 3,375,445, a gain of 80,600 cases; central Alaska increased from 1,017,206 to 1,391,951, an increase of 374,745 cases; and western Alaska advanced from 1,635,235 to 1,838,439, a gain of 203,204 cases over the pack of 1917. A further comparison shows that cohos advanced from 193,231 to 218,958, a gain of 25,727 cases; chums increased from 906,747 to 1,364,960, an advance of 458,213 cases; humpbacks increased from 2,296,976 to 2,438,954, a gain of 141,978 cases; and reds advanced from 2,488,381 to 2,533,737, an increase of 45,356 cases. The king salmon pack shows a decline from 61,951 to 49,226, a falling off of 12,725 cases from the 1917 pack. This may be attributed to the revival of the mild-cure business, which suffered some setbacks in 1917 on account of the war, and to the larger quantity frozen.

INVESTMENT IN THE SALMON-CANNING INDUSTRY IN 1918.

| Items. | Southeast Alaska. | | Central Alaska. | | Western Alaska. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* |
| Canneries operated | 76 | $5,981,072 | 29 | $2,130,051 | 30 | $4,687,956 | 135 | $12,799,079 |
| Working capital | | 11,863,980 | | 4,711,101 | | 8,005,510 | | 24,580,591 |
| Wages paid | | 5,896,473 | | 2,643,610 | | 5,280,985 | | 13,821,068 |
| Vessels: | | | | | | | | |
| Power vessels over 5 tons | 342 | 2,121,425 | 89 | 817,880 | 97 | 1,988,187 | 528 | 4,027,492 |
| Net tonnage | 6,165 | | 2,444 | | 6,920 | | 15,529 | |
| Launches under 5 tons | 163 | 153,703 | 148 | 150,449 | 37 | 139,904 | 348 | 444,056 |
| Sailing | 1 | 45,000 | 9 | 368,500 | 34 | 1,624,010 | 44 | 2,037,510 |
| Net tonnage | 1,974 | | 14,342 | | 51,058 | | 67,374 | |
| Barges | 3 | 23,673 | | | | | 3 | 23,673 |
| Net tonnage | 2,295 | | | | | | 2,295 | |
| Boats, sail and row | 1,140 | 104,711 | 730 | 64,702 | 1,513 | 269,066 | 3,383 | 438,479 |
| Lighters, scows, and house-boats | 370 | 254,960 | 217 | 168,958 | 190 | 251,836 | 777 | 675,654 |
| Pile drivers | 54 | 202,842 | 40 | 156,535 | 29 | 95,421 | 123 | 544,898 |
| Apparatus: | | | | | | | | |
| Haul seines | 140 | 68,330 | 115 | 49,868 | 11 | 1,410 | 266 | 119,608 |
| Fathoms | 16,823 | | 17,824 | | 745 | | 35,492 | |
| Purse seines | 384 | 285,666 | 68 | 34,280 | 34 | 47,900 | 486 | 367,846 |
| Fathoms | 69,120 | | 9,686 | | 9,150 | | 87,956 | |
| Gill nets | 407 | 41,748 | 1,067 | 112,484 | 2,656 | 516,556 | 4,130 | 670,788 |
| Fathoms | 47,577 | | 80,018 | | 339,032 | | 466,627 | |
| Pound nets, driven | 286 | 1,626,951 | 140 | 551,813 | 17 | 59,386 | 443 | 2,238,150 |
| Pound nets, floating | 77 | 210,432 | | | | | 77 | 210,432 |
| Dip nets | | | 36 | 450 | | | 36 | 450 |
| Fish wheels | | | | | 6 | 1,336 | 6 | 1,336 |
| Hand lines | 4 | 160 | | | 134 | 127 | 138 | 287 |
| Total | | 28,971,126 | | 11,960,681 | | 22,969,590 | | 63,901,397 |

## Persons Engaged in the Salmon-Canning Industry in 1918.

| Occupations and races. | Southeast Alaska. | Central Alaska. | Western Alaska. | Total. |
|---|---|---|---|---|
| Fishermen: | | | | |
| Whites | 1,530 | 1,307 | 3,296 | 6,133 |
| Natives | 1,507 | 290 | 202 | 1,999 |
| Japanese | ..... | 1 | ..... | 1 |
| Mexicans | 47 | ..... | ..... | 47 |
| Miscellaneous [a] | 243 | ..... | ..... | 243 |
| Total | 3,327 | 1,598 | 3,498 | 8,423 |
| Shoresmen: | | | | |
| Whites | 3,339 | 889 | 2,014 | 6,242 |
| Natives | 1,561 | 581 | 573 | 2,715 |
| Chinese | 1,374 | 562 | 798 | 2,734 |
| Japanese | 822 | 303 | 339 | 1,464 |
| Filipinos | 731 | 279 | 328 | 1,338 |
| Mexicans | 229 | 229 | 1,204 | 1,662 |
| Miscellaneous [a] | 129 | 55 | 458 | 642 |
| Total | 8,185 | 2,898 | 5,714 | 16,797 |
| Transporters: | | | | |
| Whites | 697 | 301 | 221 | 1,219 |
| Natives | 15 | 24 | 5 | 44 |
| Miscellaneous [a] | 10 | 5 | 4 | 19 |
| Total | 722 | 330 | 230 | 1,282 |
| Grand total: | | | | |
| Whites | 5,566 | 2,497 | 5,531 | 13,594 |
| Natives | 3,083 | 895 | 780 | 4,758 |
| Chinese | 1,374 | 562 | 798 | 2,734 |
| Japanese | 822 | 304 | 339 | 1,465 |
| Filipinos | 731 | 279 | 328 | 1,338 |
| Mexicans | 276 | 229 | 1,204 | 1,709 |
| Miscellaneous [a] | 382 | 60 | 462 | 904 |
| Total | 12,234 | 4,826 | 9,442 | 26,502 |

[a] Porto Ricans, Kanakas, Negroes, etc.

## Output of Canned Salmon in 1918.[a]

| Product. | Southeast Alaska. | | Central Alaska. | | Western Alaska. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Cases.* | *Value.* | *Cases.* | *Value.* | *Cases.* | *Value.* | *Cases.* | *Value.* |
| Coho, or silver: | | | | | | | | |
| ½-pound flat | 22,598 | $275,879 | 3,009 | $38,508 | 631 | $8,076 | 26,238 | $322,463 |
| 1-pound flat | 8,898 | 79,252 | 1,227 | 11,768 | 2,661 | 25,545 | 12,786 | 116,565 |
| 1-pound tall | 115,828 | 1,005,039 | 55,598 | 484,996 | 8,508 | 75,916 | 179,934 | 1,565,951 |
| Total | 147,324 | 1,360,170 | 59,834 | 535,272 | 11,800 | 109,537 | 218,958 | 2,004,979 |
| Chum, or keta: | | | | | | | | |
| ½-pound flat | 3,559 | 31,128 | ..... | ..... | ..... | ..... | 3,559 | 31,128 |
| 1-pound flat | 2,996 | 19,094 | ..... | ..... | ..... | ..... | 2,996 | 19,094 |
| 1-pound tall | 953,961 | 5,956,446 | 300,494 | 1,900,437 | 103,950 | 655,767 | 1,358,405 | 8,512,650 |
| Total | 960,516 | 6,006,668 | 300,494 | 1,900,437 | 103,950 | 655,767 | 1,364,960 | 8,562,872 |
| Humpback, or pink: | | | | | | | | |
| ½-pound flat | 61,128 | 563,470 | 2,429 | 21,902 | ..... | ..... | 63,557 | 585,372 |
| 1-pound flat | 19,838 | 133,458 | 372 | 2,678 | 5 | 33 | 20,215 | 136,169 |
| 1-pound tall | 1,954,417 | 12,698,557 | 373,421 | 2,460,043 | 27,344 | 188,315 | 2,355,182 | 15,346,915 |
| Total | 2,035,383 | 13,395,485 | 376,222 | 2,484,623 | 27,349 | 188,348 | 2,438,954 | 16,068,456 |
| King, or spring: | | | | | | | | |
| ½-pound flat | 4,275 | 53,942 | 1,561 | 20,648 | 164 | 2,171 | 6,000 | 76,761 |
| 1-pound flat | 2,343 | 22,852 | 422 | 4,160 | 2,502 | 32,526 | 5,267 | 59,538 |
| 1-pound tall | 9,738 | 84,310 | 13,060 | 120,361 | 15,161 | 144,325 | 37,959 | 348,996 |
| Total | 16,356 | 161,104 | 15,043 | 145,169 | 17,827 | 179,022 | 49,226 | 485,295 |
| Red, or sockeye: | | | | | | | | |
| ½-pound flat | 58,580 | 761,793 | 55,765 | 726,485 | 22,663 | 299,150 | 137,008 | 1,787,428 |
| 1-pound flat | 50,849 | 513,507 | 41,081 | 410,810 | 59,934 | 591,680 | 151,864 | 1,515,997 |
| 1-pound tall | 106,437 | 935,597 | 543,512 | 4,980,362 | 1,594,916 | 14,700,963 | 2,244,865 | 20,616,922 |
| Total | 215,866 | 2,210,897 | 640,358 | 6,117,657 | 1,677,513 | 15,591,793 | 2,533,737 | 23,920,347 |
| Grand total | 3,375,445 | 23,134,324 | 1,391,951 | 11,183,158 | 1,838,439 | 16,724,467 | 6,605,835 | 51,041,949 |

[a] Cases containing ½-pound cans have been reduced one-half in number, and thus, for the purpose of affording fair comparison, all are put upon the basis of forty-eight 1-pound cans per case.

OUTPUT OF CANNED SALMON, 1912 TO 1918.[a]

| Product. | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 | Total. |
|---|---|---|---|---|---|---|---|---|
| Coho, or silver: | *Cases.* | *Cases.* | *Cases.* | *Cases.* | *Cases.* | *Cases.* | *Cases.* | *Cases.* |
| ½-pound flat | 2,719 | 3,587 | 4,579 | 2,050 | 13,145 | 30,412 | 26,238 | 82,730 |
| 1-pound flat | 17 | 266 | 285 | 2,338 | 8,191 | 362 | 12,786 | 24,245 |
| 1-pound tall | 163,462 | 71,926 | 152,199 | 119,880 | 240,573 | 162,457 | 179,934 | 1,090,431 |
| Total | 166,198 | 75,779 | 157,063 | 124,268 | 261,909 | 193,231 | 218,958 | 1,197,406 |
| Chum, or keta: | | | | | | | | |
| ½-pound flat | 2,795 | 985 | 373 | ..... | 1,423 | 26,760 | 3,559 | 35,895 |
| 1-pound flat | ..... | 2,619 | 5,568 | 317 | ..... | 2,530 | 2,996 | 14,030 |
| 1-pound tall | 661,838 | 287,314 | 657,918 | 479,629 | 722,692 | 877,457 | 1,358,405 | 5,045,253 |
| Total | 664,633 | 290,918 | 663,859 | 479,946 | 724,115 | 906,747 | 1,364,960 | 5,095,178 |
| Humpback, or pink: | | | | | | | | |
| ½-pound flat | 13,712 | 20,822 | 2,103 | 4,325 | 41,491 | 91,403 | 63,557 | 237,413 |
| 1-pound flat | ..... | 3,258 | 9,286 | 3,508 | 14,706 | 6,014 | 20,215 | 57,077 |
| 1-pound tall | 1,266,426 | 1,348,801 | 974,660 | 1,867,683 | 1,681,506 | 2,199,559 | 2,355,182 | 11,693,817 |
| Total | 1,280,138 | 1,372,881 | 986,049 | 1,875,516 | 1,737,703 | 2,296,976 | 2,438,954 | 11,988,307 |
| King, or spring: | | | | | | | | |
| ½-pound flat | 5,151 | 1,585 | 3,143 | 2,404 | 2,617 | 12,973 | 6,000 | 33,873 |
| 1-pound flat | ..... | ..... | 4,804 | 3,755 | 3,804 | 5,133 | 5,267 | 22,763 |
| 1-pound tall | 38,166 | 32,785 | 40,092 | 82,092 | 59,452 | 43,845 | 37,959 | 334,391 |
| Total | 43,317 | 34,370 | 48,039 | 88,251 | 65,873 | 61,951 | 49,226 | 391,027 |
| Red, or sockeye: | | | | | | | | |
| ½-pound flat | 28,024 | 29,041 | 53,825 | 52,033 | 81,565 | 124,309 | 137,008 | 505,805 |
| 1-pound flat | 16,242 | 11,735 | 64,671 | 112,847 | 86,395 | 89,612 | 151,804 | 533,366 |
| 1-pound tall | 1,856,089 | 1,924,461 | 2,083,147 | 1,765,139 | 1,936,971 | 2,274,460 | 2,244,865 | 14,085,132 |
| 1½-pound nominals | ..... | ..... | ..... | 2,293 | ..... | ..... | ..... | 2,293 |
| 2-pound nominals | ..... | ..... | ..... | ..... | 6,006 | ..... | ..... | 6,006 |
| Total | 1,900,355 | 1,965,237 | 2,201,643 | 1,932,312 | 2,110,937 | 2,488,381 | 2,533,737 | 15,132,602 |
| Grand total | 4,054,641 | 3,739,185 | 4,056,653 | 4,500,293 | 4,900,627 | 5,947,286 | 6,605,835 | 33,804,520 |

[a] The number of cases shown has been put upon the common basis of forty-eight 1-pound cans per case.

AVERAGE ANNUAL PRICE PER CASE OF FORTY-EIGHT 1-POUND CANS OF SALMON, 1908 TO 1918.

| Product. | 1908 | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coho, or silver | $3.98 | $4.07 | $4.89 | $5.67 | $4.44 | $3.45 | $4.39 | $4.31 | $5.34 | $8.76 | $9.15 |
| Chum, or keta | 2.53 | 2.28 | 3.04 | 3.72 | 2.37 | 2.21 | 3.37 | 2.59 | 3.34 | 6.14 | 6.27 |
| Humpback, or pink | 2.69 | 2.40 | 3.15 | 3.94 | 2.55 | 2.58 | 3.50 | 2.78 | 3.64 | 6.44 | 6.58 |
| King, or spring | 4.20 | 4.32 | 5.34 | 6.48 | 5.37 | 4.04 | 5.01 | 4.63 | 5.36 | 10.40 | 9.85 |
| Red, or sockeye | 4.52 | 4.53 | 5.30 | 6.33 | 5.45 | 4.54 | 5.58 | 5.82 | 6.04 | 9.48 | 9.44 |

LOSSES AND DISASTERS IN THE SALMON-CANNING INDUSTRY.

The most serious losses in the salmon-canning industry occurred in western Alaska and were occasioned by the unusual ice conditions which prevailed there until June. The ice floes in Bristol Bay were the direct cause of the loss of the ship *Tacoma*, 1,672 tons net, owned by the Alaska Packers Association and valued at $12,500, and of the ship *W. B. Flint*, 746 tons net, belonging to Libby, McNeill & Libby and valued at $35,000. Part of the cargo of the latter vessel was also lost, having a value of $26,360. A number of other cannery vessels sustained minor injuries in the ice. The Bureau's steamer *Roosevelt* extended aid to a number of cannery ships in distress in the ice and rescued 21 men from the *Tacoma* who had been encamped for some time on the ice after the ship sank.

Other losses in western Alaska consisted chiefly of miscellaneous fishing gear, small boats, supplies, and fish, and damages to buildings. The Everett Packing Co. at Herendeen Bay lost $6,000 worth of canned salmon, while its cannery buildings were damaged to the extent of $5,000. Libby, McNeill & Libby lost a scow load of supplies valued at $25,469 and a scow load of fresh salmon worth $14,239. Two small boats, valued at $1,275, and miscellaneous fishing gear, worth $9,454, constitute the remaining losses of the western district. The total losses in western Alaska amounted to $139,297, of which $106,277 was sustained by Libby, McNeill & Libby.

The total losses in central Alaska aggregated $15,452, consisting of small boats, scows, skiffs, and a small quantity of fishing gear.

In southeastern Alaska the two major losses were cannery tenders, one of which, the *Ilwaco*, 41 tons net, belonged to the Alaska Herring & Sardine Co. and was valued at $30,000; the other was owned by the F. C. Barnes Co. and was valued at $15,000. The other losses of the district were small boats valued at $6,225; fishing gear, $2,004; miscellaneous small buildings, $16,407, and fishery products $2,760. The losses in southeastern Alaska reached a total value of $72,396.

In the salmon-canning industry of Alaska there occurred a loss of 12 lives. In southeastern Alaska 1 fisherman was drowned and 4 shoresmen were accidentally killed; in central Alaska, 2 fishermen were drowned, while 1 shoresman was accidentally killed; in western Alaska, 1 fisherman was drowned and 3 shoresmen killed.

No disastrous fires occurred during the year, and had it not been for the extraordinary conditions on Bristol Bay the losses in the salmon-canning industry would have been extremely small. As it was, the losses reported for the whole of Alaska amounted to $227,145.

## MILD CURING OF SALMON.

The mild-cured salmon industry in Alaska shows a slight increase in production in 1918 over that of 1917. The pack in 1918 was 3,948 tierces as compared with 3,563 in 1917; all but 40 tierces of the 1918 pack came from southeastern Alaska.

The total number of mild-curers was 17, of which the operations of 10 were incidental to other business, chiefly salmon canning. Those whose business was primarily mild curing are as follows:

| | |
|---|---|
| Pacific Mild Cure Co. | Waterfall.<br>Port Alexander.<br>Port Conclusion.<br>Three floating plants. |
| Southern Alaska Canning Co. | Fanshaw. |
| Vendsyssel Packing Co. (Inc.) | Tyee. |
| Columbia & Northern Fishing & Packing Co. | Wrangell. |
| H. R. Thompson | Ketchikan. |
| Panama Pacific Commercial Co. | Sitka Hot Springs. |
| M. B. Dahl & Co. | Floating plant. |

Minor losses of buildings and wharves valued at $8,000 and fishing gear valued at $4,000 occurred in connection with the mild-cure industry in southeastern Alaska.

INVESTMENT IN THE SALMON MILD-CURING INDUSTRY OF SOUTHEAST ALASKA IN 1918.

| Items. | Number. | Value. | Items. | Number. | Value. |
|---|---|---|---|---|---|
| Plants | 12 | $87,294 | Gear: | | |
| Operating capital | | 579,295 | Seines, purse | 3 | $2,850 |
| Vessels: | | | Fathoms | 640 | |
| Power vessels over 5 tons | 19 | 82,505 | Seines, beach | 5 | 2,450 |
| Net tonnage | 298 | | Fathoms | 460 | |
| Barges | 4 | 8,882 | Total | | 786,342 |
| Net tonnage | 202 | | | | |
| Launches under 5 tons | 4 | 2,674 | | | |
| Boats, sail and row | 30 | 2,302 | | | |
| Lighters and scows | 3 | 18,000 | | | |

PERSONS ENGAGED IN THE SALMON MILD-CURING INDUSTRY OF SOUTHEAST ALASKA IN 1918.

| Occupations and races. | Number. | Occupations and races. | Number. |
|---|---|---|---|
| Fishermen: | | Shoresmen—Continued. | |
| Whites | 268 | Japanese | 1 |
| Natives | 30 | Total | 97 |
| Total | 298 | Transporters: Whites | 66 |
| Shoresmen: | | Grand total | 461 |
| Whites | 88 | | |
| Natives | 8 | | |

PRODUCTS OF THE SALMON MILD-CURING INDUSTRY IN 1918.

| Species. | Tierces. | Pounds. | Value. |
|---|---|---|---|
| Southeast Alaska: | | | |
| Coho salmon | 171 | 136,800 | $16,017 |
| King salmon | 3,733 | 2,986,400 | 590,402 |
| Red salmon | 4 | 3,200 | 332 |
| Total | 3,908 | 3,126,400 | 606,751 |
| Central Alaska: King salmon | 40 | 32,000 | 1,200 |
| Grand total | 3,948 | 3,158,400 | 607,951 |

## SALMON PICKLING.

Notwithstanding the larger number of salmon used in the canning industry in 1918, there was a material advance in the production of pickled salmon, represented principally by the larger operations of the companies engaged in salmon canning in western Alaska. The number of salteries decreased, but the investment in the salmon-pickling industry was considerably larger than in 1917. The decrease in plants was due to their conversion into canneries and in some instances to the reclassification of establishments by reason of increased activities along other lines.

Out of a total of 27 salteries, as compared with 37 in 1917, southeastern Alaska is credited with 7, a decline of 6; central Alaska with 9, a decrease of 2, and western Alaska with 11, a falling off of 2. This is a decrease of 10 salteries for Alaska as a whole. The investment in

1918 was $1,362,957, as against $862,399 in 1917, an increase of $500,558. The number of persons employed increased from 509 in 1917 to 815 in 1918.

Alaska produced 56,890 barrels of pickled salmon in 1918, as against 36,390 barrels in 1917. The value of the pack was $1,079,881, an increase over 1917 of $489,384.

The following operators put up considerable quantities of pickled salmon, though in some instances such work was incidental to other more important activities, in which event the latter would govern the classification of the plant elsewhere in this report:

| | |
|---|---|
| Southeastern Alaska: | |
| Beauclare Packing Co. | Port Beauclare. |
| H. Bergman | Ketchikan. |
| Columbia & Northern Fishing & Packing Co. | Wrangell. |
| Lisianski Packing Co. | Lisianski Strait. |
| Southern Alaska Canning Co. | Fanshaw. |
| Vendsyssel Packing Co. | Tyee. |
| W. H. Barrington | Wrangell. |
| Republic Fisheries Co. | Tebenkoff Bay. |
| Trout Fisheries Co. | Ketchikan. |
| Central Alaska: | |
| Northern Fisheries (Inc.) | Kodiak. |
| Alaska Codfish Co. | Unga. |
| Ohm Fish & Packing Co. | Sheep Point. |
| Port Gravina Fishing Co. | Sheep Bay. |
| Shumagin Packing Co. | Orzinski Bay. |
| | Squaw Harbor. |
| Kachemak Saltery & Canning Co. | Swanson Creek. |
| W. J. Riegel | Uyak. |
| Western Alaska: | |
| Alaska Salmon Co. | Kvichak. |
| Alaska Fishing Co. | Dutch Harbor. |
| Alaska Packers Association | Ugaguk. |
| | Kvichak. |
| | Naknek. |
| | Nushagak. |
| Bristol Bay Packing Co. | Koggiung. |
| Golden Gate Salmon Co. | Kvichak. |
| Libby, McNeill & Libby | Igushik. |
| | Koggiung. |
| | Lockanok. |
| Naknek Packing Co. | Naknek. |
| Peter M. Nelson | Kvichak. |
| Red Salmon Canning Co. | Ugashik. |

The only reported losses of property and products in the salmon-pickling industry occurred in central and western Alaska and aggregated $100,548. The losses in the central district were boats valued at $10,370; buildings and wharves, $900; fishing gear, $6,878; and pickled salmon, $4,000; or a total of $22,148. All the losses in the western district were sustained by Peter M. Nelson at the Kvichak saltery, and consisted of 3,300 barrels of pickled salmon, valued at $75,900, and damages to the wharf of $2,500.

INVESTMENT IN THE SALMON-PICKLING INDUSTRY IN 1918.

| Items. | Southeast Alaska. | | Central Alaska. | | Western Alaska. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* |
| Salteries | 7 | $67,190 | 9 | $96,670 | 11 | $106,719 | 27 | $270,579 |
| Operating capital | ..... | 132,817 | ..... | 227,063 | ..... | 301,196 | ..... | 661,076 |
| Vessels: | | | | | | | | |
| Power vessels over 5 tons | 7 | 44,500 | 14 | 74,750 | 2 | 20,500 | 23 | 139,750 |
| Net tonnage | 136 | ..... | 190 | ..... | 29 | ..... | 355 | ..... |
| Sailing | ..... | ..... | ..... | ..... | 6 | 117,000 | 6 | 117,000 |
| Net tonnage | ..... | ..... | ..... | ..... | 1,560 | ..... | 1,560 | ..... |
| Launches under 5 tons | 6 | 4,500 | 10 | 10,786 | 10 | 15,350 | 26 | 30,636 |
| Boats, sail and row | 35 | 6,873 | 89 | 7,251 | 65 | 13,460 | 189 | 27,584 |
| Lighters and scows | 4 | 1,200 | 17 | 10,900 | 8 | 7,000 | 29 | 19,100 |
| Pile drivers | ..... | ..... | 2 | 1,300 | 1 | 2,000 | 3 | 3,300 |
| Gear: | | | | | | | | |
| Haul seines | 8 | 2,162 | 37 | 11,125 | 11 | 750 | 56 | 14,037 |
| Fathoms | 585 | ..... | 2,574 | ..... | 395 | ..... | 3,554 | ..... |
| Purse seines | 8 | 5,600 | 5 | 10,000 | ..... | ..... | 13 | 15,600 |
| Fathoms | 1,290 | ..... | 880 | ..... | ..... | ..... | 2,170 | ..... |
| Gill nets | 3 | 538 | 91 | 5,060 | 79 | 8,489 | 173 | 14,087 |
| Fathoms | 385 | ..... | 2,795 | ..... | 6,555 | ..... | 9,735 | ..... |
| Pound nets, driven | 1 | 100 | 26 | 35,100 | ..... | ..... | 27 | 35,200 |
| Pound nets, floating | 2 | 12,826 | ..... | ..... | ..... | ..... | 2 | 12,826 |
| Lines | ..... | ..... | 27 | 675 | 10 | 27 | 37 | 702 |
| Dip nets | ..... | ..... | 52 | 1,480 | ..... | ..... | 52 | 1,480 |
| Total | ..... | 278,306 | ..... | 492,160 | ..... | 592,491 | ..... | 1,362,957 |

PERSONS ENGAGED IN THE SALMON-PICKLING INDUSTRY IN 1918.

| Occupations and races. | Southeast Alaska. | Central Alaska. | Western Alaska. | Total. |
|---|---|---|---|---|
| Fishermen: | | | | |
| Whites | 35 | 119 | 72 | 226 |
| Natives | 12 | 34 | 66 | 112 |
| Others | ..... | 2 | ..... | 2 |
| Total | 47 | 155 | 138 | 340 |
| Shoresmen: | | | | |
| Whites | 74 | 174 | 62 | 310 |
| Natives | 8 | 56 | 25 | 89 |
| Others | 1 | 17 | 21 | 39 |
| Total | 83 | 247 | 108 | 438 |
| Transporters: | | | | |
| Whites | 3 | 19 | 7 | 29 |
| Natives | ..... | 5 | 2 | 7 |
| Others | ..... | 1 | ..... | 1 |
| Total | 3 | 25 | 9 | 37 |
| Grand total | 133 | 427 | 255 | 815 |

BARRELS[a] OF SALMON PICKLED IN 1918, BY SPECIES.

| Product. | Southeast Alaska. | | Central Alaska. | | Western Alaska. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* |
| Coho, or silver | 1,784 | $33,739 | 574 | $10,759 | 143 | $2,654 | 2,501 | $47,152 |
| Coho bellies | 10 | 180 | ..... | ..... | ..... | ..... | 10 | 180 |
| Coho backs | 8 | 80 | 1 | 20 | ..... | ..... | 9 | 100 |
| Chum, or keta | 2,012 | 28,326 | 3,833 | 52,954 | 235 | 3,598 | 6,080 | 84,878 |
| Humpback, or pink | 5,249 | 78,778 | 6,044 | 93,207 | 680 | 10,505 | 11,973 | 182,490 |
| Humpback bellies | ..... | ..... | 26 | 650 | ..... | ..... | 26 | 650 |
| King, or spring | 94 | 1,593 | 57 | 1,220 | 146 | 4,832 | 297 | 7,645 |
| Red, or sockeye | 190 | 3,449 | 4,731 | 90,316 | 31,056 | 662,426 | 35,977 | 756,191 |
| Red bellies | ..... | ..... | ..... | ..... | 17 | 595 | 17 | 595 |
| Total | 9,347 | 146,145 | 15,266 | 249,126 | 32,277 | 684,610 | 56,890 | 1,079,881 |

[a] Barrels holding 200 pounds of fish.

## SALMON FREEZING.

The entire output of frozen salmon shipped from Alaska in 1918 was prepared in the southeastern district at eight freezing plants, five of which were operated in connection with other fishery enterprises. Those engaged in freezing salmon were as follows:

| | |
|---|---|
| Henry Goemaere | Washington Bay. |
| Juneau Cold Storage Co | Juneau. |
| Booth Fisheries Co | Sitka. |
| Columbia & Northern Fishing & Packing Co | Wrangell. |
| Libby, McNeill & Libby | Taku Harbor. |
| New England Fish Co | Ketchikan. |
| National Independent Fisheries Co | Ketchikan. |
| Trout Fisheries Co | Ketchikan. |

In 1918 the production of frozen salmon was 1,877,922 pounds, valued at $170,864, being an increase over the output of 1917 of 595,740 pounds and $89,290 in value.

INVESTMENT IN THE FROZEN-SALMON INDUSTRY IN ALASKA IN 1918.

| Items. | Number. | Value. |
|---|---|---|
| Freezing plants | 3 | $44,931 |
| Operating capital | | 57,287 |
| Launches under 5 tons | 5 | 13,374 |
| Boats, sail and row | 10 | 455 |
| Lighters and scows | 1 | 150 |
| Gear: | | |
| Haul seines (450 fathoms) | 6 | 2,400 |
| Purse seines (165 fathoms) | 1 | 1,500 |
| Gill nets (1,050 fathoms) | 21 | 1,575 |
| Pound nets, driven | 1 | 2,500 |
| Total | | 124,172 |

PERSONS ENGAGED IN THE FROZEN-SALMON INDUSTRY IN 1918.

| Occupations and races. | Number. |
|---|---|
| Fishermen: | |
| Whites | 34 |
| Natives | 10 |
| Shoresmen: Whites | 2 |
| Transporters: Whites | 4 |
| Total | 50 |

PRODUCTS OF THE FROZEN-SALMON INDUSTRY IN 1918.

| Species. | Pounds. | Value. |
|---|---|---|
| Coho salmon | 458,858 | $39,487 |
| Chum salmon | 288,786 | 27,108 |
| Humpback salmon | 272,850 | 9,479 |
| King salmon | 709,185 | 81,777 |
| Red salmon | 148,243 | 13,013 |
| Total | 1,877,922 | 170,864 |

## FRESH-SALMON TRADE.

The fresh-salmon industry in Alaska in 1918 made some advance over that of 1917. Available statistics indicate that 4,260,915 pounds valued at $336,576 were shipped from the Territory in 1918. Production thus increased this year 701,130 pounds, while there was a gain in value of $32,528. To these figures should be added a reasonable quantity of salmon to cover the consumption of these fish in Alaska. By reason of the fewer boats engaged in the commerce of Alaska in 1918 and the reduced population of the Territory, it would be fair to estimate that approximately 500,000 pounds of salmon of all species, valued at $50,000, were consumed locally in Alaska, or considerably less than the estimate for 1917.

The principal shippers of fresh salmon were as follows:

| | |
|---|---|
| Columbia & Northern Fishing & Packing Co. | Wrangell. |
| National Independent Fisheries Co. | Ketchikan. |
| | Juneau. |
| Pacific Mild Cure Co. | Port Conclusion. |
| | Waterfall. |
| | Port Alexander. |
| Ripley Fish Co. | Petersburg. |
| | Douglas. |
| | Wrangell. |
| | Ketchikan. |
| H. Bergman | Ketchikan. |
| Glacier Fish Co. | Scow Bay. |
| Whiz Fish Co. | Ketchikan. |
| San Juan Fishing & Packing Co. | Ketchikan. |

INVESTMENT IN THE FRESH-SALMON TRADE OF ALASKA IN 1918.

| Items. | Number. | Value. | Items. | Number. | Value. |
|---|---|---|---|---|---|
| Operating capital | ..... | $35,065 | Seines, haul (100 fathoms) | 1 | $100 |
| Wages paid | ..... | 15,848 | Gill nets (140 fathoms) | 4 | 200 |
| Launches | 4 | 28,400 | Pound nets, driven | 2 | 33,876 |
| Rowboats | 7 | 250 | | | |
| Scows | 1 | 50 | Total | ..... | 114,689 |

PERSONS ENGAGED IN THE FRESH-SALMON TRADE OF ALASKA IN 1918.

| Occupations and races. | Number. |
|---|---|
| Fishermen: Whites | 18 |
| Shoresmen: Whites | 13 |
| Transporters: Whites | 14 |
| Total | 45 |

PRODUCTS OF THE FRESH-SALMON TRADE OF ALASKA IN 1918.

| Species. | Pounds. | Value. | Species. | Pounds. | Value. |
|---|---|---|---|---|---|
| Southeast Alaska: | | | Central Alaska: | | |
| Coho salmon | 824,810 | $40,795 | Coho salmon | 600 | $60 |
| Chum salmon | 448,332 | 13,813 | Chum salmon | 1,560 | 15 |
| Humpback salmon | 546,069 | 24,430 | Red salmon | 28,750 | 511 |
| King salmon | 2,111,938 | 231,619 | | | |
| Red salmon | 298,856 | 25,333 | Total | 30,910 | 586 |
| Total | 4,230,005 | 335,990 | Grand total | 4,260,915 | 336,576 |

## DRY SALTING OF SALMON.

The dry salting of salmon in Alaska is a business of comparatively slight importance, being limited to the activities of a few operators in southeastern and western Alaska. In the southeastern district the F. C. Barnes Co., at Lake Bay, dry salted a small quantity of coho salmon, and A. H. Humphries, operating a floating plant, prepared in like manner a few thousand pounds of humpback salmon. In the western district the Kuskokwim Fishing & Transportation Co., at Apokak, dry salted a considerable quantity of coho, chum, king, and red salmon, and the Carlisle Packing Co., at Andreafski, similarly prepared a limited quantity of cohos and chums.

INVESTMENT IN THE DRY-SALTING SALMON BUSINESS IN ALASKA IN 1918.

| Items. | Number. | Value. | Items. | Number. | Value. |
|---|---|---|---|---|---|
| Plants | | $10,000 | Barges | 1 | $2,000 |
| Operating capital | | 15,000 | Purse seines (140 fathoms) | 1 | 5,000 |
| Wages paid | | 16,700 | Gill nets (1,560 fathoms) | 39 | 4,000 |
| Launches | 2 | 1,750 | | | |
| Rowboats | 17 | 895 | Total | | 58,345 |
| Scows | 1 | 3,000 | | | |

PERSONS ENGAGED IN THE DRY-SALTING SALMON BUSINESS IN 1918.

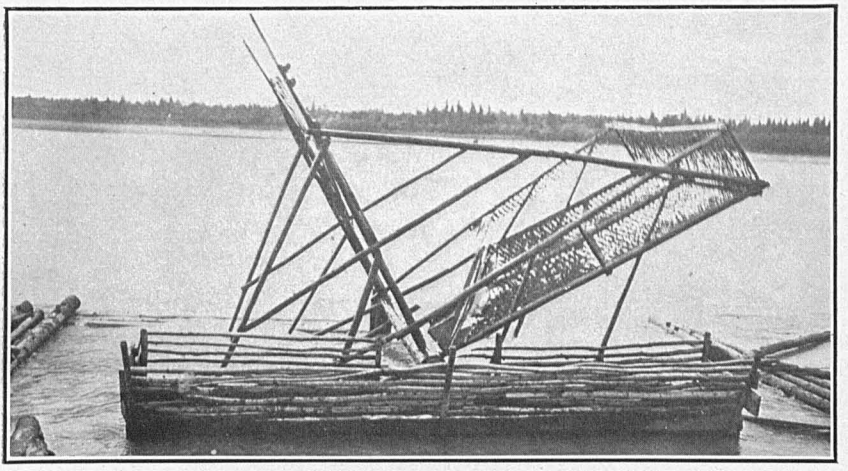
| Occupations and races. | Number. |
|---|---|
| Fishermen: | |
| Whites | 22 |
| Natives | 47 |
| Total | 69 |
| Shoresmen: Whites | 4 |
| Transporters: Whites | 3 |
| Grand total | 76 |

PRODUCTS OF THE DRY-SALTING SALMON BUSINESS IN ALASKA IN 1918.

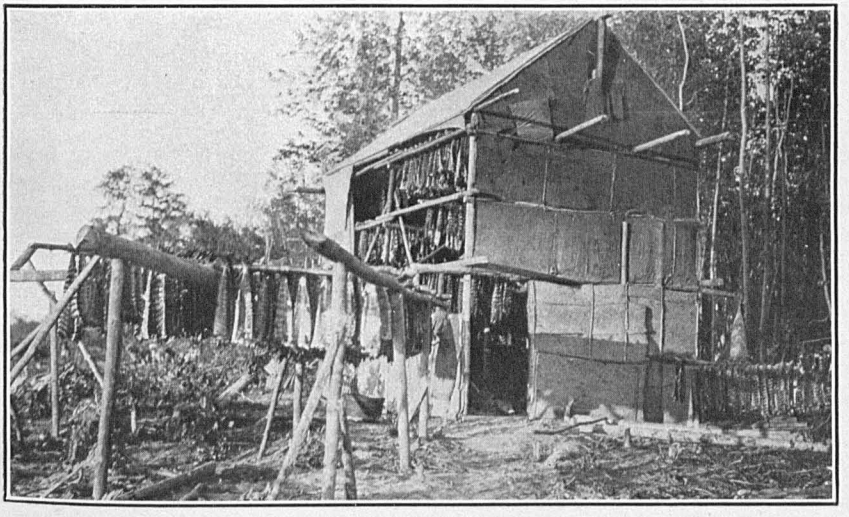
| Species. | Pounds. | Value. |
|---|---|---|
| Southeast Alaska: | | |
| Coho salmon | 3,000 | $300 |
| Humpback salmon | 15,600 | 1,170 |
| Total | 18,600 | 1,470 |
| Western Alaska: | | |
| Coho salmon | 312,560 | 30,916 |
| Chum salmon | 95,085 | 8,193 |
| King salmon | 61,845 | 4,366 |
| Red salmon | 28,885 | 2,599 |
| Total | 498,375 | 46,074 |
| Grand total | 516,975 | 47,544 |

## DRYING AND SMOKING OF SALMON.

As a commercial undertaking the drying and smoking of salmon for export appears to have been discontinued. It is noted elsewhere in this report, however, that a considerable quantity of salmon was dried by the whites and natives of the Yukon River region. A conser-



NATIVE SALMON WHEEL, YUKON RIVER.



NATIVE METHOD OF CURING SALMON, YUKON RIVER, 1918.

vative estimate indicates that 500,000 pounds of coho, 500,000 pounds of chum, and 400,000 pounds of king salmon were dried for use in the interior of Alaska, thus making a total of 1,400,000 pounds, valued at $140,000. This product is used chiefly as food for the natives and their dogs.

According to careful estimates, the investment in this business consists of 393 fish wheels, valued at $19,650, and 130 gill nets, aggregating 3,250 fathoms, valued at $6,500, or a total of $26,150.

### SALMON BY-PRODUCTS.

The utilization of offal and other waste material at the salmon canneries in Alaska in the manufacture of oil, fish meal, and fertilizer was carried on by the Fish Canners By-Products Co., at Ward Cove, and the Pacific American Fisheries, at Excursion Inlet and Ikatan, the latter plant being new in 1918.

The industry shows an investment in 1918 of $109,782, which is an increase of $1,629 over 1917. Employment was given to 20 men, 45 less than the number employed in 1917. The value of the products was $40,047, as compared with $61,873 in 1917. This decline is due chiefly to the lessened production of oil, the falling off being 20,526 gallons.

OUTPUT OF BY-PRODUCTS INDUSTRY IN ALASKA IN 1918.

| Items. | Quantity. | Value. |
|---|---|---|
| Oil.....gallons.. | 4,624 | $4,624 |
| Fertilizer.....tons.. | 684 | 35,423 |
| Total..... | ..... | 40,047 |

### HALIBUT FISHERY.

For many years the halibut fishery has been second in importance to the salmon industry. In 1918, however, the great activity in the herring fishery placed it next in importance to the salmon, thus putting the halibut in third place. A great increase occurred in the herring industry, while the halibut fishery showed but a slight increase.

The total catch of halibut from Pacific waters in 1918 was considerably less than that of the previous year, due chiefly to withdrawals of men and vessels on account of the war. There is a slight increase, however, in the figures compiled by the Bureau in respect to the yield of halibut from the Alaskan banks. Because of difficulties in securing statistical information as to the exact source of the halibut catches, it has been necessary to make certain estimates in respect to investment and production credited to Alaska. It is believed, however, that the figures are so nearly correct as to be acceptable for all practical purposes.

At a number of sessions of the Canadian-American Fishery Conference consideration was given the halibut fishery of the Pacific coast and Alaska. Details in respect thereto appear on page 21 in this report.

STATISTICAL SUMMARY.

The halibut industry in Alaska shows an investment of $2,594,292 in 1918 as compared with $2,200,987 in 1917, an increase of $393,305, which amount is due to the enhanced value of all vessels on account of war conditions. The number of persons employed was 1,186, an increase of 277 over the number reported in 1917. The products of this fishery totaled 13,869,706 pounds of halibut, valued at $1,667,686. This is an increase of 716,295 pounds over the production of 1917, while the value of products increased $547,460.

The principal operators in the halibut industry were the Booth Fisheries Co., at Sitka; Glacier Fish Co., at Scow Bay; Marathon Fishing & Packing Co., at Petersburg, where the barge *Amelia* was used as a floating plant; National Independent Fisheries Co., at Juneau and Ketchikan; New England Fish Co., at Ketchikan; Ripley Fish Co., at Douglas, Ketchikan, Petersburg, and Wrangell; Whiz Fish Co., at Ketchikan; and the San Juan Fishing & Packing Co., at Seward.

INVESTMENT IN THE ALASKA HALIBUT FISHERY IN 1918.

| Items. | Number. | Value. | Items. | Number. | Value. |
|---|---|---|---|---|---|
| Fishing vessels: | | | Fishing vessels—Continued. | | |
| Steamer and gas | 118 | $1,536,100 | Dories and scows | 264 | $16,850 |
| Tonnage | 2,270 | ..... | Fishing apparatus | ..... | 44,910 |
| Launches | 4 | 4,300 | Shore and fixed property | ..... | 292,132 |
| Outfit | ..... | 700,000 | Total | ..... | 2,594,292 |

PERSONS ENGAGED IN THE ALASKA HALIBUT FISHERY IN 1918.

| Races. | Number. |
|---|---|
| Whites | 1,183 |
| Natives | 3 |
| Total | 1,186 |

PRODUCTS OF THE ALASKA HALIBUT FISHERY IN 1918.

| Products. | Pounds. | Value. |
|---|---|---|
| Fresh (including local) | 10,491,777 | $1,315,985 |
| Frozen | 3,337,529 | 348,866 |
| Dry salted | 40,400 | 2,835 |
| Total | 13,869,706 | 1,667,686 |

## COD FISHERY.

The cod fishery of Alaska maintains a remarkably uniform production year after year. Approximately two-thirds of the catch of cod is made in Bering Sea, while the remainder is taken chiefly off the southern shore of the Alaska Peninsula. The fleet of vessels annually visiting the cod banks of western Alaska changes but little as the seasons pass. In 1918 the catch in Bering Sea was somewhat less

than in 1917, but the shore-station catch during the winter was, in round numbers, 1,000,000 pounds more than in the 1917 season, which was sufficient to offset the shortage in the vessel fishing.

The demand for cod was strong throughout the year in this country, leaving only a small quantity available for export. The condition of the market was such that several hundred tons of Japanese-caught cod were landed at San Francisco.

## VESSEL FISHERY.

No changes are noted in the companies engaged in the vessel cod fishery of Alaska in 1918 or in the total number of vessels in the cod fleet. Some of the vessels which have been listed for years as being engaged in this fishery do not appear in the present fleet, as they were employed in the trans-Pacific commerce, where under present conditions high charter rates are obtainable. Other vessels, however, were added to the fleet to take the place of those operating in the offshore trade. The *Galilee*, owned by the Union Fish Co., returned from a voyage to foreign waters in time to sail for Bering Sea on April 26 under charter to the Northern Fisheries (Inc.). The *S. N. Castle* (464 tons net), belonging to the Alaska Codfish Co., and the *Fanny Dutard* (252 tons net), owned by J. A. Matheson, were engaged in foreign commerce during the year and did not go to Alaska. The *Vega* (223 tons net), operated by the Union Fish Co. in 1917 on a fishing voyage to Alaska, was sold in the fall of that year. The Union Fish Co. increased its fleet by the addition of two vessels, the *Beulah* and the *Louise*, of 339 and 328 tons net, respectively. The Alaska Codfish Co. sent three power schooners to Alaska for work in connection with the shore stations, the *Alasco I* (23 tons net), *Alasco II* (5 tons net), and the *Alasco III* (8 tons net). Each made the voyage from San Francisco to Alaska under its own power in from 15 to 20 days, a remarkable achievement for such small vessels.

ALASKA COD FLEET IN 1918.

| Names. | Rig. | Net tonnage. | Operators. |
|---|---|---|---|
| City of Papeete | Schooner | 370 | Alaska Codfish Co., San Francisco, Calif. |
| Glendale | do | 281 | Do. |
| Allen A | do | 266 | Do. |
| Maweema | do | 392 | Do. |
| Alasco I | Power schooner | 23 | Do. |
| Alasco II | do | 5 | Do. |
| Alasco III | do | 8 | Do. |
| Azalea | Schooner | 327 | J. A. Matheson, Anacortes, Wash. |
| Alice | Power schooner | 15 | Northern Fisheries (Inc.), Anacortes, Wash. |
| Valdez | do | 10 | Do. |
| Charles Brown | Schooner | 64 | Do. |
| John A | do | 235 | Pacific Coast Codfish Co., Seattle, Wash. |
| Charles R. Wilson | do | 328 | Do. |
| Maid of Orleans | do | 171 | Do. |
| Alice | do | 220 | Robinson Fisheries Co., Anacortes, Wash. |
| Wawona | do | 431 | Do. |
| Golden State | Power schooner | 223 | Union Fish Co., San Francisco, Calif. |
| Sequoia | Schooner | 324 | Do. |
| Galilee[a] | do | 328 | Do. |
| Beulah | do | 339 | Do. |
| Louise | do | 328 | Do. |
| Martha | do | 14 | Do. |
| Pirate | Power schooner | 30 | Do. |
| Union Flag | do | 10 | Do. |

[a] Chartered to Northern Fisheries (Inc.) in 1918.

### SHORE STATIONS.

Four companies in southeastern Alaska handled small quantities of cod in connection with other fishery business. They were the Booth Fisheries Co., at Sitka; Libby, McNeill & Libby, at Taku Harbor; New England Fish Co., at Ketchikan; and the Ripley Fish Co., at Douglas, Ketchikan, and Petersburg. In central Alaska there were 15 operators, the important ones being the Alaska Codfish Co., with stations at Unga, Kelleys Rock, and Delarof Harbor on Unga Island, Companys Harbor and Murphys Cove on Sannak Island, Dora Harbor on Unimak Island, and one station on Nagai Island; Shumagin Packing Co., at Squaw Harbor on Unga Island; Northern Fisheries (Inc.), at Kodiak; and the Union Fish Co., at Pirate Cove on Popof Island, Unga on Unga Island, Northwest Harbor on Herendeen Island, Pavlof Harbor on Sannak Island, and Dora Harbor on Unimak Island. In western Alaska cod were put up incidentally at 11 shore stations operated by companies engaged chiefly in other lines of fishery business. In this connection mention may be made of the Akutan Codfish Co., at Akutan; Nelson Lagoon Packing Co., at Nelson Lagoon; and the Unalaska Atkafish Co., at English Bay.

The most notable development in the cod fisheries of central Alaska occurred at Kodiak, where the Northern Fisheries (Inc.) established a shore station and caused some local activity by bringing in a few experienced fishermen, whose success in fishing the adjacent waters was sufficient to induce several natives and white men residing at Kodiak to also engage in cod fishing. Operations were necessarily restricted to inland waters, as no suitable vessels were available for offshore work.

There is a great difference in the quality of cod taken from the various localities in this region. Sycamore Bay produces the best and largest fish, but it is easily fished out—that is, there may be a month of good fishing followed by one when no fish can be taken, then in the next month the catch will again be better. This disappearance of the cod is not understood unless it is due to temporary exhaustion of the food supply. As the food is replenished, the fish return. Some of the cod taken in this bay are equal in both size and quality to those caught in Bering Sea, individuals weighing 30 pounds or more being secured. As a rule, however, cod from these inland waters are rather undersized, many being accepted only at half price by the company.

A total of 2,336 cases of canned cod were packed by the Pacific American Fisheries at its Port Moller cannery and the Nelson Lagoon Packing Co. at Nelson Lagoon.

### STATISTICAL SUMMARY.

The Alaska codfish industry shows an investment of $1,271,118 in 1918, which is a decrease of $137,147 from the investment in 1917. A total of 697 persons were employed, as compared with 795 in 1917.

This fishery produced a total of 14,062,960 pounds of cod, valued at $957,184. This is an increase of 285,490 pounds in production and $212,208 in value.

INVESTMENT IN THE COD FISHERY IN ALASKA IN 1918.

| Items. | Number. | Value. | Items. | Number. | Value. |
|---|---|---|---|---|---|
| Value of shore stations | | $169,952 | Vessels—Continued. | | |
| Cost of operations | | 332,743 | Rowboats | 483 | $22,395 |
| Wages paid | | 430,426 | Pile drivers | 2 | 250 |
| Vessels: | | | Gear: | | |
| Power vessels over 5 tons | 11 | 94,364 | Seines (341 fathoms) | 5 | 700 |
| Net tonnage | 427 | | Gill nets (54 fathoms) | 2 | 90 |
| Launches under 5 tons | 18 | 2,156 | Lines | 2,129 | 2,242 |
| Sailing vessels | 15 | 215,800 | | | |
| Net tonnage | 4,336 | | Total | | 1,271,118 |

PERSONS ENGAGED IN THE ALASKA COD FISHERY IN 1918.

| Occupations and races. | Number. | Occupations and races. | Number. |
|---|---|---|---|
| Fishermen: | | Transporters: | |
| Whites | 474 | Whites | 138 |
| Natives | 50 | Natives | 4 |
| Total | 524 | Total | 142 |
| Shoresmen: Whites | 31 | Grand total | 697 |

PRODUCTS OF ALASKA COD FISHERY IN 1918.

| Products. | Pounds. | Value. | Products. | Pounds. | Value. |
|---|---|---|---|---|---|
| Vessel catch: | | | Canned: | | |
| Dry salted cod | 8,204,500 | $590,370 | In 1-pound flats (2,336 cases) | 112,128 | $14,175 |
| Pickled cod | 996,459 | 48,333 | | | |
| Tongues | 17,600 | 1,760 | Total: | | |
| Frozen cod | 239,138 | 6,894 | Dry salted cod | 10,902,507 | 778,737 |
| Total | 9,457,697 | 647,357 | Pickled cod | 2,650,073 | 142,200 |
| Shore-station catch: | | | Stockfish | 38,268 | 7,128 |
| Dry salted cod | 2,698,007 | 188,367 | Tongues | 18,800 | 1,840 |
| Pickled cod | 1,653,614 | 93,867 | Frozen cod | 273,326 | 10,312 |
| Stockfish | 38,268 | 7,128 | Fresh cod | 67,458 | 2,742 |
| Tongues | 1,200 | 80 | Canned | 112,128 | 14,175 |
| Frozen cod | 34,188 | 3,418 | Oil (50 gallons) | 400 | 50 |
| Fresh cod | 67,458 | 2,742 | | | |
| Total | 4,492,735 | 295,602 | Total | 14,062,960 | 957,184 |

## HERRING FISHERY.

The Government was successful in its efforts to introduce the Scotch method of curing herring into Alaska in 1917. A comparatively small pack was made, but the demonstrations of the method of cure under the immediate direction and supervision of Aug. H. D. Klie attracted considerable attention to the end that in 1918 several packers were prepared to follow that method. In 1917 the market for Scotch-cured herring remained firm throughout the year. The Norwegian-cured product was not in the same demand and packers who employed that cure experienced some difficulty in disposing of their herring.

Before operations began in 1918, Mr. Klie revised his published directions regarding the Scotch cure to suit conditions in Alaska and to stimulate more interest in that method. The Government continued the work it began in 1917 by again sending Assistant Clarence L. Anderson and Fishery Expert William P. Studdert to central Alaska to give instruction in curing and packing herring by the Scotch formula. During the summer they rendered valuable

assistance to the Ohm Fish & Packing Co., at Sheep Point, and to the Carlisle Packing Co., Franklin Packing Co., and Haynes Fisheries, all three plants being at Port Ashton or Sawmill Bay. Late in the year Mr. Studdert went to Halibut Cove, where some 15 operators were engaged in packing herring, three of whom, the Kachemak Saltery & Canning Co., the Alaska Sea Food Products Co., and Keith McCullough, were interested in and made considerable packs of Scotch-cured herring.

When the 1918 pack began to arrive in Seattle, it was found that in several instances packers had been careless in their work, and that a faulty product which could hardly be marketed was the result. This carelessness manifested itself in poor and loose packing, insufficient salting, oversalting, and improper grading. Packers were therefore notified that herring branded as Scotch cured must meet certain known requirements in order to be acceptable to the trade and comply with the provisions of the pure food and drug act in regard to branding. Consideration is being given to an inspection service under Government auspices to pass upon the quality of herring landed at Seattle.

The great expansion of the herring industry in Alaska as a direct consequence of the exploitation work of 1917 in introducing the Scotch cure extended also to the operations of packers who preferred to follow the Norwegian cure, as increased activities in the one direction also stimulated production in the other.

Herring fishing in southeastern Alaska and in the Prince William Sound district of central Alaska is principally by means of purse seines. Fish of all sizes are thus taken. Since there are limitations upon the size of herring which may be pickled for food, it naturally follows that a considerable quantity of small fish are taken which can not be used and are therefore thrown away. In the aggregate thousands of barrels of herring are thus destroyed. Where herring are taken in purse seines it would seem that this loss is unavoidable unless they are impounded, thus enabling the removal and segregation, by gill netting in the pounds, of those of proper sizes for pickling. The small fish would pass through the nets and could be released after the larger ones are removed. The practicability of this manner of sorting herring has not been demonstrated successfully as yet, but experienced herring operators raise no special objection thereto where herring are held in bights or small coves. Herring are taken in Halibut Cove with gill nets. By using nets of proper mesh, the taking of small fish is reduced to a minimum. Probably very little waste occurs here as the herring are uniformly large in the locality.

### STATISTICAL SUMMARY.

The herring industry of Alaska shows an investment of $1,802,817 in 1918, as compared with $562,002 in 1917, or a gain of 220 per cent. The number of persons employed was 884, as compared with 214 in 1917. The value of the products was $1,819,538, as against $767,729, an increase of $1,051,809 over 1917. This shows a material development of the herring fishery of Alaska. It is especially interesting to note that the chief product was the Scotch-cured herring, of which the equivalent of 38,977 full Scotch barrels, or 9,744,175 pounds, was packed. The pack of Norwegian-cured herring exceeds all previous records, a total of 8,968,515 pounds, or the equivalent of 49,842 barrels, having been produced in 1918.

Losses in the herring industry were comparatively small. A launch valued at $8,000 and a barge valued at $4,000 were lost by the Kachemak Saltery & Canning Co. Miscellaneous small boats, gear, and supplies, valued at $2,179, and herring products valued at $8,459, were also lost. The total losses were therefore $22,638.

INVESTMENT IN THE HERRING FISHERY IN ALASKA IN 1918.

| Items. | Southeast Alaska. | | Central Alaska. | | Western Alaska. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* | *No.* | *Value.* |
| Plants operated | 9 | $238,496 | 25 | $188,008 | 2 | $6,800 | 36 | $433,304 |
| Operating capital | ..... | 516,993 | ..... | 357,178 | ..... | 39,722 | ..... | 913,893 |
| Vessels: | | | | | | | | |
| Power vessels over 5 tons | 24 | 134,000 | 14 | 80,300 | 1 | 6,500 | 39 | 220,800 |
| Net tonnage | 478 | ..... | 264 | ..... | 11 | ..... | 753 | ..... |
| Barges | 1 | 7,000 | 3 | 13,000 | ..... | ..... | 4 | 20,000 |
| Launches under 5 tons | 4 | 4,000 | 16 | 21,400 | 1 | 250 | 21 | 28,650 |
| Boats, row and seine | 40 | 2,955 | 75 | 5,485 | 20 | 1,737 | 135 | 10,177 |
| Lighters and scows | 14 | 33,250 | 26 | 14,900 | 1 | 300 | 41 | 48,450 |
| Pile drivers | 2 | 1,500 | 1 | 1,000 | ..... | ..... | 3 | 2,500 |
| Gear: | | | | | | | | |
| Haul seines | 18 | 23,800 | 16 | 12,396 | 2 | 530 | 36 | 36,726 |
| Fathoms | 1,839 | ..... | 1,810 | ..... | 200 | ..... | 3,849 | ..... |
| Purse seines | 32 | 55,000 | 6 | 16,500 | 4 | 2,520 | 42 | 74,020 |
| Fathoms | 4,505 | ..... | 1,410 | ..... | 400 | ..... | 6,315 | ..... |
| Gill nets | 10 | 300 | 69 | 5,968 | 162 | 3,929 | 241 | 10,197 |
| Fathoms | 500 | ..... | 3,030 | ..... | 2,593 | ..... | 6,123 | ..... |
| Dip nets | 3 | 600 | ..... | ..... | ..... | ..... | 3 | 600 |
| Pound nets, floating | 2 | 500 | ..... | ..... | ..... | ..... | 2 | 500 |
| Pots | ..... | ..... | 5 | 2,500 | ..... | ..... | 5 | 2,500 |
| Skates | ..... | ..... | 7 | 500 | ..... | ..... | 7 | 500 |
| Total | ..... | 1,018,394 | ..... | 722,135 | ..... | 62,288 | ..... | 1,802,817 |

PERSONS ENGAGED IN THE ALASKA HERRING FISHERY IN 1918.

| Occupations and races. | Southeast Alaska. | Central Alaska. | Western Alaska. | Total. |
|---|---|---|---|---|
| Fishermen: | | | | |
| Whites | 121 | 115 | 8 | 244 |
| Natives | 1 | 4 | 19 | 24 |
| Others | 9 | ..... | ..... | 9 |
| Total | 131 | 119 | 27 | 277 |
| Shoresmen: | | | | |
| Whites | 306 | 176 | 3 | 485 |
| Natives | 2 | 12 | 59 | 73 |
| Others | 8 | 16 | ..... | 24 |
| Total | 316 | 204 | 62 | 582 |
| Transporters: Whites | 12 | 13 | ..... | 25 |
| Grand total | 459 | 336 | 89 | 884 |

PRODUCTS OF ALASKA HERRING FISHERY IN 1918.

| Products. | Quantity. | Value. |
|---|---|---|
| Herring: | | |
| Canned (1-pound cans) ..... cases | 31,719 | $231,735 |
| Dry salted for food ..... pounds | 100,000 | 1,500 |
| Fresh for food ..... do | 606,326 | 6,564 |
| Fresh for bait ..... do | 1,407,200 | 17,827 |
| Frozen for bait ..... do | 4,152,835 | 36,654 |
| Pickled for food, Scotch cure ..... do | 9,744,175 | 748,606 |
| Pickled for food, Norwegian cure ..... do | 8,968,515 | 632,402 |
| Oil ..... gallons | 138,012 | 97,000 |
| Fertilizer ..... tons | 645 | 47,250 |
| Total | ..... | 1,819,538 |

## WHALE FISHERY.

### SHORE STATIONS.

The whaling industry in Alaska is represented by the operations of three companies, namely, the United States Whaling Co., at Port Armstrong, the North Pacific Sea Products Co., at Akutan, and the Beluga Whaling Co., on the Beluga River.

The United States Whaling Co. operated one less steamer in whale killing than heretofore, only the *Star II* and *Star III* (97 tons each) being engaged. The North Pacific Sea Products Co. increased its whaling fleet by the addition of one vessel, the steamer *Paterson* (77 tons), thus making four steamers engaged in whale killing, the other three being those used in 1917, the *Kodiak* and *Unimak* (99 tons each), and the *Tanginak* (71 tons). The power schooner *Halcyon* (61 tons) was also used. In addition to the barge *Fresno* (1,149 tons), the steamer *Elihu Thompson* (448 tons) was used as a transporting and refrigerating vessel.

The *Halcyon* was lost in November by being blown to sea from her moorings in the harbor at Akutan. No one was aboard the vessel. It was valued at $10.000. Buildings valued at $5,000 were also destroyed.

### STATISTICAL SUMMARY.

The whaling industry in Alaska in 1918 shows an investment of $1,350,971, a decrease of $258,955 from 1917. It gave employment to 325 persons as compared with 262 in 1917. Products valued at $834,127 were obtained, which is an increase of $179,255 over 1917. The total number of whales taken was 448, which is 25 more than the number obtained in 1917.

PRODUCTS OF ALASKA SHORE WHALING OPERATIONS IN 1918.

| Products. | Quantity. | Value. |
|---|---|---|
| Whale oil.....gallons.. | 672,989 | $421,942 |
| Sperm oil.....do.... | 338,931 | 327,420 |
| Fertilizer, meat.....pounds.. | 1,698,000 | 66,845 |
| Fertilizer, bone.....do.... | 361,600 | 7,410 |
| Whalebone.....do.... | 8,223 | 1,644 |
| Ivory, sperm.....do.... | 866 | 216 |
| Meat, frozen.....do.... | 148,000 | 7,400 |
| Hides, beluga.....do.... | 2,500 | 1,250 |
| Total..... | ..... | 834,127 |

WHALES TAKEN IN SHORE OPERATIONS IN 1918.

| Species. | Number. | Species. | Number. |
|---|---|---|---|
| Finback | 170 | Sei | 4 |
| Humpback | 58 | Beluga | 42 |
| Sulphur-bottom | 82 | | |
| Sperm | 92 | Total | 448 |

INVESTMENT IN SHORE WHALE FISHERY IN ALASKA IN 1918.

| Items. | Number. | Value. | Items. | Number. | Value. |
|---|---|---|---|---|---|
| Vessels: | | | Vessels—Continued. | | |
| Steam and gas | 8 | $420,000 | Pile driver | 1 | $150 |
| Net tonnage | 1,049 | | Value of plants | | 326,545 |
| Barge | 1 | 30,000 | Cash capital | | 314,933 |
| Net tonnage | 1,149 | | Wages paid | | 256,983 |
| Launches under 5 tons | 2 | 1,900 | | | |
| Rowboats | 2 | 60 | Total | | 1,350,971 |
| Scows | 2 | 400 | | | |

PERSONS ENGAGED IN THE SHORE WHALE FISHERY IN ALASKA IN 1918.

| Races. | Number. |
|---|---|
| Whites | 246 |
| Natives | 36 |
| Japanese | 43 |
| Total | 325 |

## CLAM FISHERY.

Clam canning in Alaska in 1918 was carried on by seven companies, four of which, the Alaska Clam Canning Co., Petersburg, Noyes Island Packing Co., Steamboat Bay, Sitka Packing Co., Sitka,and the Red Cross Packing Co., Juneau, were located in southeastern Alaska, while the other three, the Lighthouse Canning Co., Pioneer Packing Co., and the Pinnacle Rock Packing Co., were in central Alaska, at or near Cordova, where most of the clam pack was made. Clam canning in southeastern Alaska, except by the Red Cross Packing Co., was incidental to salmon canning. In central Alaska the Pioneer Packing Co. and the Pinnacle Rock Packing Co. engaged exclusively in clam canning, but the Lighthouse Canning Co. entered the salmon-canning business. It is probable that similar action will be taken by the other companies, as they admit that the clam beds are approaching serious depletion, which in another year or so will have reached a point where profitable digging can not be carried on.

The Alaska Sea Food Co.'s plant near Cape Whitshed was built primarily as a clam cannery. Canning began in 1917, but the plant was burned early in the season and was not rebuilt in time to resume operations that year. In 1918 it opened as a salmon cannery.

This industry shows an investment of $247,757, which is a decrease of $47,230 from 1917. It gave employment to 182 persons, or 44 less than in 1917. A total of 43,575 cases were packed as against 74,515 cases in 1917. The value of clam products was $214,504, as compared with $274,036 in 1917, a decrease of $59,532.

INVESTMENT IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1918.

| Items. | Number. | Value. |
|---|---|---|
| Canneries operated | 3 | $56,200 |
| Working capital | | 82,367 |
| Wages paid | | 92,830 |
| Vessels: | | |
| Over 5 tons | 1 | 6,000 |
| Tonnage | 25 | |
| Launches under 5 tons | 15 | 7,042 |
| Rowboats and skiffs | 53 | 2,499 |
| Lighters and scows | 1 | 819 |
| Total | | 247,757 |

PERSONS ENGAGED IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1918.

| Occupations and races. | Number. |
|---|---|
| Diggers: Whites | 107 |
| Shoresmen: Whites | 72 |
| Transporters: Whites | 3 |
| Total | 182 |

PRODUCTS OF CLAM CANNERIES IN ALASKA IN 1918.

| Products. | Cases. | Value. |
|---|---|---|
| Clams: | | |
| ½-pound cans (48 per case) | 18,240 | $88,698 |
| 10-ounce cans (48 per case) | 150 | 600 |
| 12-ounce cans (48 per case) | 1,797 | 8,500 |
| 1-pound cans (48 per case) | 21,684 | 109,174 |
| 2-pound cans | 1,487 | 6,894 |
| 10-pound cans (6 per case) | 125 | 500 |
| Clam juice: | | |
| 10-pound cans (6 per case) | 92 | 138 |
| Total | 43,575 | 214,504 |

## MINOR FISHERIES.

### TROUT.

The trout fishery of Alaska has not attracted much attention although it is of growing importance. One concern, the Midnight Sun Packing Co., at Kotzebue, reports that its major operations consisted of the catching and packing of Dolly Varden trout. This company canned 2,587 cases of trout, the value of which was $24,105, or more than the value of all the trout products of Alaska in 1917. There was also a considerable increase in the quantity of fresh and frozen trout produced, the records for 1918 showing an aggregate production of 69,718 pounds, valued at $7,343, as against 42,966 pounds, valued at $4,018, in 1917. This increase occurred chiefly in southeastern Alaska. The total production of pickled trout was 105 barrels, as against 174 barrels in 1917. The total value of all trout products in 1918 was $33,684, an increase of $16,788 over the yield of 1917.

PRODUCTS OF THE ALASKA TROUT FISHERY IN 1918.

| Section and species. | Fresh. | | Frozen. | | Pickled. | | Canned. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Barrels.* | *Value.* | *Cases.* | *Value.* |
| Southeast Alaska: | | | | | | | | |
| Dolly Varden | 47,169 | $5,725 | 985 | $197 | 3 | $95 | ..... | ..... |
| Steelhead | 13,049 | 850 | 675 | 101 | 8 | 112 | ..... | ..... |
| Total | 60,218 | 6,575 | 1,660 | 298 | 11 | 207 | ..... | ..... |
| Central Alaska: | | | | | | | | |
| Dolly Varden | ..... | ..... | 7,840 | 470 | 74 | 1,236 | 33 | $295 |
| Steelhead | ..... | ..... | ..... | ..... | ..... | ..... | 21 | 168 |
| Total | ..... | ..... | 7,840 | 470 | 74 | 1,236 | 54 | 463 |
| Western Alaska: | | | | | | | | |
| Dolly Varden | ..... | ..... | ..... | ..... | 20 | 330 | 2,587 | 24,105 |
| Grand total | 60,218 | 6,575 | 9,500 | 768 | 105 | 1,773 | 2,641 | 24,568 |

### SABLEFISH.

The sablefish, or black cod, as it was once known, is taken incidentally by those engaged in halibut fishing on the offshore banks of Alaska. The bulk of the catch was marketed fresh or frozen, while a small quantity was pickled. The yield was 1,336,039 pounds, or 315,549 pounds more than in 1917. The products in 1918 were valued at $67,351, as compared with $38,303 in 1917, a gain of $29,048.

SHIPMENTS OF SABLEFISH FROM ALASKA WATERS IN 1918.

| Condition. | Pounds. | Value. |
|---|---|---|
| Fresh | 842,386 | $41,122 |
| Frozen | 411,955 | 20,004 |
| Pickled | 81,698 | 6,225 |
| Total | 1,336,039 | 67,351 |

### RED ROCKFISH.

The production of red rockfish in 1918 was 338,669 pounds, valued at $12,186, as compared with 150,453 pounds in 1917, valued at $3,696. This was a very gratifying increase in the take and utilization of this somewhat neglected fish. The rockfish, as in the case of several other species of fish, does not support an independent industry, but is taken chiefly in connection with the halibut fishery.

### CRABS.

Commercially, the crabs of Alaska attract little attention, although they are recognized as a superior sea food, widely distributed, and reasonably abundant. The only reported crab fishery was carried on by John Murphy, at Tenakee, Alaska, who took 720 dozen, valued at $1,440. The total investment in this industry was $739. Crabs are used to a very considerable extent by local residents of various parts of Alaska.

### SHRIMPS.

The shrimp fishery of Alaska is centered in the Petersburg region and at Thomas Bay. The Glacier Fish Co., at Scow Bay, the Ripley Fish Co., at Petersburg, and H. Van Vlack & Co., at Thomas Bay, handled shrimps. The latter concern, in addition to dealing in fresh shrimps as the other companies did, canned 524 cases, valued at $3,200. The total sales of fresh shrimps were 48,204 pounds, valued at $10,806. The total value of the shrimp products of Alaska in 1918 was $14,006.

### MISCELLANEOUS FISHERY PRODUCTS.

In the various fishery operations in Alaska certain species of fish are taken and used to a limited extent by the companies handling fresh and frozen fish. These miscellaneous products are not given separate classification, but consist in large part of ling cod, flatfish, and pollock, the total yield being 246,968 pounds, valued at $7,696. In addition to this, 7,850 pounds of atkafish, valued at $645, were pickled in western Alaska.

## MINOR FUR-BEARING ANIMALS.

### FIELD WORK.

The work of enforcing the law and regulations for the protection of fur-bearing animals in Alaska in 1918 was carried on by representatives of the Bureau in the usual manner. The greatly increased activities in connection with the fisheries demanded much of the time of field employees, but all the attention possible was devoted to matters pertaining to the minor fur-bearing animals. Two wardens in the interior of Alaska and one special fur warden have given particular attention to fur work.

Through a reciprocal arrangement with the Governor of Alaska, employees of this Bureau have been appointed ex officio game wardens, and the territorial game wardens and special employees for the suppression of the liquor traffic among the Indians have been designated special wardens in the Alaska service of the Bureau of Fisheries without additional compensation. This increases the Bureau's personnel in Alaska by 11 members, as follows:

Game wardens: Patrick Hamilton, Ketchikan; J. C. Lund, Juneau; P. S. Ericksen, McCarthy; J. A. Baughman, Seward; Stephen Foster, Nenana; R. E. Steel, Eagle; and M. O. Colberg, Nome.

Special employees: J. F. McDonald, Juneau; J. A. Bourke, Valdez; Thomas P. Killeen, Nome; and John A. Moe, Ruby.

Game Warden F. A. Martin, at Anchorage, had already been appointed a special fur warden at a nominal salary to succeed a former employee of similar status.

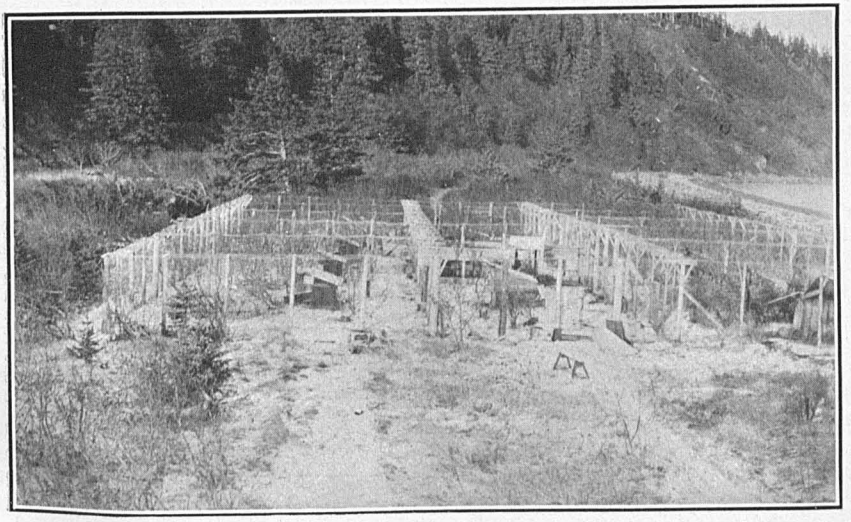
This arrangement was completed in July and assistance has been given chiefly in the matter of reporting violations of the law and regulations, and making seizures of illegally taken skins.

### REGULATIONS.

In the main the regulations remained the same as in 1917. The prohibition in respect to the taking of marten in Alaska continued in force. The prohibition as to the taking of beaver was extended until November 1, 1923. The situation in regard to the shipment of beaver and marten skins from Alaska has not been considered altogether satisfactory on account of the number of skins of both species which are declared to have been procured in Canada. It is possible that the regulations are thus evaded in some cases. The desirability of having similar regulations put in effect by the Canadian authorities is being considered, as it is believed that where depletion has occurred in Alaska the same condition probably exists in the contiguous Provinces of Canada.

Seasons for the taking of wild fur-bearing animals were unchanged, with the exception that in the region drained by streams flowing into the Arctic Ocean north of the sixty-eighth parallel of north latitude the open season for taking foxes was extended 30 days, to include April 14 of each year. This change was made on the recommendation of the Governor of Alaska. It was advocated by Archdeacon Stuck and Dr. V. Stefansson, who have a thorough knowledge of conditions

BUREAU'S ALASKA FUR WARDEN AND DOG TEAM, YUKON RIVER.



FOX CORRALS AND BREEDING PENS, CENTRAL ALASKA.

in the far northern part of Alaska. T. L. Richardson, Government teacher and United States commissioner at Barrow, Alaska, also urged this extension of the season. The killing of any fur-bearing animal for which a close season exists is prohibited if its fur is unprime.

A regulation has also been issued to prohibit the use of dogs in the taking of fur-bearing animals. This was deemed necessary, because of the custom, particularly in the Kodiak region, of pursuing foxes with dogs. It is reported that a hound will run down a fox in a very few minutes, and, if the hunter does not quickly catch up with the dog, the fox will soon be so mangled as to greatly reduce the value of the pelt or even render it practically worthless.

The regulation regarding the use of dogs was promulgated September 18, 1918, as follows:

*Dogs.*—The use of dogs for pursuing and killing fur-bearing animals for which close seasons exist is prohibited.

On September 24, 1918, the following regulation in respect to foxes was approved:

*Fox.*—The killing of any fox is prohibited throughout the season from March 15 to November 15, both days inclusive, of each year; except that in the region drained by streams flowing into the Arctic Ocean north of the sixty-eighth parallel of north latitude, the prohibited season shall be from April 15 to November 15, both days inclusive, of each year.

## VIOLATIONS OF REGULATIONS AND SEIZURES OF SKINS.

More active efforts were made in the current calendar year to prevent violations of the regulations and to cause the infliction of adequate penalties when violations occurred. The depletion of the once-plentiful supply of fur-bearing animals has aroused residents of Alaska to a realization of the necessity for proper protection of this natural resource, in consequence of which excellent cooperation is given usually in securing information for prosecutions.

In January, 1918, the Bureau seized at Seattle, Wash., 47 unprime red-fox skins and 3 unprime cross-fox skins from a shipment by O. K. Quean, of Unalaska, Alaska. About the same time the master of the fisheries steamer *Roosevelt* seized from a seaman aboard the vessel 5 unprime fox skins which had been secured at Unalaska on the last voyage of that vessel. These skins were sold at Seattle for the benefit of the Government.

On February 6, 1918, the collector of customs at San Francisco forwarded to the Bureau 4 pup sealskins which were seized at that port in 1914. No claim or application for their return was made by the owner, and instructions were given by the Secretary of the Treasury for the forwarding of the skins to the Department of Commerce. They were subsequently sold for Government account by Funsten Bros. & Co.

On February 18, 1918, Samuel Gowen, special fur warden of the Bureau, seized from Ike Koslosky, manager of the Northwestern Fur Co., at Anchorage, Alaska, 96 beaver skins, 41 unprime mink skins, and 1 unprime land otter skin. Koslosky was fined $100 and costs, amounting to $30, in the United States commissioner's court for having the skins in his possession. The skins were forwarded to Tacoma for sale for the account of the Government.

Warden Shirley A. Baker, stationed at Dillingham, in western Alaska, reported that on March 18, 1918, he seized 1 unprime cross-fox skin from John Matson at Squaw Harbor. On May 15 he seized 6 mink and 16 muskrats from Tom Tennison at Dillingham. He also confiscated 5 bottles of strychnine which were in the possession of Tennison. In addition 16 muskrats and 1 mink were seized from Otto Johannesen of Mulchatna.

Warden C. L. Larson reported that on May 4, 1918, D. O. Banville was convicted in the United States commissioner's court at Franklin of having purchased and shipped a marten skin illegally taken by an Indian. He was fined $20 and paid costs amounting to $2.75.

On June 19, 1918, Game Warden R. E. Steel reported from Eagle, Alaska, that, acting upon information from the deputy United States marshal at Fort Yukon, he had found and taken possession of 21 marten skins which had been mailed at Fort Yukon addressed to a New York firm. The skins were forwarded to the Bureau.

On July 17, 1918, Warden C. F. Townsend reported from Ruby that a United States marshal had turned over to him 10 beaver skins seized from a trader from Seattle. The skins were forwarded to Seattle.

On August 5, 1918, Assistant Agent Christoffers cooperated with customs inspectors at Seattle in the examination of furs transported by the schooner *Ruby*. Seizures were made of the following unprime skins: 3 mink skins consigned by L. K. Goodmanson of Bethel, Alaska, to Louis Levy, San Francisco; 4 mink skins, consigned by Oscar Samuelson, Bethel, Alaska, to Seattle Fur Sales Agency, Seattle; 6 mink, consigned by J. A. Dull, of Bethel, Alaska, to West Coast Grocery Co., Tacoma, Wash.; 21 mink skins consigned from Apokak, Alaska, to the Kuskokwim Fishing & Transportation Co., Seattle; 1 weasel and 7 mink skins consigned by C. F. Carlson, of Bethel, Alaska, to B. B. Green for Horner-Williamson Co., New York City.

Warden C. F. Townsend reported from Russian Mission, on August 20 the seizure from August Melzer, a trader, of 3 beaver, 3 lynx, and 1 mink. The beaver were concealed in the lynx skins, and the latter, although prime, were accordingly confiscated also. The skins were forwarded to Seattle.

On December 11 Special Warden Martin reported the seizure at Seward from J. H. Smith of 1 beaver skin. A search warrant was issued for the examination of Smith's baggage, which resulted in securing this skin. He was charged with its unlawful possession and pleaded guilty in the United States commissioner's court at Seward, being fined $75, with costs in the sum of $22.05. The skin was forwarded to Seattle.

On November 21 Special Warden F. A. Martin at Anchorage seized 10 beaver skins from John Brunner which had been brought in as baggage. Brunner was tried before the United States commissioner at that place and was found guilty of unlawful possession of these skins and was fined $100 and paid costs amounting to $24.30. The skins were forwarded to Seattle.

Assistant Agent Christoffers reported on November 22 the seizure at Seattle of the following furs: From shipment by Capt. Louis Knaflich from Seward, Alaska, to the Kuskokwim Fishing & Transportation Co. at Seattle, 6 unprime weasel skins; from shipment by August Melzer at Nome to himself at Seattle, 5 unprime mink skins.

Assistant Agent Christoffers confiscated from H. Roseboom of Bellingham, Wash., 9 fur-seal skins which had been purchased from natives in the Bristol Bay district in 1917. The Solicitor of the Department ruled that these skins could not be properly authenticated as having been lawfully taken and must be sold at public auction for the account of the Government. After such sale certificates would be issued to show that purchasers were lawfully entitled to their possession.

Warden C. F. Townsend, of Fairbanks, reported that he investigated the rumor as to a case of poisoning at Shageluk in the fall of 1917, but obtained no definite information.

On March 4, 1918, Nicholai Mudock was arrested on complaint of Warden Shirley A. Baker for having killed two sea otters off Sutwik Island, on the Pacific side of the Alaska Peninsula, between April 18 and 25, 1917. The case was tried at Naknek on March 13. Mudock pleaded guilty and was sentenced to three months in jail. A heavier penalty was not imposed on account of the defendant's precarious physical condition. Mudock claimed to have sold one of the skins to William Rutchow, a fur trader at Cold Bay. Careful search failed to locate the skin in Rutchow's possession. Warden Baker complained to the marshal at Kodiak that Rutchow was selling whisky and making seditious remarks. He was subsequently fined $600 and costs for these two offenses. The other skin had also been sold, and it was not located.

## SALES OF SEIZED SKINS.

During the calendar year 1918, the following confiscated skins were sold at public auction: 41 mink, 96 beaver, 1 land otter, 51 red fox, 4 cross fox, 2 sea otters, and 13 fur-seal skins. The gross amount received was $2,609.90. Commission and other expenses amounted to $115.02, leaving a balance of $2,494.88 turned into the United States Treasury. A considerable number of confiscated skins were awaiting sale at the end of the year.

## FUR FARMING.

Accurate information in regard to fur-farming operations in Alaska is difficult to obtain and is of fragmentary character. In many cases operations are incidental to other work and have been more or less unsuccessful. The data which the Bureau of Fisheries publishes are obtained from correspondence with fur farmers and from reports of employees in Alaska. The Bureau has no direct jurisdiction over fur-farming operations, other than the enforcement of the law and regulations for the protection of fur-bearing animals in Alaska. A number of islands, however, are available for lease by the Department of Commerce for fox propagation purposes.

George L. Morrison, of Hot Springs, reports that considerable loss occurred in his operations in the spring of 1918 because of a disastrous flood, in consequence of which only 33 silver pups were raised from the stock of 29 pairs of silvers and 1 pair of crosses retained in 1917. It was the intention to take the pelts of 25 of the silvers this season. The foxes are kept in 60 corrals, 30 of which are 27 by 27 feet, and 30 are 6 by 27 feet. Mr. Morrison leased his ranch in the fall of 1918 and intended to enter military service.

W. H. Newton, of Healy River, post office Richardson, continued operations with two pairs of foxes. One litter of 6 was raised. He has retained 4 pairs all reared in captivity, and hopes for better success as they are docile and almost domesticated. It was stated that he feeds cooked fish and vegetables. Mr. Newton considers the locality ideal for fur farming, as the food is secured with a minimum of effort and will stay frozen all winter without spoiling. He also contemplates experimenting with marten.

F. Berry, Homer (via Seldovia), is undertaking fox farming in partnership with Dr. E. F. German of Anchorage. They have 1 pair of silver-black foxes and expect to increase the stock and also to secure mink.

Sholin Bros. & Co., of Homer, report satisfactory progress in fur farming. Operations were begun in 1915 with 3 pairs of silver-black foxes; there was no increase in 1916, but in 1917 there were two litters of 5 each which were raised successfully. Sixteen pups were successfully reared in 1918. Three pairs of young foxes have been sold and they retained 12 pairs for breeding purposes. The pens are about 36 by 40 feet, with log houses and dens inside. Cooked fish mixed with corn meal, etc., and rabbits and meat scraps are fed.

James McPherson, of Ellamar, has blue foxes on Peak and Naked Islands in Prince William Sound. The foxes run wild on the islands, the exact number not being known. Fifty-three pelts were taken in 1918. The principal food is fish of various kinds.

J. D. Jefferson, of Valdez, reports excellent success with blue foxes placed on Bald Head Chris Island in 1917. The foxes run at large on the island, but he thinks there are about 15 young. None was killed for fur. The principal food is fish, with rice, oatmeal or corn meal, cooked, with occasionally a little raw fish or game. The foxes thrived and have become extremely tame. Mr. Jefferson reports that they eat ravenously except during the season when the fur is prime. The cross foxes placed on the Dutch Group have not been successful and all but one were lost. Mr. Jefferson intends to place blues on this island and have a keeper to look after them. He states that food is plentiful and easily obtained.

John Tashwak, who has been carrying on fox farming on a small island near Afognak Island, reported that all of his foxes escaped by swimming to the latter island, and that he had none on hand at the end of the year.

Alex. Friedolin continued operations with blue foxes on Hog Island, about 3 miles from Afognak village. He states that many young foxes were lost in the spring and only two young were observed during the summer. The foxes run at large on the island, and on account of crowded conditions in the burrows he has experimented in constructing artificial burrows of logs with dirt on top and covered with roofs; these are dry and warm, but the foxes have not made use of them. In December, 1918, 6 male foxes were killed, and the remaining 3 females and 2 males were liberated for breeding stock. Two additional male foxes were procured and turned loose on the island. Three blue fox pelts sold early in 1919 brought $91 each.

Joseph Filardeau, who maintains a fox farm at the head of Kachemak Bay, reports considerable difficulty and losses of foxes in 1918 through fright as the result of strangers working on the pens, and also because of a shortage of proper food. Mr. Filardeau does not consider foxes any harder to raise than other animals with the right loca-

tion and proper food, but says that if they are kept too secluded and are unaccustomed to seeing strangers and hearing varied sounds they become extremely sensitive and difficult to handle if anything unusual occurs. His stock consists of 5 pairs of foxes and two additional females. Their chief food is sun-cured salmon, with some porcupine and rabbit meat. Because of the scarcity of rabbits, Mr. Filardeau is raising Belgian hares for fox food. He describes his fox pens as follows:

As for the pens—I have built them differently from the usual way owing to the character of the land, a sandy clay which gets very muddy and retains the dampness. The pens are built 24 by 40 feet and 6 feet high, with a 2-inch plank floor, and the sides are planked 2 feet high; from there up is 14-gauge wire netting. These pens are also covered with 16-gauge wire. I keep about 6 inches of gravel and dirt over the floor, also fresh sod, which I think absolutely necessary. As for shade, in summer time I cut grass and throw it over the wire; I also give them green grass inside the pens. The pens are built in two parts, with a wire partition in the center and a sliding door at each end, giving the foxes a chance for a run and exercise.

The dens are built outside the pens, and are of double inch plain lumber, with dirt packed around them. The dens are connected by means of a spout to the pens. There are two dens for each pen.

Peter Petrovsky, of Uyak, continued operations on Amook Island with 3 pairs of silver foxes, 1 cross female and 1 blue male. Only 2 pups were raised in 1918. Mr. Petrovsky does not consider the corral method very satisfactory on account of the prohibition against the killing of birds, which makes it difficult to get a sufficient variety of food.

A. B. Somerville forwarded a photograph of the skins taken from the ranches operated by him in the Aleutian Islands Reservation. These were the first secured since the island was stocked in 1912, and resulted in a take of 224 blue and 15 white pelts, which it is stated sold for $14,000.

S. Applegate, of Berkeley, Calif., maintains blue-fox ranches on Samalga, Ogliuga, and Skagul Islands, within the Aleutian Islands Reservation. In regard to his operations Mr. Applegate writes as follows:

I do not know the number of foxes on either of the islands, as they are allowed to run free, so of course I would not know the number of young born. From the reports of the natives who look after the foxes for me, the litters usually number 5 to 10 young ones; therefore I would judge that they will probably average about 7 young at a birth. As many as 14 have been seen in one litter.

My foxes receive no artificial food, as there seems to be plenty of natural food on the three islands I have chosen. One year I had a fox or two killed each month, just to see in what condition they were. I was told they were found to be quite fat, so I concluded it was unnecessary to import food for them. Their fur in the season of killing has always been found to be long, thick, and glossy, indicating a healthy bodily condition.

I have used corrals and have found that it was a quite impossible, or at least a very uncertain, way to raise them, for they would not breed. I believe the same thing has been experienced elsewhere where it has been attempted.

As to the future prospects, I do not expect any more from my islands than they have yielded in the past. From Samalga Island I will average between 45 and 50 foxes each year. From Ogliuga and Skagul I can not say just what number I can take, as I have had only one season's killing from each.

The islands are all small, Samalga being 4¾ miles long and less than a quarter of a mile wide. Ogliuga and Skagul are only about 300 yards apart, and each is about 2½ miles in length.

As to the number of young foxes successfully raised, from my 18 years' experience on Samalga Island, I should say that about one and a half survives out of each litter; or, in other words, about 80 per cent never attain full growth. This great loss is due to their fighting among themselves and to their being preyed upon by ravens, large gulls, and eagles, particularly eagles. I have been paying the natives for many years

a bounty on each eagle they kill. From 1907 to 1918 they turned over to me the claws of 1,065 eagles. Prior to 1907 I kept no record of the number of eagles killed.

Joseph Voelkl, 18 Mile Post, Haines, reported that the foxes he retained from 1917 had not bred and he had killed all of them. Five of his stock of minks escaped from the pen and he killed the remainder. He states, however, that he expects to build new corrals and obtain new stock.

A. C. Smith, Porcupine, Chilkat Valley, reported that he has 8 pens and a stock of 4 pairs of breeders, 3 silver and 1 cross. Two litters were born in 1918, one of 4 silvers and one of two crosses. He raised 3 of the silvers and 1 cross. The foxes are kept in 8 pens about 20 by 40 feet. The feed given is house scraps, bear meat, horse meat, rabbits, owls, eagles, rice, corn meal, rolled oats, and all kinds of green vegetables.

Rufus D. Blakely, of Ketchikan, has undertaken the raising of muskrats in lakes on Bold Island. It was thought that the efforts to stock the lakes with suitable plants for food were not very successful, because of the condition of the soil, which will require considerable expense for proper treatment. It was stated that the owners contemplate further experiments, possibly with marten and foxes, which require different food.

Inspector E. P. Walker comments as follows on operators in southeastern Alaska:

John Fanning, who was operating at McHenry Anchorage, Etolin Island, has abandoned his place. The few animals he had in captivity are reported to have escaped, and it is probable that the marten that were on the small island were trapped. Thus there remain but the following four positively known to be operating in the district:

A. C. Smith, at Porcupine, Chilkat Valley, foxes of red stock.

James York, on Sumdum Island, blue foxes.

Green and a partner, successors to Barkdahl & Green, on Sokoi Island, foxes of blue and red stock.

Bert Maycock, on Windfall Island, marten and probably some mink.

F. E. Blitz, an educated, temperate man, who has been the only successful fur raiser in the vicinity of Telegraph Creek, British Columbia (160 miles up the Stikine River), feels that fur farming is a thoroughly practical undertaking if properly located and given the same attention and energies that would be devoted to any other high-class stock raising. He feels that the cause of the numerous failures has been almost wholly due to drink, or, as he expressed it in another way, due to "men who would never make a success of anything."

Warden M. J. O'Connor, after a tour of inspection of fox farms in the Chilkat Valley, expressed the following opinion as to reasons for lack of success:

I discovered that the fur farms in this district have not been given proper attention for the raising of furs for commercial purposes, principally because the operators do not give their entire time to the business. It appears, after talking with the leading fur farmers in this vicinity, that their breeding pens are not properly situated in that they are built adjoining each other, when they should be entirely apart and at a distance so that the mothers can not hear the young in other pens, nor even see other foxes, since the sight of such makes them very nervous.

## SHIPMENT OF FURS FROM ALASKA.

As in previous seasons, shipments of furs from Alaska were reported on special blanks prepared by the Bureau. Supplies of blanks were furnished to all postmasters in Alaska and to commercial companies, express companies, and all persons known to be shippers of furs. Postmasters cooperated by indorsing the reports of mail shipments after having been properly filled out and forwarded them to the Bureau.

The furs shipped from Alaska in 1918 increased greatly in value as a result of the general rise in prices. It is generally conceded that the fur animals of Alaska are decreasing in number, although a larger shipment of all species was reported in 1918 with the exception of lynx and foxes. Reliance must be placed on the cooperation of the shippers in making correct reports. Shipments otherwise than by mail are checked by comparison with the records of the collector of customs at Juneau. For convenience the fur year is reckoned from November 16 of one year to November 15 of the following year.

The following table shows the detailed statistics as compiled from information furnished the Bureau in regard to furs shipped from Alaska in 1916, 1917, and 1918:

FURS SHIPPED FROM ALASKA IN 1916, 1917, AND 1918.

| Species. | Year ended Nov. 15, 1916. | | | Year ended Nov. 15, 1917. | | | Year ended Nov. 15, 1918. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number of pelts. | Average value. | Total value. | Number of pelts. | Average value. | Total value. | Number of pelts. | Average value. | Total value. |
| Bear: | | | | | | | | | |
| Black | 1,129 | $9.00 | $10,161.00 | 1,061 | $14.00 | $14,854.00 | 1,164 | $15.00 | $17,460.00 |
| Brown | 41 | 7.50 | 307.50 | 62 | 12.00 | 744.00 | 35 | 12.00 | 420.00 |
| Glacier | 5 | 50.00 | 250.00 | 8 | 20.00 | 160.00 | 35 | 30.00 | 1,050.00 |
| Grizzly | 14 | 14.00 | 196.00 | 13 | 17.00 | 221.00 | 42 | 20.00 | 840.00 |
| Polar | ..... | ..... | ..... | [a] 144 | 40.00 | 5,760.00 | ..... | ..... | ..... |
| Beaver | [b] 37 | 6.50 | 240.50 | [c] 118 | 10.00 | 1,180.00 | [d] 109 | 21.00 | 2,289.00 |
| Ermine | 4,345 | .80 | 3,476.00 | 4,639 | .90 | 4,175.10 | 9,133 | 1.50 | 13,699.50 |
| Fox: | | | | | | | | | |
| Black | 26 | 250.00 | 6,500.00 | 10 | 160.00 | 1,600.00 | 6 | 150.00 | 900.00 |
| Blue | 659 | 50.00 | 32,950.00 | 887 | 58.00 | 51,446.00 | 740 | 85.00 | 62,900.00 |
| Blue, Pribilof Islands | 420 | 48.20 | 20,242.00 | 567 | 61.11 | 34,653.50 | 692 | 82.51 | 57,099.50 |
| Cross | 2,508 | 25.00 | 62,700.00 | 2,669 | 35.00 | 93,415.00 | 1,704 | 50.00 | 85,200.00 |
| Red | 15,711 | 12.00 | 188,532.00 | 10,485 | 24.00 | 251,640.00 | 12,232 | 28.00 | 342,496.00 |
| Silver gray | 318 | 150.00 | 47,700.00 | 443 | 120.00 | 53,160.00 | 440 | 140.00 | 61,600.00 |
| White | 6,178 | 20.00 | 123,560.00 | 3,082 | 28.00 | 103,096.00 | 4,531 | 40.00 | 181,240.00 |
| White, Pribilof Islands | 20 | 14.25 | 285.00 | 39 | 26.33 | 1,027.00 | 19 | 56.84 | 1,080.00 |
| Hare, Arctic | 1,090 | .15 | 163.50 | 89 | .40 | 35.60 | 38 | .10 | 3.80 |
| Lynx | 21,608 | 12.00 | 259,296.00 | 21,210 | 14.00 | 296,940.00 | 7,692 | 26.00 | 199,992.00 |
| Marten | 3,100 | 9.00 | 27,900.00 | [e] 1,210 | 14.00 | 16,940.00 | [e] 1,023 | 19.00 | 19,437.00 |
| Mink | 22,255 | 4.00 | 89,020.00 | 18,832 | 4.00 | 75,328.00 | 24,572 | 6.50 | 159,718.00 |
| Muskrat | 101,827 | .35 | 35,639.45 | 72,264 | .45 | 32,518.80 | 86,624 | 1.20 | 103,948.80 |
| Otter: | | | | | | | | | |
| Land | 1,330 | 15.00 | 19,950.00 | 1,308 | 15.00 | 19,620.00 | 1,647 | 22.00 | 36,234.00 |
| Sea | [f] 1 | 500.00 | 500.00 | [g] 2 | 344.85 | 689.70 | [f] 1 | 150.00 | 150.00 |
| Seal, fur, Pribilof Islands | 7,061 | 30.00 | 211,830.00 | 9,140 | 30.00 | 274,200.00 | [h]30,819 | 30.00 | 924,570.00 |
| Seal, fur | ..... | ..... | ..... | [i] 5 | 30.00 | 150.00 | [j] 9 | 30.00 | 270.00 |
| Squirrel | 214 | .10 | 21.40 | 117 | .05 | 5.85 | 153 | .02 | 3.06 |
| Wolf | 57 | 7.00 | 399.00 | 195 | 8.00 | 1,560.00 | 207 | 18.00 | 3,726.00 |
| Wolverine | 297 | 6.00 | 1,782.00 | 435 | 8.00 | 3,480.00 | 846 | 14.00 | 11,844.00 |
| Total | ..... | ..... | 1,143,601.35 | ..... | ..... | 1,338,599.55 | ..... | ..... | 2,288,170.66 |

[a] The killing of polar bears in Alaska is unlawful.
[b] Shipped under permit.
[c] A considerable number were seized skins. } It is unlawful to kill beavers in Alaska.
[d] Confiscated skins.
[e] Checked against affidavits permitting shipments. It is unlawful to kill marten in Alaska.
[f] Found dead.
[g] Unlawfully killed by natives.
[h] This is total number of skins shipped; total number seals killed was 34,890.
[i] Taken by natives.
[j] Confiscated skins.

## LEASING OF ISLANDS FOR FUR FARMING.

The Department of Commerce is authorized to lease for the propagation of foxes and other fur-bearing animals the Alaskan islands listed below:

ISLANDS WHICH MAY BE LEASED FOR FUR FARMING.

| Name of island. | Location. |
|---|---|
| Chirikof | Southwest of Kodiak Island. |
| Long | Near Kodiak Island. |
| Marmot | East of Afognak Island. |
| Little Koniuji | Shumagin Group. |
| Simeonof | Do. |
| Little Naked | One of Naked Islands, Prince William Sound. |
| Carlson (Crafton) | Prince William Sound. |
| Middleton | Gulf of Alaska. |
| Pearl | One of Chugach Islands. |
| Elizabeth | Do. |
| Aghiyuk | One of Semidi Islands. |
| Chowiet | Do. |

The lease on Simeonof Island to J. C. Smith, of Sand Point, was canceled for nonpayment of rent.

On December 31, 1918, the following islands were under lease:

| Name of island. | Annual rental. | Lessee. |
|---|---|---|
| Middleton | $200 | Joseph Ibach, Cordova, Alaska. |
| Little Koniuji | 205 | Andrew Grosvold, Sand Point, Alaska. |
| Pearl | 200 | I. D. Nordyke, Seldovia, Alaska. |

*Middleton Island, Gulf of Alaska.*—This island is under lease to Joseph Ibach, of Cordova. The foxes run wild on the island and the lessee is unable to tell how many there are. In 1918, 100 blue foxes were killed.

*Little Koniuji Island, Shumagin Group.*—Andrew Grosvold successfully continued fox-farming operations on this island. Detailed information with regard thereto is not available at the present.

*Pearl Island, Chugach Group.*—This island was leased from July 1, 1917, to I. D. Nordyke of Seldovia. It was not stocked with foxes, as Mr. Nordyke expected to enter military service, but he reports that arrangements will be made to begin operations in the season of 1919.

# FUR-SEAL INDUSTRY.

## PRIBILOF ISLANDS.

### GENERAL ADMINISTRATIVE WORK.

In 1918 the work at the Pribilof Islands was expanded greatly in a number of lines and plans and arrangements were made for new features. With the expiration of the close season of seal killings in August, 1917, commercial killing was undertaken at the opening of the killing season in 1918. Additional labor was brought from the Aleutian Islands and assistants were sent from the States for the season. By means of a special allotment it was possible to erect and equip a by-products plant, which is in readiness for operation in 1919. Considerable building work was undertaken, including new dwellings for natives, salt houses, and a cold-storage building. Routine work was carried on as usual, an important feature of which was the taking of a census of the seal herds on the two islands. Cargo for the islands was again transported by the Bureau's steamer *Roosevelt*.

### PERSONNEL.

The statutory employees of the Bureau on the Pribilof Islands in 1918 are listed in the introduction. As a matter of record, the following information in regard to their activities is given, likewise in respect to a number of temporary employees who were at the islands for brief periods:

Agent and Caretaker H. C. Fassett, of St. Paul Island, arrived there May 8, relieving G. Dallas Hanna, who had been in charge of the Bureau's work since in December. Mrs. Myra B. Fassett was employed as a temporary assistant on St. Paul Island. Dr. Harold Heath, of Stanford University, arrived at St. Paul Island on the *Saturn* May 8 to participate in the taking of the seal census. Assistant Agent A. C. Reynolds returned to St. Paul Island in May. Mrs. A. C. Reynolds was employed as nurse on St. George Island. Five men, Zac Botwright, Chas. Schwind, Emil Reinheimer, J. H. Quatmann, and Fred Noack, were sent by Funsten Bros. & Co. to the islands in May to assist in sealing work. R. B. Bentley and J. M. Bush were employed in connection with the by-products plant. They arrived at St. Paul Island August 11, leaving for the States in December. Dr. Charles E. Johnson, who relieved Dr. W. T. Miles, physician, on St. George Island, arrived there in August. Andrew Peterson and Reason C. Gordon, carpenters for St. Paul and St. George Islands, respectively, arrived in August and left in December. Dr. Heath and Dr. Miles left St. Paul August 13 on the *Cedar*. H. D. Aller arrived at St. George Island November 3 to take up the duties of storekeeper. Dr. H. H. Stromberger arrived at St. Paul Island November 5 to succeed Dr. W. B. Hunter, who had resigned. Dr. and Mrs. Hunter left St. Paul in December. Mr. and Mrs. George Haley, school teachers on St. Paul Island, resumed their duties on November 5. G. Dallas Hanna and the five men from Funstens left the islands on September 16 on the *Roosevelt* for Seattle. Assistant Agent Reynolds and Mrs. Reynolds left St. George Island October 22, on a special trip of the cutter *Bear*, arriving at Seattle November 5.

By direction of the Secretary of Commerce, the agents and caretakers on the Pribilof Islands were sent copies of the following letter from the Secretary of the Navy, dated June 27, 1918, expressing the appreciation of the commanding officer of the Alaskan Radio Expedition, 1918, for their cooperation and assistance:

I have the honor to quote the following letter received from the commanding officer, Alaskan Radio Expedition, 1918, for your information:

"Upon the arrival of the Alaskan Radio Expedition and U. S. S. *Saturn* at the Pribilof Islands we were given every assistance that could possibly be expected from the Bureau of Fisheries. The agents in charge, Mr. A. H. Proctor and Mr. H. C. Fassett, merit being brought to the attention of the Department of Commerce for their many acts which were so largely instrumental in promoting the work of the expedition.

"To enumerate the many ways in which they assisted us would be a tedious task. This assistance ranged from placing their transportation and repair facilities at our disposal to furnishing accommodations and subsistence to officers and yard officials in charge of the construction work. Aside from the material assistance they were able to afford, their spirit of coordination was in itself highly appreciated."

Hon. Fred M. Brown, judge of the United States Court, division No. 3, Territory of Alaska, advised in February that he has appointed A. H. Proctor, agent and caretaker, St. George Island, as United States commissioner. This was done upon recommendation of the Bureau, it being thought necessary at the time in order to comply with the marriage-law requirements of the Territory of Alaska.

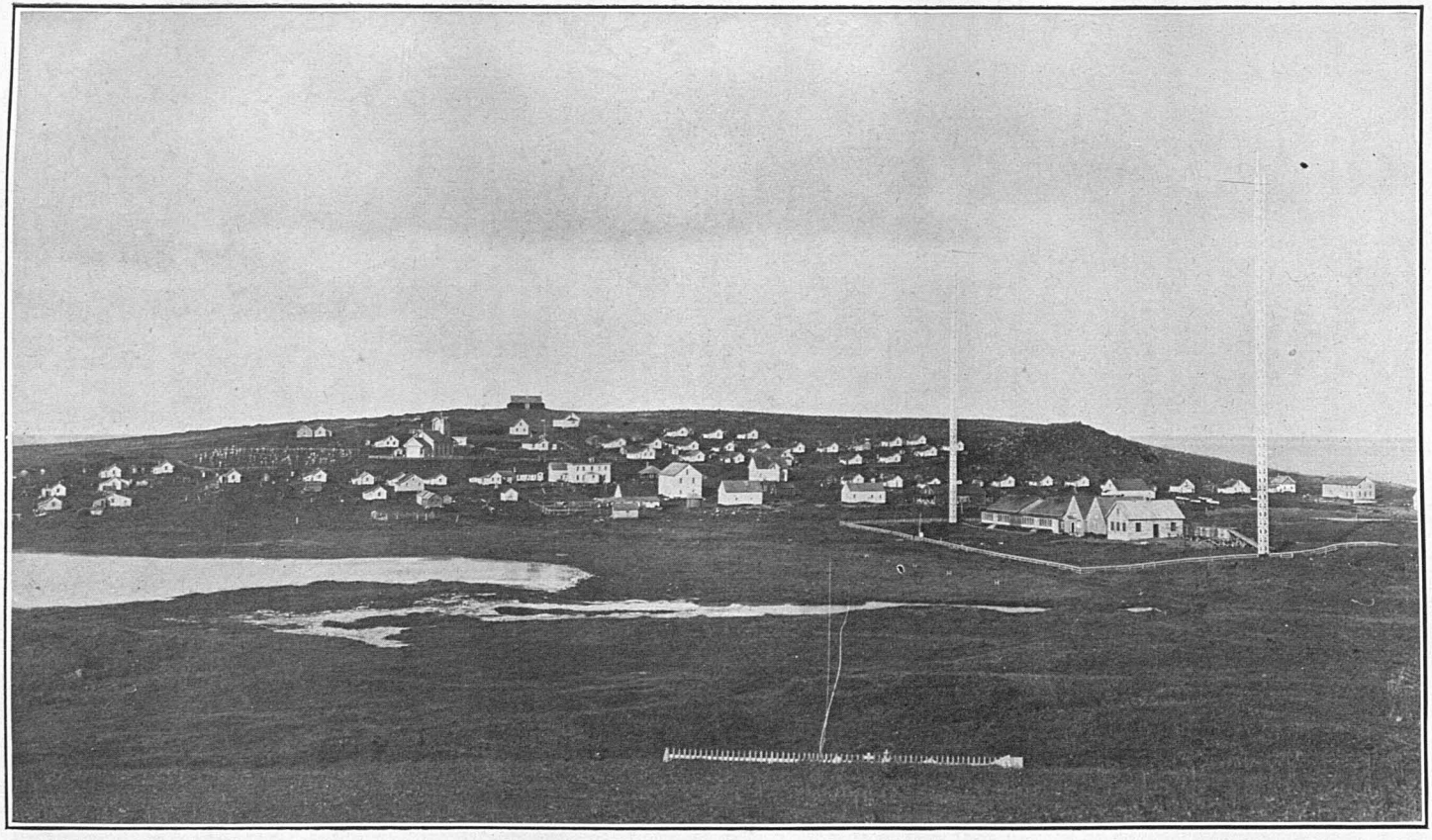
## PURCHASE AND TRANSPORTATION OF SUPPLIES.

As heretofore, arrangements were made to furnish the islands with supplies and equipment essential to the welfare of the natives and regular employees comprising the Bureau's staff. Schedules were printed listing most of the items requisitioned by the agents. Every effort was made to reduce all supplies as much as possible on account of war conditions. Bids were opened at Washington, May 28, for general supplies. It was found there had occurred a considerable advance in price on most of the commodities needed. Supplies were assembled at Seattle, the most convenient shipping point for the Pribilofs. Most of the successful bidders were located at Seattle.

Arrangements were made with Hibbard, Swenson & Co. at Seattle to transport 100 tons of coal from Seattle to the Pribilof Islands on the *Belvedere*, a power trading schooner, which has made several voyages to the Siberian and Arctic coasts. The War Trade Board had considered the advisability of refusing a license for stores and bunker supplies, but the owners offered to transport to the Pribilofs 100 tons of cargo without cost to the Bureau. Upon representations of the advantage accruing to the Bureau, the War Trade Board granted the necessary license. The *Belvedere* left Seattle on April 1 with 100 tons of coal and a few other supplies for the Pribilofs. The vessel finished discharging at the islands on April 30.

The *Roosevelt* left Seattle April 27 with a cargo of approximately 319 tons of general freight and 115,000 feet of lumber for the islands. Passengers were five men in the employ of Funsten Bros. & Co., who were sent to assist in sealing work, and Mr. and Mrs. A. C. Reynolds. Three light motor trucks were included in the cargo.

Arrangements were made with the Bureau of Lighthouses for the transportation on the lighthouse tender *Cedar* of certain heavy items of machinery for the by-products plant, it being regarded that the hoisting gear on the *Roosevelt* would not handle these heavy pieces.



GENERAL VIEW OF VILLAGE, ST. PAUL ISLAND, ALASKA.

The *Cedar* sailed from Seattle June 12 and stopped at Anacortes, where two additional pieces were picked up. The vessel arrived at St. Paul Island August 11.

The *Roosevelt* sailed from Seattle July 26 with 285 tons of general cargo and about 62,000 feet of lumber. The cargo was made up chiefly of materials for the by-products plant. Passengers were two by-products experts, two carpenters, and Dr. Charles E. Johnson, who was to relieve Dr. W. T. Miles as physician on St. George Island.

On account of the large accumulation of freight at Seattle, it was regarded as impossible for the *Roosevelt* to make complete deliveries before winter, hence arrangements were made for the transportation of 200 tons of salt and 100 tons of general supplies on the steamer *Firwood*, sailing from Seattle the middle of August. This cargo was transshipped by the *Roosevelt* from Unalaska in conjunction with the transportation of coal purchased at that place.

The *Roosevelt* sailed from Seattle October 15 on the final trip of the season with 340 tons of general supplies for the Pribilofs. Passengers were H. D. Aller for St. George Island and Dr. and Mrs. Stromberger and Mr. and Mrs. George Haley for St. Paul Island; also two persons identified with the radio station on the latter island.

Through the courtesy of the Coast Guard, 56 barrels, containing 1,978 fur-seal skins, were loaded October 6 at St. George Island on the cutter *Bear*. The vessel landed these skins at Seattle on November 5. This cooperative action by the Coast Guard was of much benefit, as it lessened the work falling to the *Roosevelt* later on when heavy gales at the islands interfered greatly with operations. It was reported that the continuance of heavy weather made it possible to work cargo at St. George Island only three days during the month of November.

### BUILDINGS, WATER SUPPLY, AND ROADS.

On St. Paul Island two dwellings were practically completed for occupancy by natives, and a new salt house was carried well toward completion. A new chicken house was constructed chiefly from old materials. Some alterations were made in the Government house to provide greater comfort to the occupants and a start was made toward temporarily repairing the company house, where several employees live. A home-made hot and cold water system was installed in the latter building, which added greatly to the comfort of those residing there.

During the winter of 1917–18 storm windows were placed on the natives' dwellings for the first time. This resulted in considerable saving of fuel as well as adding to the comfort of the people.

The water supply system for St. Paul Island is far from satisfactory, but extensive changes were not possible during the year. It is planned eventually to run a pipe line to Ice House Lake, but work on this project is temporarily held in abeyance. During the winter of 1917–18 the pipe line from the well which had been previously used to carry water to the tanks on the village hill burst at an unknown point. Later a well was dug 16 feet deep in the north end of the village. A flow of water exceeding 20,000 gallons daily was struck, and a pump and pipe line were temporarily installed connecting with the village hill tanks. At first this water was of excellent quality, but after some weeks it became slightly saline, so that its principal

use consisted of affording fire protection and water for laundry and similar purposes. This relieved the natives from carrying a large amount of water during the summer from the wells located about one-half mile from the village, previously their sole source of supply.

A by-products building for the conversion of seal carcasses into oil and fertilizer was built. Machinery was installed and a preliminary trial made in the fall of the year. Details in regard to this project are given under another heading.

With the press of other important duties, not a great deal of time could be devoted to the construction of roads on St. Paul Island. However, many bad places in the existing trails were so improved that it became possible to transport to the salt house the sealskins which were secured on the distant killing fields, with the exception of those taken at Northeast Point. The establishment of a good system of roads on the islands is believed to be one of the most important things to be considered in the future. It is hoped that a definite program can be outlined whereby transportation of the island products may be satisfactorily accomplished. One of the most urgent needs of good roads is to afford the seal rookeries protection in case of raids. These properties are so valuable that it is hoped means will be provided soon whereby armed parties can be transported to any necessary point on very short notice.

On St. George Island building operations constituted the chief work after the seal-killing season was over. Two new dwellings were constructed for the natives and are now occupied. A new salt house was built and will be ready for use in 1919. Temporary repairs were made to many of the buildings, the timbers of which are badly decayed as a result of the 40 years or more some of the structures have been in use.

In the early part of the spring roadways were partially constructed about the village to enable the transportation of seal products and other freight. Time did not permit the building of completed highways, but they were placed in such condition as to prove of great value. The plan being outlined for roads on this island is based upon the needs of sealing operations and the protection required for the rookeries.

Some progress was made in improving the water supply on St. George Island.

### STEAMER "ROOSEVELT."

The Bureau's steamer *Roosevelt* was used in 1918 as a supply ship for the Pribilof Islands. Three voyages were made to the islands during the season, the final trip extending well into the winter.

On the first voyage the *Roosevelt* left Seattle April 27 with a full cargo of supplies, arriving at Akutan May 9. Fuel was taken aboard and the vessel proceeded to the Pribilofs. After part of the cargo was discharged diphtheria broke out on board, making it necessary to proceed to quarantine at Unalaska. The physician at St. Paul administered antitoxin before the vessel left. On May 27 the *Roosevelt* arranged to leave for Akutan to take on fuel oil, proceeding thence to Bristol Bay to render aid to several cannery ships in distress on account of the heavy ice. After completing this important work the vessel returned to Akutan and thence to the Pribilof Islands, arriving June 16. The ship had on board 11 Aleut workmen from Unalaska,

which were landed at St. Paul. On the return voyage the vessel left the Pribilofs June 22, the chief items of the cargo being 3,542 fur-seal skins and 711 fox skins. The ship arrived at Seattle July 7.

Certain repairs were then undertaken as a result of some damage received while the vessel was engaged in rescue work in Bristol Bay. It is remarkable that only very slight damage was done to the *Roosevelt* notwithstanding that the vessel broke through 16 feet of ice in places.

In the work in Bristol Bay the *Roosevelt* succeeded after a long search in rescuing 21 persons from a camp on an ice floe where they had taken refuge after the cannery ship *Tacoma* had sunk. The cannery ships *St. Nicholas, Centennial,* and *Star of Chili* were brought to safety by the *Roosevelt.* It is said that the *St. Nicholas* would probably have been a total loss inside of 12 hours, with all hands. There were over 300 people on board, including 115 of the *Tacoma's* complement. The *Centennial,* with 161 persons on board, would probably have been a total loss inside of another week. The *Star of Chili,* which had 220 persons aboard, was in no immediate danger. The *Roosevelt* was actively engaged in this work for a period of approximately 16 days, beginning from the time of departure from Unalaska on May 27. Much credit is due Capt. Bierd and the officers and crew for the splendid results achieved. In this connection it seems appropriate to quote from a letter of July 2, 1918, from the Association of Pacific Fisheries, through its secretary, in regard to services performed by the *Roosevelt:*

> We wish to express the appreciation of the association and its members, especially those engaged in Bering Sea operations, to you and through you to the officers and crew of the steamer *Roosevelt,* for the excellent service rendered by that vessel in extricating the large fleet of cannery vessels from the pronounced danger of the ice in the Bristol Bay district. Many of the packers concerned have doubtless expressed themselves on this subject, and it is our pleasure to convey to you the thanks of the association in its entirety.

Letters commendatory of the excellent work done by the *Roosevelt* in respect to the rescue of vessels in Bristol Bay were received from Messrs. H. F. Fortmann of the Alaska Packers Association, and F. Barker of the Columbia River Packers' Association.

On July 26 the *Roosevelt* sailed from Seattle, arriving at the islands in August. After discharging, a trip was made to Unalaska for coal for island use. On September 16 the vessel left the Pribilofs with 17,816 sealskins and about 55 tons of old bones on board, arriving at Seattle October 3. Some delay occurred at Unalaska on account of illness of the first and second officers.

The *Roosevelt* left Seattle October 15 and arrived at the Pribilofs November 3, after having called en route at Akutan and Unalaska. Severe weather was encountered around the islands, which so delayed the discharge of cargo that it became necessary for the vessel to proceed to Akutan the latter part of November for fuel oil. The ship arrived back at the Pribilofs December 2, and left there December 12 with 7,483 sealskins and minor items of cargo aboard. Seattle was reached January 3, 1919.

### POWER LIGHTER.

The sundry civil act approved July 1, 1918, contained an item of $20,000 for the purchase or construction of a power lighter for the Pribilof Islands. It had been pointed out to Congress that a vessel approximately 75 feet in length would be very valuable for purposes of communication between St. Paul and St. George Islands and for trips to Unalaska, 250 miles distant, the nearest port of call by regular commercial vessels. It was indicated also that such a tender or lighter would be of much use in assisting with the loading and discharging of freight at the islands, it being necessary for the supply ship to anchor some distance offshore. Still another use for such a vessel would be in guard duty, it being the intention to mount guns on the boat.

In due time plans were drawn by Lee and Brinton, naval architects at Seattle, for a sea-going vessel 70 feet in length, 17 feet in beam, and equipped with an 80-horsepower heavy-duty engine. Fuel tanks were provided for a cruising radius of more than 2,000 miles; the vessel's cargo capacity was to be about 30 tons. Adequate accommodations were to be provided for crew and passengers. Bids were opened at the Seattle office on December 3, 1918, but as the lowest was in the sum of $27,500 nothing could be done because of the inadequacy of the appropriation. After readvertisement bids were again opened at the Seattle office on January 8, 1919, but the lowest was $26,900. It is the purpose to secure, if possible, a supplemental appropriation by Congress in order that this vessel may be built or a suitable substitute purchased.

### INSTALLATION OF ELECTRIC LIGHTS.

Through cooperation with Gunner L. B. Dustin of the Naval Radio Station the Bureau was able to install a small electric-lighting plant in the village on St. Paul Island. Almost all of the equipment except the engine was borrowed from the radio station and was subject to return at any time. The miscellaneous supplies which were borrowed have been returned, but the Bureau is still using the generator and switchboard.

The engine and generator were placed on the concrete basement floor of the Government shop and belt was run to the floor above which operated band saw, lathe, and grindstone. Lights were installed in the shop, company house, dispensary, club house, and Government house. Outside wiring consisted chiefly of scraps picked up about the station. Properly insulated wires protected by moldings were placed inside. The distributing switches are protected with fuses and outlets to lines are made in an approved manner. The wiring was done by the electricians of the radio station.

The engine was equipped to burn kerosene and it was found that the quantity used was less than two-thirds that which had formerly been used in the same buildings in kerosene lamps. Owing to the economy thus secured and the superior surroundings which electric lights provide, plans are being made for the lighting of the villages on both islands by this means.

The Bureau is under great obligation to the personnel of the radio station in this matter.

### USE OF AUTO TRUCKS.

On the first trip of the *Roosevelt* in 1918 three 1-ton auto trucks were sent to the Pribilof Islands, one to St. George and two to St. Paul. These were Ford machines with Wright truck attachments, and they proved of very great value on both islands.

On St. George Island the truck was used in the early part of the season to construct roads about the village, and later when the sealing operations began, skins were hauled to the salt house and carcasses were hauled to the silo for preservation for winter fox food. After the sealing season was over the truck was of further use in moving building materials and other supplies about the village. Heretofore the only means of conveying freight on St. George was by man power, other than for the short tramroad extending from the landing part way up the village hill.

The St. Paul Island trucks were placed in immediate operation and were used in such work as had been done previously by mules. Sealskins were hauled from several killing grounds to the salt house, freight was distributed from the landings, and some work was done toward the building of roads to the more distant parts of the island. There was some difficulty experienced on this island in getting the machines through loose sand, which occurs especially on the way to Northeast Point. In fact, it was not possible to get within 4 miles of this large killing ground.

The feasibility of using power transportation equipment on the islands was thus fully demonstrated. The Bureau plans to provide additional trucks or tractors as soon as possible.

### BY-PRODUCTS PLANT.

During the season of 1918 a by-products plant was erected on St. Paul Island for the reduction of seal carcasses. A special allotment of $25,000 was secured in April from the National Security and Defense Fund for this plant, of which $24,125.07 had been expended at the end of the year for special machinery, supplies, equipment, and miscellaneous expenses. The building is 55 by 75 feet, of two-story frame construction, with concrete foundation. The chief items of equipment are as follows: One 300-ton hydraulic tankage press; 1 rotary vacuum fertilizer drier; 1 vacuum pump 6 by 8 by 12, with condenser; 2 grease tanks; 2 digesters, maximum capacity 4½ tons each; one 4,000-gallon fir tank; two 125-barrel closed-top oil tanks; 2 steel tanks, small; one 35-horsepower boiler; one 12-horsepower horizontal steam engine; one 15-horsepower horizontal gas engine; one 6-horsepower horizontal gas engine. The machinery has been so placed that 2 more digesters can be added without rearrangement.

The building was put up and machinery installed under the supervision of R. B. Bentley, a by-products expert engaged for the season. Although the plant was completed too late for much practical use before the seal migration was over, two experimental tests were made which gave interesting results. In the first test 71 carcasses were placed in the digester, some of which weighed as much as 180 pounds, and in the second test 73 carcasses were used, ranging in weight from 41 to 131 pounds. It was found that from 3 to 3½ hours was the

length of time necessary to cook the carcasses, depending on size, in order to soften the bones sufficiently for proper handling in the press. This was with a load of 6,000 pounds of raw material in the digester. Pressure of between 2,200 and 2,500 pounds is required to remove the oil from the material after it comes from the digester. In drying, a steam pressure of 45 pounds was carried on the drier, the time required being 2½ hours. It is reported that the meal is of very good quality and will not need grinding, as the largest piece of bone is not larger than a match head.

In these two tests with 144 carcasses, or 12,644 pounds of raw product, 2,738 pounds of seal meal and 70 gallons of oil were secured, an average of 19 pounds of meal and one-half gallon of oil per carcass. This, however, is not considered to be a fair test of the quantity of oil obtainable because quite an amount of oil in spaces in the machinery was not recovered, and moreover the seals were taken in the latter part of October just before the end of the migration, when they are poor and thin, with almost no blubber remaining on them. During the regular killing season prior to August 10 much more blubber will remain on the carcasses, and it is estimated that an average of 2 gallons of oil will be obtained from each carcass.

Arrangements are being made for tractors and trailers for use in the season of 1919 for transportation of carcasses principally from Northeast Point, where large killings are made.

### COLLECTIONS OF OLD SEAL AND SEA-LION BONES.

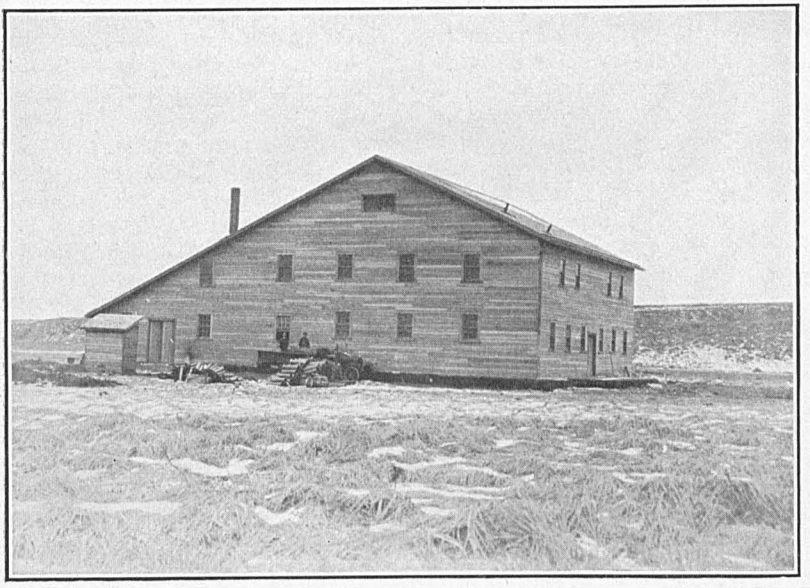
Three shipments of old seal and sea-lion bones from the Pribilof Islands were made in 1918, which were delivered at Seattle as follows: July 7, gross weight 86,010 pounds; October 3, gross weight 108,726 pounds, and January 3, gross weight, 30,631 pounds. These bones were delivered to Brady & Co., of Seattle, under contract to purchase at $29 per ton. The total net weight of the three shipments was 205,611 pounds, and the net proceeds after deducting expenses for weighing, resacking, etc., were $2,785.66, of which the natives earned $1,119.80 for collecting the bones. The balance was turned into the Treasury of the United States.

On account of the great expansion of activity in other lines of work on the islands, it has not been possible to devote much attention to the collecting of seal bones. It is planned that the bones now awaiting shipment will be sold on local proposals at Seattle or San Francisco, as means for their transportation become available.

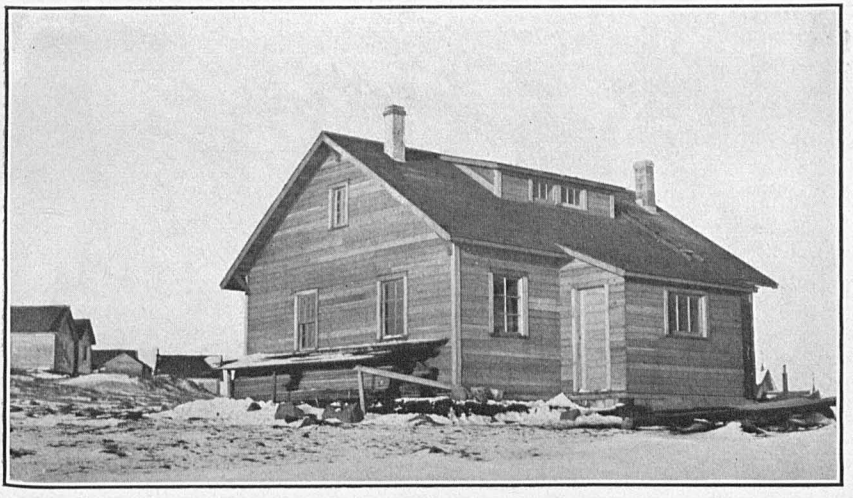
### NATIVES OF THE PRIBILOF ISLANDS.

#### HEALTH CONDITIONS.

In the main the health of the people on the Pribilof Islands, Alaska, during the calendar year 1918, has been good. Births have exceeded deaths, as shown by the census report, and no dangerous epidemic of infectious disease manifested itself. Through the greatest of good fortune Spanish influenza did not reach these isolated islands. Grave consequences were foreseen in case it should have broken out. Diphtheria occurred on board the Bureau's supply vessel *Roosevelt*, but fortunately before there had been any exposures of consequence, the use of antitoxin by the St. Paul physician was effective in preventing the introduction of this disease. The vessel was quarantined in Unalaska until it was safe to return to the islands.



BY-PRODUCTS PLANT, ST. PAUL ISLAND, 1918.



NEW TYPE OF NATIVE COTTAGE, PRIBILOF ISLANDS, 1918.

The labor connected with the taking of upward of 30,000 sealskins in the short period of about two months was very fatiguing to the natives, because it had been so long since they had been employed to such an extent before. Not since 1889 had as many been taken, which was of course before most workmen of the present generation were old enough to go on the killing fields. It is believed that in subsequent seasons this difficulty will not be encountered to such an appreciable extent.

Several major operations were successfully performed by the island physicians, most notable among which was that by Dr. W. Byrd Hunter on account of the unfortunate fall from a cliff on St. Paul Island of Dr. Harold Heath, of Stanford University, temporarily in the Bureau's service as naturalist. The trail over which he was walking near Tolstoi rookery caved away, and he fell upon jagged rocks about 45 feet below. Fractures of both legs and of a number of face bones resulted. Through prompt and efficient medical and hospital attention his life was saved, but he was incapacitated for many months.

The Bureau sent to St. Paul Island some lantern slides which were received from the Public Health Service. These were shown in connection with motion-picture exhibitions and were productive of considerable interest among both natives and employees.

As with the schools, progress toward an ideal situation in medical and sanitary matters is necessarily slow. Notable progress, however, is made each season, and when it is considered that 60 years ago the population was living in underground hovels, the results in the aggregate are highly satisfactory. Each year marks a step forward in the betterment of the natives from both medical and moral standpoints. One of the greatest results obtained has seemed to be the elimination of church practices which were conducive to the spread of tuberculosis and other communicable diseases. The natives in general are amenable to discipline and after a little cheerful persuasion are willing to abandon inherited and acquired customs which are believed to be injurious. Physicians have compared the island communities most favorably with such places as coal-mining camps. Some of the Bureau's officials who have had occasion to visit many parts of Alaska in the course of their duties have stated that the conditions on the Pribilofs are much better than among the other native communities.

In the fall of 1918 A. C. Reynolds, then assistant agent on St. Paul Island, was taken ill with what was diagnosed brain tumor. His condition became so serious that the physician asked for his immediate removal to the States. Through the cooperation of the Coast Guard the cutter *Bear* called at St. Paul Island and took Mr. Reynolds and his wife to Seattle. On November 9, a few days after arrival, he passed away. His loss is seriously felt by all concerned.

### SCHOOLS.

It is believed that the earnest efforts of the school-teachers on St. Paul and St. George Islands have been rewarded with encouraging progress. In any one year it would be impossible to effect a revolution in the entire social life of the natives, yet this would be necessary to produce the condition which is most desired. The making over of

people living in an aboriginal manner and without knowledge of American institutions into useful citizens of the country must necessarily be a slow process. Many persons whose acquaintance with them lasts but the brief period of one or two years are apt to become discouraged and give up hope of any material change for the better. When it is remembered, however, that all progress which has been made to the present time has occurred in comparatively few years, it must be admitted that the work of the teachers has been splendid.

There are many handicaps in their way, yet it appears that these are being overcome in the best possible manner. It is the purpose to create a community of English-speaking people with all the knowledge which is required of the best American citizen. The greatest obstacle to this is the fact that the people speak the Aleut language in their homes. Some of the older ones, who had little or no opportunity to attend the schools, have little knowledge of the English language. The children are in English-speaking surroundings (school room) a very short time, yet many of them are able to speak and write on any of the subjects which come within their purview; so it becomes clear that the English language can be established in the short period of about one generation in a locality where another language is used exclusively.

Another thing which hinders progress of the children in school is the lack of textbooks which would be most suited to their purposes, but this can not be overcome, because books which would be best adapted to the north are not in existence. The people of the Pribilof Islands have never seen most of the articles upon which the text of elementary class books is based. Hence a great deal of improvisation must be resorted to by the teacher.

C. E. Crompton, school-teacher on St. George Island during the winter of 1917–18, has analyzed the problem very carefully. The following quotations from his report will throw further light thereon:

> The children were obedient, as polite and well mannered as they knew, and the schoolroom in general always presented a neat and well-ordered appearance. Uncleanliness was exceptional, and no criticism was made except in the case of two families, who were already noted for being the most backward in the community.
>
> The greater number of the children take school and its work quite seriously, and although this tendency was not deterred, an effort was made to encourage them in play. This they do not know how to do, and when opportunity was offered they were shown simple little games, how to make toys of paper and wood, and various other ways of amusing themselves. This, of course, was outside of school hours.
>
> The pupils are tractable, good natured, supersensitive, and responsive to good treatment, and it is felt that they try to do right most of the time. This is true of the normal adult Aleut as well.
>
> The methods of instruction in general were the same as those in force during the preceding term, and they were found quite satisfactory. It is believed that the system of teaching which is now in vogue in the island schools is admirably suited to the needs and capabilities of the children, and will produce excellent results if continued through a period of years. Written work was required in all classes; such work had to be reasonably neat and no copying was permitted. The papers were in most cases made out with pencil, corrected by the teacher or by the pupils in class, and returned to the owners that they might know their mistakes.
>
> No strict rules are adhered to in the advancement of the pupils. They go forward as individuals whenever their work warrants the step; never before. With this plan in operation, no bright pupil is held back because of dull ones in his class.
>
> One of the greatest drawbacks to the school work was the haste with which classes had to be handled in order to hear them all within the school day. This condition must invariably result when children of all ages resort to the same schoolroom.

At all times it was the aim to keep alive interest in the school, its work, and the advantages to be gained from earnest application to what it had to offer. With this in mind, steady routine work was avoided as much as was consistent with the desired rate of progress. Singing, spelling matches, addition and multiplication drills and talks by the teacher on subjects which could be understood, did much toward this end. This occasional stimulation of interest is believed to be very important inasmuch as it seems a trait of the Aleut to demand periodical excitement and variation as the price of his undivided attention.

As has often been said, the seeming apathy with which the Aleut people regard the study of our language constitutes the greatest difficulty in the accomplishment of other work in the schools. This is indeed true, and while the belief is entertained that considerable progress has been made during the past term, the day when it will cease to be the prime factor in the school work is not yet in sight.

As in several previous terms the exclusive use of English in the schoolroom was insisted upon. It was voluntarily used to a certain degree in the outdoor play about the school building. In order to encourage expression the pupils were not prohibited from conversing freely in an undertone as long as this did not disturb the hearing of classes and general order of the room. It was felt that this laxity of strict class-room discipline was in good cause as the free exchange of thought, in English, is one of the most desirable ends we have in view for the present.

The story books received last November from the Bureau through its librarian were placed in a neat bookcase and given a permanent place in the schoolroom. The children were allowed to take these in systematic order one at a time, and they proved of very great assistance in the work. Many of the adults availed themselves of this opportunity to obtain reading matter and some became regular applicants. It is hoped that more books of a similar character to these may be furnished from time to time to the end that this little library may eventually become a dependable source of entertainment for the children. The books already sent were exceptionally appropriate for the existing needs. The value of children's periodicals such as the Youth's Companion, the American Boy, St. Nicholas, and others, is inestimable in this connection.

As in other subjects, the difficulty incident to the study of arithmetic texts was entirely due to an incomplete understanding on the part of the pupils of the English statements contained in them. It is felt that of all studies arithmetic is the most difficult to present in an orderly manner to the Aleuts. However, regular classes were held, embracing subjects from simple addition to computing area and volume.

Daily practice in writing was continued throughout the term and steady improvement was noticeable in many cases. Toward the close of the term all were asked to write a letter to some one whom they knew on St. Paul Island. This idea was taken up with apparent pleasure, and the correspondence was mailed in the regular manner. Many of them wrote very intelligible letters about school, community, and family affairs, and it is planned to encourage further letter writing between people of the islands in order that they may more often be called upon to express their thoughts in our language.

Spelling is the one subject in which the Aleuts do not meet with the usual difficulties. They can commit the words by simple observation of their structure without making any effort to understand their meaning. In this last connection, however, they were given the definition of each word as they wrote it out, and a test late in the term showed that they had grasped the meaning of a great number of words.

The institution of a course in manual training, it is believed, would prove very beneficial. With the number of pupils at present under one teacher, however, it would be an impracticable step. Other important studies would have to be abandoned.

Instruction in cobbling was given to the older boys, and the resulting work was entirely worthy of the effort made. It is felt that this is a good measure of thrift, and that similar instruction should be continued during each school year, even at the sacrifice of some textbook studies.

It is appropriate here to comment on the work of the junior school which was conducted by Mrs. Proctor. The value of this little preparatory course is inestimable. The pupils coming from there to the senior school have already obtained a knowledge of conversational English, of what the school is and its purpose, and also an understanding of schoolroom decorum, which is sometimes hard to impress upon very young children. If the senior school-teacher were to devote the time and attention necessary to starting in of the newcomers, it would very seriously handicap the work of the older children.

The number of pupils enrolled in the school was 15 boys and 18 girls, a total of 33. The average daily attendance was 27.25 and the percentage of punctuality 99.56.

On St. Paul Island the regular plan of procedure has been followed by the teachers. In addition to the usual work, the girls have had either sewing or knitting lessons once each week. In sewing it was aimed to teach the most common stitches and to sew on buttons and make button holes. Mittens and socks were made in the knitting classes.

In order to promote their knowledge of English, the children were required in a great many cases to write out the weekly requests for supplies from the store for their families. The adding up of all these proved to be valuable training in arithmetic.

It is reported that the books which were sent to the school library were much appreciated by both teachers and pupils. These volumes have greatly increased the interest in the school work and have led to some reading in the homes by both children and parents.

ATTENDANCE AT SALEM INDIAN TRAINING SCHOOL, CHEMAWA, OREG.

Encouragement has been given to the natives of the Pribilof Islands to attend the Salem Indian Training School at Chemawa, Oreg. It is believed that in addition to the educational advantages thus available, the opportunity to come in contact with the outside world tends to broaden their views and to be beneficial in many ways. Several have thus embraced this opportunity to receive an education. From March 31, 1917, the date of the last census, to the end of 1918, two had completed the course and returned to the islands. These were John Hanson of St. Paul Island, and Constantine Lestenkof of St. George Island, both young men who are now among the most useful to the Bureau and the communities. Some Pribilof natives, after completing the course of study, have chosen to remain in the States.

During the above-mentioned period one native other than those named returned to the islands and five departed for the school. One returned to the islands for a visit at the close of his first term of three years, but again enrolled for a second term. The authorities at the school have spoken in the highest terms regarding the intelligence and behavior of the Pribilof natives.

Unfortunately two boys died at the school in 1918. Terrenty Merculieff, age 14, died June 18, of pneumonia. His mother, Agafia Merculieff, three brothers and one sister reside at St. Paul Island. He entered school during the summer of 1917. His estate consisting of $36.44 on December 31, 1918, in the custody of the Commissioner of Fisheries as trustee, will be disposed of properly in due time.

Alexey Emanoff, age 18, died October 14 of pulmonary tuberculosis. He is survived by a stepmother and four stepbrothers on St. Paul Island, but he had been cared for by Ekaterina Krukoff, to whom his estate of $270.41, in the custody of the Commissioner of Fisheries as trustee, will pass. He entered school at Chemawa in the fall of 1915, but was kept at a sanitarium at Lapwai, Idaho, the greater part of the time.

The following table gives the status of Pribilof natives at Chemawa, as of December 31, 1918:

NATIVE SCHOOL CHILDREN, ST. GEORGE ISLAND, ALASKA.

PRIBILOF ISLANDS NATIVES IN ATTENDANCE AT SALEM INDIAN TRAINING SCHOOL, DEC. 31, 1918.

| Name. | Island residence. | Year of enrollment. |
|---|---|---|
| Emanoff, Ioniky | St. Paul | 1916 |
| Fratis, Agrifina | do | 1915 |
| Fratis, Akalina [a] | do | 1915 |
| Fratis, Martha | do | 1915 |
| Fratis, Ouliana | do | 1915 |
| Kochergin, Peter T | do | 1916 |
| Lekanof, George | St. George | 1914 |
| Melovidov, Alfey | St. Paul | 1917 |
| Shabalin, Daniel | do | 1917 |
| Stepetin, Nicolai | do | 1917 |
| Stepetin, Vasilii | do | 1917 |

[a] Mother of Agrifina, Martha, and Ouliana Fratis, but not actually in attendance at the school.

MOTION PICTURES.

In the fall of 1916 the personnel of the Naval Radio Station on St. Paul Island purchased a motion-picture projector. The Bureau secured 100,000 feet of films, chiefly of an educational and news-pictorial character, although a few reels were comedies and dramas. Through informal arrangements the employees of the radio station furnished the current and operated the machine. This was installed in the building known as the native shop, and exhibitions were given at regular intervals throughout the fall and winter. It is the expressed opinion of every one concerned that this was probably the best investment which had ever been made from an educational standpoint for the natives.

Under similar arrangement films were secured in the fall of 1917 and exhibitions were given through the following winter months with the same gratifying results. In the spring of 1918, the natives of St. Paul Island subscribed funds for the purchase of the machine from the radio station employees. Films were provided by the Bureau the following fall in the same manner as before.

The natives of St. George Island organized in the spring of 1918 and subscribed funds for the purchase of a motion-picture projector. This was sent from Seattle in the summer and put in operation in the fall with films supplied in the same manner as for St. Paul Island.

SAVINGS ACCOUNTS.

As in previous years, a number of the natives of the Pribilof Islands have personal funds which are in the custody of the United States Commissioner of Fisheries as trustee. These funds are still on deposit with the Washington Loan & Trust Co., Washington, D. C., and draw interest of 3 per cent per annum, calculated on monthly balances. During the year 1918 one native, Elisaveta Rukovishnikoff, withdrew all funds which were to her credit and the account has therefore been closed.

On January 1, 1918, the balance was $4,454.98. Interest credited July 1, 1918, amounted to $60.12, and on December 31, 1918, $50.70, making a total of $110.82 for the entire year. No funds were deposited during the year, and withdrawals amounted to $1,391.15, leaving a balance on December 31, 1918, of $3,174.65, in accordance with the itemized statement which follows.

PRIBILOF ISLANDS NATIVES' SAVINGS ACCOUNTS IN THE CUSTODY OF THE UNITED STATES COMMISSIONER OF FISHERIES, AS TRUSTEE, DEC. 31, 1918.

| Funds of— | Amount. | Funds of— | Amount. |
|---|---|---|---|
| St. Paul Island: | | St. Paul Island—Continued. | |
| Bourdukofsky, Apollon | $95.07 | Merculieff, Paul A | $14.27 |
| Bourdukofsky, Peter | 57.19 | Merculieff, Terenty [a] | 36.44 |
| Diakanof, Auxenia (Mrs. C. H. Hope) | 24.25 | Oustigoff, Peter | 23.03 |
| Emanoff, Alexey [a] | 278.51 | Pankoff, Agrippina | 222.05 |
| Fratis, Agrifina [b] | 87.53 | Pankoff, Maria M | 40.64 |
| Fratis, Akalina [b] | 516.03 | Sedick, Marina | .38 |
| Fratis, Martha [b] | 87.53 | Tetoff, Vikenty M | 40.63 |
| Fratis, Ouliana [b] | 87.53 | St. George Island: | |
| Gromoff, Iuliania | 401.21 | Galanin, Mary | 272.22 |
| Hanson, John | 18.20 | Lestenkof, Michael | 111.27 |
| Kozloff, Parascovia | 82.91 | Merculief, Agrifina | 116.58 |
| Krukoff, Iuleta | 42.63 | Merculief, Joseph | 22.88 |
| Mandregan, Alexandra M | 9.64 | Merculief, Polyxenia | 11.57 |
| Melovidov, Alfey | 40.64 | Philomonof, Mary [a] | 111.76 |
| Melovidov, Anton | 3.50 | Philomonof, Zoya [c] | 110.57 |
| Melovidov, Iosef | 40.64 | Shane, Michael | 27.95 |
| Merculieff, Dosofey | 36.44 | Zacharof, Emanuel | 30.08 |
| Merculieff, Makary | 36.44 | | |
| Merculieff, Mariamna | 36.44 | Total | 3,174.65 |

[a] Deceased, estate undivided.
[b] Not living on islands in 1918.
[c] Married to Michael Borenien in July, 1918. Left St. Paul Island in December, 1918.

LIBERTY BONDS.

The natives of the Pribilof Islands subscribed to Liberty bonds of the third issue in the amount of $2,350. Of this sum, St. George Island natives purchased $1,200 worth with money earned by taking fox skins, and $300 worth from funds on deposit with the Washington Loan & Trust Co. St. Paul Island natives purchased $850 worth from funds on deposit at the same bank. These bonds, 47 in all, were of $50 denomination. Since purchase, three have been disposed of by the natives at par value, and the remaining 44 are being held in a safe-deposit box at the Washington Loan & Trust Co.

The natives of St. George Island subscribed to Liberty bonds of the fourth issue in the amount of $2,150; the bonds numbering 43 in all are of $50 denomination. Of this amount, $150 contributed by the natives of St. George Island was invested in three bonds as the beginning of a fund to be used for the building of a new parsonage. These three bonds are being held in the name of the "St. George Island Church Building Fund." They are also in a safe-deposit box at the Washington Loan & Trust Co. These 43 bonds were purchased with funds earned by the St. George natives for the taking of sealskins.

The St. Paul Island natives subscribed to Liberty bonds of the fourth issue in the amount of $4,700. These bonds, 94 in number, are of $50 denomination. They were purchased direct from the Treasury Department by the Commissioner of Fisheries with funds earned by the natives for the taking of sealskins and were forwarded to the island April 10, 1919. There were also purchased from the Treasury Department nine $50 bonds of this issue for the Chinese cook on St. Paul Island. These bonds were forwarded to Assistant Agent Christoffers at the Seattle office, to be held by him pending instructions from the owner regarding their disposition.

On April 10, 1919, there were forwarded to the natives of St. George Island all interest coupons due through April 15, 1919, on the bonds of the fourth issue and also all interest coupons due through March 15, 1919, on the bonds of the third issue. There were sent to the St. Paul Island natives coupons due on the bonds of the third issue through March 15, 1919. The total of all coupons forwarded amounted to $122.63.

DIVISION OF SEALING FUND IN 1918.

Pursuant to the terms of the contract with the Department of Commerce, Messrs. Funsten Bros. & Co., of St. Louis, advanced funds for the reimbursement of natives at the Pribilof Islands for taking fur-seal skins. In 1918 the sums of $17,376.35 and $3,600 were deposited with the Dexter Horton National Bank at Seattle to the credit of H. C. Fassett and A. H. Proctor, respectively.

*St. Paul Island.*—The natives were classified according to their value and ability. On St. Paul Island the sealers were divided into four classes, as follows:

DIVISION OF SEALING FUND, ST. PAUL ISLAND, 1918.

| | Number of men. | Share of each. |
|---|---|---|
| First class | 21 | $391.50 |
| Second class | 9 | 293.50 |
| Third class | 9 | 195.50 |
| Fourth class | 5 | 98.00 |
| Total | 44 | ..... |

In addition there were 10 others, 8 boys and 2 laundresses, who received small amounts on St. Paul Island. The total take of skins was 26,881, but a deduction of 377 was made for faulty workmanship, leaving 26,504 skins at 50 cents per skin, or a total of $13,252, which was disbursed on 54 vouchers for the services of an equal number of St. Paul natives in obtaining and preparing for shipment the sealskins taken from the beginning of the calendar year through August 10, 1918.

In addition, pay rolls for the services of 11 Unalaska natives from June 1 through November 19, 1918, in the sum of $4,024.35 were paid. Also the sum of $100 was disbursed as a special emolument to two native foremen.

The following is a statement of these disbursements for St. Paul Island:

| | |
|---|---|
| Payments to 54 natives | $13,252.00 |
| Payments to 2 foremen | 100.00 |
| Payments to 11 Unalaska laborers | 4,024.35 |
| Total | 17,376.35 |

The above payments aggregate the total sum deposited to Mr. Fassett's credit.

*St. George Island.*—The take of sealskins on St. George Island in the calendar year 1918 through August 10 was 7,000. In arriving at the method of dividing the earnings of the natives, Mr. Proctor rated the sealers as follows:

DIVISION OF SEALING FUND, ST. GEORGE ISLAND, 1918.

| | Number of men. | Share of each. |
|---|---|---|
| First class | 13 | $147.50 |
| Second class | 7 | 118.00 |
| Third class | 3 | 95.50 |
| Fourth class | 3 | 81.00 |
| Fifth class | 3 | 66.00 |
| Total | 29 | |

No deductions were made for faulty skinning, but four men were demoted to a lower class because of improper work. Two foremen were paid a total of $100 and three boys were allowed $10 each. The payments made to 32 St. George natives aggregated $3,600, the total sum placed to Mr. Proctor's credit.

CENSUS.

It is the policy of the Bureau to take an annual census of the native inhabitants of the Pribilof Islands and publish the full records from time to time. The census in 1918, a recapitulation of which is given below, was taken as of March 31.

RECAPITULATION OF CENSUS OF NATIVES.

| | | |
|---|---|---|
| St. Paul Island: | | |
| Resident population Mar. 31, 1917 | | 193 |
| Births during year ending Mar. 31, 1918 | | 12 |
| | | 205 |
| Arrivals during year (from St. George Island) | | 3 |
| Arrivals during year (from Unalaska) | | 1 |
| | | 209 |
| Deaths during year | | 3 |
| | | 206 |
| Departures during year (to St. George Island) | | 2 |
| | | 204 |
| Departures during year (to Chemawa, Oreg.) | | 5 |
| Total native resident population Mar. 31, 1918 | | 199 |
| Natives at Salem Indian Training School at Chemawa, Oreg | | 12 |
| Total natives accredited | | 211 |
| St. George Island: | | |
| Resident population Mar. 31, 1917 | | 123 |
| Births during year ending Mar. 31, 1918 | | 6 |
| | | 129 |
| Arrivals during year (from St. Paul Island) | | 2 |
| | | 131 |
| Arrivals during year (from Chemawa, Oreg.) | | 1 |
| | | 132 |

| | |
|---|---|
| St. George Island—Continued. | |
| Deaths during year | 6 |
| | 126 |
| Departures during year (to St. Paul Island) | 3 |
| Total native resident population Mar. 31, 1918 | 123 |
| Native at Salem Indian Training School at Chemawa, Oreg | 1 |
| Total natives accredited | 124 |

It will be noted that the total native population on both islands on March 31, 1918, was 322 and the total accredited to the islands was 335.

## FUR-SEAL HERD.

### QUOTAS FOR KILLING.

The killing of seals for commercial purposes could have begun legally on August 25, 1917, upon the expiration of the closed season, but it is not practicable to take skins at that time of year. Later, after October 20, when the stagy period is over, a large number could not be secured because the annual southward migration was then well advanced. Therefore commercial operations opened in reality in 1918.

The establishment of the number and age of animals to be killed is placed by law in the hands of the Secretary of Commerce. Thus on April 11, 1918, the following telegraphic instructions were issued to the island agents:

> Secretary directs killing present year twenty-five thousand male seals three years old and upwards. Twenty thousand St. Paul and five thousand St. George. Make every practicable effort complete commercial killing by August tenth. Kill as many large seals as practicable, keeping in mind number which census report shows should be reserved each age class. Law requires reservation five thousand selected three-year-olds, which reservation should be made in ratio five St. Paul and one St. George. If conditions warrant, Department will instruct kill ten thousand additional seals. Therefore, keep Bureau fully informed regarding conditions bearing on availability seals and ability islands take increased number skins.

Upon the receipt subsequently of favorable reports from the islands, on July 18 the quota was definitely fixed at 28,000 for St. Paul Island and 7,000 for St. George Island. The St. George quota was secured by August 10, and on October 14, it was increased to 7,700 in order to provide food for the natives. It is not expected that the ratio of one on St. George to four on St. Paul can be maintained indefinitely because the history of the herd and census reports show that this is not the actual proportion of the animals resorting to each island.

### KILLINGS OF SEALS.

*St. Paul Island.*—During the calendar year 1918, there were killed on St. Paul Island 27,503 seals. These were handled in 76 separate drives beginning on January 14 and ending on December 12.

*St. George Island.*—During the corresponding period 7,387 seals were killed on St. George Island. These were handled in 43 drives, beginning on June 3 and ending on November 19.

Thus there were killed on the Pribilof Islands a total of 34,890 seals, the largest number secured in any one year since 1889. The details of the killings are shown in the following tables:

RECORD OF SEAL KILLINGS ON ST. PAUL ISLAND IN 1918.

| Date. | Serial number. | Hauling ground. | Skins secured. |
|---|---|---|---|
| Jan. 14 | 1 | Sivutch (Sea Lion Rock) | 27 |
| Mar. 7 | 2 | do | 139 |
| May 6 | 3 | do | 164 |
| 25 | 4 | Northeast Point | 358 |
| June 1 | 5 | Tolstoi | 91 |
| 4 | 6 | Zapadni | 320 |
| 6 | 7 | Northeast Point | 163 |
| 7 | 8 | do | 533 |
| 8 | 9 | Polovina | 243 |
| 10 | 10 | Reef | 670 |
| 12 | 11 | do | 289 |
| 14 | 12 | Zapadni | 545 |
| 15 | 13 | Tolstoi | 424 |
| 15 | 14 | Northeast Point | 139 |
| 21 | 15 | Reef | 267 |
| 22 | 16 | do | 1,039 |
| 24 | 17 | Northeast Point | 1,062 |
| 25 | 18 | Polovina | 513 |
| 26 | 19 | Zapadni | 796 |
| 27 | 20 | Gorbatch | 331 |
| 28 | 21 | Tolstoi | 465 |
| 29 | 22 | Reef | 1,276 |
| July 1 | 23 | Northeast Point | 1,037 |
| 2 | 24 | Polovina | 350 |
| 3 | 25 | Zapadni | 292 |
| 4 | 26 | Gorbatch | 349 |
| 5 | 27 | Tolstoi | 285 |
| 6 | 28 | Reef | 974 |
| 8 | 29 | Zapadni | 781 |
| 9 | 30 | Tolstoi, Lukanin, and Kitovi | 362 |
| 10 | 31 | Reef | 545 |
| 11 | 32 | Gorbatch | 746 |
| 13 | 33 | Northeast Point | 1,052 |
| 15 | 34 | Zapadni | 648 |
| 16 | 35 | Reef | 653 |
| 17 | 36 | Tolstoi | 351 |
| 17 | 37 | Lukanin and Kitovi | 83 |
| 18 | 38 | Polovina | 255 |
| 18 | 39 | Tolstoi | 157 |
| 19 | 40 | Zapadni | 566 |
| 20 | 41 | Reef | 409 |
| 23 | 42 | do | 482 |
| 24 | 43 | Tolstoi | 204 |
| 24 | 44 | Lukanin and Kitovi | 138 |
| 25 | 45 | Northeast Point | 1,047 |
| 26 | 46 | Polovina | 253 |
| 27 | 47 | Reef | 706 |
| 29 | 48 | Zapadni | 371 |
| 30 | 49 | Tolstoi | 222 |
| 30 | 50 | Lukanin and Kitovi | 151 |
| 31 | 51 | Reef | 566 |
| Aug. 1 | 52 | Zapadni | 368 |
| 2 | 53 | Polovina | 183 |
| 3 | 54 | Northeast Point | 1,112 |
| 5 | 55 | Tolstoi | 213 |
| 5 | 56 | Lukanin and Kitovi | 100 |
| 6 | 57 | Reef | 644 |
| 8 | 58 | Little Zapadni | 94 |
| 8 | 59 | Zapadni | 198 |
| 10 | 60 | Reef | 80 |
| 26 | 61 | Gorbatch | 20 |
| Sept. 14 | 62 | do | 21 |
| Oct. 1 | 63 | do | 18 |
| 12 | 64 | Reef | 17 |
| 16 | 65 | do | 24 |
| 23 | 66 | Tolstoi | 123 |
| 28 | 67 | Reef | 74 |
| 30 | 68 | do | 36 |
| 30 | 69 | Tolstoi | 11 |
| Nov. 2 | 70 | Reef | 13 |
| 5 | 71 | do | 24 |
| 9 | 72 | Northeast Point | 63 |
| 11 | 73 | Reef | 41 |
| 23 | 74 | do | 73 |
| 29 | 75 | do | 57 |
| Dec. 5 | 76 | Northeast Point | 7 |
| | | Total | 27,503 |

RECORD OF SEAL KILLINGS ON ST. GEORGE ISLAND IN 1918.

| Date. | Serial number. | Hauling ground. | Skins secured. |
|---|---|---|---|
| June 3 | 1 | North | 43 |
| 5 | 2 | East | 163 |
| 9 | 3 | Staraya Artil | 91 |
| 10 | 4 | North | 62 |
| 11 | 5 | East | 77 |
| 14 | 6 | Zapadni | 36 |
| 15 | 7 | Staraya Artil | 95 |
| 15 | 8 | North | 183 |
| 17 | 9 | East | 244 |
| 19 | 10 | Zapadni | 50 |
| 20 | 11 | Staraya Artil | 131 |
| 21 | 12 | North | 125 |
| 23 | 13 | East | 346 |
| 25 | 14 | Staraya Artil | 192 |
| 26 | 15 | North | 268 |
| 27 | 16 | East | 300 |
| 30 | 17 | Staraya Artil | 178 |
| July 1 | 18 | North | 191 |
| 3 | 19 | East | 611 |
| 5 | 20 | Staraya Artil | 100 |
| 5 | 21 | North | 220 |
| 8 | 22 | East | 416 |
| 9 | 23 | Staraya Artil | 161 |
| 10 | 24 | North | 348 |
| 18 | 25 | do | 207 |
| 20 | 26 | East | 287 |
| 22 | 27 | Staraya Artil | 212 |
| 23 | 28 | East | 174 |
| 25 | 29 | Zapadni | 151 |
| 26 | 30 | Staraya Artil | 144 |
| 28 | 31 | North | 158 |
| 29 | 32 | East | 385 |
| 31 | 33 | North | 206 |
| 31 | 34 | Staraya Artil | 156 |
| Aug. 5 | 35 | East | 206 |
| 9 | 36 | North | 83 |
| Oct. 21 | 37 | do | 48 |
| 25 | 38 | East | 66 |
| Nov. 1 | 39 | North | 72 |
| 2 | 40 | Zapadni | 16 |
| 5 | 41 | East | 74 |
| 14 | 42 | North | 49 |
| 19 | 43 | Staraya Artil | 62 |
| | | Total | 7,387 |

FUR SEALS ON SHORE AND IN SURF.

BRANDED SEALS AND AGE STANDARDS.

In 1912, through the initiative of George A. Clark, 5,228 fur-seal pups were branded with an inverted T on the top of the head. Of these, 1,944 were males, 1,796 were females, and the sex was not recorded for 1,488. It may be supposed that half, or 744, of the latter were males, because the births of the sexes are generally believed to be equal. This would make the total number of males branded in that year 2,688. These animals have been reappearing upon the hauling grounds every year and much valuable information has been secured from them on the growth of fur seals. Some have been killed each year and the records secured have been published in this and corresponding reports for previous years. On the islands it has been the practice to record the length of the body, the gross weight after sticking, and the weight of the skin before salting. Each skin has been tagged, and after arrival at St. Louis the trade classification has been ascertained by experts in this work.

In 1918 these seals were 6 years old. On St. Paul 23 were killed and on St. George 14, a total of 37. All were secured before the close of the sealing season on August 10, none being taken during the fall season. The records of these 37 branded seals are shown in the following table:

RECORDS OF BRANDED 6-YEAR-OLD MALE FUR SEALS KILLED ON THE PRIBILOF ISLANDS DURING THE CALENDAR YEAR 1918.

| Serial No. of skins. | Date of killing. | Island. | Carcass weight.[a] | Carcass length. | Green-skin weight. | | Trade classification.[b] |
|---|---|---|---|---|---|---|---|
| | | | *Pounds.* | *Inches.* | *Pounds.* | *Ounces.* | |
| AP 6456 | Mar. 7, 1918 | St. Paul | 115 | 54.75 | 16 | 4 | Extra extra large. |
| AP 6457 | May 6, 1918 | do | 175 | 63.00 | 20 | 12 | Wig. |
| AP 6458 | June 1, 1918 | do | 172 | 61.75 | 20 | 6 | Extra extra large. |
| AP 6459 | June 10, 1918 | do | 155 | 58.50 | 16 | | Do. |
| AP 6460 | do | do | 158 | 61.50 | 18 | 8 | Do. |
| AP 6461 | do | do | 144 | 57.00 | 16 | | Do. |
| AP 6462 | June 12, 1918 | do | 170.50 | 60.25 | 17 | | Do. |
| AP 6463 | June 21, 1918 | do | 254 | 66.50 | 35 | | Wig. |
| AP 6464 | do | do | 157 | 58.00 | 20 | | Extra extra large. |
| AP 6465 | do | do | 149 | 59.75 | 22 | | Do. |
| AP 6466 | do | do | 141 | 57.00 | 20 | | Do. |
| AP 6467 | June 22, 1918 | do | 170 | 63.25 | 23 | | Wig. |
| AP 6468 | do | do | 198 | 64.00 | 28 | | Do. |
| AP 6469 | do | do | 175 | 62.00 | 21 | | Do. |
| AP 6470 | do | do | 197 | 63.50 | 27 | | Do. |
| AP 6471 | June 27, 1918 | do | 185 | 61.00 | 21 | | |
| AP 6474 | June 29, 1918 | do | 174 | 63.50 | 24 | 8 | Wig. |
| AP 6475 | do | do | 154 | 58.00 | 21 | 8 | Extra extra large. |
| AP 6476 | do | do | 112 | 56.25 | 15 | | Do. |
| AP 6477 | do | do | 166 | 60.00 | 22 | | Do. |
| AP 6478 | do | do | 132 | 58.75 | 17 | | Do. |
| AP 6479 | do | do | 198 | 65.00 | 27 | | Wig. |
| AP 6480 | do | do | 138 | 59.50 | 19 | | Do. |
| G 5999 | June 10, 1918 | St. George | | | 37 | | Wig. |
| G 6000 | June 12, 1918 | do | 151 | 59.00 | 20 | | Do. |
| G 6001 | June 15, 1918 | do | 158.75 | 58.75 | 34 | 12 | Do. |
| G 6002 | do | do | 182.25 | 60.75 | 28 | | Do. |
| G 6003 | June 17, 1918 | do | 171.25 | 62.00 | 23 | | Do. |
| G 6004 | June 21, 1918 | do | 126 | 57.50 | 18 | | Do. |
| G 6005 | June 26, 1918 | do | 318 | 64.50 | 27 | | Do. |
| G 6006 | do | do | 235 | 60.00 | 25 | 8 | Do. |
| G 6007 | July 1, 1918 | do | 264.50 | 63.25 | 25 | | Do. |
| G 6008 | do | do | 177 | 60.50 | 23 | | Do. |
| G 6009 | do | do | 155 | 58.00 | 20 | 8 | Extra extra large. |
| G 6010 | July 5, 1918 | do | 275 | 69.75 | 45 | | Wig. |
| G 6011 | do | do | 200 | 61.75 | 26 | 8 | Do. |
| G 6012 | July 31, 1918 | do | 117 | 57.00 | 14 | 8 | Extra extra large. |

[a] Seals were bled before being weighed.
[b] For new trade classification names, see table, p. 98.

The records of these branded seals are of very great importance, because they show the range of variation in the size of each age class. There has not been found any single external characteristic which can be relied upon absolutely for the differentiation of one age from that above or below it. The weighing of the skin is very unreliable as an indication of age, as the weight varies according to the condition of each animal and the manner in which the skin is removed from the carcass. The weight of animals in any class is likewise subject to great variation, depending entirely upon their physical condition when killed. The length of the body from the tip of the nose to the base of the tail also varies; there is an overlapping in this respect of any three consecutive age classes. A sufficient number of the branded animals of each age up to 6 years have been killed, however, to show the extremes of length of the majority of each class.

It is reasonable to assume that the remainder of the herd is subject to the same variations as the branded animals, so that when these points separating the several ages are found for the latter they can be used as standards for the classification of all animals which may be killed.

Owing to the fact that the seals obtain a considerable part of their growth during the summer season, the lengths in summer are not applicable to animals which may be killed in the fall; the number of branded animals, however, which have been killed in the fall is not sufficient to make the results of computations based on them entirely satisfactory. Such information as there is leads to the belief that the addition of 2 inches to the maximum and minimum lengths as found for summer seals is sufficiently accurate for the segregation of those taken in the fall. The fall killings are small anyway, being made largely in order to provide food for the natives for winter, and are insignificant in comparison with the total number killed.

The following table shows the measurements which will be used in making the age classification of all seals killed in 1919:

AGE STANDARDS OF BODY LENGTHS OF FUR SEALS.

| Age. | Lengths of summer seals. | Lengths of fall seals. |
|---|---|---|
| | *Inches.* | *Inches.* |
| Yearlings | Up to 36.75 | Up to 38.75 |
| 2-year-olds | 37 to 40.75 | 39 to 42.75 |
| 3-year-olds | 41 to 45.75 | 43 to 47.75 |
| 4-year-olds | 46 to 51.75 | 48 to 53.75 |
| 5-year-olds | 52 to 57.75 | 54 to 59.75 |
| 6-year-olds | 58 to 63.75 | 60 to 65.75 |

AGE CLASSIFICATION OF SEALS KILLED.

Whenever seals are killed on the Pribilof Islands the lengths are taken by means of a pair of beam calipers. These records enable the age classification by comparison with the standards derived from the measurements of branded animals of known age. This work is highly important because it enables for the first time the securing of definite information regarding the number of animals in a particular age class, and any required reserves can thus be determined with accuracy.

In order to complete the record of seals killed on the Pribilof Islands in the calendar year 1917, the following table is presented to supplement the information contained in the table on page 118 of the report of Alaska Fisheries and Fur Industries in 1917, which contained information only as to the ages of seals taken in the summer sealing season of 1917:

AGES OF SEALS KILLED ON THE PRIBILOF ISLANDS FROM AUG. 10 TO DEC. 31, 1917.[a]

| Age. | St. Paul. | St. George. | Total. |
|---|---|---|---|
| Yearlings | 1 | ..... | 1 |
| 2-year-olds | 161 | 18 | 179 |
| 3-year-olds | 712 | 495 | 1,207 |
| 4-year-olds | 261 | 135 | 396 |
| 5-year-olds | 30 | ..... | 30 |
| Unmeasured | 1 | ..... | 1 |
| Total | 1,166 | 648 | 1,814 |

[a] The few cows which were killed accidentally are classified in the tables along with the males in order to make the record complete. The final result arrived at is not appreciably affected thereby.

The ages of all seals killed in the calendar year 1918 have been computed as follows:

AGES OF SEALS KILLED ON THE PRIBILOF ISLANDS IN THE CALENDAR YEAR 1918.[a]

| Age. | Summer, 1918. | | | Fall, 1918. | | | Grand total. |
|---|---|---|---|---|---|---|---|
| | St. Paul. | St. George. | Total. | St. Paul. | St. George. | Total. | |
| Yearlings | 12 | 1 | 13 | 2 | ..... | 2 | 15 |
| 2-year-olds | 198 | 53 | 251 | 13 | 1 | 14 | 265 |
| 3-year-olds | 12,706 | 3,748 | 16,454 | 239 | 313 | 552 | 17,006 |
| 4-year-olds | 9,468 | 1,718 | 11,186 | 199 | 30 | 229 | 11,415 |
| 5-year-olds | 3,528 | 766 | 4,294 | 123 | 25 | 148 | 4,442 |
| 6-year-olds | 702 | 326 | 1,028 | 38 | 15 | 53 | 1,081 |
| 7-year-olds | 259 | 388 | 647 | 8 | 3 | 11 | 658 |
| Unclassified | 8 | ..... | 8 | ..... | ..... | ..... | 8 |
| Total | 26,881 | 7,000 | 33,881 | 622 | 387 | 1,009 | 34,890 |

[a] The few cows which were killed accidentally are classified in the tables along with the males in order to make the record complete. The final result arrived at is not appreciably affected thereby. See p. 119 for details regarding the cows.

## CLASSIFICATION OF SEALSKINS FOR THE TRADE.

The names which have in the past been applied to the various sizes of sealskins were arbitrarily chosen and bore no relation whatever to the age of the animal. They conflicted with the terminology which has come to be recognized throughout the world in its application to the living animals. Thus under the old trade names the word "pups" entered into four designations which might include animals from 1 to 4 years old, inclusive, but which never referred to those to which the term "pups" is properly applicable. The young of the year in which born have always been known by this name, but their skins have never been on the market.

In order to do away with this anomalous condition and prevent confusion in the minds of the uninformed, a new set of names was adopted

in 1918 for the several sizes of skins which bear no age relation to the animals at all. The sizes of the grades were not changed. The following table shows the equivalents.

TRADE CLASSIFICATION OF SEALSKINS.

| Old names. | New names. | Lengths. |
|---|---|---|
| | | *Inches.* |
| Wigs | Wigs | Above 55 |
| Middlings | Extra extra large | 49 to 55 |
| Middlings and smalls | Extra large | 46 to 48 |
| Smalls | Large | 43 to 45 |
| Large pups | Mediums | 39 to 42 |
| Middling pups | Small mediums | 35 to 38 |
| Small pups | | |
| Extra small pups | | |

This terminology was used in the two public-auction sales at St. Louis in 1918 and was accepted by the trade without confusion.

CENSUS.

A census of the seal herd was taken in 1918 at the usual time by employees of the Bureau. An increase of the number of cows slightly greater than the normal which has prevailed for several years is encouraging. Slight differences in methods of computation have been instituted as the knowledge of death rates and other factors have required. Complete information on this subject is given in the report by G. Dallas Hanna published herewith.

Following is a statement showing the numerical strength of the herd in 1918 as compared with the six preceding years:

GENERAL COMPARISON OF RECENT CENSUSES OF THE SEAL HERD.

| Class of seals. | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 |
|---|---|---|---|---|---|---|---|
| Harem bulls | 1,358 | 1,403 | 1,559 | 2,151 | 3,500 | 4,850 | 5,344 |
| Breeding cows | 81,984 | 92,269 | 93,250 | 103,527 | 116,977 | 128,024 | 142,915 |
| Surplus bulls | | | | | | 8,977 | 17,110 |
| Idle bulls | 113 | 105 | 172 | 673 | 2,632 | 2,706 | 2,444 |
| Young bulls (chiefly 5-year-olds) | 199 | 259 | 1,658 | | | | |
| 6-year-old males | | | | | 11,167 | 15,397 | 13,755 |
| 5-year-old males | | | | 11,271 | 15,494 | 14,813 | 11,941 |
| 4-year-old males | 100 | 2,000 | 9,939 | 15,848 | 15,427 | 16,631 | 7,114 |
| 3-year-old males | 2,000 | 10,000 | 13,880 | 18,282 | 19,402 | 19,507 | 9,117 |
| 2-year-old males | 11,000 | 15,000 | 17,422 | 23,990 | 24,169 | 26,815 | 30,159 |
| Yearling males | 13,000 | 20,000 | 23,068 | 30,307 | 33,645 | 38,013 | 41,595 |
| 2-year-old cows | 11,000 | 15,000 | 17,422 | 23,990 | 24,245 | 26,917 | 30,415 |
| Yearling cows | 13,000 | 20,000 | 23,067 | 30,306 | 33,646 | 38,018 | 41,608 |
| Pups | 81,984 | 92,269 | 93,250 | 103,527 | 116,977 | 128,024 | 142,915 |
| Total | 215,738 | 268,305 | 294,687 | 363,872 | 417,281 | 468,692 | 496,432 |

SPECIMENS OF FUR SEALS FOR SCIENTIFIC PURPOSES.

From time to time calls are made upon the Bureau by scientific institutions for specimens of the Alaska fur seal for exhibition or other purposes. There is no authority in law whereby animals may be killed to supply this demand. A few cows and bulls and a considerable number of pups are found dead on the rookeries each year, however, and these afford a means of filling such requirements.

In 1916 the California Academy of Sciences made a request for sufficient material to enable a mounted group to be installed in its museum in San Francisco. It was not practicable to secure sufficient animals at the Pribilofs for this purpose until in 1918. In all, 13 pups and 16 older seals, a total of 29 specimens, were collected and shipped to this institution in 1917 and 1918. The records of these animals were made separately from the regular take of skins.

Existing law requires that all sealskins from the Pribilof Islands shall be sold and the proceeds covered into the Treasury. In arriving at a price to be fixed for such specimens from dead animals, consideration has been taken of the fact that many of them are worthless commercially and for others it would be difficult to obtain an equitable appraisement. Therefore, the sum of $1 each was fixed as the value of the pups and $5 each for all older animals. The institution securing the specimens paid all charges for labor and transportation connected therewith.

### DEATH OF FUR SEALS AT AQUARIUM.

The two Alaska fur seals which have been at the Washington aquarium of the Bureau since the summer of 1909 died in 1918, the female on September 1 and the male on September 25. Autopsies were performed by experts of the Bureau of Animal Industry and showed the cause of the death of the female to be congestion of the lungs, and of the male to be acute general enteritis, perhaps of bacterial origin.

These two seals were born at St. Paul Island, Bering Sea, in July, 1909. Shortly afterwards they were found to be waifs whose mothers had been killed at sea by hunters, and they would have starved to death, as so many thousands of their kind did every year, had they not been bottle-fed during the early weeks of their existence. They were the only Alaskan fur seals which have borne confinement more than a year or two. Several lots brought to the States as pups and distributed to aquaria and zoological gardens succumbed in a short time. An interesting fact is that whereas in nature fur seals never enter fresh water, these particular individuals had never been in salt water.

## FOXES.

### SEASON OF 1917–18.

Only one species of fox is found on the Pribilofs, *Vulpes pribilofensis* Merriam. It appears in both the blue and white color phases, with the former predominating. In fact, through the system of capture employed on St. George Island since 1897, the proportion of white foxes has been reduced to a negligible factor. On St. Paul approximately 25 per cent of the skins secured are white. Pribilof Island blue foxes have long been considered the best which reach the markets. Although there is a small percentage of poorer grades, as would be expected among so large a number, in the main the fur is long, dark, and silky.

The method of feeding and trapping established on St. George Island in 1897 by James Judge has been highly successful. The Bureau plans to take active steps to establish it in the near future on St. Paul Island.

*St. George Island.*—The following extract from the report of Agent A. H. Proctor on foxing operations on St. George Island for the season 1917–18 was written on October 31, 1918, and gives interesting details of the work.

The presence of the U. S. F. S. *Roosevelt* at the islands discharging cargo delayed trapping operations until the night of December 19, 1917. The *Roosevelt* made her final departure December 17, and two nights later trapping for skins began, and continued at suitable intervals until the night of February 8, 1918, when operations were suspended for the season. The trap at the village was operated, in all, 24 nights, that at Zapadni 11 nights, and string traps were used in the village proper three afternoons. Trapping at the village trap and at Zapadni was concurrent.

As noted in the accompanying record, two mangy males whose bodies were entirely denuded of hair or fur were shot in the village, and as their skins were worthless they were publicly burned. These animals were killed to prevent them from spreading the mange.

During the trapping season there were killed for skins 320 blue males and 279 blue females, 2 white males, and 3 white females; a total of 604 skins. To that total were added the skins of three blue males which were found dead, bringing the total number of skins for shipment to 607. The entire shipment was forwarded on the *Roosevelt* June 21, 1918.

Including the 3 found dead, 1,017 foxes were handled during the season. Of that number 200 males and 208 females were branded and released for breeders. Following the established practice, all animals unfit for breeders that entered the trap were killed, but in order to produce present revenue, and for the better reason that the herd could well afford it, a proper percentage of animals bearing a higher grade of pelt were also killed.

The breeders, 200 blue males and 208 blue females, consisted of the finest specimens that passed through the trap, and considered as a whole they were very high grade in every respect. Those released for breeders received a mark that identified them and secured them immunity from killing at a later period in the season. Males were branded or marked by clipping a broad ring from the fur near the end of the tail; females were similarly marked, but the band was clipped near the base of the tail. These marks remained until the coat was shed the following summer. No male that weighed less than 10½ pounds nor a female that weighed less than 7½ pounds were reserved for breeding. All were in such fine condition that none were released that even approximated those weights.

The season of 1917–18 was in every respect the most successful one for 25 years. The most recent season that approaches it was that of 1905–6, when 1,062 foxes were handled, but in that year only 481 were killed. In point of number of skins secured the past season was exceeded only by that of 1892–93, when 928 skins were secured. The large take of 1917–18 followed immediately after the large catch of the previous season, and clearly demonstrates the wonderful increase that has taken place within the past few years. This is further demonstrated by the ease with which the catch was secured, as is shown by the accompanying record.

After the close of trapping operations reliable persons report having seen large numbers of unbranded foxes at large at various points on the island, and many were also observed in the vicinity of the village and at the feeding ground. No reliable estimate can be made of the number of foxes alive at the close of trapping, but it is more than safe to say that the 200 pairs released for breeders represented far less than one-half of the number. The presence of unbranded foxes after the close of trapping operations shows conclusively that all do not resort to the village to feed, at least during the hours when the trap is in operation. This is, of course, not true of them all, as some branded animals have been seen at the most remote points. Zapadni appears to have a colony that rarely visits the village, and the same appears to be true of Garden Cove. Recognizing that, it has been customary to preserve food at Zapadni for winter's use, and this season 200 seal carcasses were preserved there, and at this writing something less than one-half of it has been consumed.

The first night of trapping invariably is the best, and the number then handled may be accepted as a good indication (weather conditions remaining favorable) of what the final take may be. On the first night of 1917–18 we killed 197 foxes, and then had to suspend operations early and while they were coming to the trap in increasing numbers, because our shoproom was too small to permit us to stretch and dry a greater number. The same lack of shoproom made it impracticable for us to resume trapping before December 27, eight days after the first night. On the second night we killed 133. These two nights, it is believed, exceed any similar record since the present trapping method was established in 1897.

During the remainder of the season foxes gathered about the trap in large numbers nightly, but many had become trap-shy and could not be induced to enter in anything approximating the number taken during the first two nights. Contrary to the writer's previous experience, not one night was a failure. The nearest to a failure was the night of January 11, when only one fox was caught, and this is accounted for by the fact that during all that day and up to within two hours of opening the trap a gasoline engine was in operation within 100 feet of the trap, and it is certain that the noise and odor of the engine kept foxes away until very late at night. That night an unusually large amount of food was placed outside the trap after the latter was closed, and by morning it was entirely consumed, thus showing that a large number had fed there later in the night. After that experience bone grinding was postponed until after fox trapping closed for the season.

From early in May until about September 15 foxes find abundant food on the cliffs and in the rocks where the birds nest thickly. The bird migration is practically over by September 15 and by that date the foxes seek food elsewhere. The beaches furnish a limited amount under ordinary conditions and at rare intervals a whale or sea lion is washed up, but such food supplies at that season can not be depended upon and in consequence preserved food must be supplied. Feeding at the trap began September 15 and was continued until May 8 until least auklets (choochkies) and other birds appeared in sufficient numbers to provide a food supply more to their taste, when the foxes ceased to visit the village feeding ground.

For more than 20 years food has been the one great and constant problem in fox propagation on this island. Previous to that time the large number of seals killed annually and left on the killing fields provided a supply ample to sustain a very large fox herd. As seal killings diminished, fox life decreased. In 1897 Assistant Agent James Judge began preserving seal carcasses in an abandoned silo. These carcasses were taken out, freshened, and fed during the winter. This experiment met with such success that it has been followed ever since. But for a number of years sufficient seal carcasses were not available and the food supply was to some extent added to by the purchase of salted salmon and other fish and on one occasion whale meat.

During the summer of 1917 the viscera and other waste portions of seals were preserved in the silo, and that together with a portion of the meat from the large number of seals killed during the late fall furnished the largest supply of food for a number of years and enabled the herd to secure an ample amount of nourishing food throughout the winter and spring. As a result the females were strong and brought a larger percentage of their young through the nursing period.

Taking 7,000 seals during the sealing season of 1918, for the first time in many years, provided sufficient meat in excess of the natives' requirements to enable us to preserve a large supply for the foxes. Early in the summer it was seen that the one silo would not suffice and work was at once begun on another. It was completed and filled before the close of the sealing season and about 300 carcasses from the last killings of the season had to be left on the killing field. Flesh decays slowly here and the carcasses on the killing field furnished ample food for the young and old after the birds began to leave.

Following the plan begun in 1916, a pipe-line was laid on top of the ground early in October from the silos to the standpipe in the siphon line connecting the village with Upper Lake. Fresh water was run into the silos for four weeks and the small amount of salt sprinkled over the carcasses when they were placed in the silos was thoroughly washed away. The meat so preserved is remarkably firm, but is very high and seems to be relished by foxes. It is this meat that is being fed out nightly. While this partially putrid meat furnishes their principal food supply during the winter months, the foxes secure a varying amount from the beaches, and it is not unusual for them to entirely desert the village feeding ground when sea food becomes abundant along the beaches.

Young foxes make their first appearance about the entrance of the warrens early in June, and this year it was seen that litters brought to that age were unusually large and well nourished. As fall came on the inexperienced young had ample food close at hand and they were seen feeding on the old killing field in large numbers, and by October the three hundred odd carcasses gave evidence of their activities. The foregoing applies particularly to the litters in and about the village, but visits to Zapadni, Staraya Artil, Garden Cove, and the vicinity of East Rookery showed that the young in those sections were in exceedingly fine condition and families were large.

In September, 1918, a pair of young foxes was secured from Sagchudak Island, an islet near the southern shore of Atka Island of the Aleutian Group. They were secured in exchange for a pair of young foxes from the St. George herd. The transfer was authorized by the Bureau in a telegram dated September 5, 1918, and the trade was made with Reverend Mr. Hotovitsky, of Unalaska, who, it is believed, is engaged in

fox raising in some part of the Aleutians. The new foxes were permanently marked by clipping the top of the right ear and slitting the left. They were kept under treatment until the wounds healed and were then released. They immediately took up their residence under the boardwalk leading to the radio station, where they have since lived. They are frequently seen and are in excellent condition.

The physical and numerical strength of the herd warrants a take of skins materially in excess of that of last year, and it is not unlikely that approximately 900 skins may be secured. A greater number would not weaken the herd, and it is my opinion, based upon my own observations and reliable reports from others, that a take of 1,000 would not represent the year's increment.

Aside from the number of foxes, the weather during trapping time is a material factor which must be considered. Cold, clear nights when the tide is high, are the best, and on such nights good catches are to be expected.

The production of animals with the best grade of pelts is one of the objects we are aiming at, but it is a question whether the finest pelts can be produced so long as the herd is forced to subsist largely upon carrion. The commercial value of the herd is great enough to warrant serious consideration being given to the erection of a cold-storage plant in which 2,000 or more seal carcasses could be preserved in a frozen state to be fed fresh to the foxes during the winter. While such a number of carcasses would in itself be insufficient to subsist the herd, its prophylactic value would be great when used to vary the diet.

From an economic point of view no better way of disposing of seal carcasses can be found than that of converting them into food for the blue-fox herd. Many years will pass before the number of seals killed on St. George will exceed the combined needs of the natives and the fox herd.

The experience of last season demonstrated that the fox herd has outgrown the limits of our present shop and that a much larger building is required for drying and stretching the pelts unless the take of skins is to be kept within the limit of the present small building. During the coming trapping season it is proposed to utilize the least-finished native dwelling for drying skins, but that building will be available for the one season only.

RECORD OF FOXES TRAPPED ON ST. GEORGE ISLAND, ALASKA, SEASON 1917–18.

| Serial number of killing. | Date. | Where taken. | Blue. | | White. | | Found dead.[a] | Marked and released as breeders.[a] | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Male. | Female. | Male. | Female. | Male. | Male. | Female. |
| | 1917. | | | | | | | | |
| ..... | Nov. 26 | Village | ..... | ..... | ..... | ..... | 1 | ..... | ..... |
| ..... | Nov. 27 | .....do | ..... | ..... | ..... | ..... | 1 | ..... | ..... |
| 1..... | Dec. 19 | Village trap | 114 | 83 | ..... | ..... | ..... | 3 | 4 |
| 2..... | Dec. 27 | .....do | 73 | 59 | 1 | ..... | ..... | 8 | 11 |
| | 1918. | | | | | | | | |
| 3..... | Jan. 2 | Village trap | 9 | 8 | ..... | ..... | ..... | 6 | 9 |
| 4..... | Jan. 3 | .....do | 5 | 10 | ..... | ..... | ..... | 2 | 1 |
| 5..... | Jan. 4 | .....do | 8 | 5 | ..... | ..... | ..... | 7 | 6 |
| 6..... | Jan. 9 | .....do | 16 | 21 | ..... | ..... | ..... | 12 | 14 |
| 7..... | Jan. 11 | .....do | ..... | 1 | ..... | ..... | ..... | ..... | ..... |
| 8..... | Jan. 14 | .....do | 9 | 9 | ..... | ..... | ..... | 1 | 4 |
| 9..... | Jan. 16 | .....do | 17 | 11 | ..... | ..... | ..... | 7 | 9 |
| 10..... | Jan. 20 | .....do | 20 | 1 | ..... | ..... | ..... | 8 | 11 |
| 11..... | Jan. 21 | .....do | 8 | 11 | ..... | 1 | ..... | 9 | 9 |
| 12..... | Jan. 22 | .....do | 4 | 3 | 1 | ..... | ..... | 6 | 14 |
| 13..... | Jan. 23 | .....do | 5 | 4 | ..... | ..... | ..... | 22 | 21 |
| 14..... | Jan. 25 | .....do | 2 | 3 | ..... | ..... | ..... | 15 | 13 |
| ..... | Jan. 27 | Village (shot) | 1 | ..... | ..... | ..... | ..... | ..... | ..... |
| 15..... | Jan. 28 | Village trap | 2 | 7 | ..... | ..... | ..... | ..... | 1 |
| 16..... | Jan. 29 | .....do | 3 | 7 | ..... | ..... | ..... | 2 | 3 |
| ..... | Jan. 30 | Village (shot) | (b) | ..... | ..... | ..... | ..... | ..... | ..... |
| 1..... | Jan. 24 | Zapadni | ..... | ..... | ..... | ..... | ..... | [c] 1 | ..... |
| 2..... | Jan. 25 | .....do | ..... | ..... | ..... | ..... | ..... | 1 | 1 |

[a] All blue.
[b] An animal entirely devoid of hair or fur was shot; skin publicly burned in shop stove.
[c] This animal weighed 24 pounds.

RECORD OF FOXES TRAPPED ON ST. GEORGE ISLAND, ALASKA, SEASON 1917–18—Continued.

| Serial number of killing. | Date. | Where taken. | Blue. | | White. | | Found dead.[a] | Marked and released as breeders.[a] | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Male. | Female. | Male. | Female. | Male. | Male. | Female. |
| | 1917. | | | | | | | | |
| 3 | Jan. 26 | Zapadni | | | | | | 2 | 4 |
| 4 | Jan. 27 | do | 1 | 1 | | | | | |
| 5 | Jan. 28 | do | 1 | | | | | | |
| 6 | Jan. 29 | do | 1 | 1 | | | | | |
| 17 | Jan. 30 | Village trap | 1 | 2 | | | | 2 | |
| 18 | Jan. 31 | do | [b] 2 | 1 | | | | 6 | 10 |
| | 31 | Village (string trap) | | 1 | | | | 2 | 5 |
| 7 | 31 | Zapadni | 1 | | | | | | |
| 19 | Feb. 1 | Village trap | 3 | 4 | | | | 18 | 10 |
| | 1 | Village (string trap) | 1 | | | | | | 3 |
| 20 | Feb. 3 | Village trap | 3 | 14 | | | | 18 | 7 |
| | 3 | Shot | | | | 1 | | | |
| | Feb. 4 | Village (string trap) | 1 | 1 | | | | 13 | 11 |
| 21 | 4 | Village trap | 3 | 5 | | | | 10 | 7 |
| 22 | Feb. 5 | do | 3 | 5 | | | | 9 | 7 |
| 8 | Feb. 1 | Zapadni | 3 | | | | | | |
| 9 | Feb. 3 | do | | | | | | 2 | 1 |
| 10 | Feb. 4 | do | | | | | | 1 | 1 |
| 11 | Feb. 5 | do | | | | | | 1 | |
| 23 | Feb. 6 | Village trap | | 1 | | | | 1 | 3 |
| | 6 | Village (shot) | | | | 1 | | | |
| 24 | Feb. 8 | Village trap | | | | | | 5 | 8 |
| | Mar. 1 | Village | | | | | 1 | | |
| Total | | | 320 | 279 | 2 | 3 | 3 | 200 | 208 |

[a] All blue.
[b] One additional male was killed, body devoid of hair; skin publicly burned in shop stove.

*St. Paul Island.*—The foxes on St. Paul Island run wild and are captured in steel traps. No selection can thus be made for a breeding reserve and the dangers of overtrapping are obvious. For some reason not adequately explained this island has never been the equal of St. George for foxes, although it is larger, has more extensive beach areas, and about seven times as large a seal herd.

At the present time fox life seems to be at a low ebb. In 1917–18 10 days' trapping under excellent weather conditions and with about 300 more traps in use than for several years previous resulted in a catch of only 104 animals, whereas, in the winter of 1914–15 over 200 pelts were secured in this time. It is entirely possible to practically exterminate the animals here if very close supervision is not given. It is planned to make a thorough attempt to institute the Judge system of feeding and selection at an early date. If it can be made a success on St. Paul Island, the dangers of overtrapping will disappear and will, it is hoped, bring the St. Paul herd to a high state of excellence.

### PAYMENTS TO NATIVES.

The natives are paid $5 from the proceeds of the sales for each fox skin secured. Since this is in return for labor performed, no distinction is made between the white and blue pelts. The work required is the same on each. On St. Paul Island the pelts brought in by each native are credited to him. This plan can not be followed on St. George Island because of the manner of taking and killing.

Accordingly, a division of the total for the community is made and each man entitled to a share is credited with his proportion. The more skillful persons receive the largest shares. Thirty-nine natives of St. Paul Island earned $520 for the taking of 90 blue and 14 white foxes. After the checks were stated, Innokenty Sedick died and the amount of $5 which was due him was equally divided between three of his heirs. Twenty-six natives of St. George Island earned $3,035 for the taking of 602 blue and 5 white foxes.

SEASON OF 1918–19.

On St. Paul Island the extent of trapping was left to the judgment of Agent Fassett. On December 15, 45 natives with 8 traps each, making a total of 320 traps, began operations. The traps were left out 5 days, or until December 19, and the result was 119 blue and 25 white pelts, a total of 144. As unusually favorable conditions prevailed, no further trapping was recommended by the agent. Upon the close of trapping, the feeding of processed seal meat from the by-products factory was instituted each week at three different places.

On St. George Island trapping began December 16, and at the end of the month 339 blue and 3 white skins had been secured. During January 202 blue skins were secured, making the total to the end of the month 541 blue and 3 white, or 544 altogether. Since the animals were reported mating on that date, trapping was restricted to mangy and other animals unfit for breeders. Of these, 7 blue and 2 white were secured in February.

Agent Proctor telegraphed that the small catch was due to the stranding of a large whale under the high bluffs and its subsequent breaking up and drifting to all beaches. An abundant food supply was thus provided, so that the foxes were not obliged to resort to the station. Foxes appeared abundant and all were very fat.

SUMMARY OF 1918–19 FOX CATCH.

| | Blue. | White. | Total. |
|---|---|---|---|
| St. Paul Island | 119 | 25 | 144 |
| St. George Island | 548 | 5 | 553 |
| Total | 667 | 30 | 697 |

REINDEER.

The reindeer herds on St. George Island and St. Paul Island have continued to increase very satisfactorily. The surplus males furnish a limited amount of food, which takes the place of fresh beef to a very large extent. It is planned that at no very distant time the islands shall be practically self-supporting in the way of fresh meat from this and other sources.

On St. Paul Island in the summer of 1918 there were 160 animals, including 40 fawns. Two were killed and three others in poor physical condition probably died, leaving a total of 155 in the herd at the close of the calendar year.

On St. George Island there were reported 114 of all sizes at the end of the calendar year. This brings the total up to 269 for both islands,

as compared with 154 for 1915. A total of 20 animals was used for food on both islands during 1918.

Since the reindeer subsists during the winter upon one or two species of lichens, which are of very slow growth and of limited distribution on the Pribilofs, the Bureau plans to institute an inquiry into the probable maximum size of herds which can be continually maintained on each island.

## BIRDS.

During the course of several years at the Pribilof Islands, Dr. G. Dallas Hanna has from time to time devoted considerable study to the enormous numbers of birds in that region. As the result of his observations the following has been recently submitted by Dr. Hanna:

The enormous numbers of sea birds which nest on the Pribilof Islands form one of the most interesting spectacles to be found there. Some of the species have been estimated in millions.

Many employees have given the subject a share of attention during their residence there, and the islands have thus come to be better known in this respect than any similar area in Alaska. Collections have been sent in from time to time, and almost without exception they contained some species which attracted unusual attention. Stragglers arrive from all directions and a considerable number of them may be expected every year. The total number of species which breed or are found regularly in migration is only 45; but the number of stragglers has swelled the list to 129. Of these no less than 14 represent the first records of the species having been secured in North America. Five others were originally described from this locality.

Specimens have been collected of all except 6 of these 129 species, and of those collected the U. S. National Museum possesses specimens from the islands of all but one.

While it is impracticable at the present time for any of the Pribilof employees to devote much time to the collection of birds, owing to the shortage of assistants, the Bureau encourages the preservation of any specimens which may appear strange or which possess some unusual interest.

The list which follows was originally prepared by Dr. C. W. Richmond, of the National Museum, for use on the islands in recognizing other desirable species. It has been added to by the present writer after completing the study of the last collection he brought from the islands. Names have been corrected and slight changes made by Dr. H. C. Oberholser, of the Bureau of Biological Survey.

### CHECK LIST OF BIRDS OF THE PRIBILOF ISLANDS, ALASKA, WITH THE NAMES OF PERSONS FIRST RECORDING THE SPECIES FROM THE ISLANDS.

*Colymbus holbœllii.* Holbœll's Grebe. ELLIOTT.
*Colymbus auritus.* Horned Grebe. HANNA.
*Gavia adamsi.* Yellow-billed Loon. TOWNSEND.
*Gavia arctica.* Black-throated Loon. ELLIOTT.
*Lunda cirrhata.* Tufted Puffin.[a] COINDE.
*Fratercula corniculata.* Horned Puffin.[a] ELLIOTT.
*Phaleris psittacula.* Paroquet Auklet.[a] COINDE.
*Æthia cristatella.* Crested Auklet.[a] COINDE.
*Æthia pusilla.* Least Auklet.[a] COINDE.
*Synthliboramphus antiquus.* Ancient Murrelet. DALL and BANNISTER.
*Brachyramphus marmoratus.* Marbled Murrelet. HANNA.
*Cepphus columba.* Pigeon Guillemot.[b] NELSON.
*Uria troille californica.* California Murre.[a] ELLIOTT.
*Uria lomvia arra.* Pallas's Murre.[a] DALL and BANNISTER.
*Coprotheres pomarinus.* Pomarine Jaeger. ELLIOTT.
*Stercorarius parasiticus.* Parasitic Jaeger. ELLIOTT.
*Stercorarius longicaudus.* Long-tailed Jaeger. ELLIOTT.
*Rissa tridactyla pollicaris.* Pacific Kittiwake.[a] COINDE.
*Rissa brevirostris.* Red-legged Kittiwake.[a] COINDE.
*Pagophila alba.* Ivory Gull. PALMER.
*Larus hyperboreus hyperboreus.* Glaucous Gull.[a] OBERHOLSER.
*Larus hyperboreus barrovianus.* PALMER.

[a] Species which breed regularly. The mallard and green-winged teal have also been known to nest on St. Paul once each.
[b] Regular migrants.

*Larus glaucescens.* Glaucous-winged Gull.[a] ELLIOTT.
*Larus schistisagus.* Slaty-backed Gull.[b] PALMER.
*Rhodestethia rosea.* Ross's Gull. 2 specimens. EVERMANN.
*Xema sabini.* Sabine's Gull.[c] PALMER.
*Sterna paradisæa.* Arctic Tern.[c] PALMER.
*Phœbastria albatrus.* Short-tailed Albatross. ELLIOTT.
*Fulmarus glacialis rodgersii.* Rodgers's Fulmar.[a] DALL and BANNISTER.
*Puffinus tenuirostris.* Slender-billed Shearwater. HANNA.
*Oceanodroma furcata.* Forked-tail Petrel. PALMER.
*Phalacrocorax pelagicus robustus.* Violet-green Cormorant.[c] BAIRD, BREWER and RIDGWAY.
*Phalacrocorax urile.* Red-faced Cormorant.[a] COINDE.
*Mergus americanus.* Merganser. DALL.
*Mergus serrator.* Red-breasted Merganser. EVERMANN.
*Anas platyrhyncha.* Mallard.[c] ELLIOTT.
*Chaulelasmus streperus.* Gadwall. EVERMANN.
*Mareca penelope.* European Widgeon.[d] ELLIOTT.
*Eunetta falcata.* Falcated Teal.[d] HANNA.
*Nettion crecca.* European Teal. HANNA.
*Nettion carolinense.* Green-winged Teal.[c] PALMER.
*Spatula clypeata.* Shoveller. EVERMANN.
*Dafila acuta.* Pintail.[c] EVERMANN.
*Aristonetta valisineria.* Canvas-back. HANNA.
*Marila fuligula.* Tufted Duck.[d] EVERMANN.
*Marila ferina.* Pochard. EVERMANN.
*Marila marila.* Scaup Duck. EVERMANN.
*Clangula clangula clangula.*[d] European Golden-eye. HANNA.
*Clangula clangula americana.* Golden-eye. HANNA.
*Charitonetta albeola.* Buffle-head. HANNA.
*Harelda hyemalis.* Old-squaw.[a] ELLIOTT.
*Histrionicus histrionicus pacificus.* Pacific Harlequin Duck.[c] ELLIOTT.
*Polysticta stelleri.* Steller's Eider.[c] ELLIOTT.
*Arctonetta fischeri.* Spectacled Eider. HANNA.
*Somateria v-nigra.* Pacific Eider.[c] PALMER.
*Erionetta spectabilis.* King Eider.[c] EVERMANN.
*Melanitta deglandi dixoni.* Pacific White-winged Scoter.[c] HANNA.
*Chen hyperborea hyperborea.* Snow Goose. HANNA.
*Anser albifronsalbi frons.* White-fronted Goose. PALMER.
*Branta canadensis hutchinsii.* Hutchins's Goose. HANNA.
*Branta canadensis minima.* Cackling Goose.[c,e] ELLIOTT.
*Branta nigricans.* Black Brant. HANNA.
*Philacte canagica.* Emperor Goose.[c] ELLIOTT.
*Olor columbianus.* Whistling Swan. PALMER.
*Grus canadensis canadensis.* Little Brown Crane.[b] TOWNSEND.
*Phalaropus fulicarius.* Red Phalarope.[c] ELLIOTT.
*Lobipes lobatus.* Northern Phalarope.[a] ELLIOTT.
*Arquatella maritima couesi.* Aleutian Sandpiper. SEALE
*Arquatella maritima ptilocnemis.* Pribilof Sandpiper.[a,e] DALL and BANNISTER.
*Pisobia maculata.* Pectoral Sandpiper.[c] PALMER.
*Pisobia acuminata.* Sharp-tailed Sandpiper.[c] BISHOP.
*Pisobia bairdii.* Baird's Sandpiper. HANNA.
*Pisobia minutilla minutilla.* Least Sandpiper. HANNA.
*Pisobia subminuta.* Long-toed Stint.[d] RIDGWAY.
*Pelidna alpina sakhalina.* Red-backed Sandpiper. BISHOP.
*Ereunetes pusillus.* Semipalmated Sandpiper. PALMER.
*Vetola lapponica baueri.* Pacific Godwit.[c] ELLIOTT.
*Totanus flavipes.* Yellow-legs. PALMER.
*Totanus melanoleucus.* Greater Yellow-legs.[f] SEALE.
*Rhyacophilus glareola.* Wood Sandpiper. HANNA.
*Heteroscelus incanus.* Wandering Tattler.[c] ELLIOTT.
*Heteroscelus brevipes.* Polynesian Tattler.[d] HANNA.
*Philomachus pugnax.* Ruff. EVERMANN.
*Phæopus hudsonicus.* Hudsonian Curlew.[b] PALMER.
*Phæopus borealis.* Eskimo Curlew. ELLIOTT.
*Phæopus tahitiensis.* Bristle-thighed Curlew. HANNA.
*Pluvialis dominica fulva.* Pacific Golden Plover.[c,d] COINDE.
*Charadrius semipalmatus.* Semipalmated Plover. PALMER.

[a] Species which breed regularly. The mallard and green-winged teal have also been known to nest on St. Paul once each.
[b] Species which have been recorded but of which no specimens have apparently been collected.
[c] Regular migrants.
[d] Species from the Pribilof Islands which constitute the first records for North America.
[e] Species originally described from the Pribilof Islands.
[f] A specimen has been collected but it is not in the National Museum.

*Arenaria interpres interpres.* Turnstone.[a] COINDE.
*Hæmatopus bachmani.* Black Oystercatcher. HANNA.
*Archibuteo lagopus sancti-johannis.* Rough-legged Hawk. HANNA.
*Thallasoaëtus pelagicus.* Kamchatkan Sea Eagle.[b] HANNA.
*Haliæetus leucocephalus alascanus.* Northern Bald Eagle.[c] PALMER.
*Hierofalco rusticolus candicans.* Gyrfalcon.[a] ELLIOTT.
*Rhynchodon peregrinus anatum.* Duck Hawk.[c] PALMER.
*Rhynchodon peregrinus pealei.* Peale's Falcon. HANNA.
*Asio flammeus flammeus.* Short-eared Owl. PALMER.
*Cryptoglaux funerea funerea.* Tengmalm's Owl.[b] EVERMANN.
*Cryptoglaux funerea richardsoni.* Richardson's Owl. EVERMANN.
*Nyctea nyctea.* Snowy Owl.[a] PALMER.
*Cuculus canorus telephonus.* Kamchatkan Cuckoo.[b] PALMER.
*Colaptes auratus luteus.* Northern Flicker. CLARK.
*Euphagus carolinus.* Rusty Blackbird. EVERMANN.
*Coccothraustes coccothraustes japonicus.* Japanese Hawfinch.[b] EVERMANN.
*Pinicola enucleator kamtschatkensis.* Kamchatkan Pine Grosbeak.[b] RILEY.
*Leucosticte tephrocotis griseonucha.* Aleutian Rosy Finch.[d] DALL and BANNISTER.
*Acanthis hornemannii exilipes.* Hoary Redpoll. HANNA.
*Acanthis linaria linaria.* Redpoll.[a] ELLIOTT.
*Spinus pinus pinus.* Pine Siskin. HANNA.
*Plectrophenax nivalis nivalis.* Snowflake. EVERMANN.
*Plectrophenax nivalis townsendi.* Pribilof Snowflake.[d, e] DALL and BANNISTER.
*Plectrophenax hyperboreus.* McKay's Snowflake. HANNA.
*Calcarius lapponicus alascensis.* Alaska Longspur.[d, e] ELLIOTT.
*Passerculus sandwichensis sandwichensis.* Aleutian Savannah Sparrow. PALMER.
*Zonotrichia gambeli.* Gambel's Sparrow. EVERMANN.
*Junco hyemalis hyemalis.* Slate-colored Junco. HANNA.
*Melospiza melodia sanaka.* Aleutian Song Sparrow. HANNA.
*Passerella iliaca sinuosa.* Valdez. Fox Sparrow. EVERMANN.
*Fringilla montifringilla.* Brambling.[b] HANNA.
*Petrochelidon lunifrons lunifrons.* Cliff Swallow. HANNA.
*Hirundo rustica erythrogastris.* Barn Swallow.[c] PALMER.
*Tachycineta thalassina lepida.* Northern Violet-green Swallow. HANNA.
*Wilsonia pusilla pileolata.* Pileolated Warbler. HANNA.
*Anthus spinoletta rubescens.* Pipit.[a] PALMER.
*Anthus spinoletta japonicus.* Japanese Pipit.[b] HANNA.
*Nannus alascensis.* Alaska Wren. [d, e] DALL and BANNISTER.
*Hylocichla aliciæ aliciæ.* Gray-cheeked Thrush. HANNA.
*Planesticus migratorius migratorius.* Robin. ELLIOTT.
*Œnanthe œnanthe œnanthe.* Wheatear. SEALE.

## DOGS PROHIBITED.

An order issued by the Secretary of Commerce on January 17, 1917, excludes all dogs from the Pribilof Islands. This was to prevent any possible disturbance of the fur seals and foxes. The order reads as follows:

In order to prevent molestation of the fur-seal and fox herds, the landing of any dogs at the Pribilof Islands is hereby prohibited. It is directed that any and all dogs now on the Pribilof Islands must be removed not later than July 1, 1917. Officials in charge of St. Paul and St. George Islands will enforce this order.

## RADIO STATIONS.

The Navy Department continued the maintenance of radio stations on St. Paul and St. George Islands. These have been of inestimable value to the Bureau in the conduct of its operations. The value does not end with the official transmission of messages. Through the cooperation of the local representatives of both departments a great deal

[a] Regular migrants.
[b] Species from the Pribilof Islands which constitute the first records for North America.
[c] Species which have been recorded but of which no specimens have apparently been collected.
[d] Species which breed regularly. The mallard and green-winged teal have also been known to nest on St. Paul once each.
[e] Species originally described, from the Pribilof Islands.

is accomplished which otherwise would be impossible. The men at the radio stations ordinarily are skilled in mechanical and electrical work, and especially in the upkeep of gasoline engines. Accordingly they have given much valuable assistance and advice.

Through the cooperation of employees of the radio station on St. Paul Island it was possible to install the electric lights in the Government buildings as mentioned elsewhere in this report.

The Navy Department sent the U. S. S. *Saturn* to the islands in May, 1918, to carry supplies to the radio stations and make additions and repairs. On St. Paul Island an underground concrete food-storage cellar was constructed and a sewer was placed leading from the buildings to the sea. Other activities consisted largely of repairs and upkeep.

On St. George Island a building was constructed to serve as a power house and storage room, new masts were erected for the aerial, and a higher-powered transmission set was installed than had been previously in use.

## PATROL OF THE NORTH PACIFIC OCEAN AND BERING SEA.

The usual patrol for the protection of migrating fur seals was maintained by the Coast Guard. The cutter *Unalga* left San Francisco about April 20, and carried on the patrol until October. The cutter *Bear* made the annual cruise to Arctic Alaska and then remained in Bering Sea until late in October, when a special trip to Seattle was made for the purpose of bringing out Assistant Agent Reynolds. Valuable assistance was also given the Bureau in the transportation of other passengers to the islands and the carrying of mail and supplies, for which courtesies acknowledgment is here made.

## SEALING PRIVILEGES ACCORDED ABORIGINES.

Indians along the coast of Washington and Oregon availed themselves of the privileges granted under the North Pacific Sealing Convention of July 7, 1911, and the act of August 24, 1912, giving effect thereto, and in the season of 1918 a number of fur-seal skins were taken in accordance with law. Skins were authenticated by Dr. C. L. Woods, superintendent and physician, United States Indian Service, Neah Bay, Wash., who reported a total of 395 certificates issued and skins tagged by him in the year 1918. The records show that 251 of these skins were from male seals and 142 from females, while the sex of two was not recorded. These skins were taken in April, May, and June, 1918. It is thought that other skins may have been taken, but reports of authentication have not been received. Dr. Otis O. Benson, superintendent of the Taholah Indian Agency, Taholah, Wash., and Mr. A. H. Dodge, who has succeeded Dr. Woods at Neah Bay, have been authorized to authenticate all fur-seal skins properly taken by Indians under their jurisdiction.

## SHIPMENT OF SKINS FROM PRIBILOF ISLANDS IN 1918.

*Fur-seal skins.*—The fur-seal skins were shipped in four lots in 1918. The first shipment left the islands June 22 on the Bureau's steamer *Roosevelt*, and consisted of 3,104 skins from St. Paul Island and 438 from St. George. The skins were delivered at Seattle and

forwarded on July 8, by Assistant Agent Christoffers, to Funsten Bros. & Co., St. Louis. The shipment was made by freight in two carloads over the Northern Pacific Railway, arriving at its destination July 29 and 30.

The second shipment of skins was made on September 14 on the steamer *Roosevelt,* and consisted of 17,816 skins from St. Paul Island. Continuous gales prevented the loading of any skins at St. George Island on this trip. The shipment was landed at Seattle and was forwarded on October 5 in four cars via the Northern Pacific Railway to St. Louis, reaching there October 30, 31, and November 1.

A third shipment of skins was made on the Coast Guard cutter *Bear,* and consisted of 1,978 skins loaded at St. George Island on October 6. They were landed at Seattle on November 5 and forwarded on the same day to Funsten Bros. & Co., St. Louis, arriving there November 25.

The final shipment of the season was made from the Pribilof Islands December 12 on the steamer *Roosevelt,* and consisted of 2,899 skins from St. Paul Island and 4,584 skins from St. George. The vessel reached Seattle January 3. The skins were forwarded to St. Louis January 4 in two cars via the Northern Pacific Railway, arriving at their destination January 29, 1919.

The following table shows details of the shipments:

SHIPMENTS OF SEALSKINS FROM PRIBILOF ISLANDS IN 1918.

| Date. | Vessel. | Arrived Seattle. | St. Paul. | | St. George. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | | | *Casks.* | *Skins.* | *Casks.* | *Skins.* | *Casks.* | *Skins.* |
| June 22 | Roosevelt | July 7 | 139 | 3,104 | 31 | 438 | 170 | 3,542 |
| Sept. 14 | ....do | Oct. 3 | 528 | 17,816 | ..... | ..... | 528 | 17,816 |
| Oct. 6 | Bear | Nov. 5 | ..... | ..... | 56 | 1,978 | 56 | 1,978 |
| Dec. 12 | Roosevelt | Jan. 3 | 71 | 2,899 | 156 | 4,584 | 227 | 7,483 |
| | Total | ..... | 738 | 23,819 | 243 | 7,000 | 981 | 30,819 |

The following statement shows the islands' record as to numbers of skins taken and shipped:

St. Paul Island:

| | | |
|---|---|---|
| Number of skins on hand Jan. 1, 1918 | 112 | |
| Number taken during year | 27,503 | |
| Total | 27,615 | |
| Shipped during year | 23,819 | |
| Number remaining on St. Paul Island | | 3,796 |

St. George Island:

| | | |
|---|---|---|
| Number of skins taken during year | 7,387 | |
| Shipped during year | 7,000 | |
| Number remaining on St. George Island | | 387 |
| Total on both islands Dec. 31, 1918 | | 4,183 |

*Fox skins.*—The fox skins taken on the Pribilof Islands in the season of 1917–18 were brought down on the first trip of the *Roosevelt,* June 22, arriving at Seattle, July 7. They were at once forwarded by American Railway Express to Funsten Bros. & Co., St. Louis. The shipment consisted of 692 blues and 19 whites, secured as follows: St. George, 602 blue and 5 white; St. Paul, 90 blue and 14 white.

## SALES OF FUR-SEAL SKINS.

In the calendar year 1918 two sales of dressed, dyed, and machined fur-seal skins were held at St. Louis, Mo., by Funsten Bros. & Co. The skins were disposed of at public auction to the highest bidders. The sales occurred on April 22 and October 7. The total number of skins sold was 8,100, and the total amount bid at the two sales was $375,385.

At the sale on April 22 the number of skins sold was 6,100, and the total price bid was $271,945. The maximum price received was $64, and the average per skin was $44.58, an advance of 30 per cent over the average of $33.17 per skin realized at the sale the previous October. The following table shows details in regard to the sale:

DETAILS OF SALE OF 6,100 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, APR. 22, 1918.

| Lot No. | Number of skins. | Trade classification. | Price per skin. | Total for lot. |
|---|---|---|---|---|
| 1 | 65 | 15 wigs; 50 extra extra large | $64.00 | $4,160.00 |
| 2 | 50 | Extra extra large | 57.00 | 2,850.00 |
| 3 | 50 | do | 58.00 | 2,900.00 |
| 4 | 50 | do | 56.00 | 2,800.00 |
| 5 | 50 | do | 57.00 | 2,850.00 |
| 6 | 50 | do | 56.00 | 2,800.00 |
| 7 | 50 | Extra extra large; cut, scarred, etc | 40.00 | 2,000.00 |
| 8 | 40 | do | 43.00 | 1,720.00 |
| 9 | 70 | Extra large | 51.00 | 3,570.00 |
| 10 | 70 | do | 51.00 | 3,570.00 |
| 11 | 70 | do | 54.00 | 3,780.00 |
| 12 | 70 | do | 56.00 | 3,920.00 |
| 13 | 70 | do | 56.00 | 3,920.00 |
| 14 | 70 | do | 53.00 | 3,710.00 |
| 15 | 70 | do | 57.00 | 3,990.00 |
| 16 | 70 | do | 57.00 | 3,990.00 |
| 17 | 70 | do | 54.00 | 3,780.00 |
| 18 | 70 | do | 56.00 | 3,920.00 |
| 19 | 70 | do | 53.00 | 3,710.00 |
| 20 | 60 | do | 54.00 | 3,240.00 |
| 21 | 50 | Extra large; cut, scarred, etc | 35.00 | 1,750.00 |
| 22 | 50 | do | 38.00 | 1,900.00 |
| 23 | 50 | do | 36.50 | 1,825.00 |
| 24 | 40 | do | 37.50 | 1,500.00 |
| 25 | 80 | Large | 48.00 | 3,840.00 |
| 26 | 80 | do | 50.00 | 4,000.00 |
| 27 | 80 | do | 50.00 | 4,000.00 |
| 28 | 80 | do | 51.00 | 4,080.00 |
| 29 | 80 | do | 51.00 | 4,080.00 |
| 30 | 80 | do | 53.00 | 4,240.00 |
| 31 | 80 | do | 54.50 | 4,360.00 |
| 32 | 80 | do | 53.00 | 4,240.00 |
| 33 | 80 | do | 53.00 | 4,240.00 |
| 34 | 80 | do | 52.00 | 4,160.00 |
| 35 | 80 | do | 53.00 | 4,240.00 |
| 36 | 80 | do | 52.00 | 4,160.00 |
| 37 | 80 | do | 54.50 | 4,360.00 |
| 38 | 80 | do | 52.00 | 4,160.00 |
| 39 | 80 | do | 53.00 | 4,240.00 |
| 40 | 80 | do | 52.00 | 4,160.00 |
| 41 | 80 | do | 53.00 | 4,240.00 |
| 42 | 80 | do | 52.00 | 4,160.00 |
| 43 | 80 | Large; cut, scarred, etc | 35.00 | 2,800.00 |
| 44 | 80 | do | 33.00 | 2,640.00 |
| 45 | 80 | do | 36.00 | 2,880.00 |
| 46 | 80 | do | 37.00 | 2,960.00 |
| 47 | 80 | do | 36.00 | 2,880.00 |
| 48 | 60 | do | 37.50 | 2,250.00 |
| 49 | 90 | Mediums | 43.00 | 3,870.00 |
| 50 | 90 | do | 40.50 | 3,645.00 |
| 51 | 90 | do | 40.50 | 3,645.00 |
| 52 | 90 | do | 39.00 | 3,510.00 |
| 53 | 90 | do | 41.50 | 3,735.00 |
| 54 | 90 | do | 41.00 | 3,690.00 |
| 55 | 90 | do | 39.00 | 3,510.00 |
| 56 | 90 | do | 40.00 | 3,600.00 |

DETAILS OF SALE OF 6,100 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, APR. 22, 1918—Continued.

| Lot No. | Number of skins. | Trade classification. | Price per skin. | Total for lot. |
|---|---|---|---|---|
| 57 | 90 | Mediums | 41.00 | 3,690.00 |
| 58 | 90 | do | 41.00 | 3,690.00 |
| 59 | 90 | do | 43.00 | 3,870.00 |
| 60 | 90 | do | 40.00 | 3,600.00 |
| 61 | 90 | do | 43.50 | 3,915.00 |
| 62 | 90 | do | 45.50 | 4,095.00 |
| 63 | 90 | do | 45.00 | 4,050.00 |
| 64 | 90 | do | 43.00 | 3,870.00 |
| 65 | 90 | do | 44.50 | 4,005.00 |
| 66 | 90 | do | 44.50 | 4,005.00 |
| 67 | 90 | Mediums; cut, scarred, etc. | 33.00 | 2,970.00 |
| 68 | 90 | do | 34.00 | 3,060.00 |
| 69 | 90 | do | 31.00 | 2,790.00 |
| 70 | 90 | do | 34.50 | 3,105.00 |
| 71 | 90 | do | 34.50 | 3,105.00 |
| 72 | 90 | Small mediums | 40.00 | 3,600.00 |
| 73 | 90 | do | 39.50 | 3,555.00 |
| 74 | 60 | do | 38.50 | 2,310.00 |
| 75 | 60 | do | 43.50 | 2,610.00 |
| 76 | 50 | Small mediums; cut, scarred, etc. | 30.00 | 1,500.00 |
| 77 | 50 | do | 29.00 | 1,450.00 |
| 78 | 35 | III. (1 wig; 7 extra extra large; 27 extra large) | 35.50 | 1,242.50 |
| 79 | 35 | III. (1 wig; 6 extra extra large; 28 extra large) | 34.00 | 1,190.00 |
| 80 | 60 | III. (24 large; 23 mediums; 13 small mediums) | 28.00 | 1,680.00 |
| 81 | 60 | III. (24 large; 23 mediums; 13 small mediums) | 27.50 | 1,650.00 |
| 82 | 60 | III. (26 large; 26 mediums; 8 small mediums) | 26.50 | 1,590.00 |
| 83 | 55 | IV. (1 extra extra large; 4 extra large; 10 large; 35 mediums; 5 small mediums) | 18.50 | 1,017.50 |
| Total | 6,100 | | | 271,945.00 |

The following table gives a summary of the trade classification and the percentage of the total number in each class:

SUMMARY OF TRADE CLASSIFICATION AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS, APR. 22, 1918.

| Trade classification. | Number in class. | Percentage. |
|---|---|---|
| Wigs | 17 | 0.28 |
| Extra extra large | 404 | 6.62 |
| Extra large | 1,079 | 17.69 |
| Large | 1,984 | 32.54 |
| Mediums | 2,177 | 35.68 |
| Small mediums | 439 | 7.19 |
| Total | 6,100 | 100.00 |

At the sale on October 7, 1918, the number of skins sold was 2,000 and the total price bid was $103,440. The highest price received was $75, and the average per skin was $51.72, an increase of 16 per cent over the April sale. The following table shows details in regard to the sale:

DETAILS OF SALE OF 2,000 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, OCT. 7, 1918.

| Lot No. | Number of skins. | Trade classification. | Price per skin. | Total for lot. |
|---|---|---|---|---|
| 1 | 30 | Wigs | $75 | $2,250 |
| 2 | 50 | Extra extra large | 57 | 2,850 |
| 3 | 50 | do | 57 | 2,850 |
| 4 | 50 | do | 57 | 2,850 |
| 5 | 50 | do | 56 | 2,800 |
| 6 | 30 | do | 71 | 2,130 |
| 7 | 50 | Extra extra large; cut, scarred, etc | 42 | 2,100 |
| 8 | 70 | Extra large | 53 | 3,710 |
| 9 | 70 | do | 52 | 3,640 |
| 10 | 70 | do | 52 | 3,640 |
| 11 | 70 | do | 60 | 4,200 |
| 12 | 70 | do | 62 | 4,340 |
| 13 | 40 | do | 64 | 2,560 |
| 14 | 35 | Extra large; cut, scarred, etc | 39 | 1,365 |
| 15 | 35 | do | 43 | 1,505 |
| 16 | 80 | Large | 51 | 4,080 |
| 17 | 80 | do | 51 | 4,080 |
| 18 | 80 | do | 52 | 4,160 |
| 19 | 80 | do | 55 | 4,400 |
| 20 | 80 | do | 60 | 4,800 |
| 21 | 80 | do | 61 | 4,880 |
| 22 | 80 | do | 61 | 4,880 |
| 23 | 40 | do | 58 | 2,320 |
| 24 | 50 | Large; cut, scarred, etc | 40 | 2,000 |
| 25 | 50 | do | 40 | 2,000 |
| 26 | 90 | Mediums | 48 | 4,320 |
| 27 | 90 | do | 47 | 4,230 |
| 28 | 90 | do | 47 | 4,230 |
| 29 | 90 | do | 46 | 4,140 |
| 30 | 50 | Mediums; cut, scarred, etc | 35 | 1,750 |
| 31 | 30 | Small mediums | 40 | 1,200 |
| 32 | 30 | do | 38 | 1,140 |
| 33 | 30 | Small mediums; cut, scarred, etc | 33 | 990 |
| 34 | 30 | III.. 3 extra extra large<br>12 large<br>12 mediums<br>3 small mediums | 35 | 1,050 |
| Total | 2,000 | | | 103,440 |

The following table gives a summary of the trade classification and the percentage of the total number in each class:

SUMMARY OF TRADE CLASSIFICATION AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS, OCT. 7, 1918.

| Trade classification. | Number in class. | Percentage. |
|---|---|---|
| Wigs | 30 | 1.50 |
| Extra extra large | 283 | 14.15 |
| Extra large | 460 | 23.00 |
| Large | 712 | 35.60 |
| Mediums | 422 | 21.10 |
| Small mediums | 93 | 4.65 |
| Total | 2,000 | 100.00 |

## GRADES AND COMPARATIVE VALUES OF SEALSKINS.

It appears advisable to record the comparative trade classifications and values received for the various sizes of sealskins offered for sale at St. Louis, April 22 and October 7, 1918. The following table gives the number and grade of skins of each category, and the high, low, and average prices received:

COMPARATIVE VALUES BY GRADES AND SIZES OF SEALSKINS SOLD IN 1918.

| Classes and sales. | Grade. | Number. | High. | Low. | Average. | Total. | Total number. | Average. | Total price. |
|---|---|---|---|---|---|---|---|---|---|
| Wigs: | | | | | | | | | |
| Apr. 22 | I and II | 15 | $64.00 | $64.00 | $64.00 | $960.00 | 17 | $60.55 | $1,029.50 |
| | III | 2 | 35.50 | 34.00 | 34.75 | 69.50 | | | |
| Oct. 7 | I and II | 30 | 75.00 | 75.00 | 75.00 | 2,250.00 | 30 | 75.00 | 2,250.00 |
| Extra extra large: | | | | | | | | | |
| Apr. 22 | I and II | 300 | 64.00 | 56.00 | 58.00 | 17,400.00 | 404 | 53.44 | 21,591.00 |
| | Cut, etc | 90 | 43.00 | 40.00 | 41.33 | 3,720.00 | | | |
| | III | 13 | 35.50 | 34.00 | 34.80 | 452.50 | | | |
| | IV | 1 | 18.50 | 18.50 | 18.50 | 18.50 | | | |
| Oct. 7 | I and II | 230 | 71.00 | 56.00 | 58.60 | 13,480.00 | 283 | 55.42 | 15,685.00 |
| | Cut, etc | 50 | 42.00 | 42.00 | 42.00 | 2,100.00 | | | |
| | III | 3 | 35.00 | 35.00 | 35.00 | 105.00 | | | |
| Extra large: | | | | | | | | | |
| Apr. 22 | I and II | 803 | 57.00 | 51.00 | 54.33 | 45,100.00 | 1,079 | 50.10 | 54,059.50 |
| | Cut, etc | 190 | 38.00 | 35.00 | 36.71 | 6,975.00 | | | |
| | III | 55 | 35.50 | 34.00 | 34.73 | 1,910.50 | | | |
| | IV | 4 | 18.50 | 18.50 | 18.50 | 74.00 | | | |
| Oct. 7 | I and II | 390 | 64.00 | 52.00 | 56.64 | 22,090.00 | 460 | 54.26 | 24,960.00 |
| | Cut, etc | 70 | 43.00 | 39.00 | 41.00 | 2,870.00 | | | |
| Large: | | | | | | | | | |
| Apr. 22 | I and II | 1,440 | 54.50 | 48.00 | 52.05 | 74,960.00 | 1,984 | 47.16 | 93,576.00 |
| | Cut, etc | 460 | 37.50 | 33.00 | 35.67 | 16,410.00 | | | |
| | III | 74 | 28.00 | 26.50 | 27.31 | 2,021.00 | | | |
| | IV | 10 | 18.50 | 18.50 | 18.50 | 185.00 | | | |
| Oct. 7 | I and II | 600 | 61.00 | 51.00 | 56.00 | 33,600.00 | 712 | 53.39 | 38,020.00 |
| | Cut, etc | 100 | 40.00 | 40.00 | 40.00 | 4,000.00 | | | |
| | III | 12 | 35.00 | 35.00 | 35.00 | 420.00 | | | |
| Mediums: | | | | | | | | | |
| Apr. 22 | I and II | 1,620 | 45.50 | 39.00 | 41.97 | 67,995.00 | 2,177 | 39.33 | 85,638.00 |
| | Cut, etc | 450 | 34.50 | 31.00 | 33.40 | 15,030.00 | | | |
| | III | 72 | 28.00 | 26.50 | 27.29 | 1,965.50 | | | |
| | IV | 35 | 18.50 | 18.50 | 18.50 | 647.50 | | | |
| Oct. 7 | I and II | 360 | 48.00 | 46.00 | 47.00 | 16,920.00 | 422 | 45.23 | 19,090.00 |
| | Cut, etc | 50 | 35.00 | 35.00 | 35.00 | 1,750.00 | | | |
| | III | 12 | 35.00 | 35.00 | 35.00 | 420.00 | | | |
| Small mediums: | | | | | | | | | |
| Apr. 22 | I and II | 300 | 43.00 | 38.50 | 39.91 | 12,075.00 | 439 | 36.10 | 16,051.00 |
| | Cut, etc | 100 | 30.00 | 29.00 | 29.50 | 2,950.00 | | | |
| | III | 34 | 28.00 | 26.50 | 27.45 | 933.50 | | | |
| | IV | 5 | 18.50 | 18.50 | 18.50 | 92.50 | | | |
| Oct. 7 | I and II | 60 | 40.00 | 38.00 | 39.00 | 2,340.00 | 93 | 36.93 | 3,435.00 |
| | Cut, etc | 30 | 33.00 | 33.00 | 33.00 | 990.00 | | | |
| | III | 3 | 35.00 | 35.00 | 35.00 | 105.00 | | | |
| Apr. 22 | | | | | | | 6,100 | 44.58 | 271,945.00 |
| Oct. 7 | | | | | | | 2,000 | 51.72 | 103,440.00 |
| Both sales | | | | | | | 8,100 | 46.34 | 375,385.00 |

RECAPITULATION OF SALES OF FUR-SEAL SKINS IN 1918.

| | Apr. 22, 1918. | | Oct. 7, 1918. | | Total. | |
|---|---|---|---|---|---|---|
| | Number. | Amount. | Number. | Amount. | Number. | Amount. |
| Wigs | 17 | $1,029.50 | 30 | $2,250.00 | 47 | $3,279.50 |
| Extra extra large | 404 | 21,591.00 | 283 | 15,685.00 | 687 | 37,276.00 |
| Extra large | 1,079 | 54,059.50 | 460 | 24,960.00 | 1,539 | 79,019.50 |
| Large | 1,984 | 93,576.00 | 712 | 38,020.00 | 2,696 | 131,596.00 |
| Mediums | 2,177 | 85,638.00 | 422 | 19,090.00 | 2,599 | 104,728.00 |
| Small mediums | 439 | 16,051.00 | 93 | 3,435.00 | 532 | 19,486.00 |
| Total | 6,100 | 271,945.00 | 2,000 | 103,440.00 | 8,100 | 375,385.00 |

## FUR-SEAL SKINS ON HAND DECEMBER 31, 1918.

The 1917 report of Alaska Fisheries and Fur Industries, page 95, gives the number of fur-seal skins on hand in the States on December 31, 1917, as 9,600. Of these, 12 skins were in storage in Washington, D. C., thus making the apparent number on hand at St. Louis, 9,588. There was, however, a discrepancy of 2 skins in the shipment from St. George Island in 1914, which should be deducted from the latter number, thus leaving a total of 9,586 on hand at St. Louis as of December 31, 1918. Slight discrepancies sometimes occur between the count on the islands and the final count at St. Louis. The following table shows the receipt of shipments and the sales of skins by Funsten Bros. & Co. during the calendar year 1918:

FUR-SEAL SKINS AT ST. LOUIS IN 1918.

| | | |
|---|---|---|
| On hand, St. Louis, Jan. 1, 1918 | | 9,586 |
| Shipments received in 1918: | | |
| February | 4,258 | |
| July | 3,542 | |
| October | 17,816 | |
| November | 1,978 | 27,594 |
| Total | | 37,180 |
| Sales during 1918: | | |
| April 22 | 6,100 | |
| October 7 | 2,000 | 8,100 |
| Balance on hand Dec. 31, 1918 | | 29,080 |

The above number remaining on hand is the same as reported by Funsten Bros. & Co. under date of January 8, 1919. There were, in addition to the above, 7,483 skins en route from the Pribilof Islands at the end of the year. They reached St. Louis January 29, 1919.

## SALE OF FOX SKINS.

The take of fox skins during the season of 1917–18 was given on pages 88–89 of the 1917 Alaska report as 90 blue and 14 white for St. Paul Island, and 602 blue and 5 white for St. George Island. These skins were shipped from the Islands on the *Roosevelt* June 22, and were sold in St. Louis at public auction on October 7, 1918. The 692 blue foxes brought $57,099.50, an average of $82.51 each. This was an advance of 35 per cent over the prices received for the 1916–17 skins at the sale in October, 1917. The 19 white-fox skins brought $1,080, or $48 to $60 each.

DETAILS OF SALE OF 692 BLUE-FOX SKINS AND 19 WHITE-FOX SKINS FROM PRIBILOF ISLANDS AT ST. LOUIS, OCT. 7, 1918.

| Lot No. | Number of skins. | Trade classification. | Price per skin. | Total for lot. |
|---|---|---|---|---|
| Blue-fox skins: | | | | |
| 120 | 4 | Fine dark | $116.00 | $464.00 |
| 121 | 6 | ....do | 136.00 | 816.00 |
| 122 | 10 | I dark | 113.00 | 1,130.00 |
| 123 | 10 | ....do | 96.00 | 960.00 |
| 124 | 8 | ....do | 93.00 | 744.00 |
| 125 | 8 | ....do | 91.00 | 728.00 |
| 126 | 6 | II extra large dark | 93.00 | 558.00 |
| 127 | 6 | II dark | 86.00 | 516.00 |
| 128 | 6 | ....do | 85.00 | 510.00 |
| 129 | 12 | ....do | 88.00 | 1,056.00 |
| 130 | 12 | ....do | 86.00 | 1,032.00 |
| 131 | 12 | ....do | 82.00 | 984.00 |
| 132 | 8 | II extra large low dark | 76.00 | 608.00 |
| 133 | 10 | II low dark | 65.00 | 650.00 |
| 134 | 9 | ....do | 62.00 | 558.00 |
| 135 | 4 | I extra large blue | 116.00 | 464.00 |
| 136 | 5 | ....do | 95.00 | 475.00 |
| 137 | 10 | I blue | 94.00 | 940.00 |
| 138 | 10 | ....do | 80.00 | 800.00 |
| 139 | 10 | ....do | 92.50 | 925.00 |
| 140 | 12 | II blue | 80.00 | 960.00 |
| 141 | 16 | ....do | 70.00 | 1,120.00 |
| 142 | 12 | ....do | 69.00 | 828.00 |
| 143 | 12 | II low blue | 73.00 | 876.00 |
| 144 | 13 | II low | 61.00 | 793.00 |
| 145 | 14 | ....do | 53.00 | 742.00 |
| 146 | 10 | I silvery | 104.00 | 1,040.00 |
| 147 | 13 | II pale | 63.00 | 819.00 |
| 148 | 21 | III dark | 45.00 | 945.00 |
| 149 | 20 | III blue | 47.00 | 940.00 |
| 150 | 4 | Extra fine dark | 200.00 | 800.00 |
| 151 | 8 | I extra large fine dark | 165.00 | 1,320.00 |
| 152 | 5 | Fine dark | 175.00 | 875.00 |
| 153 | 5 | ....do | 150.00 | 750.00 |
| 154 | 5 | II extra large dark | 125.00 | 625.00 |
| 155 | 6 | Fine dark | 140.00 | 840.00 |
| 156 | 7 | II dark | 88.00 | 616.00 |
| 157 | 10 | Fine blue | 130.00 | 1,300.00 |
| 158 | 8 | I blue | 100.00 | 800.00 |
| 159 | 12 | II blue | 88.00 | 1,056.00 |
| 160 | 5 | II low blue | 76.00 | 380.00 |
| 161 | 5 | I extra large blue | 120.00 | 600.00 |
| 162 | 4 | Fine dark | 175.00 | 700.00 |
| 163 | 4 | I extra large dark | 170.00 | 680.00 |
| 164 | 10 | I dark | 160.00 | 1,600.00 |
| 165 | 10 | ....do | 140.00 | 1,400.00 |
| 166 | 8 | II extra large dark | 94.00 | 752.00 |
| 167 | 8 | II dark | 92.00 | 736.00 |
| 168 | 6 | ....do | 88.00 | 528.00 |
| 169 | 12 | ....do | 84.00 | 1,008.00 |
| 170 | 12 | ....do | 87.00 | 1,044.00 |
| 171 | 8 | II extra large low dark | 68.00 | 544.00 |
| 172 | 4 | I extra large blue | 105.00 | 420.00 |
| 173 | 4 | ....do | 105.00 | 420.00 |
| 174 | 10 | I blue | 95.00 | 950.00 |
| 175 | 10 | ....do | 97.00 | 970.00 |
| 176 | 6 | ....do | 80.00 | 480.00 |
| 177 | 8 | II extra large blue | 90.00 | 720.00 |
| 178 | 12 | II blue | 88.00 | 1,056.00 |
| 179 | 14 | ....do | 86.00 | 1,204.00 |
| 180 | 14 | ....do | 84.00 | 1,176.00 |
| 181 | 12 | ....do | 84.00 | 1,008.00 |
| 182 | 12 | ....do | 70.00 | 840.00 |
| 183 | 12 | II low blue | 73.00 | 876.00 |
| 184 | 12 | ....do | 69.00 | 828.00 |
| 185 | 14 | II low | 60.00 | 840.00 |
| 186 | 9 | II low dark | 74.00 | 666.00 |
| 187 | 14 | I and II pale | 58.00 | 812.00 |
| 188 | 18 | III | 35.00 | 630.00 |
| 189 | 21 | IV | 11.00 | 231.00 |
| 190 | 15 | V | 2.50 | 37.50 |
| White-fox skins: | | | | |
| 191 | 14 | I and II extra large | 60.00 | 840.00 |
| 192 | 5 | I and II white fox | 48.00 | 240.00 |
| Total | 711 | | | 58,179.50 |

# FUR-SEAL CENSUS, PRIBILOF ISLANDS, 1918.

By G. Dallas Hanna.

## SCOPE OF 1918 CENSUS.

The census of the fur-seal herd resorting to the Pribilof Islands in 1918 was taken in the usual manner. It is gratifying to note that a continued increase is shown. The important element of the herd, the breeding cows, began to gain immediately upon the cessation of pelagic sealing in 1911. The influence of this has probably ceased to exist by this time and the herd appears to have settled upon a normal annual rate of increase of about 10 per cent. The actual average for seven years has been 9.78 per cent.

Information procured by Agents Fassett and Proctor in seal killings has been freely used in the census computations. Those actually assisting in the rookery counts were C. E. Crompton and the late A. C. Reynolds. The Bureau was deprived of the important assistance in field work of Dr. Harold Heath through an unfortunate accident in which he was severely injured. A cliff caved away as he was passing along Tolstoi Point and in the fall upon the rocks below he suffered fractures of both legs and of several face bones.

The Coast Guard cutter *Unalga* furnished transportation between the islands at the proper times for census work.

The plan of the 1917 census was followed closely. Harems were counted on all rookeries at the height of the breeding season and enough pups were counted later to ascertain the average harem. With this as a basis, the total number of pups was computed and also the remainder of the information so necessary to a thorough understanding of the subject was derived. Little could be accomplished in way of area computations.

Commercial killing in 1918 furnished an opportunity to test the estimates of bachelors of previous years. The quota taken was larger than in any year since 1889, and it was the general opinion of all concerned on the islands that the figures for each age which had been computed in advance were conservative. Age determination of all seals killed, by measurement of the carcass, has made it possible to not only keep the reserve required by law, but also to state with a reasonable degree of accuracy the number of any one class remaining for killing in subsequent years. The estimates are believed to be under rather than over the actual number of each class in existence.

## PUPS.

Pup counting began just as soon as it was possible to enter the rookeries with reasonable safety to human life and continued until the number which was swimming made the figures obtainable subject to too great an error to warrant further work. The same field methods were used as in former years. As in 1917 those rookeries were selected for counting which were known from past records and observations on the ground to be representative of the herd. The average harem thus ascertained proved to be almost exactly the same as that which was found in 1917, and it appears from all avail-

able information that this is about as low as it can go. As long as the percentage of nonbreeding bulls to breeding bulls remains as high as it has been in these two years there is no probability that the average harem will materially change for the herd.

There is a general stability or sameness developing on the rookeries due to the excess of bulls, and the deviation of the average harem on certain rookeries from the general average seems now to be due largely to topography of the breeding areas. This is indicated by the similarity of the average harems on rookeries counted the past two seasons.

Since pups could not be counted on all rookeries, the average harem had to be computed for many of them. On account of the closeness of the 1917 and 1918 figures on those areas counted it was placed at the same as the 1917 figure in most cases. The only exceptions to this rule were in those cases in which field observations were convincing proof that the 1917 condition was abnormal and had disappeared.

Since so many factors relating to the pups are directly dependent upon the average harem, this has formed the basis of most of the computations found in the following tables. Thus it is well known that the percentage of dead pups on a given rookery is dependent on the topography of the rookeries, the number of harem bulls, and the average harem. With these factors constant, the percentage must be constant when pelagic sealing is nonexistent and no epidemic occurs, no evidence of either of which was observed in 1918. Therefore it seems justifiable to place the percentage of dead on rookeries not actually counted at the same as was carefully computed for 1917. This brings it to 3 per cent for the herd.

DISTRIBUTION OF PUPS IN 1918.

| Rookery. | Date of counts. | Living pups. | Dead pups. | Total pups. | Percentage dead. |
|---|---|---|---|---|---|
| ST. PAUL ISLAND. | | | | | |
| Kitovi | | 2,502 | 38 | [a] 2,540 | 1.49 |
| Lukanin | | 2,174 | 61 | [a] 2,235 | 2.72 |
| Gorbatch | | 9,154 | 332 | [a] 9,486 | 3.49 |
| Ardiguen | | 778 | 14 | [a] 792 | 1.76 |
| Reef | Aug. 9–10 | 18,890 | 508 | 19,398 | 2.61 |
| Sivutch | | 6,167 | 158 | [a] 6,325 | 2.49 |
| Lagoon | Aug. 7 | 493 | 19 | 512 | 3.71 |
| Tolstoi | | 16,349 | 376 | [a] 16,725 | 2.24 |
| Zapadni | | 11,156 | 304 | [a] 11,460 | 2.65 |
| Little Zapadni | | 8,795 | 294 | [a] 9,089 | 3.23 |
| Zapadni Reef | Aug. 8 | 517 | 19 | 536 | 3.54 |
| Polovina | Aug. 12 | 5,191 | 152 | 5,343 | 2.84 |
| Polovina Cliffs | | 1,824 | 58 | [a] 1,882 | 3.08 |
| Little Polovina | | 1,473 | 18 | [a] 1,491 | 1.20 |
| Morjovi | | 3,224 | 111 | [a] 3,335 | 3.32 |
| Vostochni | | 30,057 | 1,411 | [a] 31,468 | 4.48 |
| Total | | 118,744 | 3,873 | 122,617 | 3.15 |
| ST. GEORGE ISLAND. | | | | | |
| North | | 6,837 | 174 | [a] 7,011 | 2.48 |
| Staraya Artil | | 5,332 | 108 | [a] 5,440 | 1.98 |
| Zapadni | Aug. 14 | 796 | 10 | 806 | 1.24 |
| South | do | 61 | | 61 | |
| East Reef | Aug. 15 | 2,092 | 28 | 2,120 | 1.31 |
| East Cliffs | | 4,751 | 109 | [a] 4,860 | 2.24 |
| Total | | 19,869 | 429 | 20,298 | 2.11 |
| Total, both islands | | 138,613 | 4,302 | 142,915 | 3.01 |

[a] Based on estimated average harem.

The percentage of increase in the number of pups on a given rookery is dependent upon the choosing of a landing place by the cows. Accordingly great variations in the percentage of gain on individual rookeries have been recorded during the past few years. Thus in 1918 one rookery on which a count was made gained 154 per cent, while another lost 3 per cent. There is no adequate explanation available for these conditions. The gains for the entire herd, however, seem to be following closely an autocatylitic curve, as was pointed out by Prof. G. H. Parker.[a] During the past six years the percentages of increase have been 12.54, 1.06, 11.02, 12.99, 9.44, and 11.63, with an average of 9.78 since 1912. For a rough calculation into the future it may be placed at 10 per cent, and taking into consideration the conservative errors of the census it may actually exceed this figure through a period of years.

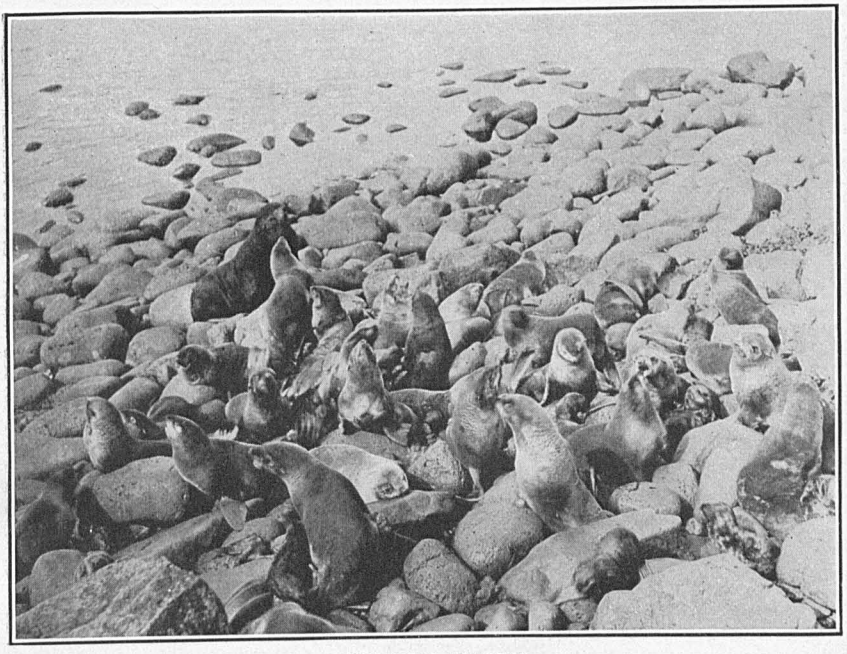
PERCENTAGE OF INCREASE OR DECREASE IN THE NUMBER OF PUPS IN 1918 FROM 1917.

| Rookery. | Total pups, 1917. | Total pups, 1918. | Percentage of increase (+) or decrease (−). |
|---|---|---|---|
| ST. PAUL ISLAND. | | | |
| Kitovi | 2,520 | 2,540 | + 0.79 |
| Lukanin | 2,235 | 2,235 | ..... |
| Gorbatch | 8,049 | 9,486 | + 9.67 |
| Ardiguen | 726 | 792 | + 9.09 |
| Reef | 17,442 | 19,398 | + 11.21 |
| Sivutch | 5,060 | 6,325 | + 25.00 |
| Lagoon | 466 | 512 | + 9.87 |
| Tolstoi | 15,433 | 16,725 | + 8.37 |
| Zapadni | 9,828 | 11,460 | + 16.60 |
| Little Zapadni | 6,863 | 9,089 | + 32.43 |
| Zapadni Reef | 358 | 536 | + 49.72 |
| Polovina | 4,918 | 5,343 | + 8.64 |
| Polovina Cliffs | 1,761 | 1,882 | + 6.87 |
| Little Polovina | 1,260 | 1,491 | + 18.33 |
| Morjovi | 2,921 | 3,335 | + 14.17 |
| Vostochni | 28,249 | 31,468 | + 11.39 |
| Total | 108,689 | 122,617 | + 12.81 |
| ST. GEORGE ISLAND. | | | |
| North | 6,783 | 7,011 | + 3.36 |
| Staraya Artil | 5,642 | 5,440 | − 3.58 |
| Zapadni | 1,050 | 806 | − 2.32 |
| South | 24 | 61 | +154.16 |
| East Reef | 1,786 | 2,120 | + 13.70 |
| East Cliffs | 4,050 | 4,860 | + 20.00 |
| Total | 19,335 | 20,298 | + 4.98 |
| Total, both islands | 128,024 | 142,915 | + 11.63 |

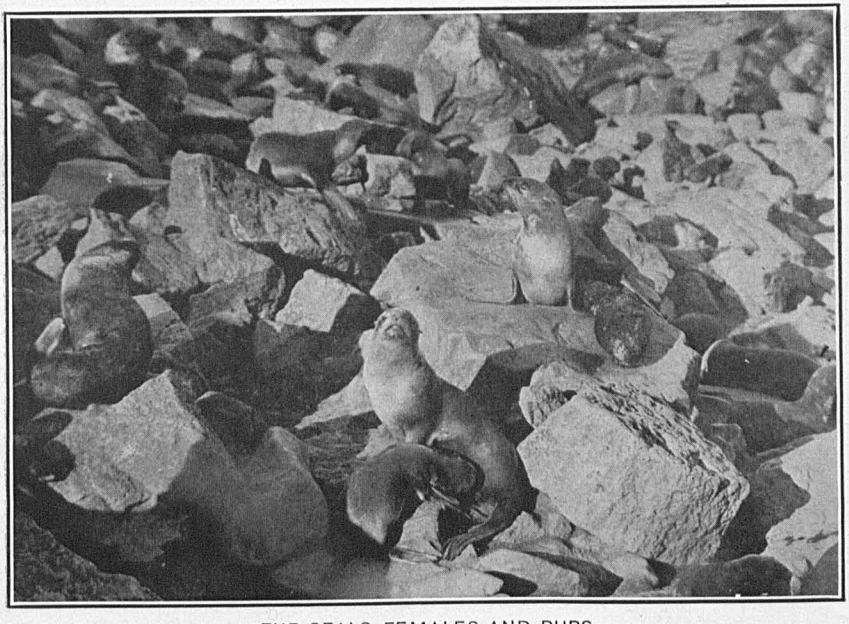
## BREEDING COWS.

By inference the number of breeding cows is the same as the number of pups, 142,915. This is a very creditable increase of 14,891, or 11.63 per cent from 1917. The increase showed very materially on the rookeries. Many of the avenues left for ingress and egress to the hauling grounds have closed up or are fast closing. Small outlying breeding masses of seals are being joined to larger masses and there is a general expansion rearward. The season was marked by the establishment of very few new breeding sections.

[a] Proceedings, National Academy of Science, vol. 4, p. 169.



A FUR-SEAL HAREM.



FUR SEALS, FEMALES AND PUPS.

Some, which in 1917 promised to develop, were abandoned. For instance, the lone bull failed to return to Otter Island to try to establish a harem, and no cows returned to Suthetunga, otherwise known as Zapadni Point. There seemed to be a tendency everywhere toward crowding in the larger areas, but the records do not bear this out. The phenomenal growth of 154 per cent on South Rookery is a feature of interest. Especially is this true in the light of conditions on Zapadni (St. George) about half a mile distant. For some unaccountable reason this rookery fails to develop.

### CHARTS OF BREEDING AREAS.

Unfortunately it was not possible to test the area method of computation of seals on the breeding grounds of St. Paul Island again this year. Charts were carefully made on St. George, however, by Mr. A. C. Reynolds, and his areas have been determined as follows by means of a polar planimeter:

AREAS OF ST. GEORGE ROOKERIES.

| Rookery. | Square feet. | Rookery. | Square feet. |
|---|---|---|---|
| North | 102,000 | East Reef | 35,600 |
| Staraya Artil | 65,200 | East Cliffs | 35,200 |
| Zapadni | 17,200 | | |

No chart of South Rookery was made, because it has been established since the Coast and Geodetic Survey completed its work. In other cases their charts were taken in the field and the plotting carefully done there.

### LOSS OF COWS ON ISLANDS.

On four rookeries of St. Paul Island 29 dead cows were found during the counting of 19,398 pups. This proportion applied to the entire herd would give 213 as the total dead. This number is to be compared with 39 for 1916 and 129 for 1917. The increase in the percentage of loss of cows on the rookeries is larger than the normal percentage of increase of this class, due solely to the great surplus of males which has developed in recent years. If the progeny of these lost cows is ascertained for 20 or more years ahead, it will be found that the herd is suffering a very perceptible injury. It can only be avoided by reducing the number of breeding and fighting bulls, which will result in an increase in the average harem.

In 1918 the agents have kept very accurate records of the loss of cows during commercial killing. It has always been known that an occasional cow will go on the bachelor's hauling grounds and may even give birth to her pup there. Should she be young, it is almost impossible to distinguish her from the 3-year-old males without capturing her and making an anatomical examination. This is impracticable industrially. Occasionally a cow in the drive will be hit with a club unavoidably, even though she be recognized. The total number killed in the most extensive work since 1889 was St.

Paul 23 and St. George 12. It was customary in commercial sealing throughout the leases 1871 to 1909 to close operations at the end of July, because the rigid discipline of the harem masters is then relaxed and cows wander in increased numbers to the hauling grounds. The danger of killing them after that date is greater than before.

## HERMAPHRODITE SEALS.

In the 1918 killings two hermaphrodite seals were found on St. Paul Island. Both were too small to have begun the development of the outward appearance of the bull and were supposed to be 3-year-old males by the clubbers. The skull of one which was studied had the characteristics of both sexes while the only generative organs present were ovaries.

## THE 3-YEAR-OLD COWS.

Since 1915 the loss of seals during the first three years has been placed at 50 per cent. The result arrived at in 1918 is further evidence that this rate of loss is approximately correct.

In 1917 there were estimated 128,024 breeding cows. By deducting 10 per cent or 12,802 which have been lost due to old age there remain 115,222 of the 1917 herd in 1918. This figure deducted from the total number calculated for 1918 (142,915) leaves 27,693 to represent the increment of 3-year-old cows in this year.

To get at the actual number of this class it is necessary to go back to 1915, when a complete pup count was made showing 103,527. If half of these were males and half females and all had lived, there would be 51,763 new cows in 1918. If half died, however, there would only be 25,881, a number so close to that calculated above, 27,693, as to be significant. The difference would be easily accounted for in many ways, such as an annual variation of losses, inexact equality of births of sexes, etc.

AVERAGE HAREMS ON ROOKERIES COUNTED IN 1918.

| Rookery. | Breeding cows. | Harem bulls. | Average harem. |
|---|---|---|---|
| ST. PAUL ISLAND. | | | |
| Reef | 19,398 | 688 | 28.19 |
| Lagoon | 512 | 25 | 20.48 |
| Zapadni Reef | 536 | 27 | 19.85 |
| Polovina | 5,343 | 185 | 28.88 |
| Total | 25,789 | 925 | 27.88 |
| ST. GEORGE ISLAND. | | | |
| Zapadni | 806 | 43 | 18.74 |
| South | 61 | 8 | 7.62 |
| East Reef | 2,120 | 99 | 21.41 |
| Total | 2,987 | 150 | 19.91 |
| Total, both islands | 28,776 | 1,075 | 26.76 |

THE AVERAGE HAREM IN 1918 FOR ALL ROOKERIES.

| Rookery. | Breeding cows. | Harem bulls. | Average harem. |
|---|---|---|---|
| ST. PAUL ISLAND. | | | |
| Kitovi | 2,540 | 127 | a 20.00 |
| Lukanin | 2,235 | 100 | a 22.35 |
| Gorbatch | 9,486 | 306 | a 31.00 |
| Ardiguen | 792 | 36 | a 22.00 |
| Reef | 10,398 | 688 | 28.19 |
| Sivutch | 6,325 | 230 | a 27.50 |
| Lagoon | 512 | 25 | 20.48 |
| Tolstoi | 16,725 | 625 | a 26.76 |
| Zapadni | 11,460 | 494 | a 23.19 |
| Little Zapadni | 9,089 | 343 | a 26.49 |
| Zapadni Reef | 536 | 27 | 19.85 |
| Polovina | 5,343 | 185 | 28.88 |
| Polovina Cliffs | 1,882 | 93 | a 20.23 |
| Little Polovina | 1,491 | 52 | a 28.67 |
| Morjovi | 3,335 | 145 | a 23.00 |
| Vostochni | 31,468 | 1,134 | a 27.74 |
| Total | 122,617 | 4,610 | 26.59 |
| ST. GEORGE ISLAND. | | | |
| North | 7,011 | 262 | a 26.75 |
| Staraya Artil | 5,440 | 160 | a 34.00 |
| Zapadni | 806 | 43 | 18.74 |
| South | 61 | 8 | 7.62 |
| East Reef | 2,120 | 99 | 21.41 |
| East Cliffs | 4,860 | 162 | a30.00 |
| Total | 20,298 | 734 | 27.65 |
| Total, both islands | 142,915 | 5,344 | 26.74 |

a Estimate.

## AGES OF COWS.

The maximum age which the female seal attains is not known at present, but this continues to be one of the most important unsolved problems in connection with the herd. No opportunity to gather information upon the subject has been overlooked.

Branding of female pups was first undertaken in 1896 by the Jordan Commission. It had as its object in those days the making of the skins of the female seals of such small value that it would not be profitable for pelagic sealers to continue in business. It was believed at first that the results to be obtained were of sufficient value to warrant the continuation of the process for a considerable period of years; accordingly instructions were issued, and the branding continued up to and including the season of 1902. The derival of important biological information from these branded animals seemed to be an overlooked possibility. As a measure of protection to the female seals it was a failure.

In 1896, 377 pups were branded; 124 of these had three bars across the back and one down the center, 191 had a single bar across the back, and 62 had this and three bars across the back. In 1897, 847 were branded: with three bars across the back, 1,033 had two bars, and 5,498 had one bar. Thereafter the single bar was used entirely, with the exception of 1898, when 300 were branded with a diagonal bar across the back. The total number branded during any of the years after 1897 can not be given, because the figures for St. George Island are lacking, but from 1898 to 1902 the numbers branded on St. Paul Island were secured from the island log.

FEMALE PUPS BRANDED, 1896 TO 1902.

| Year. | Number. | Year. | Number. |
|---|---|---|---|
| 1896 | [a] 377 | 1901 | [b] 4,173 |
| 1897 | [a] 7,369 | 1902 | [b] 1,416 |
| 1898 | [b] 2,363 | | |
| 1899 | [b] 2,191 | Total | 19,587 |
| 1900 | [b] 1,698 | | |

[a] Including St. George Island. [b] St. Paul Island only.

These branded animals have returned to the rookeries each succeeding season up to and including 1918, but since the single bar brand was used in many successive years we are not safe in assuming that any branded animal bearing this brand was born before 1902. This would make the unquestionable age of branded cows seen in 1918, 16 years. Since the cow brings forth her first young when 3 years old, this would give her 15 breeding years at least. Thus the assumption of a normal old-age death rate of the female of 10 per cent per year seems to be if anything too large.

In 1918 there were observed by Mr. Reynolds, Mr. Crompton, and myself six of these brands which may be known as the 1902 series, three on St. Paul and three on St. George. Two of these had nursing pups. When it is considered that these branded animals passed through nine years of relentless pelagic sealing, this is not an insignificant number by any means.

There is little to record regarding the 1912 series of branded cows. They were observed on many rookeries and seemed to be normal in every respect.

## BREEDING BULLS.

The count of bulls actually in charge of harems was made complete at the usual time—the height of the breeding season. It continues to be the most important of all census work, and great care has been taken to make it as accurate as possible. The count is attended with considerable danger to human life when the rookeries are as large as in 1918. In order to get a vantage point from which beachline harems can be seen and counted, it is often necessary to run the cordon of idle bulls. A misstep or a fall would likely prove fatal. In other places it is necessary to set up a long ladder in order to get a view of distant bulls which could not possibly be seen from the ground. This ladder must be held by natives, and when a high wind is blowing there is considerable danger of it overturning. A fall to the jagged rocks below would be serious. Plans are being considered for a platform walkway for one of the St. George rookeries, and if it proves a success here the same will probably be installed on St. Paul. In some cases when the weather is suitable certain rookeries can be counted more accurately from a boat than from the land. In this way good counts were obtained on Lagoon, Tolstoi, the three Zapadnis, and Sivutch on St. Paul and on Staraya Artil and the two East rookeries on St. George.

The number of breeding bulls is obviously greatly in excess of the actual requirements on the rookeries. In addition to these there is a large reserve of idle and surplus bulls.

Facts obtained in 1918 from the 1912 branded males are of the greatest significance in showing where this excess came from. The 1912 seals were 6 years old this year. The supposition has generally prevailed in the past that males of this age were fully grown and able to hold harems or at least skirt the rookeries as idle bulls. But this is not true. The 6-year-old male is hardly half grown and resorts to the hauling grounds or elsewhere. He is not physically able to get anywhere near the breeding cows.

These 6-year-olds were born the year the closed season became effective. Commercial killing was not done in 1912. So where does this great excess of full-grown males come from which has been found in 1916, 1917, and 1918? Obviously it can not be from the 6-year-olds. Likewise it can not wholly be from those animals which were born in 1910 and 1911, because they were only 6 years old in 1916 and 1917, respectively, when there was a surplus. Therefore the closed season of 1912–1917 has not yet become effective upon the breeding grounds, and the surplus found in 1916 and 1917 and in large part in 1918 comes from those reserves spared from the killings of 1908 to 1911. The reserves then made for breeding purposes were too large rather than too small. They provided the herd with so many bulls that the death rate of both pups and cows on land is far above what it should be.

## IDLE BULLS.

Idle bulls were counted at the same time as the harems, and as the rookeries exist to-day this is a difficult task. There are so many nonbreeding males about the rookeries that some plan had to be followed in segregating the idle bulls and that class variously known as quitters, young bulls, and half bulls. It has been learned that about three tiers of males just outside of the harems are stationary and hold their positions tenaciously. They are found spaced about as the harem bulls. Out beyond these there are more bulls, however, which wander here and there endeavoring to find a place where they can get in close to the harems. The plan followed the past two years has been to classify those holding positions as idle bulls and all others as surplus bulls. This is a distinction which in some cases is hard to decide upon and the classes intergrade. However, it does not seem practicable to call all males about the rookery, not actually in possession of cows, idle bulls. This might be done to obtain a figure for the total available reserve males except for the fact that not half of them are about the rookery. Large numbers give up hope of holding harems and go to the hauling grounds and to sea to cruise about the rookery margins. These must be estimated. Therefore the plan adopted seems best to follow.

The harem count gave the following results:

HAREM AND IDLE BULLS IN 1918.

| Rookery. | Date. | Harem bulls. | Idle bulls. | Total. |
|---|---|---|---|---|
| ST. PAUL ISLAND. | | | | |
| Kitovi | July 16 | 127 | 82 | 219 |
| Lukanin | do | 100 | 49 | 149 |
| Gorbatch | do | 306 | 137 | 443 |
| Ardiguen | do | 36 | 13 | 49 |
| Reef | do | 688 | 307 | 995 |
| Sivutch | July 19 | 230 | 90 | 320 |
| Lagoon | July 18 | 25 | 18 | 43 |
| Tolstoi | do | 625 | 312 | 937 |
| Zapadni | do | 494 | 193 | 687 |
| Little Zapadni | do | 343 | 199 | 542 |
| Zapadni Reef | do | 27 | 8 | 35 |
| Suthetunga | do | | | |
| Polovina | do | 185 | 131 | 316 |
| Polovina Cliffs | do | 93 | 59 | 152 |
| Little Polovina | do | 52 | 23 | 75 |
| Morjovi | July 17 | 145 | 94 | 239 |
| Vostochni | do | 1,134 | 530 | 1,664 |
| Total | | 4,610 | 2,245 | 6,855 |
| ST. GEORGE ISLAND. | | | | |
| North | July 22 | 262 | 64 | 326 |
| Staraya Artil | July 23 | 160 | 40 | 200 |
| Zapadni | July 22 | 43 | 20 | 63 |
| South | do | 8 | 8 | 16 |
| East Reef | July 23 | 99 | 45 | 144 |
| East Cliffs | do | 162 | 22 | 184 |
| Total | | 734 | 199 | 933 |
| Total, both islands | | 5,344 | 2,444 | 7,788 |

PERCENTAGE OF IDLE BULLS TO HAREM BULLS COMPARED TO THE AVERAGE HAREM IN 1918.

| Rookery. | Percentage idle bulls to harem bulls. | Average harem. |
|---|---|---|
| ST. PAUL ISLAND. | | |
| Kitovi | 65.35 | 20.00 |
| Lukanin | 49.00 | 22.35 |
| Gorbatch | 44.77 | 31.00 |
| Ardiguen | 36.11 | 22.00 |
| Reef | 44.62 | 28.19 |
| Sivutch | 39.13 | 27.50 |
| Lagoon | 72.00 | 20.48 |
| Tolstoi | 49.92 | 26.76 |
| Zapadni | 39.06 | 23.19 |
| Little Zapadni | 58.01 | 26.49 |
| Zapadni Reef | 29.62 | 19.85 |
| Polovina | 70.81 | 28.88 |
| Polovina Cliffs | 63.44 | 20.23 |
| Little Polovina | 44.23 | 28.67 |
| Morjovi | 64.82 | 23.00 |
| Vostochni | 46.73 | 27.74 |
| Total | 48.72 | 26.59 |
| ST. GEORGE ISLAND. | | |
| North | 24.42 | 26.75 |
| Staraya Artil | 25.00 | 34.00 |
| Zapadni | 46.51 | 18.74 |
| South | 100.00 | 7.62 |
| East Reef | 45.45 | 21.41 |
| East Cliffs | 13.58 | 30.00 |
| Total | 27.11 | 27.65 |
| Total, both islands | 45.75 | 26.74 |

## SURPLUS BULLS.

No count of bachelors on the hauling grounds was made at the height of the season because of the interference this would have caused in the killings then taking place. In its stead the surplus bulls were counted about the back of the rookeries. This class includes those males found here and likewise those which are on the hauling grounds and elsewhere; obviously, the last must be estimated. No counts of them are possible. A count about the rookeries, however, is valuable because in a way it shows a breeding reserve which is unquestionably known to be in existence. For this purpose they might be added to the idle bulls but would tend to give an erroneous impression, because the count only represents a very small fraction of the number in actual existence. If those counted were added to the number of idle bulls they would make 2,444 + 3,951, or 6,395 nonbreeding males found about the rookeries at the time of the 1918 height of season harem count. This makes the percentage of idle and surplus bulls to harem bulls 119.66. From this it is apparent why the average harem was at or very near a minimum.

SURPLUS BULLS COUNTED IN 1918.

| Rookery. | Surplus bulls. | Rookery. | Surplus bulls. |
|---|---|---|---|
| ST. PAUL ISLAND. | | ST. GEORGE ISLAND. | |
| Kitovi | 60 | North | 91 |
| Lukanin | 56 | Staraya Artil | 56 |
| Gorbatch | 168 | Zapadni | 29 |
| Reef | 595 | South | 4 |
| Sivutch | 250 | East Reef | 37 |
| Tolstoi | 267 | Total | 217 |
| Suthetunga | 93 | | |
| Zapadni | 500 | Total, both islands | 3,951 |
| Little Zapadni | 54 | | |
| Polovina | 194 | | |
| Little Polovina | 80 | | |
| Morjovi | 157 | | |
| Vostochni | 1,260 | | |
| Total | 3,734 | | |

## GAINS OF BULLS.

The great significant fact standing out in the census work of 1918 is the percentage of gain of harem bulls. This was 10.18 for the entire herd, a figure differing but slightly from the increase of the cows. Since there was an overabundance of idle and surplus bulls, it seems to show conclusively that the average harem in these two years was at its minimum. The average increase of harem bulls the five preceding years was 36.68 per cent. The increase or decrease of idle bulls means but little at this time. The difficulties of determining the actual number in this class as distinct from surplus bulls are almost insurmountable. Those animals at the rear of the rookery which might properly be called idle bulls either merge into the hauling grounds on one side occupied solely by surplus bulls and bachelors, or on the other side into the group properly known as idle bulls. It would not be right to call all bulls on the hauling grounds "idle bulls." Neither could the figure obtained from counting surplus bulls on the back of a rookery be considered to represent all the animals in this group. The great difficulty lies in the fact that in a large number of cases there is no line of demarcation between a rookery and a hauling ground. The rearward extension of the breeding seals is bordered by a sharp line, but the other classes are not.

At present there is no perfectly adequate means of classifying the nonbreeding bulls, and the plan adopted must be continued in spite of any faults it may possess.

COMPARISON OF HAREM AND IDLE BULLS IN 1918 WITH 1917.

| Rookery. | Harem bulls. | | | Idle bulls. | | | Total. | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1917. | 1918. | Gain or loss. | 1917. | 1918. | Gain or loss. | 1917. | 1918. | Gain or loss. |
| ST. PAUL ISLAND. | | | *Per cent.* | | | *Per cent.* | | | *Per cent.* |
| Kitovi | 126 | 127 | + 0.79 | 56 | 82 | + 46.42 | 182 | 209 | + 9.34 |
| Lukanin | 100 | 100 | ..... | 54 | 49 | − 9.25 | 154 | 149 | − 3.24 |
| Gorbatch | 279 | 306 | + 9.67 | 130 | 137 | + 5.38 | 409 | 443 | + 8.31 |
| Ardiguen | 33 | 36 | + 9.09 | 28 | 13 | − 53.57 | 61 | 49 | −19.67 |
| Reef | 613 | 688 | +12.23 | 237 | 307 | + 29.53 | 850 | 995 | +17.05 |
| Sivutch | 184 | 230 | +25.00 | 72 | 90 | + 25.00 | 256 | 320 | +25.00 |
| Otter Island | ..... | ..... | ..... | 1 | ..... | ..... | 1 | ..... | ..... |
| Lagoon | 24 | 25 | + 4.16 | 15 | 18 | + 20.00 | 39 | 43 | +10.25 |
| Tolstoi | 671 | 625 | − 6.85 | 180 | 312 | + 73.33 | 851 | 937 | +10.10 |
| Suthetunga | 2 | ..... | ..... | 64 | ..... | ..... | 66 | ..... | ..... |
| Zapadni | 420 | 494 | +17.61 | 342 | 193 | − 43.56 | 762 | 687 | − 9.84 |
| Little Zapadni | 259 | 343 | +32.43 | 70 | 199 | +184.28 | 329 | 542 | +64.74 |
| Zapadni Reef | 22 | 27 | +22.72 | 13 | 8 | − 38.46 | 35 | 35 | ..... |
| Polovina | 166 | 185 | +11.44 | 130 | 131 | + .76 | 296 | 316 | + 6.75 |
| Polovina Cliffs | 87 | 93 | + 6.89 | 31 | 59 | + 90.32 | 118 | 152 | +28.81 |
| Little Polovina | 35 | 52 | +48.57 | 51 | 23 | − 54.90 | 86 | 75 | −12.79 |
| Morjovi | 127 | 145 | +14.17 | 83 | 94 | + 13.25 | 210 | 239 | +13.80 |
| Vostochni | 1,018 | 1,134 | +11.39 | 784 | 530 | − 32.39 | 1,802 | 1,664 | − 7.65 |
| Total | 4,166 | 4,610 | +10.65 | 2,341 | 2,245 | − 4.10 | 6,507 | 6,855 | + 5.34 |
| ST. GEORGE ISLAND. | | | | | | | | | |
| North | 266 | 262 | − 1.50 | 114 | 64 | − 43.85 | 380 | 326 | −14.21 |
| Staraya Artil | 163 | 160 | − 1.84 | 113 | 40 | − 64.60 | 276 | 200 | −27.53 |
| Zapadni | 33 | 43 | +30.30 | 17 | 20 | + 17.64 | 50 | 63 | +26.00 |
| South | 6 | 8 | +33.33 | 6 | 8 | + 33.33 | 12 | 16 | +33.33 |
| East Reef | 81 | 99 | +22.22 | 54 | 45 | − 16.66 | 135 | 144 | + 6.66 |
| East Cliffs | 135 | 162 | +20.00 | 61 | 22 | − 63.93 | 196 | 184 | − 6.12 |
| Total | 684 | 734 | + 7.30 | 365 | 199 | − 45.47 | 1,049 | 933 | −11.05 |
| Total, both islands | 4,850 | 5,344 | +10.18 | 2,706 | 2,444 | − 9.68 | 7,556 | 7,788 | + 2.99 |

## AGES OF BULLS.

The age at which a male fur seal is full grown and the old-age limit are very important problems which are as yet only partially solved. It is known definitely that the breeding age is not reached in six years. And if the size at this age is any indication of the period of adolescence, full growth may not be reached until about the tenth year. This remains to be determined in the future from branded animals.

The maximum age is not certainly known, but has been estimated at from 15 to 20 years. The number of breeding years, however, is known positively to be as many as five, but not certainly any more. Probably the period is shorter when a large number of bulls makes incessant fighting a necessity than when they are few and lead a comparatively quiet existence.

The minimum breeding limit of five years has been assumed in 1918 on account of new information which has been obtained. Accordingly, 20 per cent has been deducted for annual old-age loss to the classes of bulls.

## YEARLINGS.

Permission was asked for and granted on August 7 for the killing of 10 yearling males in order to be able to add to the meager stock of knowledge of this class. Owing to their rarity on the hauling grounds at that time of year, great difficulty was encountered in

finding the desired number. A drive from Zapadni August 8 yielded 4. On August 9 and 10 none was found on Polovina, Lukanin, Kitovi, Tolstoi, or Reef. Two more were secured on Zapadni on the latter date, making 6 altogether. Subsequent examination of the skulls of 4 more, thought to be yearlings when killed, proved them to be 2-year-olds. This study of the skulls has not as yet been completed, but is expected to yield valuable data on the growth of fur seals.

The information secured from the 6 undoubted yearlings follows:

DATA ON YEARLING SEALSKINS.

| Tag No. | Date. | Carcass weight. | Length. | Skin weight. |
|---|---|---|---|---|
| | | *Lbs. Oz.* | *Inches.* | *Lbs. Oz.* |
| A 6483 | Aug. 8. | 30 6 | 35.25 | 4 12 |
| A 6485 | ...do.... | 28 | 35.00 | 4 5 |
| A 6486 | ...do.... | 30 6 | 35.50 | 4 |
| A 6487 | ...do.... | 32 12 | 36.00 | 4 14 |
| A 6489 | Aug. 10. | 30 14 | 34.25 | Not taken. |
| A 6491 | ...do.... | 33 10 | 34.25 | Do. |

## ADOLESCENT SEALS.

The numbers of animals estimated for each age class is taken up in the statement of complete census following. These are found from the counts and estimates of 1917 by deducting 35 per cent for natural mortality the first year, 20 per cent the second, and 4 per cent the third. Also all animals killed for their skins have been deducted from their proper classes. This includes all killings from August 11, 1917, to August 10, 1918, the sealing year. The totals represent those supposed to be alive on the latter date.

## COMPLETE CENSUS OF FUR SEALS AS OF AUGUST 10, 1918.

| | | |
|---|---|---|
| Pups, counted and estimated | | 142,915 |
| Breeding cows, 3 years old and over, by inference | | 142,915 |
| Harem bulls, counted | | 5,344 |
| Idle bulls, counted | | 2,444 |
| Yearlings, male and female, estimated: | | |
| Pups born in 1917 | 128,024 | |
| 35 per cent deducted for natural mortality | 44,808 | |
| Yearlings, both sexes, beginning 1918 | 83,216 | |
| Females, 50 per cent | 41,608 | |
| | | 41,608 |
| Males beginning of 1918 | 41,608 | |
| Males killed in 1918 | 13 | |
| Males Aug. 10, 1918 | | 41,595 |
| 2-year-olds, male and female, estimated: | | |
| Yearling females Aug. 10, 1917 | 38,018 | |
| 20 per cent deducted for natural mortality | 7,603 | |
| 2-year-old females Aug. 10, 1918 | | 30,415 |
| Yearling males, Aug. 10, 1917 | 38,013 | |
| Males killed fall of 1917 | 1 | |
| Males end of 1917 | 38,012 | |
| 20 per cent deducted for natural mortality | 7,602 | |
| 2-year-old males beginning of 1918 | 30,410 | |
| 2-year-old males killed 1918 | 251 | |
| 2-year-old males Aug. 10, 1918 | | 30,159 |

| | | |
|---|---|---|
| 3-year-old males, estimated: | | |
| 2-year-old males Aug. 10, 1917 | 26,815 | |
| 2-year-old males killed fall 1917 | 179 | |
| 2-year-old males end of 1917 | 26,636 | |
| 4 per cent deducted for natural mortality | 1,065 | |
| 3-year-old males beginning of 1918 | 25,571 | |
| 3-year-old males killed in 1918 | 16,454 | |
| 3-year-old males Aug. 10, 1918 | | 9,117 |
| 4-year-old males, estimated: | | |
| 3-year-old males Aug. 10, 1917 | 19,507 | |
| 3-year-old males killed fall 1917 | 1,207 | |
| 4-year-old males beginning 1918 | 18,300 | |
| 4-year-old males killed in 1918 | 11,186 | |
| 4-year-old males Aug. 10, 1918 | | 7,114 |
| 5-year-old males, estimated: | | |
| 4-year-old males Aug. 10, 1917 | 16,631 | |
| 4-year-old males killed fall 1917 | 396 | |
| 5-year-old males beginning 1918 | 16,235 | |
| 5-year-old males killed 1918 | 4,294 | |
| 5-year-old males, Aug. 10, 1918 | | 11,941 |
| 6-year-old males, estimated: | | |
| 5-year-old males Aug. 10, 1917 | 14,813 | |
| 5-year-old males killed fall 1917 | 30 | |
| 6-year-old males beginning 1918 | 14,783 | |
| 6-year-old males killed 1918 | 1,028 | |
| 6-year-old males Aug. 10, 1918 | | 13,755 |
| Surplus bulls, counted and estimated: | | |
| Breeding bulls in 1917 | 7,556 | |
| 20 per cent deducted for old-age loss | 1,511 | |
| 1917 bulls remaining in 1918 | 6,045 | |
| Breeding bulls in 1918 | 7,788 | |
| 1917 bulls remaining deducted | 6,045 | |
| Increment of new bulls in 1918 | 1,743 | |
| 6-year-old males in 1917 | 15,397 | |
| Surplus bulls in 1917 | 8,977 | |
| Total surplus bull stock for 1918 | 24,374 | |
| 20 per cent deducted for old-age loss | 4,874 | |
| Remaining surplus for 1918 | 19,500 | |
| 7-year-olds and over killed in 1918 | 647 | |
| | 18,853 | |
| Increment of new breeding bulls for 1918 deducted | 1,743 | |
| Surplus bulls, Aug. 10, 1918 | | 17,110 |

RECAPITULATION.

| | |
|---|---|
| Pups | 142,915 |
| Cows | 142,915 |
| Harem bulls | 5,344 |
| Idle bulls | 2,444 |
| Yearling females | 41,608 |
| Yearling males | 41,595 |
| 2-year-old females | 30,415 |
| 2-year-old males | 30,159 |
| 3-year-old males | 9,117 |
| 4-year-old males | 7,114 |
| 5-year-old males | 11,941 |
| 6-year-old males | 13,755 |
| Surplus bulls | 17,110 |
| Total | 496,432 |

# MIGRATION OF ADULT SOCKEYE SALMON IN PUGET SOUND AND FRASER RIVER

By HENRY O'MALLEY
*Field Assistant, U. S. Bureau of Fisheries*
*In Charge of Operations on the Pacific Coast*

and

WILLIS H. RICH
*Field Assistant, U. S. Bureau of Fisheries*

**Appendix VIII to the Report of the U. S. Commissioner of Fisheries for 1918**

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# CONTENTS.

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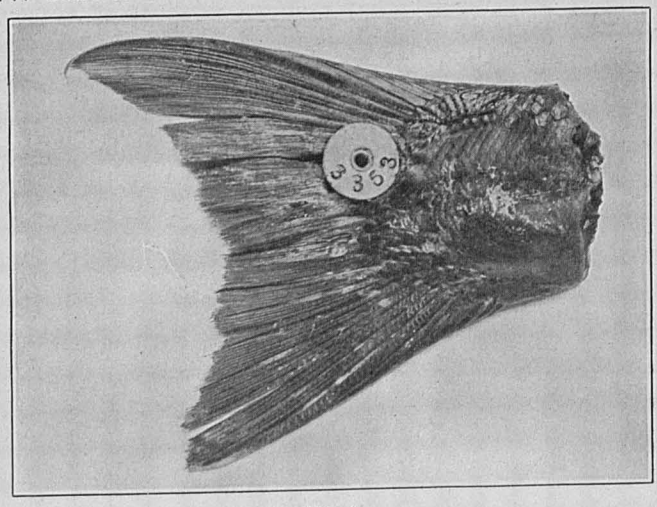



FIG. 1.

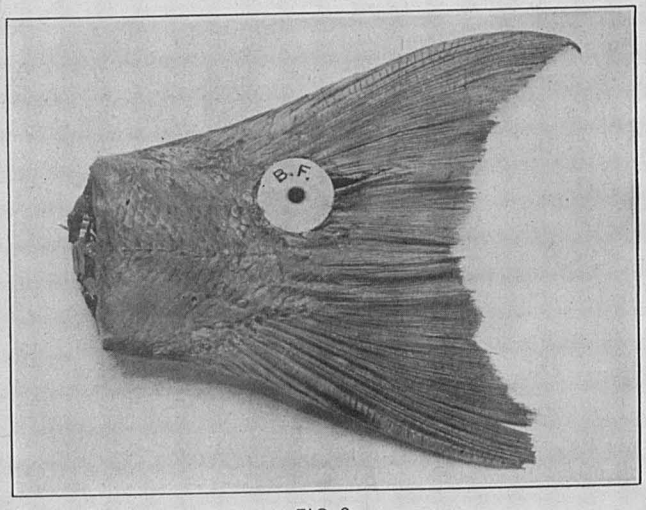



FIG. 2.

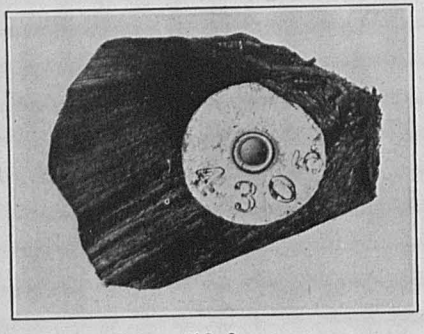



FIG. 3.

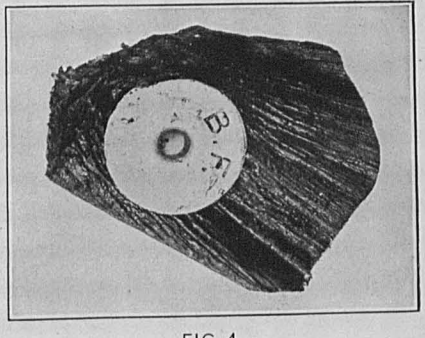



FIG. 4.

# MIGRATION OF ADULT SOCKEYE SALMON IN PUGET SOUND AND FRASER RIVER.

By HENRY O'MALLEY, *Field Assistant, U. S. Bureau of Fisheries, in Charge of Operations on the Pacific Coast,*
and
WILLIS H. RICH, *Field Assistant, U. S. Bureau of Fisheries.*

## INTRODUCTION.

During the American-Canadian Fisheries Conference on the Pacific coast, in April and May, 1918, the question was constantly raised as to the time required for the sockeye salmon of Fraser River to pass through Puget Sound.

In order to determine this important question, Dr. Hugh M. Smith, United States Commissioner of Fisheries, and W. A. Found, superintendent of the Canadian fisheries, decided to carry out an extensive marking experiment. Early in July the authors were detailed to take immediate charge for the U. S. Bureau of Fisheries, and to confer with Lieut. Col. F. H. Cunningham, acting for the Canadian Government. The final arrangements were that the Canadian fisheries authorities would handle the marking operations in Canadian waters, the U. S. Bureau of Fisheries the marking operations in Puget Sound, and that each Government would attend to the collecting of data in its respective waters.

The authors are especially indebted to H. J. Todd & Sons; E. B. Deming, Pacific American Fisheries; W. A. Lowman, Coast Fish Co.; Frank Wright, Carlisle Packing Co.; and J. W. Elliott, Alaska Packers Association. Without the cooperation of these men and the members of their respective organizations it would have been impossible to have successfully conducted this experiment. L. H. Darwin, Washington State fish commissioner, and his deputies also rendered valuable assistance. Many helpful suggestions were received from Dr. Charles H. Gilbert, of Stanford University.

## PROCEDURE.

### TAGS AND THEIR ATTACHMENT.

The method adopted for procuring the desired data was to mark, with serially numbered tags, enough adult sockeye salmon so that a sufficient number of returns could reasonably be expected. After consideration of several types of tags the one finally accepted was of the "bachelor-button" type, similar to those in use for marking cattle

and other live stock. This button comes in two separate halves, each with a hollow central extension which forms the shaft of the complete button. The shaft of one half of the button is small enough to pass through the shaft and long enough to extend slightly beyond the face of the other half. When placed together in the proper position the two halves are fastened by means of a special crimping tool. This is built on the general plan of a pair of pliers; but the jaws meet only toward the tips, at which points are conical elevations. By fitting these elevations into the open ends of the shaft and closing the tool firmly, the end of the smaller inner shaft is spread sufficiently to prevent its being pulled back through the outer shaft.

The buttons were made of either silver or aluminum. Some fear was entertained that the aluminum might corrode in the salt water sufficiently to make it difficult or impossible to read the numbers, but in this experiment there was absolutely no difficulty on this account. No corrosion is noticeable on any of the buttons returned, although some of them must have been three or four weeks in practically pure salt water. This is contrary to the experience of Greene,[a] who found that salt water had a strongly corrosive action on aluminum buttons of similar style. This may have been due to some slight difference in the alloy of which the buttons were made.

The buttons were attached to the upper lobe of the caudal (tail) fin. It was first necessary to cut a hole of the proper size to admit the shaft of the button. This was done by means of an ordinary leather punch. Figures 1 to 4, Plate I, show, in situ, both sides of two buttons which were returned.

The operation of attaching the tags required, usually, less than one minute, and no particularly unfavorable results of tagging were noticed. At some of the stations where the marking was done the fish were held in crates until after the marking for the day was complete, and it was noticed that they soon recovered from the effects of being out of water while the tags were being attached and were apparently in perfect condition when liberated.

Reports that the tags were "worrying" the fish and causing them to wear their tails in an effort to remove the tags were investigated and found to be quite unfounded. Tails of several fish have been preserved and show no indication of such wearing as had been asserted. Figures 1 and 2, Plate I, are from such a specimen.

The fish to be marked were taken from the traps at the time of lifting and were held either in crates or in one of the pockets of the spiller until they could be marked and released.

## MARKING STATIONS.

Marking stations were established at five points in Puget Sound, as follows: Near Sooke, Vancouver Island, British Columbia; Salmon Banks, just south of San Juan Archipelago; near Point Partridge, Whidby Island; near Village Point, Lummi Island; and at the last trap in American waters on Point Roberts. For convenience these have been designated in the following pages as stations A, B, C, D, and E, respectively.

[a] Greene, Charles W.: The migration of salmon in the Columbia River. Bulletin, U. S. Bureau of Fisheries for 1909, Vol. XXIX, pp. 129-148. Washington, 1911.

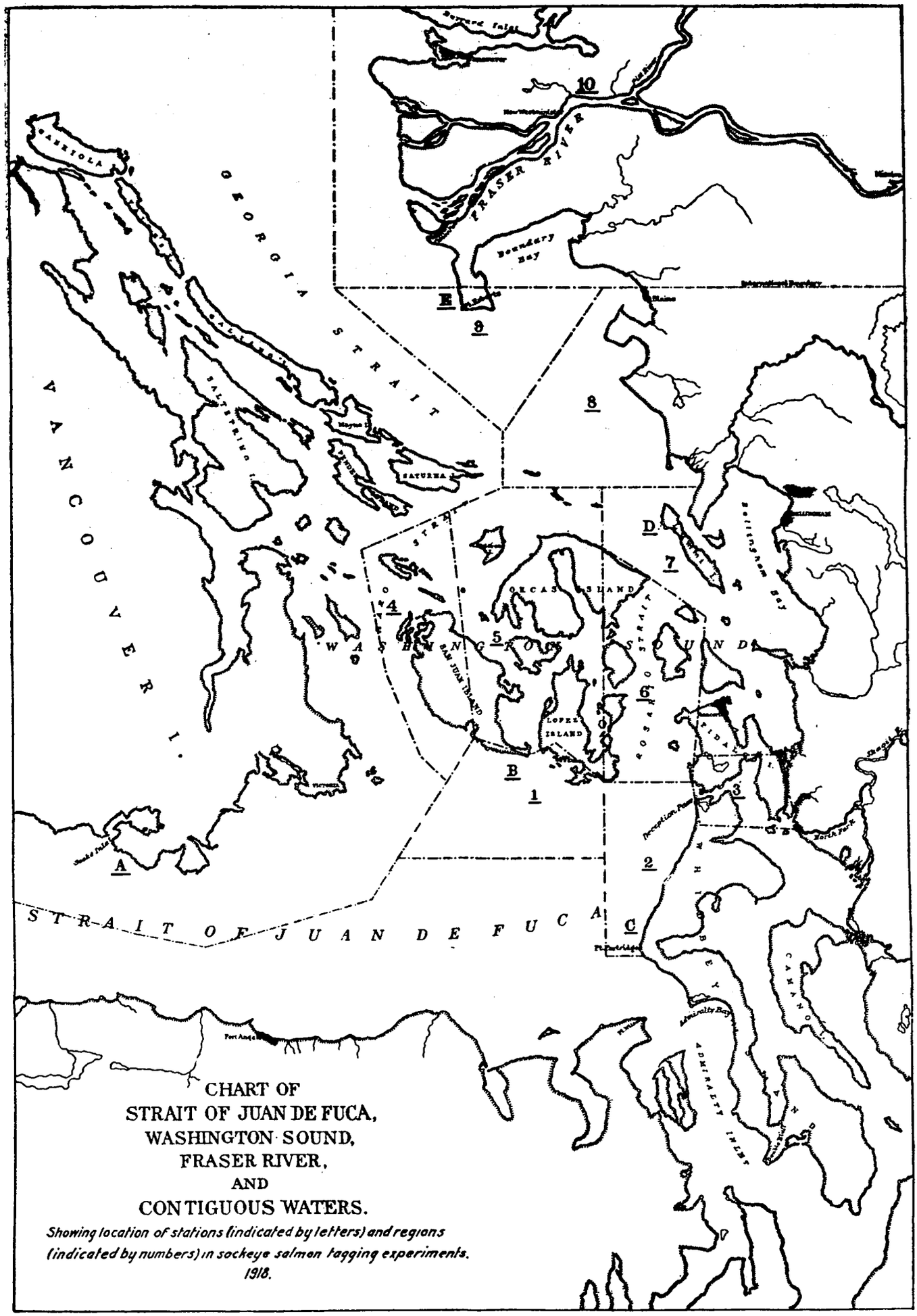



CHART OF
STRAIT OF JUAN DE FUCA,
WASHINGTON SOUND,
FRASER RIVER,
AND
CONTIGUOUS WATERS.

*Showing location of stations (indicated by letters) and regions (indicated by numbers) in sockeye salmon tagging experiments.*
*1918.*

The work at these stations was in charge of the following men:

A. Sooke, British Columbia—
W. H. Rich, field assistant, U. S. Bureau of Fisheries. (July 14 to 23.)
Dr. C. McLean Fraser, director of the biological station, Nanaimo, British Columbia. (July 23 to the end of the season.)
Alex. Robertson, superintendent, Harrison Lake hatchery, Dominion fisheries department.
B. Salmon Banks—
Walter C. Buckmaster, apprentice fish-culturist, U. S. Bureau of Fisheries.
C. Point Partridge—
Clive L. Henry, apprentice fish-culturist, U. S. Bureau of Fisheries.
D. Lummi Island—
Don E. Courser, apprentice fish-culturist, U. S. Bureau of Fisheries.
E. Point Roberts—
Joseph Kemmerich, foreman, U. S. Bureau of Fisheries.

The last four of these stations were under the general supervision of Dennis Winn, field superintendent, U. S. Bureau of Fisheries.

## COLLECTION AND ORGANIZATION OF DATA.

In the collection of data reliance was necessarily placed in fishermen, trap tenders, and cannery men. A reward of 25 cents was offered for the return of each button accompanied by information giving the date and place of capture. Specimens taken in American waters were taken care of by Dennis Winn, at the Seattle office of the U. S. Bureau of Fisheries, and those taken in Canadian waters by Col. Cunningham, at the office of the Dominion fisheries department at New Westminster, British Columbia. One of the tags reported from the upper regions of the Fraser River was secured by J. P. Babcock, assistant to the commissioner of fisheries for the Province of British Columbia.

While the majority of these records are considered approximately correct, data secured in this manner are necessarily subject to some inaccuracies, both as to time and place of capture. In the authors' opinion, however, these inaccuracies will be balanced so that with reasonably large series the averages should be reliable. In cases where the data were obviously wrong the records have been omitted. This has been done in several instances where the date given for the capture was earlier than that on which the fish was recorded as having been marked. A number of tags were returned with incomplete data, either the date or the place of capture, or both, wanting. All such cases have been omitted entirely from consideration.

For the convenient organization of the data the American waters of the Sound from which returns were reported have been divided into nine regions. Several factors guided in establishing the boundaries of these regions: (1) The general geography of the district, (2) the grouping of traps, and (3) the nature of the descriptions giving the locality where the tags were recovered. These last frequently indicated merely the general region in which the tag was taken, i. e., Rosario Strait. The boundaries of these regions, as well as the location of the marking stations, are shown on the accompanying map. All of the records reported from the Canadian waters which are open to commercial fishing have been treated together. For this reason that part of the Strait of Georgia just outside the mouths of the Fraser River and the river itself, from the mouth to Mission Bridge, together constitute the tenth region. The reasons for so treating the Canadian returns are given on pages 26 and 27.

## STATISTICAL STUDY OF DATA.

### GENERAL FEATURES.

In the following study the chief concern is with what is believed to be a strict and reasonably complete presentation of the facts. There has been no attempt to draw conclusions regarding the bearing of these facts upon the particular problems connected with the conservation of the sockeyes of the Fraser River. Some of the tables present similar data as seen from different points of view. This has, perhaps, been carried to an extreme in order that all obtainable facts might be available. Other tables are presented rather as matters of record than as having any especial bearing on the main problems in hand. For the most part such tables are presented without detailed comment.

### RAW DATA.

Table 1 gives for each marking station the numbers of the tags attached each day. As noted in the table, silver tags were used only at Sooke (station A). At all other stations aluminum tags were used, and the first few tags used at Sooke were also of aluminum, numbers 5 to 29, inclusive.

TABLE 1.—LIST OF TAG NUMBERS ATTACHED AT EACH MARKING STATION.

STATION A, SOOKE, BRITISH COLUMBIA.[a]

| Numbers. | | Date. | Total. | Numbers. | | Date. | Total. |
|---|---|---|---|---|---|---|---|
| From— | To— | | | From— | To— | | |
| | | 1918. | | | | 1918. | |
| 5 | 8 | July 14 | 4 | 1718 | 1822 | July 31 | 105 |
| 9 | 29 | July 21 | 21 | 1823 | 1900 | Aug. 1 | 77 |
| 1326 | 1350 | do | 25 | 1901 | 2038 | Aug. 2 | 138 |
| 1353 | 1362 | July 22 | 10 | 2039 | 2078 | Aug. 4 | 41 |
| 1363 | 1382 | July 23 | 20 | 2088 | 2100 | do | 23 |
| 1383 | 1390 | July 24 | 8 | 2080 | 2087 | Aug. 6 | 8 |
| 1391 | 1447 | July 25 | 56 | 2101 | 2123 | do | 23 |
| 1448 | 1545 | July 27 | 98 | 2125 | 2127 | do | 3 |
| 1546 | 1617 | July 28 | 72 | | | | |
| 1618 | 1717 | July 30 | 99 | | | Total | 831 |

STATION B, SALMON BANKS, WASH.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1918. | | | | 1918. | |
| 3001 | 3025 | July 21 | 25 | 3455 | 3496 | July 31 | 42 |
| 3026 | 3065 | July 22 | 40 | 3497 | 3600 | Aug. 1 | 104 |
| 3066 | 3160 | July 23 | 95 | 3601 | 3664 | Aug. 2 | 64 |
| 3161 | 3216 | July 24 | 56 | 3665 | 3758 | Aug. 4 | 94 |
| 3217 | 3266 | July 25 | 50 | 3759 | 3800 | Aug. 5 | 42 |
| 3267 | 3377 | July 26 | 111 | 3801 | 3836 | Aug. 7 | 36 |
| 3401 | 3454 | July 28 | 54 | | | | |
| 3378 | 3394 | July 30 | 17 | | | Total | 836 |
| 3395 | 3400 | July 31 | 6 | | | | |

STATION C, POINT PARTRIDGE, WASH.[b]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1918. | | | | 1918. | |
| 1001 | 1043 | July 17 | 43 | 1547 | 1664 | Aug. 7 | 118 |
| 1044 | 1093 | July 19 | 50 | 1665 | 1769 | Aug. 9 | 105 |
| 1094 | 1154 | July 22 | 61 | 1770 | 1924 | Aug. 13 | 155 |
| 1155 | 1230 | July 24 | 76 | 1925 | 2000 | Aug. 14 | 76 |
| 1231 | 1382 | July 26 | 152 | | | | |
| 1383 | 1546 | Aug. 6 | 164 | | | Total | 1,000 |

[a] Tag Nos. 5 to 29, attached at station A, and the tags used at all other stations were aluminum. With the exception of those noted, all tags attached at station A were of silver.

[b] This is the official list as given by the assistant having charge of the marking at this station. The records for Aug. 6 and subsequent dates are subject to suspicion on account of an admitted lack of veracity in the accounts. Previous to this date Dennis Winn was present at the markings.

TABLE 1.—LIST OF TAG NUMBERS ATTACHED AT EACH MARKING STATION—Contd.

STATION D, LUMMI ISLAND, WASH.

| Numbers. | | Date. | Total. | Numbers. | | Date. | Total. |
|---|---|---|---|---|---|---|---|
| From— | To— | | | From— | To— | | |
| | | 1918. | | | | 1918. | |
| 2001 | 2085 | July 19 | 85 | 2478 | 2555 | Aug. 5 | 78 |
| 2086 | 2177 | July 23 | 92 | 2556 | 2649 | Aug. 6 | 94 |
| 2178 | 2251 | July 24 | 74 | 2650 | 2690 | Aug. 7 | 41 |
| 2252 | 2314 | July 28 | 63 | 2691 | 2737 | Aug. 9 | 47 |
| 2315 | 2360 | July 30 | 46 | | | | |
| 2361 | 2416 | Aug. 2 | 56 | | | Total | 737 |
| 2417 | 2477 | Aug. 4 | 61 | | | | |

STATION E, POINT ROBERTS, WASH.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1918. | | | | 1918. | |
| 4001 | 4095 | July 25 | 95 | 4819 | 4834 | Aug. 7 | 16 |
| 4096 | 4165 | July 26 | 70 | 4835 | 4952 | Aug. 8 | 118 |
| 4166 | 4258 | July 29 | 93 | 30 | 85 | Aug. 15 | 56 |
| 4259 | 4372 | July 30 | 114 | 86 | 97 | Aug. 16 | 12 |
| 4373 | 4494 | July 31 | 122 | 98 | 120 | Aug. 19 | 23 |
| 4495 | 4533 | Aug. 1 | 39 | 121 | 151 | Aug. 20 | 31 |
| 4534 | 4630 | Aug. 2 | 97 | 152 | 167 | Aug. 21 | 16 |
| 4631 | 4743 | Aug. 5 | 113 | | | | |
| 4744 | 4818 | Aug. 6 | 75 | | | Total | 1,090 |

Table 2 gives in serial order for each station a complete list of the tags returned, showing the station where and the date on which the tags were attached, the date and region of capture, and the number of days en route. Tables 1 and 2 contain the raw data from which all of the subsequent tables were constructed.

TABLE 2.—LIST OF TAGS RETURNED.

TAGS ATTACHED AT STATION A, SOOKE, BRITISH COLUMBIA.

| Tag No. | Date fish marked. | Date fish re-caught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish re-caught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 7 | July 14 | July 19 | 2 | 5 | 1362 | July 22 | July 23 | 1 | 1 |
| 12 | July 21 | July 23 | 9 | 2 | 1368 | July 23 | July 30 | 10 | 7 |
| 14 | ...do | Aug. 1 | 8 | 11 | 1371 | ...do | July 31 | 10 | 8 |
| 16 | ...do | Aug. 26 | (a) | 36 | 1390 | July 24 | July 29 | 6 | 5 |
| 19 | ...do | Aug. 1 | (b) | 11 | 1404 | July 25 | ...do | 9 | 4 |
| 21 | ...do | July 24 | 7 | 3 | 1405 | ...do | July 28 | 1 | 3 |
| 25 | ...do | July 25 | 9 | 4 | 1407 | ...do | Aug. 4 | 1 | 10 |
| 26 | ...do | July 23 | 2 | 2 | 1423 | ...do | July 30 | 8 | 5 |
| 27 | ...do | July 25 | 1 | 4 | 1449 | July 27 | Aug. 1 | 10 | 5 |
| 28 | ...do | July 24 | 2 | 3 | 1455 | ...do | July 30 | 1 | 3 |
| 29 | ...do | July 31 | 6 | 10 | 1463 | ...do | Aug. 2 | 6 | 6 |
| 1328 | ...do | July 25 | 2 | 4 | 1467 | ...do | July 31 | 9 | 4 |
| 1331 | ...do | July 26 | 2 | 5 | 1468 | ...do | July 30 | 6 | 3 |
| 1332 | ...do | July 23 | 1 | 2 | 1473 | ...do | Aug. 3 | 7 | 7 |
| 1335 | ...do | July 24 | 2 | 3 | 1477 | ...do | Aug. 5 | 7 | 9 |
| 1339 | ...do | ...do | 2 | 3 | 1481 | ...do | July 29 | 6 | 2 |
| 1342 | ...do | July 28 | 9 | 7 | 1486 | ...do | July 31 | 6 | 4 |
| 1353 | July 22 | ...do | 2 | 6 | 1505 | ...do | Aug. 1 | (c) | 5 |
| 1357 | ...do | July 26 | 10 | 4 | 1512 | ...do | Aug. 6 | 6 | 10 |
| 1359 | ...do | July 30 | 10 | 8 | 1513 | ...do | July 28 | (d) | 1 |

a Hell's Gate, 80 miles above Mission, Fraser River.
b Yale, 60 miles above Mission, Fraser River.
c No Point trap, Vancouver Island.
d Beachy trap, Vancouver Island.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION A, SOOKE, BRITISH COLUMBIA—Continued.

| Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 1515 | July 27 | Aug. 4 | 7 | 8 | 1796 | July 31 | Aug. 12 | 7 | 12 |
| 1519 | ...do | Sept. 14 | (a) | 49 | 1797 | ...do | Aug. 7 | 8 | 7 |
| 1529 | ...do | July 30 | 6 | 3 | 1801 | ...do | Aug. 18 | 8 | 18 |
| 1538 | ...do | Aug. 5 | 7 | 9 | 1806 | ...do | Aug. 13 | 8 | 13 |
| 1543 | ...do | July 30 | 7 | 3 | 1814 | ...do | Aug. 6 | 6 | 6 |
| 1546 | July 28 | July 29 | 6 | 1 | 1815 | ...do | Aug. 5 | 7 | 5 |
| 1549 | ...do | ...do | 1 | 1 | 1816 | ...do | ...do | 8 | 5 |
| 1551 | ...do | Aug. 1 | (b) | 4 | 1818 | ...do | Aug. 6 | 8 | 6 |
| 1565 | ...do | Aug. 4 | 7 | 7 | 1821 | ...do | Aug. 5 | 6 | 5 |
| 1573 | ...do | Aug. 23 | 9 | 26 | 1838 | Aug. 1 | Aug. 9 | 10 | 8 |
| 1588 | ...do | Aug. 2 | 6 | 4 | 1839 | ...do | Aug. 4 | 7 | 3 |
| 1591 | ...do | Aug. 9 | 6 | 12 | 1843 | ...do | Aug. 6 | 2 | 5 |
| 1592 | ...do | Aug. 5 | 10 | 8 | 1844 | ...do | Aug. 7 | 8 | 6 |
| 1593 | ...do | Aug. 4 | 8 | 7 | 1845 | ...do | Aug. 5 | 7 | 4 |
| 1597 | ...do | Aug. 9 | 6 | 12 | 1852 | ...do | Aug. 4 | 1 | 3 |
| 1602 | ...do | Aug. 4 | 7 | 7 | 1854 | ...do | Aug. 6 | 6 | 5 |
| 1607 | ...do | ...do | 8 | 7 | 1855 | ...do | Aug. 4 | 2 | 3 |
| 1610 | ...do | July 31 | 6 | 3 | 1857 | ...do | Aug. 5 | 6 | 4 |
| 1617 | ...do | Aug. 2 | 10 | 5 | 1870 | ...do | ...do | 7 | 4 |
| 1619 | July 30 | Aug. 1 | 4 | 2 | 1873 | ...do | Aug. 7 | 7 | 6 |
| 1629 | ...do | Aug. 7 | 8 | 8 | 1889 | ...do | Aug. 5 | 8 | 4 |
| 1633 | ...do | ...do | 7 | 8 | 1901 | Aug. 2 | Aug. 6 | 6 | 4 |
| 1637 | ...do | Aug. 6 | 2 | 7 | 1902 | ...do | Aug. 8 | 10 | 6 |
| 1640 | ...do | Aug. 1 | (c) | 2 | 1903 | ...do | Aug. 7 | 9 | 5 |
| 1653 | ...do | Aug. 6 | 7 | 7 | 1904 | ...do | Aug. 6 | 8 | 4 |
| 1658 | ...do | Aug. 1 | (c) | 2 | 1905 | ...do | Aug. 7 | 8 | 5 |
| 1662 | ...do | ...do | (c) | 2 | 1907 | ...do | Aug. 5 | 7 | 3 |
| 1663 | ...do | Aug. 7 | 9 | 7 | 1920 | ...do | Aug. 13 | 9 | 11 |
| 1664 | ...do | Aug. 11 | 6 | 12 | 1929 | ...do | ...do | 2 | 2 |
| 1665 | ...do | Aug. 1 | (c) | 2 | 1935 | ...do | Aug. 8 | 7 | 6 |
| 1667 | ...do | Aug. 11 | 8 | 12 | 1957 | ...do | Aug. 4 | 1 | 2 |
| 1672 | ...do | Aug. 9 | 7 | 10 | 1958 | ...do | Aug. 6 | 7 | 4 |
| 1673 | ...do | Aug. 5 | 6 | 6 | 1964 | ...do | Aug. 5 | (c) | 2 |
| 1682 | ...do | Aug. 1 | 1 | 1 | 1986 | ...do | ...do | 2 | 3 |
| 1686 | ...do | Aug. 6 | 2 | 7 | 1992 | ...do | Aug. 2 | 7 | 1 |
| 1697 | ...do | July 31 | 1 | 1 | 1996 | ...do | Aug. 4 | 7 | 2 |
| 1699 | ...do | Aug. 8 | 9 | 9 | 2004 | ...do | Aug. 8 | 8 | 6 |
| 1712 | ...do | Aug. 5 | 9 | 6 | 2015 | ...do | Aug. 6 | 6 | 4 |
| 1714 | ...do | Aug. 1 | 9 | 2 | 2018 | ...do | Aug. 12 | 10 | 10 |
| 1721 | July 31 | Aug. 5 | 8 | 5 | 2024 | ...do | Aug. 6 | 6 | 4 |
| 1727 | ...do | Aug. 3 | 7 | 3 | 2029 | ...do | Aug. 7 | 7 | 5 |
| 1735 | ...do | Aug. 18 | 10 | 18 | 2032 | ...do | Aug. 9 | 8 | 7 |
| 1738 | ...do | Aug. 4 | 2 | 5 | 2050 | Aug. 4 | Aug. 8 | 8 | 4 |
| 1739 | ...do | Aug. 8 | 7 | 8 | 2053 | ...do | Sept. 6 | 10 | 33 |
| 1753 | ...do | Aug. 14 | 8 | 14 | 2071 | ...do | Aug. 7 | 7 | 3 |
| 1756 | ...do | Aug. 5 | 8 | 5 | 2073 | ...do | Aug. 11 | 9 | 7 |
| 1761 | ...do | Aug. 6 | 7 | 6 | 2074 | ...do | Aug. 7 | 1 | 3 |
| 1764 | ...do | Aug. 4 | 7 | 4 | 2093 | ...do | ...do | 2 | 3 |
| 1767 | ...do | Aug. 11 | 7 | 11 | 2097 | ...do | Aug. 8 | 8 | 4 |
| 1769 | ...do | Aug. 9 | 10 | 9 | 2100 | ...do | Aug. 9 | 8 | 5 |
| 1778 | ...do | Aug. 11 | 7 | 11 | 2103 | Aug. 6 | ...do | 8 | 3 |
| 1780 | ...do | Aug. 16 | 8 | 16 | 2113 | ...do | ...do | 7 | 3 |
| 1783 | ...do | Aug. 5 | 6 | 5 | 2116 | ...do | Aug. 11 | 7 | 5 |
| 1786 | ...do | Aug. 18 | 10 | 18 | | | | | |

TAGS ATTACHED AT STATION B, SALMON BANKS, WASH.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 3007 | July 21 | July 26 | 10 | 5 | 3052 | July 22 | July 23 | 2 | 1 |
| 3009 | ...do | July 29 | 1 | 8 | 3060 | ...do | July 24 | 2 | 2 |
| 3014 | ...do | ...do | 1 | 8 | 3062 | ...do | July 25 | 8 | 3 |
| 3015 | ...do | July 24 | 9 | 3 | 3070 | July 23 | ...do | 1 | 2 |
| 3024 | ...do | July 25 | 10 | 4 | 3075 | ...do | July 24 | 1 | 2 |
| 3028 | July 22 | July 24 | 2 | 2 | 3079 | ...do | July 25 | 1 | 2 |
| 3036 | ...do | Aug. 6 | 7 | 15 | 3086 | ...do | July 27 | 10 | 4 |
| 3037 | ...do | July 24 | 2 | 2 | 3087 | ...do | July 26 | 6 | 3 |
| 3039 | ...do | ...do | 1 | 2 | 3088 | ...do | July 25 | 9 | 2 |
| 3040 | ...do | July 25 | 2 | 3 | 3089 | ...do | July 26 | 2 | 3 |
| 3042 | ...do | July 29 | 8 | 7 | 3093 | ...do | ...do | 9 | 3 |
| 3050 | ...do | July 24 | 9 | 2 | 3103 | ...do | July 25 | 9 | 2 |

a Samaquam, Lillooet River, 25 miles above Harrison Lake, 90 miles above Mission.
b No Point trap, Vancouver Island.
c Beachy trap, Vancouver Island.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION B, SALMON BANKS, WASH.—Continued.

| Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 3104 | July 23 | July 28 | 10 | 5 | 3326 | July 26 | July 29 | 1 | 3 |
| 3111 | ...do.... | July 29 | 10 | 6 | 3328 | ...do.... | ...do.... | 9 | 3 |
| 3118 | ...do.... | July 24 | 1 | 1 | 3329 | ...do.... | July 31 | 1 | 5 |
| 3121 | ...do.... | July 26 | 1 | 3 | 3330 | ...do.... | Aug. 22 | 9 | 27 |
| 3125 | ...do.... | July 25 | 2 | 2 | 3335 | ...do.... | July 29 | 10 | 3 |
| 3128 | ...do.... | July 26 | 10 | 3 | 3337 | ...do.... | July 30 | 10 | 4 |
| 3129 | ...do.... | July 24 | 1 | 1 | 3339 | ...do.... | Aug. 5 | 9 | 10 |
| 3133 | ...do.... | July 28 | 10 | 5 | 3340 | ...do.... | July 30 | 9 | 4 |
| 3134 | ...do.... | July 25 | 4 | 2 | 3350 | ...do.... | July 31 | 6 | 5 |
| 3143 | ...do.... | July 29 | 10 | 6 | 3351 | ...do.... | July 29 | 9 | 3 |
| 3146 | ...do.... | July 28 | 10 | 5 | 3354 | ...do.... | July 30 | 9 | 4 |
| 3147 | ...do.... | July 29 | 9 | 5 | 3355 | ...do.... | July 29 | 8 | 3 |
| 3148 | ...do.... | ...do.... | 6 | 6 | 3356 | ...do.... | July 31 | 10 | 5 |
| 3149 | ...do.... | July 23 | 10 | 1 | 3357 | ...do.... | July 28 | 9 | 2 |
| 3150 | ...do.... | July 26 | 8 | 3 | 3358 | ...do.... | July 29 | 10 | 3 |
| 3153 | ...do.... | July 31 | 2 | 8 | 3361 | ...do.... | ...do.... | 6 | 3 |
| 3158 | ...do.... | Aug. 1 | 2 | 9 | 3366 | ...do.... | Aug. 8 | 9 | 13 |
| 3160 | ...do.... | July 29 | 9 | 6 | 3367 | ...do.... | July 28 | 1 | 2 |
| 3168 | July 24 | July 26 | 9 | 2 | 3368 | ...do.... | Aug. 1 | 8 | 6 |
| 3169 | ...do.... | July 24 | 1 | 1 | 3372 | ...do.... | July 30 | 10 | 4 |
| 3173 | ...do.... | July 28 | 9 | 4 | 3375 | ...do.... | July 31 | 10 | 5 |
| 3174 | ...do.... | July 29 | 10 | 5 | 3377 | ...do.... | ...do.... | 8 | 5 |
| 3175 | ...do.... | July 25 | 1 | 1 | 3378 | July 30 | Aug. 4 | 7 | 5 |
| 3176 | ...do.... | July 28 | 2 | 4 | 3382 | ...do.... | July 31 | 6 | 1 |
| 3180 | ...do.... | Aug. 2 | 2 | 9 | 3394 | ...do.... | Aug. 5 | 7 | 1 |
| 3184 | ...do.... | July 26 | 9 | 2 | 3397 | July 31 | Aug. 1 | 7 | 1 |
| 3185 | ...do.... | Aug. 2 | 10 | 9 | 3398 | ...do.... | Aug. 4 | 7 | 4 |
| 3188 | ...do.... | July 28 | 10 | 4 | 3399 | ...do.... | Aug. 2 | 2 | 2 |
| 3189 | ...do.... | July 30 | 6 | 6 | 3402 | July 28 | July 30 | 9 | 2 |
| 3194 | ...do.... | July 26 | 6 | 2 | 3403 | ...do.... | Aug. 1 | 7 | 4 |
| 3198 | ...do.... | Sept. 15 | (a) | 53 | 3404 | ...do.... | July 28 | 1 | 1 |
| 3199 | ...do.... | July 29 | 10 | 5 | 3405 | ...do.... | ...do.... | 1 | 1 |
| 3200 | ...do.... | July 25 | 4 | 1 | 3409 | ...do.... | ...do.... | 1 | 1 |
| 3205 | ...do.... | Aug. 1 | 7 | 8 | 3410 | ...do.... | Aug. 2 | 10 | 5 |
| 3210 | ...do.... | July 25 | 6 | 1 | 3412 | ...do.... | Aug. 9 | 9 | 12 |
| 3216 | ...do.... | ...do.... | 1 | 1 | 3414 | ...do.... | July 30 | 7 | 2 |
| 3222 | July 25 | Aug. 2 | 8 | 8 | 3415 | ...do.... | Aug. 4 | 2 | 7 |
| 3223 | ...do.... | July 30 | 10 | 5 | 3418 | ...do.... | July 30 | 9 | 2 |
| 3226 | ...do.... | July 26 | 6 | 1 | 3423 | ...do.... | ...do.... | 9 | 2 |
| 3232 | ...do.... | July 30 | 10 | 5 | 3425 | ...do.... | July 29 | 1 | 1 |
| 3244 | ...do.... | Aug. 7 | 10 | 13 | 3428 | ...do.... | July 31 | 8 | 3 |
| 3245 | ...do.... | Aug. 27 | (b) | 33 | 3432 | ...do.... | Aug. 8 | 8 | 11 |
| 3246 | ...do.... | Aug. 21 | 10 | 27 | 3433 | ...do.... | July 31 | 6 | 3 |
| 3251 | ...do.... | July 28 | 10 | 3 | 3434 | ...do.... | July 30 | 10 | 2 |
| 3253 | ...do.... | July 26 | 6 | 1 | 3437 | ...do.... | Aug. 5 | 1 | 8 |
| 3255 | ...do.... | Aug. 19 | 10 | 25 | 3441 | ...do.... | Aug. 8 | 10 | 6 |
| 3257 | ...do.... | July 29 | 10 | 4 | 3442 | ...do.... | July 30 | 9 | 2 |
| 3259 | ...do.... | Aug. 8 | 2 | 14 | 3443 | ...do.... | Aug. 13 | 9 | 16 |
| 3266 | ...do.... | Aug. 1 | 8 | 7 | 3444 | ...do.... | July 29 | 1 | 1 |
| 3268 | July 26 | July 31 | 1 | 5 | 3445 | ...do.... | ...do.... | 1 | 1 |
| 3269 | ...do.... | July 29 | 7 | 3 | 3446 | ...do.... | July 30 | 2 | 2 |
| 3270 | ...do.... | July 28 | 1 | 2 | 3448 | ...do.... | July 31 | 8 | 3 |
| 3272 | ...do.... | July 29 | 8 | 3 | 3450 | ...do.... | Aug. 1 | 9 | 4 |
| 3273 | ...do.... | July 28 | 10 | 2 | 3451 | ...do.... | July 31 | 10 | 3 |
| 3274 | ...do.... | ...do.... | 1 | 2 | 3452 | ...do.... | July 30 | 2 | 2 |
| 3275 | ...do.... | ...do.... | 1 | 2 | 3457 | July 31 | Aug. 6 | 7 | 6 |
| 3278 | ...do.... | July 30 | 10 | 4 | 3460 | ...do.... | Aug. 4 | 8 | 4 |
| 3281 | ...do.... | July 31 | (c) | 5 | 3461 | ...do.... | Aug. 3 | 8 | 3 |
| 3286 | ...do.... | July 29 | 7 | 3 | 3462 | ...do.... | Aug. 6 | 8 | 6 |
| 3288 | ...do.... | July 28 | 1 | 2 | 3463 | ...do.... | Aug. 30 | (e) | 30 |
| 3290 | ...do.... | July 29 | 1 | 3 | 3469 | ...do.... | Aug. 1 | 1 | 1 |
| 3294 | ...do.... | ...do.... | 9 | 3 | 3471 | ...do.... | ...do.... | 7 | 1 |
| 3295 | ...do.... | July 28 | 1 | 2 | 3474 | ...do.... | Aug. 2 | 6 | 2 |
| 3297 | ...do.... | July 31 | 1 | 5 | 3475 | ...do.... | ...do.... | 1 | 2 |
| 3298 | ...do.... | July 26 | 10 | 1 | 3478 | ...do.... | Aug. 1 | 1 | 1 |
| 3299 | ...do.... | Aug. 18 | 8 | 23 | 3481 | ...do.... | ...do.... | 8 | 1 |
| 3301 | ...do.... | July 30 | 10 | 4 | 3484 | ...do.... | Aug. 5 | 2 | 5 |
| 3309 | ...do.... | July 29 | 1 | 3 | 3486 | ...do.... | Aug. 1 | 2 | 1 |
| 3312 | ...do.... | Aug. 1 | 9 | 6 | 3487 | ...do.... | Aug. 2 | 8 | 2 |
| 3317 | ...do.... | Aug. 5 | 7 | 10 | 3490 | ...do.... | Aug. 4 | 7 | 4 |
| 3321 | ...do.... | Sept. 15 | (d) | 51 | 3495 | ...do.... | Aug. 2 | 8 | 2 |
| 3322 | ...do.... | July 30 | 10 | 4 | 3496 | ...do.... | Aug. 6 | 1 | 6 |

a Four miles above Pitt Lake, 30 miles from Fraser River, 50 miles from ocean.
b Soda Creek, 280 miles above Mission.
c Devil's Run, 10 miles above Mission.
d Four Mile Creek, Pitt River, 30 miles above Fraser River, 50 miles from ocean.
e Hagenson Slough, 30 miles above Fraser, 50 miles from ocean.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION B, SALMON BANKS, WASH.—Continued.

| Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. |
|---|---|---|---|---|
| | 1918. | 1918. | | |
| 3501 | Aug. 1 | Aug. 2 | 1 | 1 |
| 3502 | do | Aug. 5 | 8 | 4 |
| 3508 | do | Aug. 2 | 6 | 1 |
| 3510 | do | Aug. 12[a] | 10 | 11 |
| 3513 | do | Aug. 4 | 8 | 3 |
| 3514 | do | Aug. 2 | 1 | 1 |
| 3518 | do | Aug. 15 | 10 | 14 |
| 3522 | do | Aug. 2 | 6 | 1 |
| 3523 | do | do | 1 | 1 |
| 3524 | do | Aug. 5 | 8 | 4 |
| 3526 | do | Aug. 2 | 9 | 1 |
| 3527 | do | Aug. 4 | 8 | 3 |
| 3528 | do | Aug. 6 | 8 | 5 |
| 3529 | do | Aug. 4 | 10 | 3 |
| 3535 | do | Aug. 5 | 7 | 4 |
| 3537 | do | Aug. 2 | 6 | 1 |
| 3541 | do | Aug. 5 | 2 | 4 |
| 3544 | do | do | 9 | 4 |
| 3545 | do | Aug. 2 | 6 | 1 |
| 3547 | do | Aug. 5 | [b] | 4 |
| 3548 | do | Aug. 3 | 8 | 2 |
| 3550 | do | Aug. 4 | 2 | 3 |
| 3551 | do | Aug. 2 | 6 | 1 |
| 3552 | do | Aug. 4 | 10 | 3 |
| 3553 | do | Aug. 7 | 8 | 6 |
| 3554 | do | Aug. 4 | 7 | 3 |
| 3555 | do | do | 8 | 3 |
| 3556 | do | Aug. 5 | 8 | 4 |
| 3557 | do | Aug. 11 | 8 | 10 |
| 3562 | do | Aug. 2 | 6 | 1 |
| 3567 | do | Aug. 1 | 4 | 1 |
| 3574 | do | Aug. 4 | 8 | 3 |
| 3577 | do | do | 7 | 4 |
| 3578 | do | Aug. 2 | 6 | 1 |
| 3579 | do | Aug. 4 | 7 | 3 |
| 3582 | do | Aug. 6 | 4 | 5 |
| 3583 | do | do | 8 | 5 |
| 3584 | do | Aug. 12 | 7 | 11 |
| 2585 | do | Aug. 5 | 9 | 4 |
| 3587 | do | Aug. 2 | 1 | 1 |
| 3588 | do | Aug. 5 | 1 | 4 |
| 3589 | do | Aug. 7 | 8 | 6 |
| 3590 | do | Aug. 5 | 8 | 4 |
| 3591 | do | do | 10 | 4 |
| 3594 | do | Aug. 6 | 6 | 5 |
| 3598 | do | Aug. 2 | 6 | 1 |
| 3605 | Aug. 2 | Aug. 5 | 8 | 3 |
| 3606 | do | do | 9 | 3 |
| 3610 | do | Aug. 14 | 8 | 12 |
| 3613 | do | Aug. 5 | 8 | 3 |
| 3617 | do | Aug. 4 | 1 | 2 |
| 3619 | do | Aug. 5 | 7 | 3 |
| 3624 | do | do | 1 | 3 |
| 3625 | do | Aug. 7 | 8 | 5 |
| 3630 | do | Aug. 4 | 1 | 2 |
| 3632 | do | do | 1 | 2 |
| 3633 | do | Aug. 7 | 8 | 5 |
| 3634 | do | do | 9 | 5 |
| 3635 | do | Aug. 4 | 1 | 2 |
| 3637 | do | Aug. 14 | 2 | 12 |
| 3639 | do | Aug. 17[c] | 10 | 15 |
| 3642 | do | Aug. 5 | 9 | 3 |
| 3643 | do | do | 9 | 3 |
| 3644 | do | do | 7 | 3 |
| 3646 | do | do | 9 | 3 |
| 3648 | do | do | 8 | 3 |
| 3653 | do | do | 7 | 3 |
| 3658 | do | Aug. 6 | 10 | 4 |
| 3662 | do | do | 10 | 4 |
| 3663 | do | Aug. 7 | 8 | 5 |
| 3667 | Aug. 4 | Aug. 5 | 1 | 1 |
| 3670 | do | Aug. 10 | 8 | 6 |
| 3672 | do | Aug. 4 | 6 | 2 |
| 3673 | do | do | 2 | 2 |
| 3677 | do | do | 2 | 2 |
| 3678 | do | Aug. 9 | 8 | 5 |
| 3680 | do | Aug. 20 | 10 | 16 |
| 3682 | do | Aug. 7 | 8 | 3 |
| 3685 | do | do | 8 | 3 |
| 3687 | do | do | 8 | 3 |
| 3688 | do | Aug. 18 | 9 | 14 |
| 3693 | do | Sept. 17 | [d] | 44 |
| 3694 | do | Aug. 14 | 2 | 10 |
| 3695 | do | Aug. 6 | 8 | 2 |
| 3696 | do | do | 7 | 2 |
| 3699 | do | Aug. 8 | 9 | 4 |
| 3700 | do | Aug. 6 | 8 | 2 |
| 3702 | do | Aug. 5 | 6 | 1 |
| 3703 | do | Aug. 9[e] | 10 | 5 |
| 3704 | do | Aug. 6 | 7 | 2 |
| 3705 | do | Aug. 7 | 10 | 3 |
| 3711 | do | Aug. 6 | 2 | 2 |
| 3713 | do | do | 7 | 2 |
| 3714 | do | Aug. 9 | 9 | 5 |
| 3715 | do | Aug. 6 | 2 | 2 |
| 3718 | do | Aug. 19 | 10 | 15 |
| 3721 | do | Aug. 7 | 9 | 3 |
| 3722 | do | Aug. 9 | 10 | 5 |
| 3727 | do | Aug. 7 | 8 | 3 |
| 3728 | do | do | 9 | 3 |
| 3730 | do | Aug. 6 | 2 | 2 |
| 3735 | do | do | 7 | 2 |
| 3737 | do | Aug. 5 | 7 | 1 |
| 3739 | do | do | 1 | 1 |
| 3741 | do | Aug. 6 | 7 | 2 |
| 3742 | do | Aug. 8 | 8 | 4 |
| 3743 | do | Aug. 7 | 6 | 3 |
| 3744 | do | Aug. 16 | [f] | 12 |
| 3746 | do | Aug. 8 | 10 | 4 |
| 3747 | do | Aug. 11 | 7 | 7 |
| 3752 | do | Aug. 23 | 9 | 19 |
| 3754 | do | Aug. 7 | 1 | 3 |
| 3756 | do | Aug. 6 | 7 | 2 |
| 3757 | do | Aug. 5 | 1 | 1 |
| 3760 | Aug. 5 | Aug. 9 | 9 | 4 |
| 3762 | do | Aug. 7 | 2 | 2 |
| 3764 | do | Aug. 9 | 8 | 4 |
| 3773 | do | Aug. 7 | 8 | 2 |
| 3775 | do | Aug. 13 | 7 | 8 |
| 3777 | do | Aug. 9 | 7 | 4 |
| 3778 | do | Aug. 12 | 9 | 7 |
| 3779 | do | Sept. 20 | [d] | 46 |
| 3780 | do | Aug. 7 | 6 | 2 |
| 3783 | do | Aug. 10 | 8 | 5 |
| 3789 | do | Aug. 8 | 8 | 3 |
| 3790 | do | do | 9 | 3 |
| 3791 | do | Aug. 7 | 7 | 2 |
| 3792 | do | Aug. 6 | 7 | 1 |
| 3794 | do | Aug. 8 | 2 | 3 |
| 3795 | do | Aug. 9 | 9 | 4 |
| 3797 | do | Aug. 12 | 10 | 7 |
| 3800 | do | Aug. 18 | 9 | 13 |
| 3801 | Aug. 7 | Aug. 12 | 9 | 5 |
| 3805 | do | Aug. 10 | 9 | 3 |
| 3806 | do | do | 8 | 3 |
| 3807 | do | Aug. 9 | 7 | 2 |
| 3812 | do | Aug. 11 | 8 | 4 |
| 3818 | do | Sept. 3 | [g] | 27 |
| 3819 | do | Aug. 14 | 9 | 7 |
| 3820 | do | Aug. 12 | 10 | 5 |
| 3826 | do | Aug. 13 | 10 | 6 |
| 3829 | do | Aug. 18[h] | 10 | 11 |
| 3835 | do | Aug. 10 | 8 | 3 |

[a] The record is Sept. 12, but this is possibly a mistake, and the more probable date is Aug. 12, as tabulated.
[b] Fraser River, 5 miles above Yale, 60 miles above Mission.
[c] The record is Sept. 17, but this is possibly a mistake, and the more probable date is Aug. 17, as tabulated.
[d] Birkenhead River, 25 miles above Lillooet Lake, 130 miles above Mission, Fraser River.
[e] The record is Sept. 9, but this is possibly a mistake, and the more probable date is Aug. 9, as tabulated.
[f] Fraser River, 65 miles above Mission.
[g] Four Mile Creek, Pitt River, 30 miles above Fraser River, 50 miles from ocean.
[h] The record is Sept. 18, but this is possibly a mistake, and the more probable date is Aug. 18, as tabulated.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION C, POINT PARTRIDGE, WASH.

| Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 1001 | July 17 | July 19 | 7 | 2 | 1231 | July 26 | Aug. 5 | 9 | 10 |
| 1003 | ...do... | July 20 | 4 | 3 | 1235 | ...do... | July 30 | 8 | 4 |
| 1010 | ...do... | July 22 | 4 | 5 | 1238 | ...do... | July 29 | 2 | 3 |
| 1011 | ...do... | July 23 | 9 | 6 | 1239 | ...do... | Aug. 18 | 8 | 23 |
| 1017 | ...do... | July 20 | 8 | 3 | 1241 | ...do... | July 29 | 2 | 3 |
| 1018 | ...do... | July 23 | 9 | 6 | 1242 | ...do... | Aug. 1 | 7 | 6 |
| 1019 | ...do... | July 22 | 1 | 5 | 1244 | ...do... | July 29 | 8 | 3 |
| 1023 | ...do... | July 20 | 4 | 3 | 1249 | ...do... | Aug. 6 | (c) | 11 |
| 1030 | ...do... | July 22 | 1 | 5 | 1251 | ...do... | July 29 | 8 | 3 |
| 1031 | ...do... | July 21 | 10 | 4 | 1264 | ...do... | July 30 | 8 | 4 |
| 1036 | ...do... | July 20 | 1 | 3 | 1269 | ...do... | July 31 | 6 | 5 |
| 1037 | ...do... | July 25 | 1 | 8 | 1278 | ...do... | Aug. 1 | 8 | 6 |
| 1038 | ...do... | Aug. 17 | (a) | 31 | 1285 | ...do... | July 29 | 2 | 3 |
| 1041 | ...do... | July 24 | 7 | 7 | 1289 | ...do... | Aug. 18 | 10 | 23 |
| 1044 | July 19 | ...do... | 6 | 5 | 1290 | ...do... | July 29 | 8 | 3 |
| 1050 | ...do... | July 22 | 9 | 3 | 1293 | ...do... | Aug. 5 | 7 | 10 |
| 1052 | ...do... | July 24 | 6 | 5 | 1296 | ...do... | July 30 | 10 | 4 |
| 1055 | ...do... | July 22 | 2 | 3 | 1307 | ...do... | Aug. 1 | 8 | 6 |
| 1057 | ...do... | ...do... | 7 | 3 | 1308 | ...do... | Aug. 5 | 10 | 10 |
| 1058 | ...do... | ...do... | 3 | 3 | 1309 | ...do... | Aug. 2 | 2 | 7 |
| 1059 | ...do... | July 23 | 7 | 4 | 1310 | ...do... | July 30 | 9 | 4 |
| 1061 | ...do... | July 21 | 2 | 2 | 1313 | ...do... | July 28 | 8 | 2 |
| 1063 | ...do... | July 22 | 7 | 3 | 1317 | ...do... | Aug. 2 | 9 | 7 |
| 1067 | ...do... | July 24 | 8 | 5 | 1320 | ...do... | Aug. 11 | 8 | 16 |
| 1069 | ...do... | Aug. 2 | 8 | 14 | 1322 | ...do... | Aug. 5 | 10 | 10 |
| 1075 | ...do... | July 22 | 2 | 3 | 1328 | ...do... | July 30 | 6 | 4 |
| 1078 | ...do... | ...do... | 2 | 3 | 1330 | ...do... | ...do... | 1 | 4 |
| 1079 | ...do... | July 24 | 6 | 5 | 1334 | ...do... | ...do... | 10 | 4 |
| 1080 | ...do... | July 22 | 8 | 3 | 1337 | ...do... | ...do... | 9 | 4 |
| 1085 | ...do... | ...do... | 2 | 3 | 1344 | ...do... | July 29 | 1 | 3 |
| 1088 | ...do... | July 21 | 8 | 2 | 1346 | ...do... | ...do... | 1 | 3 |
| 1090 | ...do... | July 24 | 6 | 5 | 1347 | ...do... | ...do... | 1 | 3 |
| 1092 | ...do... | July 30 | 6 | 11 | 1351 | ...do... | Aug. 4 | 7 | 9 |
| 1094 | July 22 | July 26 | 8 | 4 | 1353 | ...do... | Aug. 1 | 8 | 6 |
| 1098 | ...do... | July 23 | 7 | 1 | 1354 | ...do... | ...do... | 8 | 6 |
| 1104 | ...do... | ...do... | 1 | 1 | 1355 | ...do... | ...do... | 10 | 6 |
| 1106 | ...do... | July 24 | 1 | 3 | 1357 | ...do... | Aug. 9 | 6 | 14 |
| 1107 | ...do... | July 25 | 2 | 3 | 1360 | ...do... | Aug. 1 | 2 | 6 |
| 1109 | ...do... | Aug. 12 | 10 | 21 | 1363 | ...do... | Aug. 12 | 7 | 17 |
| 1111 | ...do... | July 24 | 1 | 2 | 1366 | ...do... | Aug. 4 | 7 | 9 |
| 1116 | ...do... | July 25 | 8 | 3 | 1368 | ...do... | July 29 | 7 | 3 |
| 1124 | ...do... | July 24 | 6 | 2 | 1369 | ...do... | July 30 | 9 | 4 |
| 1128 | ...do... | July 30 | 8 | 8 | 1372 | ...do... | Aug. 16 | 9 | 21 |
| 1129 | ...do... | ...do... | 9 | 8 | 1373 | ...do... | Aug. 18d | 10 | 23 |
| 1130 | ...do... | July 28 | 10 | 6 | 1374 | ...do... | July 30 | 8 | 4 |
| 1132 | ...do... | July 29 | 1 | 7 | 1375 | ...do... | July 29 | 1 | 3 |
| 1135 | ...do... | ...do... | 9 | 7 | 1377 | ...do... | Aug. 6 | 2 | 11 |
| 1138 | ...do... | July 24 | 2 | 2 | 1380 | ...do... | Aug. 1 | 9 | 6 |
| 1151 | ...do... | July 26 | 9 | 4 | 1424 | Aug. 6 | Aug. 7 | 2 | 1 |
| 1156 | July 24 | July 31 | 3 | 7 | 1438 | ...do... | Aug. 11 | 7 | 5 |
| 1157 | ...do... | Aug. 8 | 2 | 15 | 1548 | Aug. 7 | Aug. 9 | 1 | 2 |
| 1163 | ...do... | Aug. 10 | (b) | 17 | 1559 | ...do... | Aug. 14 | 8 | 7 |
| 1165 | ...do... | Aug. 1 | 8 | 8 | 1567 | ...do... | Aug. 7 | 2 | 1 |
| 1167 | ...do... | July 29 | 10 | 5 | 1569 | ...do... | Aug. 11 | 8 | 4 |
| 1169 | ...do... | July 30 | 2 | 6 | 1575 | ...do... | ...do... | 8 | 4 |
| 1173 | ...do... | Aug. 5 | 10 | 12 | 1577 | ...do... | Aug. 14 | 10 | 7 |
| 1175 | ...do... | Aug. 6 | 2 | 13 | 1579 | ...do... | Aug. 9 | 2 | 2 |
| 1176 | ...do... | July 29 | 6 | 5 | 1591 | ...do... | Aug. 13 | 8 | 5 |
| 1177 | ...do... | July 31 | 6 | 7 | 1598 | ...do... | ...do... | 4 | 6 |
| 1185 | ...do... | July 25 | 1 | 1 | 1604 | ...do... | Aug. 16 | 6 | 9 |
| 1192 | ...do... | July 31 | 10 | 7 | 1609 | ...do... | Aug. 13 | 8 | 6 |
| 1193 | ...do... | July 30 | 9 | 6 | 1617 | ...do... | Aug. 9 | 7 | 2 |
| 1194 | ...do... | Aug. 10 | (b) | 17 | 1628 | ...do... | Aug. 11 | 8 | 4 |
| 1196 | ...do... | July 29 | 1 | 5 | 1639 | ...do... | Aug. 13 | 9 | 5 |
| 1197 | ...do... | ...do... | 9 | 5 | 1673 | Aug. 9 | Aug. 16 | 8 | 7 |
| 1199 | ...do... | July 31 | 6 | 7 | 1677 | ...do... | Aug. 13 | 9 | 4 |
| 1205 | ...do... | July 30 | 2 | 6 | 1681 | ...do... | Aug. 18 | 8 | 9 |
| 1207 | ...do... | Aug. 1 | 9 | 8 | 1687 | ...do... | Aug. 14 | 6 | 5 |
| 1212 | ...do... | July 29 | 10 | 5 | 1689 | ...do... | Aug. 15 | 8 | 6 |
| 1213 | ...do... | Aug. 7 | 10 | 14 | 1691 | ...do... | Aug. 14 | 9 | 5 |
| 1221 | ...do... | July 30 | 8 | 6 | 1695 | ...do... | Aug. 13 | 8 | 4 |
| 1223 | ...do... | July 31 | 9 | 7 | 1704 | ...do... | Aug. 12 | 6 | 3 |
| 1228 | ...do... | ...do... | 1 | 7 | 1705 | ...do... | Aug. 13 | 8 | 4 |
| 1229 | ...do... | July 29 | 8 | 5 | 1717 | ...do... | ...do... | 7 | 4 |

a Devil's Run, 10 miles above Mission, Fraser River.
b Ebey's Landing, below Point Partridge.
c Otter Point, Vancouver Island.
d The record is Sept. 18, but this is possibly a mistake, and the more probable date is Aug. 18, as tabulated.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION C, POINT PARTRIDGE, WASH.—Continued.

| Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 1719 | Aug. 9 | Aug. 13 | 9 | 4 | 1865 | Aug. 13 | Aug. 15 | 1 | 2 |
| 1721 | ...do | Aug. 14 | 8 | 5 | 1867 | ...do | Aug. 19 | 7 | 6 |
| 1723 | ...do | Aug. 11 | 1 | 2 | 1878 | ...do | Aug. 16 | 1 | 3 |
| 1724 | ...do | Aug. 12 | 6 | 3 | 1887 | ...do | Aug. 22 | 9 | 9 |
| 1732 | ...do | ...do | 7 | 3 | 1889 | ...do | Aug. 15 | 2 | 2 |
| 1735 | ...do | Aug. 22 | 9 | 13 | 1891 | ...do | Aug. 16 | 8 | 3 |
| 1736 | ...do | Aug. 18 | 10 | 9 | 1897 | ...do | Aug. 15 | 8 | 2 |
| 1741 | ...do | Aug. 9 | 2 | 1 | 1899 | ...do | Aug. 19 | 7 | 6 |
| 1743 | ...do | Aug. 13 | 8 | 4 | 1900 | ...do | Aug. 15 | 2 | 2 |
| 1746 | ...do | Aug. 18 | 8 | 9 | 1907 | ...do | ...do | 1 | 2 |
| 1749 | ...do | Aug. 12 | 8 | 3 | 1915 | ...do | Aug. 16 | 9 | 3 |
| 1762 | ...do | Aug. 23 | 6 | 14 | 1931 | Aug. 14 | Aug. 19 | 7 | 5 |
| 1763 | ...do | Aug. 13 | 2 | 4 | 1932 | ...do | ...do | 7 | 5 |
| 1768 | ...do | Aug. 14 | 9 | 5 | 1933 | ...do | Aug. 23 | 10 | 9 |
| 1769 | ...do | Aug. 13 | 8 | 4 | 1935 | ...do | Aug. 16 | 6 | 2 |
| 1773 | Aug. 13 | Aug. 15 | 8 | 2 | 1939 | ...do | ...do | 2 | 2 |
| 1787 | ...do | Aug. 21 | 9 | 8 | 1945 | ...do | Sept. 3 | 10 | 19 |
| 1793 | ...do | Aug. 18 | 9 | 5 | 1952 | ...do | Aug. 19 | 7 | 5 |
| 1796 | ...do | Aug. 13 | 2 | 1 | 1957 | ...do | Aug. 17 | 1 | 2 |
| 1807 | ...do | Aug. 17 | 9 | 4 | 1969 | ...do | Aug. 16 | 2 | 3 |
| 1812 | ...do | Aug. 14 | 2 | 1 | 1970 | ...do | ...do | 2 | 2 |
| 1820 | ...do | Aug. 19 | 8 | 3 | 1976 | ...do | Aug. 19 | 2 | 5 |
| 1835 | ...do | Aug. 14 | 2 | 1 | 1982 | ...do | Aug. 15 | 2 | 1 |
| 1846 | ...do | Aug. 16 | 4 | 3 | 1986 | ...do | Aug. 20 | 8 | 6 |
| 1851 | ...do | ...do | 8 | 3 | 1993 | ...do | Aug. 15 | 2 | 1 |
| 1853 | ...do | Aug. 18 | 8 | 5 | 1999 | ...do | Aug. 25 | 10 | 11 |
| 1854 | ...do | Aug. 16 | 8 | 3 | 2000 | ...do | Aug. 16 | 2 | 2 |
| 1856 | ...do | Aug. 14 | 1 | 1 | | | | | |

TAGS ATTACHED AT STATION D, LUMMI ISLAND, WASH.

| | 1918. | 1918. | | | | 1918. | 1918. | | |
|---|---|---|---|---|---|---|---|---|---|
| 2002 | July 19 | July 30 | 9 | 11 | 2125 | Aug. 13 | July 26 | 8 | 3 |
| 2003 | ...do | July 22 | 8 | 3 | 2137 | ...do | July 24 | 8 | 1 |
| 2013 | ...do | ...do | 8 | 3 | 2147 | ...do | July 25 | 8 | 2 |
| 2015 | ...do | ...do | 8 | 3 | 2148 | ...do | July 30 | 10 | 7 |
| 2020 | ...do | ...do | 10 | 3 | 2158 | ...do | July 24 | 8 | 1 |
| 2031 | ...do | ...do | 8 | 3 | 2160 | ...do | ...do | 9 | 1 |
| 2033 | ...do | July 23 | 9 | 4 | 2161 | ...do | Aug. 13 | 10 | 21 |
| 2037 | ...do | Aug. 6 | 8 | 18 | 2166 | ...do | July 26 | 10 | 3 |
| 2038 | ...do | July 21 | 8 | 2 | 2171 | ...do | July 25 | 9 | 2 |
| 2039 | ...do | July 22 | 8 | 3 | 2173 | ...do | July 24 | 8 | 1 |
| 2040 | ...do | July 25 | 9 | 6 | 2174 | ...do | ...do | 8 | 1 |
| 2044 | ...do | July 24 | 9 | 3 | 2175 | ...do | July 31 | 8 | 8 |
| 2049 | ...do | ...do | 8 | 5 | 2177 | ...do | July 24 | 8 | 1 |
| 2051 | ...do | Aug. 9 | 8 | 21 | 2181 | July 24 | Aug. 2 | 10 | 9 |
| 2052 | ...do | July 22 | 8 | 3 | 2183 | ...do | July 25 | 9 | 1 |
| 2055 | ...do | ...do | 7 | 3 | 2185 | ...do | July 29 | 9 | 5 |
| 2057 | ...do | July 23 | 9 | 4 | 2186 | ...do | July 25 | 8 | 1 |
| 2061 | ...do | July 22 | 8 | 3 | 2189 | ...do | July 28 | 9 | 4 |
| 2063 | ...do | July 24 | 8 | 1 | 2190 | ...do | July 26 | 9 | 2 |
| 2065 | ...do | July 22 | 8 | 3 | 2201 | ...do | Aug. 6 | 9 | 13 |
| 2069 | ...do | ...do | 8 | 3 | 2210 | ...do | Aug. 12 | 10 | 19 |
| 2072 | ...do | July 21 | 9 | 2 | 2214 | ...do | July 26 | 9 | 2 |
| 2073 | ...do | July 24 | 8 | 5 | 2216 | ...do | July 25 | 9 | 1 |
| 2075 | ...do | ...do | 7 | 5 | 2221 | ...do | July 29 | 10 | 5 |
| 2078 | ...do | July 22 | 8 | 3 | 2226 | ...do | July 26 | 9 | 2 |
| 2079 | ...do | ...do | 9 | 3 | 2231 | ...do | July 29 | 9 | 5 |
| 2082 | ...do | July 23 | 9 | 4 | 2232 | ...do | July 27 | 9 | 3 |
| 2084 | ...do | Aug. 16 | (a) | 28 | 2234 | ...do | July 28 | 9 | 4 |
| 2088 | July 23 | July 26 | 8 | 3 | 2237 | ...do | July 29 | 10 | 5 |
| 2090 | ...do | July 24 | 8 | 1 | 2238 | ...do | July 26 | 9 | 2 |
| 2092 | ...do | ...do | 8 | 1 | 2240 | ...do | July 29 | 9 | 5 |
| 2094 | ...do | ...do | 8 | 1 | 2241 | ...do | July 26 | 9 | 2 |
| 2095 | ...do | ...do | 8 | 1 | 2242 | ...do | July 30 | 9 | 6 |
| 2096 | ...do | July 26 | 8 | 3 | 2246 | ...do | July 25 | 8 | 1 |
| 2098 | ...do | July 24 | 8 | 1 | 2250 | ...do | July 28 | 8 | 4 |
| 2100 | ...do | Aug. 2 | (b) | 10 | 2251 | ...do | Aug. 5 | 10 | 12 |
| 2103 | ...do | July 26 | 8 | 3 | 2252 | July 28 | Aug. 30 | 10 | 33 |
| 2108 | ...do | July 25 | 9 | 2 | 2253 | ...do | Aug. 7 | 9 | 10 |
| 2112 | ...do | July 24 | 9 | 1 | 2255 | ...do | July 29 | 9 | 1 |
| 2122 | ...do | ...do | 8 | 1 | 2257 | ...do | July 30 | 8 | 2 |

a Soda Creek Canyon, 280 miles above Mission, Fraser River.
b Yale, 60 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION D, LUMMI ISLAND, WASH.—Continued.

| Tag No. | Date fish marked. | Date fish re-caught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish re-caught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 2259 | July 28 | Aug. 1 | 9 | 4 | 2438 | Aug. 4 | Aug. 5 | 8 | 1 |
| 2261 | ...do | July 30 | 8 | 2 | 2439 | ...do | Aug. 4 | 7 | 1 |
| 2265 | ...do | July 29 | 8 | 1 | 2440 | ...do | Aug. 5 | 9 | 3 |
| 2268 | ...do | Aug. 26 | (a) | 29 | 2441 | ...do | ...do | 8 | 1 |
| 2269 | ...do | July 31 | 8 | 3 | 2442 | ...do | Aug. 16 | 8 | 2 |
| 2270 | ...do | July 30 | 9 | 2 | 2443 | ...do | Aug. 6 | 9 | 2 |
| 2271 | ...do | Aug. 1 | 10 | 4 | 2444 | ...do | Aug. 5 | 9 | 1 |
| 2280 | ...do | July 30 | 8 | 2 | 2445 | ...do | ...do | 8 | 1 |
| 2282 | ...do | ...do | 9 | 2 | 2449 | ...do | ...do | 8 | 1 |
| 2285 | ...do | Aug. 11 | 10 | 15 | 2453 | ...do | ...do | 8 | 1 |
| 2286 | ...do | July 29 | 1 | 1 | 2455 | ...do | ...do | 8 | 1 |
| 2287 | ...do | July 30 | 9 | 2 | 2456 | ...do | Aug. 6 | 8 | 2 |
| 2288 | ...do | ...do | 9 | 2 | 2457 | ...do | ...do | 8 | 2 |
| 2289 | ...do | Aug. 8 | 10 | 11 | 2459 | ...do | Aug. 7 | 9 | 3 |
| 2290 | ...do | July 30 | 8 | 2 | 2464 | ...do | Aug. 5 | 9 | 1 |
| 2291 | ...do | Aug. 1 | 9 | 3 | 2465 | ...do | Sept. 3 | 10 | 30 |
| 2295 | ...do | July 30 | 9 | 2 | 2460 | ...do | Aug. 6 | 9 | 2 |
| 2300 | ...do | July 29 | 8 | 1 | 2469 | ...do | Aug. 5 | 8 | 1 |
| 2302 | ...do | July 30 | 9 | 2 | 2471 | ...do | Aug. 6 | 8 | 2 |
| 2304 | ...do | July 29 | 8 | 1 | 2472 | ...do | Aug. 5 | 9 | 1 |
| 2310 | ...do | ...do | 1 | 1 | 2474 | ...do | Aug. 6 | 9 | 2 |
| 2312 | ...do | July 30 | 9 | 1 | 2475 | ...do | ...do | 8 | 2 |
| 2313 | ...do | July 29 | 8 | 2 | 2476 | ...do | ...do | 8 | 2 |
| 2314 | ...do | July 30 | 9 | 2 | 2478 | Aug. 5 | ...do | 8 | 1 |
| 2315 | July 30 | Aug. 30 | (b) | 31 | 2482 | ...do | Aug. 7 | 8 | 2 |
| 2319 | ...do | Aug. 1 | 9 | 2 | 2485 | ...do | ...do | 9 | 2 |
| 2323 | ...do | Aug. 2 | 8 | 3 | 2487 | ...do | ...do | 8 | 2 |
| 2324 | ...do | Aug. 1 | 9 | 2 | 2488 | ...do | ...do | 9 | 2 |
| 2328 | ...do | ...do | 9 | 2 | 2492 | ...do | ...do | 9 | 2 |
| 2330 | ...do | July 31 | 10 | 1 | 2493 | ...do | Aug. 6 | 8 | 1 |
| 2331 | ...do | Aug. 2 | 10 | 3 | 2495 | ...do | ...do | 8 | 1 |
| 2335 | ...do | ...do | 8 | 3 | 2497 | ...do | ...do | 8 | 1 |
| 2338 | ...do | July 31 | 10 | 1 | 2501 | ...do | ...do | 9 | 1 |
| 2344 | ...do | July 30 | 8 | 1 | 2503 | ...do | Aug. 23[d] | 10 | 18 |
| 2346 | ...do | Aug. 2 | 2 | 3 | 2507 | ...do | Sept. 20 | (e) | 46 |
| 2347 | ...do | Aug. 1 | 8 | 2 | 2510 | ...do | Aug. 7 | 8 | 2 |
| 2349 | ...do | July 31 | 9 | 1 | 2512 | ...do | Aug. 6 | 8 | 1 |
| 2358 | ...do | Aug. 1 | 8 | 2 | 2515 | ...do | Aug. 9 | 9 | 4 |
| 2359 | ...do | Aug. 2 | 10 | 3 | 2516 | ...do | Aug. 6 | 9 | 1 |
| 2365 | Aug. 2 | Aug. 4 | 8 | 2 | 2517 | ...do | Aug. 7 | 9 | 2 |
| 2367 | ...do | Aug. 5 | 7 | 3 | 2518 | ...do | Aug. 6 | 8 | 1 |
| 2368 | ...do | ...do | 10 | 3 | 2522 | ...do | Aug. 7 | 8 | 2 |
| 2370 | ...do | Aug. 4 | 8 | 2 | 2523 | ...do | Aug. 6 | 8 | 1 |
| 2373 | ...do | ...do | 8 | 2 | 2529 | ...do | Aug. 7 | 8 | 2 |
| 2375 | ...do | ...do | 8 | 2 | 2530 | ...do | Aug. 6 | 8 | 1 |
| 2376 | ...do | Aug. 5 | 9 | 3 | 2531 | ...do | Aug. 7 | 8 | 2 |
| 2381 | ...do | ...do | 9 | 3 | 2535 | ...do | Aug. 6 | 9 | 1 |
| 2384 | ...do | ...do | 8 | 3 | 2539 | ...do | Aug. 7 | 8 | 2 |
| 2389 | ...do | Aug. 2 | 9 | 1 | 2541 | ...do | Aug. 6 | 8 | 1 |
| 2391 | ...do | Aug. 6 | 8 | 4 | 2542 | ...do | Aug. 8 | 8 | 3 |
| 2394 | ...do | Aug. 25 | 10 | 23 | 2544 | ...do | Aug. 7 | 8 | 2 |
| 2401 | ...do | Aug. 4 | 9 | 2 | 2546 | ...do | ...do | 8 | 2 |
| 2403 | ...do | Aug. 5 | 9 | 3 | 2547 | ...do | Aug. 6 | 8 | 1 |
| 2404 | ...do | Aug. 13 | 10 | 11 | 2548 | ...do | Aug. 8 | 10 | 3 |
| 2405 | ...do | Aug. 5 | 9 | 3 | 2549 | ...do | ...do | 8 | 3 |
| 2410 | ...do | Aug. 2 | 9 | 1 | 2551 | ...do | Aug. 6 | 8 | 1 |
| 2413 | ...do | Aug. 9 | 9 | 7 | 2552 | ...do | Aug. 8 | 10 | 3 |
| 2414 | ...do | Aug. 5 | 9 | 3 | 2554 | ...do | Aug. 7 | 8 | 2 |
| 2416 | ...do | Aug. 8 | 9 | 6 | 2556 | Aug. 6 | ...do | 9 | 1 |
| 2420 | Aug. 4 | Aug. 7 | 8 | 3 | 2557 | ...do | Aug. 8 | 8 | 2 |
| 2421 | ...do | Aug. 5 | 8 | 1 | 2558 | ...do | Aug. 9 | 10 | 3 |
| 2424 | ...do | Aug. 6 | 8 | 2 | 2559 | ...do | Aug. 6 | 9 | 1 |
| 2426 | ...do | Aug. 4 | 7 | 1 | 2560 | ...do | Aug. 7 | 9 | 1 |
| 2428 | ...do | Aug. 5 | 7 | 1 | 2566 | ...do | Aug. 9 | 10 | 3 |
| 2429 | ...do | Aug. 19[c] | 10 | 15 | 2569 | ...do | ...do | 9 | 3 |
| 2431 | ...do | Aug. 5 | 7 | 1 | 2570 | ...do | Aug. 6 | 9 | 1 |
| 2432 | ...do | ...do | 7 | 1 | 2574 | ...do | Aug. 9 | 9 | 3 |
| 2434 | ...do | Aug. 7 | 8 | 3 | 2575 | ...do | ...do | 10 | 3 |
| 2435 | ...do | Aug. 6 | 8 | 2 | 2576 | ...do | Aug. 16 | (f) | 10 |
| 2436 | ...do | ...do | 9 | 2 | 2578 | ...do | Aug. 11 | 7 | 5 |
| 2437 | ...do | Aug. 5 | 8 | 1 | 2579 | ...do | Aug. 9 | 8 | 3 |

[a] Hell's Gate, 80 miles above Mission, Fraser River.
[b] Lytton, 110 miles above Mission, Fraser River.
[c] The record is Sept. 19, but this is possibly a mistake, and the more probable date is Aug. 19, as tabulated.
[d] The record is Sept. 23, but this is possibly a mistake, and the more probable date is Aug. 23, as tabulated.
[e] Birkenhead River, 25 miles above Lillooet Lake, 130 miles above Mission, Fraser River.
[f] Strawberry Island, 50 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION D, LUMMI ISLAND, WASH.—Continued.

| Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 2580 | Aug. 6 | Aug. 9 | 2 | 3 | 2651 | Aug. 7 | Aug. 12 | 8 | 5 |
| 2583 | ...do | Aug. 7 | 8 | 1 | 2655 | ...do | Aug. 9 | 8 | 2 |
| 2584 | ...do | Aug. 10 | 8 | 4 | 2657 | ...do | Aug. 8 | 8 | 1 |
| 2585 | ...do | ...do | 8 | 4 | 2659 | ...do | ...do | 9 | 1 |
| 2587 | ...do | Aug. 11 | 8 | 5 | 2661 | ...do | ...do | 8 | 1 |
| 2588 | ...do | Aug. 8 | 8 | 2 | 2662 | ...do | Aug. 9 | 9 | 2 |
| 2589 | ...do | Aug. 7 | 9 | 1 | 2666 | ...do | Aug. 10 | 8 | 3 |
| 2591 | ...do | ...do | 9 | 1 | 2669 | ...do | ...do | 9 | 3 |
| 2592 | ...do | ...do | 9 | 1 | 2670 | ...do | Aug. 9 | 9 | 2 |
| 2593 | ...do | Aug. 6 | 9 | 1 | 2672 | ...do | ...do | 9 | 2 |
| 2595 | ...do | Aug. 9 | 8 | 3 | 2675 | ...do | ...do | 8 | 2 |
| 2598 | ...do | Aug. 12 | 8 | 6 | 2676 | ...do | Sept. 16 | (b) | 40 |
| 2602 | ...do | Aug. 9 | 9 | 3 | 2678 | ...do | Aug. 10 | 8 | 3 |
| 2603 | ...do | ...do | 10 | 3 | 2682 | ...do | Aug. 12 | 10 | 5 |
| 2604 | ...do | Aug. 8 | 8 | 2 | 2683 | ...do | Aug. 9 | 8 | 2 |
| 2605 | ...do | Aug. 9 | 9 | 3 | 2684 | ...do | ...do | 9 | 2 |
| 2610 | ...do | ...do | 9 | 3 | 2685 | ...do | ...do | 9 | 2 |
| 2611 | ...do | Aug. 7 | 8 | 1 | 2686 | ...do | Aug. 12 | 9 | 5 |
| 2612 | ...do | Aug. 12 | 8 | 6 | 2687 | ...do | Aug. 8 | 8 | 1 |
| 2614 | ...do | Aug. 8 | 9 | 2 | 2688 | ...do | ...do | 8 | 1 |
| 2616 | ...do | Aug. 7 | 9 | 1 | 2689 | ...do | ...do | 9 | 1 |
| 2618 | ...do | Aug. 8 | 10 | 2 | 2692 | Aug. 9 | Aug. 11 | 8 | 2 |
| 2621 | ...do | Aug. 9 | 8 | 3 | 2699 | ...do | ...do | 8 | 2 |
| 2622 | ...do | Aug. 10 | 9 | 4 | 2707 | ...do | Aug. 13 | 9 | 4 |
| 2623 | ...do | Aug. 11 | 9 | 5 | 2710 | ...do | Sept. 4 | (c) | 26 |
| 2625 | ...do | Aug. 8 | 9 | 2 | 2713 | ...do | Aug. 16 | 8 | 7 |
| 2627 | ...do | Aug. 7 | 8 | 1 | 2717 | ...do | Aug. 12 | 9 | 3 |
| 2628 | ...do | ...do | 9 | 1 | 2718 | ...do | Aug. 14 | 10 | 5 |
| 2629 | ...do | Aug. 11 | 10 | 5 | 2719 | ...do | Aug. 12 | 10 | 3 |
| 2630 | ...do | Aug. 8 | 9 | 2 | 2720 | ...do | Aug. 15 | 8 | 6 |
| 2631 | ...do | Aug. 11 | 7 | 5 | 2722 | ...do | Aug. 13 | 9 | 4 |
| 2633 | ...do | Aug. 9 | 9 | 3 | 2726 | ...do | Aug. 14 | 9 | 5 |
| 2634 | ...do | Aug. 15 | 9 | 9 | 2728 | ...do | Aug. 12 | 10 | 3 |
| 2635 | ...do | Aug. 7 | 9 | 1 | 2733 | ...do | Aug. 11 | 8 | 2 |
| 2636 | ...do | Aug. 8 | 8 | 2 | 2734 | ...do | Aug. 11–13 | 9 | 3 |
| 2642 | ...do | ...do | 9 | 2 | | | | | |
| 2645 | ...do | Aug. 7 | 8 | 1 | 2736 | ...do | Aug. 14 | 9 | 5 |
| 2646 | ...do | Aug. 8 | 8 | 2 | 2737 | ...do | Aug. 19 | 7 | 10 |
| 2648 | ...do | Sept. 19 | (a) | 44 | | | | | |

TAGS ATTACHED AT STATION E, POINT ROBERTS, WASH.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 36 | Aug. 15 | Aug. 18 | 10 | 3 | 4001 | July 25 | July 29 | 10 | 4 |
| 38 | ...do | Aug. 16 | 10 | 1 | 4007 | ...do | Aug. 4 | 7 | 11 |
| 72 | ...do | Sept. 20 | (d) | 36 | 4008 | ...do | July 26 | 10 | 1 |
| 74 | ...do | Sept. 24 | (d) | 40 | 4012 | ...do | Aug. 5 | (g) | 11 |
| 75 | ...do | Sept. 21 | (d) | 37 | 4025 | ...do | July 30 | 10 | 5 |
| 83 | ...do | Sept. 15 | (d) | 31 | 4047 | ...do | July 29 | (h) | 4 |
| 84 | ...do | Sept. 10 | 10 | 26 | 4065 | ...do | July 28 | 10 | 3 |
| 90 | Aug. 16 | Sept. 2 | (e) | 17 | 4071 | ...do | July 29 | 10 | 4 |
| 100 | Aug. 19 | Aug. 19 | 10 | 1 | 4103 | July 26 | Aug. 3 | 10 | 8 |
| 113 | ...do | Aug. 22 | 10 | 3 | 4104 | ...do | July 29 | 10 | 3 |
| 126 | Aug. 20 | Aug. 21 | 10 | 1 | 4107 | ...do | July 30 | 10 | 4 |
| 127 | ...do | Aug. 22 | 10 | 2 | 4109 | ...do | July 29 | 10 | 3 |
| 130 | ...do | Sept. 5 | 10 | 16 | 4117 | ...do | July 31 | 10 | 5 |
| 137 | ...do | Aug. 28 | 10 | 8 | 4121 | ...do | July 30 | 10 | 4 |
| 140 | ...do | Aug. 22 | 10 | 2 | 4122 | ...do | July 28 | 10 | 2 |
| 149 | ...do | ...do | 10 | 2 | 4129 | ...do | July 29 | 10 | 3 |
| 151 | ...do | ...do | 10 | 2 | 4138 | ...do | ...do | 10 | 3 |
| 156 | Aug. 21 | Aug. 21 | 10 | 1 | 4142 | ...do | July 28 | 10 | 2 |
| 164 | ...do | Oct. 7 | (d) | 47 | 4150 | ...do | Aug. 5 | (i) | 10 |
| 165 | ...do | Aug. 21 | 10 | 1 | 4166 | July 29 | Aug. 9 | 10 | 11 |
| 167 | ...do | Aug. 27[f] | 10 | 6 | 4174 | ...do | Aug. 16 | (j) | 18 |

[a] Four miles above Pitt Lake, 30 miles from Fraser River, 50 miles from ocean.
[b] Near Spuzzum, 65 miles above Mission, Fraser River.
[c] Mountain Slough, above Pitt Lake, 30 miles from Fraser River, 50 miles from ocean.
[d] Birkenhead River, 25 miles above Lillooet Lake, 130 miles above Mission, Fraser River.
[e] Samaquam, Lillooet River, 25 miles above Harrison Lake, 90 miles above Mission.
[f] The record is Sept. 27, but this is possibly a mistake, and the more probable date is Aug. 27, as tabulated.
[g] Five miles above Yale, 65 miles above Mission, Fraser River.
[h] Mouth of Chilliwack River, 12 miles above Mission, Fraser River.
[i] Yale, 60 miles above Mission, Fraser River.
[j] Strawberry Island, 50 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION E, POINT ROBERTS, WASH.—Continued.

| Tag No. | Date fish marked. | Date fish re-caught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish re-caught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 4183 | July 29 | Aug. 2 | 8 | 4 | 4405 | July 31 | Aug. 11 | 10 | 11 |
| 4187 | ...do | Aug. 4 | 10 | 6 | 4407 | ...do | Aug. 15 | 10 | 15 |
| 4196 | ...do | Aug. 12 | 10 | 14 | 4415 | ...do | Aug. 2 | 10 | 2 |
| 4198 | ...do | Sept. 12 | (a) | 45 | 4417 | ...do | Aug. 5 | 10 | 6 |
| 4203 | ...do | Aug. 2 | 8 | 4 | 4423 | ...do | Aug. 1 | 10 | 1 |
| 4207 | ...do | July 30 | 10 | 1 | 4432 | ...do | ...do | 9 | 1 |
| 4209 | ...do | Aug. 5 | 10 | 7 | 4434 | ...do | July 31 | 10 | 1 |
| 4211 | ...do | July 30 | 10 | 1 | 4436 | ...do | Aug. 30 | 10 | 30 |
| 4216 | ...do | Aug. 2 | 9 | 4 | 4438 | ...do | Aug. 11 | 7 | 11 |
| 4219 | ...do | July 31 | 10 | 2 | 4446 | ...do | Aug. 2 | 10 | 2 |
| 4220 | ...do | ...do | 10 | 2 | 4447 | ...do | Aug. 21 | 10 | 21 |
| 4221 | ...do | July 30 | 10 | 1 | 4454 | ...do | Aug. 6 | 8 | 6 |
| 4246 | ...do | Aug. 1 | 9 | 3 | 4461 | ...do | Aug. 7 | 10 | 7 |
| 4249 | ...do | Aug. 5 | (b) | 6 | 4464 | ...do | ...do | 10 | 7 |
| 4252 | ...do | Aug. 7 | (c) | 9 | 4467 | ...do | Aug. 5 | 8 | 5 |
| 4258 | ...do | Aug. 1 | 8 | 3 | 4468 | ...do | Aug. 16 | 8 | 16 |
| 4264 | July 30 | Aug. 2 | 10 | 3 | 4474 | ...do | Aug. 20 | 10 | 20 |
| 4267 | ...do | ...do | 10 | 3 | 4476 | ...do | Aug. 5 | 9 | 5 |
| 4268 | ...do | Aug. 3 | 8 | 4 | 4478 | ...do | Aug. 9 | 10 | 9 |
| 4270 | ...do | July 30 | 10 | 1 | 4480 | ...do | Aug. 5 | 10 | 5 |
| 4271 | ...do | Aug. 2 | 10 | 3 | 4481 | ...do | Aug. 7 | 10 | 7 |
| 4274 | ...do | Aug. 5 | 10 | 6 | 4482 | ...do | Aug. 28 | (h) | 28 |
| 4277 | ...do | July 31 | 10 | 1 | 4483 | ...do | Aug. 2 | 10 | 2 |
| 4279 | ...do | Aug. 16 | 10 | 17 | 4485 | ...do | Aug. 5 | 9 | 5 |
| 4283 | ...do | Aug. 5 | 10 | 6 | 4486 | ...do | Aug. 2 | 10 | 2 |
| 4284 | ...do | Aug. 6 | 10 | 7 | 4487 | ...do | Aug. 5 | 8 | 5 |
| 4286 | ...do | Aug. 20 | (d) | 21 | 4488 | ...do | Aug. 1 | 10 | 1 |
| 4288 | ...do | Aug. 2 | 8 | 3 | 4489 | ...do | July 31 | 10 | 1 |
| 4289 | ...do | ...do | 10 | 3 | 4491 | ...do | Aug. 1 | 9 | 1 |
| 4291 | ...do | Aug. 26 | 10 | 27 | 4492 | ...do | Aug. 6 | 10 | 6 |
| 4296 | ...do | Aug. 14 | 9 | 15 | 4499 | Aug. 1 | Aug. 4 | 10 | 3 |
| 4300 | ...do | Aug. 4 | 8 | 5 | 4500 | ...do | Aug. 8 | 10 | 7 |
| 4305 | ...do | Sept. 13 | (f) | 45 | 4502 | ...do | Aug. 12 | 9 | 11 |
| 4315 | ...do | Aug. 6 | 9 | 7 | 4506 | ...do | Aug. 19 | 10 | 18 |
| 4317 | ...do | Aug. 2 | 10 | 3 | 4508 | ...do | Aug. 13 | 10 | 12 |
| 4327 | ...do | Aug. 30 | (g) | 31 | 4509 | ...do | Aug. 4 | 10 | 3 |
| 4331 | ...do | Aug. 1 | 10 | 2 | 4511 | ...do | Sept. 2 | 10 | 32 |
| 4340 | ...do | Aug. 4 | 9 | 5 | 4515 | ...do | Aug. 4 | 10 | 3 |
| 4348 | ...do | July 30 | 10 | 1 | 4516 | ...do | Aug. 12 | 10 | 11 |
| 4349 | ...do | ...do | 10 | 1 | 4521 | ...do | Aug. 6 | 10 | 5 |
| 4352 | ...do | Aug. 9 | (h) | 10 | 4524 | ...do | Aug. 21 | 10 | 20 |
| 4353 | ...do | July 30 | 9 | 1 | 4525 | ...do | Aug. 2 | 10 | 1 |
| 4356 | ...do | July 31 | 10 | 1 | 4526 | ...do | Aug. 6 | 10 | 5 |
| 4357 | ...do | Aug. 4 | 10 | 5 | 4538 | ...do | Aug. 2 | 10 | 1 |
| 4359 | ...do | Aug. 7 | 10 | 8 | 4534 | Aug. 2 | Aug. 5 | 10 | 3 |
| 4360 | ...do | Aug. 8 | 9 | 9 | 4540 | ...do | ...do | 10 | 3 |
| 4367 | ...do | Aug. 6 | 10 | 7 | 4544 | ...do | Aug. 11 | 10 | 9 |
| 4368 | ...do | Aug. 27 | (i) | 28 | 4545 | ...do | Aug. 7 | (c) | 5 |
| 4370 | ...do | Sept. 14 | (j) | 46 | 4547 | ...do | Aug. 5 | (i) | 3 |
| 4375 | July 31 | Sept. 10 | (a) | 41 | 4553 | ...do | Aug. 4 | 10 | 2 |
| 4376 | ...do | Aug. 15 | 10 | 15 | 4556 | ...do | Aug. 5 | 10 | 3 |
| 4381 | ...do | Aug. 7 | 8 | 7 | 4558 | ...do | Aug. 4 | 10 | 2 |
| 4383 | ...do | Aug. 1 | 10 | 1 | 4560 | ...do | Aug. 12 | 8 | 10 |
| 4384 | ...do | Aug. 6 | 10 | 6 | 4562 | ...do | Aug. 8 | 10 | 6 |
| 4389 | ...do | Aug. 21 | 10 | 21 | 4569 | ...do | Aug. 4 | 10 | 2 |
| 4392 | ...do | July 31 | 10 | 1 | 4573 | ...do | Aug. 5 | 10 | 3 |
| 4393 | ...do | Aug. 30 | 10 | 30 | 4595 | ...do | Aug. 7 | 10 | 5 |
| 4402 | ...do | Aug. 5 | 9 | 5 | 4590 | ...do | Aug. 9 | 8 | 7 |
| 4403 | ...do | Aug. 1 | 10 | 1 | 4601 | ...do | Aug. 20 | 10 | 18 |
| 4404 | ...do | Aug. 4 | 7 | 4 | 4603 | ...do | Aug. 13 | (m) | 11 |

a Portage Creek, foot of Anderson Lake, 170 miles above Mission.
b Twenty-seven miles above Mission, Fraser River.
c Devils Run, 10 miles above Mission, Fraser River.
d Tenmile House, above Harrison Lake, 75 miles above Mission.
e The record is Sept. 26, but this is possibly a mistake, and the more probable date is Aug. 26, as tabulated
f Chilcoten River, 235 miles above Mission.
g Lillooet Bridge, 150 miles above Mission, Fraser River.
h Hell's Gate, 80 miles above Mission, Fraser River.
i Skookum Chuck, on Lillooet River, 12 miles above Harrison Lake, 75 miles above Mission.
j Birkenhead River, 25 miles above Lillooet River, 130 miles above Mission, Fraser River.
k The record is Sept. 8, but this is possibly a mistake, and the more probable date is Aug. 8, as tabulated.
l Three miles above Mission, Fraser River.
m Trafalgar Flat, 50 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION E, POINT ROBERTS, WASH.—Continued.

| Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. | Tag No. | Date fish marked. | Date fish recaught. | Region where taken. | Days en route. |
|---|---|---|---|---|---|---|---|---|---|
| | 1918. | 1918. | | | | 1918. | 1918. | | |
| 4606 | Aug. 2 | Aug. 4 | 10 | 2 | 4759 | Aug. 6 | Aug. 30 | 10 | 24 |
| 4607 | ...do... | Aug. 7 | 9 | 5 | 4760 | ...do... | Aug. 16 | 10 | 10 |
| 4608 | ...do... | Aug. 5 | 10 | 3 | 4765 | ...do... | Aug. 8 | 10 | 2 |
| 4609 | ...do... | Aug. 6 | 9 | 4 | 4773 | ...do... | Aug. 12 | 10 | 6 |
| 4610 | ...do... | Sept. 11 | (a) | 40 | 4776 | ...do... | Aug. 20c | 10 | 14 |
| 4614 | ...do... | Aug. 5 | 9 | 3 | 4777 | ...do... | Aug. 7 | 10 | 1 |
| 4622 | ...do... | Aug. 11 | 9 | 9 | 4780 | ...do... | Aug. 11 | 9 | 5 |
| 4627 | ...do... | ...do... | 10 | 9 | 4784 | ...do... | Aug. 9 | 9 | 3 |
| 4633 | Aug. 5 | Aug. 20 | 9 | 15 | 4790 | ...do... | Aug. 18 | 10 | 12 |
| 4635 | ...do... | Aug. 9 | 6 | 4 | 4791 | ...do... | Aug. 7 | 10 | 1 |
| 4639 | ...do... | Aug. 20 | 10 | 15 | 4796 | ...do... | Aug. 19 | 10 | 13 |
| 4640 | ...do... | Aug. 9 | 10 | 4 | 4799 | ...do... | Aug. 26 | 10 | 20 |
| 4653 | ...do... | Nov. 16 | (b) | 103 | 4800 | ...do... | Aug. 13 | 10 | 7 |
| 4654 | ...do... | Aug. 11 | 10 | 6 | 4801 | ...do... | Aug. 6 | 10 | 10 |
| 4657 | ...do... | Aug. 13 | 10 | 8 | 4803 | ...do... | Aug. 7 | 10 | 1 |
| 4660 | ...do... | Aug. 7 | 10 | 2 | 4808 | ...do... | Aug. 8 | 10 | 2 |
| 4663 | ...do... | Aug. 9 | 10 | 4 | 4809 | ...do... | Aug. 30 | 10 | 24 |
| 4664 | ...do... | Aug. 11 | 9 | 6 | 4812 | ...do... | Aug. 12 | 10 | 6 |
| 4669 | ...do... | Aug. 6 | 10 | 1 | 4813 | ...do... | Aug. 8 | 10 | 2 |
| 4670 | ...do... | Aug. 15 | 10 | 10 | 4814 | ...do... | ...do... | 10 | 2 |
| 4677 | ...do... | Aug. 7 | 10 | 2 | 4818 | ...do... | Aug. 22d | 10 | 16 |
| 4686 | ...do... | Aug. 18 | 10 | 13 | 4823 | Aug. 7 | Aug. 13 | 10 | 6 |
| 4687 | ...do... | Aug. 8 | 10 | 3 | 4825 | ...do... | Aug. 9 | 9 | 2 |
| 4691 | ...do... | Aug. 11 | 7 | 6 | 4828 | ...do... | Aug. 7 | 10 | 1 |
| 4692 | ...do... | Aug. 16 | 9 | 11 | 4830 | ...do... | Aug. 16 | (e) | 9 |
| 4694 | ...do... | Sept. 6 | 10 | 32 | 4831 | ...do... | Aug. 7 | 10 | 1 |
| 4708 | ...do... | Aug. 12 | 9 | 7 | 4833 | ...do... | Aug. 10 | 10 | 3 |
| 4709 | ...do... | ...do... | 10 | 7 | 4836 | Aug. 8 | Aug. 18 | 10 | 10 |
| 4713 | ...do... | Sept. 5 | 10 | 31 | 4847 | ...do... | Aug. 12 | 10 | 4 |
| 4714 | ...do... | Aug. 12 | 10 | 7 | 4801 | ...do... | Aug. 8 | 10 | 1 |
| 4732 | ...do... | Aug. 20 | 10 | 15 | 4809 | ...do... | Aug. 10 | 10 | 2 |
| 4733 | ...do... | Aug. 6 | 10 | 1 | 4870 | ...do... | Aug. 19 | (f) | 11 |
| 4735 | ...do... | Aug. 9 | 9 | 4 | 4879 | ...do... | Aug. 18 | 8 | 10 |
| 4738 | ...do... | Aug. 26 | 10 | 21 | 4883 | ...do... | Aug. 12 | 9 | 4 |
| 4740 | ...do... | Aug. 9 | 10 | 4 | 4886 | ...do... | Aug. 10 | 10 | 2 |
| 4751 | Aug. 6 | ...do... | 10 | 3 | 4896 | ...do... | Aug. 12 | 10 | 4 |
| 4753 | ...do... | Aug. 12 | 9 | 6 | 4913 | ...do... | ...do... | 10 | 4 |
| 4754 | ...do... | Aug. 6 | 10 | 1 | 4914 | ...do... | Aug. 9 | 10 | 1 |
| 4756 | ...do... | Aug. 18 | 10 | 12 | 4921 | ...do... | Aug. 11 | 10 | 3 |

a Samaquam, Lillooet River, 25 miles above Harrison Lake, 90 miles above Mission.
b Mouth of Seymour Creek, Burrard Inlet, at North Vancouver.
c The record is Sept. 20, but this is possibly a mistake, and the more propable date is Aug. 20, as tabulated.
d The record is Sept. 22, but this is possibly a mistake, and the more probable date is Aug. 22, as tabulated.
e American Bar, 50 miles above Mission, Fraser River.
f Trafalgar Flat, 50 miles above Mission, Fraser River.

## PERCENTAGE OF RETURNS.

Table 3 shows the percentage of returns from each day's marking at each station. The data from which the percentages were obtained are also given. In general the returns indicate that the marking was quite uniformly successful. This is especially true with that done at stations B and D. The marking done at station A suffered somewhat in efficiency for a few days at the time the change was made in the personnel but otherwise is satisfactory. The records from station E show a sudden diminution in the percentage of returns on August 8 and for the following three days on which fish were marked. No explanation can be given for this. As stated (note to Table 1, station C), the accuracy of the August records for station C is subject to considerable question, and the operator at this point has admitted reporting incorrectly the number of fish marked on August 6. But 2 out of 164 reported marked on this date were recovered, a much lower percentage than was obtained from any other day's marking. These facts have thrown the record of

marking done at this station during August so much under suspicion that it was considered necessary, in certain phases of the study, to disregard entirely the returns.

It is important to call attention to the fact that the figures given in Table 3 can not be accepted as giving any adequate idea of the percentage of fish entering from the ocean which are caught while passing through the waters where commercial fishing is permitted. Several indeterminate factors must modify the percentage of returns to such an extent that, while they are reasonably comparable inter se, the actual figures give a much-distorted idea of the toll taken from the run as it is passing through the Sound and river. Two of these factors are especially obvious, i. e.: (1) The figures as given here do not include all of the actual returns, since some were omitted on account of faulty or incomplete data; the error from this factor, however, is not great, approximately 5 per cent; (2) a much more important source of error is due to lost tags. There are no means of knowing just how many were taken and not turned in. Nor can anything more be learned as to the number of tags lost from the fish between the time they were attached and the time the fish were captured. Numerous reliable reports came to us of fish that showed splits in the tail fins terminating in holes similar to the one made with the leather punch. Apparently the tags had in some manner become caught and pulled out. Another possibility is that some of the fish were unable to stand the operation necessary to the attachment of the tag, more particularly the attendant handling and removal from the water.

All of these factors would tend to increase the percentage of fish captured, but obviously there are no means for determining to what extent.

TABLE 3.—NUMBER OF FISH MARKED EACH DAY, TOTAL NUMBER OF RETURNS FROM EACH DAY'S MARKING, AND PERCENTAGES OF RETURNS FOR EACH STATION, 1918.

| Date marked. | Station A. | | | Station B. | | | Station C. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Marked. | Returned. | Percentage returned. | Marked. | Returned. | Percentage returned. | Marked. | Returned. | Percentage returned. |
| July 14 | 4 | 1 | 25 | | | | | | |
| 17 | | | | | | | 43 | 14 | 32 |
| 19 | | | | | | | 50 | 19 | 38 |
| 21 | 46 | 16 | 35 | 25 | 5 | 20 | | | |
| 22 | 10 | 4 | 40 | 40 | 10 | 25 | 61 | 16 | 26 |
| 23 | 20 | 2 | 10 | 95 | 27 | 28 | | | |
| 24 | 8 | 1 | 12 | 56 | 18 | 32 | 76 | 25 | 33 |
| 25 | 56 | 4 | 7 | 50 | 13 | 26 | | | |
| 26 | | | | 111 | 45 | 40 | 152 | 48 | 32 |
| 27 | 98 | 16 | 16 | | | | | | |
| 28 | 72 | 15 | 21 | 54 | 27 | 50 | | | |
| 30 | 99 | 20 | 20 | 17 | 3 | 18 | | | |
| 31 | 105 | 24 | 23 | 48 | 20 | 42 | | | |
| Aug. 1 | 77 | 12 | 16 | 104 | 46 | 44 | | | |
| 2 | 138 | 21 | 15 | 64 | 24 | 38 | | | |
| 4 | 64 | 8 | 12 | 94 | 44 | 47 | | | |
| 5 | | | | 42 | 18 | 43 | | | |
| 6 | 34 | 3 | 9 | | | | 164 | 2 | 1 |
| 7 | | | | 36 | 11 | 31 | 118 | 14 | 12 |
| 9 | | | | | | | 105 | 25 | 24 |
| 13 | | | | | | | 155 | 24 | 15 |
| 14 | | | | | | | 76 | 16 | 21 |
| Total | 831 | 147 | 17.7 | 836 | 311 | 37.3 | 1,000 | 203 | 20.3 |

TABLE 3.—NUMBER OF FISH MARKED EACH DAY, TOTAL NUMBER OF RETURNS FROM EACH DAY'S MARKING, AND PERCENTAGES OF RETURNS FOR EACH STATION, 1918—Continued.

| Date marked. | Station D. | | | Station E. | | |
|---|---|---|---|---|---|---|
| | Marked. | Returned. | Percentage returned. | Marked. | Returned. | Percentage returned. |
| July 19 | 85 | 28 | 33 | | | |
| 23 | 92 | 25 | 27 | | | |
| 24 | 74 | 23 | 31 | | | |
| 25 | | | | 95 | 8 | 8 |
| 26 | | | | 70 | 11 | 16 |
| 28 | 63 | 28 | 44 | | | |
| 29 | | | | 93 | 18 | 19 |
| 30 | 46 | 15 | 33 | 114 | 33 | 29 |
| 31 | | | | 122 | 41 | 34 |
| Aug. 1 | | | | 39 | 14 | 36 |
| 2 | 56 | 20 | 36 | 97 | 24 | 25 |
| 4 | 61 | 35 | 57 | | | |
| 5 | 78 | 35 | 45 | 113 | 27 | 24 |
| 6 | 94 | 52 | 55 | 75 | 25 | 33 |
| 7 | 41 | 21 | 51 | 16 | 6 | 37 |
| 8 | | | | 118 | 12 | 10 |
| 9 | 47 | 16 | 34 | | | |
| 15 | | | | 56 | 7 | 12 |
| 16 | | | | 12 | 1 | 8 |
| 19 | | | | 23 | 2 | 9 |
| 20 | | | | 31 | 7 | 23 |
| 21 | | | | 16 | 4 | 25 |
| Total | 737 | 298 | 40.5 | 1,090 | 240 | 22 |

Total number marked ..... 4,494
Total number returned ..... 1,199
Percentage returned ..... 26.6

Among the specimens listed in Table 2 the following were recorded as having been taken outside the limits of the regions indicated on the map and from waters other than the Fraser River above Mission Bridge:

| | Days out. |
|---|---|
| 1 specimen, Burrard Islet, marked Aug. 5, station E | 103? |
| 2 specimens, Ebey's Landing, marked July 24, station C | 17 |
| 1 specimen, near Sooke, British Columbia, marked July 26, station C | 11 |
| 2 specimens, near Sooke, British Columbia, marked July 27, station A | 1–5 |
| 1 specimen, near Sooke, British Columbia, marked July 28, station A | 4 |
| 4 specimens, near Sooke, British Columbia, marked July 30, station A | 2 |
| 1 specimen, near Sooke, British Columbia, marked Aug. 2, station A | 2 |

These specimens from without the limits were so few that they have been omitted from further consideration. It seems probable that, with the exception of the specimens marked at station A and taken near Sooke, these represent runs of sockeyes which were bound to some stream other than the Fraser River.

In the following tables separate consideration has been given to those fish which came from the tributaries of the Fraser and from the main river above Mission Bridge. The problems connected with the fish from these upper waters are sufficiently distinct from those connected with the fish taken by commercial fishermen to demand such separate treatment.

Table 4 gives the number of specimens returned (1) from the main commercial fishing grounds, (2) from the upper Fraser River, and (3) from outside these limits.

TABLE 4.—NUMBER OF MARKED FISH TAKEN IN NUMBERED DISTRICTS OF PUGET SOUND AND FRASER RIVER, UPPER FRASER RIVER, AND OUTSIDE THESE BOUNDARIES.

| Marking station. | Total returned. | Number from— | | |
|---|---|---|---|---|
| | | Main districts. | Upper Frazer River. | Outside limits. |
| A | 147 | 136 | 3 | 8 |
| B | 311 | 301 | 10 | ..... |
| C | 203 | 199 | 1 | 3 |
| D | 298 | 289 | 9 | ..... |
| E | 240 | 212 | 27 | 1 |
| Total | 1,199 | 1,137 | 50 | 12 |

## DETAILED STUDY OF RETURNS FROM THE COMMERCIAL FISHING DISTRICTS.

Two tables have been prepared for each of the marking stations, presenting in detail the data obtained from the marking: First, a table showing for each day's marking the number and percentage of specimens recovered from each region and the average number of days required for the journey; second, a table showing the distribution of returns according to the region from which the return was reported and the number of days en route. This last is given as a matter of record and in order to show something of the range of variation underlying the average rates of progress as given in various other tables. It is upon the data given in these tables that the general discussions of the routes and rates of travel which immediately follow are based.

TABLE 5.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION A TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

| Date marked. | 1 | | 2 | | 4 | | 6 | | 7 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. |
| July 14 | ..... | ..... | 1 | 5.0 | ..... | ..... | ..... | ..... | ..... | ..... |
| 21 | 2 | 3.0 | 6 | 3.3 | ..... | ..... | 1 | 10.0 | 1 | 3.0 |
| 22 | 1 | 1.0 | 1 | 6.0 | ..... | ..... | ..... | ..... | ..... | ..... |
| 24 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 5.0 | ..... | ..... |
| 25 | 2 | 6.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 27 | 1 | 3.0 | ..... | ..... | ..... | ..... | 6 | 3.7 | 4 | 8.5 |
| 28 | 1 | 1.0 | ..... | ..... | ..... | ..... | 5 | 6.4 | 3 | 5.3 |
| 30 | 2 | 1.0 | 2 | 7.0 | 1 | 2.0 | 2 | 9.0 | 3 | 8.3 |
| 31 | ..... | ..... | 1 | 5.0 | ..... | ..... | 3 | 5.3 | 8 | 7.5 |
| Aug. 1 | 1 | 3.0 | 2 | 4.0 | ..... | ..... | 2 | 4.5 | 4 | 4.2 |
| 2 | 1 | 2.0 | 2 | 2.5 | ..... | ..... | 3 | 4.0 | 6 | 3.5 |
| 4 | 1 | 3.0 | 1 | 3.0 | ..... | ..... | ..... | ..... | 1 | 3.0 |
| 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | 4.0 |
| Total | 12 | ..... | 16 | ..... | 1 | ..... | 23 | ..... | 32 | ..... |
| Average [b] | ..... | 2.8 | ..... | 4.1 | ..... | 2.0 | ..... | 5.7 | ..... | 5.8 |

[a] No specimens marked at station A were recovered in regions 3 and 5.
[b] Weighted mean.

TABLE 5.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION A TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918—Continued.

| Date marked. | 8 | | 9 | | 10 | | Total marked. | Total returned. | Percentage returned. |
|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | | | |
| July 14 | | | | | | | 4 | 1 | 25 |
| 21 | 1 | 11.0 | 3 | 4.3 | | | 46 | 14 | 30 |
| 22 | | | | | 2 | 6.0 | 10 | 4 | 40 |
| 23 | | | | | 2 | 7.5 | 20 | 2 | 10 |
| 24 | | | | | | | 8 | 1 | 12 |
| 25 | 1 | 5.0 | 1 | 4.0 | | | 56 | 4 | 7 |
| 27 | | | 1 | 4.0 | 1 | 5.0 | 98 | 13 | 13 |
| 28 | 2 | 7.0 | 1 | 26.0 | 2 | 6.5 | 72 | 14 | 19 |
| 30 | 2 | 10.0 | 4 | 6.0 | | | 99 | 16 | 16 |
| 31 | 9 | 9.9 | | | 3 | 15.0 | 105 | 24 | 23 |
| Aug. 1 | 2 | 5.0 | | | 1 | 8.0 | 77 | 12 | 16 |
| 2 | 4 | 5.5 | 2 | 8.0 | 2 | 8.0 | 138 | 20 | 14 |
| 4 | 3 | 4.3 | 1 | 7.0 | 1 | 33.0 | 64 | 8 | 12 |
| 6 | 1 | 3.0 | | | | | 34 | 3 | 9 |
| Total | 25 | | 13 | | 14 | | 831 | 136 | 16.3 |
| Average [a] | | 7.5 | | 7.2 | | 10.5 | | | |

[a] Weighted mean.

TABLE 6.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION A ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

| Days en route. | 1 | 2 | 4 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|
| 1 | 4 | | | 1 | 1 | | | |
| 2 | 2 | 2 | 1 | 1 | 2 | | 2 | |
| 3 | 4 | 6 | | 3 | 6 | 1 | | |
| 4 | 1 | 1 | | 6 | 4 | 4 | 3 | 1 |
| 5 | | 4 | | 5 | 3 | 6 | 1 | 2 |
| 6 | | 1 | | 2 | 3 | 3 | 1 | 1 |
| 7 | | 2 | | | 4 | 4 | 3 | 1 |
| 8 | | | | | 3 | 1 | | 4 |
| 9 | | | | | 2 | | 1 | 1 |
| 10 | 1 | | | 2 | 1 | | | 1 |
| 11 | | | | | 2 | 1 | 1 | |
| 12 | | | | 3 | 1 | 1 | | |
| 13 | | | | | | 1 | | |
| 14 | | | | | | 1 | | |
| 16 | | | | | | 1 | | |
| 18 | | | | | | 1 | | 2 |
| 26 | | | | | | | 1 | |
| 33 | | | | | | | | 1 |
| Total | 12 | 16 | 1 | 23 | 32 | 25 | 13 | 14 |

[a] No specimens marked at station A were recovered in regions 3 and 5.

TABLE 7.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION B TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

| Date marked. | 1 | | 2 | | 4 | | 6 | | 7 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. |
| July 21 | 2 | 8.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 22 | 1 | 2.0 | 5 | 2.0 | ..... | ..... | ..... | ..... | 1 | 15.0 |
| 23 | 6 | 1.8 | 4 | 5.5 | 1 | 2.0 | 2 | 4.5 | ..... | ..... |
| 24 | 3 | 1.0 | 2 | 6.5 | 1 | 1.0 | 3 | 3.0 | 1 | 8.0 |
| 25 | ..... | ..... | 1 | 14.0 | ..... | ..... | 2 | 1.0 | ..... | ..... |
| 26 | 12 | 3.0 | ..... | ..... | ..... | ..... | 2 | 4.0 | 3 | 5.3 |
| 28 | 7 | 2.0 | 3 | 3.7 | ..... | ..... | 1 | 3.0 | 2 | 3.0 |
| 30 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1.0 | 2 | 5.5 |
| 31 | 4 | 2.5 | 3 | 2.7 | ..... | ..... | 1 | 2.0 | 5 | 3.2 |
| Aug. 1 | 5 | 1.6 | 2 | 3.5 | 2 | 3.0 | 9 | 1.4 | 5 | 5.0 |
| 2 | 5 | 2.2 | 1 | 12.0 | ..... | ..... | ..... | ..... | 3 | 3.0 |
| 4 | 4 | 1.2 | 6 | 3.3 | ..... | ..... | 3 | 2.0 | 8 | 2.5 |
| 5 | ..... | ..... | 2 | 2.5 | ..... | ..... | 1 | 2.0 | 4 | 3.7 |
| 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 2.0 |
| Total | 49 | ..... | 29 | ..... | 4 | ..... | 25 | ..... | 35 | ..... |
| Average [b] | ..... | 2.4 | ..... | 4.2 | ..... | 2.2 | ..... | 2.3 | ..... | 4.4 |

| Date marked. | 8 | | 9 | | 10 | | Total marked. | Total returned. | Percentage returned. |
|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | | | |
| July 21 | ..... | ..... | 1 | 3.0 | 2 | 4.5 | 25 | 5 | 20 |
| 22 | 2 | 5.0 | 1 | 2.0 | ..... | ..... | 40 | 10 | 25 |
| 23 | 1 | 3.0 | 5 | 3.6 | 8 | 4.4 | 95 | 27 | 28 |
| 24 | ..... | ..... | 3 | 2.7 | 4 | 5.7 | 56 | 17 | 30 |
| 25 | 2 | 7.5 | ..... | ..... | 7 | 11.7 | 50 | 12 | 24 |
| 26 | 5 | 8.0 | 10 | 7.5 | 11 | 3.5 | 111 | 43 | 39 |
| 28 | 3 | 5.7 | 7 | 5.7 | 4 | 4.0 | 54 | 27 | 50 |
| 30 | ..... | ..... | ..... | ..... | ..... | ..... | 17 | 3 | 18 |
| 31 | 6 | 3.0 | ..... | ..... | ..... | ..... | 48 | 19 | 40 |
| Aug. 1 | 14 | 4.4 | 3 | 3.0 | 5 | 7.0 | 104 | 45 | 43 |
| 2 | 7 | 5.1 | 5 | 3.4 | 3 | 8.0 | 64 | 24 | 38 |
| 4 | 9 | 3.4 | 6 | 8.0 | 6 | 8.7 | 94 | 42 | 45 |
| 5 | 4 | 3.5 | 5 | 6.2 | 1 | 7.0 | 42 | 17 | 41 |
| 7 | 3 | 3.3 | 3 | 5.0 | 3 | 7.3 | 36 | 10 | 28 |
| Total | 56 | ..... | 49 | ..... | 54 | ..... | 836 | 301 | 36 |
| Average [b] | ..... | 4.6 | ..... | 5.4 | ..... | 6.3 | ..... | ..... | ..... |

[a] No specimens marked at station B were recovered in regions 3 and 5.
[b] Weighted mean.

TABLE 8.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION B ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

| Days en route. | 1 | 2 | 4 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|
| 1 | 20 | 2 | 2 | 13 | 4 | 1 | 1 | 2 |
| 2 | 15 | 13 | 1 | 4 | 9 | 6 | 10 | 2 |
| 3 | 6 | 4 | ..... | 4 | 7 | 21 | 13 | 8 |
| 4 | 1 | 2 | ..... | ..... | 6 | 8 | 9 | 14 |
| 5 | 3 | 1 | 1 | 2 | 1 | 8 | 4 | 14 |
| 6 | 1 | ..... | ..... | 2 | 2 | 5 | 2 | 5 |
| 7 | ..... | 1 | ..... | ..... | 1 | 2 | 2 | 1 |
| 8 | 3 | 1 | ..... | ..... | 2 | 1 | ..... | ..... |
| 9 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | 1 |
| 10 | ..... | 1 | ..... | ..... | 1 | 1 | 1 | ..... |
| 11 | ..... | ..... | ..... | ..... | 1 | 1 | ..... | 1 |
| 12 | ..... | 1 | ..... | ..... | ..... | 1 | 1 | ..... |
| 13 | ..... | ..... | ..... | ..... | ..... | ..... | 2 | 1 |
| 14 | ..... | 1 | ..... | ..... | ..... | ..... | 1 | ..... |
| 15 | ..... | ..... | ..... | ..... | 1 | ..... | ..... | 2 |
| 16 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1 |
| 19 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... |
| 23 | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... |
| 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 27 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1 |
| Total | 49 | 29 | 4 | 25 | 35 | 56 | 49 | 54 |

[a] No specimens marked at station B were recovered in regions 3 and 5.

TABLE 9.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION C TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

| Date marked. | 1 | | 2 | | 3 | | 4 | | 6 | | 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. |
| July 17 | 4 | 5.2 | ..... | ..... | ..... | ..... | 3 | 4.3 | ..... | ..... | 2 | 4.5 |
| 19 | ..... | ..... | 5 | 2.8 | 1 | 3.0 | ..... | ..... | 5 | 6.2 | 3 | 3.3 |
| 22 | 4 | 3.0 | 2 | 2.5 | ..... | ..... | ..... | ..... | 1 | 2.0 | 1 | 1.0 |
| 24 | 3 | 4.3 | 4 | 10.0 | 1 | 7.0 | ..... | ..... | 3 | 6.3 | ..... | ..... |
| 26 | 5 | 3.2 | 6 | 5.5 | ..... | ..... | ..... | ..... | 3 | 7.6 | 6 | 9.0 |
| Aug. 6 | ..... | ..... | 1 | 1.0 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 5.0 |
| 7 | 1 | 2.0 | 2 | 1.5 | ..... | ..... | 1 | 6.0 | 1 | 9.0 | 1 | 2.0 |
| 9 | 1 | 2.0 | 2 | 2.5 | ..... | ..... | ..... | ..... | 4 | 6.2 | 2 | 3.5 |
| 13 | 4 | 2.0 | 5 | 1.4 | ..... | ..... | 1 | 3.0 | ..... | ..... | 2 | 6.0 |
| 14 | 1 | 3.0 | 7 | 2.1 | ..... | ..... | ..... | ..... | 1 | 2.0 | 3 | 5.0 |
| Total | 23 | ..... | 34 | ..... | 2 | ..... | 5 | ..... | 18 | ..... | 21 | ..... |
| Average [b] | ..... | 3.0 | ..... | 3.8 | ..... | 5.0 | ..... | 4.4 | ..... | 6.2 | ..... | 5.5 |

| Date marked. | 8 | | 9 | | 10 | | Total marked. | Total returned. | Percentage returned. |
|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | | | |
| July 17 | 1 | 3.0 | 2 | 6.0 | 1 | 4.0 | 43 | 13 | 30.0 |
| 19 | 4 | 6.0 | 1 | 3.0 | ..... | ..... | 50 | 19 | 38.0 |
| 22 | 3 | 5.0 | 3 | 6.3 | 2 | 13.5 | 61 | 16 | 26.0 |
| 24 | 3 | 6.3 | 4 | 6.5 | 5 | 8.6 | 76 | 23 | 30.0 |
| 26 | 13 | 6.6 | 7 | 8.0 | 7 | 11.4 | 152 | 47 | 33.0 |
| Aug. 6 | ..... | ..... | ..... | ..... | ..... | ..... | 164 | 2 | 1.0 |
| 7 | 6 | 5.0 | 1 | 5.0 | 1 | 7.0 | 118 | 14 | 12.0 |
| 9 | 10 | 5.5 | 5 | 6.2 | 1 | 9.0 | 105 | 25 | 24.0 |
| 13 | 7 | 3.0 | 5 | 5.8 | ..... | ..... | 155 | 24 | 15.5 |
| 14 | 1 | 6.0 | ..... | ..... | 3 | 13.0 | 76 | 16 | 21.0 |
| Total | 48 | ..... | 28 | ..... | 20 | ..... | 1,000 | 199 | 19.9 |
| Average [b] | ..... | 5.4 | ..... | 6.5 | ..... | 10.4 | ..... | ..... | ..... |

[a] No specimens marked at station C were taken in region 5.
[b] Weighted mean.

TABLE 10.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION C ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

| Days en route. | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 8 | ..... | ..... | ..... | 1 | ..... | ..... | ..... |
| 2 | 6 | 9 | ..... | ..... | 2 | 2 | 4 | ..... | ..... |
| 3 | 7 | 7 | 1 | 1 | 2 | 4 | 11 | 2 | ..... |
| 4 | 1 | 1 | ..... | 2 | 1 | 2 | 11 | 7 | 3 |
| 5 | 3 | 1 | ..... | 1 | 7 | 4 | 5 | 5 | 2 |
| 6 | ..... | 3 | ..... | 1 | ..... | 3 | 8 | 3 | 2 |
| 7 | 2 | 1 | 1 | ..... | 2 | 1 | 2 | 3 | 2 |
| 8 | 1 | 1 | ..... | ..... | ..... | ..... | 2 | 4 | ..... |
| 9 | ..... | ..... | ..... | ..... | 1 | 2 | 2 | 1 | 2 |
| 10 | ..... | ..... | ..... | ..... | ..... | 1 | ..... | 1 | 2 |
| 11 | ..... | 1 | ..... | ..... | 1 | ..... | ..... | ..... | 1 |
| 12 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 13 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 1 | ..... |
| 14 | ..... | ..... | ..... | ..... | 2 | ..... | 1 | ..... | 1 |
| 15 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 16 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... |
| 17 | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... |
| 19 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 21 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1 |
| 23 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | 2 |
| Total | 23 | 34 | 2 | 5 | 18 | 21 | 48 | 28 | 20 |

[a] No specimens marked at station C were recovered in region 5.

TABLE 11.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION D TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

| Date marked. | 1 | | 2 | | 7 | | 8 | | 9 | | 10 | | Total number marked. | Total number returned. | Percentage returned. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | | | |
| July 19 | ..... | ..... | ..... | ..... | 2 | 4.0 | 16 | 5.1 | 8 | 4.6 | 1 | 3.0 | 85 | 27 | 32 |
| 23 | ..... | ..... | ..... | ..... | ..... | ..... | 17 | 1.9 | 4 | 1.5 | 3 | 10.3 | 92 | 24 | 26 |
| 24 | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 2.0 | 15 | 3.8 | 5 | 10.2 | 74 | 23 | 31 |
| 28 | 2 | 1.0 | ..... | ..... | ..... | ..... | 9 | 1.4 | 12 | 2.8 | 4 | 15.7 | 63 | 27 | 43 |
| 30 | ..... | ..... | 1 | 3.0 | ..... | ..... | 5 | 2.2 | 4 | 1.7 | 4 | 2.0 | 46 | 14 | 30 |
| Aug. 2 | ..... | ..... | ..... | ..... | 1 | 3.0 | 6 | 2.5 | 10 | 2.8 | 3 | 12.3 | 56 | 20 | 36 |
| 4 | ..... | ..... | ..... | ..... | 5 | 1.0 | 19 | 1.6 | 9 | 1.6 | 2 | 22.5 | 61 | 35 | 57 |
| 5 | ..... | ..... | ..... | ..... | ..... | ..... | 23 | 1.6 | 8 | 1.9 | 3 | 8.0 | 78 | 34 | 44 |
| 6 | ..... | ..... | ..... | ..... | 2 | 5.0 | 18 | 2.8 | 24 | 2.3 | 6 | 3.2 | 94 | 50 | 53 |
| 7 | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 1.8 | 9 | 2.2 | 1 | 5.0 | 41 | 20 | 49 |
| 9 | ..... | ..... | ..... | ..... | 1 | 10.0 | 5 | 3.8 | 6 | 4.0 | 3 | 3.7 | 47 | 15 | 32 |
| Total | 2 | ..... | 1 | ..... | 11 | ..... | 131 | ..... | 109 | ..... | 35 | ..... | 737 | 289 | 39 |
| Average [b] | ..... | 1.0 | ..... | 3.0 | ..... | 3.3 | ..... | 2.5 | ..... | 2.7 | ..... | 8.5 | .... | .... | .... |

[a] No specimens marked at station D were recovered in regions 3, 4, 5, and 6. [b] Weighted mean.

TABLE 12.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION D ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

| Days en route. | 1 | 2 | 7 | 8 | 9 | 10 | Days en route. | 1 | 2 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | ..... | 5 | 47 | 28 | 2 | 12 | ..... | ..... | ..... | ..... | ..... | 1 |
| 2 | ..... | ..... | ..... | 39 | 38 | 1 | 13 | ..... | ..... | ..... | ..... | 1 | ..... |
| 3 | ..... | 1 | 2 | 28 | 19 | 12 | 15 | ..... | ..... | ..... | ..... | ..... | 2 |
| 4 | ..... | ..... | ..... | 6 | 10 | 2 | 18 | ..... | ..... | ..... | 1 | ..... | 1 |
| 5 | ..... | ..... | 3 | 4 | 7 | 5 | 20 | ..... | ..... | ..... | ..... | ..... | 1 |
| 6 | ..... | ..... | ..... | 3 | 2 | ..... | 21 | ..... | ..... | ..... | 1 | ..... | 1 |
| 7 | ..... | ..... | ..... | 1 | 1 | 1 | 23 | ..... | ..... | ..... | ..... | ..... | 1 |
| 8 | ..... | ..... | ..... | 1 | ..... | ..... | 30 | ..... | ..... | ..... | ..... | ..... | 1 |
| 9 | ..... | ..... | ..... | ..... | 1 | ..... | 33 | ..... | ..... | ..... | ..... | ..... | 1 |
| 10 | ..... | ..... | 1 | ..... | 1 | 1 | | | | | | | |
| 11 | ..... | ..... | ..... | ..... | 1 | 2 | Total | 2 | 1 | 11 | 131 | 109 | 35 |

[a] No specimens marked at station D were recovered in regions 3, 4, 5, and 6.

TABLE 13.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION E TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

| Date marked. | 6 | | 7 | | 8 | | 9 | | 10 | | Total marked. | Total returned. | Percentage returned. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | | | |
| July 25 | ..... | ..... | 1 | 11.0 | ..... | ..... | ..... | ..... | 5 | 3.4 | 95 | 6 | 6 |
| 26 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 3.7 | 70 | 10 | 14 |
| 29 | ..... | ..... | ..... | ..... | 3 | 3.7 | 2 | 3.5 | 9 | 5.0 | 93 | 14 | 15 |
| 30 | ..... | ..... | ..... | ..... | 3 | 4.0 | 5 | 7.4 | 19 | 5.5 | 114 | 27 | 23 |
| 31 | ..... | ..... | 2 | 7.5 | 5 | 7.8 | 5 | 3.4 | 27 | 8.3 | 122 | 39 | 32 |
| Aug. 1 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 11.0 | 13 | 9.3 | 39 | 14 | 36 |
| 2 | ..... | ..... | ..... | ..... | 2 | 8.5 | 4 | 5.2 | 14 | 4.9 | 97 | 20 | 21 |
| 5 | 1 | 4.0 | 1 | 6.0 | ..... | ..... | 5 | 8.6 | 19 | 9.8 | 113 | 26 | 23 |
| 6 | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 4.7 | 22 | 7.9 | 75 | 25 | 33 |
| 7 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 2.0 | 4 | 2.7 | 16 | 5 | 31 |
| 8 | ..... | ..... | ..... | ..... | 1 | 10.0 | 1 | 4.0 | 9 | 3.4 | 118 | 11 | 10 |
| 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 10.0 | 56 | 3 | 5 |
| 16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12 | ..... | ..... |
| 19 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | 2.0 | 23 | 2 | 8 |
| 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 | 4.7 | 31 | 7 | 23 |
| 21 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 2.7 | 16 | 3 | 19 |
| Total | 1 | ..... | 4 | ..... | 14 | ..... | 27 | ..... | 165 | ..... | 1,090 | 212 | 19.5 |
| Average[b] | ..... | 4.0 | ..... | 8.0 | ..... | 6.4 | ..... | 5.8 | ..... | 6.7 | ..... | ..... | ..... |

[a] No specimens marked at station E were recovered in regions 1, 2, 3, 4, and 5. [b] Weighted mean.

TABLE 14.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION E ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

| Days en route. | 6 | 7 | 8 | 9 | 10 | Days en route. | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | ..... | ..... | 3 | 34 | 15 | ..... | ..... | ..... | 2 | 4 |
| 2 | ..... | ..... | ..... | 1 | 25 | 16 | ..... | ..... | 1 | ..... | 2 |
| 3 | ..... | ..... | 2 | 3 | 24 | 17 | ..... | ..... | ..... | ..... | 1 |
| 4 | 1 | 1 | 3 | 4 | 10 | 18 | ..... | ..... | ..... | ..... | 2 |
| 5 | ..... | ..... | 3 | 6 | 7 | 20 | ..... | ..... | ..... | ..... | 3 |
| 6 | ..... | 1 | 1 | 2 | 12 | 21 | ..... | ..... | ..... | ..... | 3 |
| 7 | ..... | ..... | 2 | 2 | 10 | 24 | ..... | ..... | ..... | ..... | 2 |
| 8 | ..... | ..... | ..... | ..... | 4 | 26 | ..... | ..... | ..... | ..... | 1 |
| 9 | ..... | ..... | ..... | 2 | 3 | 27 | ..... | ..... | ..... | ..... | 1 |
| 10 | ..... | ..... | 2 | ..... | 3 | 30 | ..... | ..... | ..... | ..... | 2 |
| 11 | ..... | 2 | ..... | 2 | 3 | 31 | ..... | ..... | ..... | ..... | 1 |
| 12 | ..... | ..... | ..... | ..... | 3 | 32 | ..... | ..... | ..... | ..... | 2 |
| 13 | ..... | ..... | ..... | ..... | 2 | | | | | | |
| 14 | ..... | ..... | ..... | ..... | 2 | Total | 1 | 4 | 14 | 27 | 165 |

[a] No specimens marked at station E were recovered in regions 1, 2, 3, 4, and 5.

It was hoped that much more detailed information as to the migration up the Fraser River might be presented, and to that end the river and the waters of the Strait of Georgia around the mouth of the river had been divided into 20 regions, each comprising about 5 miles of the river or offshore about the mouths. The returns from Canada were at first studied on this basis, but it finally became clear that the subdivisions were much too small to give results of any significance. These 20 regions were then combined into 7, as follows:

Region 10. Banks off the mouth of the south arm and Canoe Pass.
Region 11. South arm and Canoe Pass up as far as Deas Island.
Region 12. South arm from Deas Island to New Westminster.
Region 13. Banks off the mouth of the north arm.
Region 14. North arm.
Region 15. Fraser River from New Westminster to the mouth of Pitt River.
Region 16. Fraser River from the mouth of Pitt River to Mission Bridge.

Table 15 gives the number of specimens, which were marked at each of the marking stations, recovered from each of these regions, and the average number of days en route. It is apparent from this that even with this increase in the size of the regions no significant and consistent difference in the length of time required to reach the different regions appears, and for the purposes of statistical analysis it was necessary to consider all of the returns from the main Canadian waters as constituting a single group, and to combine regions 10 to 16 into one region, 10. It is much to be regretted that the data are not such as to make possible a reliable estimate of the rate of travel in the river itself. Whether this is due to the manner of collecting and recording the data can not be stated. Although these records from Canadian waters do not admit of detailed analysis, when combined as a single group they agree well with the results obtained from American waters.

TABLE 15.—NUMBER OF SPECIMENS MARKED AT EACH STATION RECOVERED IN EACH REGION IN CANADIAN WATERS, INCLUDING THE FRASER RIVER TO MISSION BRIGDE ONLY, AND AVERAGE NUMBER OF DAYS EN ROUTE.

| | Station. | | | | | Total fish. | Average number days en route.[a] |
|---|---|---|---|---|---|---|---|
| | A. | B. | C. | D. | E. | | |
| Region 10: | | | | | | | |
| Fish | 3 | 15 | 7 | 11 | 35 | 71 | ..... |
| Days | 7.0 | 6.3 | 10.3 | 8.0 | 6.8 | ..... | 7.2 |
| Region 11: | | | | | | | |
| Fish | 8 | 27 | 8 | 15 | 77 | 135 | ..... |
| Days | 13.5 | 6.0 | 6.9 | 9.1 | 6.1 | ..... | 6.9 |
| Region 12: | | | | | | | |
| Fish | 2 | 5 | 2 | 3 | 11 | 23 | ..... |
| Days | 6.5 | 5.6 | 13.5 | 12.3 | 5.2 | ..... | 7.0 |
| Region 13: | | | | | | | |
| Fish | ..... | ..... | ..... | 3 | 11 | 14 | ..... |
| Days | ..... | ..... | ..... | 2.7 | 9.9 | ..... | 8.4 |
| Region 14: | | | | | | | |
| Fish | ..... | 1 | ..... | 1 | 18 | 20 | ..... |
| Days | ..... | 5.0 | ..... | 1.0 | 6.8 | ..... | 6.4 |
| Region 15: | | | | | | | |
| Fish | ..... | 2 | 2 | 2 | 4 | 10 | ..... |
| Days | ..... | 5.5 | 14.5 | 3.0 | 9.7 | ..... | 8.5 |
| Region 16: | | | | | | | |
| Fish | 1 | 4 | 1 | ..... | 10 | 16 | ..... |
| Days | 5.0 | 7.8 | 10.0 | ..... | 6.0 | ..... | 6.6 |
| Total fish | 14 | 54 | 20 | 35 | 166 | 289 | ..... |
| Average number days en route[a] | 10.5 | 6.3 | 10.4 | 8.5 | 6.7 | ..... | 7.1 |

[a] Weighted mean.

In Table 16 is shown the total number of individuals marked at each station which were taken in each region, together with the average time en route. This combines the totals and averages developed in Tables 5 to 14.

TABLE 16.—NUMBER OF SPECIMENS MARKED AT EACH STATION TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE.[a]

| | 1 | | 2 | | 3 | | 4 | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. |
| A | 12 | 2.8 | 16 | 4.1 | ..... | ..... | 1 | 2 | 23 | 5.7 |
| B | 49 | 2.4 | 29 | 4.2 | ..... | ..... | 4 | 2.2 | 25 | 2.3 |
| C | 23 | 3.0 | 34 | 3.8 | 2 | 5.0 | 5 | 4.4 | 18 | 6.1 |
| D | 2 | 1.0 | 1 | 3.0 | ..... | ..... | ..... | ..... | ..... | ..... |
| E | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 4.0 |
| Total | 86 | ..... | 80 | ..... | 2 | ..... | 10 | ..... | 67 | ..... |

| | 7 | | 8 | | 9 | | 10 | | Total. |
|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Days. | Fish. | Days. | Fish. | Days. | Fish. | Days. | |
| A | 32 | 5.8 | 25 | 7.5 | 13 | 7.2 | 14 | 10.5 | 136 |
| B | 35 | 4.4 | 56 | 4.6 | 49 | 5.4 | 54 | 6.3 | 301 |
| C | 21 | 5.5 | 48 | 5.4 | 28 | 6.5 | 20 | 10.4 | 199 |
| D | 11 | 3.3 | 131 | 2.5 | 109 | 2.7 | 35 | 8.5 | 289 |
| E | 4 | 8.0 | 14 | 6.4 | 27 | 5.8 | 166 | 6.7 | 212 |
| Total | 103 | ..... | 274 | ..... | 226 | ..... | 289 | ..... | 1,137 |

[a] No specimens were taken in region 5.

ROUTES TAKEN BY FRASER RIVER SOCKEYES THROUGH PUGET SOUND.—Tables 17 and 18 show in complementary ways the distribution of returned fish according to the station at which they were marked and the region in which they were taken. Table 17 gives the percentages of the total returns from each station which were taken in each region; and Table 18, the percentages of the total returns from each region which were marked at each station. The returns from regions 3, 4, and 5 are practically negligible. It is quite obvious that the great majority of the fish, on entering the Sound through the Strait of Juan de Fuca, pass across to Washington Sound, and especially the southern shores of the southern islands of the San Juan Archipelago (region 1) and the western shore of Whidbey Island (region 2); 8.8 per cent of the returned fish which were marked at Sooke were taken in region 1 and 11.8 per cent in region 2.

TABLE 17.—PERCENTAGES OF TOTAL FISH RECOVERED FROM EACH MARKING STATION WHICH WERE TAKEN IN EACH REGION.[a]

| | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| A | 8.8 | 11.8 | ..... | 0.7 | 17.0 | 23.5 | 18.4 | 9.5 | 10.3 |
| B | 16.2 | 9.6 | ..... | 1.3 | 8.3 | 11.6 | 18.6 | 16.2 | 17.9 |
| C | 11.5 | 17.0 | 1 | 2.5 | 9.0 | 10.5 | 24.1 | 14.0 | 10.0 |
| D | .7 | .4 | ..... | ..... | ..... | 3.8 | 45.3 | 37.7 | 12.1 |
| E | ..... | ..... | ..... | ..... | .5 | 1.9 | 6.6 | 12.7 | 78.3 |

[a] No specimens were recovered in region 5.

TABLE 18.—PERCENTAGES OF TOTAL FISH RECOVERED FROM EACH REGION WHICH WERE MARKED AT EACH STATION.[a]

| | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| A | 14.0 | 20.0 | ..... | 10 | 34.3 | 31.0 | 9.1 | 5.8 | 4.8 |
| B | 57.0 | 36.2 | ..... | 40 | 37.3 | 33.9 | 20.4 | 21.6 | 18.6 |
| C | 26.7 | 42.5 | 100 | 50 | 26.8 | 20.4 | 17.5 | 12.4 | 6.9 |
| D | 2.3 | 1.3 | ..... | ..... | ..... | 10.7 | 47.8 | 48.3 | 12.1 |
| E | ..... | ..... | ..... | ..... | 1.5 | 3.8 | 5.1 | 11.9 | 57.4 |

[a] No specimens were recovered in region 5.

There is apparently considerable interchange of fish between regions 1 and 2, as is evidenced by the fact that 9.6 per cent of the returned fish marked at station B, located in region 1, were taken in region 2, and that 11.5 per cent of the fish marked at station C, in region 2, were taken in region 1. From the region of Washington Sound a very few fish pass northward through Haro Strait (region 4), but the proportion must be small compared with those passing through Rosario Strait and on up through the Strait of Georgia. The apparent proportions may, however, be modified by the fact that there are many more traps in Rosario Strait than in Haro Strait. The few fish taken in Haro Strait came from stations A, B, and C, as would be expected. Only two specimens were taken in Deception Pass, both marked at station C. No fish are recorded as having been taken in the central channels of the San Juan Archipelago.

From the southern part of the Strait of Georgia (locally designated the Gulf of Georgia) the fish pass Point Roberts and enter Canadian territorial waters. Very soon thereafter they must enter the river, especially through Canoe Pass and the main mouth of the south arm, and begin their journey up the river to the spawning grounds.

In summarizing, the route followed by the very great majority of the salmon entering the Strait of Juan de Fuca and bound for the Fraser River may be stated as follows: Across Washington Sound to the "Banks" south of the San Juan Islands and to the western shore of Whidbey Island; from there northward through Rosario Strait and the southern part of the Strait of Georgia, past Point Roberts to the mouths of the Fraser River. There is no evidence to indicate that this route is varied in different parts of the season.

As might be expected, this route is well indicated by the location of the various trap sites. The approximate number of traps in the various regions of Puget Sound for which licenses were issued in 1918 is as follows:[a]

| | | | |
|---|---|---|---|
| Region 1 | 14 | Region 7 | 11 |
| Region 2 | 20 | Region 8 | 40 |
| Region 3 | 13 | Region 9 | 39 |
| Region 4 | 11 | | |
| Region 5 | 4 | Total | 178 |
| Region 6 | 26 | | |

In addition to the above there are 6 traps located on the Canadian side of the Straits of Juan de Fuca, on Vancouver Island, 11 scattering traps along the southern shore of these straits, and 29 in Ad-

[a] Based upon licenses issued by the Fish and Game Commission of the State of Washington.

miralty Straits, chiefly between Admiralty Bay and Double Bluff. There are also a few in Hood Canal and that part of the Sound extending south past Seattle, Saratoga Passage, and Padilla Bay. The ones listed above are those of chief concern here.

Little if any correlation between the number of traps and the number of marked fish taken in any particular region can be shown. In Table 19 the six regions from which most of the returns came have been arranged in the order of the number of traps located in each. Then is given, for each region, the percentages of fish marked at stations A and B which were recaptured in the respective regions. The other stations were not similarly treated, since only from these two did the fish pass through nearly all regions. Although no correlation is apparent here we would expect such a correlation to appear if sufficient data were available.

TABLE 19.—NUMBER OF TRAPS IN VARIOUS REGIONS AND NUMBER OF MARKED FISH TAKEN IN THOSE REGIONS.

| Region. | Number of traps. | Percentage of returns from stations— | |
|---|---|---|---|
| | | A. | B. |
| 7 | 11 | 3.85 | 4.18 |
| 1 | 14 | 1.44 | 5.86 |
| 2 | 20 | 1.92 | 3.46 |
| 6 | 26 | 2.76 | 2.99 |
| 9 | 39 | 1.56 | 5.86 |
| 8 | 40 | 3.00 | 6.69 |

In a few instances a retrograde migration has apparently taken place, and the fish have traveled away from rather than toward the mouth of the Fraser River. It is possible that faulty data may account for this, especially in such extreme cases as those fish marked at station D and reported taken in regions 1 and 2; or it may be that these are not Fraser River fish, but are sockeyes bound for some other stream.

RATE OF MIGRATION.—A number of the preceding tables give, variously grouped, the average number of days required to pass from each marking station to each region. Tables 5, 7, 9, 11, and 13 show the total range of variation in this regard for each station, and the general averages for each station are shown in Table 16. From the last-mentioned table it is apparent that, as would be expected, the time en route usually increases as the distance between the station and the regions where the fish were recovered increases. Those fish which were captured in the same region in which they were marked—such, for instance, as were marked at station B and recovered from region 1—have evidently been slow to resume the migration after the marking. Forty-nine specimens marked at station B were taken in region 1 after being out an average of 2.4 days. From station C, 34 specimens were taken in region 2 after an interval of 3.8 days. Eleven specimens from station D were taken in region 7 after an average of 3.3 days, and 27 specimens from station E were taken in region 9 after 5.8 days. It seems quite clear

that, in the case of fish which have been recaptured comparatively close to the point at which they were liberated, the rate of progress is slower than that of fish taken a greater distance from the marking station. Also, as may be seen from Table 16, in cases where a retrograde migration has taken place the rate of progress has usually been slow. These occurrences may possibly be due to some slight injury, or other unfavorable result, due to the handling attendant upon tagging. It may also be due to inaccurate data. In either case it would seem justifiable, when estimating the normal rate of progress through the Sound, to consider only those cases of forward migration in which the fish have traveled a reasonably long distance from the station at which they were marked, say not less than 20 miles.

In the case of the Canadian records it will be noted that the correlation between the distance traveled and the time en route is very low. The average time required to pass from station E, at Point Roberts, into the Fraser River is 6.7 days. This would indicate a much slower rate of migration here than in other parts of the Sound. In order to throw additional light upon this point, the difference between the time required for fish marked at stations A, B, C, and D to reach the vicinity of Point Roberts (region 9) and that which elapsed before the fish from these same stations were taken in Canadian waters has been calculated as follows:

| | Days. |
|---|---|
| Station A | 3.3 |
| Station B | .9 |
| Station C | 3.9 |
| Station D | 5.8 |
| Average (simple mean) | 3.47 |

This indicates a rate of progress between Point Roberts and the Fraser River almost twice as rapid as that indicated solely by the results of the marking at Point Roberts, and one agreeing much better with the results obtained from the American records.

The previous tables have shown the rate of travel as the number of days required to pass from the marking station to the various regions of the Sound. In order to make these figures comparable, the rate in miles per day has been calculated for each instance. This has been done by simply dividing the distance traveled by the time required to make the journey. Table 20 gives the distances from each marking station to each of the established regions of the Sound. These distances were measured, by means of an ordinary map measure, from the marking station to approximately the center of the region in question. The most direct route possible was chosen.

TABLE 20.—DISTANCES IN PUGET SOUND FROM MARKING STATIONS TO REGIONS WHERE FISH WERE TAKEN.[a]

| Station. | Region. | Miles. | Station. | Region. | Miles. | Station. | Region. | Miles. |
|---|---|---|---|---|---|---|---|---|
| A | 1 | 35 | C | 1 | 15.5 | E | 1 | 62 |
| | 2 | 47.5 | | 2 | ..... | | 2 | 59.5 |
| | 3 | 57 | | 3 | 15.5 | | 3 | 62.5 |
| | 4 | 45 | | 4 | 35 | | 4 | 35 |
| | 5 | 52.5 | | 5 | 23.5 | | 5 | 35 |
| | 6 | 60 | | 6 | 20 | | 6 | 45 |
| | 7 | 71 | | 7 | 33 | | 7 | 35 |
| | 8 | 83 | | 8 | 45 | | 8 | 20.5 |
| | 9 | 92.5 | | 9 | 59.5 | | 9 | ..... |
| | 10 | 122.5 | | 10 | 89.5 | | 10 | 30 |
| B | 1 | ..... | D | 1 | 33.5 | | | |
| | 2 | 15 | | 2 | 28 | | | |
| | 3 | 21.5 | | 3 | 29.5 | | | |
| | 4 | 17.5 | | 4 | 51.5 | | | |
| | 5 | 10 | | 5 | 41.5 | | | |
| | 6 | 21.5 | | 6 | 13 | | | |
| | 7 | 33.5 | | 7 | ..... | | | |
| | 8 | 47.5 | | 8 | 11.5 | | | |
| | 9 | 62 | | 9 | 27.5 | | | |
| | 10 | 92 | | 10 | 57.5 | | | |

[a] As it is obvious that the majority of the fish pass through Rosario Straits, the distances, wherever applicable, have been measured over this route.

TABLE 21.—NUMBER OF SPECIMENS MARKED AT EACH STATION TAKEN IN EACH REGION AND RATE OF PROGRESS IN MILES PER DAY.[a]

| | A. | B. | C. | D. | E. | | A. | B. | C. | D. | E. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Region 1: | | | | | | Region 7: | | | | | |
| Fish | 12 | 49 | 23 | 2 | ..... | Fish | 32 | 35 | 21 | 11 | 4 |
| Rate | 12.5 | ..... | 5.2 | 33.5 | ..... | Rate | 12.2 | 7.6 | 6.0 | ..... | 4.4 |
| Region 2: | | | | | | Region 8: | | | | | |
| Fish | 16 | 29 | 34 | 1 | ..... | Fish | 25 | 56 | 48 | 131 | 14 |
| Rate | 11.5 | 3.6 | ..... | 9.3 | ..... | Rate | 11.1 | 10.3 | 8.3 | 4.6 | 3.2 |
| Region 3: | | | | | | Region 9: | | | | | |
| Fish | ..... | ..... | 2 | ..... | ..... | Fish | 13 | 49 | 28 | 109 | 27 |
| Rate | ..... | ..... | 3.1 | ..... | ..... | Rate | 12.8 | 11.5 | 9.1 | 10.2 | ..... |
| Region 4: | | | | | | Region 10: | | | | | |
| Fish | 1 | 4 | 5 | ..... | ..... | Fish | 14 | 54 | 20 | 35 | 166 |
| Rate | 22.5 | 8.0 | 8.0 | ..... | ..... | Rate | 11.7 | 14.6 | 8.6 | 6.8 | 4.5 |
| Region 6: | | | | | | | | | | | |
| Fish | 23 | 25 | 18 | ..... | 1 | | | | | | |
| Rate | 10.5 | 9.3 | 3.3 | ..... | 11.2 | | | | | | |

[a] No specimens were taken in region 5.

Table 21 gives the results of these calculations of the rate in miles per day, together with the number of individuals on which the calculations are based. From this has been calculated the mean rate of travel.[a] In doing this all cases have been omitted which were based on (1) less than 10 individuals, (2) a distance traveled of less than 20 miles, and (3) a retrograde migration relative to the mouth of the Fraser River. This has been done to exclude, as nearly as possible, all abnormal figures. With these exclusions there remain 19 categories on which to base the final conclusions as to the rate of migration. The data for these 19 categories are given separately in the following table:

[a] For this and other similar means the "harmonic mean" recommended by Yule (An Introduction to the Theory of Statistics), Rugg (Statistical Methods Applied to Education), and others, for the calculation of mean rates based on units of work, has been used. The harmonic mean is defined by Rugg as "the reciprocal of the arithmetic mean of the reciprocals of the individual measures of the series."

TABLE 22.—RATE OF PROGRESS IN THE 19 CATEGORIES CONTAINING THE MOST RELIABLE DATA.

| Station marked. | Region where captured. | Distance traveled. | Specimens. | Rate per day. |
|---|---|---|---|---|
| | | *Miles.* | *Number.* | *Miles.* |
| A | 1 | 35 | 12 | 12.5 |
| | 2 | 47.5 | 16 | 11.5 |
| | 6 | 60 | 23 | 10.5 |
| | 7 | 71 | 32 | 12.2 |
| | 8 | 83 | 25 | 11.1 |
| | 9 | 92.5 | 13 | 12.8 |
| | 10 | 122.5 | 14 | 11.7 |
| B | 6 | 21.5 | 25 | 9.3 |
| | 7 | 33.5 | 35 | 7.6 |
| | 8 | 47.5 | 56 | 10.3 |
| | 9 | 62 | 49 | 11.5 |
| | 10 | 92 | 54 | 14.6 |
| C | 7 | 33 | 20 | 6.0 |
| | 8 | 45 | 48 | 8.3 |
| | 9 | 59.5 | 28 | 9.1 |
| | 10 | 89.5 | 20 | 8.6 |
| D | 9 | 27.5 | 109 | 10.2 |
| | 10 | 57.5 | 35 | 6.8 |
| E | 10 | 30 | 166 | 4.5 |

Calculated from these figures the mean rate of migration is 7.8 miles per day. If the Canadian records are omitted, the rate is 9.7 miles per day.

Greene,[a] in his study of the migration of salmon (chinook, silver salmon, and steelhead) in the Columbia River, obtained results quite different from these. He estimates that from 30 to 40 days are usually required for the process of acclimatization to fresh water, during which time the fish work back and forth with the tides. After entering water which is wholly fresh he estimates the rate of travel of silver salmon and steelhead at 6.36 to 7.50 miles per day, although he concedes that this is only about one-third of the rate of travel as estimated by men engaged in the fishing industry and seems to imply that their figures are probably more reliable than his own. Greene's figures should be accepted with considerable caution on account of the comparatively few individuals marked and the fact that three species were represented and all combined to give his final results. The sockeye tagging experiment has produced no evidence indicating that the migration is especially retarded during the passage from salt to fresh water. As may be seen from Table 15, there is no great difference in the time required to pass from American waters to the Fraser River, just within the mouths, and that required to pass above New Westminister, where the water is entirely fresh. Furthermore, as will be seen later, in the case of fish taken on or near the spawning grounds in the tributaries, the time elapsed since marking averages between 30 and 40 days, the time given by Greene as required for the process of acclimatization. It may be concluded either that Greene's results are wholly unreliable or that the migration of sockeye is quite different from that of the species studied by him, which is, of course, entirely possible. The rate of migration of the quinnat (chinook) salmon of the Sacramento River as given by Rutter [b] is much more nearly in accord with the results of this sockeye study. He estimates

[a] Greene, Charles W.: The migration of salmon in the Columbia River. Bulletin U. S. Bureau of Fisheries for 1909, Vol. XXIX, pp. 129–148. Washington, 1911.

[b] Rutter, Cloudsley: Natural history of the quinnat salmon. Bulletin U. S. Fish Commission for 1902, Vol. XXII, pp. 65–142. Washington, 1903.

the rate of progress through brackish water to average 7 or 8 miles per day and that through fresh water to be between 15 and 20 miles per day. These figures apply only to the spring run on the Sacramento River. The migration of the fall run is considerably slower, averaging but 4 to 5 miles per day through the fresh water. Greene's observations were, of course, made upon fall run fish.

A further analysis of data has shown some interesting variations in the rate of migration. A calculation of the mean rate of migration from each marking station indicates that the rate of travel decreases as the fish approach nearer the mouth of the Fraser River as follows: Station B, 10.5; station C, 7.9; station D, 9.1; station E, 4.5.

Finally the rates of migration for different parts of the season have been calculated. Data given in Tables 1 and 2 were first condensed into quartiles and then into halves, and the rate of travel in miles per day was calculated for each of these. The positions of the quarter points determining the quartiles were based on the number of fish marked, not on the number returned. In adopting a central point on which to separate the halves it was rather arbitrarily determined to consider all fish marked during July as belonging to the first half and all those marked during August as belonging to the second half. It is more convenient to think of the halves as separated in this manner, and the central point separating the fish marked into halves comes sufficiently close to the 1st of August to warrant the division on this basis. These calculations have not been made for stations C and E nor for any cases based on less than 10 individuals or showing a retrograde migration relative to the mouth of the Fraser River. The inaccuracies in the marking record at station C would have made such treatment valueless. In the case of station E, over 78 per cent of the fish recovered were taken in Canadian waters. Inasmuch as the authors were unable to make a detailed analysis of the Canadian records, it has seemed best not to attempt too detailed an analysis of the records obtained from the marking at station E.

TABLE 23.—RATE IN MILES PER DAY IN DIFFERENT QUARTILES—RETURNS FROM STATION A, BY REGIONS.

| Quartiles. | 1 | | 2 | | 6 | | 7 | | 8 | | 9 | | 10 | | Total fish. | Average rate.[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | | |
| First | 6 | 9.2 | 8 | 12.2 | 6 | 13.9 | 3 | 11.3 | 2 | 10.4 | 5 | 22.0 | 5 | 19.1 | 35 | 13.0 |
| Second | 3 | 35.0 | 2 | 6.8 | 9 | 8.6 | 8 | 9.9 | 4 | 9.8 | 5 | 9.2 | 2 | 18.8 | 33 | 10.0 |
| Third | 1 | 11.6 | 4 | 12.8 | 6 | 12.5 | 13 | 11.4 | 13 | 10.0 | 2 | 11.6 | 5 | 10.4 | 44 | 11.1 |
| Fourth | 2 | 14.0 | 2 | 15.8 | 2 | 15.0 | 8 | 19.7 | 6 | 17.3 | 1 | 13.2 | 2 | 5.7 | 23 | 14.5 |

[a] Harmonic mean.

TABLE 24.—RATE IN MILES PER DAY IN DIFFERENT HALVES—RETURNS FROM STATION A, BY REGIONS.

| Halves. | 1 | | 2 | | 6 | | 7 | | 8 | | 9 | | 10 | | Total fish. | Average rate.[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | | |
| First | 9 | 12.1 | 11 | 10.3 | 18 | 9.8 | 19 | 9.7 | 15 | 8.9 | 10 | 13.0 | 10 | 13.6 | 92 | 10.5 |
| Second | 3 | 13.0 | 5 | 14.8 | 5 | 14.3 | 13 | 18.7 | 10 | 17.3 | 3 | 12.0 | 4 | 8.6 | 43 | 14.8 |

[a] Harmonic mean.

TABLE 25.—RATE IN MILES PER DAY IN DIFFERENT QUARTILES—RETURNS FROM STATION B, BY REGIONS.

| Quartiles. | 6 | | 7 | | 8 | | 9 | | 10 | | Total fish. | Average rate.[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | | |
| First | 4 | 5.1 | 2 | 2.9 | 3 | 11.0 | 10 | 20.0 | 14 | 18.4 | 33 | 11.0 |
| Second | 6 | 9.3 | 9 | 9.1 | 9 | 6.2 | 14 | 10.3 | 21 | 14.4 | 59 | 10.0 |
| Third | 11 | 14.3 | 9 | 7.7 | 25 | 11.3 | 7 | 12.6 | 6 | 14.6 | 58 | 11.3 |
| Fourth | 4 | 10.8 | 15 | 11.7 | 19 | 13.2 | 18 | 10.3 | 13 | 13.3 | 69 | 11.9 |

[a] Harmonic mean.

TABLE 26.—RATE IN MILES PER DAY IN DIFFERENT HALVES—RETURNS FROM STATION B, BY REGIONS.

| Halves. | 6 | | 7 | | 8 | | 9 | | 10 | | Total fish. | Average rate.[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | | |
| First | 12 | 7.7 | 14 | 6.6 | 19 | 8.8 | 27 | 12.1 | 36 | 16.1 | 108 | 10.5 |
| Second | 13 | 12.6 | 21 | 8.6 | 37 | 11.6 | 22 | 11.3 | 18 | 13.4 | 111 | 10.9 |

[a] Harmonic mean.

TABLE 27.—RATE IN MILES PER DAY IN DIFFERENT QUARTILES—RETURNS FROM STATION D, BY REGIONS.

| Quartiles. | 8 | | 9 | | 10 | | Total fish. | Average rate.[a] | Average rate (for regions 9 and 10 only). |
|---|---|---|---|---|---|---|---|---|---|
| | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | | | |
| First | 33 | 3.7 | 13 | 8.1 | 5 | 6.7 | 51 | 4.6 | 7.6 |
| Second | 18 | 6.4 | 30 | 8.6 | 13 | 6.5 | 61 | 7.3 | 7.8 |
| Third | 46 | 6.8 | 27 | 13.1 | 7 | 3.9 | 80 | 7.5 | 8.8 |
| Fourth | 34 | 4.4 | 39 | 11.0 | 10 | 16.4 | 83 | 7.0 | 11.8 |

[a] Harmonic mean.

TABLE 28.—RATE IN MILES PER DAY IN DIFFERENT HALVES—RETURNS FROM STATION D, BY REGIONS.

| Halves. | 8 | | 9 | | 10 | | Total fish. | Average rate.[a] |
|---|---|---|---|---|---|---|---|---|
| | Fish. | Rate. | Fish. | Rate. | Fish. | Rate. | | |
| First | 50 | 4.3 | 43 | 8.3 | 17 | 6.2 | 110 | 5.6 |
| Second | 81 | 5.5 | 66 | 11.5 | 18 | 7.4 | 165 | 7.2 |

[a] Harmonic mean.

In the case of the quartiles, the indications are that the rate is more rapid in the first than in the second quartile, and that the rates in the third and fourth quartiles are successively more rapid than in the second. This does not appear clearly in the results from station D, especially when the returns from region 8 are included. Omitting the returns from region 8 (which is deemed legitimate, considering the comparatively short distance traveled, just 20 miles from station D to the center of region 8) brings the results more nearly in accord with those obtained from stations A and B, the only disagreement being in the rate during the first quartile. This is, in the case of station D, slightly less, rather than greater, than the rate in the second quartile.

It seems not unlikely that the difference in rates of travel shown in the different quartiles may be explained as indicating racial differences existing in the fish composing different parts of the run. Gilbert [a] has demonstrated that the Fraser River run is composed of a number of distinguishable races, each bound to a different spawning region. The assumption that these races may have different rates of migration while passing through the waters of the Sound does not seem to be a difficult one to accept.

In the case of the halves, the results from all three stations are in complete agreement, indicating that the rate during the second half is distinctly more rapid than during the first half.

In connection with the above determination of the rate of progress through Puget Sound, it must be borne in mind that the rates are undoubtedly lower than they should be. This necessarily follows when it is considered that seldom less than one day, and frequently three or four days, elapses between the times when the traps are lifted and the fish reported. Again, the fish may spend some time in the hearts and pot of the trap before entering the spiller, from which they may be taken at the next lift. A fish entering the trap immediately after it has been lifted would not be reported before the next day at the earliest, thus adding at least one day to the actual time required to make the journey from the marking station. If traps were uniformly lifted at 24-hour intervals, 12 hours could with safety be subtracted from the average number of days en route and the rate calculated accordingly. The authors' knowledge on this point, however, is not sufficient to warrant such treatment. It would undoubtedly be a step in the right direction, but would tend to give an opinion that the rates have been fully corrected, which would be quite unwarranted by the facts. It is possible that the error involved is within the limits of error dependent upon other factors.

### RETURNS FROM TRIBUTARY STREAMS AND THE FRASER RIVER ABOVE MISSION BRIDGE.

Returns were obtained from various sections of the Fraser River watershed which have not been included in the regions indicated on the map. These sections may be indicated as follows:

| | Specimens. |
|---|---|
| Main river, 3 to 27 miles above Mission | 7 |
| Main river, near Hope, Yale, Hell's Gate, and Spuzzum | 16 |
| Main river at Lytton and Lillooet | 2 |
| Main river at Soda Creek | 2 |
| Pitt River | 6 |
| Harrison Lake system, between Harrison and Lillooet Lakes | 5 |
| Harrison Lake system, Birkenhead River | 9 |
| Seton Lake system, Portage Creek | 2 |
| Chilcotin River | 1 |

The complete data concerning these returns are given in Table 29. The mean dates on which the fish captured in each of the above districts were marked have been calculated and appear in the summary. This was done in order to see, if possible, when the fish bound to the different tributaries were to be found in Puget Sound. The possibility of a segregation in time of the races demonstrated by Dr. Gilbert has been suggested above.

[a] Gilbert, Charles H.: Contributions to the life history of the sockeye salmon. Report, commissioner of fisheries for the Province of British Columbia for 1917, paper No. 4, pp. Q33-80. Victoria, 1918.

TABLE 29.—RETURNS OF SPECIMENS MARKED AT EACH STATION FROM FRASER RIVER OTHER THAN THE MAIN RIVER FROM THE MOUTH TO MISSION BRIDGE, 1918.

| Section. | A. | | | B. | | | C. | | | D. | | | E. | | | Summary. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date marked. | Date taken. | Days en route. | Date marked. | Date taken. | Days en route. | Date marked. | Date taken. | Days en route. | Date marked. | Date taken. | Days en route. | Date marked. | Date taken. | Days en route. | Fish taken. | Mean date marked. | Average days en route. |
| 3-27 miles above Mission, main river | | | | July 26 | July 31 | 5 | July 17 | Aug. 17 | 31 | | | | July 29 | Aug. 5 | 6 | 7 | July 27 | 9.3 |
| | | | | | | | | | | | | | ...do... | Aug. 7 | 9 | | | |
| | | | | | | | | | | | | | Aug. 2 | Aug. 5 | 3 | | | |
| | | | | | | | | | | | | | ...do... | Aug. 7 | 5 | | | |
| | | | | | | | | | | | | | July 25 | July 29 | 4 | | | |
| Near Hope, Yale, Spuzzum, and Hell's Gate, main river | July 21 | Aug. 1 | 11 | Aug. 1 | Aug. 5 | 4 | | | | July 23 | Aug. 2 | 10 | ...do... | Aug. 5 | 11 | 16 | July 30 | 16.3 |
| | ...do... | Aug. 26 | 36 | Aug. 4 | Aug. 16 | 12 | | | | July 28 | Aug. 26 | 29 | July 26 | ...do... | 10 | | | |
| | | | | | | | | | | Aug. 6 | Aug. 16 | 10 | July 29 | Aug. 16 | 18 | | | |
| | | | | | | | | | | Aug. 7 | Sept. 16 | 40 | July 30 | Aug. 9 | 10 | | | |
| | | | | | | | | | | | | | July 31 | Aug. 28 | 28 | | | |
| | | | | | | | | | | | | | Aug. 2 | Aug. 13 | 11 | | | |
| | | | | | | | | | | | | | Aug. 7 | Aug. 16 | 9 | | | |
| | | | | | | | | | | | | | Aug. 8 | Aug. 19 | 11 | | | |
| Lytton and Lillooet Bridge, main river | | | | | | | | | | July 30 | Aug. 30 | 31 | July 30 | Aug. 30 | 31 | 2 | ...do... | 31.0 |
| Soda Creek, main river | | | | July 25 | Aug. 27 | 33 | | | | July 19 | Aug. 16 | 28 | | | | 2 | July 22 | 30.5 |
| Pitt River, 5 miles above Pitt Lake | | | | July 24 | Sept. 15 | 53 | | | | | | | | | | 6 | Aug. 3 | 38.5 |
| | | | | July 26 | ...do... | 51 | | | | Aug. 6 | Sept. 19 | 44 | | | | | | |
| | | | | July 31 | Aug. 30 | 30 | | | | Aug. 9 | Sept. 4 | 26 | | | | | | |
| | | | | Aug. 7 | Sept. 3 | 27 | | | | | | | | | | | | |
| Between Harrison and Lillooet Lakes | July 27 | Sept. 14 | 49 | | | | | | | | | | July 30 | Aug. 20 | 21 | 5 | Aug. 2 | 31.0 |
| | | | | | | | | | | | | | ...do... | Aug. 27 | 28 | | | |
| | | | | | | | | | | | | | Aug. 2 | Sept. 11 | 40 | | | |
| | | | | | | | | | | | | | Aug. 16 | Sept. 2 | 17 | | | |
| Harrison and Lillooet Lakes, Birkenhead River | | | | Aug. 4 | Sept. 17 | 44 | | | | | | | July 30 | Sept. 14 | 46 | 9 | Aug. 10 | 41.4 |
| | | | | Aug. 5 | Sept. 20 | 46 | | | | Aug. 5 | Sept. 20 | 46 | Aug. 15 | Sept. 15 | 31 | | | |
| | | | | | | | | | | | | | ...do... | Sept. 20 | 36 | | | |
| | | | | | | | | | | | | | ...do... | Sept. 21 | 37 | | | |
| | | | | | | | | | | | | | ...do... | Sept. 24 | 40 | | | |
| | | | | | | | | | | | | | Aug. 21 | Oct. 7 | 47 | | | |
| Seton and Anderson Lakes, Portage Creek | | | | | | | | | | | | | July 29 | Sept. 12 | 45 | 2 | July 30 | 43.0 |
| | | | | | | | | | | | | | July 31 | Sept. 10 | 41 | | | |
| Chilcotin River | | | | | | | | | | | | | July 30 | Sept. 13 | 45 | 1 | ...do... | 45.0 |
| Total | | | | | | | | | | | | | | | | 50 | | |

The data here presented are quite too fragmentary to afford a basis for more than the most tentative conclusions; but the following points are suggested:

1. The fish which go farthest up the main river before turning into the tributary in which they are to spawn run earlier in the season.

2. The main bulk of the fish which pass up the main river past Hope are to be found in Puget Sound at the height of the season, the latter part of July and early in August.

3. The fish entering the lower tributaries, Pitt River and the Harrison Lake system, come largely from those fish constituting the last half of the run.

In the event that it were deemed desirable to stop commercial fishing for part of the season, it would seem that the first part should be selected, as the indications are that there is a larger proportion of the upriver fish in the first half of the run, and these are the fish which have suffered more severely as a result of the disaster of 1913.

## SUMMARY.

1. The experiment of tagging adult sockeye salmon in Puget Sound was initiated in an effort to determine the routes and rates of migration of Fraser River sockeyes in passing through the waters where commercial fishing is permitted.

2. During July and August, 1918, numbered silver or aluminum buttons were attached to 4,494 adult sockeyes. Of these 1,199 were later recovered and data as to time and place of capture secured.

3. The route most commonly followed passes from the Strait of Juan de Fuca across Washington Sound to the Salmon Banks and Whidbey Island, then through Rosario Strait and the southern part of the Strait of Georgia, past Point Roberts to the mouths of the Fraser River.

4. The rate of migration as determined by the data for American waters is approximately 10 miles per day.

5. The migration is more rapid during the last half than during the first half of the season.

# FISHES IN RELATION TO MOSQUITO CONTROL IN PONDS

By SAMUEL F. HILDEBRAND
*Superintendent, U. S. Fisheries Biological Station*
*Key West, Fla.*

**Appendix IX to the Report of the U. S. Commissioner of Fisheries for 1918**

# CONTENTS.

# FISHES IN RELATION TO MOSQUITO CONTROL IN PONDS.

By SAMUEL F. HILDEBRAND,
*Superintendent, U. S. Fisheries Biological Station, Key West, Fla.*

## INTRODUCTION.

The United States Commissioner of Fisheries, in response to a request from the United States Public Health Service for an ichthyologist, detailed the writer to cooperate with the public health authorities of the extra-cantonment zone of Camp Hancock, Augusta, Ga., in an antimalarial campaign. The duty assigned to the author was an investigation of the effectiveness of fishes as eradicators of the aquatic stages of the mosquito, and the conduct of such operations as would promise secure "fish control" in the extra-cantonment zone, where there were many swamps, ponds, and small lakes in which control by oiling was impracticable. This area covers a territory approximately a mile wide surrounding the camp, the city of Augusta, and a belt about a mile wide surrounding the city limits. The swamps, fortunately, were nearly all drainable, but the ponds were mostly so situated and of such a nature that draining was either impracticable or impossible. The ponds, however, presented a situation which offered excellent opportunities for testing the practical value of fishes as eradicators of mosquito larvæ and pupæ. Experiments were at once started and observations were continued from March, 1918, to November 8, 1918. Much credit for the success of the work is due the local authorities of the United States Public Health Service for their excellent cooperation in furnishing labor, transportation, and other facilities for conducting the investigation.

Quite a number of species of fishes have been mentioned by writers in connection with the mosquito problem. The usefulness of some of these in aquaria and small pools, at least, is well known, but accurate information as to their effectiveness in larger bodies of water, and especially in places where the immature mosquito finds protection among plants or débris, is largely wanting. The summer's investigation was almost wholly devoted to the determination of the practical value in antimalarial work of the top minnow, *Gambusia affinis* (Baird and Girard).

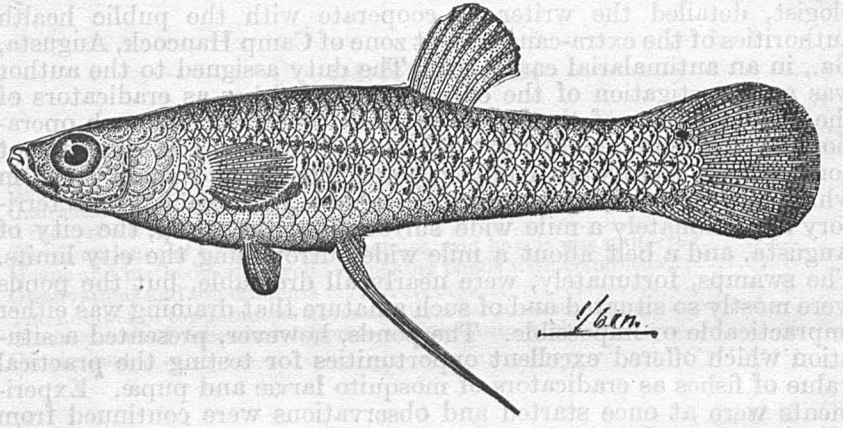
The experiments were conducted in a large series of ponds which afforded many different conditions. It is the writer's intention to relate how the investigation was conducted and to mention results and conclusions. It is hoped that the value of the top minnow may

[a] This report embodies the results of investigations conducted by the Bureau of Fisheries in cooperation with the Public Health Service and was published originally by the United States Public Health Service in Public Health Reports, Vol. 34, No. 21, May 23, 1919.

become better understood thereby and that the observations reported will be of help to those who in the future may wish to employ this useful little fish in antimalarial work.

## GENERAL TOPOGRAPHY OF AUGUSTA AND SURROUNDING TERRITORY.

The city of Augusta is situated on the Savannah River, in a low and rather flat valley, and because of the recurrence of floods and the consequent danger to life and property, a levee was constructed between the river and the adjacent territory. However, there is a considerable elevation westward or toward the "Hill" section of the city, beyond which lies Camp Hancock. The one-mile belt surrounding the city extends across the Savannah River and includes a section of South Carolina. There were many swamps in this rather flat territory, but fortunately most of these were drainable and have been eliminated by the United States Public Health Service in coop-



Gambusia affinis (male).

eration with the authorities of Richmond County and the city of Augusta. In addition to the swamps there are many ponds. Nearly all of these are artificial and they vary in size and depth. Drainage, in most instances, is impracticable, if indeed not impossible. The majority of these ponds were made in the manufacture of brick, an industry which was started in Augusta in about 1808. The clay pits made by these manufacturing concerns, because of the flat nature of the country, soon become filled with water. Sometimes after hard rains the water is pumped out and digging is resumed in the old pits, but frequently the digging machines are moved. Thus new ponds are being formed constantly. There are more than one hundred of these clay pits in the territory under protection, and in addition there are a number of ponds or lakes which were made for the purpose of furnishing a water supply, or for water power.

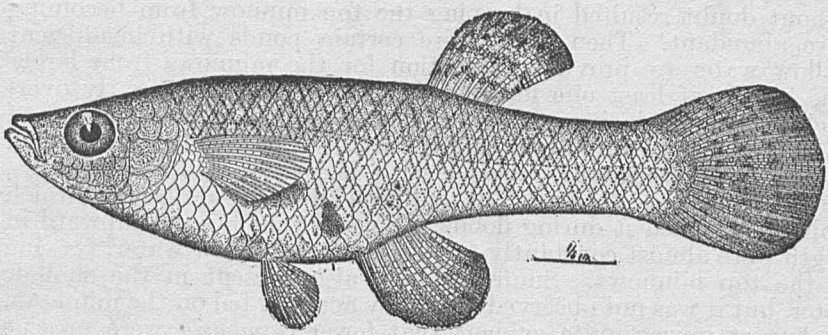
These ponds present a variety of conditions. Some of them are very old and have become partly filled with sediment; the shores are often gently sloping and much aquatic vegetation is present. Such ponds usually furnish an ideal environment for the support of mosquito larvæ. The newer ponds generally have steep shores;

there is not much vegetation, but considerable wave action, and as a rule these ponds are not well suited to prolific mosquito breeding.

## GAMBUSIA AFFINIS AND THE GENERAL PLAN PURSUED IN TESTING ITS VALUE IN ANTIMOSQUITO WORK.

*Gambusia* was selected for the present tests because, first, it seeks its food at the surface, which appears to make it especially suitable for antimosquito work; second, it lives and thrives under a large variety of conditions and especially in water suitable for the support of mosquito larvæ; third, it proved to be quite common in the extra-cantonment zone and adjacent territory; fourth, it is very prolific; and fifth, its usefulness in destroying mosquito larvæ in aquaria and fountains was already well known.

This fish does not lay eggs, but gives birth to well developed and very active young. It, therefore, requires no special environment, as most other fishes do, for depositing and hatching the eggs. Young



Gambusia affinis (female).

of the season were noticed for the first time on April 24, and during the latter half of October a gravid female still occasionally appeared among collections. The author,[a] working with *Gambusia* at Beaufort, N. C., found that it breeds throughout the summer and that a new brood is produced at intervals of about one month or six weeks. It was observed that a single female gave birth to six broods of young during a single season. The number of young produced at one time appears to bear a direct relation to the size of the female, a large female producing many more young than a small one. The largest brood observed by the writer numbered 63, but Smith,[b] working with fish from the Potomac River, found 100 in a single brood. The young are approximately one-half inch in total length when born; they are very active and are apparently much better adapted to begin the struggle for an existence than most fish hatched from eggs. They, in fact, are ready to begin the work of destroying mosquito larvæ at once, for the writer has seen them attacking and eating small and even medium-sized mosquito larvæ in aquaria before they were a day old. *Gambusia* gains growth rapidly and the earliest broods of the season, born in April and May, become

[a] Hildebrand, Samuel F., Report, U. S. Commissioner of Fisheries, Appendix VI, 1917, p. 6.
[b] Smith, H. M., Science, n. s., Vol. XXXVI, 1912, p. 224.

sexually mature and produce young when four to five months old. The later broods of course do not produce young until the following season.

The general plan pursued in testing the practical value of the top minnow in antimalarial work may be divided into three principal lines of activity, viz: First, that of protecting *Gambusia* in the area in which the tests were to be made; second, that of increasing the number of top minnows in the ponds in which the mosquito nuisance was to be abated by means other than protection; and, third, that of making careful field observations.

## THE ABUNDANCE OF GAMBUSIA, ITS ENEMIES, AND HOW IT WAS PROTECTED.

The top minnow was present in nearly all of the older ponds, doubtlessly having reached these during times of flood. It, however, was not found abundant, except in a very few ponds and swamps. The common local practice of using *Gambusia* for bait for larger fish without doubt resulted in keeping the top minnow from becoming more abundant. Then there were certain ponds with insufficient shallow water to provide protection for the minnows from larger fish, and in at least one instance a lake had become greatly overstocked with predacious fishes, so that there was a great dearth of food. This lake is situated in Allen Park, within the city of Augusta. It had been artificially stocked with large-mouthed black bass, locally known as "trout," in addition to several species which probably reached it during floods. Bass of 3 inches and upward in length were almost constantly present in very shallow water, preying on the top minnows. Sunfishes were also present in the shallow water, but it was not observed that they actually fed on the minnows. In August it was quite evident that fewer *Gambusia* were present in this lake than there were in April, notwithstanding the fact that approximately 18,000 minnows had been introduced from other sources during the intervening months. Other ponds apparently well stocked with sunfishes and bass, and which certainly did not offer better protection for the minnow than the lake in Allen Park, were stocked with *Gambusia*, but in none of these did such disastrous results ensue. In Allen Park all fishing was prohibited, while in the other ponds there was a limited amount of hook and line fishing. The entire prohibition of fishing in Allen Park doubtlessly accounts for the great abundance of predacious fishes, and the shortage of food made it necessary for the fish to venture into shallower water than they ordinarily do in search of food. Later when an effort was made to give *Gambusia* a chance of survival in Allen Park, it was learned that the shortage of food was so great that cannibalism had undoubtedly prevailed.

The following experiment shows that the common local species of sunfishes are not serious enemies of *Gambusia*. It, therefore, is quite certain that the bass was the chief enemy of the minnow in Allen Park. An old pond, measuring about 75 by 50 feet, with an average depth of approximately 5 feet, was stocked during the first week of April with about 3,000 sunfishes. Probably about 90 per cent of the fish were bream, *Lepomis incisor* (Cuvier and Valenciennes), and the others were warmouth and a few of other species.

The pond was already well stocked with *Gambusia*, and it doubtlessly possessed conditions suitable for the propagation of the top minnow, but probably not for that of sunfishes. However, there were present before stocking a few sunfishes. The bottom of the pond was very muddy, the shore edges were almost free of vegetation, there was little algæ, and the water was quite foul. Nearly all of the sunfishes lived, so far as known, and the top minnow made a notable increase during the summer. It undoubtedly is true that *Gambusia* is not as abundant in this pond with the large number of sunfishes present as it otherwise would have been, but the experiment certainly shows that the bream is not very destructive to the top minnow.

*Gambusia* in a few instances needed protection from natural enemies, but much more generally from man. The top minnow had become quite a favorite bait for larger fish, and wherever this fish was fairly common, fishermen and bait collectors were frequently seen catching it with small seines and dip nets. This practice quite certainly did more than any other one thing toward preventing *Gambusia* from becoming more abundant. Consequently, it was thought advisable to publish a notice in the local newspapers, explaining that this fish was useful in destroying the wiggle-tail and asking fishermen to kindly discontinue using it for bait. In addition, a placard was posted at each pond, stating that the small fish were protected as a health measure and that they were not to be used for bait. The response to these requests was most cordial, as not an offender was seen.

Several ponds with steep shores provided very little shallow water and the top minnow did not thrive. These ponds supported larger fish, including the large-mouthed black bass, and it is believed that they destroyed the minnows. The chief protection which *Gambusia* finds from the larger predacious fishes, appears to be shallow water. An effort, therefore, was made to provide this protection in the above-mentioned ponds by grading the shore at several points in each pond. The difficulty encountered in the pond in Allen Park has already been mentioned. This greatly overstocked lake was seined, and a large number of predacious fishes were removed. It was then restocked with *Gambusia*, and after that, bass were not observed feeding on the top minnow. The provisions against natural enemies were made too late in the season to bear very evident results during the present investigation.

## MEANS AND METHODS EMPLOYED IN STOCKING PONDS WITH GAMBUSIA.

Minnows for stocking ponds were secured mainly from two sources; first, from swamps within the protected area which were being drained; and second, from waters outside of the extra-cantonment zone, from places where minnows did not appear to be needed. Large numbers of minnows were secured from these sources and placed in ponds where few or none were present.

One pond, about 100 by 30 feet, with an average depth of about 3 feet, was used as a "hatchery." This pond has a very muddy bottom and it supports much algæ and several attached plants. All fish were removed from this pond. Then a partition, composed

partly of a dam and partly of wire netting, was built across the pond. About 3,000 adult female *Gambusia* were placed in the larger compartment. No record was kept of the number of males which were introduced, as this is relatively unimportant,[a] but there were probably not more than 10 to each 100 females. The purpose of dividing the pond into two compartments, using a one-fourth inch wire screen for a portion of the partition, was to give the young fish an opportunity to migrate to that section of the pond where they could not be followed by the adults. This was thought advantageous because of the cannibalistic habit of *Gambusia*, which the mother, in confinement at least, so impressively displays by eating her own young oftentimes nearly as rapidly as they are born. The one-fourth inch mesh, however, proved to be a little too large, and some of the adults succeeded in getting through it. The reproduction in this hatchery, nevertheless, exceeded all expectations. This pond, being conveniently situated, furnished a ready supply of top minnows for aquaria, fountains, pools, and wells wherever they were found to be needed or as requests for them were received.

A very useful net for collecting top minnows is a small bobbinet seine. The one used by the writer was about 12 feet long and 3 feet deep. Such a net, if made of a good grade of netting, is light and durable, and it can be quickly and easily handled. A dipnet, also made of bobbinet, was used to some advantage in places where there was so much vegetation that a seine could not be operated.

## OBSERVATIONS AND EXPERIMENTS.

Field observations were made at all ponds in the protected zone at more or less definite intervals of one week each throughout the investigation. These were often extended beyond the protected area for the purpose of obtaining checks on the effectiveness of the work within the zone.

As early as March 29 a certain pond was found to be fairly alive with mosquito larvæ and pupæ. Further investigation proved that no fish were present. Top minnows were then placed in the pond for the purpose of observing whether or not the fish would destroy the large numbers of immature mosquitoes. The fish, however, all died in less than 45 minutes. Since the pond was near that portion of the Georgia Chemical Works where sulphuric acid is manufactured, the presence of a chemical fatal to fish life was at once suspected. A litmus-paper test gave a strongly acid reaction. While the first purpose of the experiment failed, it, nevertheless, was learned that mosquitoes can breed in water so strongly acid that *Gambusia* is killed almost instantly thereby. There, however, was another pond very near the acid pond and in appearance very similar to it. This one was well supplied with top minnows in addition to a few food fishes, and it was entirely free of mosquito larvæ. As it did not seem reasonable that mosquitoes would select the acid pond in preference to the unpolluted one for breeding purposes, the only apparent logical conclusion was that the absence of mosquito larvæ in the latter was due to the presence of natural enemies or fish.

Another situation very similar to the one discussed in the preceding paragraph was not far away, for there were nearly end to end an

[a] Hildebrand, Samuel F., Report, U. S. Commissioner of Fisheries, Appendix VI, 1917, p. 7.

acid swamp and the pond previously referred to as the hatchery. *Anopheles* bred in the acid swamp throughout the season, except as interrupted from time to time by the application of oil. The hatchery pond, which was evidently well suited for the support of *Anopheles* larvæ, was, nevertheless, free from them, except when the vegetation became dense and provided protection.

On April 1, mosquito larvæ of the *Culex* type were found in a ditch, in several pools, and in a large pond. These waters were all free of débris and vegetation. The pond had steep shores, and it was very clean. It was one of the newer brickyard ponds, and no fish were present. All of these places, being close together, were stocked with *Gambusia* at the same time. Only 6 fish were placed in each of the pools, which were about 10 to 12 feet long, about 2 feet wide, and very shallow. Each pool supported thousands of mosquito larvæ, but in about two weeks they were made entirely free of wrigglers by the fish and remained so until they became dry later in the season. The presence of comparatively few skins showed that not many of the larvæ reached the adult stage. The ditch referred to was approximately 30 feet long and 1 foot wide. Mosquito larvæ were especially abundant in it. About 200 top minnows were placed there, and in two weeks it was completely free of wrigglers. Mosquito larvæ were seen only along the shore of the big pond. It was at first stocked with about 1,500 *Gambusia*, but later several thousand more were added. The larvæ in this pond, too, disappeared in about two weeks from the time the first fish were introduced and none were again seen until September. By that time the shores had become overgrown with vegetation which furnished protection for *Anopheles* larvæ against fish. This vegetation was cut and the shores were raked. A large school of top minnows followed the workmen, destroying the immature mosquito and other insect larvæ as quickly as their hiding places were destroyed.

It was possible in several instances to connect ditches and swamps which were thickly infested with mosquito larvæ with ponds that were well supplied with top minnows. Wherever this was done, large numbers of fish entered these waters and destroyed the mosquito larvæ in a surprisingly short time.

For the purpose of comparison and as further evidence of the value of *Gambusia* in controlling mosquito breeding two other small ponds are worthy of mention. These ponds are situated at the intersection of the tracks of the Georgia Central and the Belt Line railroads, and they are of about equal size. The top minnow had reached one of the ponds from an unknown source, and it was entirely free of mosquito larvæ. The other was without fish, and mosquitoes were breeding in it in abundance. The inference, in the absence of any evidence to the contrary, of course, is that the top minnows destroyed the mosquito larvæ in the first pond.

During the latter part of October two new brickyard ponds were found to be breeding large numbers of mosquito larvæ. The ponds had become supplied with some vegetation; the mosquito larvæ, however, were not confined to these hiding places, but were quite generally distributed over the ponds, and could be seen in perfectly clear water. *Anopheles* larvæ previously had been noticed only once away from all protection, and then, as now, in a pond not stocked with fish. On October 23 about 1,000 *Gambusia* were placed in one pond

and the other was left as a control. On October 26 no pronounced reduction in the number of larvæ in the pond which had been stocked was noticeable. On October 29, however, a remarkable decrease was evident, only a few larvæ being left, and these were found in vegetation. At the end of this time the immature mosquitoes in the other pond (control) were as abundant as ever.

Many similar experiments and observations could be mentioned, but as the results for all were nearly identical it is not advantageous to do so. It then may be stated that wherever mosquitoes were breeding prolifically *Gambusia* was not present, but, if introduced, mosquito breeding was eliminated or at least greatly reduced. Wherever the complete elimination of mosquito larvæ did not result, if sufficient top minnows were present the immature mosquitoes were so protected by vegetation or débris that they could not be detected or reached by the fish.

All aquatic plants, however, do not furnish protection for mosquito larvæ and pupæ against fish, and some even may be repellent. The following-named plants appeared to provide good protection and caused considerable trouble during the investigation: (*a*) The aquatic grass, *Hydrochloa carolinensis;* (*b*) "Coon-tail moss," a species of *Myriophyllum;* and (*c*) Algæ. The aquatic grass grows in shallow water and along the shores. It has many slightly submerged leaves over which the horizontally floating or swimming *Anopheles* larvæ hover, out of sight and out of reach of fish. Wherever this plant occurs some *Anopheles* larvæ are almost sure to be present regardless of the abundance of *Gambusia.* It, therefore, is obvious that if this plant occurs in ponds in which mosquito control is desired, it must be removed. This may be done by cutting and raking, or if growing in soft mud it may be pulled up by the roots.

The plant locally known as "coon-tail moss" causes trouble only when it becomes detached and rises to the surface. This plant was present in only a few ponds in which an endeavor was made to secure mosquito control, and it caused considerable trouble in only one. It is ordinarily attached to the bottom, but in this instance some of the plants became detached from time to time and came to the surface. There each plant collected more or less débris, algæ grew among its branches and thus formed a mass in which both types of mosquito larvæ found protection. This floating mass must be removed from time to time; this can be done best on a windy day when it drifts inshore.

Algæ often form mats which float at or near the surface. Mosquito larvæ, particularly *Anopheles,* find protection from fish over and in these mats. Copper sulphate was used in the proportion of 8 pounds to 1,000,000 gallons of water for killing the algæ, but this treatment must usually be repeated frequently. Toward the close of the season a light gas oil, used by the local office of the United States Public Health Service in antimalarial work, was sprayed on the algal pads wherever the use of the water did not preclude this practice. This oil, if used in moderate quantities, is not injurious to fish; it can be quickly and conveniently applied, and it is very effective, for the algal pads act like sponges, retaining the oil and making them uninhabitable for the mosquito.

Water lilies do not, as a rule, appear to furnish much protection while growing, but some of the plants die from time to time. The

leaf then often partly sinks, forming a depression over the center while the edges remain at the surface. The cup thus formed holds enough water to support mosquito larvæ, and with respect to fish the larvæ contained therein are perfectly safe. When the dead leaves drift inshore, they of course frequently make places inaccessible to fish.

Grasses and rushes and other plants, having straight stocks and no slightly submerged leaves, furnish no protection. Areas overgrown with such plants have been carefully examined for mosquito larvæ, but wherever *Gambusia* was present no immature mosquitoes were found.

The aquatic plant, *Naias flexilis*, which was common in several ponds, forming a dense growth over the bottom, normally does not provide protection, as it does not reach the surface of the water. During the severe fall drought the water, however, became so low that it was near the surface or partly exposed in many places, making such a dense mass that fish could not penetrate it. Wherever this occurred it furnished excellent protection and *Anopheles* larvæ and pupæ were common.

The duck weed, *Spirodela polyrrhiza*, was present in only one pond, over which it formed an almost continuous cover. No mosquito larvæ were seen in this pond, indicating that this plant does not furnish protection for the mosquito from fish. It, in fact, is likely that mosquitoes can not breed under such conditions, but as this pond was well supplied with *Gambusia* no data supporting this probability were obtainable therefrom.

The smart weed (*Polygonum*) is another plant that not only does not appear to provide protection but which may actually be repellent. Many places overgrown with this weed were repeatedly examined, but mosquito larvæ were not found even in apparently favorable hiding places.

Nearly all marginal plants, by projecting partly into the water, by falling into it after maturing, or by becoming partly submerged after freshets, furnish protection for mosquito larvæ. These plants should be removed when possible.

It is evident from the study of plants in relation to mosquito control by means of fish that it is highly desirable to remove from the ponds those plants having leaves just below the surface of the water and to treat algæ in such a way as to make them useless as protectors of mosquitoes. The presence of these plants was by far the most important obstacle to be overcome in securing mosquito control in the many ponds in the extra-cantonment zone of Camp Hancock. A rather constant vigilance was necessary in order to keep a large series of ponds free of such plants, but it is not very difficult work or usually very expensive, for two laborers provided with hoes, rakes, a knapsack spray can, and some oil could take care of quite a number of ponds during the course of a season. In badly infested ponds it is occasionally advantageous to cut the vegetation with a patented device known on the market as a submarine saw.

It is very interesting to observe how quickly the top minnows learn to follow the workmen engaged in cutting and raking vegetation from ponds. They soon become quite tame and schools of them work almost under the tools of the laborers, catching mosquito larvæ and other insects as quickly as their hiding places are destroyed.

This work around the ponds caused the top minnows to become tame, and that made it possible to perform certain feeding experiments which otherwise could not have been made. One of these feeding observations is described in the writer's field notes as follows: "I took several large *Anopheles* larvæ from dense vegetation and placed them in open water among top minnows. With one larva was a small piece of bark. The larva hovered over this piece of bark and the fish did not detect it. When it was placed in open water, without the least protection, the fish swam around it, even 'nosed' it, while the larva lay perfectly motionless. At last a rather small minnow seized and swallowed it. Placed another larva in open water among fish. This one too lay perfectly still, drifting like a small stick, while fish swam all about, nosing it a time or two, but apparently not detecting that it was alive and something to eat. Finally it drifted near a tuft of grass and with a surprisingly quick movement it swam into the vegetation. It was removed and placed in open water. There it lay motionless for about five minutes, when at last it was snapped up by an undersized minnow. A third was placed in open water; it too drifted along perfectly motionless for about five minutes before it was finally detected by an undersized minnow. Once this larva drifted very close to the grass from which it was originally removed, but it made no effort to get back into it. This may have been due to the presence of fish between it and the grass." In some of the feeding experiments the larvæ were much more quickly detected by the fish than in the one just described. The rapidity with which they are found and eaten probably depends to a certain extent, at least, upon the eagerness with which food is being sought by the fish.

These feeding experiments, which were repeated many times, demonstrated that the protective instinct in mosquito larvæ is highly developed. It was shown many times that the only protection an *Anopheles* larva has from fish in open water is inactivity. When the larva thus drifts along fish evidently mistake it for an inanimate object, for, as already shown, they may swim all around it for several minutes, even touch the larva with the snout and yet not discover that it is food. The slightest movement, however, on the part of the wriggler apparently never goes unseen and it is instantly seized and devoured by the fish. It often happens that a mosquito larva placed in open water drifts toward places of protection before it is discovered by the minnows and, if no fish are very near, or are present between the larva and the place of protection, it moves toward it with a remarkable rate of speed and quickly places itself over the object near the surface of the water where it can not be seen by fish. It, however, remains motionless if fish are near.

It is not to be assumed from what has been said in the foregoing paragraphs that mosquito larvæ are as abundant in vegetation and débris when *Gambusia* is present as when absent. An *Anopheles* larva may find temporary protection over a blade of grass, but it is scarcely probable that this larva will spend its entire existence over a single blade of grass, and, if it moves, it is in great danger of losing its life. Then when it reaches the pupal stage the blade of grass is obviously not as well suited as previously to furnish protection. In this stage of life the mosquito appears to be much more active than in the larval stage. This would endanger its life still further, for it

has been shown that in the presence of fish, action is certain destruction. The presence of larvæ in a pond, therefore, must not be taken as a certain criterion that fish are failing to provide mosquito control. On the other hand the many dipping experiments have shown that comparatively few mosquito larvæ are present in the best hiding places, if *Gambusia* is at hand, for rarely more than three or four larvæ were taken at one time. When *Gambusia* was absent, it, however, was not unusual to take so many larvæ at one dip that they could not be accurately counted in the dipper.

It, then, is evident that mosquito breeding, if not entirely eliminated, is at least greatly reduced by the top minnow.

## THE NUMBER OF TOP MINNOWS NECESSARY IN ORDER TO SECURE MOSQUITO CONTROL.

The writer has already been asked several times the general question, "How many top minnows are necessary in a pond in order to prevent mosquito breeding?" Data upon which a definite answer could be based are extremely difficult to obtain, for there are scarcely two ponds which offer identical conditions. The size of the pond of course must be considered; whether or not it is subject to wave action is of importance; the presence or absence of vegetation is very important; and the presence or absence of enemies of *Gambusia* must not be overlooked. Even then, we can only make a guess, for anopheline mosquito larvæ, at least, breed much more prolifically in some ponds than they do in others for reasons not understood.

A pond on the Milledgeville Road belonging to the Sanitary Dairy Co. furnishes a notable example of a place which is apparently well adapted to mosquito breeding, yet during many inspections comparatively few larvæ were found. Among them were present not more than a half dozen *Anopheles*. There is much vegetation present along the shores, consisting principally of aquatic grass, and there is considerable débris. *Gambusia* is wanting, and the species of fishes which are present failed to provide mosquito control elsewhere. Furthermore, wherever apparently similar conditions prevail in other ponds, particularly with respect to the presence of aquatic grass, some *Anopheles* larvæ were present regardless of the abundance of *Gambusia*.

That *Anopheles* do not breed in some places which apparently offer excellent conditions for the support of the larvæ has been noted by Le Prince and Orenstein:[a] "In many places apparently well fitted for the support of *Anopheles* larvæ they were absent yet lived and developed when placed therein as an experiment. The reason why *Anopheles* eggs are not laid in certain areas apparently in every way similar to those in which larvæ are found is yet unexplained."

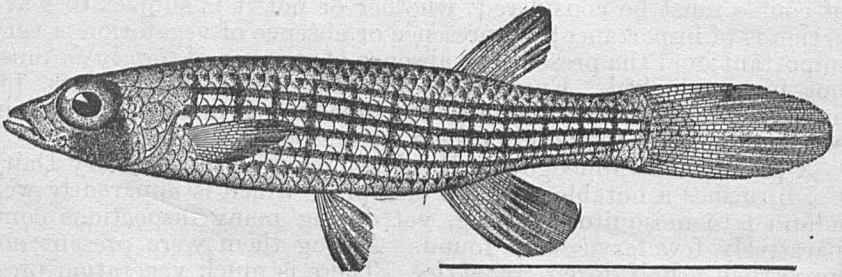
It has been demonstrated through laboratory tests that one top minnow may destroy a large number of mosquito larvæ in a short time. The writer[b] observed that one adult female ate 165 large larvæ in less than 12 hours, and Seale,[c] working with this fish in the Philippine Islands, reports that one pair of half-grown *Gambusia* ate 5,041 mosquito larvæ, by actual count, from December 9, 1915, to

[a] Le Prince, Joseph A., and Orenstein, A. J., Mosquito Control in Panama, p. 12. Putnam, New York and London, 1916.
[b] Hildebrand, Samuel F., Report U. S. Commissioner of Fisheries, Appendix VI, 1917, p. 5.
[c] Seale, Alvin, The Philippine Journal of Science, Vol. XII, sec. D, No. 3, Manila, 1917, p. 180.

February 25, 1916. It has been shown in this paper that a small number of minnows freed badly infested pools of mosquito larvæ in a short time; also that they destroyed the mosquito larvæ in ponds and kept the ponds free of the aquatic stages of the mosquito, unless protection was provided by plants or débris. From the knowledge which has thus been gained we may conclude that, if a pond furnishes little or no protection for mosquito larvæ, a small number of top minnows is sufficient, but if it does furnish protection a much larger number is desirable. Antimosquito work, however, may be started with a very small number of *Gambusia*, for this fish multiplies rapidly. There appears to be no danger of overstocking, as observations indicate that the more fish a pond supports the more certain are the practical results.

## OTHER SPECIES OF FISHES IN RELATION TO ANTIMOSQUITO WORK.

No special experiments were conducted with other species of fishes in relation to mosquito control, but some information was gained from incidental observations.



Fundulus nottii.

The "star-headed minnow," *Fundulus nottii* (Agassiz), is probably of considerable value in antimalarial work. Its habits are very similar to those of *Gambusia*, for it feeds at the surface and frequents localities suitable for the support of mosquito larvæ. Its habits certainly are such that it is worthy of a trial. This fish occurred in a few ponds in the protected area, but as *Gambusia* was also present, nothing definite in regard to their value could be learned from these sources. This species, however, was very abundant and *Gambusia* scarce in a lake located just off the Old Savannah Road, about 8 miles distant from Augusta, belonging to the Carmichael Hunting Club. This lake apparently offered excellent conditions for the support of *Anopheles* larvæ, but during two visits when several hundred yards of shore edge margined with considerable vegetation were examined only a very few larvæ were seen. The scarcity of mosquito larvæ was very probably due to the presence of *F. nottii*, unless this pond should happen to be one of those in which mosquitoes do not oviposit for reasons unknown.

Several species of sunfishes have been mentioned by authors in connection with antimosquito work, but the writer's observations indicate that they are of doubtful value. For example, one large pond supplied with bream, warmouth, and the blue-spotted sunfish supported large numbers of mosquito larvæ of both types, and top

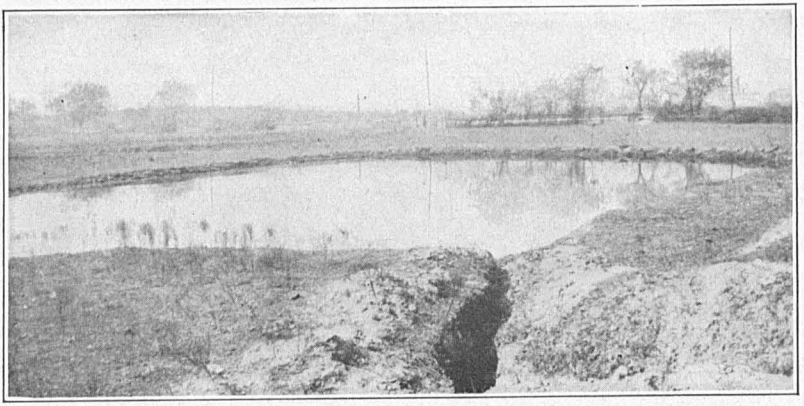


FIG. 1.—POND ABUNDANTLY STOCKED WITH SUNFISHES AND TOP MINNOWS.

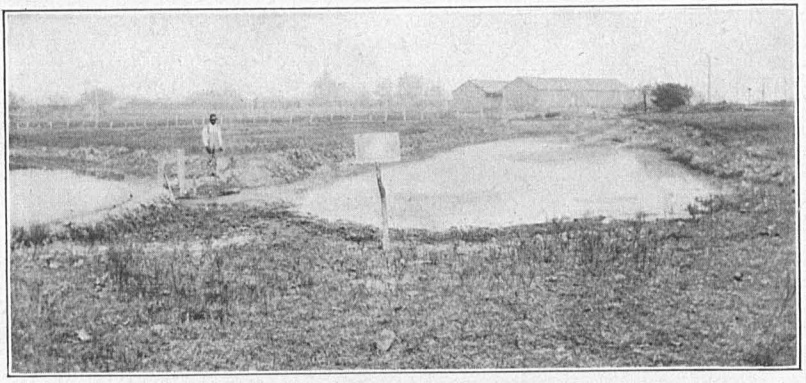


FIG. 2.—SECTION OF HATCHERY.

Notice reads: "Small fish in this pond are protected by the United States Public Health Service as a health measure, and must not be used for bait."

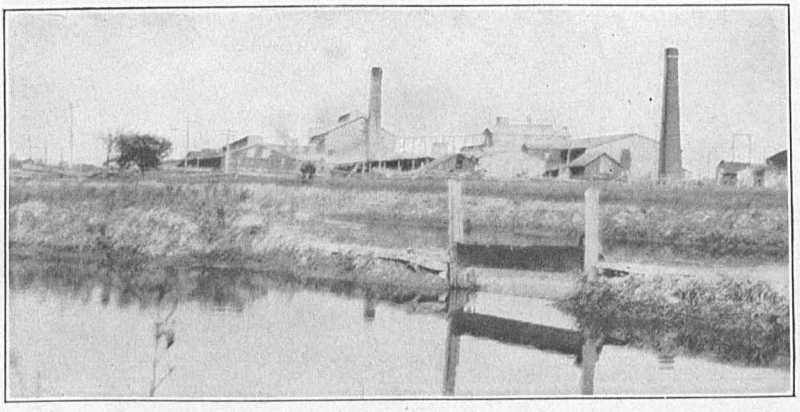


FIG. 3.—SECTION OF HATCHERY SHOWING PARTITION BETWEEN PONDS (A PORTION OF THE GEORGIA CHEMICAL WORKS IN BACKGROUND).

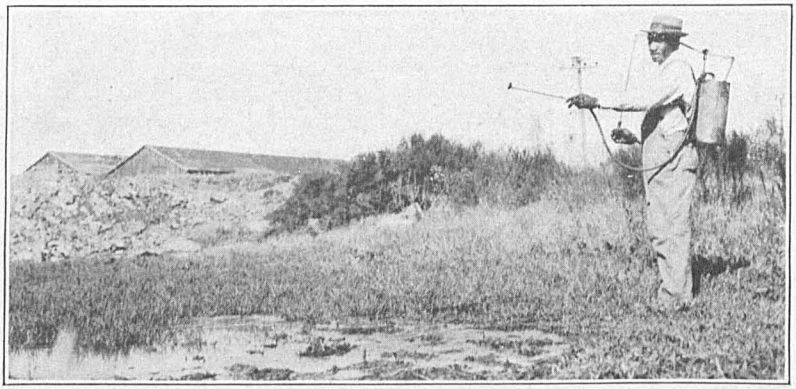


FIG. 4.—SPRAYING OIL ON AN ACID SWAMP IN WHICH FISH CAN NOT LIVE BUT WHICH SUPPORTS ANOPHELES LARVÆ.

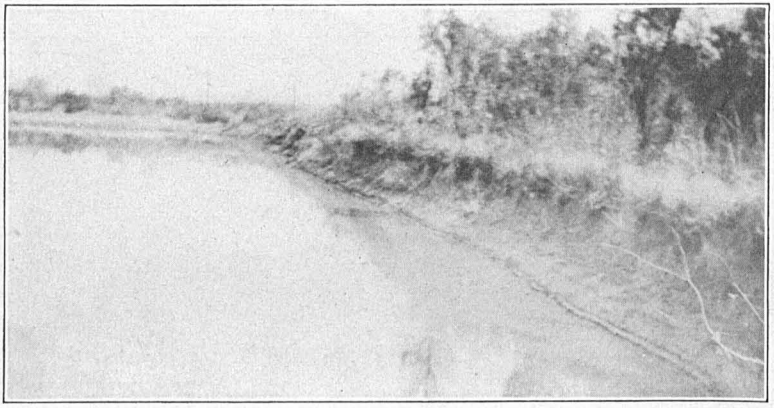


FIG. 5.—SECTION OF CLEAN SHORE OF A POND WHERE MOSQUITO LARVÆ WERE ABUNDANT BEFORE INTRODUCING TOP MINNOWS.

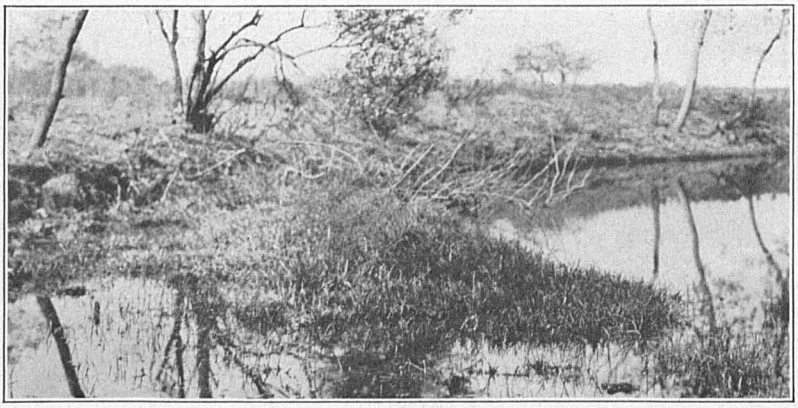


FIG. 6.—SHOWING GROWTH OF AQUATIC GRASS IN CORNER OF POND. SUCH GRASS FURNISHES EXCELLENT PROTECTION FOR MOSQUITO LARVÆ.

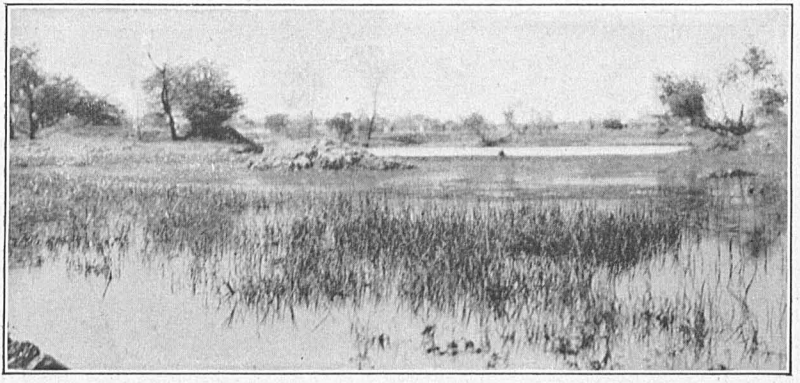


FIG. 7.—AQUATIC GRASS GROWING ALONG THE SHALLOW EDGE OF A POND WHERE IT FORMS PROTECTION FOR MOSQUITO LARVÆ.

FIG. 8.—FLOATING PLANTS OF MYRIOPHYLLUM AND DÉBRIS WHICH PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

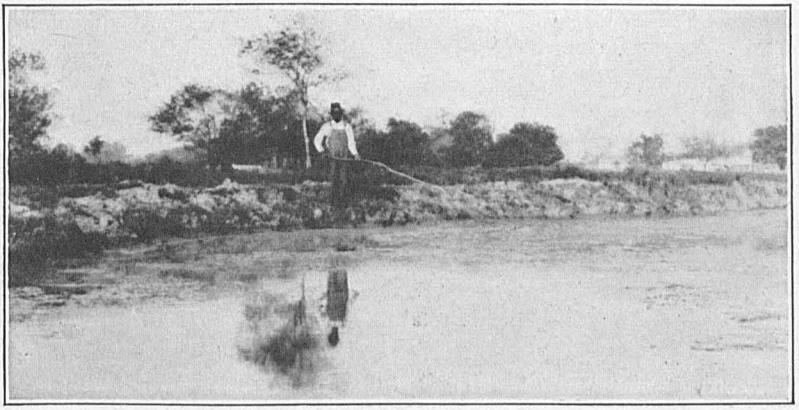


FIG. 9.—TREATING POND WITH COPPER SULPHATE FOR KILLING ALGÆ. LABORER IS DRAGGING A SMALL BAG OF THE CHEMICAL THROUGH THE WATER BY MEANS OF A POLE.

FIG. 10.—SPRAYING OIL ON ALGAL PADS TO DESTROY THEIR USEFULNESS AS HIDING PLACES FOR THE IMMATURE MOSQUITO.

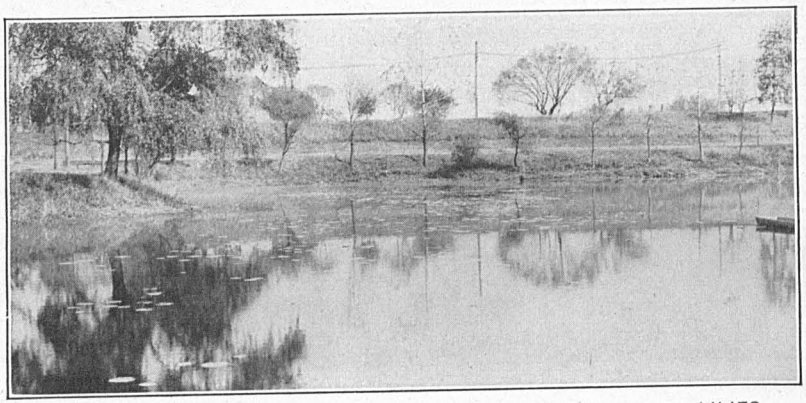


FIG. 11.—SECTION OF POND SHOWING PRESENCE OF WATER LILIES.

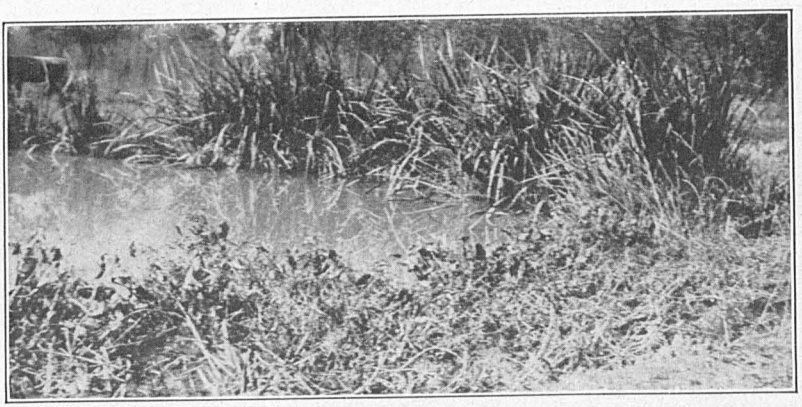


FIG. 12.—RUSHES GROWING IN END OF POND. THESE PLANTS RARELY PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

FIG. 13.—TALL RUSHES AND GRASSES WHICH DO NOT PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

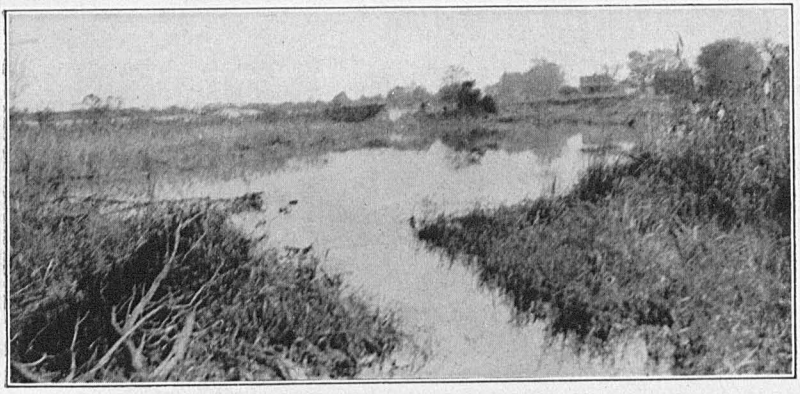


FIG. 14.—POND SUPPORTING DENSE VEGETATION CONSISTING PRINCIPALLY OF SMART WEEDS WHICH DO NOT PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

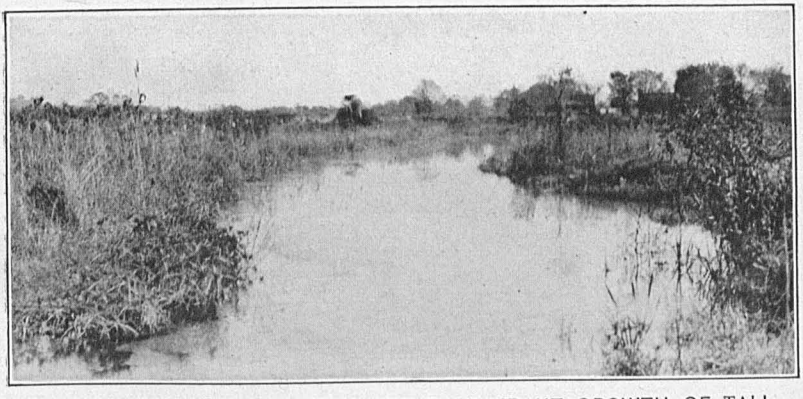


FIG. 15.—SECTION OF POND SHOWING ABUNDANT GROWTH OF TALL VEGETATION WHICH DOES NOT PROVIDE MUCH PROTECTION FOR MOSQUITO LARVÆ.

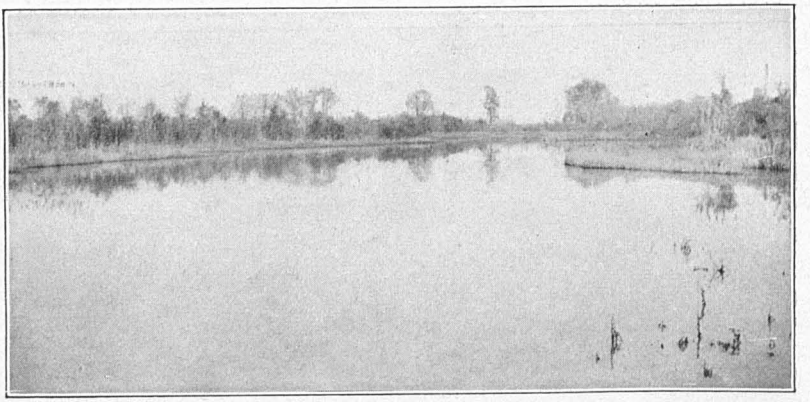


FIG. 16.—DISTANT VIEW OF POND. MUCH MARGINAL VEGETATION WHICH USUALLY FURNISHES SOME PROTECTION FOR MOSQUITO LARVÆ.

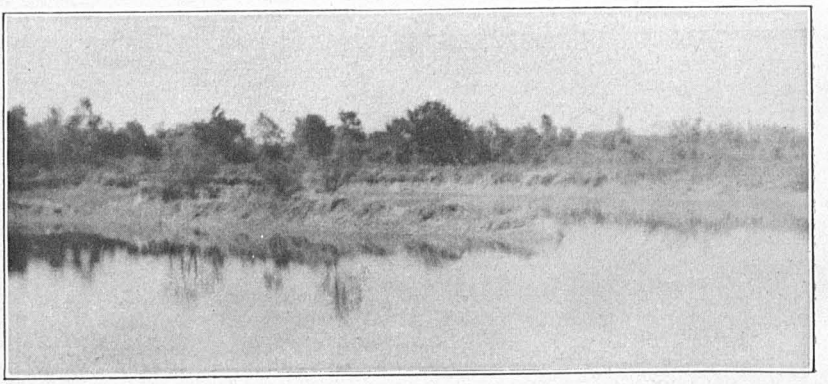


FIG. 17.—SHOWING MARGINAL VEGETATION REMOVED.

FIG. 18.—SPRAYING OIL ON ALGAL PADS.

In foreground is seen some of the aquatic grass, Hydrochloa carolinensis, which provides excellent protection for mosquito larvæ.

minnows had to be introduced in order to secure mosquito control. A similar condition in the presence of sunfishes, the pumpkin seed being the most abundant one, was observed by the writer on the Potomac River at Bryans Point, Md., in 1912.

The size and habitat of the pigmy sunfish suggest that it might be of value in the control of the mosquito, but the information obtained points to the contrary, for *Culex* larvæ were plentiful in unprotected places in a certain swamp where this fish was quite common.

The roach minnow, in confinement, at least, appears to destroy mosquito larvæ, as indicated in the following observation. Two minnows were left in a "bait well" when it was abandoned by bait collectors. This well was about 10 feet long and 5 feet wide with a depth of about 2 feet. The two minnows kept this well wholly free of mosquito larvæ for several months. Then an oil distributor came by, seeing that it was a favorable place for breeding mosquitoes, and not knowing of the presence of the fish, sprayed the well with oil. The oil killed the roach minnows, and after it evaporated mosquito larvæ appeared in countless numbers.

Goldfish, while probably of very little value in large bodies of water where other food is obtainable, are useful in confinement. A considerable number of fountains stocked with goldfish were examined, and if they were properly built so that all parts were accessible to fish, and if fairly free of vegetation and débris, no mosquito larvæ were present.

## CONCLUSIONS.

1. *Gambusia affinis* is especially suitable for antimosquito work because: (*a*) It seeks its food at the surface; (*b*) it is very prolific; (*c*) it gives birth to well-developed young, therefore requiring no special environment for depositing and hatching the eggs; (*d*) it lives and thrives under a large variety of conditions and frequents areas especially suitable for the support of mosquito larvæ; (*e*) it usually lives and multiplies in ponds stocked with predacious fishes, providing it has very shallow water for refuge.

2. Plants which have slightly submerged leaves and stems or which form floating masses are the chief sources of protection for mosquito larvæ against the top minnow. Such plants should be removed from the water or treated in such a way as to make them uninhabitable for the immature mosquito.

3. Mosquitoes may breed in water so badly polluted that *Gambusia* is almost instantly killed thereby.

4. *Gambusia affinis* is of great value in antimosquito work. It eliminates the wriggler completely from ponds which are fairly free of protective vegetation and débris. If much protection is furnished by vegetation and débris, the immature mosquito is not entirely eliminated, but the number reaching the adult stage is greatly reduced.

5. The number of top minnows necessary in a body of water in order to secure mosquito control depends largely upon the conditions which prevail with respect to places of protection, i. e., a much smaller number of *Gambusia* is necessary, if the water is fairly free of hiding places for mosquito larvæ against fish, than if the reverse is true.

# FISHERY INDUSTRIES OF THE UNITED STATES

## REPORT OF THE DIVISION OF STATISTICS AND METHODS OF THE FISHERIES FOR 1918

By LEWIS RADCLIFFE
*Assistant in Charge*

Appendix X to the Report of the U. S. Commissioner of Fisheries for 1918

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# CONTENTS.

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# FISHERY INDUSTRIES OF THE UNITED STATES.

## REPORT OF THE DIVISION OF STATISTICS AND METHODS OF THE FISHERIES FOR 1918.

By LEWIS RADCLIFFE, *Assistant in Charge.*

### INTRODUCTION.

In recent years the only report of the work of this division, including the mass of detailed statistics of the fisheries collected during the preceding calendar year, has been incorporated in the annual report of the Commissioner prepared at the close of the fiscal year. That these statistics and discussions may be made available to the public at an earlier date, and for other urgent reasons, it has been deemed advisable to issue a detailed report of the work of the division at the close of each calendar year. The work of the division for the first half of the calendar year 1918, including the results of several statistical canvasses, has been dealt with in some detail in the Commissioner's report for the fiscal year ended June 30, 1918, and has been omitted from the present report. The results of a canvass of the fisheries of the Pacific Coast States for 1915 were presented in condensed form in the Commissioner's report for the fiscal year 1917. The statistics and other information obtained in this canvass are given in detail in this report.

### SUMMARY OF THE WORK.

In its relations with the fishing industries in 1918 the Bureau has striven to render the largest possible measure of service in increasing the consumption of fish and in the development of markets for fishery products, particularly the little-used or neglected forms. Special attention has also been given to increasing the use of the waste products of the fisheries, such as roe and buckroe, the meat of whales and porpoises, etc., for food; the use of fish waste and waste fish for conversion into oil and fertilizer or fish meal as an animal feed; and the use of the skins of sharks and other unused aquatic forms for tanning into leather and the like. The adoption of improved methods and the discontinuance of wasteful practices have been encouraged.

The industries, particularly those engaged in canning and preserving fish by other methods, labor under a serious handicap through ignorance of the scientific principles underlying these operations, the methods being largely empirical. The Bureau has started investigations in the canning and salting of fish for the purpose of establishing the basic principles governing these operations and determining

their application to effect improvement in methods in practice, in the quality of the product, and in economy of operation. Although but recently inaugurated, these investigations give promise of yielding valuable results to the industry and clarifying our understanding of the processes, thereby enabling us to proceed more intelligently.

One of the major functions of the division is the taking of inventories of the fisheries. The importance of such work as a guide to the States in the enactment of proper legislation governing the protection of the fisheries, to mention only one of the needs for such work, should be self-evident. During the year the following statistical canvasses were made: Coastal fisheries of New York and New Jersey, exclusive of shellfish for 1917; the fisheries on Five-Fathom Bank, N. J., for 1916 and 1917; the shad fishery of the Hudson River for the years 1917 and 1918; the fisheries of Lake Pepin and Lake Keokuk for 1917; and the fisheries of the Great Lakes, Lake of the Woods, and Rainy Lake for 1917. In addition, the detailed statistics of the vessel fisheries centering at Boston and Gloucester, Mass., Portland, Me., and Seattle, Wash., have been collected and the information published in the form of monthly and annual bulletins for the use of the trade. These data, together with the results of the canvass of the Great Lakes fisheries, appear in the present report. The Bureau is striving to make its statistical canvasses with sufficient frequency to cover the major geographical divisions of the fisheries once in a five-year period. To do this properly will require a somewhat larger force of statistical agents.

## INCREASING CONSUMPTION OF FISHERY PRODUCTS.

The unusual demands on our food resources in 1918 afforded exceptional opportunities for educating the public to the value of fish and fishery products with which it was little acquainted. The Bureau endeavored to meet this situation and employed assistants experienced in the fisheries to assist in the development of markets and the education of the public to the merits of fish as food. It was instrumental in introducing approximately a half million pounds of Gulf fish to the markets of Nashville, Tenn., Louisville, Ky., and Indianapolis, Ind. These shipments, packed under the supervision of Government agents by the most approved methods to insure arrival in the best of condition, were made in car lots by the Gulf producers. This has resulted in enlarging the markets for fish from this region and acquainting many people with the merits of species common to the region. To effect relief for unsatisfactory shipping conditions, similar service was inaugurated between Chincoteague, Va., and the markets of Philadelphia and New York, and a number of shipments were made under supervision of Government agents.

Assistance was rendered in introducing canned river-herring products (fish, roe, and buckroe), sea herring, and gadoid buckroe to the markets of Atlanta, Ga., Birmingham and Montgomery, Ala., and Knoxville, Nashville, and Chattanooga, Tenn.; this resulted in bringing nearly 14,000 cases of these products, valued at over $54,000, to these markets.

Whaling companies were encouraged to save and market whale meat, and a placard and an economic circular were issued to aid in creating a demand for the product and in educating the housewife

how to prepare it. West-coast whaling companies have provided a cold-storage and distributing plant with a capacity of about 3,000 tons, a 500-ton freezing plant, a refrigeration steamer, and a cannery with a capacity of 50,000 cases. In 1918, 30,000 cases of the meat were canned and 195 tons of frozen meat marketed. With available equipment, an output of 50,000 cases of canned meat and 1,000 tons of frozen meat is expected during the coming season.

The following description of the methods employed in the canning of whale meat is taken from the January, 1919, Yearbook of the Pacific Fisherman:

> The equipment and method of canning are quite similar to those used in Pacific coast salmon canneries, with obvious differences in the preliminary handling. The whales for canning are hauled out on a special concrete slip, constantly flooded with fresh running water, and here the meat is removed in the same way as for freezing. After being cooled it is placed in a mild brine for about 36 hours, which removes all blood, at the same time practically eliminating the gamy taste. The strips of meat are then passed through a salmon cutter of familiar type, which cuts them into pieces the right size for 1-pound flat cans. The cans are then put through the exhaust box for 30 minutes, sealed and cooked in the retort for an hour and twenty minutes, after which they are ready for labeling and shipping.

The lack of understanding of the best ways to prepare fish for the table, of the relative merits of the different varieties of fish and fishery products, and their value as food, is to a considerable extent responsible for the lack of demand for fish. Such obstacles can best be met by education and practical demonstration. To do this, representatives of the Bureau were detailed to give lectures and demonstrations in fish cookery, beginning in May and continuing throughout the year. More than 70 demonstrations were given, the following places being visited: Seattle, Everett, Bellingham, Spokane, Yakima, and Aberdeen, Wash.; Portland and Gladstone Park, Oreg.; and San Francisco, Oakland, Berkeley, Alameda, Stockton, and Sacramento, Calif. These demonstrations were very popular with the housewives, the average attendance being about 100 persons.

The following fish and fishery products were used for demonstration purposes: Albacore, barracuda, bocaccio, bonito, carp, catfish, flounders, hake, halibut, kingfish, lingcod, chub mackerel, horse mackerel, grayfish, perch, rockfishes, sablefish, sand dab, sardine, shad, skates, skipjack, smelt, soupfin shark, sole, sturgeon, yellowtail, and heads, milts, and livers of salmon; also squid, octopus, and whale. Among the forms especially popular were shark, squid, skate, yellowtail, sablefish, flounders, sole, kingfish, mackerel, and salmon milts.

Buying of fish in the round, the viscera alone being removed, was advocated. This is cheaper and much waste is eliminated, as the head, trimmings, and bones, which are richest in flavor and are usually discarded by the dealer, are thus saved. These parts are used to make delicious soups and gravies, or, if in smaller quantity, as the foundation for a cream sauce. In thus utilizing practically every part of the fish for food, one day's supply will usually serve for two.

In place of frying, the hot-oven method of cooking was recommended. By this means practically all the unpleasant odors of cooking fish are eliminated, economy in the use of fats is effected, and time is saved in both cooking and serving. Creamed dishes, souffles, and imitation chops are made from left-over fish. Salads also are made from these, as well as from freshly steamed fish.

Through these demonstrations large numbers of women have learned that fish, when properly cooked, are most delicious, and that many of the cheaper varieties are fully the equal of some of the better-known, high-priced species. In addition, the fish dealers everywhere have been enthusiastic in the reports of increased sales of fish demonstrated. The need of more educational work of this character is evidenced at all points visited.

## NEED OF LABORATORIES FOR THE SOLUTION OF THE PRACTICAL PROBLEMS OF THE INDUSTRY.

Agriculture has benefited greatly by the work of the agricultural experiment stations, both Federal and State, through colleges devoted to the training of men and women for the industry, and through the study of the problems by highly skilled experts. The fisheries, the other great food-producing industry, with their innumerable problems, have lacked and suffered for lack of these advantages, with the result that the methods in practice have been developed empirically, without definite knowledge of the basic principles governing the operations or without their application to the best and most economical advantage. The fact that a method has worked, has sufficed. Fuel, time, labor, and food are wasted, and fisheries remain undeveloped for want of satisfactory methods of preservation and markets for the products.

The preservation of fish by salting will serve to illustrate. Although this has been practiced for centuries, there has been little improvement in the methods; large quantities of cured fish are lost annually by spoilage, and still larger quantities of fresh fish, for which no ready or accessible markets exist, are thrown away because of the possibility of loss if cured. The man in the industry is confronted with innumerable problems of spoilage, quality, color, or practical methods, and the like, problems which should be solved if the industry is to progress, but which remain unsolved because the individual lacks the facilities and frequently the training necessary to their solution.

There is also an underconsumption of fish, due, in part, to the inferior quality of much that is placed on the market, and, in part, to the consumer's ignorance of the dietetic qualities and peculiarities of the various species and their consequent improper preparation for the table. As described above, the increasing consumption of fish in districts where the Bureau educated the public to the merits of fish as food by means of lectures, demonstrations, placards, and circulars but serves to emphasize the need of further public educational work along such lines.

For years the Bureau has been handicapped in this field for lack of facilities for practical demonstration and experimentation in the methods of preparing and preserving fishery products. It has held that it should be provided with adequate equipment and personnel to render effective aid to the industry, to do in its particular field what the agricultural experiment station does for agriculture, and that it could accomplish some important results in some fields within a short period of time.

## FISHERY PRODUCTS LABORATORY.

A step has been taken in this direction, however. On July 2, 1918, the President approved and authorized an allotment of $125,000 from the fund for the national security and defense to enable the Bureau to build and equip in Washington, D. C., a laboratory in which to conduct work of this character. Work was begun immediately on the plans for the building and its equipment. Before the end of the year construction of a building of hollow tile and concrete, 45 by 80 feet, with two floors and an attic, had been begun and orders for equipment were being placed. It is expected that it will be completed and fully equipped by July 1, 1919.

On the first floor there is a large work laboratory, a chemical laboratory, low-temperature rooms for storage and refrigeration, a built-in smokehouse, incubation room, and storeroom. On the second floor are a large laboratory, a fishery-products exhibit and demonstration room, an experimental kitchen, and offices. Convenient arrangements for supplies of water, gas, and electric power have been made, and a steam boiler for supplying steam to the various units is provided for. Vacuum and compressed air pipes will be placed in convenient places.

For canning purposes there are to be a complete plant for sealing tin cans by a double seamer, an exhaust box, a retort with steam supply, a complete equipment for sealing and processing glass containers by a vacuum process, and another for tin containers in vacuo. An experimental plant for freezing fish in brine by the Ottensen method has been imported from Denmark and has been employed to demonstrate the method to interested members of the industry. For drying fish and fishery products an apparatus is being provided in which the heat will be controlled, the humidity of the air brought to any degree desired and held at that point by an air conditioner, and the volume of air driven over the product by motors controlled with dampers. This is, of course, not intended for commercial purposes, but for experiments of wide latitude. There is also a built-in smokehouse of hollow tile and cement, with a flue, iron air-tight doors, ventilators, shavings pans heated with gas, a long-distance recording thermometer, and dampers for control of heat and ventilation. Cooking vats, a hydraulic press, a filter press, and a grinder will be provided for use in problems connected with the utilization of fish waste.

The incubation room will be provided with a recording thermometer and hygrometer and electric heat. Automatic control will afford means of holding any constant temperature above ordinary temperatures up to 112° F. For refrigeration purposes a carbon-dioxide machine is to be employed, and three rooms of different temperatures, automatically controlled, the lowest ranging to −20 or −25° F., are to be provided. The experimental kitchen is fully equipped for the purposes it is to serve, as is the chemical laboratory.

In the conduct of experimental work it is regarded as of great importance that all factors which influence the character of the products be known, measured, and controlled, for it is usually by altering factors that improvements are effected. In the industry these factors—time, temperatures, strengths of brine, fuel for smokehouse, and purity of materials—are seldom measured and never

controlled. Careful consideration has, therefore, been given to means of measuring such factors in the laboratory and varying and controlling them as investigation necessitates. Wherever required, recording thermometers and hygrometers, thermostats, pitot tubes, pressure and vacuum gauges, and other measuring and controlling devices have been installed, and measuring apparatus, such as a viscosimeter, refractometer, polarimeter, colorimeter, specific-gravity balances, etc., have been provided for the chemical study of processes.

### STUDY OF THE PRINCIPLES OF PRESERVING FISH WITH SALT.

Without waiting for the completion of the fishery products laboratory, the Bureau immediately made arrangements for the initiation of various investigations, one of which concerns the preservation of fish with salt. The primary object of this investigation was to determine whether this useful method of preserving is necessarily limited to the cooler regions of the country and to a few species or whether it could by improvement be extended to other regions and other fishes. A number of fundamental questions are involved in the solution of this problem, namely, the factors influencing the rate of penetration of brine, the maximum temperature at which salting is successful, the mode of application of the salt, the effect of impurities in the salt, the rate and nature of the decomposition which takes place in tissues before the salt reaches them, the influence of the skin, fat, dressing, and cleaning, the amount of nutrients and water removed, etc. Various brands of commercial salt were compared with chemically pure salt as a standard. In the absence of proper laboratory facilities in the Washington office, the work was initiated in cooperation with the National Research Council at Johns Hopkins University Medical School, Baltimore, Md., and Dr. E. V. McCollum very kindly volunteered to supervise the experimental work done at that institution.

Significant results were attained within a few months, it being shown that the impurities in salt, even in small quantities, have a marked effect on the process of salting and on the quality of the salted product. In these experiments, squeteague were used. Pure sodium chloride penetrates the fish very rapidly and completely and produces a soft, yellow-meated, flexible fish. Small amounts of calcium chloride and magnesium chloride retard the penetration of the sodium chloride, but produce a firmer, whiter fish than pure sodium chloride. As these are common, almost constant, impurities in salt, it would appear that they may interfere with the preservation of fish in warm climates, such as obtain in our Southern States. As indicated, these products also affect the quality and appearance of the product. Thus it may be possible not only to bring about a more rapid and complete brining of fish in a much shorter time but also to produce salt fish possessing almost any desired degree of hardness and whiteness. Data were also sought as to the relative merits of the two methods of salting fish in brine or in dry salt, the amount and rate of decomposition of protein into the end product, amino-acid nitrogen, being determined. These experiments indicated that the dry-salting method is the more efficient at the higher temperatures.

Experiments in progress include the study of penetration of salt through the skin of the fish, as influenced by the impurities in the

salt, relation of freshness of fish to temperature at which it can be salted, determination of highest temperature at which it is practicable to salt fish, possible ways of improving methods in common practice, and trials of relative values of the different kinds of salt on the market.

### EXPERIMENTS IN THE PREPARATION OF FISHERY PRODUCTS FOR THE TABLE.

Supplementing the work of the field agents engaged in giving lectures and practical demonstrations of the best methods for cooking fish, the Bureau equipped an experimental kitchen and employed experts to determine the best methods of preparation of new or little-known fish and fishery products for the table.

Here a considerable number of fishery products were tried out by various individual methods of preparation, and those best suited to the particular product selected. In some cases this information was furnished direct to the trade, in others it was assembled and published in economic circulars to aid in educating the public as to the merits of, and establishing larger markets for, such heretofore little-used products. In this manner assistance has been given in increasing the production and consumption of grouper, menhaden, mussels, sharks, tullibees, and the roe and buckroe of fishes.

In addition, the assemblage of materials for a cookbook on fish was begun. This is now nearing completion, many of the recipes being tested in the experimental kitchen.

### NEW ENGLAND VESSEL FISHERIES.

The vessel fisheries centering at Boston and Gloucester, Mass., and Portland, Me., have been in a more than usually prosperous condition during the past year, notwithstanding the presence of enemy submarines along the coast and on the fishing grounds in the summer and the consequent loss of a number of fishing vessels. There was a decline in the total number of trips, but a considerable increase in the quantity and value of the products landed. The decline in the number of trips occurred at Boston and Portland, while there was an increase over the previous year at Gloucester. Statistics of these fisheries have been collected during the year by the local agents and published in monthly bulletins, showing, by species and fishing grounds, the quantities and values of fishery products landed by American and Canadian fishing vessels during the year at these ports. Two annual bulletins also have been issued, one showing the catch by months and the other by fishing grounds.

The fishing fleet which landed fishery products at these ports during the calendar year 1918 included 521 sail, steam, and gasoline screw vessels. These vessels landed at Boston 2,830 trips, aggregating 109,476,041 pounds of fish, valued at $6,587,754; at Gloucester, 3,414 trips, aggregating 74,175,499 pounds, valued at $3,062,605; and at Portland, 2,506 trips, aggregating 21,849,613 pounds, valued at $881,189. The total for the three ports amounted to 8,750 trips, aggregating 205,501,153 pounds of fresh and salted fish, having a value to the fishermen of $10,531,548. This total includes 60 trips landed at these ports by 21 Canadian fishing vessels, amounting to

5,602,749 pounds of fresh fish, valued at $218,625. These fish were landed in accordance with an arrangement with the Canadian Government, as an emergency war measure granting reciprocal privileges to fishing vessels, by which Canadian fishing vessels were permitted to land their fares at American ports direct from the fishing grounds. Canadian fishing vessels began to utilize this privilege in April and continued during the remainder of the year. The greater part of these fish, or 4,668,620 pounds, valued at $164,946, were landed at Portland.

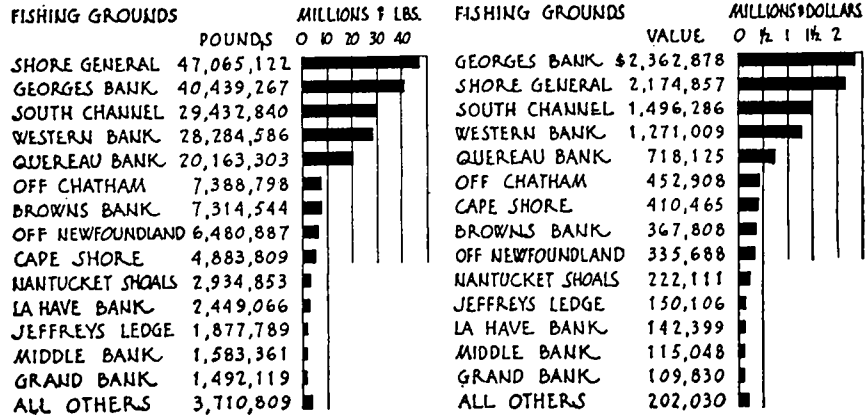



FIG. 1.—Quantities and values of fish landed by fishing vessels at Boston and Gloucester, Mass., and Portland, Me., in 1918, shown by fishing grounds.

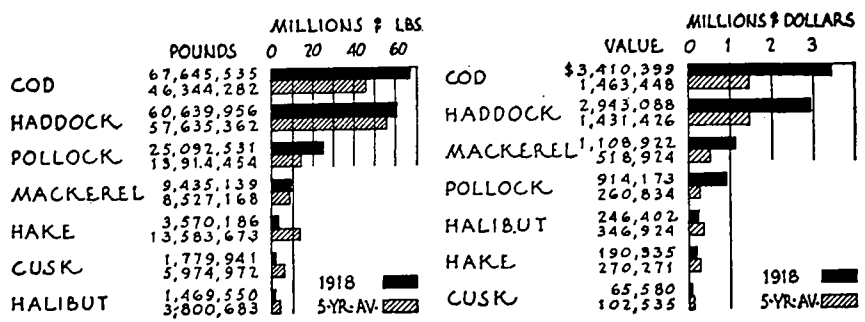



FIG. 2.—Quantities and values of the principal kinds of fish landed by fishing vessels at Boston and Gloucester, Mass., in 1918, compared with the five-year average, 1912-1916.

Compared with the previous year there was a decrease of 534 trips in the total number for the three ports, but an increase of 30,070,567 pounds, or 17.14 per cent, in the quantity, and of $2,170,216, or 25.95 per cent, in the value of the fish landed. The cod catch increased 15,357,899 pounds, or 27.19 per cent, in quantity, and $1,246,371, or 52.57 per cent, in value; haddock, 13,116,706 pounds, or 24.49 per cent, in quantity, and $682,547, or 27.12 per cent, in value; pollock, 12,052,828 pounds, or 83.07 per cent, in quantity, and $382,817, or 66.08 per cent, in value; halibut, 14,940 pounds, or 0.84 per cent, in quantity, and $83,048, or 37.88 per cent, in value; herring, 1,858,398 pounds, or 14.44 per cent, in quantity, and $162,068, or 54.27 per

cent, in value; and miscellaneous products, 309,709 pounds, or 7.88 per cent, in quantity, and $56,390, or 45.05 per cent, in value. There was also a considerable decrease in the catches of a number of species. The catch of hake decreased 2,633,817 pounds, or 33.27 per cent, in quantity, and $68,300, or 20 per cent, in value; cusk, 891,043 pounds, or 25.10 per cent, in quantity, and $16,083, or 13.50 per cent, in value; mackerel, 7,283,596 pounds, or 41.75 per cent, in quantity, and $265,195, or 18.23 per cent, in value; swordfish, 937,427 pounds, or 47.60 per cent, in quantity, and $68,977, or 23.60 per cent, in value. The Newfoundland herring catch fell off 422,932 pounds, or 6.21 per cent, in quantity, but increased $104,072, or 45.68 per cent, in value. The quantity of tilefish landed at Boston during the year declined from 1,211,450 pounds, valued at $44,743 in 1917, to 299,420 pounds, valued at $20,246 in 1918.

The following tables present in detail, by fishing grounds and by months, the products landed at Boston and Gloucester, Mass., and Portland, Me., by American and Canadian fishing vessels, for the calendar year 1918. The weights of fresh and salted fish given in these statistics represent the fish as landed from the vessels, and the values are those received by the fishermen. The grades, or sizes, given for certain species are those recognized in the trade.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS.

| Fishing grounds. | Number of trips. | Cod. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Large (10 pounds and over). | | | | Market (under 10 and over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | |
| | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| | | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value* | *Pounds.* | *Value.* |
| LANDED AT BOSTON. | | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | |
| La Have Bank | 31 | 366,795 | $27,236 | | | 354,655 | $18,015 | | | 67,745 | $1,627 | | |
| Western Bank | 180 | 3,854,620 | 255,378 | | | 2,466,376 | 111,026 | | | 85,077 | 2,457 | | |
| Quereau Bank | 6 | 95,050 | 5,072 | | | 102,090 | 4,498 | | | 2,990 | 84 | | |
| Grand Bank | 2 | 2,500 | 186 | | | 500 | 16 | | | | | | |
| St. Peters Bank | 2 | 50,000 | 2,330 | | | 15,000 | 525 | | | | | | |
| Off Newfoundland | 1 | | | | | | | 35,000 | $1,400 | | | | |
| Cape Shore | 62 | 289,672 | 22,409 | | | 322,479 | 15,646 | | | 53,328 | 1,296 | | |
| Gulf of St. Lawrence | 1 | 6,100 | 390 | | | 500 | 25 | | | | | | |
| St. Anns Bank | 1 | 4,285 | 328 | | | 31,000 | 1,575 | | | | | | |
| Roseway Bank | 1 | 8,600 | 396 | | | 9,185 | 291 | | | 2,270 | 35 | | |
| By Canadian vessels: | | | | | | | | | | | | | |
| La Have Bank | 1 | 4,200 | 312 | | | 9,385 | 384 | | | 210 | 4 | | |
| Western Bank | 1 | 3,000 | 248 | | | 10,350 | 533 | | | 2,255 | 61 | | |
| Cape Shore | 1 | 3,510 | 489 | | | 3,900 | 262 | | | 2,400 | 60 | | |
| *West of 66° W. longitude.* | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | |
| Browns Bank | 105 | 1,292,415 | 78,559 | | | 873,050 | 42,131 | | | 152,472 | 4,291 | | |
| Georges Bank | 648 | 12,331,918 | 772,387 | | | 3,693,757 | 189,301 | | | 189,134 | 4,477 | | |
| Cashes Bank | 5 | 21,825 | 1,969 | | | 15,480 | 788 | | | 3,470 | 70 | | |
| Clark Bank | 1 | 5,800 | 406 | | | 19,000 | 839 | | | 400 | 8 | | |
| Fippenies Bank | 4 | 14,890 | 1,711 | | | 9,140 | 738 | | | 3,400 | 81 | | |
| Middle Bank | 92 | 99,703 | 10,387 | | | 76,739 | 5,298 | | | 18,927 | 520 | | |
| Jeffreys Ledge | 139 | 134,961 | 10,994 | | | 72,673 | 6,126 | | | 17,560 | 604 | | |
| South Channel | 440 | 1,686,304 | 137,907 | | | 2,086,176 | 108,269 | | | 347,780 | 8,264 | | |
| Nantucket Shoals | 105 | 273,826 | 25,827 | | | 1,029,647 | 51,748 | | | 135,968 | 3,394 | | |
| Off Chatham | 270 | 1,096,836 | 83,301 | | | 1,123,608 | 60,423 | | | 279,059 | 5,946 | | |
| Bay of Fundy | 3 | 8,700 | 485 | | | 34,025 | 1,148 | | | 1,100 | 22 | | |
| Seal Island | 1 | 5,600 | 336 | | | 12,500 | 500 | | | 950 | 19 | | |
| South | 24 | | | | | 395 | 4 | | | | | | |
| Shore, general | 679 | 91,281 | 7,624 | | | 122,117 | 7,508 | | | 15,141 | 383 | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| By Canadian vessels: | | | | | | | | | | | | | |
| Browns Bank | 14 | 78,980 | 5,499 | ..... | ..... | 138,720 | 6,225 | ..... | ..... | 12,825 | 295 | ..... | ..... |
| Georges Bank | 10 | 17,715 | 1,046 | ..... | ..... | 42,530 | 1,733 | ..... | ..... | 2,565 | 57 | ..... | ..... |
| Total | 2,830 | 21,849,086 | 1,453,212 | ..... | ..... | 12,674,977 | 635,575 | 35,000 | 1,400 | 1,397,026 | 34,055 | ..... | ..... |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | |
| La Have Bank | 11 | 195,290 | 7,829 | 2,255 | $183 | 63,525 | 2,270 | 3,130 | 235 | 6,420 | 127 | 300 | $20 |
| Western Bank | 67 | 1,998,531 | 80,674 | 406,970 | 27,414 | 1,066,315 | 36,526 | 293,559 | 18,406 | 47,000 | 976 | 20,675 | 1,085 |
| Quereau Bank | 133 | 6,310,423 | 222,937 | 1,125,628 | 77,805 | 7,916,279 | 242,893 | 917,591 | 56,205 | 246,933 | 4,888 | 68,322 | 4,402 |
| Green Bank | 1 | 45,275 | 1,698 | 19,770 | 1,334 | 2,470 | 80 | 2,980 | 186 | ..... | ..... | 60 | 3 |
| Grand Bank | 16 | 447,625 | 16,370 | 350,500 | 29,011 | 105,030 | 3,208 | 158,703 | 13,216 | 4,795 | 96 | 25,815 | 2,383 |
| St. Peters Bank | 4 | 261,170 | 9,238 | 23,130 | 1,806 | 177,955 | 5,372 | 9,705 | 658 | 200 | 4 | ..... | ..... |
| Off Newfoundland | 29 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cape Shore | 31 | 6,575 | 247 | ..... | ..... | 4,420 | 144 | ..... | ..... | 475 | 10 | ..... | ..... |
| Gulf of St. Lawrence | 2 | 74,500 | 2,915 | ..... | ..... | 94,450 | 3,307 | ..... | ..... | 9,940 | 200 | ..... | ..... |
| St. Anns Bank | 1 | 2,350 | 106 | ..... | ..... | 17,350 | 694 | ..... | ..... | 1,130 | 23 | ..... | ..... |
| The Gully | 1 | 9,900 | 396 | ..... | ..... | 910 | 32 | ..... | ..... | 175 | 7 | ..... | ..... |
| By Canadian vessels: Western Bank | 1 | 17,955 | 1,011 | ..... | ..... | 19,985 | 749 | ..... | ..... | 825 | 17 | ..... | ..... |
| *West of 66° W. longitude.* | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | |
| Browns Bank | 24 | 1,149,355 | 45,602 | ..... | ..... | 384,712 | 12,886 | ..... | ..... | 26,950 | 536 | ..... | ..... |
| Georges Bank | 116 | 3,481,270 | 144,948 | ..... | ..... | 878,017 | 31,110 | ..... | ..... | 31,765 | 712 | ..... | ..... |
| Middle Bank | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Nantucket Shoals | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Seal Island | 5 | 94,235 | 3,534 | ..... | ..... | 62,255 | 2,023 | ..... | ..... | ..... | ..... | 63 | 2 |
| Shore, general | 2,961 | 2,964,812 | 163,756 | 16,765 | 1,174 | 12,983 | 423 | 965 | 55 | ..... | ..... | ..... | ..... |
| Total | 3,414 | 17,059,266 | 701,261 | 1,945,048 | 138,727 | 10,806,656 | 341,717 | 1,386,633 | 88,961 | 376,608 | 7,596 | 115,235 | 7,895 |
| LANDED AT PORTLAND. | | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | |
| La Have Bank | 7 | 37,730 | 1,660 | ..... | ..... | 26,875 | 956 | ..... | ..... | 4,320 | 82 | ..... | ..... |
| Western Bank | 14 | 557,555 | 18,210 | ..... | ..... | 12,775 | 485 | ..... | ..... | 660 | 13 | ..... | ..... |
| Quereau Bank | 1 | 48,900 | 1,467 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Green Bank | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Grand Bank | 4 | 6,290 | 252 | 1,610 | 113 | 1,815 | 64 | 590 | 39 | ..... | ..... | ..... | ..... |
| St. Peters Bank | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cape Shore | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Number of trips. | Cod. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Large (10 pounds and over). | | | | Market (under 10 and over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | |
| | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT PORTLAND—contd. | | | | | | | | | | | | | |
| *East of 66° W. longitude*—Contd. | | | | | | | | | | | | | |
| By Canadian vessels: | | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| La Have Bank | 3 | 30,120 | $1,908 | ..... | ..... | 5,130 | $186 | ..... | ..... | 65 | $1 | ..... | ..... |
| Western Bank | 16 | 750,216 | 24,929 | ..... | ..... | 422,749 | 13,153 | ..... | ..... | ..... | ..... | ..... | ..... |
| Off Newfoundland | 1 | 1,000 | 30 | ..... | ..... | 7,900 | 237 | ..... | ..... | 2,100 | 64 | ..... | ..... |
| Cape Shore | 11 | 37,820 | 1,868 | ..... | ..... | 63,065 | 2,387 | ..... | ..... | 5,135 | 114 | ..... | ..... |
| *West of 66° W. longitude.* | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | |
| Browns Bank | 1 | 5,625 | 225 | ..... | ..... | 4,810 | 144 | ..... | ..... | 2,600 | 39 | ..... | ..... |
| Georges Bank | 7 | 76,700 | 3,560 | ..... | ..... | 15,750 | 618 | ..... | ..... | 1,205 | 24 | ..... | ..... |
| Cashes Bank | 39 | 135,513 | 8,574 | ..... | ..... | 59,182 | 2,690 | ..... | ..... | 13,597 | 411 | ..... | ..... |
| Fippenies Bank | 1 | 1,840 | 64 | ..... | ..... | 1,885 | 47 | ..... | ..... | 650 | 10 | ..... | ..... |
| Platts Bank | 25 | 57,377 | 4,811 | ..... | ..... | 37,151 | 1,897 | ..... | ..... | 6,348 | 159 | ..... | ..... |
| Jeffreys Ledge | 67 | 43,350 | 3,993 | ..... | ..... | 44,550 | 3,222 | ..... | ..... | 12,802 | 480 | ..... | ..... |
| Shore, general | 2,298 | 954,136 | 71,454 | 495 | $50 | 534,731 | 31,357 | 1,122 | $107 | 130,508 | 4,366 | 1,115 | $60 |
| By Canadian vessels: Seal Island | 1 | 1,485 | 66 | ..... | ..... | 4,035 | 137 | ..... | ..... | 910 | 23 | ..... | ..... |
| Total | 2,506 | 2,745,657 | 143,071 | 2,105 | 163 | 1,242,403 | 57,580 | 1,712 | 146 | 185,900 | 5,786 | 1,115 | 60 |
| Grand total | 8,750 | 41,654,009 | 2,297,544 | 1,947,153 | 138,890 | 24,724,036 | 1,034,872 | 1,423,345 | 90,507 | 1,959,534 | 47,437 | 116,350 | 7,955 |

| Fishing grounds. | Haddock. | | | | | | | | Hake. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | | Large (6 pounds and over). | | | | Small (under 6 pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | | | | | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | | | | | |
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| By American vessels: | | | | | | | | | | | | | | | | |
| La Have Bank | 526,575 | $31,146 | ..... | ..... | 70,715 | $2,653 | ..... | ..... | 56,150 | $3,121 | ..... | ..... | 56,501 | $2,314 | ..... | ..... |
| Western Bank | 6,628,872 | 296,602 | ..... | ..... | 1,224,120 | 43,041 | ..... | ..... | 24,305 | 1,252 | ..... | ..... | 69,955 | 3,158 | ..... | ..... |
| Quereau Bank | 4,550 | 181 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,900 | 145 | ..... | ..... |
| Grand Bank | 43,000 | 1,330 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 15,500 | 873 | ..... | ..... |
| St. Peters Bank | 75,500 | 3,330 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cape Shore | 429,050 | 32,553 | ..... | ..... | 21,240 | 960 | ..... | ..... | 24,090 | 1,442 | ..... | ..... | 55,940 | 2,421 | ..... | ..... |
| Gulf of St. Lawrence | 25,500 | 1,020 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6,000 | 400 | ..... | ..... |
| St. Anns Bank | 16,000 | 1,012 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Roseway Bank | 4,250 | 206 | ..... | ..... | 1,000 | 25 | ..... | ..... | ..... | ..... | ..... | ..... | 1,340 | 40 | ..... | ..... |
| By Canadian vessels: | | | | | | | | | | | | | | | | |
| La Have Bank | 6,730 | 269 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Western Bank | 24,500 | 1,694 | ..... | ..... | 26,250 | 1,017 | ..... | ..... | ..... | ..... | ..... | ..... | 200 | 16 | ..... | ..... |
| Cape Shore | 12,400 | 558 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| *West of 66° W. longitude.* | | | | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | | | | |
| Browns Bank | 1,630,890 | 81,599 | ..... | ..... | 147,093 | 5,489 | ..... | ..... | 6,350 | 391 | ..... | ..... | 82,385 | 3,587 | ..... | ..... |
| Georges Bank | 12,074,917 | 684,575 | ..... | ..... | 2,042,605 | 87,099 | ..... | ..... | 40,745 | 2,592 | ..... | ..... | 58,568 | 3,370 | ..... | ..... |
| Cashes Bank | 9,230 | 483 | ..... | ..... | 2,980 | 65 | ..... | ..... | 3,155 | 206 | ..... | ..... | 15,480 | 628 | ..... | ..... |
| Clark Bank | 32,000 | 1,220 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Fippenies Bank | 19,675 | 1,771 | ..... | ..... | 670 | 34 | ..... | ..... | 2,710 | 304 | ..... | ..... | 13,045 | 805 | ..... | ..... |
| Middle Bank | 559,225 | 43,050 | ..... | ..... | 20,015 | 910 | ..... | ..... | 101,597 | 10,074 | ..... | ..... | 428,799 | 23,610 | ..... | ..... |
| Jeffreys Ledge | 483,870 | 49,135 | ..... | ..... | 32,030 | 2,073 | ..... | ..... | 20,013 | 2,352 | ..... | ..... | 146,620 | 11,141 | ..... | ..... |
| South Channel | 19,620,165 | 970,040 | ..... | ..... | 2,238,395 | 72,947 | ..... | ..... | 575,088 | 35,535 | ..... | ..... | 651,431 | 33,299 | ..... | ..... |
| Nantucket Shoals | 130,456 | 6,940 | ..... | ..... | 335 | 11 | ..... | ..... | 675 | 41 | ..... | ..... | 3,020 | 91 | ..... | ..... |
| Off Chatham | 3,383,360 | 216,279 | ..... | ..... | 184,875 | 7,562 | ..... | ..... | 49,540 | 4,173 | ..... | ..... | 198,545 | 9,180 | ..... | ..... |
| Bay of Fundy | 2,100 | 63 | ..... | ..... | ..... | ..... | ..... | ..... | 49,250 | 2,901 | ..... | ..... | 91,895 | 3,433 | ..... | ..... |
| Seal Island | 38,000 | 1,615 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,230 | 49 | ..... | ..... |
| South | 730 | 26 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,240 | 128 | ..... | ..... |
| Shore, general | 169,923 | 10,948 | ..... | ..... | 9,190 | 433 | ..... | ..... | 24,225 | 3,265 | ..... | ..... | 112,628 | 5,001 | ..... | ..... |
| By Canadian vessels: | | | | | | | | | | | | | | | | |
| Browns Bank | 35,435 | 1,818 | ..... | ..... | 905 | 27 | ..... | ..... | 8,850 | 248 | ..... | ..... | ..... | ..... | ..... | ..... |
| Georges Bank | 153,895 | 10,469 | ..... | ..... | 22,560 | 989 | ..... | ..... | ..... | ..... | ..... | ..... | 345 | 17 | ..... | ..... |
| Total | 46,140,828 | 2,449,932 | ..... | ..... | 6,044,978 | 225,335 | ..... | ..... | 986,743 | 67,897 | ..... | ..... | 2,015,567 | 103,706 | ..... | ..... |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Haddock. | | | | | | | | Hake. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | | Large (6 pounds and over). | | | | Small (under 6 pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | | | | | |
| By American vessels: | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Le Have Bank | 103,348 | $2,930 | ..... | ..... | ..... | ..... | ..... | ..... | 19,875 | $563 | ..... | ..... | ..... | ..... | ..... | ..... |
| Western Bank | 1,610,578 | 44,967 | 2,170 | $92 | 45,700 | $1,264 | ..... | ..... | 272,440 | 7,431 | 15,017 | $617 | ..... | ..... | ..... | ..... |
| Quereau Bank | 2,731,226 | 70,955 | 47,898 | 2,385 | ..... | ..... | 6,810 | $238 | 54,333 | 1,467 | 11,545 | 418 | ..... | ..... | ..... | ..... |
| Grand Bank | 16,550 | 416 | 2,475 | 154 | ..... | ..... | 8,829 | 618 | 14,375 | 433 | 3,180 | 170 | ..... | ..... | 460 | $25 |
| St. Peters Bank | 154,545 | 3,965 | 310 | 14 | ..... | ..... | ..... | ..... | 20,530 | 594 | 3,920 | 176 | ..... | ..... | ..... | ..... |
| Cape Shore | 3,690 | 92 | ..... | ..... | ..... | ..... | ..... | ..... | 7,870 | 197 | ..... | ..... | ..... | ..... | ..... | ..... |
| Gulf of St. Lawrence | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,885 | 87 | ..... | ..... | ..... | ..... | ..... | ..... |
| The Gully | 70 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| By Canadian vessels: Western Bank | 27,435 | 970 | ..... | ..... | 44,090 | 1,102 | ..... | ..... | 1,425 | 46 | ..... | ..... | ..... | ..... | ..... | ..... |
| *West of 66° W. longitude.* | | | | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | | | | |
| Browns Bank | 342,065 | 10,695 | ..... | ..... | 10,535 | 485 | ..... | ..... | 850 | 21 | ..... | ..... | ..... | ..... | ..... | ..... |
| Georges Bank | 2,223,175 | 70,985 | ..... | ..... | 361,265 | 11,957 | ..... | ..... | 55,495 | 1,517 | ..... | ..... | 150 | $3 | ..... | ..... |
| Seal Island | 625 | 16 | ..... | ..... | ..... | ..... | ..... | ..... | 37,385 | 1,030 | ..... | ..... | ..... | ..... | ..... | ..... |
| Shore, general | 710,761 | 43,519 | ..... | ..... | ..... | ..... | ..... | ..... | 46,036 | 3,933 | 105 | 4 | ..... | ..... | ..... | ..... |
| Total | 7,924,068 | 249,512 | 52,853 | 2,645 | 461,590 | 14,808 | 15,639 | 856 | 533,499 | 17,319 | 33,767 | 1,385 | 150 | 3 | 460 | 25 |
| LANDED AT PORTLAND. | | | | | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | | | | |
| La Have Bank | 81,055 | 3,784 | ..... | ..... | 5,585 | 138 | ..... | ..... | 1,615 | 125 | ..... | ..... | 4,840 | 240 | ..... | ..... |
| Western Bank | 1,479,420 | 46,731 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8,505 | 213 | ..... | ..... |
| Quereau Bank | 97,800 | 2,934 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Grand Bank | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| St. Peters Bank | 13,250 | 596 | ..... | ..... | 200 | 4 | ..... | ..... | 540 | 16 | 740 | 33 | ..... | ..... | ..... | ..... |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| By Canadian vessels: | | | | | | | | | | | | | | | | |
| La Have Bank | 1,130 | 35 | | | | | | | 5,455 | 327 | | | 2,205 | 88 | | |
| Western Bank | 2,759,597 | 92,009 | | | | | | | 300 | 9 | | | 2,900 | 87 | | |
| Off Newfoundland | 31,200 | 1,326 | | | | | | | 13,970 | 499 | | | 24,930 | 787 | | |
| Cape Shore | 228,375 | 9,088 | | | 5,785 | 116 | | | | | | | | | | |
| *West of 68° W. longitude.* | | | | | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | | | | | |
| Browns Bank | 24,000 | 780 | | | 4,020 | 131 | | | 1,000 | 50 | | | 2,435 | 79 | | |
| Georges Bank | 29,850 | 1,440 | | | 2,180 | 55 | | | 19,615 | 1,101 | | | 33,659 | 1,178 | | |
| Cashes Bank | 14,170 | 972 | | | 1,250 | 48 | | | | | | | 145 | 5 | | |
| Fippenies Bank | 860 | 43 | | | 300 | 9 | | | 21,351 | 1,621 | | | 70,149 | 3,107 | | |
| Platts Bank | 34,477 | 2,687 | | | 1,635 | 57 | | | 16,894 | 1,435 | | | 129,545 | 6,267 | | |
| Jeffreys Ledge | 296,712 | 26,801 | | | 19,830 | 1,003 | | | 233,296 | 17,280 | | | 1,115,374 | 48,173 | | |
| Shore, general | 860,175 | 63,611 | | | 30,949 | 1,477 | | | | | | | | | | |
| By Canadian vessels: Seal Island | 7,460 | 305 | | | 320 | 8 | | | | | | | | | | |
| Total | 5,959,531 | 253,142 | | | 72,054 | 3,046 | | | 314,036 | 22,463 | 740 | 33 | 1,395,867 | 60,254 | | |
| Grand total | 60,024,427 | 2,952,586 | 52,853 | 2,645 | 6,578,622 | 243,189 | 15,639 | 856 | 1,834,278 | 107,679 | 34,507 | 1,418 | 3,411,584 | 163,963 | 460 | 25 |

| Fishing grounds. | Pollock. | | | | Cusk. | | | | Halibut. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | | | | | | | | | | | | |
| *East of 68° W. longitude.* | | | | | | | | | | | | |
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| By American vessels: | | | | | | | | | | | | |
| La Have Bank | 32,915 | $2,074 | | | 76,235 | $3,391 | | | 19,273 | $4,566 | | |
| Western Bank | 615,275 | 26,959 | | | 122,071 | 4,747 | | | 90,655 | 21,429 | | |
| Quereau Bank | 9,850 | 340 | | | 1,940 | 63 | | | 4,890 | 716 | | |
| Grand Bank | | | | | 300 | 9 | | | 20,000 | 3,000 | | |
| St. Peters Bank | | | | | | | | | 2,262 | 515 | | |
| Cape Shore | 17,950 | 1,020 | | | 85,805 | 2,846 | | | 20,829 | 4,815 | | |
| St. Anns Bank | 200 | 8 | | | | | | | 50 | 12 | | |
| Roseway Bank | 990 | 30 | | | 12,030 | 283 | | | 394 | 74 | | |
| By Canadian vessels: | | | | | | | | | | | | |
| La Have Bank | 708 | 49 | | | 5,675 | 193 | | | 690 | 116 | | |
| Western Bank | 20,275 | 917 | | | | | | | 260 | 134 | | |
| Cape Shore | 900 | 41 | | | 2,025 | 51 | | | 41 | 6 | | |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Pollock. | | | | Cusk. | | | | Halibut. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON—continued. | | | | | | | | | | | | |
| *West of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Browns Bank | 171,070 | $9,463 | | | 317,136 | $12,316 | | | 93,087 | $19,611 | | |
| Georges Bank | 524,333 | 31,458 | | | 138,847 | 6,495 | | | 326,780 | 56,536 | | |
| Cashes Bank | 3,690 | 236 | | | 34,400 | 1,405 | | | 513 | 137 | | |
| Clark Bank | 1,800 | 72 | | | | | | | 1,586 | 367 | | |
| Fippenies Bank | 6,885 | 414 | | | 10,485 | 523 | | | 92 | 39 | | |
| Middle Bank | 45,565 | 4,018 | | | 85,452 | 3,949 | | | 4,559 | 1,431 | | |
| Jeffreys Ledge | 116,550 | 8,728 | | | 70,947 | 4,067 | | | 1,925 | 531 | | |
| South Channel | 1,061,506 | 65,102 | | | 31,515 | 1,028 | | | 69,397 | 14,783 | | |
| Nantucket Shoals | 181,821 | 9,109 | | | 1,710 | 54 | | | 9,321 | 1,561 | | |
| Off Chatham | 698,802 | 42,824 | | | 20,085 | 803 | | | 12,774 | 2,699 | | |
| Bay of Fundy | 7,960 | 296 | | | 12,520 | 387 | | | 513 | 122 | | |
| Seal Island | 2,000 | 80 | | | 9,835 | 344 | | | 797 | 209 | | |
| South | 1,070 | 37 | | | | | | | | | | |
| Shore, general | 718,951 | 45,148 | | | 21,770 | 836 | | | 2,115 | 447 | | |
| By Canadian vessels: | | | | | | | | | | | | |
| Browns Bank | 35,925 | 1,241 | | | 23,010 | 717 | | | 3,472 | 687 | | |
| Georges Bank | 14,480 | 605 | | | 4,610 | 175 | | | 620 | 121 | | |
| Total | 4,291,471 | 250,269 | | | 1,088,403 | 41,682 | | | 686,955 | 134,654 | | |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | |
| La Have Bank | 10,685 | 273 | 100 | $5 | 32,220 | 957 | 535 | $32 | 42,857 | 5,659 | | |
| Western Bank | 171,515 | 4,561 | 26,345 | 1,077 | 218,799 | 6,595 | 12,530 | 522 | 333,257 | 49,972 | 787 | $94 |
| Quereau Bank | 178,745 | 4,641 | 26,568 | 999 | 63,260 | 1,827 | 340 | 19 | 75,538 | 9,673 | 7,239 | 799 |
| Green Bank | | | | | | | | | 10,410 | 1,423 | | |
| Grand Bank | 845 | 20 | 210 | 9 | 765 | 22 | 435 | 20 | 167,966 | 21,506 | 2,905 | 347 |
| St. Peters Bank | 10,170 | 255 | 35 | 2 | 1,660 | 54 | | | 8,087 | 998 | | |
| Cape Shore | 325 | 8 | | | 3,655 | 100 | | | | | | |
| The Gully | 85 | 2 | | | | | | | 17,480 | 2,603 | | |
| By Canadian vessels: Western Bank | 24,365 | 871 | | | | | | | 86 | 32 | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *West of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | |
| Browns Bank | 45,880 | 1,045 | | | 49,345 | 1,534 | | | 1,178 | 189 | | |
| Georges Bank | 48,055 | 1,359 | | | 171,417 | 5,162 | | | 70,954 | 11,516 | | |
| Seal Island | 7,305 | 180 | | | 119,757 | 3,571 | | | | | | |
| Shore, general | 20,249,827 | 648,597 | | | 16,720 | 483 | | | 43,851 | 6,937 | | |
| Total | 20,747,802 | 661,812 | 53,258 | 2,092 | 677,598 | 20,305 | 13,940 | 593 | 771,664 | 110,508 | 10,931 | 1,249 |
| LANDED AT PORTLAND. | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | |
| La Have Bank | 2,630 | 89 | | | 12,925 | 443 | | | 34,526 | 7,707 | | |
| Western Bank | 42,138 | 982 | | | 5,915 | 164 | | | 24,683 | 4,506 | | |
| Quereau Bank | 1,900 | 29 | | | | | | | | | | |
| Green Bank | | | | | | | | | 18,144 | 460 | | |
| Grand Bank | | | | | 370 | 11 | | | 86,721 | 15,817 | | |
| St. Peters Bank | | | | | | | | | 73,289 | 13,929 | | |
| By Canadian vessels: | | | | | | | | | | | | |
| La Have Bank | 9,080 | 228 | | | 5,140 | 169 | | | 16,710 | 3,319 | | |
| Western Bank | 66,801 | 1,281 | | | 11,230 | 281 | | | 15,053 | 2,325 | | |
| Off Newfoundland | 12,035 | 361 | | | | | | | 1,628 | 301 | | |
| Cape Shore | 5,095 | 179 | | | 52,955 | 1,896 | | | 7,580 | 982 | | |
| *West of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | |
| Browns Bank | 720 | 18 | | | 1,145 | 29 | | | 914 | 180 | | |
| Georges Bank | 640 | 23 | | | 4,550 | 162 | | | 4,762 | 1,032 | | |
| Cashes Bank | 25,380 | 932 | | | 253,495 | 9,142 | | | 3,412 | 770 | | |
| Fippenies Bank | 390 | 10 | | | 1,870 | 42 | | | 123 | 25 | | |
| Platts Bank | 10,443 | 498 | | | 66,280 | 2,326 | | | 3,254 | 641 | | |
| Jeffreys Ledge | 25,430 | 1,401 | | | 66,979 | 3,573 | | | 2,400 | 515 | | |
| Shore, general | 1,265,257 | 41,877 | | | 392,565 | 19,135 | | | 18,030 | 3,327 | | |
| By Canadian vessels: Seal Island | 150 | 4 | | | 2,900 | 78 | | | 225 | 42 | | |
| Total | 1,468,089 | 47,912 | | | 878,319 | 37,451 | | | 311,454 | 55,878 | | |
| Grand total | 26,507,362 | 959,993 | 53,258 | 2,092 | 2,644,320 | 102,438 | 13,940 | 593 | 1,770,073 | 301,040 | 10,931 | 1,240 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Mackerel. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2¼ pounds). | | | | Medium (1½ to 2¼ pounds). | | | | Small (under 1½ pounds). | | | |
| | Fresh | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | | | | | | | | | | | | |
| *East of 66° W. longitude.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| By American vessels: Cape Shore | 1,366,554 | $125,287 | 66,000 | $6,930 | 4,485 | $135 | | | | | | |
| *West of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | |
| Georges Bank | 20,000 | 3,000 | | | 20,000 | 3,000 | | | | | | |
| Middle Bank | | | | | 41,385 | 6,783 | | | | | | |
| Jeffreys Ledge | | | | | 11,298 | 970 | | | | | | |
| South Channel | | | | | 264,180 | 12,510 | | | | | | |
| Nantucket Shoals | 930,938 | 111,896 | | | | | | | | | | |
| Off Chatham | 32,045 | 5,369 | | | 2,270 | 250 | | | 500 | $20 | | |
| South | 211,693 | 30,717 | | | | | | | | | | |
| Shore, general | 2,434,596 | 273,472 | 108,400 | 17,058 | 917,742 | 147,861 | 30,220 | $4,479 | 307,927 | 31,267 | 9,400 | $1,504 |
| Total | 4,995,826 | 549,741 | 174,400 | 23,988 | 1,261,360 | 171,509 | 30,220 | 4,479 | 308,427 | 31,287 | 9,400 | 1,504 |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: Cape Shore | 43,230 | 4,435 | 1,260,563 | 134,733 | | | | | | | | |
| *West of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: | | | | | | | | | | | | |
| Georges Bank | | | 56,500 | 11,303 | | | | | | | 200 | 27 |
| Middle Bank | | | | | | | 1,600 | 267 | | | | |
| Nantucket Shoals | | | 5,600 | 934 | 128,710 | 2,824 | 19,000 | 2,126 | 200 | 27 | | |
| Shore, general | 55,742 | 9,056 | 51,895 | 8,329 | 114,991 | 9,746 | 891,575 | 138,726 | | | 25,700 | 3,881 |
| Total | 98,972 | 13,491 | 1,374,558 | 155,299 | 243,701 | 12,570 | 912,175 | 141,119 | 200 | 27 | 25,900 | 3,908 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LANDED AT PORTLAND. | | | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: Cape shore | 172,185 | 12,764 | 48,200 | 4,820 | | | | | | | | |
| By Canadian vessels: Cape Shore | 29,152 | 2,423 | | | | | | | | | | |
| *West of 66° W. longitude.* | | | | | | | | | | | | |
| By American vessels: Shore, general | 242,406 | 34,124 | 1,200 | 168 | 106,241 | 14,345 | | | 123,944 | 11,358 | | |
| Total | 443,743 | 49,311 | 49,400 | 4,988 | 106,241 | 14,345 | | | 123,944 | 11,358 | | |
| Grand total | 5,538,541 | 612,543 | 1,598,358 | 184,275 | 1,611,302 | 198,424 | 942,395 | 145,598 | 432,571 | 42,672 | 35,300 | 5,412 |

| Fishing grounds. | Miscellaneous. | | | | Total. | | | | Grand total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | | |
| LANDED AT BOSTON. | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | |
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| By American vessels: | | | | | | | | | | |
| La Have Bank | 19,955 | $1,124 | | | 1,647,514 | $97,267 | | | 1,647,514 | $97,267 |
| Western Bank | 163,168 | 7,686 | | | 15,344,494 | 773,735 | | | 15,344,494 | 773,735 |
| Quereau Bank | 765 | 31 | | | 225,025 | 11,130 | | | 225,025 | 11,130 |
| Grand Bank | | | | | 81,800 | 5,414 | | | 81,800 | 5,414 |
| St. Peters Bank | | | | | 142,762 | 6,700 | | | 142,762 | 6,700 |
| Off Newfoundland | [a]80,000 | 5,600 | | | 80,000 | 5,600 | 35,000 | $1,400 | 115,000 | 7,000 |
| Cape Shore | 63,018 | 10,842 | | | 2,754,440 | 221,672 | 66,000 | 6,930 | 2,820,440 | 228,602 |
| Gulf of St. Lawrence | 3,000 | 186 | | | 41,100 | 2,021 | | | 41,100 | 2,021 |
| St. Anns Bank | 1,800 | 72 | | | 53,335 | 3,007 | | | 53,335 | 3,007 |
| Roseway Bank | 1,000 | 40 | | | 41,059 | 1,420 | | | 41,059 | 1,420 |
| By Canadian vessels: | | | | | | | | | | |
| La Have Bank | | | | | 27,598 | 1,327 | | | 27,598 | 1,327 |
| Western Bank | | | | | 87,090 | 4,620 | | | 87,090 | 4,620 |
| Cape Shore | 230 | 12 | | | 25,406 | 1,479 | | | 25,406 | 1,479 |
| *West of 66° W. longitude.* | | | | | | | | | | |
| By American vessels: | | | | | | | | | | |
| Browns Bank | 144,720 | 18,596 | | | 4,910,668 | 276,033 | | | 4,910,668 | 276,033 |
| Georges Bank | 1,138,079 | 194,272 | | | 32,599,683 | 2,038,562 | | | 32,599,683 | 2,038,562 |
| Cashes Bank | 3,180 | 160 | | | 113,433 | 6,147 | | | 113,433 | 6,147 |
| Clark Bank | 1,600 | 48 | | | 62,186 | 2,960 | | | 62,186 | 2,960 |
| Fippenies Bank | 2,865 | 154 | | | 83,857 | 6,574 | | | 83,857 | 6,574 |

[a] For footnote see page 25.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Miscellaneous. | | | | Total. | | | | Grand total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | | |
| LANDED AT BOSTON—continued. | | | | | | | | | | |
| *West of 66° W. longitude*—Continued. | | | | | | | | | | |
| By American vessels—Continued. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Middle Bank | 99,795 | $4,751 | | | 1,581,761 | $114,781 | | | 1,581,761 | $114,781 |
| Jeffreys Ledge | 87,022 | 3,924 | | | 1,195,469 | 100,645 | | | 1,195,469 | 100,645 |
| South Channel | 800,903 | 36,602 | | | 29,432,840 | 1,496,286 | | | 29,432,840 | 1,496,286 |
| Nantucket Shoals | 83,596 | 5,523 | | | 2,781,343 | 216,200 | | | 2,781,343 | 216,200 |
| Off Chatham | 306,499 | 14,089 | | | 7,388,798 | 452,908 | | | 7,388,798 | 452,908 |
| Bay of Fundy | 9,100 | 397 | | | 217,193 | 9,254 | | | 217,193 | 9,251 |
| Seal Island | 2,800 | 168 | | | 73,712 | 3,320 | | | 73,712 | 3,320 |
| South | 315,220 | 20,681 | | | 532,348 | 51,593 | | | 532,348 | 51,593 |
| Shore, general | 2,096,632 | 70,080 | | | 7,044,238 | 604,273 | 148,020 | $23,041 | 7,192,258 | 627,314 |
| By Canadian vessels: | | | | | | | | | | |
| Browns Bank | 10,080 | 454 | | | 348,202 | 17,211 | | | 348,202 | 17,211 |
| Georges Bank | 50,347 | 9,032 | | | 309,667 | 24,244 | | | 309,667 | 24,244 |
| Total | 5,485,374 | 404,529 | | | 109,227,021 | 6,556,383 | 249,020 | 31,371 | 109,476,041 | 6,587,754 |
| LANDED AT GLOUCESTER. | | | | | | | | | | |
| *East of 66° W. longitude.* | | | | | | | | | | |
| By American vessels: | | | | | | | | | | |
| La Have Bank | | | | | 474,220 | 20,608 | 6,350 | 475 | 480,570 | 21,083 |
| Western Bank | | | | | 5,764,135 | 232,966 | 778,053 | 49,307 | 6,542,188 | 282,273 |
| Quereau Bank | | | | | 17,576,737 | 559,281 | 2,212,041 | 143,270 | 19,788,778 | 702,551 |
| Green Bank | | | | | 58,155 | 3,201 | 22,810 | 1,523 | 80,965 | 4,724 |
| Grand Bank | | | | | 757,951 | 42,071 | 553,512 | 45,953 | 1,311,463 | 88,024 |
| St. Peters Bank | | | | | 634,317 | 20,480 | 37,100 | 2,656 | 671,417 | 23,136 |
| Off Newfoundland | [a] 81,800 | 4,908 | [a] 6,225,024 | $321,365 | 81,800 | 4,908 | 6,225,024 | 321,365 | 6,306,824 | 326,273 |
| Cape Shore | | | | | 70,240 | 5,233 | 1,260,563 | 134,733 | 1,330,803 | 139,966 |
| Gulf of St. Lawrence | | | | | 181,775 | 6,509 | | | 181,775 | 6,509 |
| St. Anns Bank | | | | | 20,830 | 823 | | | 20,830 | 823 |
| The Gully | | | | | 28,620 | 3,042 | | | 28,620 | 3,042 |
| By Canadian vessels: Western Bank | | | | | 136,166 | 4,798 | | | 136,166 | 4,798 |
| *West of 66° W. longitude.* | | | | | | | | | | |
| By American vessels: | | | | | | | | | | |
| Browns Bank | | | | | 2,010,870 | 72,993 | | | 2,010,870 | 72,993 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Georges Bank | | | | | 7,321,563 | 279,269 | 56,700 | 11,330 | 7,378,263 | 290,599 |
| Middle Bank | | | | | | | 1,600 | 267 | 1,600 | 267 |
| Nantucket Shoals | | | | | 128,910 | 2,851 | 24,600 | 3,060 | 153,510 | 5,911 |
| Seal Island | | | | | 321,562 | 10,354 | | | 321,562 | 10,354 |
| Shore, general | 2,218,904 | 40,494 | a7,600 | 164 | 26,434,627 | 926,944 | 994,668 | 152,335 | 27,429,295 | 1,079,279 |
| Total | 2,300,704 | 45,402 | 6,232,624 | 321,529 | 62,002,478 | 2,196,331 | 12,173,021 | 866,274 | 74,175,499 | 3,062,605 |
| LANDED AT PORTLAND. | | | | | | | | | | |
| *East of 66° W. longitude* | | | | | | | | | | |
| By American vessels: | | | | | | | | | | |
| La Have Bank | 920 | 132 | | | 213,021 | 15,356 | | | 213,021 | 15,356 |
| Western Bank | 5,970 | 143 | | | 2,137,621 | 71,447 | | | 2,137,621 | 71,447 |
| Quereau Bank | 900 | 14 | | | 119,500 | 4,444 | | | 119,500 | 4,444 |
| Green Bank | | | | | 18,144 | 460 | | | 18,144 | 460 |
| Grand Bank | 180 | 47 | | | 95,916 | 16,207 | 2,940 | 185 | 98,856 | 16,392 |
| St. Peters Bank | | | | | 86,739 | 14,529 | | | 86,739 | 14,529 |
| Cape Shore | 12,693 | 2,487 | | | 184,878 | 15,251 | 48,200 | 4,820 | 233,078 | 20,071 |
| By Canadian vessels: | | | | | | | | | | |
| La Have Bank | 5,328 | 1,105 | | | 80,363 | 7,366 | | | 80,363 | 7,366 |
| Western Bank | 10,201 | 128 | | | 4,037,027 | 134,136 | | | 4,037,027 | 134,136 |
| Off Newfoundland | | | | | 59,063 | 2,415 | | | 59,063 | 2,415 |
| Cape Shore | 220 | 8 | | | 474,082 | 20,347 | | | 474,082 | 20,347 |
| *West of 66° W. longitude.* | | | | | | | | | | |
| By American vessels: | | | | | | | | | | |
| Browns Bank | 970 | 25 | | | 44,804 | 1,571 | | | 44,804 | 1,571 |
| Georges Bank | 12,582 | 2,430 | | | 151,654 | 9,473 | | | 151,654 | 9,473 |
| Cashes Bank | 37,455 | 794 | | | 601,728 | 26,612 | | | 601,728 | 26,612 |
| Fippenies Bank | | | | | 8,063 | 255 | | | 8,063 | 255 |
| Platts Bank | 3,431 | 104 | | | 311,396 | 17,908 | | | 311,396 | 17,908 |
| Jeffreys Ledge | 23,828 | 771 | | | 682,320 | 49,461 | | | 682,320 | 49,461 |
| Shore, general | 6,432,025 | 105,995 | | | 12,439,637 | 467,879 | 3,932 | 385 | 12,443,569 | 468,264 |
| By Canadian vessels: Seal Island | 600 | 19 | | | 18,085 | 682 | | | 18,085 | 682 |
| Total | 6,547,303 | 114,202 | | | 21,794,541 | 875,799 | 55,072 | 5,390 | 21,849,613 | 881,189 |
| Grand total | 14,333,381 | 564,133 | 6,232,624 | 321,529 | 193,024,040 | 9,628,513 | 12,477,113 | 903,035 | 205,501,153 | 10,531,548 |

a Herring. Other items under "Miscellaneous" include alewives, 97 pounds, value $2; bluebacks, 16,905 pounds, value $696; bluefish, 4 pounds, value $1; bonito, 2,100 pounds, value $210; butterfish, 19,257 pounds, value $2,053; catfish or wolf fish, 233,371 pounds, value $7,768; eels, 1,620 pounds, value $88; flounders, 2,269,807 pounds, value $93,800; goosefish, 1,210 pounds, value $18; herring, 8,602,538 pounds, value $128,645; redfish, 160,889 pounds, value $4,363; salmon, 288 pounds, value $59; shad, 29,807 pounds, value $2,984; sharks, 55,906 pounds, value $1,754; skates, 179,726 pounds, value $3,958; smelt, 27,535 pounds, value $2,978; sturgeon, 4,857 pounds, value $435; swordfish, 1,034,091 pounds, value $223,192; tilefish, 299,420 pounds, value $20,246; whiting, 10,460 pounds, value $100; blackfish, 200 pounds, value $2; porpoise, 175 pounds, value $3; lobster, 502 pounds, value $119; squid, 100 pounds, value $6; livers, 1,120,331 pounds, value $52,363; sounds, 13,704 pounds, value $795; spawn, 83,166 pounds, value $6,790; and tongues, 3,515 pounds, value $197.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS.

| Months. | Number of trips. | Cod. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Large (10 pounds and over). | | | | Market (under 10 and over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | |
| | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| | | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| LANDED AT BOSTON. | | | | | | | | | | | | | |
| January | 130 | 701,631 | $63,935 | ..... | ..... | 623,320 | $40,452 | ..... | ..... | 172,201 | $4,954 | ..... | ..... |
| February | 167 | 3,112,655 | 231,856 | ..... | ..... | 533,886 | 41,727 | ..... | ..... | 72,720 | 2,250 | ..... | ..... |
| March | 239 | 3,488,862 | 210,086 | ..... | ..... | 672,728 | 36,275 | ..... | ..... | 61,784 | 1,585 | ..... | ..... |
| April | 193 | 3,982,163 | 184,645 | ..... | ..... | 720,936 | 28,631 | 35,000 | $1,400 | 59,078 | 1,249 | ..... | ..... |
| May | 265 | 2,187,848 | 107,883 | ..... | ..... | 1,398,439 | 52,877 | ..... | ..... | 160,954 | 3,844 | ..... | ..... |
| June | 224 | 1,339,123 | 92,171 | ..... | ..... | 1,502,970 | 69,902 | ..... | ..... | 150,343 | 3,273 | ..... | ..... |
| July | 337 | 1,413,700 | 97,351 | ..... | ..... | 1,933,329 | 91,230 | ..... | ..... | 143,452 | 3,183 | ..... | ..... |
| August | 367 | 1,413,906 | 105,432 | ..... | ..... | 1,421,162 | 71,707 | ..... | ..... | 187,554 | 5,014 | ..... | ..... |
| September | 269 | 1,207,809 | 108,218 | ..... | ..... | 1,305,888 | 69,963 | ..... | ..... | 176,857 | 3,802 | ..... | ..... |
| October | 250 | 886,512 | 78,668 | ..... | ..... | 832,055 | 45,354 | ..... | ..... | 83,855 | 1,641 | ..... | ..... |
| November | 231 | 1,171,679 | 86,851 | ..... | ..... | 925,755 | 42,910 | ..... | ..... | 63,833 | 1,417 | ..... | ..... |
| December | 158 | 943,198 | 86,086 | ..... | ..... | 804,509 | 44,547 | ..... | ..... | 64,395 | 1,843 | ..... | ..... |
| Total | 2,830 | 21,849,086 | 1,453,212 | ..... | ..... | 12,674,977 | 635,575 | 35,000 | 1,400 | 1,397,026 | 34,055 | ..... | ..... |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | |
| January | 171 | 25,589 | 2,642 | ..... | ..... | 5,340 | 267 | ..... | ..... | 3,210 | 32 | ..... | ..... |
| February | 86 | 158,302 | 12,114 | ..... | ..... | 20,760 | 1,322 | ..... | ..... | 2,340 | 78 | ..... | ..... |
| March | 411 | 1,169,496 | 59,542 | ..... | ..... | 186,515 | 6,963 | ..... | ..... | 2,545 | 50 | ..... | ..... |
| April | 492 | 4,611,343 | 196,271 | 12,530 | $877 | 614,699 | 20,802 | 10,025 | 577 | 29,425 | 614 | 80 | $3 |
| May | 441 | 3,324,958 | 126,267 | 16,345 | 1,062 | 2,463,628 | 79,710 | 33,963 | 1,868 | 72,105 | 1,444 | ..... | ..... |
| June | 170 | 2,546,326 | 91,748 | 722,985 | 47,691 | 2,687,531 | 81,500 | 555,448 | 33,304 | 89,391 | 1,769 | 27,250 | 1,471 |
| July | 128 | 2,135,997 | 78,088 | 493,903 | 31,958 | 2,360,963 | 72,257 | 359,668 | 20,495 | 83,272 | 1,631 | 39,882 | 2,246 |
| August | 77 | 1,535,690 | 54,450 | 165,860 | 11,438 | 1,619,180 | 48,692 | 120,816 | 7,538 | 48,385 | 968 | 4,935 | 287 |
| September | 76 | 682,275 | 25,007 | 380,475 | 30,431 | 508,340 | 16,801 | 181,220 | 13,592 | 24,210 | 540 | 8,330 | 586 |
| October | 308 | 283,527 | 21,271 | 125,775 | 12,552 | 44,465 | 1,626 | 98,038 | 8,979 | 2,500 | 84 | 23,000 | 2,185 |
| November | 647 | 427,532 | 22,410 | 27,175 | 2,718 | 249,360 | 9,906 | 27,455 | 2,608 | 14,330 | 288 | 11,758 | 1,117 |
| December | 407 | 158,231 | 11,451 | ..... | ..... | 45,875 | 1,871 | ..... | ..... | 4,895 | 98 | ..... | ..... |
| Total | 3,414 | 17,059,266 | 701,261 | 1,945,048 | 138,727 | 10,806,656 | 341,717 | 1,386,633 | 88,961 | 376,608 | 7,596 | 115,235 | 7,895 |

| LANDED AT PORTLAND. | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 125 | 51,613 | 6,283 | | | 75,532 | 7,938 | | | 24,684 | 1,678 | | |
| February | 125 | 81,336 | 5,755 | | | 68,573 | 5,144 | | | 12,982 | 616 | | |
| March | 234 | 143,628 | 7,448 | 1,610 | 113 | 79,590 | 4,131 | 590 | 39 | 15,897 | 423 | | |
| April | 221 | 362,463 | 14,031 | | | 136,999 | 4,346 | | | 32,490 | 525 | | |
| May | 346 | 340,156 | 11,913 | | | 284,922 | 9,158 | | | 13,432 | 212 | | |
| June | 318 | 547,840 | 20,204 | | | 20,339 | 902 | | | 5,010 | 96 | | |
| July | 152 | 610,213 | 27,986 | | | 24,544 | 1,350 | | | 5,398 | 173 | | |
| August | 162 | 207,625 | 13,671 | | | 241,435 | 8,059 | | | 6,769 | 140 | | |
| September | 173 | 93,328 | 8,120 | 495 | 50 | 44,096 | 2,556 | 1,122 | 107 | 10,957 | 332 | 1,115 | 60 |
| October | 234 | 110,365 | 9,238 | | | 95,457 | 4,429 | | | 16,744 | 412 | | |
| November | 217 | 105,404 | 8,773 | | | 79,586 | 3,791 | | | 15,393 | 385 | | |
| December | 199 | 91,686 | 9,649 | | | 91,330 | 5,776 | | | 26,144 | 794 | | |
| Total | 2,506 | 2,745,657 | 143,071 | 2,105 | 163 | 1,242,403 | 57,580 | 1,712 | 146 | 185,900 | 5,786 | 1,115 | 60 |
| Grand total | 8,750 | 41,654,009 | 2,297,544 | 1,947,153 | 138,890 | 24,724,036 | 1,034,872 | 1,423,345 | 90,507 | 1,959,534 | 47,437 | 116,350 | 7,955 |
| Grounds E. of 66° W. long | 654 | 15,527,557 | 708,519 | 1,929,893 | 137,666 | 13,334,418 | 465,539 | 1,421,258 | 90,345 | 546,448 | 12,246 | 115,235 | 7,895 |
| Grounds W. of 66° W. long | 8,096 | 26,126,452 | 1,589,025 | 17,260 | 1,224 | 11,389,618 | 569,333 | 2,087 | 162 | 1,413,086 | 35,191 | 1,115 | 60 |
| Landed at Boston in 1917 | 2,962 | 11,366,216 | 685,115 | | | 11,905,068 | 507,939 | | | 1,872,806 | 40,008 | | |
| Landed at Gloucester in 1917 | 3,074 | 9,983,851 | 357,420 | 2,894,581 | 149,756 | 10,168,146 | 270,762 | 3,327,379 | 157,573 | 420,291 | 5,038 | 279,406 | 10,226 |
| Landed at Portland in 1917 | 3,248 | 2,452,959 | 122,029 | 63,420 | 3,499 | 1,386,475 | 52,685 | 8,905 | 428 | 317,025 | 8,356 | | |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

| Months. | Haddock. | | | | | | | | Hake. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2½ pounds). | | | | Scrod (1 to 2½ pounds). | | | | Large (6 pounds and over). | | | | Small (under 6 pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| January | 2,516,592 | $204,155 | ..... | ..... | 733,713 | $39,962 | ..... | ..... | 5,063 | $731 | ..... | ..... | 58,729 | $5,268 | ..... | ..... |
| February | 3,739,185 | 271,190 | ..... | ..... | 753,005 | 34,332 | ..... | ..... | 3,050 | 357 | ..... | ..... | 30,876 | 2,669 | ..... | ..... |
| March | 4,658,010 | 288,361 | ..... | ..... | 784,125 | 33,915 | ..... | ..... | 3,145 | 335 | ..... | ..... | 40,885 | 2,516 | ..... | ..... |
| April | 3,501,365 | 128,652 | ..... | ..... | 542,875 | 14,507 | ..... | ..... | 2,260 | 181 | ..... | ..... | 16,560 | 752 | ..... | ..... |
| May | 3,036,590 | 123,604 | ..... | ..... | 721,820 | 13,740 | ..... | ..... | 48,560 | 2,898 | ..... | ..... | 120,475 | 4,566 | ..... | ..... |
| June | 2,174,983 | 127,129 | ..... | ..... | 458,355 | 15,824 | ..... | ..... | 25,175 | 1,221 | ..... | ..... | 44,420 | 1,922 | ..... | ..... |
| July | 3,344,996 | 149,799 | ..... | ..... | 368,405 | 11,348 | ..... | ..... | 158,723 | 8,456 | ..... | ..... | 139,045 | 7,964 | ..... | ..... |
| August | 4,204,206 | 186,969 | ..... | ..... | 205,780 | 7,033 | ..... | ..... | 183,475 | 9,718 | ..... | ..... | 244,168 | 11,663 | ..... | ..... |
| September | 5,985,043 | 258,267 | ..... | ..... | 426,353 | 13,179 | ..... | ..... | 191,819 | 13,607 | ..... | ..... | 195,102 | 10,944 | ..... | ..... |
| October | 5,075,598 | 240,521 | ..... | ..... | 424,725 | 14,369 | ..... | ..... | 160,915 | 12,208 | ..... | ..... | 358,358 | 16,872 | ..... | ..... |
| November | 4,516,580 | 225,772 | ..... | ..... | 296,862 | 9,837 | ..... | ..... | 156,901 | 12,331 | ..... | ..... | 449,089 | 17,253 | ..... | ..... |
| December | 3,387,680 | 245,513 | ..... | ..... | 328,960 | 17,289 | ..... | ..... | 47,657 | 5,854 | ..... | ..... | 317,860 | 21,317 | ..... | ..... |
| Total | 46,140,828 | 2,449,932 | ..... | ..... | 6,044,978 | 225,335 | ..... | ..... | 986,743 | 67,897 | ..... | ..... | 2,015,567 | 103,706 | ..... | ..... |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | | | | |
| January | 43,288 | 3,284 | ..... | ..... | ..... | ..... | ..... | ..... | 24,752 | 2,953 | ..... | ..... | ..... | ..... | ..... | ..... |
| February | 55,322 | 4,538 | ..... | ..... | 14,320 | 732 | ..... | ..... | 6,302 | 469 | ..... | ..... | 150 | ,3 | ..... | ..... |
| March | 794,639 | 33,857 | ..... | ..... | 175,235 | 6,209 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| April | 1,720,958 | 54,053 | ..... | ..... | 181,865 | 5,493 | ..... | ..... | 1,340 | 34 | 185 | $7 | ..... | ..... | ..... | ..... |
| May | 1,279,061 | 34,858 | 200 | $8 | 380 | 8 | ..... | ..... | 19,763 | 494 | 877 | 31 | ..... | ..... | ..... | ..... |
| June | 391,568 | 10,337 | 14,110 | 622 | ..... | ..... | ..... | ..... | 47,820 | 1,225 | 10,130 | 355 | ..... | ..... | ..... | ..... |
| July | 1,208,374 | 31,261 | 20,545 | 924 | ..... | ..... | 6,810 | $238 | 160,345 | 4,329 | 11,665 | 473 | ..... | ..... | ..... | ..... |
| August | 1,219,290 | 30,544 | 2,230 | 100 | ..... | ..... | ..... | ..... | 160,295 | 4,378 | 4,070 | 183 | ..... | ..... | ..... | ..... |
| September | 572,960 | 15,813 | 7,480 | 411 | 42,600 | 1,172 | ..... | ..... | 93,800 | 2,826 | 4,195 | 191 | ..... | ..... | ..... | ..... |
| October | 166,979 | 7,833 | 1,575 | 110 | ..... | ..... | 8,829 | 618 | 1,862 | 79 | ..... | ..... | ..... | ..... | ..... | ..... |
| November | 388,706 | 16,789 | 6,713 | 470 | 45,290 | 1,132 | ..... | ..... | 17,220 | 532 | 2,645 | 145 | ..... | ..... | 460 | $25 |
| December | 82,923 | 6,295 | ..... | ..... | 1,900 | 62 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | 7,924,068 | 249,512 | 52,853 | 2,645 | 461,590 | 14,808 | 15,639 | 856 | 533,499 | 17,319 | 33,767 | 1,385 | 150 | 3 | 460 | 25 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LANDED AT PORTLAND. | | | | | | | | | | | | | | | | |
| January | 68,551 | 9,442 | ..... | ..... | 5,479 | 435 | ..... | ..... | 4,183 | 493 | ..... | ..... | 21,059 | 1,537 | ..... | ..... |
| February | 213,117 | 20,720 | ..... | ..... | 10,687 | 610 | ..... | ..... | 2,606 | 271 | ..... | ..... | 34,041 | 2,114 | ..... | ..... |
| March | 141,946 | 10,420 | ..... | ..... | 5,976 | 283 | ..... | ..... | 12,937 | 936 | 740 | 33 | 65,615 | 3,376 | ..... | ..... |
| April | 803,893 | 30,755 | ..... | ..... | 10,604 | 311 | ..... | ..... | 20,020 | 1,074 | ..... | ..... | 30,231 | 863 | ..... | ..... |
| May | 1,197,719 | 41,899 | ..... | ..... | 9,112 | 220 | ..... | ..... | 11,588 | 597 | ..... | ..... | 60,598 | 1,864 | ..... | ..... |
| June | 1,451,422 | 44,339 | ..... | ..... | 1,312 | 39 | ..... | ..... | 11,989 | 655 | ..... | ..... | 48,601 | 1,681 | ..... | ..... |
| July | 754,062 | 26,786 | ..... | ..... | 433 | 18 | ..... | ..... | 11,153 | 664 | ..... | ..... | 38,096 | 1,586 | ..... | ..... |
| August | 600,551 | 21,335 | ..... | ..... | 219 | 10 | ..... | ..... | 20,341 | 1,180 | ..... | ..... | 80,124 | 2,912 | ..... | ..... |
| September | 33,497 | 1,927 | ..... | ..... | 1,053 | 46 | ..... | ..... | 67,848 | 5,875 | ..... | ..... | 267,678 | 13,237 | ..... | ..... |
| October | 276,854 | 13,814 | ..... | ..... | 9,813 | 371 | ..... | ..... | 78,860 | 5,631 | ..... | ..... | 407,054 | 15,270 | ..... | ..... |
| November | 176,345 | 11,115 | ..... | ..... | 5,151 | 186 | ..... | ..... | 55,767 | 3,368 | ..... | ..... | 206,455 | 7,449 | ..... | ..... |
| December | 241,574 | 20,590 | ..... | ..... | 12,215 | 517 | ..... | ..... | 16,744 | 1,719 | ..... | ..... | 136,315 | 8,365 | ..... | ..... |
| Total | 5,959,531 | 253,142 | ..... | ..... | 72,054 | 3,046 | ..... | ..... | 314,036 | 22,463 | 740 | 33 | 1,395,867 | 60,254 | ..... | ..... |
| Grand total | 60,024,427 | 2,952,586 | 52,853 | 2,645 | 6,578,622 | 243,189 | 15,639 | 856 | 1,834,278 | 107,679 | 34,507 | 1,418 | 3,411,584 | 163,963 | 460 | 25 |
| Grounds E. of 66° W. long | 17,136,196 | 650,701 | 52,853 | 2,645 | 1,444,685 | 50,320 | 15,639 | 856 | 520,158 | 17,609 | 34,402 | 1,414 | 252,896 | 10,812 | 460 | 25 |
| Grounds W. of 66° W. long | 42,888,231 | 2,301,885 | ..... | ..... | 5,133,937 | 192,869 | ..... | ..... | 1,314,120 | 90,070 | 105 | 4 | 3,158,688 | 153,151 | ..... | ..... |
| Landed at Boston in 1917 | 34,042,297 | 1,788,206 | ..... | ..... | 11,474,315 | 395,211 | ..... | ..... | 1,314,469 | 72,879 | ..... | ..... | 3,665,866 | 157,661 | ..... | ..... |
| Landed at Gloucester in 1917 | 2,585,187 | 92,977 | 159,493 | 4,899 | 64,715 | 699 | 600 | 16 | 733,856 | 21,555 | 72,202 | 2,241 | 1,570 | 56 | ..... | ..... |
| Landed at Portland in 1917 | 4,981,768 | 225,784 | ..... | ..... | 246,460 | 8,910 | ..... | ..... | 374,655 | 22,527 | 880 | 34 | 1,749,139 | 64,346 | 2,009 | 86 |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

| Months. | Pollock. | | | | Cusk. | | | | Halibut. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| January | 92,987 | $7,011 | ..... | ..... | 98,422 | $5,312 | ..... | ..... | 6,396 | $2,144 | ..... | ..... |
| February | 138,712 | 11,801 | ..... | ..... | 65,957 | 3,726 | ..... | ..... | 38,017 | 10,251 | ..... | ..... |
| March | 104,765 | 7,489 | ..... | ..... | 78,085 | 3,815 | ..... | ..... | 18,911 | 5,082 | ..... | ..... |
| April | 173,530 | 7,793 | ..... | ..... | 84,694 | 2,897 | ..... | ..... | 30,946 | 7,179 | ..... | ..... |
| May | 342,767 | 13,793 | ..... | ..... | 191,165 | 5,385 | ..... | ..... | 187,124 | 33,482 | ..... | ..... |
| June | 313,422 | 15,682 | ..... | ..... | 48,495 | 1,703 | ..... | ..... | 66,297 | 9,751 | ..... | ..... |
| July | 634,543 | 35,563 | ..... | ..... | 118,481 | 4,439 | ..... | ..... | 102,178 | 13,802 | ..... | ..... |
| August | 733,714 | 50,077 | ..... | ..... | 44,817 | 2,373 | ..... | ..... | 64,337 | 11,587 | ..... | ..... |
| September | 541,408 | 40,773 | ..... | ..... | 58,295 | 2,629 | ..... | ..... | 89,378 | 16,012 | ..... | ..... |
| October | 525,035 | 29,133 | ..... | ..... | 93,255 | 3,768 | ..... | ..... | 31,408 | 7,999 | ..... | ..... |
| November | 510,183 | 21,274 | ..... | ..... | 57,499 | 2,065 | ..... | ..... | 31,372 | 9,364 | ..... | ..... |
| December | 180,405 | 9,880 | ..... | ..... | 149,238 | 6,570 | ..... | ..... | 20,591 | 8,001 | ..... | ..... |
| Total | 4,291,471 | 250,269 | ..... | ..... | 1,088,403 | 44,682 | ..... | ..... | 686,955 | 134,654 | ..... | ..... |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| January | 297,166 | 27,069 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| February | 15,257 | 1,157 | ..... | ..... | 13,684 | 737 | ..... | ..... | 776 | 146 | ..... | ..... |
| March | 255,719 | 14,519 | ..... | ..... | 22,725 | 784 | ..... | ..... | 12,184 | 2,061 | ..... | ..... |
| April | 190,214 | 8,172 | 4,990 | $115 | 36,460 | 706 | 390 | $17 | 46,642 | 6,772 | ..... | ..... |
| May | 1,208,102 | 28,358 | ..... | ..... | 151,547 | 4,130 | ..... | ..... | 84,707 | 14,623 | ..... | ..... |
| June | 660,746 | 15,631 | 28,408 | 1,082 | 25,570 | 763 | 85 | 3 | 242,230 | 32,500 | 2,663 | $276 |
| July | 104,412 | 2,833 | 14,360 | 646 | 207,736 | 6,893 | 11,005 | 443 | 219,843 | 31,481 | 3,625 | 412 |
| August | 90,630 | 2,257 | 5,310 | 239 | 105,420 | 2,848 | 1,880 | 95 | 75,915 | 10,036 | 85 | 7 |
| September | 38,270 | 1,045 | 190 | 10 | 77,406 | 2,266 | 580 | 35 | 84,383 | 12,091 | 4,500 | 540 |
| October | 5,817,544 | 176,473 | ..... | ..... | 23,175 | 729 | ..... | ..... | 4,898 | 766 | 40 | 3 |
| November | 7,220,356 | 216,921 | ..... | ..... | 10,220 | 327 | ..... | ..... | 86 | 32 | 18 | 2 |
| December | 4,849,386 | 167,377 | ..... | ..... | 3,655 | 122 | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | 20,747,802 | 661,812 | 53,258 | 2,092 | 677,598 | 20,305 | 13,940 | 593 | 771,664 | 110,508 | 10,931 | 1,240 |
| LANDED AT PORTLAND. | | | | | | | | | | | | |
| January | 21,455 | 1,903 | ..... | ..... | 34,243 | 2,636 | ..... | ..... | 127 | 19 | ..... | ..... |
| February | 20,380 | 1,752 | ..... | ..... | 31,795 | 2,435 | ..... | ..... | 9,119 | 2,145 | ..... | ..... |
| March | 77,276 | 3,830 | ..... | ..... | 78,470 | 4,035 | ..... | ..... | 14,783 | 2,365 | ..... | ..... |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April | 144,592 | 4,156 | | | 180,826 | 5,164 | | | 16,460 | 2,493 | | |
| May | 184,174 | 4,163 | | | 56,272 | 1,501 | | | 9,276 | 1,728 | | |
| June | 334,912 | 5,920 | | | 25,738 | 1,000 | | | 49,603 | 8,168 | | |
| July | 189,270 | 5,377 | | | 58,925 | 2,889 | | | 16,063 | 2,953 | | |
| August | 21,389 | 1,118 | | | 48,501 | 2,069 | | | 27,085 | 5,468 | | |
| September | 38,657 | 2,193 | | | 75,612 | 3,858 | | | 81,779 | 14,223 | | |
| October | 222,365 | 9,421 | | | 128,618 | 5,147 | | | 59,498 | 9,213 | | |
| November | 174,494 | 6,435 | | | 94,982 | 3,173 | | | 25,608 | 6,630 | | |
| December | 39,125 | 1,644 | | | 64,337 | 3,544 | | | 2,053 | 473 | | |
| Total | 1,468,089 | 47,912 | | | 878,319 | 37,451 | | | 311,454 | 55,878 | | |
| Grand total | 26,507,362 | 959,993 | 53,258 | 2,092 | 2,644,320 | 102,438 | 13,940 | 593 | 1,770,073 | 301,040 | 10,931 | 1,240 |
| Grounds E. of 66° W. long | 1,235,477 | 45,218 | 53,258 | 2,092 | 714,975 | 24,102 | 13,940 | 593 | 1,093,359 | 176,595 | 10,931 | 1,240 |
| Grounds W. of 66° W. long | 25,271,885 | 914,775 | | | 1,929,345 | 78,336 | | | 676,714 | 124,445 | | |
| Landed at Boston in 1917 | 4,008,279 | 178,544 | | | 2,052,048 | 71,416 | | | 490,478 | 80,041 | | |
| Landed at Gloucester in 1917 | 9,137,659 | 354,119 | 39,870 | 1,204 | 577,148 | 12,821 | 20,405 | 608 | 907,770 | 96,373 | 42,364 | 3,604 |
| Landed at Portland in 1917 | 1,321,572 | 45,389 | 412 | 12 | 896,202 | 34,198 | 3,500 | 71 | 325,452 | 39,214 | | |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

| Months. | Mackerel. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large (over 2½ pounds). | | | | Medium (1½ to 2½ pounds). | | | | Small (under 1½ pounds). | | | |
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| January | | | | | | | | | | | | |
| February | | | | | | | | | | | | |
| March | | | | | | | | | | | | |
| April | | | | | | | | | | | | |
| May | 216,913 | $31,343 | | | | | | | | | | |
| June | 2,054,582 | 199,711 | 66,000 | $6,930 | 4,485 | $135 | | | | | | |
| July | 2,204,151 | 230,072 | 108,400 | 17,058 | 137,450 | 13,636 | | | | | | |
| August | 371,130 | 61,219 | | | 5,000 | 750 | | | 141,637 | $13,005 | | |
| September | 124,375 | 22,077 | | | 716,235 | 88,539 | 30,220 | $4,479 | 166,790 | 18,282 | 9,400 | $1,504 |
| October | 5,910 | 1,222 | | | 269,057 | 45,713 | | | | | | |
| November | 18,765 | 4,097 | | | 97,569 | 17,376 | | | | | | |
| December | | | | | 31,564 | 5,360 | | | | | | |
| Total | 4,995,826 | 549,741 | 174,400 | 23,988 | 1,261,360 | 171,509 | 30,220 | 4,479 | 308,427 | 31,287 | 9,400 | 1,504 |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | |
| January | | | | | | | | | | | | |
| February | | | | | | | | | | | | |
| March | | | | | | | | | | | | |
| April | | | | | | | | | | | | |
| May | 8,347 | 755 | 400 | 30 | | | | | | | | |
| June | 43,230 | 4,435 | 1,260,563 | 134,733 | | | | | | | | |
| July | 8,600 | 1,290 | 35,200 | 5,538 | 5,251 | 420 | 785,310 | 121,003 | | | | |
| August | | | 69,395 | 13,433 | 238,450 | 12,150 | 26,400 | 3,179 | 200 | 27 | 200 | 27 |
| September | | | 9,000 | 1,565 | | | 99,465 | 16,761 | | | 25,700 | 3,881 |
| October | 23,169 | 4,292 | | | | | 1,000 | 176 | | | | |
| November | 15,626 | 2,719 | | | | | | | | | | |
| December | | | | | | | | | | | | |
| Total | 98,972 | 13,491 | 1,374,558 | 155,299 | 243,701 | 12,570 | 912,175 | 141,119 | 200 | 27 | 25,900 | 3,908 |

| LANDED AT PORTLAND. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | | | | | | | | | | | | |
| February | | | | | | | | | | | | |
| March | | | | | | | | | | | | |
| April | | | | | | | | | | | | |
| May | | | | | | | | | | | | |
| June | 203,742 | 15,429 | 48,200 | 4,820 | 1,518 | 219 | | | | | | |
| July | 4,704 | 764 | | | 13,092 | 2,426 | | | 2,918 | 284 | | |
| August | 88,324 | 11,014 | 1,200 | 168 | 61,765 | 7,419 | | | 66,815 | 7,093 | | |
| September | 140,945 | 21,228 | | | 29,866 | 4,281 | | | 50,545 | 3,702 | | |
| October | 1,748 | 277 | | | | | | | 3,666 | 279 | | |
| November | 4,280 | 599 | | | | | | | | | | |
| December | | | | | | | | | | | | |
| Total | 443,743 | 49,311 | 49,400 | 4,988 | 106,241 | 14,345 | | | 123,944 | 11,358 | | |
| Grand total | 5,538,541 | 612,543 | 1,598,358 | 184,275 | 1,611,302 | 198,424 | 942,395 | 145,598 | 432,571 | 42,672 | 35,300 | 5,412 |
| Grounds E. of 66° W. long | 1,611,121 | 144,909 | 1,374,763 | 146,483 | 4,485 | 135 | | | | | | |
| Grounds W. of 66° W. long | 3,927,420 | 467,634 | 223,595 | 37,792 | 1,606,817 | 198,289 | 942,395 | 145,598 | 432,571 | 42,672 | 35,300 | 5,412 |
| Landed at Boston in 1917 | 5,839,801 | 435,325 | 219,900 | 15,205 | 2,574,546 | 211,151 | 3,600 | 270 | 933,099 | 73,246 | 272,010 | 28,397 |
| Landed at Gloucester in 1917 | 227,425 | 13,910 | 1,301,700 | 156,646 | 517,586 | 25,800 | 1,768,954 | 174,470 | 1,331,930 | 64,552 | 1,844,082 | 211,574 |
| Landed at Portland in 1917 | 450,840 | 34,167 | | | 101,885 | 7,442 | | | 54,705 | 1,964 | | |

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

| Months. | Miscellaneous.[a] | | | | Total. | | | | Grand total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | | |
| LANDED AT BOSTON. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| January | 75,986 | $3,682 | | | 5,085,040 | $377,606 | | | 5,085,040 | $377,606 |
| February | 121,787 | 8,187 | | | 8,609,850 | 618,346 | | | 8,609,850 | 618,346 |
| March | 383,220 | 14,565 | | | 10,294,520 | 604,024 | | | 10,294,520 | 604,024 |
| April | 381,079 | 16,889 | | | 9,495,486 | 393,375 | 35,000 | $1,400 | 9,530,486 | 394,775 |
| May | 874,539 | 27,944 | | | 9,487,194 | 421,359 | | | 9,487,194 | 421,359 |
| June | 478,222 | 16,719 | | | 8,660,872 | 555,143 | 66,000 | 6,930 | 8,726,872 | 562,073 |
| July | 795,893 | 97,445 | | | 11,494,346 | 764,288 | 108,400 | 17,058 | 11,602,746 | 781,346 |
| August | 923,779 | 132,500 | | | 10,144,665 | 669,047 | | | 10,144,665 | 669,047 |
| September | 306,342 | 26,871 | | | 11,491,694 | 693,163 | 39,620 | 5,983 | 11,531,314 | 699,146 |
| October | 449,155 | 25,941 | | | 9,195,838 | 523,409 | | | 9,195,838 | 523,409 |
| November | 324,159 | 17,829 | | | 8,620,246 | 468,406 | | | 8,620,246 | 468,406 |
| December | 371,213 | 15,957 | | | 6,647,270 | 468,217 | | | 6,647,270 | 468,217 |
| Total | 5,485,374 | 404,529 | | | 109,227,021 | 6,556,383 | 249,020 | 31,371 | 109,476,041 | 6,587,754 |
| LANDED AT GLOUCESTER. | | | | | | | | | | |
| January | 106,638 | 7,998 | 3,131,800 | $166,684 | 505,983 | 44,245 | 3,131,800 | 166,684 | 3,637,783 | 210,929 |
| February | 142,045 | 8,518 | 1,649,238 | 79,181 | 429,258 | 29,814 | 1,649,238 | 79,181 | 2,078,496 | 108,995 |
| March | 64,115 | 2,444 | 569,776 | 28,577 | 2,683,173 | 126,429 | 569,776 | 28,577 | 3,252,949 | 155,006 |
| April | | | | | 7,432,946 | 292,917 | 28,200 | 1,596 | 7,461,146 | 294,513 |
| May | 1,578,546 | 19,806 | | | 10,191,144 | 310,453 | 51,785 | 2,999 | 10,242,929 | 313,452 |
| June | 364,389 | 4,386 | | | 7,098,801 | 244,294 | 2,621,642 | 219,537 | 9,720,443 | 463,831 |
| July | 6,600 | 83 | 7,600 | 164 | 6,501,393 | 230,566 | 1,789,573 | 184,540 | 8,290,966 | 415,106 |
| August | | | | | 5,093,455 | 166,350 | 401,181 | 36,526 | 5,494,636 | 202,876 |
| September | | | | | 2,124,244 | 77,561 | 721,135 | 68,003 | 2,845,379 | 145,564 |
| October | | | | | 6,368,119 | 213,203 | 258,257 | 24,623 | 6,626,376 | 237,826 |
| November | 6,500 | 910 | | | 8,395,226 | 271,966 | 76,224 | 7,085 | 8,471,450 | 279,051 |
| December | 31,871 | 1,257 | 874,210 | 46,923 | 5,178,736 | 188,533 | 874,210 | 46,923 | 6,052,946 | 235,456 |
| Total | 2,300,704 | 45,402 | 6,232,624 | 321,529 | 62,002,478 | 2,196,331 | 12,173,021 | 866,274 | 74,175,499 | 3,062,605 |
| LANDED AT PORTLAND. | | | | | | | | | | |
| January | 55,911 | 1,735 | | | 362,837 | 34,099 | | | 362,837 | 34,099 |
| February | 64,692 | 2,110 | | | 549,328 | 43,672 | | | 549,328 | 43,672 |
| March | 56,461 | 1,473 | | | 692,579 | 38,720 | 2,940 | 185 | 695,519 | 38,905 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| April | 20,738 | 601 | | | 1,759,316 | 64,319 | | | 1,759,316 | 64,319 |
| May | 2,332,066 | 39,312 | | | 4,499,315 | 112,567 | | | 4,499,315 | 112,567 |
| June | 3,135,678 | 44,107 | | | 5,837,704 | 142,759 | 48,200 | 4,820 | 5,885,904 | 147,579 |
| July | 657,624 | 10,541 | | | 2,386,495 | 83,797 | | | 2,386,495 | 83,797 |
| August | 40,399 | 4,611 | | | 1,511,342 | 86,099 | 1,200 | 168 | 1,512,542 | 86,267 |
| September | 36,773 | 3,002 | | | 972,634 | 84,580 | 2,732 | 217 | 975,366 | 84,797 |
| October | 59,649 | 3,305 | | | 1,470,691 | 76,807 | | | 1,470,691 | 76,807 |
| November | 43,136 | 1,914 | | | 986,601 | 53,818 | | | 986,601 | 53,818 |
| December | 44,176 | 1,491 | | | 765,699 | 54,562 | | | 765,699 | 54,562 |
| Total | 6,547,303 | 114,202 | | | 21,794,541 | 875,799 | 55,072 | 5,390 | 21,849,613 | 881,189 |
| Grand total | 14,333,381 | 564,133 | 6,232,624 | 321,529 | 193,024,040 | 9,628,513 | 12,477,113 | 903,035 | 205,501,153 | 10,531,548 |
| Grounds E. of 66° W. long | 451,148 | 34,565 | 6,225,024 | 321,365 | 53,872,923 | 2,341,270 | 11,247,593 | 712,617 | 65,120,516 | 3,053,887 |
| Grounds W. of 66° W. long | 13,882,233 | 529,568 | 7,600 | 164 | 139,151,117 | 7,287,243 | 1,229,520 | 190,418 | 140,380,637 | 7,477,661 |
| Landed at Boston in 1917 | 6,615,341 | 425,826 | | | 98,154,629 | *a*,122,568 | 495,510 | 43,872 | 98,650,139 | 5,166,440 |
| Landed at Gloucester in 1917 | 3,404,964 | 50,268 | 6,321,810 | 212,317 | 40,062,098 | 1,366,350 | 18,072,846 | 1,085,134 | 58,134,944 | 2,451,484 |
| Landed at Portland in 1917 | 3,907,240 | 72,267 | | | 18,566,377 | 739,278 | 79,126 | 4,130 | 18,645,503 | 743,408 |

*a* Includes herring from Newfoundland, 161,800 pounds frozen, value $10,508, and 6,225,024 pounds, salted, value $321,365.

The fishery products landed at Boston and Gloucester, Mass., and Portland, Me., by fishing vessels each year are taken principally from fishing grounds lying off the coast of the United States. In the calendar year 1918, 68.10 per cent of the quantity and 70.86 per cent of the value of the catch landed at these ports by American and Canadian fishing vessels were taken from these grounds; 4.36 per cent of the quantity and 4.70 per cent of the value, consisting chiefly of herring, were taken from fishing banks off the coast of Newfoundland; and 27.52 of the quantity and 24.43 per cent of the value from fishing grounds off the Canadian Provinces. Newfoundland herring constituted 3.10 per cent of the quantity and 3.15 per cent of the value of the fishery products landed at these ports during the year. The herring were taken on the treaty coast of Newfoundland, and the cod and other species from that region were obtained from fishing banks on the high seas. All fish caught by American fishing vessels off the Canadian Provinces were from offshore fishing grounds. The catch from each of these regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN AND CANADIAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., IN 1918, FROM GROUNDS OFF THE COAST OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

| Species. | United States. | | Newfoundland. | | Canadian Provinces. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Cod: | | | | | | | | |
| Fresh | 38,747,186 | $2,186,911 | 1,131,625 | $39,770 | 28,458,768 | $1,153,172 | 68,337,579 | $3,379,853 |
| Salted | 20,525 | 1,448 | 627,863 | 50,149 | 2,838,460 | 185,755 | 3,486,848 | 237,352 |
| Haddock: | | | | | | | | |
| Fresh | 47,975,763 | 2,492,810 | 334,245 | 10,967 | 18,293,041 | 691,998 | 66,603,049 | 3,195,775 |
| Salted | ..... | ..... | 11,614 | 786 | 56,878 | 2,715 | 68,492 | 3,501 |
| Hake: | | | | | | | | |
| Fresh | 4,434,193 | 242,142 | 54,145 | 2,012 | 757,524 | 27,488 | 5,245,862 | 271,642 |
| Salted | 105 | 4 | 8,300 | 404 | 26,562 | 1,035 | 34,967 | 1,443 |
| Pollock: | | | | | | | | |
| Fresh | 25,262,430 | 914,511 | 23,050 | 636 | 1,221,882 | 44,846 | 26,507,362 | 959,993 |
| Salted | ..... | ..... | 245 | 11 | 53,013 | 2,081 | 53,258 | 2,092 |
| Cusk: | | | | | | | | |
| Fresh | 1,796,853 | 74,343 | 3,095 | 96 | 844,372 | 27,999 | 2,644,320 | 102,438 |
| Salted | ..... | ..... | 435 | 20 | 13,505 | 573 | 13,940 | 593 |
| Halibut: | | | | | | | | |
| Fresh | 675,692 | 124,194 | 388,507 | 57,949 | 705,874 | 118,897 | 1,770,073 | 301,040 |
| Salted | ..... | ..... | 2,905 | 347 | 8,026 | 893 | 10,931 | 1,240 |
| Mackerel: | | | | | | | | |
| Fresh | 5,966,808 | 708,595 | ..... | ..... | 1,615,606 | 145,044 | 7,582,414 | 853,639 |
| Salted | 1,201,290 | 188,802 | ..... | ..... | 1,374,763 | 146,483 | 2,576,053 | 335,285 |
| Herring: | | | | | | | | |
| Fresh | 8,602,538 | 128,645 | 161,800 | 10,508 | ..... | ..... | 8,764,338 | 139,153 |
| Salted | 7,600 | 164 | 6,225,024 | 321,365 | ..... | ..... | 6,232,624 | 321,529 |
| Swordfish: Fresh | 974,864 | 209,095 | 180 | 47 | 59,047 | 14,050 | 1,034,091 | 223,192 |
| Tilefish: Fresh | 299,420 | 20,246 | ..... | ..... | ..... | ..... | 299,420 | 20,246 |
| Miscellaneous: Fresh | 4,002,011 | 171,395 | ..... | ..... | 233,521 | 10,147 | 4,235,532 | 181,542 |
| Total | 139,967,278 | 7,463,305 | 8,973,033 | 495,067 | 56,560,842 | 2,573,176 | 205,501,153 | 10,531,548 |

*Cod.*—In 1918 the fishing fleet landing fish at Boston, Gloucester, and Portland was considerably larger than in the previous year. There were 5 vessels in the salt bank fishery and 123 in the market fishery landing their fares of cod and other ground fish at these ports. Large quantities of cod were also landed by vessels fishing on the shore grounds. The total catch of cod landed at these ports during the year amounted to 71,824,427 pounds, valued at $3,617,205, of which 68,337,579 pounds, valued at $3,379,853, were fresh, and 3,486,848 pounds, valued at $237,352, were salted. Cod ranked first in importance both in quantity and value among the various species landed.

*Haddock.*—The catch of haddock for the year ranked second to that of cod, the total catch amounting to 66,671,541 pounds, valued at $3,199,276, all of which was landed fresh except 68,492 pounds, valued at $3,501. The greater part of the catch was taken on Georges Bank and in South Channel.

*Hake.*—The yield of hake has fallen off very much in the past few years. In 1918 the catch amounted to 5,280,829 pounds, valued at $273,085, all landed fresh except 34,967 pounds, salted, valued at $1,443. There was a decline of 2,633,817 pounds, or over 33 per cent, in quantity, and $68,300, or 20 per cent, in value as compared with the previous year. In 1916 over 13,000,000 pounds of hake were landed at these ports, and in 1910 the receipts at Boston and Gloucester were nearly 20,000,000 pounds.

*Pollock.*—The pollock catch was much larger than usual, the quantity landed amounting to 26,560,620 pounds, valued at $962,085, all landed fresh except 53,258 pounds, salted, valued at $2,092.

*Cusk.*—The quantity of cusk landed was small as compared with recent previous years, amounting to only 2,658,260 pounds, valued at $103,031, of which 13,940 pounds, valued at $593, were salted. The catch of this species is usually from upwards of three million to upwards of six million pounds.

*Halibut.*—The yield of halibut was 1,781,004 pounds, valued at $302,280, which was all landed fresh except 10,931 pounds, salted, valued at $1,240. There was an increase in quantity over the previous year of less than 1 per cent, but an increase in value of 37.88 per cent.

*Mackerel.*—The total catch of fresh mackerel taken by the American fishing fleet in 1918 was 69,314 barrels, compared with 111,932 barrels the previous year, a decrease of 42,618 barrels. The output of salted mackerel was 13,030 barrels, as compared with 32,162 barrels the previous year, a decrease of 19,132 barrels. The quantity of mackerel landed at Boston, Gloucester, and Portland by the fishing fleet during the year was 10,158,467 pounds, valued at $1,188,924, of which 7,582,414 pounds, valued at $853,639, were fresh, and 2,576,053 pounds, valued at $335,285, were salted. This quantity includes 29,152 pounds of fresh mackerel, valued at $2,423, from the Cape Shore, landed by Canadian vessels.

The southern mackerel fleet numbered about 35 sail of seiners and 125 sail of netters. The seiners had a light catch, and reported considerable quantities of mackerel, but that they were wild, chasing live feed, and therefore hard to catch. They did not school much at night, but mostly during the day. The first seiner arrived at New York on May 6 with 13,000 large and medium mackerel, which were sold at 18 to 20 cents per pound. These fish were taken in 34 fathoms of water. The netters did not land as many mackerel as the previous year, but, owing to the higher prices received, they did well financially. The mackerel landed by the southern fleet this year were all large and medium fish and sold at 13 to 20 cents per pound, according to market conditions.

The Cape Shore fleet numbered 38 vessels, being a little larger than the previous year. No vessel made more than one trip. A large body of fish was reported and all the vessels returned with good catches. The catch taken on the Cape Shore amounted to 1,689,000 pounds of fresh mackerel and 7,558 barrels salted, compared with 2,229,900 pounds fresh and 7,131 barrels salted the previous year.

The first arrival from the Cape Shore was on June 8, and consisted of 50,000 large and medium fresh mackerel, which sold at 10½ cents per pound. One schooner, on her Cape Shore mackerel trip, obtained 95,000 pounds fresh and 375 barrels of salted mackerel, and stocked $15,665, the crew sharing $343 each. This is said to be the largest stock ever made on a single mackerel trip.

*Swordfish.*—The quantity of swordfish landed during the year was 1,034,091 pounds, valued at $223,192. The number of vessels engaged in this fishery was 37, or 5 less than in the previous year.

*Flounders.*—The catch of flounders in the vessel fisheries amounted to 2,269,807 pounds, valued at $93,800. There was an increase in the catch of flounders over the previous year of 990,086 pounds, or 77.36 per cent, in quantity, and $48,864, or 108.74 per cent, in value. The catch taken by boats under 5 tons net tonnage is not included in these statistics.

## VESSEL FISHERIES AT SEATTLE, WASH.

In the vessel fisheries at Seattle, Wash., there has been an increase in both the quantity and value of products landed by the fishing fleet, but a decrease in the products landed by collecting vessels as compared with the previous year. Statistics of the vessel fisheries at Seattle have been collected by the local agent and published as monthly and annual statistical bulletins, giving the quantity and value of fishery products landed by American fishing and collecting vessels at that port.

In 1918 the fishing fleet at Seattle landed 834 trips, aggregating 17,091,695 pounds of fish, having a value to the fishermen of $1,887,653. This catch was taken from the fishing grounds along the coast from the Oregon and Washington coasts to Portlock Bank, Alaska. The largest quantities were taken from Grays Harbor Grounds, Flattery Banks, west coast of Vancouver Island, Hecate Strait, and Portlock Bank. The products included halibut, 10,244,200 pounds, valued at $1,528,846; cod, 85,300 pounds, valued at $2,202; sablefish, 4,354,950 pounds, valued at $271,167; "lingcod," 1,784,600 pounds, valued at $62,292; rockfishes, 620,770 pounds, valued at $22,899; and sturgeon, 1,875 pounds, valued at $247. Compared with the previous year, there was an increase of 214 trips by fishing vessels, and of 437,751 pounds, or 2.64 per cent, in the quantity, and $148,851, or 8.56 per cent, in the value of the products landed. The catch of salmon by these vessels was not so large as in the previous year, but there was a large increase in the catch of sablefish, "lingcod", and rockfishes.

The fishery products taken in Puget Sound and landed at Seattle by collecting vessels during the year amounted to 10,605,323 pounds, valued at $912,598. These products included salmon, 8,929,745 pounds, valued at $811,028; steelhead trout, 433,756 pounds, valued at $57,724; herring, 580,200 pounds, valued at $11,853; smelt, 121,850 pounds, valued at $7,019; sole, 138,935 pounds, valued at $5,307; crabs, 139,821 pounds, valued at $10,368; and other species amounting to 261,016 pounds, valued at $9,299. In the products landed by collecting vessels there was a decrease from the previous year of 2,216,030 pounds, or 17.28 per cent, in quantity, and $75,961, or 7.68 per cent, in value. The quantity and value of fishing products landed at Seattle by fishing and collecting vessels in 1918 are given in detail in the following table:

## QUANTITIES AND VALUES OF CERTAIN FRESH FISHERY PRODUCTS LANDED AT SEATTLE, WASH., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1918.

### BY FISHING GROUNDS.

| | Number of trips. | Halibut. | | Cod. | | Sablefish. | | "Lingcod." | | Rockfishes. | | Sturgeon. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Oregon and Washington coasts | 24 | 519,500 | $76,138 | ..... | ..... | 231,000 | $14,685 | 135,500 | $4,450 | 21,000 | $965 | ..... | ..... | 907,000 | $96,238 |
| Columbia River grounds | 11 | 218,500 | 34,394 | ..... | ..... | 266,000 | 17,365 | 43,000 | 1,925 | 8,000 | 610 | ..... | ..... | 535,500 | 54,294 |
| Grays Harbor grounds | 31 | 298,400 | 44,789 | ..... | ..... | 713,000 | 47,811 | 42,000 | 1,295 | 17,000 | 525 | ..... | ..... | 1,070,400 | 94,420 |
| Flattery Banks | 480 | 3,038,950 | 460,646 | ..... | ..... | 1,903,200 | 114,872 | 1,184,000 | 40,613 | 286,000 | 10,432 | 475 | $72 | 6,412,625 | 626,635 |
| West coast Vancouver Island | 133 | 1,223,150 | 190,400 | ..... | ..... | 710,400 | 42,383 | 318,100 | 11,699 | 135,900 | 5,257 | 800 | 80 | 2,388,350 | 249,819 |
| Queen Charlotte Islands grounds | 3 | 97,000 | 19,560 | ..... | ..... | 14,000 | 840 | 6,000 | 240 | ..... | ..... | ..... | ..... | 117,000 | 20,640 |
| Hecate Strait | 113 | 2,573,800 | 372,388 | ..... | ..... | 416,800 | 27,167 | 53,500 | 1,985 | 142,000 | 4,690 | 600 | 95 | 3,186,700 | 406,325 |
| Forrester Island grounds | 2 | 32,000 | 5,860 | ..... | ..... | 4,000 | 240 | ..... | ..... | ..... | ..... | ..... | ..... | 36,000 | 6,100 |
| Coronation Island | 2 | 85,000 | 12,378 | ..... | ..... | 15,000 | 1,110 | ..... | ..... | ..... | ..... | ..... | ..... | 100,000 | 13,488 |
| Yakutat grounds | 15 | 820,300 | 125,811 | 51,000 | $1,380 | 51,150 | 2,989 | ..... | ..... | 9,100 | 367 | ..... | ..... | 931,550 | 130,547 |
| Cape Cleare grounds | 3 | 213,000 | 33,240 | ..... | ..... | 14,200 | 917 | ..... | ..... | ..... | ..... | ..... | ..... | 227,200 | 34,157 |
| Portlock Bank | 17 | 1,124,600 | 153,242 | 34,300 | 822 | 16,200 | 788 | 2,500 | 85 | 1,770 | 53 | ..... | ..... | 1,179,370 | 154,990 |
| Total | 834 | 10,244,200 | 1,528,846 | 85,300 | 2,202 | 4,354,950 | 271,167 | 1,784,600 | 62,292 | 620,770 | 22,899 | 1,875 | 247 | 17,091,695 | 1,887,653 |

### BY MONTHS.

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 9 | 233,200 | $43,549 | 5,100 | $204 | 53,350 | $2,514 | 5,000 | $200 | 5,000 | $200 | ..... | ..... | 301,650 | $46,667 |
| February | 18 | 327,000 | 60,925 | ..... | ..... | 53,500 | 3,048 | 40,200 | 1,608 | 8,100 | 327 | ..... | ..... | 428,800 | 65,908 |
| March | 41 | 417,300 | 62,093 | 15,000 | 300 | 85,600 | 5,445 | 76,300 | 3,981 | 52,500 | 2,762 | ..... | ..... | 646,700 | 74,581 |
| April | 113 | 959,300 | 139,789 | 25,200 | 498 | 139,800 | 9,340 | 417,500 | 15,095 | 107,870 | 4,939 | 1,075 | $167 | 1,650,745 | 169,828 |
| May | 131 | 1,553,300 | 220,424 | ..... | ..... | 359,200 | 23,421 | 651,000 | 19,635 | 105,800 | 3,191 | 800 | 80 | 2,670,100 | 266,751 |
| June | 110 | 1,339,000 | 198,794 | ..... | ..... | 542,200 | 38,021 | 195,600 | 6,813 | 83,500 | 2,628 | ..... | ..... | 2,160,300 | 246,256 |
| July | 90 | 1,429,550 | 198,140 | ..... | ..... | 733,000 | 49,592 | 92,000 | 3,170 | 71,500 | 2,435 | ..... | ..... | 2,326,050 | 253,337 |
| August | 103 | 1,352,650 | 181,949 | ..... | ..... | 974,800 | 62,565 | 63,500 | 1,725 | 44,000 | 1,280 | ..... | ..... | 2,434,950 | 247,519 |
| September | 103 | 1,565,800 | 230,708 | 36,000 | 1,080 | 875,600 | 48,645 | 104,000 | 3,725 | 67,500 | 2,047 | ..... | ..... | 2,648,900 | 286,205 |
| October | 70 | 710,700 | 120,610 | 4,000 | 120 | 417,000 | 21,640 | 46,000 | 1,510 | 33,000 | 970 | ..... | ..... | 1,210,700 | 144,850 |
| November | 33 | 240,900 | 48,700 | ..... | ..... | 98,800 | 5,310 | 44,000 | 1,570 | 21,000 | 650 | ..... | ..... | 404,700 | 56,230 |
| December | 13 | 115,500 | 23,165 | ..... | ..... | 22,100 | 1,626 | 49,500 | 3,260 | 21,000 | 1,470 | ..... | ..... | 208,100 | 29,521 |
| Total | 834 | 10,244,200 | 1,528,846 | 85,300 | 2,202 | 4,354,950 | 271,167 | 1,784,600 | 62,292 | 620,770 | 22,899 | 1,875 | 247 | 17,091,695 | 1,887,653 |

FISHERY PRODUCTS, BY MONTHS, TAKEN IN PUGET SOUND AND LANDED AT SEATTLE, WASH., BY COLLECTING VESSELS DURING THE YEAR 1918.

| Species. | January. | | February. | | March. | | April. | | May. | | June. | | July. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Skates | | | | | | | | | 1,700 | $85 | 830 | $27 | 370 | $14 |
| Sturgeon | | | | | 324,200 | $4,863 | | | 46,000 | 690 | | | | |
| Herring | | | | | | | | | | | | | | |
| Salmon: | | | | | | | | | | | | | | |
| Humpback or pink | | | | | | | | | | | | | 1,200 | 72 |
| Chum or keta | 10,000 | $1,100 | | | | | | | | | | | 4,280 | 340 |
| King or spring | 5,000 | 700 | | | | | 10,490 | $1,560 | 500,600 | 62,000 | 413,500 | 53,755 | 1,983,200 | 198,320 |
| Coho or silver | | | | | | | | | | | 34,800 | 3,480 | 10,328 | 1,032 |
| Sockeye or red | | | | | | | | | 2,200 | 275 | 9,220 | 1,198 | 12,880 | 1,288 |
| Miscellaneous | | | | | | | 25,750 | 3,962 | 55,410 | 6,926 | 25,800 | 2,580 | 5,100 | 510 |
| Trout: Steelhead | 8,000 | 1,200 | 16,100 | $2,445 | 3,000 | 450 | 14,376 | 2,300 | 215,000 | 26,775 | 7,430 | 817 | 14,640 | 1,464 |
| Smelt | | | 2,300 | 115 | | | | | | | 790 | 94 | | |
| Perch | | | 700 | 35 | | | | | 10,600 | 530 | | | | |
| Rockfishes | | | 1,000 | 70 | | | 3,240 | 260 | | | 1,720 | 41 | 1,200 | 84 |
| "Lingcod" | 2,000 | 120 | | | | | 600 | 30 | | | 6,830 | 273 | | |
| Sablefish | | | | | | | | | | | 3,700 | 142 | | |
| Cod | 2,000 | 60 | 40,000 | 1,400 | | | | | | | | | | |
| Flounders | | | 4,000 | 120 | 4,300 | 86 | 3,500 | 85 | 13,550 | 405 | 7,840 | 196 | 3,600 | 108 |
| Sole | 5,000 | 200 | 13,855 | 554 | 15,500 | 620 | 9,500 | 380 | 24,050 | 960 | 4,000 | 140 | 860 | 34 |
| Other fish | 20,000 | 400 | | | | | | | | | | | | |
| Octopus | | | | | | | | | | | | | 560 | 11 |
| Crabs | 16,368 | 981 | 7,238 | 403 | 13,530 | 2,029 | 9,680 | 804 | 14,080 | 970 | 2,684 | 183 | | |
| Total | 68,368 | 4,761 | 85,193 | 5,142 | 360,530 | 8,048 | 77,136 | 9,381 | 883,190 | 99,616 | 519,144 | 62,926 | 2,038,218 | 203,277 |

| Species. | August. | | September. | | October. | | November. | | December. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. |
| Skates | 7,970 | $159 | 21,500 | $645 | 8,270 | $168 | 5,000 | $150 | ..... | ..... | 42,740 | $1,122 |
| Sturgeon | 1,080 | 108 | 870 | 87 | 1,680 | 201 | 460 | 34 | ..... | ..... | 6,990 | 556 |
| Herring | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 210,000 | $6,300 | 580,200 | 11,853 |
| Salmon: | | | | | | | | | | | | |
| Humpback or pink | 11,210 | 660 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12,410 | 732 |
| Chum or keta | 66,900 | 2,155 | 336,000 | 10,080 | 1,768,960 | 88,448 | 331,820 | 33,180 | 360,000 | 43,200 | 2,877,960 | 178,503 |
| King or spring | 614,220 | 61,420 | 644,800 | 64,480 | 52,837 | 5,280 | 20,460 | 2,046 | ..... | ..... | 4,245,107 | 449,561 |
| Coho or silver | 160,687 | 16,068 | 588,950 | 58,950 | 800,930 | 80,009 | 35,800 | 3,580 | ..... | ..... | 1,631,488 | 163,119 |
| Sockeye or red | 6,220 | 622 | 8,000 | 30 | ..... | ..... | ..... | ..... | ..... | ..... | 38,520 | 3,413 |
| Miscellaneous | 2,200 | 222 | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | 1,500 | 124,260 | 15,700 |
| Trout: Steelhead | 1,860 | 186 | 2,080 | 20 | 7,810 | 781 | 2,660 | 266 | 140,800 | 21,020 | 433,756 | 57,724 |
| Smelt | 14,230 | 852 | 34,080 | 1,704 | 14,180 | 850 | 26,070 | 1,280 | 30,200 | 2,124 | 121,850 | 7,019 |
| Perch | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11,300 | 565 |
| Rockfishes | 9,816 | 352 | 4,800 | 240 | 6,300 | 431 | 1,600 | 112 | 6,800 | 476 | 36,476 | 2,066 |
| "Lingcod" | ..... | ..... | ..... | ..... | 9,280 | 278 | ..... | ..... | ..... | ..... | 18,710 | 701 |
| Sablefish | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,700 | 142 |
| Cod | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 42,000 | 1,460 |
| Flounders | 9,680 | 288 | 10,600 | 318 | 7,870 | 236 | 2,600 | 104 | 11,000 | 330 | 78,540 | 2,276 |
| Sole | 9,800 | 294 | 18,000 | 630 | 19,000 | 720 | 5,120 | 205 | 14,250 | 570 | 138,935 | 5,307 |
| Other fish | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20,000 | 400 |
| Octopus | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 560 | 11 |
| Crabs | ..... | ..... | ..... | ..... | 20,691 | 1,312 | ..... | ..... | 55,550 | 3,686 | [a] 139,821 | 10,368 |
| Total | 915,866 | 83,386 | 1,669,680 | 137,184 | 2,717,808 | 178,714 | 431,590 | 40,957 | 838,600 | 79,206 | 10,605,323 | 912,598 |

[a] 6,294 dozen.

## FISHERIES OF THE GREAT LAKES, LAKE OF THE WOODS, AND RAINY LAKE IN 1917.

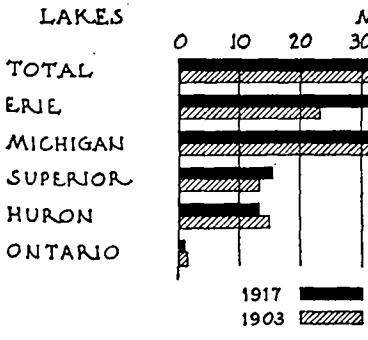
A statistical canvass of the fisheries of the Great Lakes, including Lake of the Woods, Rainy Lake, and Lakes Kabetogama and La Croix, was made during the year for the calendar year 1917.

The number of persons engaged in the fisheries of these waters in 1917 was 9,416; the investment was $10,732,879; and the products amounted to 105,926,392 pounds, valued at $6,416,477.

In the fisheries of the Great Lakes the number of persons engaged was 9,221; the investment in vessels, boats, fishing apparatus, shore and accessory property, and cash capital was $10,555,669; and the products amounted to 103,759,223 pounds; valued at $6,297,969. The principal species taken, including fresh, salted, and smoked fish, were carp, 7,163,347 pounds, valued at $334,888; ciscoes, 53,429,325 pounds, valued at $2,609,917; blue pike, 2,102,803 pounds, valued at $140,025; wall-eyed pike, 2,496,691 pounds, valued at $298,271; sauger, 3,929,172 pounds, valued at $240,035; sheepshead or drum, 2,901,994 pounds, valued at $70,936; suckers, 5,361,138 pounds, valued at $204,825; lake trout, 13,344,139 pounds, valued at $1,286,704; whitefish, 6,190,748 pounds, valued at $723,167; and yellow perch, 4,206,011 pounds, valued at $245,223. The ciscoes include lake herring, chub, longjaw, bluefin or blackfin, and tullibee.

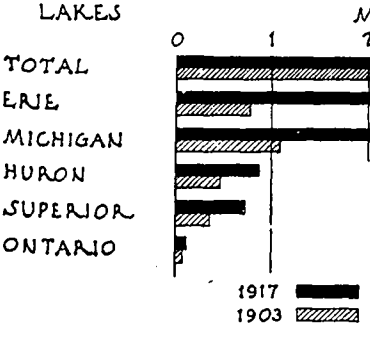
Compared with the returns for 1908, published by the Bureau of the Census, there was an increase of 8.06 per cent in the number of persons engaged, and of 119.27 per cent in the amount of capital invested, but there was a decrease of 2.69 per cent in the quantity, with an increase of 67.14 per cent in the value of the products. There was a large increase in the catch of burbot, cisco or lake herring, sheepshead or drum, and lake trout, but a decrease in carp, pike, pike perch, whitefish, and a number of other species. Compared with the statistics for 1903, published by the Bureau, there was a decrease of 1.20 per cent in the number of persons engaged, but an increase of 41.22 per cent in the amount of capital invested, and of 20.37 per cent in the quantity, and 129.39 per cent in the value of the products. There was considerable increase in nearly all of the more important species except pike perch, lake trout, and yellow perch. The increase in burbot, and possibly some of the other species, is, no doubt, due to the work of the Bureau in encouraging the more extensive use as food of species heretofore little used for that purpose.

In the fisheries of Lake of the Woods and Rainy Lake the number of persons engaged was 195; the investment was $177,210; and the products amounted to 2,167,169 pounds, valued at $118,508. The principal species taken were ciscoes, pike, wall-eyed pike, suckers, and whitefish.




| LAKES | 1917 | 1903 |
|---|---|---|
| TOTAL | 103,759,223 | 86,194,817 |
| ERIE | 38,300,238 | 23,186,556 |
| MICHIGAN | 35,460,628 | 33,579,498 |
| SUPERIOR | 15,447,432 | 13,205,013 |
| HURON | 13,496,537 | 14,977,150 |
| ONTARIO | 1,054,388 | 1,244,600 |

FIG. 3.—Quantities of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.




| LAKES | 1917 | 1903 |
|---|---|---|
| TOTAL | $6,297,969 | $2,745,501 |
| ERIE | 2,330,249 | 780,015 |
| MICHIGAN | 2,270,859 | 1,090,550 |
| HURON | 869,330 | 471,912 |
| SUPERIOR | 726,674 | 343,671 |
| ONTARIO | 100,857 | 59,353 |

FIG. 4.—Values of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.

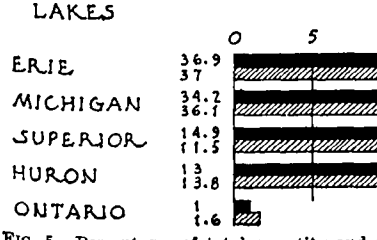
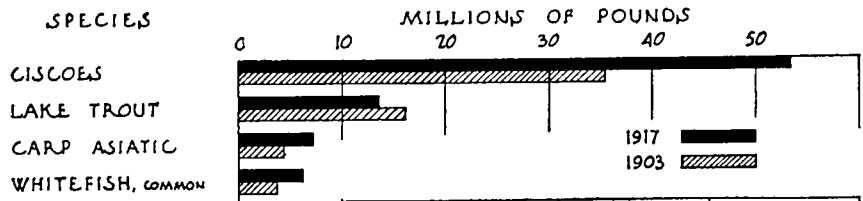
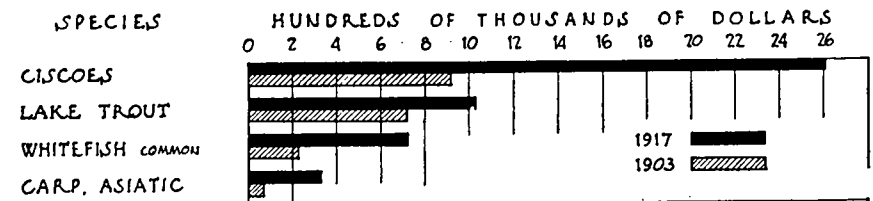



FIG. 5.—Percentages of total quantity and value of fishery products reported for each of the Great Lakes, 1917.




| SPECIES | 1917 | 1903 |
|---|---|---|
| CISCOES | 53,429,325 | 35,438,777 |
| LAKE TROUT | 13,344,139 | 16,131,938 |
| CARP ASIATIC | 7,163,347 | 4,237,643 |
| WHITEFISH, COMMON | 6,190,748 | 3,812,859 |
| SUCKERS | 5,361,138 | 6,694,040 |
| YELLOW PERCH | 4,706,011 | 6,201,723 |
| SAUGER | 3,929,172 | 1,940,355 |
| SHEEPSHEAD OR DRUM | 2,901,994 | 746,021 |
| PIKE PERCH (WALL-EYED PIKE) | 2,496,691 | 3,076,147 |
| PIKE PERCH (BLUE PIKE) | 2,102,803 | 4,981,422 |

FIG. 6.—Quantities of the more important species of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.




| SPECIES | 1917 | 1903 |
|---|---|---|
| CISCOES | $ 2,609,917 | $ 914,468 |
| LAKE TROUT | 1,286,704 | 722,525 |
| WHITEFISH, COMMON | 723,167 | 223,476 |
| CARP, ASIATIC | 334,888 | 71,285 |
| PIKE PERCH (WALL-EYED PIKE) | 298,271 | 168,284 |
| YELLOW PERCH | 245,223 | 139,670 |
| SAUGER | 240,035 | 47,697 |
| SUCKERS | 204,825 | 121,576 |
| PIKE PERCH (BLUE PIKE) | 140,025 | 191,386 |
| SHEEPSHEAD OR DRUM | 70,936 | 5,700 |

FIG. 7.—Values of the more important species of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.

## Statistics of Fisheries of the Great Lakes, Lake of the Woods, and Rainy Lake in 1917.

| Items. | Lake Superior. | | Lake Michigan. | | Lake Huron.[a] | | Lake Erie.[b] | | Lake Ontario.[c] | | Lake of the Woods and Rainy Lake.[d] | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Persons engaged | 1,348 | | 3,313 | | 1,412 | | 2,770 | | 378 | | 195 | | 9,416 | |
| INVESTMENT. | | | | | | | | | | | | | | |
| Vessels fishing, steam | 12 | $52,800 | 92 | $397,650 | 13 | $57,500 | 73 | $469,398 | | | | | 190 | $977,348 |
| Tonnage | 302 | | 1,795 | | 266 | | 1,700 | | | | | | 4,063 | |
| Outfit | | 11,080 | | 122,885 | | 22,450 | | 93,679 | | | | | | 250,094 |
| Vessels fishing, gasoline | 4 | 20,500 | 240 | 234,310 | 13 | 19,000 | 20 | 39,000 | 1 | $1,200 | | | 278 | 314,010 |
| Tonnage | 104 | | 2,113 | | 113 | | 183 | | 8 | | | | 2,521 | |
| Outfit | | 5,550 | | 56,636 | | 5,540 | | 7,986 | | 20 | | | | 75,732 |
| Vessels transporting, steam | 4 | 56,000 | | | 2 | 7,000 | 5 | 24,500 | | | 2 | $9,800 | 13 | 97,300 |
| Tonnage | 194 | | | | 24 | | 111 | | | | 29 | | 358 | |
| Outfit | | 17,880 | | | | 500 | | 5,200 | | | | 6,160 | | 29,740 |
| Vessels transporting, gasoline | 7 | 19,500 | 60 | 38,225 | 19 | 33,500 | 19 | 41,600 | 1 | 1,300 | | | 106 | 134,125 |
| Tonnage | 68 | | 495 | | 169 | | 193 | | 10 | | | | 935 | |
| Outfit | | 3,915 | | 4,515 | | 4,750 | | 9,455 | | 65 | | | | 22,700 |
| Sail and rowboats | 417 | 10,220 | 428 | 9,943 | 370 | 9,660 | 602 | 27,370 | 189 | 4,765 | 3 | 800 | 2,009 | 62,758 |
| Power boats | 280 | 82,405 | 311 | 91,595 | 264 | 104,860 | 414 | 178,815 | 79 | 17,130 | 79 | 27,300 | 1,427 | 502,105 |
| Pound nets and trap nets | 204 | 26,262 | 1,134 | 242,570 | 1,731 | 207,904 | 5,011 | 681,060 | 353 | 21,460 | 185 | 36,250 | 8,618 | 1,215,506 |
| Gill nets | 11,117 | 144,986 | 83,807 | 645,074 | 10,610 | 102,835 | 47,578 | 329,632 | 165 | 15,175 | 220 | 8,150 | 153,497 | 1,245,852 |
| Fyke nets | | | 2,828 | 39,795 | 460 | 12,135 | 801 | 44,403 | 334 | 4,374 | 30 | 400 | 4,453 | 101,107 |
| Seines | 5 | 325 | 61 | 18,120 | 83 | 9,325 | 285 | 38,867 | 12 | 610 | | | 446 | 67,247 |
| Lines | | 5,773 | | 27,868 | | 5,989 | | 741 | | 1,174 | | | | 41,545 |
| Crawfish pots | | | 6,400 | 1,600 | | | | | | | | | 6,400 | 1,600 |
| Fishing machines | | | | | | | | | 7 | 795 | | | 7 | 795 |
| Other apparatus | | | | | | 1,520 | | 10 | | 6 | | | | 1,536 |
| Shore and accessory property | | 341,310 | | 1,758,341 | | 444,092 | | 1,884,165 | | 50,235 | | 81,850 | | 4,559,993 |
| Cash capital | | 42,500 | | 349,800 | | 156,100 | | 456,886 | | 20,000 | | 6,500 | | 1,031,786 |
| Total | | 841,006 | | 4,038,927 | | 1,204,660 | | 4,332,767 | | 138,309 | | 177,210 | | 10,732,879 |

[a] Includes Lake St. Clair and St. Clair River.
[b] Includes men and investment in the wholesale fish trade of Detroit.
[c] Includes St. Lawrence and Niagara Rivers.
[d] Includes Lakes Kabetogama and La Croix.

STATISTICS OF FISHERIES OF THE GREAT LAKES, LAKE OF THE WOODS, AND RAINY LAKE IN 1917—Continued.

| Items. | Lake Superior. | | Lake Michigan. | | Lake Huron. | | Lake Erie. | | Lake Ontario. | | Lake of the Woods and Rainy Lake. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Bowfin | 2,675 | $170 | | | 200 | $4 | 5,165 | $69 | 7,046 | $350 | | | 15,086 | $593 |
| Buffalofish | | | 1,290 | $56 | | | | | | | | | 1,290 | 56 |
| Burbot | | | 166,785 | 1,436 | 2,174 | 51 | 652,870 | 8,027 | 61,760 | 2,388 | 67,740 | $564 | 951,329 | 12,466 |
| Carp, Asiatic | | | 246,503 | 7,500 | 1,230,580 | 48,126 | 5,644,792 | 277,089 | 41,472 | 2,173 | | | 7,163,347 | 334,888 |
| Catfish and bullheads | | | 164,466 | 6,627 | 33,329 | 3,295 | 618,532 | 39,232 | 47,934 | 5,935 | 9,650 | 570 | 873,911 | 55,659 |
| Ciscoes, fresh | 8,994,855 | 319,858 | 15,341,588 | 706,638 | 3,277,573 | 120,705 | 17,160,852 | 1,046,862 | 460,363 | 39,991 | 392,548 | 12,770 | 45,627,779 | 2,246,824 |
| Ciscoes, salted | 3,158,227 | 139,959 | 2,917,766 | 139,344 | 2,100,792 | 94,957 | | | 8,909 | 1,051 | | | 8,185,694 | 375,311 |
| Ciscoes, smoked | 5,400 | 432 | | | 3,000 | 120 | | | | | | | 8,400 | 552 |
| Eel | | | | | | | | | 43,007 | 3,402 | | | 43,007 | 3,402 |
| Gold-eye | | | | | | | | | | | 50,365 | 813 | 50,365 | 813 |
| Muskellunge | | | | | 145 | 15 | | | | | | | 145 | 15 |
| Pike | 5,700 | 555 | 40,597 | 3,375 | 12,354 | 1,175 | 5,666 | 550 | 16,191 | 2,149 | 553,037 | 22,109 | 633,545 | 29,913 |
| Pike perch (blue pike) | | | | | | | 2,057,073 | 135,241 | 45,730 | 4,784 | | | 2,102,803 | 140,025 |
| Pike perch (wall-eyed or yellow pike) | 27,979 | 3,774 | 132,024 | 18,445 | 1,042,642 | 126,431 | 1,291,456 | 149,163 | 2,590 | 458 | 706,279 | 67,615 | 3,202,970 | 365,886 |
| Rock bass | | | 1,714 | 137 | 4,283 | 208 | 100 | 5 | 7,525 | 463 | | | 13,622 | 813 |
| Sauger | | | | | | | 3,929,172 | 240,035 | | | | | 3,929,172 | 240,035 |
| Sheepshead or drum | | | 28,412 | 796 | 17,731 | 615 | 2,855,551 | 69,502 | 300 | 23 | | | 2,901,994 | 70,936 |
| Sturgeon | | | 10,805 | 2,517 | 4,886 | 1,063 | 28,384 | 6,064 | 51,141 | 12,057 | 13,820 | 1,659 | 109,036 | 23,360 |
| Sturgeon caviar | | | 346 | 904 | 227 | 495 | 1,018 | 2,045 | 544 | 1,232 | | | 2,135 | 4,676 |
| Suckers, fresh | 326,203 | 13,184 | 2,103,163 | 74,803 | 1,775,767 | 72,883 | 1,035,934 | 36,403 | 89,111 | 6,317 | 268,980 | 3,584 | 5,599,158 | 207,174 |
| Suckers, salted | 15,850 | 560 | 14,110 | 625 | 1,000 | 50 | | | | | | | 30,960 | 1,235 |
| Sunfish | | | | | 1,650 | 68 | | | 23,885 | 1,327 | | | 25,535 | 1,395 |
| Trout, lake, fresh | 2,581,081 | 215,397 | 8,647,895 | 852,879 | 2,070,797 | 213,790 | 1,922 | 201 | 23,694 | 2,818 | 2,630 | 209 | 13,328,019 | 1,285,294 |
| Trout, lake, salted | 7,272 | 576 | 2,820 | 259 | 8,658 | 784 | | | | | | | 18,750 | 1,619 |
| Trout, steelhead | | | 21,950 | 3,349 | | | | | | | | | 21,950 | 3,349 |
| White bass | | | 1,275 | 77 | | | 286,112 | 17,212 | | | | | 287,387 | 17,289 |
| Whitefish, common, fresh | 302,210 | 30,943 | 3,045,448 | 323,162 | 993,501 | 124,050 | 1,755,947 | 232,761 | 88,347 | 11,720 | 96,185 | 8,095 | 6,281,638 | 730,731 |
| Whitefish, common, salted | | | 1,945 | 201 | 3,350 | 330 | | | | | | | 5,295 | 531 |
| Whitefish, common, caviar | | | | | 1,375 | 257 | | | | | | | 1,375 | 257 |
| Whitefish, Menominee, fresh | 12,080 | 682 | 100,332 | 4,829 | 46,457 | 2,191 | | | | | | | 158,869 | 7,702 |
| Whitefish, Menominee, salted | 2,900 | 228 | 26,103 | 1,973 | 20,017 | 1,200 | | | | | | | 49,020 | 3,401 |
| Yellow perch, fresh | 5,000 | 356 | 2,361,071 | 116,419 | 844,019 | 56,464 | 959,357 | 69,684 | 34,839 | 2,219 | 5,835 | 510 | 4,210,121 | 245,652 |
| Yellow perch, salted | | | 1,725 | 81 | | | | | | | | | 1,725 | 81 |
| Other fish | | | | | 30 | 3 | 10,335 | 104 | | | 100 | 10 | 10,465 | 117 |
| Crawfish | | | 80,495 | 4,427 | | | | | | | | | 80,495 | 4,427 |
| Total | 15,447,432 | 726,674 | 35,460,628 | 2,270,859 | 13,496,537 | 869,330 | 38,300,238 | 2,330,249 | 1,054,388 | 100,857 | 2,167,169 | 118,508 | 105,926,392 | 6,416,477 |

NOTE.—Ciscoes include lake herring, chub, longjaw, bluefin or blackfin, and tullibee.

YIELD OF THE FISHERIES OF THE GREAT LAKES FOR VARIOUS YEARS FROM 1885 TO 1917.[a]

| Years. | Lake Superior. | | Lake Michigan. | | Lake Huron. | | Lake Erie. | | Lake Ontario. | | Lake St. Clair and St. Clair and Detroit Rivers.[b] | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| 1885 | 8,825,980 | $291,523 | 23,518,148 | $878,788 | 11,457,170 | $276,397 | 51,456,517 | $1,109,096 | 2,398,466 | $95,869 | 2,185,795 | $40,193 | 99,842,076 | $2,691,866 |
| 1890 | 6,115,992 | 220,968 | 26,434,266 | 830,465 | 10,056,381 | 221,067 | 64,850,873 | 1,000,905 | 3,446,448 | 124,786 | 2,994,571 | 73,577 | 113,898,531 | 2,471,768 |
| 1893 | 8,096,927 | 252,107 | 30,747,755 | 828,611 | 12,064,338 | 306,381 | 42,968,325 | 805,979 | 928,015 | 31,510 | 1,814,311 | 46,030 | 96,619,671 | 2,270,618 |
| 1899 | 5,429,654 | 150,862 | 34,499,996 | 876,743 | 12,418,327 | 308,078 | 58,393,864 | 1,150,895 | 2,406,332 | 100,997 | 579,067 | 23,864 | 113,727,240 | 2,611,439 |
| 1903 | 13,205,013 | 343,671 | 33,579,498 | 1,090,550 | 14,455,209 | 450,318 | 23,188,556 | 780,015 | 1,244,600 | 59,353 | 521,941 | 21,594 | 86,194,817 | 2,745,501 |
| 1908 | 10,198,000 | 342,000 | 40,019,000 | 1,554,000 | 12,932,000 | 486,000 | 41,922,000 | 1,280,000 | 823,000 | 74,000 | 737,000 | 32,000 | 106,631,000 | 3,768,000 |
| 1917 | 15,447,432 | 726,674 | 35,460,628 | 2,270,859 | 13,363,207 | 857,478 | 38,300,238 | 2,330,249 | 1,054,388 | 100,857 | 133,330 | 11,852 | 103,759,223 | 6,297,969 |

[a] The statistics for 1908 in this table are from data published by the Bureau of the Census.
[b] The decline in the fisheries of Lake St. Clair and St. Clair and Detroit Rivers is due largely to legal restrictions.

## FISHERY PRODUCTS RECEIVED AT THE MUNICIPAL FISH WHARF AND MARKET, WASHINGTON. D. C.

Large quantities of fishery products are received at the Municipal Fish Wharf and Market, Washington, D. C., from the Chesapeake region and other sections of the Atlantic coast. The salmon and part of the halibut handled are from the Pacific coast. The products are disposed of to the retail markets of the city, and are also to some extent sold at retail at the municipal market. Through the courtesy of the health department of the District of Columbia the Bureau has been furnished with daily reports of the quantity of fishery products received at this market since the latter part of March last year. These statistics have been compiled for the period from April to December, 1918, and are given in detail, by months, in the following table:

FISHERY PRODUCTS RECEIVED AT THE MUNICIPAL FISH WHARF AND MARKET, WASHINGTON, D. C., FROM APRIL TO DECEMBER, 1918.

| Species. | April. | May. | June. | July. | August. |
|---|---|---|---|---|---|
| | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* |
| Bass, black and sea | ..... | 11,800 | 25,040 | 3,317 | 1,208 |
| Bluefish | ..... | 426 | ..... | ..... | 100 |
| Butterfish | 523 | 32,360 | 69,525 | 77,609 | 58,576 |
| Carp | 15,957 | 11,956 | 5,192 | 3,450 | 2,746 |
| Catfish | 20,877 | 16,545 | 16,158 | 3,339 | 6,095 |
| Cod | 2,025 | 750 | 1,000 | 8,825 | 20,620 |
| Croaker | 386,660 | 248,340 | 197,746 | 83,641 | 40,238 |
| Drum, red | 100 | ..... | 361 | 98 | ..... |
| Eel | 2,427 | 2,102 | 694 | 573 | 123 |
| Flounders | 5,177 | 8,109 | 5,442 | 11,199 | 12,240 |
| Gizzard shad | 670 | 400 | ..... | ..... | ..... |
| Haddock | ..... | ..... | 400 | 23,025 | 34,070 |
| Hake | ..... | ..... | ..... | 450 | 2,250 |
| Halibut | 2,725 | 1,500 | 2,155 | 2,555 | 4,250 |
| Herring: | | | | | |
| River, fresh | 418,596 | 93,867 | 821 | ..... | 2,250 |
| River, salted | 5,000 | 169,000 | 27,250 | 2,500 | ..... |
| Hickory shad or jacks | 1,340 | ..... | ..... | ..... | ..... |
| Hogfish | ..... | 2,100 | 200 | ..... | 200 |
| Kingfish | 100 | 200 | ..... | 100 | ..... |
| Mackerel | ..... | 2,625 | 9,760 | 10,700 | 2,850 |
| Menhaden | 1,130 | ..... | ..... | 200 | ..... |
| Mullet | 115 | 20 | ..... | 13 | ..... |
| Perch | 32,459 | 12,089 | 7,349 | 13,023 | 1,830 |
| Pike or pickerel | 55 | 20 | ..... | ..... | 25 |
| Pollock | 300 | ..... | 400 | 9,150 | 9,700 |
| Porgy or scup | ..... | 400 | 6,000 | 2,550 | 825 |
| Salmon | ..... | ..... | 210 | 675 | ..... |
| Shad | 307,538 | 153,090 | 708 | ..... | ..... |
| Spot | ..... | 160 | 1,126 | 11,455 | 12,300 |
| Striped bass | 38,822 | 14,717 | 5,360 | 12,166 | 12,883 |
| Sturgeon | 586 | 1,376 | 455 | 90 | 80 |
| Tilefish | 2,525 | 2,500 | 735 | ..... | ..... |
| Trouts, sea | 5,131 | 434,268 | 227,000 | 122,237 | 295,271 |
| Whiting | ..... | ..... | ..... | 14,050 | 2,000 |
| Clams, hard | 7,712 | 14,624 | 14,720 | 13,824 | 13,568 |
| Oysters: | | | | | |
| In the shell | 49,861 | 9,240 | 3,486 | 2,002 | 1,470 |
| Opened | 28,364 | 3,061 | ..... | ..... | 487 |
| Squid | ..... | 1,200 | ..... | ..... | ..... |
| Crabs | 585 | 12,915 | 40,680 | 63,930 | 49,665 |
| Crab meat | 1,430 | 5,540 | 7,515 | 7,715 | 7,320 |
| Turtles | ..... | 1,685 | 225 | ..... | 260 |
| Total | 1,338,790 | 1,268,975 | 677,713 | 505,061 | 595,500 |

FISHERY PRODUCTS RECEIVED AT THE MUNICIPAL FISH WHARF AND MARKET, WASHINGTON, D. C., FROM APRIL TO DECEMBER, 1918—Continued.

| Species. | September. | October. | November. | December. | Total. |
|---|---|---|---|---|---|
| | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* |
| Bass, black and sea | 524 | 13,782 | 30,334 | 25,597 | 111,602 |
| Bluefish | 9,912 | 18,182 | 1,050 | ..... | 29,670 |
| Butterfish | 15,333 | 17,709 | 22,200 | 800 | 294,635 |
| Carp | 5,821 | 10,264 | 6,078 | 10,100 | 71,564 |
| Catfish | 12,328 | 22,209 | 20,582 | 12,745 | 130,878 |
| Cisco | ..... | ..... | 225 | 600 | 825 |
| Cod | 23,320 | 16,225 | 16,075 | 5,640 | 94,480 |
| Croaker | 23,707 | 19,010 | 17,460 | 679 | 1,017,481 |
| Drum, red | 240 | ..... | ..... | ..... | 799 |
| Eel | 689 | 1,633 | 1,947 | 1,116 | 11,304 |
| Flounders | 14,267 | 16,446 | 9,310 | 10,372 | 92,562 |
| Gizzard shad | 1,043 | 5,423 | 9,576 | 9,119 | 26,231 |
| Haddock | 69,100 | 72,950 | 41,750 | 21,205 | 263,100 |
| Hake | 2,775 | 8,600 | 27,900 | 4,200 | 46,175 |
| Hallbut | 4,375 | 11,813 | 48,935 | 850 | 79,158 |
| Herring: | | | | | |
| River, fresh | 3,650 | ..... | ..... | 300 | 519,484 |
| River, salted | ..... | ..... | ..... | ..... | 203,750 |
| Sea | ..... | 26,850 | 206,800 | 2,600 | 236,250 |
| Hickory shad or jacks | ..... | ..... | ..... | ..... | 1,340 |
| Hogfish | 200 | 600 | 920 | ..... | 4,220 |
| Kingfish | 100 | ..... | 110 | 375 | 985 |
| Mackerel | 14,090 | 13,600 | 25,850 | 60,550 | 140,025 |
| Menhaden | ..... | 300 | ..... | ..... | 1,630 |
| Mullet | 502 | 5,676 | 5,718 | 2,360 | 14,404 |
| Perch | 5,544 | 9,607 | 12,398 | 11,820 | 106,119 |
| Pike or pickerel | 720 | 1,552 | 1,911 | 1,197 | 5,480 |
| Pollock | 20,375 | 20,900 | 25,440 | 19,700 | 105,965 |
| Porgy or scup | 1,400 | 400 | ..... | ..... | 11,575 |
| Salmon | 225 | 4,450 | 12,375 | ..... | 17,935 |
| Shad | ..... | ..... | ..... | 2,972 | 464,308 |
| Sheepshead | 100 | 252 | ..... | ..... | 352 |
| Smelt | ..... | ..... | 75 | 590 | 665 |
| Spot | 15,276 | 24,230 | 6,200 | ..... | 70,737 |
| Striped bass | 12,883 | 38,731 | 24,128 | ..... | 159,690 |
| Sturgeon | 130 | 685 | 45 | 30 | 3,477 |
| Tilefish | ..... | 1,275 | 2,550 | 2,747 | 12,332 |
| Trouts, sea | 302,120 | 267,975 | 49,395 | 34,230 | 1,737,627 |
| Whitefish | ..... | ..... | 225 | ..... | 225 |
| Whiting | 4,800 | 19,000 | 104,870 | 71,488 | 216,208 |
| Clams, hard | 11,584 | 6,464 | 6,528 | 6,304 | [a] 95,328 |
| Oysters: | | | | | |
| In the shell | 39,347 | 140,497 | 218,386 | 220,129 | [b] 684,418 |
| Opened | 35,788 | 92,400 | 134,821 | 125,895 | [c] 420,816 |
| Scallops | ..... | ..... | ..... | 200 | 200 |
| Squid | ..... | ..... | ..... | ..... | 1,200 |
| Crabs | 28,020 | 5,250 | 75 | ..... | 201,120 |
| Crab meat | 5,415 | 7,445 | 4,925 | 3,725 | 51,030 |
| Shrimp | 1,050 | 1,500 | 1,050 | 950 | 4,550 |
| Terrapin | ..... | ..... | 240 | ..... | 240 |
| Turtles | 205 | ..... | 315 | 155 | 2,845 |
| Total | 686,958 | 923,885 | 1,098,772 | 671,340 | 7,766,994 |

[a] 11,916 bushels. [b] 97,774 bushels. [c] 51,008 gallons.

## FISHERIES OF THE PACIFIC COAST STATES IN 1915.

The data contained in this report apply to the year 1915, and were collected in 1916 and 1917 and prepared by Winthrop A. Roberts and Rob Leon Greer, agents of this Bureau. A statistical bulletin containing the information in condensed form was issued in October, 1917.

The number of persons employed in the fisheries of the Pacific Coast States in 1915 was 28,997, of whom 4,229 were on vessels fishing, 475 on vessels transporting fishery products, 14,235 in shore fisheries, and 10,058 in canneries and other fishery industries. Wash-

ington had 14,649 persons employed in its fisheries; Oregon, 5,900; and California 8,452.

The amount of capital invested in the fisheries of these States was $24,017,967. In Washington the investment was $14,129,553; in Oregon, $4,064,151; and in California, $5,824,263. The investment included 1,039 fishing and transporting vessels and scows of 5 net tons and upward, valued at $3,559,777 and having a net tonnage of 24,703 tons, and outfits valued at $721,156; 9,402 boats, valued at $2,850,211; fishing apparatus used by vessels and boats to the value of $3,147,785; shore and accessory property valued at $12,201,902; and cash capital amounting to $1,537,136. The forms of fishing apparatus having the greatest value were gill nets, 9,863, valued at $1,309,805, and pound nets, 483, valued at $1,122,803. These were all used in the shore or boat fisheries except 158 gill nets, valued at $4,705, employed in the vessel fisheries. The pound nets were all in Washington except 39, valued at $22,700, in Oregon.

The products of the fisheries amounted to 287,085,344 pounds, having a value to the fishermen of $9,306,448. The output in Washington was 159,053,778 pounds, valued at $5,320,725; in Oregon, 34,692,863 pounds, valued at $1,479,021; and in California, 93,338,703 pounds, valued at $2,506,702. The catch of salmon, including steelhead trout, amounted to 131,932,020 pounds, valued at $4,091,681; albacore, 21,049,190 pounds, valued at $316,103; cod, 10,487,401 pounds, valued at $343,338; and halibut, 40,825,874 pounds, valued at $2,050,709. A considerable number of other species were also taken in large quantities.

Compared with the returns for 1904, there was an increase of 47.50 per cent in the number of persons employed, 87.05 per cent in the amount of capital invested, and 70.27 per cent in the quantity and 39.30 per cent in the value of the products. Compared with the returns for 1908, published by the Bureau of the Census, there was an increase of 81.70 per cent in the number of persons employed, 58.21 per cent in the amount of capital invested, and 62.97 per cent in the quantity and 36.07 per cent in the value of the products.

The following tables contain statistics of the number of persons employed, the amount of capital invested, the quantity and value of the products of the fisheries of the Pacific Coast States in 1915, and comparative statistics of those items for various years; also, statistics of various fishery products prepared and the pack of canned salmon in Washington, Oregon, and California in 1915, comparative statistics of the number of cases of salmon canned in certain years, the yield of the fisheries of the principal rivers in 1915, and comparative statistics of the catch of introduced fishes:

## PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915.

| | Washington. | | Oregon. | | California. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| **PERSONS ENGAGED.** | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | 3,655 | | 23 | | 551 | | 4,229 | |
| On vessels transporting | 380 | | 60 | | 35 | | 475 | |
| In shore fisheries | 5,481 | | 4,472 | | 4,282 | | 14,235 | |
| On shore, in canneries, etc. | 5,129 | | 1,345 | | 3,584 | | 10,058 | |
| Total | 14,645 | | 5,900 | | 8,452 | | 28,997 | |
| **INVESTMENT.** | | | | | | | | |
| Vessels fishing | 472 | $2,194,660 | 5 | $22,650 | 73 | $354,375 | 550 | $2,571,685 |
| Tonnage | 11,363 | | 74 | | 3,198 | | 14,635 | |
| Outfit | | 578,825 | | 3,285 | | 52,791 | | 634,901 |
| Vessels transporting | 140 | 689,248 | 30 | 84,184 | 20 | 72,000 | 190 | 845,432 |
| Tonnage | 2,213 | | 267 | | 330 | | 2,810 | |
| Outfit | | 68,895 | | 11,850 | | 5,510 | | 86,255 |
| Scows (5 tons and over): | 299 | 142,660 | | | | | 299 | 142,660 |
| Tonnage | 7,258 | | | | | | 7,258 | |
| Boats, gasoline | 1,567 | 645,480 | 1,382 | 582,485 | 1,429 | 1,351,110 | 4,378 | 2,579,075 |
| Boats, sail, row, etc. | 2,591 | 96,515 | 1,264 | 69,805 | 1,169 | 104,816 | 5,024 | 271,136 |
| Apparatus, vessel fisheries: | | | | | | | | |
| Seines | 374 | 256,875 | | | 7 | 8,550 | [a] 381 | 265,425 |
| Gill nets | 5 | 450 | | | 153 | 4,255 | [b] 158 | 4,705 |
| Beam trawls | 16 | 1,440 | | | | | 16 | 1,440 |
| Trammel nets | | | | | 125 | 3,075 | [c] 125 | 3,075 |
| Lampara nets | | | | | 1 | 400 | 1 | 400 |
| Paranzella nets | | | | | 8 | 2,900 | 8 | 2,900 |
| Hoop nets | 85 | 270 | | | | | 85 | 270 |
| Pots | 220 | 325 | | | 120 | 280 | 340 | 605 |
| Whaling apparatus | | 2,050 | | | | | | 2,050 |
| Lines | | 46,800 | | 1,005 | | 1,562 | | 49,367 |
| Dredges | 10 | 275 | | | | | 10 | 275 |
| Apparatus, shore fisheries: | | | | | | | | |
| Seines | 200 | 23,145 | 75 | 35,125 | 147 | 19,485 | [d] 422 | 77,755 |
| Gill nets | 2,878 | 303,859 | 3,877 | 582,740 | 3,950 | 413,591 | [e] 9,705 | 1,305,190 |
| Pound nets | 444 | 1,100,103 | 39 | 22,700 | | | 483 | 1,122,803 |
| Lampara nets | | | | | 64 | 29,100 | 64 | 29,100 |
| Trammel nets | | | | | 2,195 | 56,325 | [f] 2,195 | 56,325 |
| Paranzella nets | | | | | 36 | 6,100 | 36 | 6,100 |
| Beam trawls | 7 | 405 | | | 9 | 400 | 16 | 805 |
| Fyke nets | | | | | 2,485 | 21,640 | 2,485 | 21,640 |
| Bag nets | | | | | 70 | 2,000 | 70 | 2,000 |
| Hoop nets | 2,402 | 7,227 | 680 | 995 | 4,860 | 13,585 | 7,942 | 21,807 |
| Dip nets | 67 | 134 | | | 11 | 64 | 78 | 198 |
| Reef nets | 8 | 425 | | | | | 8 | 425 |
| Pots and traps | 4,725 | 8,152 | 5,768 | 4,828 | 4,187 | 9,157 | 14,680 | 22,137 |
| Wheels | 2 | 1,000 | 27 | 107,800 | | | 29 | 108,800 |
| Lines | | 21,200 | | 1,438 | | 10,845 | | 33,483 |
| Dredges, tongs, hoes, rakes, etc. | | 4,536 | | 539 | | 1,170 | | 6,245 |
| Abalone outfit | | | | | | 2,460 | | 2,460 |
| Shore and accessory property | | 7,386,599 | | 2,083,913 | | 2,731,390 | | 12,201,902 |
| Cash capital | | 543,000 | | 448,809 | | 545,327 | | 1,537,136 |
| Total | | 14,129,553 | | 4,064,151 | | 5,824,263 | | 24,017,967 |
| **PRODUCTS.** | | | | | | | | |
| Albacore (or tuna): | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Fresh | | | | | 21,024,190 | $315,622 | 21,024,190 | $315,622 |
| Salted | | | | | 25,000 | 481 | 25,000 | 481 |
| Anchovies: | | | | | | | | |
| Fresh | | | | | 81,385 | 1,730 | 81,385 | 1,730 |
| Salted | | | | | 16,000 | 1,600 | 16,000 | 1,600 |
| Barracuda: | | | | | | | | |
| Fresh | | | | | 3,262,640 | 111,690 | 3,262,640 | 111,690 |
| Salted | | | | | 330,000 | 13,180 | 330,000 | 13,180 |
| Bonito | | | | | 448,256 | 12,622 | 448,256 | 12,622 |
| Carp | 200,000 | $4,000 | 50,000 | $750 | 350,815 | 6,366 | 600,815 | 11,116 |
| Catfish | | | | | 517,054 | 24,299 | 517,054 | 24,299 |
| Cod: | | | | | | | | |
| Fresh | 22,025 | 421 | 14,400 | 288 | | | 36,425 | 709 |
| Salted | 5,498,284 | 180,934 | | | 4,952,692 | 161,695 | 10,450,976 | 342,629 |
| Croaker | | | | | 3,150 | 65 | 3,150 | 65 |

[a] 201,840 yards. [b] 11,840 yards. [c] 10,000 yards. [d] 77,635 yards. [e] 2,465,920 yards. [f] 126,600 yards.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915—Continued.

| | Washington. | | Oregon. | | California. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| PRODUCTS—continued. | | | | | | | | |
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Flounders: | | | | | | | | |
| Fresh | 25,855 | $736 | 1,965 | $40 | 6,914,063 | $209,291 | 6,941,883 | $210,067 |
| Salted | | | | | 9,500 | 475 | 9,500 | 475 |
| Grayfish | 7,093,996 | 15,959 | | | | | 7,093,996 | 15,959 |
| Hake: | | | | | | | | |
| Fresh | | | | | 221,252 | 1,937 | 221,252 | 1,937 |
| Salted | | | | | 24,000 | 960 | 24,000 | 960 |
| Halibut | 40,590,705 | 2,041,279 | 235,169 | 9,430 | | | 40,825,874 | 2,050,709 |
| Hardhead | | | | | 73,423 | 3,622 | 73,423 | 3,622 |
| Herring: | | | | | | | | |
| Fresh | 2,129,149 | 9,655 | 12,500 | 383 | 764,384 | 7,116 | 2,906,033 | 17,154 |
| Salted | | | | | 50,000 | 1,000 | 50,000 | 1,000 |
| Jewfish: | | | | | | | | |
| Fresh | | | | | 116,461 | 1,859 | 116,461 | 1,859 |
| Salted | | | | | 138,000 | 5,020 | 138,000 | 5,020 |
| Kingfish | | | | | 656,003 | 17,362 | 656,003 | 17,362 |
| "Lingcod": | | | | | | | | |
| Fresh | 837,110 | 2,812 | 12,870 | 354 | 570,860 | 14,687 | 1,420,840 | 17,853 |
| Salted | | | | | 3,500 | 175 | 3,500 | 175 |
| Mackerel: | | | | | | | | |
| Fresh | | | | | 253,899 | 6,668 | 253,899 | 6,668 |
| Salted | | | | | 6,450 | 259 | 6,450 | 259 |
| Mullet | | | | | 3,000 | 300 | 3,000 | 300 |
| Perch | 14,750 | 493 | 11,930 | 360 | 216,785 | 6,327 | 243,465 | 7,180 |
| Pike, Sacramento | | | | | 15,884 | 449 | 15,884 | 449 |
| Pompano | | | | | 19,350 | 2,032 | 19,350 | 2,032 |
| Rock bass: | | | | | | | | |
| Fresh | | | | | 895,284 | 24,110 | 895,284 | 24,110 |
| Salted | | | | | 2,750 | 97 | 2,750 | 97 |
| Rockfishes: | | | | | | | | |
| Fresh | 101,351 | 2,995 | 12,000 | 445 | 4,336,254 | 145,816 | 4,449,605 | 149,256 |
| Salted | | | | | 8,000 | 400 | 8,000 | 400 |
| Sablefish | 575,810 | 13,782 | 15,520 | 388 | 64,503 | 1,359 | 655,833 | 15,529 |
| Salmon: | | | | | | | | |
| Blueback | 5,043,374 | 345,710 | 337,027 | 16,848 | | | 5,380,401 | 362,558 |
| Chinook— | | | | | | | | |
| Fresh | 18,188,160 | 699,771 | 23,482,292 | 1,209,024 | 7,283,933 | 338,549 | 48,954,385 | 2,247,344 |
| Salted | | | | | 20,000 | 2,400 | 20,000 | 2,400 |
| Chum | 17,156,224 | 282,842 | 1,981,879 | 11,081 | 38,093 | 190 | 19,176,196 | 294,113 |
| Humpback | 29,998,291 | 367,521 | | | | | 29,998,291 | 367,521 |
| Silver | 18,630,302 | 543,241 | 4,844,844 | 94,137 | 415,197 | 12,459 | 23,890,343 | 649,837 |
| Sardines: | | | | | | | | |
| Fresh | | | | | 4,387,706 | 27,651 | 4,387,706 | 27,651 |
| Salted | | | | | 1,400 | 80 | 1,400 | 80 |
| Sculpin | | | | | 8,813 | 345 | 8,813 | 345 |
| Sea bass | | | 2,000 | 60 | 1,221,262 | 49,381 | 1,223,262 | 49,441 |
| Sea trout | | | | | 6,083 | 213 | 6,083 | 213 |
| Shad: | | | | | | | | |
| Fresh | 96,298 | 1,164 | 488,625 | 4,945 | 6,840,008 | 66,982 | 7,430,931 | 73,091 |
| Salted | | | | | 10,000 | 125 | 10,000 | 125 |
| Roe | | | | | 27,033 | 2,491 | 27,033 | 2,491 |
| Sharks | 399,000 | 889 | | | 67,972 | 236 | 466,972 | 1,125 |
| Skates | 229,000 | 515 | | | 177,650 | 868 | 406,650 | 1,383 |
| Smelts | 2,158,371 | 25,333 | 3,500 | 175 | 1,137,072 | 52,978 | 3,298,943 | 78,486 |
| Sole | 68,062 | 1,951 | | | 5,761,929 | 108,254 | 5,829,991 | 110,205 |
| Spanish mackerel | | | | | 396,905 | 11,555 | 396,905 | 11,555 |
| Split-tail | | | | | 17,016 | 384 | 17,016 | 384 |
| Steelhead trout | 2,114,141 | 91,389 | 2,365,858 | 75,231 | 32,405 | 1,288 | 4,512,404 | 167,908 |
| Sting ray | | | | | 605,000 | 1,512 | 605,000 | 1,512 |
| Striped bass | | | | | 1,784,448 | 146,928 | 1,784,448 | 146,928 |
| Sturgeon | 43,656 | 2,151 | 97,785 | 5,014 | 16,924 | 987 | 158,365 | 8,152 |
| Sturgeon caviar | 300 | 75 | | | | | 300 | 75 |
| Sturgeon roe | | | | | 1,275 | 708 | 1,275 | 708 |
| Surffish | | | | | 127,500 | 7,255 | 127,500 | 7,255 |
| Tomcod | | | 22,500 | 900 | 41,912 | 939 | 64,412 | 1,839 |
| Whitebait | | | | | 56,250 | 2,250 | 56,250 | 2,250 |
| Yellowtail: | | | | | | | | |
| Fresh | | | | | 1,094,416 | 26,123 | 1,094,416 | 26,123 |
| Salted | | | | | 124,500 | 4,743 | 124,500 | 4,743 |
| Miscellaneous fishes | | | | | 17,232 | 539 | 17,232 | 539 |
| Abalone: | | | | | | | | |
| Alive | | | | | 24,026 | 517 | 24,026 | 517 |
| Meat | | | | | 730,974 | 16,830 | 730,974 | 16,830 |
| Shells | | | | | 74,000 | 1,890 | 74,000 | 1,890 |
| Pearls and blisters | | | | | | 1,240 | | 1,240 |
| Clams: | | | | | | | | |
| Hard | 175,744 | 12,191 | | | 65,856 | 17,583 | 241,600 | 29,774 |
| Soft | 1,200 | 150 | 22,460 | 3,041 | 67,160 | 18,107 | 90,820 | 21,298 |
| Razor | 372,750 | 56,446 | 77,200 | 10,900 | | | 449,950 | 67,346 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915—Continued.

| | Washington. | | Oregon. | | California. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| PRODUCTS—continued. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Mussels | 700 | $83 | ..... | ..... | 19,240 | $2,326 | 19,940 | $2,409 |
| Oysters: | | | | | | | | |
| Eastern market | 265,013 | 140,028 | ..... | ..... | 375,774 | 165,573 | 640,787 | 305,601 |
| Native— | | | | | | | | |
| Market | 450,394 | 250,298 | 1,547 | $725 | 8,435 | 6,513 | 460,376 | 257,536 |
| Seed | 24,808 | 8,619 | ..... | ..... | ..... | ..... | 24,808 | 8,619 |
| Octopus | ..... | ..... | ..... | ..... | 32,309 | 2,717 | 32,309 | 2,717 |
| Squid | 15,000 | 325 | ..... | ..... | 6,211,325 | 32,626 | 6,226,325 | 32,951 |
| Crabs | 1,734,410 | 54,526 | 415,272 | 13,755 | 1,414,155 | 128,434 | 3,563,837 | 196,715 |
| Crawfish | ..... | ..... | 183,720 | 20,747 | 550 | 265 | 184,270 | 21,012 |
| Shrimp | 386,420 | 18,719 | ..... | ..... | 298,000 | 5,550 | 684,420 | 24,269 |
| Spiny lobsters | ..... | ..... | ..... | ..... | 892,392 | 130,119 | 892,392 | 130,119 |
| Turtles | ..... | ..... | ..... | ..... | 206 | 13 | 206 | 13 |
| Cod tongues | 30,000 | 2,090 | ..... | ..... | 7,400 | 370 | 37,400 | 2,460 |
| Whale oil | 2,635,125 | 112,851 | ..... | ..... | ..... | ..... | 2,635,125 | 112,851 |
| Whalebone | 6,000 | 4,200 | ..... | ..... | ..... | ..... | 6,000 | 4,200 |
| Other whale products | 1,292,000 | 24,390 | ..... | ..... | ..... | ..... | 1,292,000 | 24,390 |
| Sea lion | ..... | ..... | ..... | ..... | 9,375 | 4,120 | 9,375 | 4,120 |
| Kelp | 450,000 | 191 | ..... | ..... | 5,000,000 | 2,500 | 5,450,000 | 2,691 |
| Other seaweeds | ..... | ..... | ..... | ..... | 6,799 | 325 | 6,799 | 325 |
| Total | 159,053,778 | 5,320,725 | 34,692,863 | 1,479,021 | 93,338,703 | 2,506,702 | 287,085,344 | 9,306,448 |

SUMMARY OF PERSONS ENGAGED, CAPITAL INVESTED, AND VALUE OF PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN CERTAIN YEARS.

| Items and States. | 1888 | 1892 | 1895 | 1899 | 1904 | 1908 | 1915 |
|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | | | | | | | |
| Washington | 3,363 | 4,310 | 6,212 | 9,911 | 8,829 | 4,954 | 14,645 |
| Oregon | 3,619 | 4,332 | 6,323 | 5,643 | 5,299 | 4,772 | 5,900 |
| California | 4,684 | 5,403 | 4,770 | 3,974 | 5,530 | 4,129 | 8,452 |
| Total | 11,666 | 14,045 | 17,305 | 19,528 | 19,658 | 13,855 | 28,997 |
| CAPITAL INVESTED. | | | | | | | |
| Washington | $1,261,078 | $1,593,567 | $2,024,469 | $6,601,243 | $5,319,201 | $3,442,000 | $14,129,553 |
| Oregon | 1,859,299 | 2,272,351 | 2,637,412 | 3,497,643 | 3,756,692 | 1,367,000 | 4,064,151 |
| California | 2,081,950 | 2,526,746 | 2,612,298 | 2,774,493 | 3,764,056 | 1,659,000 | 5,824,263 |
| Total | 5,202,327 | 6,392,664 | 7,274,179 | 12,873,379 | 12,839,949 | 6,468,000 | 24,017,967 |
| VALUE OF PRODUCTS. | | | | | | | |
| Washington | 810,326 | 931,568 | 1,402,433 | 2,871,438 | 2,972,633 | 3,513,000 | 5,320,725 |
| Oregon | 733,867 | 872,405 | 1,284,136 | 855,750 | 1,185,092 | 1,356,000 | 1,479,021 |
| California | 2,465,317 | 3,022,991 | 1,786,479 | 2,551,451 | 2,523,141 | 1,970,000 | 2,506,702 |
| Total | 4,009,510 | 4,826,964 | 4,473,048 | 6,278,639 | 6,680,866 | 6,839,000 | 9,306,448 |

QUANTITY AND VALUE OF VARIOUS FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING, IN THE PACIFIC COAST STATES IN 1915.

| Method and products. | Washington. | | Oregon. | | California. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| DRIED. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Squid | ..... | ..... | ..... | ..... | 1,200,000 | $51,000 | 1,200,000 | $51,000 |
| FROZEN. | | | | | | | | |
| Barracuda | 150 | $12 | ..... | ..... | ..... | ..... | 150 | 12 |
| Dolly Varden trout | 6,577 | 345 | ..... | ..... | ..... | ..... | 6,577 | 345 |
| Finnan Haddie | 390 | 50 | ..... | ..... | ..... | ..... | 390 | 50 |
| Flounder | 280 | 15 | ..... | ..... | ..... | ..... | 280 | 15 |
| Halibut | 2,551,537 | 122,052 | 5,000 | $450 | ..... | ..... | 2,556,537 | 122,502 |
| Herring | 1,887,645 | 28,705 | ..... | ..... | ..... | ..... | 1,887,645 | 28,705 |
| Horse mackerel | 250 | 15 | ..... | ..... | ..... | ..... | 250 | 15 |
| "Lingcod" | 20,235 | 809 | ..... | ..... | ..... | ..... | 20,235 | 809 |
| Mackerel | 870 | 45 | ..... | ..... | ..... | ..... | 870 | 45 |
| Perch | 315 | 20 | 500 | 40 | ..... | ..... | 815 | 60 |
| Rockfishes | 31,218 | 1,440 | ..... | ..... | ..... | ..... | 31,218 | 1,440 |
| Sablefish | 281,450 | 8,423 | 1,000 | 80 | ..... | ..... | 282,450 | 8,503 |
| Salmon: | | | | | | | | |
| Chinook | 650,805 | 45,074 | 95,000 | 2,700 | ..... | ..... | 745,805 | 47,774 |
| Chum | 1,680,718 | 69,568 | ..... | ..... | ..... | ..... | 1,680,718 | 69,568 |
| Silver | 1,237,158 | 64,822 | 75,023 | 3,384 | ..... | ..... | 1,312,181 | 68,206 |
| Sardines | 975 | 12 | ..... | ..... | ..... | ..... | 975 | 12 |
| Shad | ..... | ..... | 36,160 | 1,825 | ..... | ..... | 36,160 | 1,825 |
| Shad roe | 150 | 25 | 5,123 | 696 | ..... | ..... | 5,273 | 721 |
| Smelt | 105,446 | 4,673 | ..... | ..... | ..... | ..... | 105,446 | 4,673 |
| Sole | 1,100 | 44 | ..... | ..... | ..... | ..... | 1,100 | 44 |
| Spanish mackerel | 3,015 | 200 | ..... | ..... | ..... | ..... | 3,015 | 200 |
| Steelhead trout | 282,025 | 19,900 | 377,482 | 20,785 | ..... | ..... | 659,507 | 40,685 |
| Sturgeon | ..... | ..... | 49,560 | 6,426 | ..... | ..... | 49,560 | 6,426 |
| Tomcod | ..... | ..... | 500 | 40 | ..... | ..... | 500 | 40 |
| Shrimp | 24,274 | 2,425 | ..... | ..... | ..... | ..... | 24,274 | 2,425 |
| Squid | 1,035 | 55 | ..... | ..... | ..... | ..... | 1,035 | 55 |
| Lobster | 617 | 125 | ..... | ..... | ..... | ..... | 617 | 125 |
| Miscellaneous | 43,892 | 3,000 | ..... | ..... | ..... | ..... | 43,892 | 3,000 |
| Total | 8,812,127 | 371,854 | 645,348 | 36,426 | ..... | ..... | 9,457,475 | 408,280 |
| MILD-CURED. | | | | | | | | |
| Salmon: | | | | | | | | |
| Chinook | 1,208,800 | 130,052 | 2,821,027 | 384,090 | 1,761,300 | 187,220 | 5,791,127 | 677,162 |
| Chum | 83,000 | 2,060 | 4,000 | 240 | ..... | ..... | 87,000 | 2,300 |
| Silver | ..... | ..... | 40,800 | 4,095 | ..... | ..... | 40,800 | 4,095 |
| Shad | ..... | ..... | 8,000 | 440 | 105,000 | 5,250 | 113,000 | 5,690 |
| Steelhead trout | ..... | ..... | 800 | 80 | ..... | ..... | 800 | 80 |
| Total | 1,291,800 | 132,112 | 2,874,627 | 388,945 | 1,866,300 | 192,470 | 6,032,727 | 713,527 |
| PICKLED. | | | | | | | | |
| Salmon: Chinook | ..... | ..... | ..... | ..... | 215,000 | 26,950 | 245,000 | 26,950 |
| SALTED. | | | | | | | | |
| Albacore (or tuna) | ..... | ..... | ..... | ..... | 71,020 | 3,092 | 71,020 | 3,092 |
| Barracuda | ..... | ..... | ..... | ..... | 8,000 | 240 | 8,000 | 240 |
| Bonito | ..... | ..... | ..... | ..... | 8,210 | 328 | 8,210 | 328 |
| Halibut | 57,100 | 3,426 | ..... | ..... | ..... | ..... | 57,100 | 3,426 |
| Herring | 47,000 | 630 | ..... | ..... | 100,000 | 4,500 | 147,000 | 5,130 |
| Jewfish | ..... | ..... | ..... | ..... | 44,998 | 1,350 | 44,998 | 1,350 |
| "Lingcod" | 1,000 | 20 | ..... | ..... | ..... | ..... | 1,000 | 20 |
| Mackerel | ..... | ..... | ..... | ..... | 1,896 | 75 | 1,896 | 75 |
| Rock bass | ..... | ..... | ..... | ..... | 1,000 | 40 | 1,000 | 40 |
| Rockfishes | ..... | ..... | ..... | ..... | 3,500 | 122 | 3,500 | 122 |
| Sablefish | 212,300 | 9,728 | ..... | ..... | ..... | ..... | 212,300 | 9,728 |
| Salmon: | | | | | | | | |
| Chinook | ..... | ..... | ..... | ..... | 160,000 | 6,500 | 160,000 | 6,500 |
| Chum | 1,600 | 800 | 5,000 | 225 | ..... | ..... | 6,600 | 1,025 |
| Humpback | 10,000 | 400 | ..... | ..... | ..... | ..... | 10,000 | 400 |
| Silver | 1,444,800 | 91,489 | 4,200 | 377 | ..... | ..... | 1,449,000 | 91,866 |
| Sardines | ..... | ..... | ..... | ..... | 20,000 | 2,000 | 20,000 | 2,000 |
| Seabass | ..... | ..... | ..... | ..... | 3,000 | 120 | 3,000 | 120 |
| Shad | ..... | ..... | ..... | ..... | 4,558,750 | 63,212 | 4,558,750 | 63,212 |
| Spanish mackerel | ..... | ..... | ..... | ..... | 6,450 | 258 | 6,450 | 258 |
| Yellowtail | ..... | ..... | ..... | ..... | 37,158 | 1,301 | 37,158 | 1,301 |
| Total | 1,773,800 | 106,493 | 9,200 | 602 | 5,023,982 | 83,138 | 6,806,982 | 190,233 |

QUANTITY AND VALUE OF VARIOUS FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING, IN THE PACIFIC COAST STATES IN 1915—Continued.

| Method and products. | Washington. | | Oregon. | | California. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| SMOKED. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore (or tuna) | ..... | ..... | ..... | ..... | 7,600 | $858 | 7,600 | $858 |
| Cod | 50,000 | $5,000 | ..... | ..... | ..... | ..... | 50,000 | 5,000 |
| Halibut | 97,050 | 9,335 | ..... | ..... | 10,000 | 1,500 | 107,050 | 10,835 |
| Herring | 37,800 | 1,475 | ..... | ..... | 5,000 | 300 | 42,800 | 1,775 |
| Sablefish | 279,850 | 26,163 | ..... | ..... | 2,000 | 45 | 281,850 | 26,208 |
| Salmon: | | | | | | | | |
| Chinook | 1,525,520 | 147,793 | 1,075 | $134 | 10,000 | 1,500 | 1,536,595 | 149,427 |
| Chum | 65,500 | 3,288 | ..... | ..... | ..... | ..... | 65,500 | 3,288 |
| Silver | 2,200 | 218 | 500 | 50 | ..... | ..... | 2,700 | 268 |
| Sturgeon | 230 | 29 | ..... | ..... | ..... | ..... | 230 | 29 |
| Total | 2,058,210 | 193,301 | 1,575 | 184 | 34,600 | 4,203 | 2,094,385 | 197,688 |
| MISCELLANEOUS.[a] | | | | | | | | |
| Shrimp meat | 133,689 | 38,303 | ..... | ..... | ..... | ..... | 133,689 | 38,303 |
| Fertilizer | 3,851,000 | 77,560 | 400,000 | 7,600 | 850,000 | 15,305 | 5,104,000 | 100,465 |
| Poultry food | 421,000 | 10,370 | ..... | ..... | 1,140,000 | 28,200 | 1,564,000 | 38,570 |
| Glue | 400,121 | 36,200 | ..... | ..... | ..... | ..... | [b]400,121 | 36,200 |
| Oil | 1,284,338 | 50,555 | 225,000 | 9,000 | 491,752 | 19,548 | [c]2,001,090 | 79,103 |
| Ground clamshells | 300,000 | 1,500 | ..... | ..... | ..... | ..... | 300,000 | 1,500 |
| Total | 6,396,148 | 214,488 | 625,000 | 16,600 | 2,481,752 | 63,053 | 9,502,900 | 294,141 |
| Grand total | 20,332,085 | 1,018,248 | 4,155,750 | 442,757 | 10,851,634 | 420,814 | 35,339,469 | 1,881,819 |

[a] The fertilizer, poultry food, glue, and oil shown in the above table were prepared from fish and fish offal.
[b] 41,038 gallons.
[c] 266,812 gallons.

SALMON PACK OF THE PACIFIC COAST STATES IN 1915.

| Items. | Washington. | | Oregon. | | California. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Canneries[a] | 59 | $5,187,297 | 28 | $1,088,358 | 5 | $289,361 | [a] 92 | $6,565,016 |
| Cash capital | ..... | 386,300 | ..... | 339,809 | ..... | 55,000 | ..... | 781,109 |
| Persons engaged | 4,097 | ..... | 943 | ..... | 590 | ..... | 5,630 | ..... |
| Wages paid | ..... | 1,196,807 | ..... | 369,799 | ..... | 91,235 | ..... | 1,660,901 |
| PRODUCTS.[b] | | | | | | | | |
| Blueback or sock-eye ..... cases | 91,720 | 932,394 | 4,510 | 24,915 | ..... | ..... | 96,230 | 957,309 |
| Chinook ..... do | 178,464 | 1,400,220 | 292,765 | 2,246,565 | 19,508 | 109,391 | 490,737 | 3,756,176 |
| Chum ..... do | 450,409 | 1,219,061 | 40,728 | 104,698 | ..... | ..... | 491,137 | 1,323,759 |
| Humpback ..... do | 590,378 | 1,772,565 | ..... | ..... | ..... | ..... | 590,378 | 1,772,565 |
| Silver ..... do | 206,508 | 1,036,859 | 53,405 | 258,038 | 3,578 | 16,391 | 263,491 | 1,311,288 |
| Steelhead trout ..... cases | 10,270 | 64,860 | 18,783 | 112,600 | ..... | ..... | 29,053 | 177,460 |
| Total | 1,527,749 | 6,425,959 | 410,191 | 2,746,816 | 23,086 | 125,782 | 1,961,026 | 9,298,557 |

[a] 26 of these firms were also engaged in other branches of the canning or packing trade, with 6 of whom salmon canning was merely incidental.
[b] All products represent 48 pounds to the case.

COMPARATIVE SUMMARY, BY STATES, OF THE NUMBER OF CASES OF SALMON CANNED IN THE PACIFIC COAST STATES IN CERTAIN YEARS.

| States. | Blueback. | Chinook. | Chum. | Humpback. | Silver. | Steelhead trout. | Total. |
|---|---|---|---|---|---|---|---|
| 1892—Washington | 19,441 | 134,253 | 29,411 | ..... | 28,708 | 26,945 | 238,758 |
| Oregon | 51,106 | 237,681 | ..... | ..... | 60,293 | 45,403 | 394,486 |
| California | ..... | 14,334 | ..... | ..... | 1,550 | ..... | 15,884 |
| Total | 70,547 | 386,271 | 29,411 | ..... | 90,551 | 72,348 | 649,128 |
| 1893—Washington | 55,237 | 129,078 | 23,480 | 17,530 | 31,707 | 25,663 | 282,695 |
| Oregon | 23,074 | 176,024 | 9,230 | ..... | 62,913 | 39,563 | 310,804 |
| California | ..... | 26,436 | ..... | ..... | 500 | ..... | 26,936 |
| Total | 78,311 | 331,538 | 32,710 | 17,530 | 95,120 | 65,226 | 620,435 |
| 1894—Washington | 53,717 | 156,549 | 33,952 | 9,049 | 32,118 | 23,209 | 308,594 |
| Oregon | 25,523 | 216,507 | 3,162 | ..... | 100,087 | 38,829 | 384,108 |
| California | ..... | 31,663 | ..... | ..... | 500 | ..... | 32,163 |
| Total | 79,240 | 404,719 | 37,114 | 9,049 | 132,705 | 62,038 | 724,865 |
| 1895—Washington | 70,304 | 157,187 | 48,686 | 23,633 | 81,957 | 18,985 | 400,752 |
| Oregon | 12,854 | 316,284 | 27,027 | ..... | 138,981 | 30,693 | 525,839 |
| California | ..... | 28,635 | ..... | ..... | 400 | ..... | 29,035 |
| Total | 83,158 | 502,106 | 75,713 | 23,633 | 221,338 | 49,678 | 955,626 |
| 1899—Washington | 503,950 | 95,147 | 42,656 | 252,733 | 145,139 | 2,258 | 1,041,883 |
| Oregon | 19,665 | 214,821 | 18,345 | ..... | 78,730 | 9,736 | 341,297 |
| California | ..... | 34,180 | ..... | ..... | ..... | ..... | 34,180 |
| Total | 523,615 | 344,148 | 61,001 | 252,733 | 223,869 | 11,994 | 1,417,360 |
| 1904—Washington | 112,911 | 140,695 | 94,265 | ..... | 168,069 | 3,050 | 518,990 |
| Oregon | 9,264 | 223,646 | 15,150 | ..... | 65,557 | 6,818 | 320,435 |
| California | ..... | 17,807 | ..... | ..... | ..... | ..... | 17,807 |
| Total | 122,175 | 382,148 | 109,415 | ..... | 233,626 | 9,868 | 857,232 |
| 1908—Washington | ..... | ..... | ..... | ..... | ..... | ..... | 460,229 |
| Oregon | ..... | ..... | ..... | ..... | ..... | ..... | 340,396 |
| California | ..... | ..... | ..... | ..... | ..... | ..... | 3,938 |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | 804,563 |
| 1915—Washington | 91,720 | 178,464 | 450,409 | 590,378 | 206,508 | 10,270 | 1,527,749 |
| Oregon | 4,510 | 292,765 | 40,728 | ..... | 53,405 | 18,783 | 410,191 |
| California | ..... | 19,508 | ..... | ..... | 3,578 | ..... | 23,086 |
| Total | 96,230 | 490,737 | 491,137 | 590,378 | 263,491 | 29,053 | 1,961,026 |

YIELD OF THE FISHERIES OF THE PRINCIPAL RIVERS OF THE PACIFIC COAST STATES IN 1915.

| Species. | Chetco River, Oreg. | | Columbia River, Wash. and Oreg. | | Coquille River, Oreg. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | ..... | ..... | 250,000 | $4,750 | ..... | ..... |
| Salmon: | | | | | | |
| Blueback | ..... | ..... | 522,274 | 25,287 | ..... | ..... |
| Chinook | 30,560 | $1,833 | 29,620,791 | 1,454,873 | 207,138 | $5,467 |
| Chum | ..... | ..... | 2,274,082 | 13,958 | ..... | ..... |
| Humpback | ..... | ..... | 147,924 | 1,845 | ..... | ..... |
| Silver | 12,270 | 306 | 4,372,439 | 92,170 | 330,046 | 5,049 |
| Steelhead | 300 | 10 | 3,795,452 | 122,135 | 12,620 | 398 |
| Shad: Fresh | ..... | ..... | 580,985 | 5,947 | ..... | ..... |
| Smelts | ..... | ..... | 1,625,605 | 6,748 | ..... | ..... |
| Sturgeon | ..... | ..... | 133,273 | 6,793 | ..... | ..... |
| Sturgeon caviar | ..... | ..... | 300 | 75 | ..... | ..... |
| Tomcod | ..... | ..... | 22,500 | 900 | ..... | ..... |
| Crawfish | ..... | ..... | 183,720 | 20,747 | ..... | ..... |
| Total | 43,130 | 2,149 | [a] 43,529,345 | 1,756,228 | 549,804 | 10,914 |

[a] This does not include 66,000 pounds of chinook salmon, valued at $3,330; 38,093 pounds of chum salmon, valued at $190; and 12,330 pounds of silver salmon, valued at $370, taken in the Columbia River by California fishermen.

YIELD OF THE FISHERIES OF THE PRINCIPAL RIVERS OF THE PACIFIC COAST STATES IN 1915—Continued.

| Species. | Eel River, Calif. | | Klamath River, Calif. | | Necanicum River, Oreg. | | Nehalem River, Oreg. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Salmon: | | | | | | | | |
| Chinook | 447,306 | $17,886 | 643,000 | $14,467 | ..... | ..... | 371,024 | $9,212 |
| Chum | ..... | ..... | ..... | ..... | 3,220 | $45 | 176,330 | 883 |
| Silver | 71,972 | 2,846 | 174,846 | 3,497 | 42,058 | 850 | 322,632 | 6,453 |
| Steelhead | 31,605 | 1,264 | ..... | ..... | ..... | ..... | 23,644 | 945 |
| Sturgeon | 8,010 | 250 | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | 558,893 | 22,246 | 817,846 | 17,964 | 45,278 | 895 | 893,630 | 17,493 |

| Species. | Nestucca River, Oreg. | | Rogue River, Oreg. | | Sacramento River, Calif. | | San Joaquin River, Calif. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | ..... | ..... | ..... | ..... | 95,529 | $1,412 | 63,286 | $1,474 |
| Catfish | ..... | ..... | ..... | ..... | 188,267 | 7,961 | 328,787 | 16,388 |
| Hardhead | ..... | ..... | ..... | ..... | 68,749 | 3,476 | 4,674 | 146 |
| Pike, Sacramento | ..... | ..... | ..... | ..... | 10,924 | 320 | 4,960 | 129 |
| Salmon: | | | | | | | | |
| Chinook | 161,901 | $4,047 | 1,081,457 | $65,001 | 3,382,370 | 185,231 | 200,409 | 10,390 |
| Silver | 174,268 | 3,485 | 51,874 | 1,297 | ..... | ..... | ..... | ..... |
| Steelhead | 16,890 | 675 | ..... | ..... | ..... | ..... | ..... | ..... |
| Shad: | | | | | | | | |
| Fresh | ..... | ..... | ..... | ..... | 4,681,710 | 50,756 | 561,820 | 7,172 |
| Salted | ..... | ..... | ..... | ..... | 10,000 | 125 | ..... | ..... |
| Roe | ..... | ..... | ..... | ..... | 9,135 | 872 | 17,898 | 1,619 |
| Split-tail | ..... | ..... | ..... | ..... | 15,550 | 329 | 1,466 | 55 |
| Striped bass | ..... | ..... | ..... | ..... | 1,271,102 | 104,432 | 69,646 | 5,808 |
| Sturgeon | ..... | ..... | ..... | ..... | 8,855 | 732 | 59 | 5 |
| Sturgeon roe | ..... | ..... | ..... | ..... | 1,253 | 697 | 22 | 11 |
| Suckers | ..... | ..... | ..... | ..... | 689 | 16 | 1,375 | 70 |
| Turtles | ..... | ..... | ..... | ..... | ..... | ..... | 22 | 4 |
| Total | 353,059 | 8,207 | 1,133,331 | 66,298 | 9,744,133 | 356,359 | 1,254,424 | 43,361 |

| Species. | Siletz River, Oreg. | | Siuslaw River, Oreg. | | Smith River, Calif. | | Snake River, Wash. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Salmon: | | | | | | | | |
| Blueback | ..... | ..... | ..... | ..... | ..... | ..... | 4,600 | $355 |
| Chinook | 167,064 | $8,197 | 33,180 | $829 | 61,420 | $1,535 | 48,088 | 3,757 |
| Chum | 36,720 | 185 | ..... | ..... | ..... | ..... | 984 | 79 |
| Silver | 106,670 | 1,612 | 83,306 | 1,670 | 15,552 | 233 | 5,448 | 398 |
| Steelhead | ..... | ..... | 1,040 | 31 | ..... | ..... | 85,848 | 6,781 |
| Sturgeon | ..... | ..... | ..... | ..... | ..... | ..... | 1,300 | 98 |
| Total | 310,454 | 9,994 | 117,526 | 2,530 | 76,972 | 1,768 | 146,260 | 11,468 |

YIELD OF THE FISHERIES OF THE PRINCIPAL RIVERS OF THE PACIFIC COAST STATES IN 1915—Continued.

| Species. | Snohomish River, Wash. | | Umpqua River, Oreg. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | 408,815 | $7,636 |
| Catfish | | | | | 517,054 | 24,349 |
| Hardhead | | | | | 73,423 | 3,622 |
| Pike, Sacramento | | | | | 15,884 | 449 |
| Salmon: | | | | | | |
| Blueback | 2,250 | $180 | | | 529,124 | 25,822 |
| Chinook | 44,690 | 1,534 | 112,923 | $2,265 | 36,613,321 | 1,786,554 |
| Chum | 42,800 | 803 | 5,130 | 40 | 2,539,266 | 15,993 |
| Humpback | 13,900 | 208 | | | 161,824 | 2,053 |
| Silver | 304,000 | 11,695 | 548,610 | 10,000 | 6,615,991 | 141,561 |
| Steelhead | 15,750 | 945 | 3,000 | 120 | 3,986,149 | 133,304 |
| Shad: | | | | | | |
| Fresh | | | | | 5,824,515 | 63,875 |
| Salted | | | | | 10,000 | 125 |
| Roe | | | | | 27,033 | 2,491 |
| Smelts | | | | | 1,625,605 | 6,748 |
| Split-tail | | | | | 17,016 | 384 |
| Striped bass | | | | | 1,340,748 | 110,330 |
| Sturgeon | | | | | 150,297 | 7,788 |
| Sturgeon caviar | | | | | 300 | 75 |
| Sturgeon roe | | | | | 1,275 | 708 |
| Suckers | | | | | 2,064 | 86 |
| Tomcod | | | | | 22,500 | 900 |
| Crawfish | | | | | 183,720 | 20,747 |
| Turtles | | | | | 22 | 4 |
| Total | 423,390 | 15,395 | 669,663 | 12,425 | 60,665,946 | 2,355,604 |

COMPARATIVE STATEMENT OF THE CATCH OF INTRODUCED FISHES IN THE PACIFIC COAST STATES IN 1899, 1904, 1908, AND 1915.[a]

WASHINGTON.

| Species. | 1899 | | 1904 | | 1908 | | 1915 | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | | | 200,000 | $4,000 |
| Catfish | 105,700 | $2,114 | 6,000 | $300 | | | | |
| Shad | 85,000 | 1,275 | 125,287 | 1,753 | 100,000 | $1,900 | 96,298 | 1,164 |
| Total | 190,700 | 3,389 | 131,287 | 2,053 | 100,000 | 1,900 | 296,298 | 5,164 |

OREGON.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Carp | | | 20,000 | $200 | 30,000 | $300 | 50,000 | $750 |
| Catfish | 54,360 | $1,087 | 180,000 | 6,000 | 201,000 | 9,000 | | |
| Shad | 32,000 | 320 | 36,846 | 1,433 | 431,000 | 8,000 | 488,625 | 4,945 |
| Total | 86,360 | 1,407 | 236,846 | 7,633 | 662,000 | 17,300 | 538,625 | 5,695 |

CALIFORNIA.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Carp | 283,514 | $2,400 | 70,374 | $1,407 | 427,000 | $4,300 | 350,815 | $6,366 |
| Catfish | 465,911 | 12,734 | 737,144 | 20,992 | 1,069,000 | 56,000 | 517,054 | 21,299 |
| Shad | 1,137,801 | 14,303 | 327,372 | 9,960 | 1,169,000 | 12,000 | 6,858,008 | 67,107 |
| Striped bass | 1,234,230 | 61,814 | 1,570,404 | 92,116 | 1,776,000 | 135,000 | 1,784,448 | 146,928 |
| Total | 3,121,546 | 91,251 | 2,705,294 | 124,475 | 4,441,000 | 207,300 | 9,510,325 | 244,700 |

TOTAL.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Carp | 283,514 | $2,400 | 90,374 | $1,607 | 457,000 | $4,600 | 600,815 | $11,116 |
| Catfish | 625,971 | 15,935 | 923,144 | 27,292 | 1,270,000 | 65,000 | 517,054 | 24,299 |
| Shad | 1,254,801 | 15,898 | 489,505 | 13,146 | 1,700,000 | 21,900 | 7,442,931 | 73,216 |
| Striped bass | 1,234,320 | 61,814 | 1,570,404 | 92,116 | 1,776,000 | 135,000 | 1,784,448 | 146,928 |
| Total | 3,398,606 | 96,047 | 3,073,427 | 134,161 | 5,203,000 | 226,500 | 10,345,248 | 255,559 |

[a] The statistics for 1908 in this table are from data published by the Bureau of the Census.

## FISHERIES OF WASHINGTON.

The fisheries of Washington in 1915 were more extensive than those of Oregon and California combined. The number of persons employed was 14,645, of whom 3,655 were on vessels fishing, 380 on vessels transporting fishery products, 5,481 in the shore or boat fisheries, and 5,129 on shore in canneries and other fishery industries.

The investment amounted to $14,129,553, which includes 472 fishing vessels valued at $2,194,660, with a net tonnage of 11,363 tons, and outfits valued at $578,825; 140 transporting vessels, valued at $689,248, with a net tonnage of 2,213 tons, and outfits valued at $68,895; 299 scows, valued at $142,660, with a net tonnage of 7,258 tons; 1,567 gasoline boats, valued at $645,480; 2,581 sail and other boats, valued at $96,515; fishing apparatus employed on vessels to the value of $308,485; fishing apparatus employed on boats to the value of $1,475,186; shore and accessory property valued at $7,386,599; and cash capital amounting to $543,000.

The products amounted to 159,053,778 pounds, valued at $5,320,725, credited to the different districts as follows: Puget Sound, 84,204,558 pounds, valued at $2,095,547; Columbia River and tributaries, 15,796,175 pounds, valued at $496,339; Grays Harbor, 5,159,682 pounds, valued at $154,505; Willapa Harbor, 2,800,074 pounds, valued at $178,557; and the Pacific Ocean and other waters, 51,209,557 pounds, valued at $2,405,155. The catch of salmon, including steelhead, amounted to 91,130,492 pounds, valued at $2,330,474; halibut, 40,590,705 pounds, valued at $2,041,279; cod, 5,520,309 pounds, valued at $181,355; grayfish, 7,093,996 pounds, valued at $15,959; smelts, 2,158,371 pounds, valued at $25,333; crabs, 1,734,410 pounds, valued at $54,526; and oysters, eastern and native, 740,215 pounds, or 105,745 bushels, valued at $398,945. The whale products included whale oil, 2,635,125 pounds, valued at $112,851; whalebone, 6,000 pounds, valued at $4,200; and other products amounting to 1,292,000 pounds, valued at $24,390.

Compared with the returns for 1904, there was an increase of 65.87 per cent in the number of persons employed, 165.63 per cent in the amount of capital invested, and of 78.80 per cent in the quantity and 78.99 per cent in the value of the products. The products also show an increase of 58.33 per cent in the quantity and 51.45 per cent in the value over those in the returns for 1908, published by the Bureau of the Census.

For statistics as to the number of persons employed, amount of capital invested, and the quantity and value of the products of the fisheries of Washington in 1915, see table, page 51. Statistics as to the approximate catch of certain fishery products of Washington by districts in 1915 are contained in the following table:

APPROXIMATE CATCH OF CERTAIN FISHERY PRODUCTS OF WASHINGTON, BY DISTRICTS, IN 1915.

| Species. | Puget Sound. | | Columbia River.[a] | | Grays Harbor. | | Willapa Harbor. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | 200,000 | $4,000 | | | | | 200,000 | $4,000 |
| Flounders | 25,855 | $736 | | | | | | | 25,855 | 736 |
| Grayfish | 7,093,996 | 15,959 | | | | | | | 7,093,996 | 15,959 |
| Herring | 2,129,149 | 9,655 | | | | | | | 2,129,149 | 9,655 |
| "Lingcod" | 836,960 | 2,810 | | | | | | | 836,960 | 2,810 |
| Perch | 14,750 | 493 | | | | | | | 14,750 | 493 |
| Rockfishes | 80,351 | 2,472 | | | | | | | 80,351 | 2,472 |
| Salmon: | | | | | | | | | | |
| Blueback | 3,605,737 | 279,112 | 189,847 | 8,794 | 1,242,530 | $57,353 | 3,010 | $271 | 5,041,124 | 345,530 |
| Chinook | 7,554,283 | 303,352 | 9,214,877 | 367,474 | 836,550 | 16,007 | 567,760 | 11,374 | 18,143,470 | 698,207 |
| Chum | 14,707,440 | 269,152 | 821,042 | 5,646 | 1,228,227 | 5,582 | 356,715 | 1,659 | 17,113,424 | 282,039 |
| Humpback | 29,816,167 | 365,213 | 147,924 | 1,845 | 18,310 | 230 | 1,960 | 25 | 29,984,391 | 367,313 |
| Silver | 14,753,946 | 455,908 | 1,877,121 | 42,320 | 1,209,360 | 23,598 | 485,875 | 9,720 | 18,326,302 | 531,546 |
| Shad | 3,938 | 162 | 92,360 | 1,002 | | | | | 96,298 | 1,164 |
| Sharks | 399,000 | 889 | | | | | | | 399,000 | 889 |
| Skates | 229,000 | 515 | | | | | | | 229,000 | 515 |
| Smelts | 532,766 | 18,585 | 1,625,605 | 6,748 | | | | | 2,158,371 | 25,333 |
| Sole | 68,062 | 1,951 | | | | | | | 68,062 | 1,951 |
| Steelhead trout | 400,529 | 28,071 | 1,590,311 | 56,558 | 98,033 | 5,317 | 8,918 | 498 | 2,098,391 | 90,444 |
| Sturgeon | 5,778 | 295 | 36,788 | 1,877 | 1,899 | 57 | 400 | 12 | 44,856 | 2,241 |
| Sturgeon caviar | | | 300 | 75 | | | | | 300 | 75 |
| Clams: | | | | | | | | | | |
| Hard | 175,744 | 12,191 | | | | | | | 175,744 | 12,191 |
| Soft | | | | | | | 1,200 | 150 | 1,200 | 150 |
| Razor | | | | | 297,430 | 37,736 | 75,320 | 18,710 | 372,750 | 56,446 |
| Mussels | 700 | 83 | | | | | | | 700 | 83 |
| Oysters: | | | | | | | | | | |
| Eastern, market | 84,910 | 47,549 | | | 875 | 525 | 179,228 | 91,954 | 265,013 | 140,028 |
| Native— | | | | | | | | | | |
| Market | 440,685 | 245,543 | | | | | 9,709 | 4,755 | 450,394 | 250,298 |
| Seed | 12,607 | 3,390 | | | | | 12,201 | 5,229 | 24,808 | 8,619 |
| Squid | 15,000 | 325 | | | | | | | 15,000 | 325 |
| Crabs | 380,785 | 12,226 | | | 255,847 | 8,100 | 1,097,778 | 34,200 | 1,734,410 | 54,526 |
| Shrimp | 386,420 | 18,719 | | | | | | | 386,420 | 18,719 |
| Kelp | 450,000 | 191 | | | | | | | 450,000 | 191 |
| Total | 84,204,558 | 2,095,517 | 15,796,175 | 496,339 | 5,159,682 | 154,505 | 2,800,074 | 178,557 | 107,960,489 | 2,924,948 |

[a] The data for the Columbia River comprise those for all of its tributaries including the Snake River, which is also shown separately in another table.

## FISHERIES BY COUNTIES.

In 1915 commercial fishing was prosecuted in 25 counties in Washington. These include counties bordering on Puget Sound, the Pacific Ocean, and the Columbia River and tributaries. This report shows salmon, including steelhead trout, taken commercially as far from the coast as in the Snake River opposite Lewiston, Idaho. No commercial fishing, however, is followed from the latter State, as its laws discourage all but hook-and-line fishing. Practically the entire catch of the Snake River is made with seines and consists mainly of steelhead trout and chinook salmon; a few blueback, chum, and silver salmon, and sturgeon are also taken.

*King County.*—This county supports the most valuable fisheries of the State, due mainly to the fact that Seattle is located within its boundaries. Most of the State's salmon and halibut fleets are owned and operated from this city. Among other important fisheries centered here are the gill-net and troll fisheries. In 1915 the products of the fisheries of this county amounted to 54,993,930 pounds, with a value to the fishermen of $2,204,124. The two most important items of this total are 33,642,389 pounds of halibut, valued at $1,691,211, and 16,934,501 pounds of the various species of salmon, including steelhead trout, valued at $406,981. Salted cod amounting to 2,220,000 pounds, with a value of $73,980, is also an important item. These fish are taken and salted in Alaskan waters and brought back to the State for repacking and shipment.

*Whatcom County.*—The output of the fisheries of this county in 1915 amounted to 20,546,494 pounds, having a value to the fishermen of $493,887, consisting mainly of salmon. Most of these are taken with pound nets and gill nets in the shore fisheries and with purse seines in the vessel fisheries. This county, being very convenient to the fishing grounds, has many of the largest salmon canneries of the State. Bellingham and Blaine are the centers of the canning, as well as of the fishing, industry of the county.

*Skagit County.*—The fisheries of this county ranked next in importance to those of Whatcom County, the output amounting to 14,693,537 pounds, valued at $427,988. This county is also convenient to the salmon-fishing grounds, and owes its extensive fisheries to that fact. With the exception of a few cases of salmon packed at La Conner, all of the county's salmon pack was put up at Anacortes, where eight canneries were in operation in 1915. Extensive pound-net and purse-seine fisheries are also operated from here. La Conner supports valuable gill-net fisheries, the catch being taken to Anacortes. Included in the total output of the county are 3,278,284 pounds of salted cod, valued at $106,954, taken in Alaskan waters by schooners owned at Anacortes. Samish, in this county, is the most northern point in the State at which oysters are taken. In 1915, 2,400 bushels of eastern oysters, worth $9,000, and 480 bushels of native oysters, worth $1,890, were marketed from private beds in Samish Bay.

*Pierce County.*—Fishing is followed from many places in this county, but the most important fishing center in the county is Tacoma, where a large number of purse-seine vessels are owned and operated. Several halibut vessels also fish from this port. No salmon canning is done in this county, but large quantities of fish are handled at

Tacoma, either in a fresh, frozen, salted, or smoked condition. This county leads in the value of its shrimp fisheries, 201,332 pounds, having a value to the fishermen of $9,171, being credited to it in 1915. The meat of more than one-half of these shrimps is extracted by Tacoma dealers before selling. The total output of fishery products in the county was 15,861,531 pounds, valued at $408,964, as compared with 7,255,164 pounds, valued at $196,824, in 1904.

*Pacific County.*—This county ranks fifth in the value of its fishery products. The salmon fisheries are the most important, but there are also several others deserving of mention. The total production in 1915 amounted to 8,701,774 pounds, with a value to the fishermen of $398,845, showing a decline since 1904 of 427,074 pounds and of $169,350 in value. The transplanting and raising of oysters from eastern seed is an important industry in this county. In 1915 31,821 bushels were taken up and sold by the owners for $115,109. Native oysters to the amount of 1,412 bushels, valued at $4,830, were also sold, showing a great decline in production since 1904, when the last canvass by the Bureau was made. Among other items of interest were $34,400 worth of crabs and $18,710 worth of razor clams. The most valuable fisheries of the county are located at Chinook, near the mouth of the Columbia River, where pound nets are used almost exclusively. Bay Center is the center of the crab, and Nahcotta and vicinity of the razor clam, industry.

*Grays Harbor County.*—The products of this county, formerly named Chehalis, in 1915 amounted to 9,793,354 pounds, valued at $317,158. The most important items of this total are whale products, valued at $134,441. Three steamers are employed in this industry from Bay City, Wash., where a plant is located, to which the whales are brought for the manufacture of fertilizer and oil. This county differs from the four preceding counties in that the salmon fisheries hold second place instead of first. The most valuable razor-clam industry in the State is located in this county. Practically all of these clams are utilized in canneries located within the county. Aberdeen is the most important fishing and canning center.

*Thurston County.*—Olympia is the only fishing locality of any importance in this county. In this town and vicinity is centered the native oyster industry of the State. Out of a total for the county of 747,521 pounds of products, valued at $244,209, the oyster industry contributed 294,296 pounds, or 56,328 bushels, of native oysters, valued at $219,818, and 14,091 pounds, or 2,013 bushels, of eastern oysters, valued at $9,394. Seed oysters to the amount of 3,794 pounds, or 542 bushels, with an estimated value of $813, are also shown. Shrimp, smelt, and clams are important items in the total output.

*Kitsap County.*—The fisheries of this county in 1915 amounted to 9,905,345 pounds, with a value to the fishermen of $235,980, as compared with 1,052,928 pounds, valued at $38,019, in 1904. One-half of the value in 1915 is credited to halibut taken by vessels owned at various localities in the county. The next most important is the salmon fishery, the output of which amounted to 4,905,529 pounds, valued at $97,081. Several vessels were engaged in taking herring, the total catch amounting to 1,335,049 pounds, valued at $6,035. These were sold mainly for halibut bait. The smelt fishery is of some importance, the catch amounting to 94,175 pounds, valued at

$3,381. Two clam canneries at Bangor utilize most of the clams taken on the western side of the county bordering on Hood Canal. Those taken on the eastern side are sold mostly in Seattle. There are a great many fishing localities in this county, but none of great importance. There were 65 fishing vessels in the county, which constituted an important factor in its fisheries.

*Wahkiakum County.*—The total output of this county amounted to 3,808,288 pounds, valued at $142,308, showing a decline since 1904 of 5,561,387 pounds in quantity and of $234,203 in value. The catch consisted almost entirely of salmon taken in the Columbia River. The gill-net fisheries are the most important, but the pound-net fisheries at Cathlamet and vicinity contribute about one-third of the total production of the county. That town has very important gill-net fisheries also and ranks as the most important fishing center on the Columbia River. Canneries at Altoona, Brookfield, Cathlamet, and Eaglecliff utilize large quantities of salmon. A considerable quantity is also smoked at Altoona. A few shad are put up at the Altoona and Eaglecliff canneries. A very small number of cases of shad roe were also canned at Altoona.

*Snohomish County.*—The fishery production of this county in 1915 amounted to 3,253,395 pounds, valued at $78,860, showing an increase since 1904 of 1,566,830 pounds in quantity and of $42,554 in value. The catch consisted almost wholly of salmon. Everett is the important fishing center of the county, and has a large fleet of salmon purse-seine vessels. The gill-net fishery of this city is prosecuted in the Snohomish River as far up as Snohomish, but one man fishes his gill nets in the Gulf of Georgia. Four canneries at Everett utilized large quantities of salmon. A considerable number of chinook salmon were also kippered here. Many herring are frozen for use later as halibut bait.

*Clallam County.*—This county has the Strait of Juan de Fuca as its northern, and the Pacific Ocean as its western, boundary. Its fisheries in 1915 amounted to 2,219,016 pounds, valued at $56,011, of which 2,090,829 pounds, valued at $50,876, were salmon. Besides the latter, some halibut, rockfishes, clams, and crabs were taken. Neah Bay and Port Angeles are the leading fishing centers of the county. Trolling for salmon is extensively followed at both places, mainly in the Pacific Ocean off Neah Bay. The catch is handled by a cannery at Neah Bay and buyers representing wholesale firms at Seattle and Tacoma. A cannery at Mora, on the Pacific coast, utilized the salmon caught in that neighborhood. This firm went out of business in 1916. One firm at Port Williams canned both salmon and clams, most of the latter being taken in Hood Canal. A few men at Dungeness follow crabbing for several months of the year. The returns for all of the fisheries in 1915 show an increase of 221,661 pounds in quantity and $6,397 in value since 1904.

*San Juan County.*—This county is conveniently located near the salmon-fishing grounds of Puget Sound, but the population seems to favor farming more than fishing. A fleet of 13 vessels, however, is an important factor in the fishing industry of the county. Friday Harbor, with a population of 400, is the only important fishing town in the county and is more important through its salmon canning than through its fisheries. Besides the two canneries here, there are also two at Richardson, one at Shaw Island, and one at Deer Harbor. In

1915 a small plant at Port Stanley was engaged in making potash and fertilizer from kelp. The total fishery output of this county in 1915 amounted to 3,025,282 pounds, valued at $40,043, as compared with 3,180,326 pounds, valued at $103,899, in 1904. This shows a decrease of 155,044 pounds, and a proportionately greater decrease of $63,856 in value, which occurred mainly in bluebacks and chinooks.

*Mason County.*—This county ranks third in the State in the value of its oyster fisheries, being exceeded only by Pacific and Thurston Counties. In 1915 the total catch of oysters amounted to 7,512 bushels, valued at $26,815. Of these, 5,522 bushels, valued at $22,035, were native oysters; 750 bushels, valued at $2,250, were eastern oysters; and 1,240 bushels, with an estimated value of $2,530, were seed oysters. It is contrary to law to sell seed oysters, and they are taken up and used solely by oyster planters on their private beds. The clam industry is also of considerable importance, 8,000 bushels, with a value of $4,111, being marketed in 1915. Shelton is the center of the county's fishery industries. The total output of Mason County in 1915 amounted to 293,304 pounds, with a value to the fishermen of $36,104, showing a decline since 1904 of 1,875,420 pounds and of $34,017, accounted for mainly through the decline of the native oyster industry, which was affected by a freeze occurring during the 1915 season. The catch of salmon was also smaller in 1915 than in 1904.

*Island County.*—The fisheries of this county are not important as compared with those counties already mentioned, the total production in 1915 amounting to 1,856,919 pounds, valued at $19,611, as compared with 5,489,089 pounds, valued at $125,486, in 1904. The decline is mostly in the salmon fisheries. As in San Juan County, the population includes more farmers than fishermen. In 1915 there was a fleet of only three fishing vessels, notwithstanding its proximity to the prolific salmon-fishing grounds of Puget Sound. Besides salmon, the important fisheries are the crab, smelt, and grayfish. The catch of grayfish was more than one-half of the total catch of the county, but the value was less than one-seventh. During that year they were used entirely for fertilizer and oil. There are no canneries and no fishing centers of importance in the county.

*Jefferson County.*—Out of a total output of 3,919,316 pounds, valued at $74,197, 2,572,837 pounds, valued at $53,785, are credited to the pound-net fishery operated from Port Townsend. Two large salmon canneries are located at Port Townsend, and also a plant utilizing large quantities of grayfish in the preparation of fertilizer, poultry food, and oil. Hard clams and eastern oysters from private beds are among the products of this county. The returns for 1915 show an increased production over 1904 of 2,148,100 pounds and of $43,425.

*Cowlitz County.*—This county depends for its fish supply upon the Columbia River, which forms part of its western and southern boundaries; but the Cowlitz River, one of its tributaries, passing through the county from north to south, also furnishes considerable quantities. In 1915, 1,609,500 pounds of eulachon, or candlefish tabulated as smelt, valued at $6,500, were taken from one of the small tributaries of the Cowlitz River. These fish are taken in the vicinity of Kelso during January, February, and March. Such large quantities are secured within so short a period of time that it is difficult

to dispose of them at a profitable price, the latter ranging from $5 at the beginning to as low as 10 cents per box, holding 50 pounds, at the height of the season. Carrollton and Kalama are the most important fishing localities in the county, both of them supporting profitable pound-net fisheries. Gill netting and seining are also followed to some extent. Aside from 300,000 pounds of salmon frozen at Kalama, most of the catch was handled fresh by two firms at Kalama and Kelso. The total output of the county in 1915 was 3,935,756 pounds, valued at $73,643, as compared with 1,514,562 pounds, valued at $35,864, in 1904.

*Clarke County.*—The total yield of the fisheries of this county in 1915 was 1,016,122 pounds, valued at $44,584. The salmon fisheries are the most important in the county, though $4,000 worth of carp, taken from sloughs formed by overflow water from the Columbia River, forms an important item. These fish are shipped mainly to Seattle and Portland, and some are sent as far east as Butte, Mont. Vancouver is the most important fishing locality in the county.

*Lewis County.*—The fisheries of this county are unimportant, amounting in 1915 to 11,571 pounds, valued at $542, consisting of salmon taken mostly in the Chehalis and Cowlitz Rivers. No fisheries were shown for this county in 1904.

*Skamania and Klickitat Counties.*—These counties, situated on the upper Columbia River, represent the upper limit of fishing on that river. In fact, no commercial fishing of importance is done on the Washington side above Grand Dalles, in Klickitat County. Aside from a few sturgeon taken on set lines, the catch of Skamania County consisted entirely of salmon. The catch of Klickitat County consisted also of salmon which were taken both in gill nets and pound nets, the catch in the latter predominating. The catch of the two counties in 1915 combined was 325,055 pounds, valued at $12,249, showing a loss since 1904 of 674,032 pounds and $16,591.

*Franklin, Columbia, Garfield, Whitman, and Asotin Counties.*—These counties are all situated on the Snake River, and the catch credited to them represents the total output of that river. Aside from the use of a few set lines for sturgeon and gill nets for salmon, the seine is the only form of apparatus used on the river. A few bluebacks are taken, but the greater part of the catch consists of chinook, silver, and steelhead. The uppermost point on the river, where commercial fishing is followed, is just above Clarkston, Wash., or Lewiston, Idaho. The most important catches of the river are made at this point. The fishing is followed in February and March, and again in August, September, and October. Except for some shipped to Spokane and near-by towns, the catch is sold locally. The total output of the five counties in 1915 amounted to 146,268 pounds, valued at $11,468.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES.

| | Asotin. | | Clallam. | | Clarke. | | Columbia. | | Cowlitz. | | Franklin. | | Garfield. | | Grays Harbor. | | Island. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | | | | | | | | | | | | | | | 68 | | 20 | |
| On vessels transporting | | | 2 | | | | | | 2 | | | | | | 12 | | | |
| In shore fisheries | 38 | | 244 | | 92 | | 5 | | 177 | | 5 | | 9 | | 859 | | 129 | |
| On shore, in canneries, etc | | | 107 | | | | | | 18 | | | | | | 741 | | | |
| Total | 38 | | 353 | | 92 | | 5 | | 197 | | 5 | | 9 | | 1,680 | | 149 | |
| INVESTMENT. | | | | | | | | | | | | | | | | | | |
| Vessels fishing | | | | | | | | | | | | | | | 9 | $161,200 | 3 | $9,000 |
| Tonnage | | | | | | | | | | | | | | | 377 | | 46 | |
| Outfit | | | | | | | | | | | | | | | | 11,135 | | 910 |
| Vessels transporting | | | 1 | $4,000 | | | | | 2 | $3,000 | | | | | 6 | 13,750 | | |
| Tonnage | | | 10 | | | | | | 12 | | | | | | 53 | | | |
| Outfit | | | | 625 | | | | | | 400 | | | | | | 1,375 | | |
| Scows (5 tons and over) | | | 2 | 1,400 | | | | | | | | | | | 5 | 2,475 | | |
| Tonnage | | | 42 | | | | | | | | | | | | 204 | | | |
| Boats: | | | | | | | | | | | | | | | | | | |
| Gasoline | | | 90 | 32,350 | 55 | $18,950 | | | 122 | 29,450 | 1 | $400 | | | 99 | 34,445 | 42 | 15,050 |
| Sail, row, etc | 11 | $230 | 128 | 2,020 | 34 | 2,815 | 2 | $30 | 64 | 2,790 | 2 | 30 | 3 | $45 | 193 | 4,510 | 62 | 925 |
| Apparatus, vessel fisheries: | | | | | | | | | | | | | | | | | | |
| Seines | | | | | | | | | | | | | | | | | 3 | 2,400 |
| Length in yards | | | | | | | | | | | | | | | | | 1,550 | |
| Whaling apparatus | | | | | | | | | | | | | | | | 2,000 | | |
| Lines | | | | | | | | | | | | | | | | 750 | | |
| Apparatus, shore fisheries: | | | | | | | | | | | | | | | | | | |
| Seines | 7 | 650 | 4 | 725 | 1 | 125 | 2 | 160 | 2 | 700 | 1 | 100 | 3 | 300 | | | 33 | 1,945 |
| Length in yards | 750 | | 635 | | 150 | | 225 | | 670 | | 115 | | 350 | | | | 2,310 | |
| Gill nets | 5 | 275 | 45 | 1,260 | 64 | 22,660 | | | 236 | 50,380 | | | | | 344 | 24,590 | | |
| Length in yards | 425 | | 2,675 | | 25,750 | | | | 66,315 | | | | | | 48,748 | | | |
| Pound nets | | | | | 6 | 4,200 | | | 21 | 7,200 | | | | | 26 | 20,300 | | |
| Hoop nets | | | | | | | | | | | | | | | 365 | 1,290 | | |
| Dip nets | | | | | 4 | 8 | | | 62 | 124 | | | | | | | | |
| Pots | | | 135 | 200 | | | | | | | | | | | 525 | 1,050 | 2,270 | 4,540 |
| Lines | | | | 3,425 | | 75 | | | | | | 30 | | | | 500 | | 980 |
| Dredges, tongs, rakes, etc | | | | 7 | | | | | | | | | | | | 846 | | 6 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shore and accessory property | | 800 | | 154,980 | | 1,065 | | 100 | | 32,645 | | 100 | | 110 | | 371,670 | | 650 |
| Cash capital | | | | 16,500 | | | | | | 5,600 | | | | | | 75,700 | | |
| Total | | 1,955 | | 217,492 | | 49,898 | | 290 | | 132,289 | | 660 | | 455 | | 727,586 | | 36,406 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | 200,000 | $4,000 | | | | | | | | | | | 1,080,000 | $2,429 |
| Grayfish | | | 42,000 | $1,920 | | | | | | | | | | | 413,000 | $21,607 | | |
| Halibut | | | | | | | | | | | | | | | 150 | 2 | | |
| "Lingcod" | | | | | | | | | | | | | | | | | 500 | 15 |
| Perch | | | 57,000 | 1,425 | | | | | | | | | | | 21,000 | 523 | 1,000 | 35 |
| Rockfishes | | | | | | | | | | | | | | | | | | |
| Salmon: | | | | | | | | | | | | | | | | | | |
| Blueback or sockeye | 1,100 | $88 | | | 9,710 | 484 | | | 9,880 | $457 | | | 2,250 | $180 | 1,242,530 | 57,353 | 5,800 | 444 |
| Chinook | 17,160 | 1,372 | 384,426 | 9,614 | 655,325 | 36,711 | 10,125 | $759 | 1,782,875 | 55,586 | 2,490 | $199 | 14,640 | 1,170 | 912,005 | 18,745 | 62,484 | 1,683 |
| Chum | | | 50,376 | 691 | 17,100 | 85 | | | 165,350 | 826 | 984 | 79 | | | 1,340,262 | 6,145 | 50,024 | 717 |
| Humpback | | | 61,050 | 1,482 | | | | | 240 | 3 | | | | | 19,170 | 240 | 80,428 | 992 |
| Silver | 1,080 | 86 | 1,594,977 | 39,089 | 33,800 | 877 | | | 180,020 | 4,179 | 680 | 54 | | | 1,316,670 | 25,969 | 283,348 | 7,266 |
| Shad | | | | | 19,550 | 197 | | | 19,200 | 293 | | | | | | | | |
| Sharks | | | | | | | | | | | | | | | | | 64,000 | 141 |
| Skates | | | | | | | | | | | | | | | | | 44,000 | 99 |
| Smelts | | | | | 12,550 | 126 | | | 1,609,500 | 6,580 | | | | | | | 71,500 | 2,543 |
| Sole | | | | | | | | | | | | | | | | | 500 | 20 |
| Steelhead trout | 62,128 | 4,971 | | | 65,537 | 1,971 | 9,600 | 720 | 161,966 | 5,383 | | | 10,136 | 811 | 105,350 | 5,714 | 158 | 10 |
| Sturgeon | | | | | 2,550 | 133 | | | 6,725 | 336 | 1,200 | 90 | | | 1,940 | 58 | | |
| Clams: | | | | | | | | | | | | | | | | | 552 | 45 |
| Hard | | | 2,520 | 190 | | | | | | | | | | | 297,430 | 37,736 | | |
| Razor | | | | | | | | | | | | | | | | | | |
| Oysters: Eastern, market | | | | | | | | | | | | | | | 875 | 525 | | |
| Crabs | | | 26,667 | 1,600 | | | | | | | | | | | 255,847 | 8,100 | 112,625 | 3,172 |
| Whale oil | | | | | | | | | | | | | | | 2,575,125 | 110,051 | | |
| Other whale products | | | | | | | | | | | | | | | 1,292,000 | 24,390 | | |
| Total | 81,468 | 6,517 | 2,219,016 | 56,011 | 1,016,122 | 44,584 | 19,725 | 1,479 | 3,935,756 | 73,643 | 5,354 | 422 | 27,026 | 2,161 | 9,793,354 | 317,158 | 1,856,919 | 19,611 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES—Continued.

| | Jefferson. | | King. | | Kitsap. | | Klickitat | | Lewis. | | Mason. | | Pacific. | | Pierce. | | San Juan. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | 11 | | 1,779 | | 430 | | | | | | | | 11 | | 523 | | 85 | |
| On vessels transporting | 18 | | 39 | | 2 | | | | | | | | 13 | | 12 | | 22 | |
| In shore fisheries | 166 | | 496 | | 225 | | 7 | | 15 | | 92 | | 717 | | 208 | | 106 | |
| On shore, in canneries, etc | 156 | | 432 | | 13 | | | | | | 8 | | 171 | | 97 | | 339 | |
| Total | 351 | | 2,746 | | 670 | | 7 | | 15 | | 100 | | 912 | | 840 | | 552 | |
| INVESTMENT. | | | | | | | | | | | | | | | | | | |
| Vessels fishing | 2 | $6,500 | 206 | $1,162,110 | 65 | $176,500 | | | | | | | 5 | $19,000 | 59 | $290,400 | 13 | $40,300 |
| Tonnage | 18 | | 5,845 | | 880 | | | | | | | | 39 | | 1,377 | | 179 | |
| Outfit | | 875 | | 404,550 | | 37,575 | | | | | | | | 1,410 | | 52,225 | | 5,280 |
| Vessels transporting | 7 | 30,100 | 16 | 54,500 | 2 | 4,500 | | | | | | | 10 | 23,400 | 6 | 22,500 | 10 | 43,500 |
| Tonnage | 88 | | 212 | | 17 | | | | | | | | 78 | | 78 | | 125 | |
| Outfit | | 4,350 | | 7,670 | | 250 | | | | | | | | 1,685 | | 2,450 | | 3,625 |
| Scows (5 tons and over) | 18 | 12,550 | 7 | 3,900 | | | | | | | | | | | 2 | 1,400 | 16 | 10,300 |
| Tonnage | 734 | | 173 | | | | | | | | | | | | 37 | | 375 | |
| Boats: | | | | | | | | | | | | | | | | | | |
| Gasoline | 33 | 12,650 | 157 | 103,200 | 82 | 35,950 | 4 | $1,050 | | | 28 | $10,575 | 302 | 116,425 | 70 | 41,710 | 22 | 12,800 |
| Sail, row, etc | 93 | 2,710 | 180 | 7,275 | 127 | 1,920 | 5 | 390 | 15 | $170 | 87 | 1,785 | 336 | 10,820 | 130 | 6,270 | 40 | 2,165 |
| Apparatus, vessel fisheries: | | | | | | | | | | | | | | | | | | |
| Seines | 1 | 900 | 138 | 92,090 | 68 | 42,230 | | | | | | | | | 61 | 41,700 | 13 | 9,900 |
| Lengths in yards | 500 | | 77,065 | | 32,275 | | | | | | | | | | 32,975 | | 6,550 | |
| Gill nets | | | 4 | 50 | | | | | | | | | | | | | | |
| Length in yards | | | 640 | | | | | | | | | | | | | | | |
| Beam trawls | | | 7 | 215 | | | | | | | | | | | 5 | 625 | | |
| Hoop nets | | | | | | | | | | | | | 25 | 70 | | | | |
| Pots | | | 20 | 25 | | | | | | | | | | | 200 | 300 | | |
| Whaling apparatus | | | | 50 | | | | | | | | | | | | | | |
| Lines | | 210 | | 37,965 | | 2,675 | | | | | | | | | | 4,550 | | |
| Dredges | | | | | | | | | | | | | 8 | 200 | | | | |
| Apparatus, shore fisheries: | | | | | | | | | | | | | | | | | | |
| Seines | 12 | 825 | 21 | 5,070 | 38 | 2,885 | | | | | 15 | 960 | 2 | 600 | 20 | 1,350 | 3 | 915 |
| Length in yards | 1,310 | | 4,855 | | 3,615 | | | | | | 1,565 | | 800 | | 1,695 | | 585 | |
| Gill nets | 4 | 120 | 312 | 27,668 | 33 | 2,995 | 5 | 100 | 15 | 295 | 6 | 305 | 221 | 44,060 | 97 | 2,970 | 6 | 875 |
| Length in yards | 295 | | 66,440 | | 7,820 | | 170 | | 435 | | 1,050 | | 66,720 | | 8,540 | | 2,500 | |
| Beam trawls | | | | | 3 | 55 | | | | | | | | | 1 | 125 | | |
| Pound nets | 8 | 60,000 | 27 | 127,000 | 4 | 9,700 | 6 | 2,500 | | | | | 197 | 133,950 | 1 | 5,000 | 4 | 17,700 |
| Hoop nets | | | | | | | | | | | | | 2,037 | 5,937 | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reef nets | | | | | | | | | | | | | | | | | | | 6 | 345 |
| Pots | 25 | 37 | 60 | 75 | | | | | | | | | | | | 150 | 225 | | | |
| Wheels | | | | | | | | | | | | | | 2 | 1,000 | | | | | |
| Lines | | 920 | | 3,689 | | 1,242 | | | | | | 110 | | | 3,670 | | 2,047 | | | 400 |
| Dredges, tongs, rakes, etc | | 33 | | 3 | | 52 | | | | | | 400 | | | 1,702 | | 6 | | | 5 |
| Shore and accessory property | | 206,171 | | 1,444,075 | | 8,450 | | 550 | | | | 5,725 | | | 212,250 | | 247,625 | | | 413,451 |
| Cash capital | | 15,000 | | 74,800 | | 1,500 | | | | | | 2,000 | | | 47,200 | | 18,000 | | | 35,000 |
| Total | | 353,951 | | 3,555,980 | | 328,479 | | 4,590 | | 465 | | 21,860 | | | 623,379 | | 741,478 | | | 596,561 |
| PRODUCTS. | | | | | | | | | | | | | | | | | | | | |
| Cod: | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Lbs.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | | |
| Fresh | | | 15,525 | $281 | 6,500 | $140 | | | | | | | | | | | | | | |
| Salted | | | 2,220,000 | 73,980 | | | | | | | | | | | | | | | | |
| Flounders | 6,000 | $120 | 1,255 | 21 | 16,600 | 575 | | | | | | | | | | 2,000 | $20 | | | |
| Grayfish | 1,180,000 | 2,649 | 704,662 | 1,587 | 980,000 | 2,209 | | | | | | | | | | 1,529,334 | 3,441 | 820,000 | $1,844 | |
| Halibut | 43,000 | 2,660 | 33,642,389 | 1,691,211 | 2,401,956 | 120,754 | | | | | | | | | | 4,003,260 | 201,257 | 100 | 10 | |
| Herring | 10,700 | 80 | 441,200 | 2,064 | 1,335,049 | 6,035 | | | | | | | | | | 45,000 | 200 | | | |
| "Lingcod" | 3,300 | 97 | 42,160 | 899 | 1,000 | 25 | | | | | | | | | | | | | | |
| Perch | 5,500 | 140 | 2,150 | 93 | 1,900 | 94 | | | | | 1,000 | $40 | | | | 3,700 | 111 | | | |
| Rockfishes | 5,000 | 300 | 8,201 | 289 | 5,150 | 278 | | | | | 1,000 | 35 | | | | | | 2,000 | 70 | |
| Sable fish | | | 526,810 | 12,557 | 27,000 | 675 | | | | | | | | | | 21,000 | 525 | | | |
| Salmon: | | | | | | | | | | | | | | | | | | | | |
| Blueback, or sockeye | 24,680 | 1,983 | 657,182 | 50,602 | 172,450 | 14,554 | 20,940 | $1,047 | 75 | $7 | | | 112,357 | $4,837 | 291,575 | 25,154 | 61,105 | 5,498 | | |
| Chinook | 637,136 | 21,866 | 1,450,927 | 69,664 | 199,462 | 6,086 | 66,245 | 3,013 | 7,930 | 418 | 13,883 | 516 | 4,371,135 | 155,126 | 293,334 | 12,101 | 133,517 | 3,357 | | |
| Chum | 278,112 | 3,627 | 4,510,124 | 96,472 | 1,742,524 | 29,194 | | | 385 | 5 | 22,840 | 153 | 506,582 | 2,511 | 3,536,170 | 56,266 | 121,168 | 1,967 | | |
| Humpback | 839,494 | 10,493 | 7,166,451 | 78,336 | 2,030,192 | 22,813 | 1,104 | 13 | | | 782 | 11 | 2,160 | 27 | 4,406,756 | 52,974 | 1,023,308 | 12,860 | | |
| Silver | 760,360 | 23,145 | 2,983,403 | 99,126 | 756,249 | 24,103 | 66,600 | 1,500 | 2,710 | 77 | 73,040 | 2,118 | 1,458,686 | 29,985 | 1,321,364 | 42,331 | 367,240 | 13,575 | | |
| Shad | | | 3,878 | 160 | | | | | | | | | 21,626 | 187 | | | | | | |
| Sharks | 42,000 | 93 | 180,000 | 404 | 16,000 | 35 | | | | | | | | | 70,000 | 157 | 22,000 | 48 | | |
| Skates | 26,000 | 60 | 78,000 | 173 | 12,000 | 27 | | | | | | | | | 48,000 | 108 | 18,000 | 41 | | |
| Smelts | 7,300 | 355 | 53,600 | 1,784 | 94,175 | 3,381 | | | | | 62,300 | 2,180 | 55 | 2 | 30,300 | 1,050 | 2,076 | 74 | | |
| Sole | 1,000 | 30 | 10,562 | 351 | 56,000 | 1,550 | | | | | | | | | | | | | | |
| Steelhead trout | 22,160 | 1,322 | 166,414 | 12,781 | 4,652 | 331 | 40,024 | 1,301 | 471 | 35 | 1,875 | 125 | 786,043 | 26,333 | 8,232 | 626 | 288 | 18 | | |
| Sturgeon | 2,380 | 68 | 2,480 | 172 | 78 | 5 | | | | | | | 17,100 | 784 | | | | | | |
| Sturgeon caviar | | | | | | | | | | | | | 300 | 75 | | | | | | |
| Clams: | | | | | | | | | | | | | | | | | | | | |
| Hard | 17,944 | 1,269 | 864 | 110 | 35,760 | 2,371 | | | | | 64,000 | 4,111 | | | 5,680 | 425 | 4,480 | 490 | | |
| Soft | | | | | | | | | | | | | 1,200 | 150 | | | | | | |
| Razor | | | | | | | | | | | | | 75,320 | 18,710 | | | | | | |
| Oysters: | | | | | | | | | | | | | | | | | | | | |
| Eastern, market | 5,250 | 3,750 | | | | | | | | | 5,250 | 2,250 | 222,747 | 115,109 | | | | | | |
| Native— | | | | | | | | | | | | | | | | | | | | |
| Market | | | | | | | | | | | 38,654 | 22,035 | 9,884 | 4,830 | 4,200 | 1,725 | | | | |
| Seed | | | | | | | | | | | 8,680 | 2,530 | 12,201 | 5,229 | 133 | 47 | | | | |
| Squid | | | | | | | | | | | | | | | 15,000 | 325 | | | | |
| Crabs | 2,000 | 90 | 3,243 | 121 | | | | | | | | | 1,104,378 | 34,400 | 25,161 | 950 | | | | |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES—Continued.

| | Jefferson. | | King. | | Kitsap. | | Klickitat. | | Lewis. | | Mason. | | Pacific. | | Pierce. | | San Juan. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTS—continued. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Lbs.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Lbs.* | *Value.* |
| Shrimp | | | 44,450 | $3,050 | 10,648 | $745 | | | | | | | | | 201,332 | $9,171 | | |
| Cod tongues | | | 12,000 | 836 | | | | | | | | | | | | | | |
| Whale oil | | | 60,000 | 2,800 | | | | | | | | | | | | | | |
| Whalebone | | | 6,000 | 4,200 | | | | | | | | | | | | | | |
| Kelp | | | | | | | | | | | | | | | | | 450,000 | $191 |
| Total | 3,919,316 | $74,197 | 54,993,930 | 2,204,124 | 9,905,345 | 235,980 | 194,913 | $6,874 | 11,571 | $542 | 293,304 | $36,104 | 8,701,774 | $298,845 | 15,861,531 | 408,964 | 3,025,282 | 40,043 |

| | Skagit. | | Skamania. | | Snohomish. | | Thurston. | | Wahkiakum. | | Whatcom. | | Whitman. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | 271 | | | | 137 | | 8 | | 7 | | 305 | | | | 3,655 | |
| On vessels transporting | 70 | | | | 26 | | 3 | | 14 | | 145 | | | | 380 | |
| In shore fisheries | 453 | | 27 | | 262 | | 162 | | 355 | | 621 | | 11 | | 5,481 | |
| On shore, in canneries, etc | 1,111 | | | | 240 | | 79 | | 223 | | 1,473 | | | | 5,208 | |
| Total | 1,905 | | 27 | | 665 | | 252 | | 599 | | 2,544 | | 11 | | 14,724 | |
| INVESTMENT. | | | | | | | | | | | | | | | | |
| Vessels fishing | 20 | $97,150 | | | 20 | $57,000 | 4 | $6,400 | 1 | $1,900 | 51 | $167,200 | | | 472 | $2,194,660 |
| Tonnage | 1,435 | | | | 287 | | 29 | | 6 | | 845 | | | | 11,363 | |
| Outfit | | 29,230 | | | | 11,410 | | 1,200 | | 450 | | 22,575 | | | | 578,825 |
| Vessels transporting | 24 | 213,698 | | | 5 | 17,500 | 3 | 5,300 | 7 | 13,700 | 41 | 239,800 | | | 140 | 689,248 |
| Tonnage | 547 | | | | 76 | | 21 | | 58 | | 838 | | | | 2,213 | |
| Outfit | | 16,175 | | | | 3,875 | | 1,000 | | 1,825 | | 23,590 | | | | 68,895 |
| Scows (5 tons and over) | 87 | 35,775 | | | 9 | 8,300 | | | | | 151 | 66,560 | | | 297 | 142,660 |
| Tonnage | 1,644 | | | | 285 | | | | | | 3,764 | | | | 7,258 | |
| Boats: | | | | | | | | | | | | | | | | |
| Gasoline | 106 | 48,250 | 15 | $2,775 | 48 | 29,000 | 23 | 13,100 | 188 | 57,075 | 80 | 30,275 | | | 1,567 | 645,480 |
| Sail, row, etc | 333 | 15,575 | 17 | 895 | 230 | 4,545 | 129 | 5,175 | 109 | 6,500 | 296 | 18,350 | 5 | $75 | 2,631 | 98,015 |
| Apparatus, vessel fisheries: | | | | | | | | | | | | | | | | |
| Seines | 15 | 12,350 | | | 20 | 12,685 | 2 | 120 | 1 | 900 | 52 | 41,600 | | | 374 | 256,875 |
| Length in yards | 8,200 | | | | 10,305 | | 145 | | 400 | | 27,975 | | | | 197,940 | |
| Gill nets | | | | | 1 | 400 | | | | | | | | | 5 | 450 |
| Length in yards | | | | | 600 | | | | | | | | | | 1,240 | |
| Beam trawls | | | | | | | 4 | 600 | | | | | | | 16 | 1,440 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hoop nets | | | | | | | | | | | | | 60 | 200 | | | 85 | 270 |
| Pots | | | | | | | | | | | | | | | | | 220 | 325 |
| Whaling apparatus | | | | | | | | | | | | | | | | | | 2,050 |
| Lines | | 400 | | | | 250 | | | | | | | | | | | | 46,800 |
| Dredges | 2 | 75 | | | | | | | | | | | | | | | 10 | 275 |
| Apparatus, shore fisheries: | | | | | | | | | | | | | | | | | | |
| Seines | 11 | 2,100 | | | 2 | 150 | 13 | 1,350 | 2 | 600 | 5 | 1,350 | 3 | 285 | 200 | 23,145 | | |
| Length in yards | 2,140 | | | | 200 | | 1,325 | | 800 | | 875 | | 370 | | 25,340 | | | |
| Gill nets | 403 | 20,831 | 39 | 3,030 | 350 | 8,480 | 1 | 175 | 365 | 76,725 | 326 | 21,030 | 1 | 35 | 2,878 | 308,859 | | |
| Length in yards | 55,175 | | 4,220 | | 21,230 | | 450 | | 134,365 | | 58,725 | | 30 | | 572,078 | | | |
| Beam trawls | | | | | | | 3 | 225 | | | | | | | 7 | 405 | | |
| Pound nets | 41 | 176,653 | | | | | | | 38 | 30,400 | 65 | 505,500 | | | 444 | 1,100,103 | | |
| Hoop nets | | | | | | | | | | | | | | | 2,402 | 7,227 | | |
| Dip nets | | | | | | | | | 1 | 2 | | | | | 67 | 134 | | |
| Reef nets | | | | | | | | | | | 2 | 80 | | | 8 | 425 | | |
| Pots | 630 | 645 | | | 80 | 155 | | | | | 850 | 1,225 | | | 4,725 | 8,152 | | |
| Wheels | | | | | | | | | | | | | | | 2 | 1,000 | | |
| Lines | | 1,752 | | 20 | | 1,190 | | | | | | 1,150 | | | | 21,200 | | |
| Dredges, tongs, rakes, etc | | 4 | | | | 10 | | 1,455 | | | | 7 | | | | 4,536 | | |
| Shore and accessory property | | 1,403,369 | | 35 | | 387,117 | | 54,985 | | 342,804 | | 2,097,832 | | 150 | | 7,386,709 | | |
| Cash capital | | 62,000 | | | | 18,200 | | 14,500 | | 31,000 | | 126,000 | | | | 543,000 | | |
| Total | | 2,136,032 | | 6,755 | | 560,267 | | 105,585 | | 563,881 | | 3,364,324 | | 545 | | 14,131,163 | | |

| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carp | | | | | | | | | | | | | | | 200,000 | 4,000 |
| Cod: | | | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | | | 22,025 | 421 |
| Salted | 3,278,284 | $106,954 | | | | | | | | | | | | | 5,498,284 | 180,934 |
| Flounders | | | | | | | | | | | | | | | 25,855 | 736 |
| Grayfish | | | | | | | | | | | 800,000 | $1,800 | | | 7,093,996 | 15,959 |
| Halibut | | | | | 45,000 | $1,860 | | | | | | | | | 40,590,705 | 2,041,279 |
| Herring | 2,200 | 22 | | | 275,000 | 1,169 | | | | | 20,000 | 85 | | | 2,129,149 | 9,655 |
| "Lingcod" | 790,500 | 1,789 | | | | | | | | | | | | | 837,110 | 2,812 |
| Perch | | | | | | | | | | | | | | | 14,750 | 493 |
| Rockfishes | 1,000 | 40 | | | | | | | | | | | | | 101,351 | 2,995 |
| Sablefish | | | | | 1,000 | 25 | | | | | | | | | 575,810 | 13,782 |
| Salmon: | | | | | | | | | | | | | | | | |
| Blue-back, or sockeye | 557,770 | 47,930 | 7,755 | $386 | 80,670 | 6,453 | 7,780 | $690 | 23,645 | $1,181 | 1,752,870 | 126,295 | 1,250 | $87 | 5,043,374 | 345,710 |
| Chinook | 2,036,367 | 82,328 | 95,375 | 4,384 | 209,860 | 6,779 | 330 | 20 | 2,600,571 | 115,293 | 2,226,885 | 92,724 | 3,673 | 257 | 18,188,160 | 699,771 |
| Chum | 1,840,300 | 36,329 | 8,750 | 43 | 500,718 | 9,398 | 840 | 5 | 233,011 | 1,193 | 2,230,604 | 37,136 | | | 17,156,224 | 282,842 |
| Humpback | 3,879,170 | 57,081 | | | 1,120,508 | 16,796 | 29,644 | 480 | 4,900 | 61 | 9,332,934 | 112,859 | | | 29,998,291 | 367,521 |
| Silver | 2,040,040 | 71,658 | 5,000 | 112 | 975,608 | 33,928 | 4,068 | 135 | 468,888 | 10,441 | 3,932,783 | 113,229 | 3,688 | 258 | 18,630,302 | 543,241 |
| Shad | 483 | 15 | 100 | 1 | | | | | 31,461 | 311 | | | | | 96,298 | 1,164 |
| Sharks | | | | | | | | | | | 5,000 | 11 | | | 399,000 | 889 |
| Skates | | | | | | | | | | | 3,000 | 7 | | | 229,000 | 515 |
| Smelts | 44,191 | 1,331 | | | 1,406 | 50 | 121,988 | 4,275 | 3,500 | 40 | 43,930 | 1,562 | | | 2,158,371 | 25,333 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES—Continued.

| PRODUCTS—continued. | Skagit. | | Skamania. | | Snohomish. | | Thurston. | | Wahkiakum. | | Whatcom. | | Whitman. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Sole | | | | | | | | | | | | | | | 68,062 | $1,951 |
| Steelhead trout | 137,439 | $8,974 | 10,662 | $319 | 31,865 | $1,910 | | | 436,549 | $13,471 | 48,608 | $3,484 | 3,984 | $279 | 2,114,141 | 91,389 |
| Sturgeon | 840 | 50 | 2,500 | 130 | | | | | 5,763 | 317 | | | 100 | 8 | 43,656 | 2,151 |
| Sturgeon caviar | | | | | | | | | | | | | | | 300 | 75 |
| Clams: | | | | | | | | | | | | | | | | |
| Hard | 176 | 25 | | | 1,760 | 242 | 40,000 | $2,743 | | | 2,008 | 170 | | | 175,744 | 12,191 |
| Soft | | | | | | | | | | | | | | | 1,200 | 150 |
| Razor | | | | | | | | | | | | | | | 372,750 | 56,446 |
| Mussels | | | | | | | 700 | 83 | | | | | | | 700 | 83 |
| Oysters: | | | | | | | | | | | | | | | | |
| Eastern, market | 16,800 | 9,000 | | | | | 14,091 | 9,394 | | | | | | | 265,013 | 140,028 |
| Native— | | | | | | | | | | | | | | | | |
| Market | 3,360 | 1,890 | | | | | 394,296 | 219,818 | | | | | | | 450,394 | 250,298 |
| Seed | | | | | | | 3,794 | 813 | | | | | | | 24,808 | 8,619 |
| Squid | | | | | | | | | | | | | | | 15,000 | 325 |
| Crabs | 46,617 | 1,318 | | | 10,000 | 250 | | | | | 147,872 | 4,255 | | | 1,734,410 | 54,526 |
| Shrimp | | | | | | | 129,990 | 5,753 | | | | | | | 386,420 | 18,719 |
| Cod tongues | 18,000 | 1,254 | | | | | | | | | | | | | 30,000 | 2,090 |
| Whale oil | | | | | | | | | | | | | | | 2,635,125 | 112,851 |
| Whalebone | | | | | | | | | | | | | | | 6,000 | 4,200 |
| Other whale products | | | | | | | | | | | | | | | 1,292,000 | 24,390 |
| Kelp | | | | | | | | | | | | | | | 450,000 | 191 |
| Total | 14,693,537 | 427,988 | 130,142 | 5,375 | 3,253,395 | 78,860 | 747,521 | 244,209 | 3,808,288 | 142,308 | 20,546,494 | 493,887 | 12,695 | 889 | 159,053,778 | 5,320,725 |

## PRODUCTS BY APPARATUS.

The following are the different forms of apparatus used in the fisheries of Washington, in the order of their importance, based on the value of their catch. The kinds of apparatus, such as dredges, tongs, etc., used in taking oysters, clams, and mussels are so varied that they are not given any particular ranking on the basis of catch.

*Lines.*—Lines are used both in the vessel and shore fisheries, but their importance is due mainly to their use in the halibut vessel fisheries. The total catch of all species by lines in 1915 amounted to 58,923,651 pounds, with a value to the fishermen of $2,446,323. Of this amount, halibut contributed 40,590,705 pounds, valued at $2,041,279. The total catch by lines in 1904 amounted to only 15,897,155 pounds, valued at $458,375.

*Trolling.*—Trolling has in recent years become one of the important fisheries of Washington. It is followed in Neah Bay, Strait of Juan de Fuca, and in the Pacific Ocean off the village of Neah Bay, and more recently a very large number of boats have been trolling off the mouth of the Columbia River. With the exception of fishermen from a few towns in Pacific County, however, the latter fishery was of no great importance in 1915. In 1916, while no statistics are available, it was reliably reported that as many as 1,500 boats from Washington and Oregon were engaged in trolling off the Columbia River; some of these were sport fishermen, but the greater proportion were engaged in commercial fishing. Some of the boats were from as far up the river as Vancouver. Many of the gill-net fishermen laid aside their nets to troll.

In 1915 nearly 500 boats were engaged at times in trolling in the vicinity of Neah Bay. As in halibut fishing, it is followed on banks, very little being done in deep water. The boats alternate between fishing in Neah Bay and in the ocean, according to the run of fish. If the weather is favorable and fishing good, a boat may remain out in the ocean, but this condition is said to have been reversed in 1916. The greatest distance resorted to by trollers is off Swiftsure Lightship, 15 miles WNW. from Tatoosh Island. More trolling was done on this than on any other ocean bank in 1915.

The season for trolling is usually from June 15 to September 15, and often continues until the last of October or later; but the fall gales usually put an end to the fishing, as the boats are too small to weather heavy seas.

The catch consists almost entirely of chinook and silver salmon. The former species usually predominates, but in 1915 silver salmon were much more plentiful. In 1915 probably three-fifths of the catch was sold to a nearby cannery and the remainder to buyers representing wholesale dealers in Seattle and a few in Tacoma. The fish are delivered to the canneries by means of "tenders." The tenders are gasoline boats, each of which tows a large scow. The gasoline boat loads first and makes the trip to the cannery while the scow is being loaded. The scow is usually anchored in Neah Bay. The fish are sold in the round by the fishermen. When sold to a nearby cannery the fish are not dressed until landed at the cannery; when sold to distant canneries they are dressed on the cannery scows as they are brought in. In 1916 a canning firm at Anacortes had a scow anchored in Neah Bay fitted up with an "iron chink," or dress-

ing machine, which eviscerates and cuts off the head, fins, and tail of the fish.

When fishing on the outside in the ocean fishermen leave the village of Neah Bay or vicinity at about 1 a. m. and reach the fishing grounds at 4 o'clock. The best trolling is supposed to be at daylight. Fishing is usually continued until dark; if intending to remain the boat is anchored on the bank overnight, and fishing is resumed the next morning and continued until noon of the following day, when a return is made to Neah Bay for the night. Another trip is made to the fishing grounds on the following morning. These return trips to Neah Bay are often necessitated by the failure of the tender to get out to the fishing grounds.

The boats used for trolling are of gasoline power, and, with few exceptions, are less than 5 net tons in size and very seldom have more than one man aboard. A considerable number of rowboats, however, are also used in the fishery. It is a common occurrence for a gasoline boat to have two rowboats in tow while trolling, and occasionally as many as four may be under tow. When the two rowboats are being towed each will be off the quarter of the gas boat and about 200 feet behind it. In the case of four rowboats the second two boats are at a distance of about 600 feet behind the gasoline boat. The distance between the boats is so arranged that the lines will not interfere with each other. The common practice is for the owner of the rowboat to give one-third of his catch to the owner of the gas boat for being towed. It is said that rowboat fishing is often as successful as that from the gas boat.

Gas boats usually have three lines fishing at a time—one from each quarter of the boat and the other attached to a pole 6 feet long, placed upright near the center of the boat and running off from the stern. The side lines are worked from outriggers 10 feet long, projecting out from the side of the boat. No bait, but a spoon is always used. Until recent years two and sometimes three hooks were used, but now the common practice is to use only one hook.

*Pound nets.*—Based upon the value of the catch, pound nets ranked second in importance among the forms of fishery apparatus used in Washington in 1915. The catch for that year amounted to 37,560,330 pounds, valued at $991,115, an increase of 10,102,969 pounds and $130,818 since 1904. There were 444 pound nets, costing $1,100,103, operated in the State in 1915. It is customary among the owners of pound nets in Washington to include in the value of the pound net the estimated value of the "stand," or bottom, where the net is set, but that practice has not been followed in this report. It is no doubt true that in most cases considerable value does attach to the stand, which is proved by the fact that even though a pound net is not to be fished a license is nevertheless secured from the State simply to hold the stand, for which large sums have often been offered. Pound nets are quite generally used throughout the Puget Sound region and also in the Columbia River as far up as commercial fishing is followed. The nets used in the Puget Sound region are much larger and more expensive than those used in the Columbia River and are commonly owned by corporations, while those in the latter stream are owned mostly by individuals. The name "trap" is always used for pound nets in this region.

Pound nets used in Washington waters are similar in principle to those used on the Atlantic coast, consisting of a leader, one and very often two hearts, a large followed by a small one, and a tunnel leading into the pot. In addition, however, what is known as a "spiller" is attached to the side of the pot. A tunnel leads from the pot into the spiller, the fish being removed from the latter, the same as from the pot, where there is no spiller. As a rule in Puget Sound wire is commonly used for the leaders and hearts and cotton twine for the pot and spiller. Occasionally wire is also used for the pot, but never in the spiller, as it could not then be fished. Wire has come into use within recent years. It is fastened to the top of the stakes by the use of boards. In addition to the two hearts some pound nets have what are termed "jiggers" attached to the inside of the first or large heart. These are in reality equivalent to another and larger heart. The netting of the pot very seldom extends to the bottom, as this would mean an unnecessary expenditure, but instead an "apron" of netting leading up from the heart to the bottom of the pot is used to lead the fish into the pot. Some pound nets are set to fish only one side, the location rendering the other side useless for fishing.

The pound nets in Willapa Harbor are quite small as compared with those in Puget Sound. The leaders are usually 100 feet or less in length, and only one heart is used. A wing is used from one side of the heart to draw the fish into it. In order to use all available space, the tunnel from the heart to the pot opens out from the side instead of the end of the heart. The tunnel is about 3 feet wide at the large end and narrows down to 18 inches at the small end. The tunnel from the pot to the spiller is still smaller; but even as small as these entrances are, it is said that seals sometimes succeed in getting into the pot and sometimes even into the spiller. All parts of these nets are made of twine.

Pound nets, as previously stated, are fished in the Columbia River on the Washington side as far up as commercial fishing is followed; but more are set off Chinook than from all other points on the river combined. The total number operated in 1915 in the vicinity of that town was 118, having a value of $97,700. These nets, as the value indicates, are much smaller than those used in Puget Sound and are set in water from 15 to 25 feet deep. The leaders range in length from 100 to 900 feet. One heart only is used; this has an average length of from 30 to 35 feet and a width of 40 feet. The pots range in size from 32 to 36 feet square and the spiller from 16 to 24 feet square. The entire net is made of twine, no wire, as in Puget Sound, being used. In places where the current is very strong, the entrance from the heart to the pot is similar to those of nets in Willapa Harbor; that is, from the side of the heart. In this case the pot and spiller are upstream from the heart.

The pound nets used farther up the Columbia River at Kalama are like those below, except that they have no spiller, the catch being taken direct from the pot. The leaders vary in length from 150 to 600 feet, and the pots are usually about 24 feet square.

The pound-net season on the Columbia River is from May 1 to August 25, and from September 10 to March 1, but only a few continue fishing after the first of December. During the spring and summer season, fishing is prohibited from 6 p. m. on Saturdays to 6 p. m. on Sundays. The pound-net stakes are allowed to remain down

during the entire year below Altoona, while above that town the Government requires that the stakes be removed after fishing ceases, except during the interval between the summer and fall fishing.

The nets are often set on sand bars, and the pots, in many cases, are out of water at extreme low tide.

*Seines.*—The total catch with seines in Washington in 1915 amounted to 39,332,569 pounds, having a value to the fishermen of $734,154, as compared with 19,814,215 pounds, valued at $427,896, taken in 1904. The seine catch now ranks third in value among the different forms of apparatus. In 1904 the entire catch was made in the shore fisheries, while in 1915 nearly 90 per cent of the catch was made by vessels of 5 tons and over. Haul seines are used mostly in the shore fisheries, while with few exceptions purse seines are used on vessels; this illustrates the advance made in this fishery. Purse seines are used chiefly in the Puget Sound region, less than a half dozen being operated in the Columbia River. Occasionally purse-seine vessels work outside of the 3-mile limit, and even as far as 15 miles off Cape Flattery; but one objection to this offshore fishing is that the salmon taken there on their way to their spawning ground are quite fat. Unless they are cleaned and prepared for canning at once they are unfit for use when taken ashore. This drawback has in a measure been overcome, as in trolling, by one cannery anchoring a scow provided with an "iron chink" on the fishing grounds near Cape Flattery for cleaning the salmon as soon as delivered. In most cases the catch of purse-seine vessels is delivered to buy boats owned by the several salmon canneries, which come direct to the fishing grounds for the fish.

The purse-seine season has until recently always begun about July 1 with fishing for bluebacks or sockeyes. Within the past few years, however, a few of the larger vessels have been fishing for silver salmon some distance off Cape Flattery from about June 10 to the middle of July. In 1916 this work was prosecuted until the latter part of August. Very little purse seining is done during January, February, and March, or in fact, until June or July, when the new season begins. Various sections of Puget Sound are closed to purse seines during certain periods of the year, and the entire sound and its tributaries are closed to all fishing, except with hook and line, from March 1 to April 15, both dates inclusive.

Purse seines in Washington are restricted in length by law to 1,800 lineal feet, measured on cork line when wet. Most of the fishermen aim to have their seines up to the legal limit. The depth averages about 400 meshes of 3¼ inches, 9 or 12 thread cotton twine, with 50 meshes of 5 inch, 15 or 18 thread cotton twine on the bottom. The bunt is from 60 to 75 feet long, and 200 meshes of 3-inch 18-thread cotton twine deep. The crew on a purse-seine vessel ranges from five to eight men, a majority of the vessels having seven men. The custom is for the owner of the vessel to furnish the boat, seine, dishes, and everything except the food. The vessel is allotted four shares, and the members of the crew one share each. In a crew of seven men, including the owner, there would be 11 shares; that is, the boat would draw four shares, and the remaining seven shares would be divided among the owner and six men. Of course, when the owner does not work he gets no share except the vessel's four shares. The cook does only light work, but helps in fishing and draws

one share. Where the food is bought at the beginning of the season each man pays his share, or is charged with it. With a crew of seven men, each member of the crew would pay one-eleventh of the cost of food. The first purse seining in Washington is said to have been in 1894 or 1895.

*Gill nets.*—Gill nets are of two kinds, drift and set, and are more generally used in the fisheries of Washington than any other form of fishing apparatus. The total catch with gill nets in 1915 amounted to 13,599,830 pounds, valued at $453,864, as compared with 21,013,582 pounds, valued at $632,810, in 1904, showing a decided decline with this apparatus. In 1915, 19,760 pounds, valued at $446, were taken in the vessel fisheries, and about the same quantity in 1904. The products consisted mainly of the different species of salmon. Gill nets are fished in most of the tide-water streams of the State. The most prolific of these is, of course, the Columbia River. Another very important stream is the Quinault River, running through the Indian reservation of the same name. In 1915 a catch of more than one and a quarter million pounds of salmon was made in this stream by the Indians living on the reservation. These Indians are very industrious and took advantage of one of the best salmon runs recorded on the river. More than 90 per cent of the catch consisted of bluebacks, or sockeyes, which were used by the canneries at Aberdeen and Hoquiam. Drift gill nets are used much more extensively than set gill nets.

A description of drift gill nets used in the vicinity of Seattle will answer in most particulars for those used at other localities in the State.

These nets are almost invariably of No. 40 linen twine, which for chinook salmon is 9-ply, for bluebacks 6-ply, and for silver and chum salmon 7-ply. No special nets are used for humpbacks and steelheads. The following sizes of mesh are used: For chinook, 6½ to 8-inch; for sockeye, 5¾-inch; for silver, 6 to 6¾-inch; for chum, 6 to 6¾-inch. Steelhead are usually caught in a 6¾ to 7-inch mesh. About the only nets of cotton twine used are those fished for salmon trout, another name for small salmon up to 2 pounds in weight; but even for this purpose the linen twine is preferable. It is customary for a fisherman to have a different gill net for each species of salmon except steelhead and humpback. The length of the nets varies from 40 to 450 fathoms; the majority of the nets being from 150 to 200 fathoms long. The shorter nets are used from rowboats and are set mostly in the Duwamish River. The longer nets are used from the gasoline boats and are fished in Puget Sound and other waters as far north as the Gulf of Georgia near Blaine and Point Roberts. The fishermen usually go to the more distant waters for bluebacks; for silver salmon they fish near Everett and San Juan Islands. The chum salmon are taken near Seattle and Rollingbay, as are also the chinooks. The depth of the nets ranges from 30 to 50 meshes. About one-half of the boats used for drift gill netting at Seattle are gasoline with an average value of $600. The other half are row skiffs worth $25 each. From one to two men go in a gasoline boat, but only one man goes in a skiff. The nets were formerly set at an angle, but the practice now is to set them in a straight line.

The fishermen at Everett use these drift gill nets in the Snohomish River. Only rowboats are used on the stream. The nets average

about 90 yards in length and 25 meshes (6½ inches) in depth. Silver salmon predominate in the catch.

Drift gill netting is usually followed at night, as the water is too clear, except after a freshet, to fish during the day.

An extensive drift gill-net fishery is prosecuted from La Conner, Skagit County, in the north fork of the Skagit River. A few boats from this vicinity also go as far north as the Gulf of Georgia. Most of the fishing in these waters, as well as in the Strait of Juan de Fuca, is done during the summer, and mostly for bluebacks, though humpbacks are also taken at the same time. Silver salmon are taken more in the tributary streams. In 1915 the spring and summer catch from the Skagit River was utilized by the fresh-fish markets, but the fall catch was delivered to the canneries. In 1916 practically the entire catch, with the exception of steelhead, was utilized by the canneries.

The drift gill-net fishermen at towns on Grays Harbor are divided between those fishing on the Chehalis and those fishing on the Columbia Rivers; the former using row, and the latter gasoline, boats. The nets used on the Chehalis River average 100 yards in length and 35 meshes of 6¾ inches in depth. Chinook, silver, and chum salmon in the order of their importance were taken. A few men use nets with 8¼-inch mesh for the larger chinook salmon.

The distance a net is allowed to drift before being lifted is termed a "drift" or "reach." On this river it is from 500 to 1,000 feet, depending upon the condition of the bottom as to snags or other obstructions. In 1915, the catch was sold mostly to near-by canneries, but conditions were somewhat changed in 1916.

Drift gill nets used on the Columbia River in Washington vary in length from 450 to 500 yards, used at Ilwaco at the mouth of the river, to 250 yards at Stevenson, the most distant point up the river at which they are used. At Vancouver and vicinity, however, the nets average about 600 yards in length. The depth of the net varies from 25 to 30 feet. This applies only to surface drift nets; diver or bottom nets will be described later. No. 40 linen twine running from 7 to 14 ply is almost invariably used. With few exceptions, two men are required to fish a net. None but gasoline boats are used. The fishing is ordinarily followed at night, but when the water becomes roily it can be done during the day. A "drift" or "reach" varies according to the locality and conditions. A net is sometimes allowed to drift a mile before lifting. During the spring the State law prohibits fishing from 6 p. m. Saturday until 6 p. m. Sunday. Gill nets are washed about every week in a solution of bluestone and water to remove the slime. It is a common practice to tan the nets at intervals to render them less discernible in the water. The drift gill nets just described are all surface nets. Above Altoona a net known as a "diver," or submersible drift gill net, is used. The diver is similar to the surface net except that the corks are smaller and the cork and lead lines lighter, so that it will just touch the bottom. The nets are also shorter and much more shallow than the surface nets. The number in use increases going up the river from Altoona, and above Kalama it is the only kind used. Those used at Kalama and above are, however, different from those below. Instead of one they have three webs, similar to a trammel net, except that the salmon are gilled and not pocketed. The three webs are suspended

from a common cork line, but there are two lead lines. The back webbing is usually from 3 to 5 feet deeper than the other two. The two front nets hang together from the cork line to the front lead line. The back, or main, net hangs from the cork line to the other lead line. The first and third nets commonly have a mesh of 8 inches and 7 inches, respectively, while the middle net has a mesh of 10 or 11 inches. The front net is called the "apron." Several reasons are assigned for using diver gill nets. One is that they are sunk to avoid driftwood or other refuse on the surface, especially during the spring freshets. Another reason is that the fish, having encountered so many surface gill nets and pound nets in the river below, become more timid and swim lower. Diver nets float much more slowly than surface nets. It is always necessary to clean the bottom of the river before setting diver nets.

The most profitable drift netting is followed from the first of May until the latter part of August. Some fishing is also followed in the fall, but it is not so profitable then, as the run consists mainly of "tuties" or fall chinooks, which sell for a very low price and are scarcely worth handling.

*Set gill nets.*—Set gill nets are much shorter than drift gill nets and are fished in small streams or inlets. The two extremes of length would probably be 6 and 100 yards, but a fair average might be about 15 yards. Their depth ranges from 30 to 50 meshes, the number varying the same as in the drift net. Linen twine of the same kind and size, as for drift nets is used. It is almost a universal custom to set them in eddies, one end being tied to a stake, or some stationary object, and the other anchored. Sometimes they are buoyed or anchored at each end. They can not be set across a navigable stream, as they would interfere with navigation. One man is sufficient to handle one or more set nets, a rowboat being commonly used. The extent of the set gill-net fishery is small as compared with drift gill netting. Silver, chinook, steelhead, and chum salmon, in the order of their importance, are the principal species taken.

*Harpoons.*—Harpoons are used only in the whale fishery, which is centered mainly in Pacific County. One coast-trading steamer owned in Seattle also followed whaling incidentally for a short time. The harpoon gun used in the whale fishery is, in reality, a small cannon placed on a raised platform on the forward part of the boat. The bomb, a sharp-pointed projectile about a foot long, is screwed onto the tip of the harpoon. The stem or handle of the harpoon is sometimes one solid piece, but more often two pieces united at the end. The advantage of the latter kind is that it is light and can be sent a greater distance. The head of the harpoon consists of four flukes or barbs which are lashed together by spun yarn. The harpoon, with bomb attached, is about 5 feet long. When the harpoon enters the whale, the spun yarn is shoved off the flukes, allowing the latter to open in the body of the whale. At the same time, as soon as the bomb enters the whale, it is exploded into many pieces. There is usually an interval of two seconds after firing before the bomb explodes, this interval depending upon how hard the powder is packed in the bomb. The ignition of the powder in the bomb follows the shoving off of the spun yarn from the flukes of the harpoon, the latter operation pulling a wire connecting with a fuse cap in the bomb. In some instances, but not in this case, an igniter

fastened to the sight of the gun connects with the powder in the bomb, the act of firing exploding the bomb. One pound of ordinary gunpowder is required for the gun and the same amount for loading the bomb. The harpoon is loaded into the gun to the lower or unattached ends of the flukes. The gun, of course, loads from the muzzle. Each steamer carries one gun.

A harpoon can be fired with accuracy a distance of 50 yards. One shot is sometimes sufficient; if a vital spot is reached, the whale is killed instantly. Sometimes it is necessary to shoot twice with a harpoon similar to the one above, and occasionally for the second or third shot a harpoon without flukes, or a "shooting lance," as it is called, is used. A line 4 inches in circumference and from 25 to 40 fathoms long, called the "foregoer," is attached to the end of the harpoon and in turn is spliced to the main line, 6 inches in circumference and 360 fathoms long. The latter line reels out over a winch on the forward part of the boat as the whale tries to escape. It is sometimes necessary to play the whale five or six hours, and occasionally it is necessary to fire three harpoons into it before it is captured. The harpoons are usually extracted from the whale, straightened, and used again. The whale is towed to land as soon as killed, but should there be several in sight an effort is made to get the others before taking any ashore. A proficient gunner on a whale steamer commands good wages.

*Hoop nets and pots.*—Hoop nets, or "ring nets," as they are commonly called, and pots are used exclusively in catching crabs. The output with hoop nets far exceeds that with pots. A hoop net consists of two hoops, one 3 feet and the other or lower one 2½ feet in diameter, placed 14 inches apart and connected with netting, netting also being around the bottom of the lower hoop to hold the crabs. The net, of course, collapses when set on the bottom. Bait consisting of clams is placed in a small knit bag tied to one of the hoops. The most important points in the State where hoop nets are used are Bay Center, Tokeland, and South Bend, in Pacific County, and Westport, in Grays Harbor County.

Pots are more generally used at Utsaladdy and Dungeness, in Island and Clallam Counties, respectively. While hoop nets are sometimes set on the inside of Grays Harbor and Willapa Harbor, it is the general practice to set them in the Pacific Ocean a few hundred yards from shore. Occasionally a fisherman will set his nets 2 or 3 miles from shore, but the best catches are made just outside the breakers.

It is usually necessary to cross a bar in going to and from the fishing grounds in the ocean, and this fact makes it one of the most hazardous of the State's fisheries. This, together with unfavorable weather conditions, reduces the number of trips possible for a boat. The nets are generally set in strings of 20 to 30, placed 200 to 300 feet apart and in from 5 to 8 fathoms of water. If the crabs are plentiful, the nets are fished continuously; this would mean an interval of about an hour in fishing the same net. Each net is located by means of a buoy; sometimes two, but more often one man goes to a boat.

The pots used in catching crabs vary in style, but their general appearance is somewhat similar to the eastern lobster pot, except for having a flat top. They vary from 3 to 4 feet in length, 15 to 30 inches in width, and 14 to 20 inches in height, and have a funnel

at each end. Some have wooden and others an iron frame. Some are inclosed with wire netting and others with slats made of laths. Those with wooden frames are anchored with bricks, while those with iron frames need nothing to sink them. The pots are baited with grayfish, sharks, or other cheap fish and clams. The crab fishery is followed in the fall, winter, and spring.

*Beam trawls.*—The total catch with beam trawls in 1915 amounted to 434,313 pounds, valued at $20,191, of which 290,935 pounds, valued at $14,154, were taken in the vessel and the remainder in the shore fisheries. With the exception of 47,893 pounds of mixed fish, mainly sole, valued at $1,472, the catch consisted entirely of shrimp. The beam trawls used for fish are similar to those used in taking shrimp, except that they are much smaller. The present style of beam trawl for shrimp came into use in 1913. It consists of a wooden beam of 6-inch scantling, 20 to 25 feet long, to each end of which is fastened an iron runner. The beam sets about 3 feet, or the height of the runners, above the ground. A bag 20 to 30 feet long, of 1-inch mesh for shrimp, and 4-inch mesh for groundfish, is fastened to the beam and sides of the runners. There is a slack in the lower part of the mouth of the bag. A bridle extends a few feet in front of the runners, and to this bridle is attached a cable fastened at the other end to the boat.

The shrimp trawl in use for many years before the introduction of the present style consisted of a frame of 1¼-inch iron working over the bottom on two shoes, one on each side. The mouth of the bag was fastened to the upper and lower parts of the frame.

The vessels engaged in beam trawling ranged in size from 5 to 27 net tons; nearly one-half of them were steamers, and the remainder were operated by gasoline. The crew usually consisted of two men. The fishing is followed in from 18 to 35 fathoms of water. Shrimp can be taken from April 1 to December 31, but the best catches are made in November and December.

*Dip nets.*—The use of dip nets is restricted exclusively to taking eulachon or candlefish, which are tabulated as smelts. This fishery is confined mostly to Kelso and vicinity, in Cowlitz County. The total catch with dip nets in 1915 amounted to 1,619,500 pounds, valued at $6,695, all taken in the shore fisheries.

*Reef nets.*—Reef nets were used only in the shore fisheries, the total catch in 1915 amounting to 170,207 pounds, valued at $4,199. The catch consisted of several species of salmon. Reef nets are fished only in San Juan and Whatcom Counties, and mostly by Indians. As the name indicates, they are always set on reefs. They are made entirely of netting, have a leader, and are similar in appearance to a small pound net without a heart, but are less substantially constructed. The reef acts as a leader in addition to the one of netting. At the outer end of the latter is a pound or pot having four sides into which the fish lead. The front or inshore side of this pot is dropped down when the net is fishing to allow the fish to enter. When the Indians see the fish moving in considerable quantities toward the pot, they yell and make as much noise as possible to frighten them into entering it, after which they pull up the front part to prevent their escape. It usually requires six men in two canoes to fish a net. A canoe is stationed on each side of the pot, the men in each holding a line con-

nected with the front of the pot. As soon as the fish have entered, the men pull the front up with these lines. The bottom of the pound is then lifted so that the fish can be removed with dip nets.

*Wheels.*—Wheels are of two kinds, movable and stationary. Two of the latter kind were fished in the Columbia River off Pacific County. The catch was unimportant, amounting in 1915 to only 5,234 pounds, with a value of $211.

*Dredges, tongs, rakes, hoes, etc.*—The dredge is the only one of these apparatus used both in the vessel and shore fisheries. Out of a total catch of 1,740,609 pounds, valued at $468,006, 1,227,315 pounds, valued at $433,985, were taken inshore, and the remainder in the vessel fisheries. Compared with the catch by the same apparatus in 1904, there was a decrease of 525,920 pounds and an increase of $2,132. The loss of weight was mainly in native oysters.

Dredges are used exclusively in taking oysters and are similar to those used in the east for this purpose. Tongs, rakes, and hoes are also used for taking oysters. Both hoes and forks are used in catching hard clams, but shovels only are used for razor clams. The few mussels shown were taken with the oysters.

YIELD OF THE VESSEL FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

| Apparatus and species. | Grays Harbor. | | Island. | | Jefferson. | | King. | | Kitsap. | | Pacific. | | Pierce. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Seines: | | | | | | | | | | | | | | |
| Herring | | | | | | | 337,450 | $1,567 | 1,302,951 | $5,536 | | | 45,000 | $200 |
| Salmon— | | | | | | | | | | | | | | |
| Blueback or sockeye | | | 5,800 | $444 | 1,140 | $100 | 352,265 | 31,168 | 156,560 | 13,300 | | | 283,795 | 24,529 |
| Chinook | | | 278 | 9 | 8,000 | 280 | 81,555 | 2,654 | 87,935 | 2,859 | | | 104,099 | 3,121 |
| Chum | | | 43,224 | 703 | 38,936 | 633 | 3,665,604 | 78,357 | 1,700,970 | 27,607 | | | 3,419,920 | 55,526 |
| Humpback | | | 74,828 | 922 | 19,224 | 240 | 5,284,916 | 59,361 | 2,007,612 | 22,449 | | | 4,353,636 | 51,760 |
| Silver | | | 11,154 | 409 | 3,726 | 137 | 835,153 | 32,478 | 274,038 | 10,964 | | | 666,612 | 25,623 |
| Smelt | | | | | | | 16,998 | 522 | 8,288 | 295 | | | | |
| Steelhead trout | | | | | 25 | 2 | 1,976 | 113 | 557 | 37 | | | 235 | 16 |
| Sturgeon | | | | | | | 200 | 12 | | | | | | |
| Total | | | 135,284 | 2,487 | 71,051 | 1,392 | 10,576,117 | 206,232 | 5,538,911 | 83,047 | | | 8,873,297 | 160,775 |
| Gill nets: | | | | | | | | | | | | | | |
| Cod | | | | | | | 15,000 | 265 | | | | | | |
| "Lingcod" | | | | | | | 160 | 6 | | | | | | |
| Total | | | | | | | 15,160 | 271 | | | | | | |
| Beam trawl: | | | | | | | | | | | | | | |
| Cod | | | | | | | 225 | 7 | | | | | | |
| Flounders | | | | | | | 555 | 7 | | | | | | |
| Perch | | | | | | | 50 | 3 | | | | | | |
| Rockfishes | | | | | | | 201 | 11 | | | | | | |
| Sole | | | | | | | 6,562 | 214 | | | | | | |
| Shrimp | | | | | | | 44,450 | 3,050 | | | | | 139,432 | 6,386 |
| Total | | | | | | | 52,043 | 3,292 | | | | | 139,432 | 6,386 |
| Hoop nets and pots: Crabs | | | | | | | 1,450 | 54 | | | 6,600 | $200 | 22,661 | 850 |
| Lines: | | | | | | | | | | | | | | |
| Cod, salted | | | | | | | 2,220,000 | 73,980 | | | | | | |
| Halibut | 413,000 | $21,607 | | | 31,000 | 1,700 | 33,627,389 | 1,690,566 | 2,401,956 | 120,754 | | | 4,003,260 | 201,257 |
| "Lingcod" | | | | | | | 21,400 | 625 | | | | | | |
| Rockfishes | 18,000 | 448 | | | | | 4,900 | 119 | | | | | | |
| Sablefish | | | | | | | 526,810 | 12,557 | 27,000 | 675 | | | 21,000 | 525 |
| Salmon— | | | | | | | | | | | | | | |
| Chinook | 15,000 | 740 | | | | | 23,400 | 925 | 3,000 | 75 | | | 2,000 | 50 |
| Humpback | | | | | | | 455 | 5 | | | | | | |
| Silver | 7,000 | 140 | | | | | 45,500 | 925 | 6,500 | 175 | | | 10,000 | 200 |
| Cod tongues | | | | | | | 12,000 | 836 | | | | | | |
| Total | 453,000 | 22,935 | | | 31,000 | 1,700 | 36,481,854 | 1,780,538 | 2,438,456 | 121,679 | | | 4,036,260 | 202,032 |

YIELD OF THE VESSEL FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

| Apparatus and species. | Grays Harbor. | | Island. | | Jefferson. | | King. | | Kitsap. | | Pacific. | | Pierce. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Dredges, etc.: | | | | | | | | | | | | | | |
| Eastern oysters, market | | | | | | | | | | | 43,519 | $23,155 | | |
| Native oysters, market | | | | | | | | | | | 175 | 75 | | |
| Total | | | | | | | | | | | 43,694 | 23,230 | | |
| Harpoons: | | | | | | | | | | | | | | |
| Whalebone | | | | | | | 6,000 | $4,200 | | | | | | |
| Whale oil | 2,575,125 | $110,051 | | | | | 60,000 | 2,800 | | | | | | |
| Other whale products | 1,292,000 | 24,390 | | | | | | | | | | | | |
| Total | 3,867,125 | 134,441 | | | | | 66,000 | 7,000 | | | | | | |
| Grand total | 4,320,125 | 157,376 | 135,284 | $2,487 | 102,051 | $3,092 | 47,192,624 | 1,997,387 | 7,977,367 | $204,726 | 50,294 | 23,430 | 13,071,650 | $370,043 |

| Apparatus and species. | San Juan. | | Skagit. | | Snohomish. | | Thurston. | | Wahkiakum. | | Whatcom. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Seines: | | | | | | | | | | | | | | |
| Herring | | | | | 275,000 | $1,169 | | | | | 20,000 | $85 | 1,980,401 | $8,557 |
| Salmon— | | | | | | | | | | | | | | |
| Blueback or sockeye | 25,425 | $2,288 | 55,585 | $4,446 | 70,670 | 5,653 | | | | | 258,790 | 23,230 | 1,210,030 | 105,158 |
| Chinook | 2,676 | 83 | 65,686 | 2,299 | 60,704 | 2,125 | | | 62,500 | $1,560 | 43,968 | 1,548 | 517,401 | 16,538 |
| Chum | 103,912 | 1,688 | 540,000 | 12,125 | 398,904 | 7,479 | | | 24,000 | 120 | 1,695,648 | 27,199 | 11,631,118 | 211,437 |
| Humpback | 459,300 | 5,739 | 762,800 | 11,442 | 1,080,048 | 16,200 | | | | | 3,180,261 | 36,148 | 17,222,628 | 204,261 |
| Silver | 60,174 | 2,381 | 121,800 | 5,075 | 161,460 | 6,727 | | | 20,000 | 400 | 492,174 | 18,335 | 2,646,291 | 102,529 |
| Shad | | | 423 | 13 | | | | | | | | | 423 | 13 |
| Smelt | 1,000 | 35 | | | 1,406 | 50 | 47,488 | $1,665 | | | | | 75,180 | 2,567 |
| Steelhead trout | 50 | 2 | 13,787 | 824 | 75 | 4 | | | 2,500 | 80 | 475 | 32 | 19,680 | 1,110 |
| Sturgeon | | | | | | | | | | | | | 200 | 12 |
| Total | 652,537 | 12,216 | 1,560,081 | 36,224 | 2,048,267 | 39,407 | 47,488 | 1,665 | 109,000 | 2,160 | 5,691,319 | 106,577 | 35,303,352 | 652,182 |
| Gill nets: | | | | | | | | | | | | | | |
| Cod | | | | | | | | | | | | | 15,000 | 265 |
| "Lingcod" | | | | | | | | | | | | | 160 | 6 |
| Salmon— | | | | | | | | | | | | | | |
| Blueback | | | | | 750 | 60 | | | | | | | 750 | 60 |
| Chinook | | | | | 250 | 10 | | | | | | | 250 | 10 |
| Chum | | | | | 400 | 7 | | | | | | | 400 | 7 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Humpback | | | | | 1,200 | 18 | | | | | | | 1,200 | 18 |
| Silver | | | | | 2,000 | 80 | | | | | | | 2,000 | 80 |
| Total | | | | | 4,600 | 175 | | | | | | | 19,760 | 446 |
| Beam trawl: | | | | | | | | | | | | | | |
| Cod | | | | | | | | | | | | | 225 | 7 |
| Flounders | | | | | | | | | | | | | 555 | 7 |
| Perch | | | | | | | | | | | | | 50 | 3 |
| Rockfishes | | | | | | | | | | | | | 201 | 11 |
| Sole | | | | | | | | | | | | | 6,562 | 214 |
| Shrimp | | | | | | | 99,460 | 4,476 | | | | | 283,342 | 13,912 |
| Total | | | | | | | 99,460 | 4,476 | | | | | 290,935 | 14,154 |
| Hoop nets and pots: Crabs | | | | | | | | | | | 61,520 | 2,000 | 92,231 | 3,104 |
| Lines: | | | | | | | | | | | | | | |
| Cod, salted | | | 3,278,284 | 106,954 | | | | | | | | | 5,498,284 | 180,934 |
| Halibut | | | | | 45,000 | 1,860 | | | | | | | 40,521,605 | 2,037,744 |
| "Lingcod" | | | | | | | | | | | | | 21,400 | 625 |
| Rockfishes | | | | | | | | | | | | | 22,900 | 567 |
| Sablefish | | | | | 1,000 | 25 | | | | | | | 575,810 | 13,782 |
| Salmon— | | | | | | | | | | | | | | |
| Chinook | | | | | 4,600 | 200 | | | | | | | 48,000 | 1,990 |
| Humpback | | | | | | | | | | | | | 455 | 5 |
| Silver | | | | | 9,000 | 275 | | | | | | | 78,000 | 1,715 |
| Cod tongues | | | 18,000 | 1,254 | | | | | | | | | 30,000 | 2,090 |
| Total | | | 3,296,284 | 108,208 | 59,600 | 2,360 | | | | | | | 46,796,454 | 2,239,452 |
| Dredges, etc.: | | | | | | | | | | | | | | |
| Eastern oysters, market | | | 16,800 | 9,000 | | | | | | | | | 60,319 | 32,155 |
| Native oysters, market | | | 2,800 | 1,600 | | | | | | | | | 2,975 | 1,675 |
| Kelp | 450,000 | 191 | | | | | | | | | | | 450,000 | 191 |
| Total | 450,000 | 191 | 19,600 | 10,600 | | | | | | | | | 513,294 | 34,021 |
| Harpoons: | | | | | | | | | | | | | | |
| Whalebone | | | | | | | | | | | | | 6,000 | 4,200 |
| Whale oil | | | | | | | | | | | | | 2,635,125 | 112,851 |
| Other whale products | | | | | | | | | | | | | 1,292,000 | 24,390 |
| Total | | | | | | | | | | | | | 3,933,125 | 141,441 |
| Grand total | 1,102,537 | 12,407 | 4,875,965 | 155,032 | 2,112,467 | 41,942 | 146,948 | 6,141 | 109,000 | 2,160 | 5,752,839 | 108,577 | 86,949,151 | 3,084,800 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

BY SEINES.

| Species. | Asotin. | | Clallam. | | Clarke. | | Columbia. | | Cowlitz. | | Franklin. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* |
| Carp | ..... | ..... | ..... | ..... | 200,000 | $4,000 | ..... | ..... | ..... | ..... | ..... | ..... |
| Salmon: | | | | | | | | | | | | |
| Blueback or sockeye | 1,100 | $88 | ..... | ..... | ..... | ..... | ..... | ..... | 100 | $5 | ..... | ..... |
| Chinook | 17,130 | 1,370 | 29,590 | $740 | ..... | ..... | 10,125 | $759 | 172,500 | 4,140 | 2,490 | $199 |
| Chum | ..... | ..... | 21,386 | 371 | ..... | ..... | ..... | ..... | 5,400 | 27 | 984 | 79 |
| Silver | 1,080 | 86 | 61,530 | 1,168 | ..... | ..... | ..... | ..... | ..... | ..... | 680 | 54 |
| Shad | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10,600 | 208 | ..... | ..... |
| Steelhead trout | 61,088 | 4,887 | ..... | ..... | ..... | ..... | 9,600 | 720 | 5,817 | 174 | ..... | ..... |
| Total | 80,398 | 6,431 | 112,506 | 2,279 | 200,000 | 4,000 | 19,725 | 1,479 | 194,417 | 4,554 | 4,154 | 332 |

| Species. | Garfield. | | Island. | | Jefferson. | | King. | | Kitsap. | | Mason. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* |
| Cod | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,800 | $35 | ..... | ..... |
| Flounders | ..... | ..... | ..... | ..... | 6,000 | $120 | 500 | $12 | 13,000 | 375 | ..... | ..... |
| Grayfish | ..... | ..... | 280,000 | $629 | 220,000 | 494 | ..... | ..... | 450,000 | 1,017 | ..... | ..... |
| Herring | ..... | ..... | ..... | ..... | 10,700 | 80 | 103,750 | 497 | 32,098 | 499 | ..... | ..... |
| "Lingcod" | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,000 | 25 | ..... | ..... |
| Perch | ..... | ..... | 500 | 15 | 500 | 15 | 2,100 | 90 | ..... | ..... | 1,000 | $40 |
| Rockfishes | ..... | ..... | ..... | ..... | 4,000 | 240 | 2,300 | 135 | 2,800 | 160 | ..... | ..... |
| Salmon: | | | | | | | | | | | | |
| Blueback or sockeye | 2,250 | $180 | ..... | ..... | ..... | ..... | 15,505 | 1,345 | ..... | ..... | ..... | ..... |
| Chinook | 14,640 | 1,170 | 11,050 | 396 | 250 | 8 | 3,650 | 127 | 3,485 | 140 | 1,100 | 66 |
| Chum | ..... | ..... | 6,800 | 14 | 5,600 | 75 | 150,400 | 3,284 | 8,532 | 185 | 19,720 | 125 |
| Humpback | ..... | ..... | 1,400 | 18 | ..... | ..... | 224,196 | 2,521 | 1,112 | 23 | 32 | 1 |
| Silver | ..... | ..... | 3,450 | 138 | 3,650 | 150 | 33,222 | 1,258 | 2,953 | 118 | 20,250 | 743 |
| Sharks | ..... | ..... | 18,000 | 41 | 14,000 | 32 | ..... | ..... | 10,000 | 22 | ..... | ..... |
| Skates | ..... | ..... | 12,000 | 27 | 8,000 | 18 | ..... | ..... | 8,000 | 18 | ..... | ..... |
| Smelt | ..... | ..... | 71,500 | 2,543 | 7,300 | 355 | 26,003 | 887 | 85,201 | 3,063 | 62,300 | 2,180 |
| Sole | ..... | ..... | 500 | 20 | 1,000 | 30 | 4,000 | 137 | 19,400 | 532 | ..... | ..... |
| Steelhead trout | 10,136 | 811 | 158 | 10 | ..... | ..... | 825 | 66 | 25 | 2 | ..... | ..... |
| Total | 27,026 | 2,161 | 405,358 | 3,851 | 281,000 | 1,617 | 566,451 | 10,359 | 639,406 | 6,214 | 104,402 | 3,155 |

| Species. | Pacific. | | Pierce. | | San Juan. | | Skagit. | | Snohomish. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* |
| Flounders | ..... | ..... | 2,000 | $20 | ..... | ..... | ..... | ..... | ..... | ..... |
| Grayfish | ..... | ..... | 250,000 | 562 | 60,000 | $135 | ..... | ..... | ..... | ..... |
| Perch | ..... | ..... | 1,200 | 36 | ..... | ..... | ..... | ..... | ..... | ..... |
| Salmon: | | | | | | | | | | |
| Blueback or sockeye | 29,850 | $597 | ..... | ..... | ..... | ..... | 9,500 | $850 | ..... | ..... |
| Chinook | 153,675 | 9,220 | 3,075 | 122 | ..... | ..... | 1,870 | 70 | 225 | $8 |
| Chum | ..... | ..... | 20,480 | 139 | ..... | ..... | 92,000 | 1,700 | ..... | ..... |
| Humpback | ..... | ..... | 2,432 | 59 | 28,000 | $420 | 131,200 | 1,500 | 6,500 | 100 |
| Silver | ..... | ..... | 8,824 | 306 | ..... | ..... | 16,100 | 625 | 25 | 1 |
| Shad | 12,959 | 130 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sharks | ..... | ..... | 10,000 | 22 | 2,000 | 5 | ..... | ..... | ..... | ..... |
| Skates | ..... | ..... | 8,000 | 18 | 2,000 | 4 | ..... | ..... | ..... | ..... |
| Smelt | ..... | ..... | 25,200 | 855 | 1,076 | 39 | 43,591 | 1,313 | ..... | ..... |
| Steelhead trout | 49,225 | 1,723 | ..... | ..... | ..... | ..... | 750 | 45 | ..... | ..... |
| Sturgeon | 2,600 | 156 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Caviar | 150 | 38 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | 248,459 | 11,864 | 331,211 | 2,139 | 93,076 | 603 | 295,011 | 6,103 | 6,750 | 109 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES SPECIES, AND APPARATUS—Continued.

BY SEINES—Continued.

| Species. | Thurston. | | Wahkiakum. | | Whatcom. | | Whitman. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* |
| Carp | | | | | | | | | 200,000 | $4,000 |
| Cod | | | | | | | | | 1,800 | 35 |
| Flounders | | | | | | | | | 21,500 | 527 |
| Grayfish | | | | | | | | | 1,260,000 | 2,837 |
| Herring | | | | | | | | | 146,548 | 1,076 |
| "Lingcod" | | | | | | | | | 1,000 | 25 |
| Perch | | | | | | | | | 5,300 | 196 |
| Rockfishes | | | | | | | | | 9,100 | 535 |
| Salmon: | | | | | | | | | | |
| Blueback or sockeye | 4,980 | $440 | 15,530 | $776 | 5,500 | $495 | 1,250 | $87 | 85,565 | 4,863 |
| Chinook | | | 94,250 | 5,655 | 960 | 30 | 2,848 | 199 | 522,913 | 24,419 |
| Chum | | | | | 32,000 | 520 | | | 363,302 | 6,519 |
| Humpback | 26,304 | 395 | | | 68,000 | 650 | | | 489,176 | 5,687 |
| Silver | 1,878 | 70 | | | 10,800 | 375 | 3,688 | 258 | 168,130 | 5,350 |
| Shad | | | 26,828 | 268 | | | | | 50,387 | 606 |
| Sharks | | | | | | | | | 54,000 | 122 |
| Skates | | | | | | | | | 38,000 | 85 |
| Smelt | 74,500 | 2,610 | | | 38,430 | 1,367 | | | 435,101 | 15,212 |
| Sole | | | | | | | | | 24,900 | 719 |
| Steelhead trout | | | 8,037 | 240 | | | 3,984 | 279 | 149,645 | 8,957 |
| Sturgeon | | | | | | | 100 | 8 | 2,700 | 164 |
| Caviar | | | | | | | | | 150 | 38 |
| Total | 107,662 | 3,515 | 144,645 | 6,939 | 155,690 | 3,437 | 11,870 | 831 | 4,029,217 | 81,972 |

BY GILL NETS.

| Species. | Asotin. | | Clallam. | | Clarke. | | Cowlitz. | | Grays Harbor. | | Jefferson. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* |
| "Lingcod" | | | | | | | | | | | 300 | $7 |
| Perch | | | | | | | | | | | 5,000 | 125 |
| Rockfishes | | | | | | | | | | | 1,000 | 60 |
| Salmon: | | | | | | | | | | | | |
| Blueback or sockeye | | | | | 7,710 | $384 | 9,780 | $452 | 1,242,530 | $57,353 | | |
| Chinook | 30 | $2 | 78,960 | $1,976 | 510,200 | 30,611 | 852,125 | 19,346 | 498,170 | 9,938 | 20 | 1 |
| Chum | | | 13,490 | 165 | 7,900 | 39 | 51,200 | 256 | 973,962 | 4,480 | 4,600 | 57 |
| Humpback | | | 38,400 | 1,200 | | | 240 | 3 | 18,420 | 231 | | |
| Silver | | | 80,148 | 1,687 | 6,100 | 142 | 21,520 | 499 | 727,430 | 13,957 | 6,720 | 193 |
| Shad | | | | | 19,550 | 197 | 8,600 | 85 | | | | |
| Smelt | | | | | 50 | 1 | 6,000 | 50 | | | | |
| Steelhead trout | 1,040 | 84 | | | 42,412 | 1,277 | 119,712 | 4,117 | 82,850 | 4,364 | 3,560 | 20 |
| Sturgeon | | | | | 2,500 | 130 | 6,400 | 320 | 240 | 7 | | |
| Total | 1,070 | 86 | 210,998 | 5,028 | 596,422 | 32,781 | 1,075,577 | 25,128 | 3,543,602 | 90,330 | 21,200 | 463 |

| Species. | King. | | Kitsap. | | Klickitat. | | Lewis. | | Mason. | | Pacific. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* | *Lbs.* | *Value.* |
| Cod | | | 4,700 | $105 | | | | | | | | |
| Flounders | | | 600 | 18 | | | | | | | | |
| Perch | | | 1,900 | 94 | | | | | | | | |
| Salmon: | | | | | | | | | | | | |
| Blueback or sockeye | 88,550 | $7,080 | 9,385 | 734 | 90 | $5 | 75 | $7 | | | 4,240 | $332 |
| Chinook | 138,420 | 5,553 | 3,518 | 132 | 2,375 | 163 | 7,930 | 418 | 3,648 | $220 | 1,231,220 | 57,806 |
| Chum | 252,080 | 3,780 | 10,178 | 215 | | | 385 | 5 | 3,120 | 28 | 220,889 | 1,110 |
| Humpback | 62,480 | 469 | 3,376 | 53 | | | | | | | 400 | 5 |
| Silver | 258,424 | 9,927 | 20,073 | 817 | | | 2,710 | 77 | 4,800 | 175 | 149,779 | 2,997 |
| Shad | | | | | | | | | | | 47 | 1 |
| Smelt | | | 686 | 23 | | | | | | | | |
| Sole | | | 200 | 6 | | | | | | | | |
| Steelhead trout | 70,325 | 5,605 | 1,545 | 117 | 2,337 | 165 | 471 | 35 | 1,875 | 125 | 33,642 | 1,288 |
| Sturgeon | | | | | | | | | | | 11,800 | 518 |
| Caviar | | | | | | | | | | | 150 | 37 |
| Total | 870,279 | 32,414 | 56,161 | 2,314 | 4,802 | 333 | 11,571 | 542 | 13,443 | 548 | 1,658,167 | 64,094 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS—Continued.

| Species. | Pierce. | | San Juan. | | Skagit. | | Skamania. | | Snohomish. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Perch | 2,500 | $75 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Salmon: | | | | | | | | | | |
| Blueback or sockeye | 7,750 | 622 | 10,565 | $950 | 12,435 | $560 | 7,755 | $386 | 9,250 | $740 |
| Chinook | 14,640 | 923 | 549 | 14 | 444,398 | 20,398 | 95,375 | 4,384 | 75,790 | 2,654 |
| Chum | 48,170 | 301 | 7,840 | 127 | 824,800 | 15,044 | 8,750 | 43 | 101,414 | 1,912 |
| Humpback | 38,488 | 962 | 120,288 | 1,503 | 82,820 | 950 | ..... | ..... | 27,810 | 416 |
| Silver | 50,148 | 1,505 | 17,388 | 724 | 444,578 | 17,597 | 5,000 | 112 | 477,989 | 18,602 |
| Shad | ..... | ..... | ..... | ..... | ..... | ..... | 100 | 1 | ..... | ..... |
| Smelt | 5,100 | 195 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Steelhead trout | 5,812 | 460 | ..... | ..... | 30,302 | 2,195 | 10,662 | 319 | 31,790 | 1,906 |
| Sturgeon | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 | 100 | ..... | ..... |
| Total | 172,608 | 5,043 | 156,630 | 3,318 | 1,839,333 | 56,744 | 129,642 | 5,345 | 724,043 | 26,230 |

| Species. | Thurston. | | Wahkiakum. | | Whatcom. | | Whitman. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Cod | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4,700 | $105 |
| Flounders | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 600 | 18 |
| "Lingcod" | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 | 7 |
| Perch | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9,400 | 294 |
| Rockfishes | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,000 | 60 |
| Salmon: | | | | | | | | | | |
| Blueback or sockeye | 2,800 | $250 | 3,500 | $175 | 44,740 | $3,361 | ..... | ..... | 1,461,155 | 73,391 |
| Chinook | 330 | 20 | 1,346,900 | 67,331 | 29,520 | 1,541 | 825 | $58 | 5,334,943 | 223,489 |
| Chum | 840 | 5 | 164,675 | 849 | 114,500 | 1,416 | ..... | ..... | 2,814,793 | 29,832 |
| Humpback | 3,340 | 85 | 700 | 9 | 23,372 | 296 | ..... | ..... | 420,134 | 6,182 |
| Silver | 2,190 | 65 | 68,140 | 1,376 | 417,617 | 16,843 | ..... | ..... | 2,760,754 | 87,295 |
| Shad | ..... | ..... | 3,912 | 36 | ..... | ..... | ..... | ..... | 32,209 | 320 |
| Smelt | ..... | ..... | ..... | ..... | 5,500 | 195 | ..... | ..... | 17,336 | 464 |
| Sole | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 200 | 6 |
| Steelhead trout | ..... | ..... | 243,711 | 7,547 | 12,150 | 931 | ..... | ..... | 694,196 | 30,555 |
| Sturgeon | ..... | ..... | 5,260 | 288 | ..... | ..... | ..... | ..... | 28,200 | 1,363 |
| Caviar | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 150 | 37 |
| Total | 9,500 | 425 | 1,836,798 | 77,611 | 647,399 | 24,583 | 825 | 58 | 13,580,070 | 453,418 |

BY BEAM TRAWLS.

| Species. | Kitsap. | | Pierce. | | Thurston. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Flounders | 2,600 | $150 | ..... | ..... | ..... | ..... | 2,600 | $150 |
| Rockfishes | 1,700 | 80 | ..... | ..... | ..... | ..... | 1,700 | 80 |
| Sole | 36,000 | 1,000 | ..... | ..... | ..... | ..... | 36,000 | 1,000 |
| Shrimp | 10,648 | 745 | 61,900 | $2,785 | 30,530 | $1,277 | 103,078 | 4,807 |
| Total | 50,948 | 1,975 | 61,900 | 2,785 | 30,530 | 1,277 | 143,378 | 6,037 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY POUND NETS.

| Species. | Clarke. | | Cowlitz. | | Grays Harbor. | | Jefferson. | | King. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Grayfish | ..... | ..... | ..... | ..... | ..... | ..... | 400,000 | $900 | 100,000 | $225 |
| "Lingcod" | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20,000 | 250 |
| Salmon: | | | | | | | | | | |
| Blueback or sockeye | 2,000 | $100 | ..... | ..... | ..... | ..... | 23,540 | 1,883 | 200,745 | 11,000 |
| Chinook | 145,125 | 6,100 | 758,250 | $32,100 | 377,200 | $7,544 | 585,460 | $20,491 | 1,010,240 | 55,563 |
| Chum | 9,200 | 46 | 108,750 | 543 | 366,300 | 1,665 | 228,976 | 2,862 | 442,040 | 11,051 |
| Humpback | ..... | ..... | ..... | ..... | ..... | ..... | 816,820 | 10,210 | 1,576,004 | 15,760 |
| Silver | 24,000 | 660 | 158,500 | 3,680 | 527,000 | 10,540 | 481,086 | 16,036 | 793,716 | 29,103 |
| Shad | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,878 | 160 |
| Sharks | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | 22 | ..... | ..... |
| Skates | ..... | ..... | ..... | ..... | ..... | ..... | 6,000 | 13 | ..... | ..... |
| Smelt | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10,599 | 375 |
| Steelhead trout | 23,125 | 694 | 36,437 | 1,092 | 22,500 | 1,350 | 18,575 | 1,300 | 93,288 | 6,997 |
| Sturgeon | 50 | 3 | 325 | 16 | 1,700 | 51 | 2,380 | 68 | 2,280 | 160 |
| Total | 203,500 | 7,603 | 1,062,262 | 37,431 | 1,294,700 | 21,150 | 2,572,837 | 53,785 | 4,252,790 | 130,644 |

| Species. | Kitsap. | | Klickitat. | | Pacific. | | Pierce. | | San Juan. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Grayfish | 220,000 | $495 | ..... | ..... | ..... | ..... | ..... | ..... | 380,000 | $855 |
| Salmon: | | | | | | | | | | |
| Blueback or sockeye | 6,505 | 520 | 20,850 | $1,042 | 76,667 | $3,828 | 30 | $3 | 18,325 | 1,649 |
| Chinook | 21,136 | 870 | 63,870 | 2,850 | 2,890,690 | 83,262 | 9,900 | 645 | 105,006 | 2,625 |
| Chum | 22,844 | 1,187 | ..... | ..... | 279,693 | 1,401 | 47,600 | 300 | 472 | 7 |
| Humpback | 11,492 | 205 | 1,104 | 13 | 1,760 | 22 | 3,200 | 80 | 321,272 | 4,016 |
| Silver | 30,373 | 1,471 | 66,600 | 1,500 | 718,607 | 14,371 | 9,900 | 300 | 165,114 | 6,879 |
| Shad | ..... | ..... | ..... | ..... | 8,223 | 52 | ..... | ..... | ..... | ..... |
| Sharks | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12,000 | 26 |
| Skates | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8,000 | 18 |
| Smelt | ..... | ..... | ..... | ..... | 55 | 2 | ..... | ..... | ..... | ..... |
| Squid | ..... | ..... | ..... | ..... | ..... | ..... | 15,000 | 325 | ..... | ..... |
| Steelhead trout | 2,525 | 175 | 37,687 | 1,136 | 697,039 | 23,556 | 2,185 | 150 | 13 | 1 |
| Sturgeon | 78 | 5 | ..... | ..... | 2,600 | 104 | ..... | ..... | ..... | ..... |
| Total | 314,953 | 4,928 | 190,111 | 6,541 | 4,675,334 | 126,598 | 87,815 | 1,803 | 1,010,202 | 16,076 |

| Species. | Skagit. | | Wahkiakum. | | Whatcom. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Grayfish | ..... | ..... | ..... | ..... | 800,000 | $1,800 | 1,900,000 | $4,275 |
| Herring | 2,200 | $22 | ..... | ..... | ..... | ..... | 2,200 | 22 |
| "Lingcod" | 790,000 | 1,777 | ..... | ..... | ..... | ..... | 810,000 | 2,027 |
| Salmon: | | | | | | | | |
| Blueback or sockeye | 480,250 | 42,074 | 4,615 | $230 | 1,431,340 | 98,274 | 2,264,867 | 160,603 |
| Chinook | 1,397,000 | 56,375 | 1,096,921 | 40,747 | 2,070,222 | 87,550 | 10,531,020 | 396,722 |
| Chum | 383,500 | 7,460 | 44,336 | 224 | 388,456 | 8,001 | 2,322,167 | 34,747 |
| Humpback | 2,892,000 | 43,060 | 4,200 | 52 | 6,033,348 | 75,416 | 11,661,200 | 148,834 |
| Silver | 794,800 | 31,792 | 380,748 | 8,665 | 2,580,282 | 66,878 | 6,730,726 | 191,875 |
| Shad | 60 | 2 | 721 | 7 | ..... | ..... | 12,882 | 221 |
| Sharks | ..... | ..... | ..... | ..... | 5,000 | 11 | 27,000 | 59 |
| Skates | ..... | ..... | ..... | ..... | 3,000 | 7 | 17,000 | 38 |
| Smelt | 600 | 18 | ..... | ..... | ..... | ..... | 11,254 | 395 |
| Squid | ..... | ..... | ..... | ..... | ..... | ..... | 15,000 | 325 |
| Steelhead trout | 92,600 | 5,910 | 182,301 | 5,604 | 35,983 | 2,521 | 1,244,258 | 50,486 |
| Sturgeon | 840 | 50 | 503 | 29 | ..... | ..... | 10,756 | 486 |
| Total | 6,833,850 | 188,540 | 1,714,345 | 55,558 | 13,347,631 | 340,458 | 37,560,330 | 991,115 |

BY HOOP NETS.

| Species. | Grays Harbor. | | Pacific. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | 169,885 | $5,425 | 1,097,778 | $34,200 | 1,267,663 | $39,625 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY DIP NETS.

| Species. | Clarke. | | Cowlitz. | | Wahkiakum. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Smelt | 12,500 | $125 | 1,603,500 | $6,530 | 3,500 | $40 | 1,619,500 | $6,695 |

BY REEF NETS.

| Species. | San Juan. | | Whatcom. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Salmon: | | | | | | |
| Blueback or sockeye | 6,790 | $611 | 12,500 | $935 | 19,290 | $1,546 |
| Chinook | 5,016 | 125 | ..... | ..... | 5,016 | 125 |
| Chum | 8,944 | 145 | ..... | ..... | 8,944 | 145 |
| Humpback | 92,948 | 1,162 | 21,200 | 265 | 114,148 | 1,427 |
| Silver | 22,584 | 941 | ..... | ..... | 22,584 | 941 |
| Steelhead trout | 225 | 15 | ..... | ..... | 225 | 15 |
| Total | 136,507 | 2,999 | 33,700 | 1,200 | 170,207 | 4,199 |

BY POTS.

| Species. | Clallam. | | Grays Harbor. | | Island. | | Jefferson. | | King. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | 26,667 | $1,600 | 85,962 | $2,675 | 112,625 | $3,172 | 2,000 | $90 | 1,793 | $67 |

| Species. | Pierce. | | Skagit. | | Snohomish. | | Whatcom. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | 2,500 | $100 | 46,617 | $1,318 | 10,000 | $250 | 86,352 | $2,525 | 374,516 | $11,797 |

BY WHEELS.

| Species. | Pacific. | | Species. | Pacific. | |
|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | | *Pounds.* | *Value.* |
| Salmon: | | | | | |
| Blueback or sockeye | 1,600 | $80 | Sturgeon | 100 | $6 |
| *Chinook* | 500 | 30 | | | |
| Shad | 397 | 4 | Total | 5,234 | 211 |
| Steelhead trout | 2,637 | 91 | | | |

BY LINES.

| Species. | Clallam. | | Clarke. | | Franklin. | | Grays Harbor. | | Island. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Grayfish | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 800,000 | $1,800 |
| Halibut | 42,000 | $1,920 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| "Lingcod" | ..... | ..... | ..... | ..... | ..... | ..... | 150 | $2 | ..... | ..... |
| Rockfishes | 57,000 | 1,425 | ..... | ..... | ..... | ..... | 3,000 | 75 | 1,000 | 35 |
| Salmon: | | | | | | | | | | |
| Chinook | 275,876 | 6,898 | ..... | ..... | ..... | ..... | 21,635 | 523 | 51,156 | 1,278 |
| Chum | 15,500 | 155 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Humpback | 22,650 | 282 | ..... | ..... | ..... | ..... | 750 | 9 | 4,200 | 52 |
| Silver | 1,453,299 | 36,234 | 3,700 | $75 | ..... | ..... | 55,240 | 1,332 | 268,744 | 6,719 |
| Sharks | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 46,000 | 100 |
| Skates | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 32,000 | 72 |
| Sturgeon | ..... | ..... | ..... | ..... | 1,200 | $90 | ..... | ..... | ..... | ..... |
| Total | 1,866,325 | 46,914 | 3,700 | 75 | 1,200 | 90 | 80,775 | 1,941 | 1,203,100 | 10,056 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY LINES—Continued.

| Species. | Jefferson. | | King. | | Kitsap. | | Mason. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Cod | | | 300 | $9 | | | | |
| Flounders | | | 200 | 2 | 400 | $32 | | |
| Grayfish | 560,000 | $1,255 | 604,662 | 1,362 | 310,000 | 697 | | |
| Halibut | 12,000 | 960 | 15,000 | 645 | | | | |
| "Lingcod" | 3,000 | 90 | 600 | 18 | | | | |
| Rockfishes | | | 800 | 24 | 650 | 38 | 1,000 | $35 |
| Salmon: | | | | | | | | |
| Blueback or sockeye | | | 117 | 9 | | | | |
| Chinook | 43,406 | 1,086 | 193,662 | 4,842 | 80,388 | 2,010 | 9,135 | 230 |
| Humpback | 3,450 | 43 | 18,400 | 220 | 6,600 | 83 | 750 | 10 |
| Silver | 265,178 | 6,629 | 1,017,388 | 25,435 | 422,312 | 10,558 | 47,990 | 1,200 |
| Sharks | 18,000 | 39 | 180,000 | 404 | 6,000 | 13 | | |
| Skates | 12,000 | 29 | 78,000 | 173 | 4,000 | 9 | | |
| Soles | | | | | 400 | 12 | | |
| Total | 917,034 | 10,131 | 2,109,129 | 33,143 | 830,750 | 13,452 | 58,875 | 1,475 |

| Species. | Pacific. | | Pierce. | | San Juan. | | Skagit. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Grayfish | | | 1,279,334 | $2,879 | 380,000 | $854 | | |
| Halibut | | | | | 100 | 10 | | |
| "Lingcod" | | | | | | | 500 | $12 |
| Rockfishes | | | | | 2,000 | 70 | 1,000 | 40 |
| Salmon: | | | | | | | | |
| Chinook | 95,050 | $4,808 | 159,620 | 7,240 | 20,270 | 510 | 127,413 | 3,188 |
| Humpback | | | 9,000 | 113 | 1,500 | 20 | 10,350 | 129 |
| Silver | 590,300 | 12,617 | 575,880 | 14,397 | 101,980 | 2,650 | 662,762 | 16,569 |
| Sharks | | | 60,000 | 135 | 8,000 | 17 | | |
| Skates | | | 40,000 | 90 | 8,000 | 19 | | |
| Steelhead trout | 3,500 | 175 | | | | | | |
| Total | 688,850 | 17,600 | 2,123,834 | 24,854 | 521,850 | 4,150 | 802,025 | 19,936 |

| Species. | Skamania. | | Snohomish. | | Whatcom. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Cod | | | | | | | 300 | $9 |
| Flounders | | | | | | | 600 | 34 |
| Grayfish | | | | | | | 3,933,996 | 8,847 |
| Halibut | | | | | | | 69,100 | 3,535 |
| "Lingcod" | | | | | | | 4,250 | 122 |
| Rockfishes | | | | | | | 66,450 | 1,742 |
| Salmon: | | | | | | | | |
| Blueback or sockeye | | | | | | | 117 | 9 |
| Chinook | | | 68,291 | $1,782 | 82,215 | $2,055 | 1,228,117 | 36,448 |
| Chum | | | | | | | 15,500 | 155 |
| Humpback | | | 4,950 | 62 | 6,750 | 84 | 89,350 | 1,107 |
| Silver | | | 325,134 | 8,243 | 431,910 | 10,798 | 6,221,817 | 153,456 |
| Sharks | | | | | | | 318,000 | 708 |
| Skates | | | | | | | 174,000 | 392 |
| Soles | | | | | | | 400 | 12 |
| Steelhead trout | | | | | | | 3,500 | 175 |
| Sturgeon | 500 | $30 | | | | | 1,700 | 120 |
| Total | 500 | 30 | 398,375 | 10,087 | 520,875 | 12,937 | 12,127,197 | 206,871 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY TONGS, RAKES, ETC.

| Species. | Clallam. | | Grays Harbor. | | Island. | | Jefferson. | | King. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Clams: | | | | | | | | | | |
| Hard | 2,520 | $190 | ..... | ..... | 552 | $45 | 17,944 | $1,269 | 864 | $110 |
| Razor | ..... | ..... | 297,430 | $37,736 | ..... | ..... | ..... | ..... | ..... | ..... |
| Oysters: Eastern, market | ..... | ..... | 875 | 525 | ..... | ..... | 5,250 | 3,750 | ..... | ..... |
| Total | 2,520 | 190 | 298,305 | 38,261 | 552 | 45 | 23,194 | 5,019 | 864 | 110 |

| Species. | Kitsap. | | Mason. | | Pacific. | | Pierce. | | San Juan. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Clams: | | | | | | | | | | |
| Hard | 35,760 | $2,371 | 64,000 | $4,111 | ..... | ..... | 5,680 | $125 | 4,480 | $490 |
| Soft | ..... | ..... | ..... | ..... | 1,200 | $150 | ..... | ..... | ..... | ..... |
| Razor | ..... | ..... | ..... | ..... | 75,320 | 18,710 | ..... | ..... | ..... | ..... |
| Oysters: | | | | | | | | | | |
| Eastern, market | ..... | ..... | 5,250 | 2,250 | 179,228 | 91,954 | ..... | ..... | ..... | ..... |
| Native | ..... | ..... | 38,654 | 22,035 | 9,709 | 4,755 | 4,200 | 1,725 | ..... | ..... |
| Seed | ..... | ..... | 8,680 | 2,530 | 12,201 | 5,229 | 133 | 47 | ..... | ..... |
| Total | 35,760 | 2,371 | 116,584 | 30,926 | 277,658 | 120,798 | 10,013 | 2,197 | 4,480 | 490 |

| Species. | Skagit. | | Snohomish. | | Thurston. | | Whatcom. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Clams: | | | | | | | | | | |
| Hard | 176 | $25 | 1,760 | $242 | 40,000 | $2,743 | 2,008 | $170 | 175,444 | $12,191 |
| Soft | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,200 | 150 |
| Razor | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 372,750 | 56,446 |
| Oyster: | | | | | | | | | | |
| Eastern, market | ..... | ..... | ..... | ..... | 14,091 | 9,394 | ..... | ..... | 204,694 | 107,873 |
| Native | 560 | 290 | ..... | ..... | 394,296 | 219,818 | ..... | ..... | 447,419 | 248,623 |
| Seed | ..... | ..... | ..... | ..... | 3,794 | 813 | ..... | ..... | 24,808 | 8,619 |
| Mussels | ..... | ..... | ..... | ..... | 700 | 83 | ..... | ..... | 700 | 83 |
| Total | 736 | 315 | 1,760 | 242 | 452,881 | 232,851 | 2,008 | 170 | 1,227,315 | 433,985 |

## NOTES ON SPECIES.

*Halibut.*—Halibut is the most valuable species taken in the fisheries of Washington. The value of the catch in 1915 was nearly three times as great as that of chinook salmon, the next species in importance. The total production was 40,590,705 pounds, with a value to the fishermen of $2,041,279, as compared with 15,897,155 pounds, valued at $458,375, in 1904. The halibut were all taken with lines, and all but 69,100 pounds were taken in the vessel fisheries. Halibut on the Pacific coast average smaller in size than on the Atlantic coast.

The halibut vessel fishery on the Pacific coast really began when the schooners *Oscar and Hattie* and *Mollie Adams*, from Massachusetts, rounded Cape Horn and reached Puget Sound in 1888. The first fishing by these vessels was done during the summer and fall of that year, and the trips would have been very successful had it not been for the high price of ice. The total catch of the two vessels for the season amounted to 570,000 pounds of fresh and salted halibut, valued at $18,400. Some difficulty was at first experienced in freezing and getting the fish to the Atlantic coast markets in good condition, but with the introduction of refrigerator cars no further difficulty has

been encountered, and the shipments have steadily increased. The halibut fleet has increased from the 2 sail vessels just mentioned, in 1888, to a fleet of 97 vessels in 1915, most of them hailing from Seattle. While sail vessels were at first employed in the fishery, in 1915, with the exception of 5 steamers the halibut fleet consisted entirely of gasoline vessels, ranging in size from a few boats under 5 net tons to one of 115 net tons, and were usually owned by corporations. The crews vary from 5 to 19 men on the gasoline boats and from 37 to 44 men on the steamers. Some of the smaller boats do not carry any dories, the fishing being done from the deck. A large majority of the vessels are engaged exclusively in the halibut fishery, but a few discontinue purse seining at times to catch halibut. The number of dories carried varies from 2 on the small gasoline vessels to 12 on the larger steamers. The engineer, cook, and deck hands of a halibut vessel very seldom do any fishing.

Halibut are caught exclusively on trawl lines. The amount of gear used to a vessel ranges from 2 to 8 skates, a skate having a uniform length of 220 hooks placed 9 feet apart. There are ordinarily 7 lines, each 50 fathoms in length, to a skate. The lines are always set with the tide and wind. The men usually start out at about daybreak, and sometimes lines are set as late as 5 p. m. The gear is allowed to remain out about an hour before fishing is begun. From three to four hours are required to lift and fish a gear, the time varying according to amount set. The baiting is done on the fishing grounds just before setting out the lines. From the latter part of November to the last of January torches are used early in the morning and in the evening while fishing. The hooks commonly used are the Arthur James and Mustad hooks, Nos. 6283 and 6284, and are seized on the line with No. 12 linen twine.

Herring is the principal bait used; salmon are also used, but only in small quantities. Large numbers of herring from Puget Sound are utilized, but the main supply comes from Alaska, where many fishermen are occupied exclusively in catching bait for halibut vessels. In starting on a halibut trip it is customary to take 10 barrels of bait to each dory. A steamer will sometimes take as much as 200 barrels of herring on a trip. Bait is taken from Seattle only when going on a short trip. The herring bait is always used fresh, and in 1915 the cost was about $2 per barrel of 200 pounds. The price was about the same in Alaska.

In the early days of the fishery halibut were taken almost exclusively in the vicinity of Cape Flattery, but now the vessels go from 150 to 1,500 miles from Seattle, the nearest fishing bank being the one off Cape Flattery and the most distant one the Portlock Bank. The average length of a trip is 15 days, but some trips to nearby banks are made in 7 or 8 days. Besides the halibut banks already named, Hecate Straits and Yakitat Bank may be mentioned. The most prolific of these is Hecate Straits, 350 to 500 miles from Seattle. Very few vessels from Seattle go farther north than these grounds. While in that region the most convenient place for rebaiting is at Prince Rupert, Canada. In recent years, under an order in council passed at Ottawa, United States vessels can buy bait only upon condition that the catch is landed at Prince Rupert. This has had a depressing effect upon the halibut trade of Seattle, resulting in some of the larger wholesale firms moving to Prince Rupert.

Halibut are prepared for market by eviscerating and filling the cavity with ice. They are then covered with ice and kept in pens in the hold of the vessel to prevent them from sliding around. The heads of the fish are cut off upon the arrival of the vessel at the home dock.

The fishery is followed throughout the entire year except when the vessel is laid up for repairs. Owing to the long distance traveled and the rough weather often encountered, halibut fishing constitutes a dangerous occupation, some men being lost every year. In 1915, 60 men were lost.

In the early days of the halibut fishery the local demand was light, a vessel load of 20,000 pounds being sufficient to supply it. In addition to halibut, the vessels also bring in small quantities of sablefish, the total quantity in 1915 amounting to 575,810 pounds, valued at $13,782. This species is one of the most palatable fishes found on the Pacific coast, or elsewhere. For some unaccountable reason it has not been utilized to any great extent, but the indications now are that increasing quantities will be brought in annually.

*Salmon.*—The total catch of all species of salmon, including steelhead trout, in 1915 amounted to 91,130,492 pounds, valued at $2,330,474. The catch of the different species in the order of their importance was as follows: Chinook, 18,188,160 pounds, valued at $699,771; silver, 18,630,302 pounds, valued at $543,241; humpback, 29,998,291 pounds, valued at $367,521; blueback or sockeye, 5,043,374 pounds, valued at $345,810; chum, 17,156,244 pounds, valued at $282,842; and steelhead, 2,114,141 pounds, valued at $91,389. The greater part of the catch was utilized in canning. Large quantities were also used for freezing, smoking, salting, and mild curing. From the above, it will be seen that the fishermen received the following average prices per pound for the different species: Bluebacks, 6¼ cents; steelhead trout, 4$\frac{3}{10}$ cents; chinook, 3¾ cents; silver, 2$\frac{9}{10}$ cents; chum, 1½ cents; and humpbacks, 1½ cents.

*Chinook.*—Chinook salmon are taken in every county of the State having fisheries, but Pacific County, with a catch of 4,371,135 pounds, is far in the lead. The greater part of the catch is taken in the Columbia River. The pound-net fisheries at Chinook and gill-net fisheries at Ilwaco contribute a large part of the catch. Wahkiakum County, situated entirely on the Columbia River, ranks next to Pacific County, with a catch of 2,600,571 pounds. There are several very important fishing points in this county, but Cathlamet, with its valuable pound-net and gill-net fisheries, is the leading one. Whatcom and Skagit Counties, both on Puget Sound, also furnish large catches of chinook, pound nets being the principal apparatus of capture. Cowlitz County, on the Columbia River, and King County, on Puget Sound, are also deserving of mention for their output of chinook. This species is taken commercially as far from the coast as in the Snake River at Clarkston, Wash., opposite Lewiston, Idaho. It is an important item in the seine catch of that vicinity.

Chinook are found during the entire year in Washington, but the best catches are made between May 1 and September 15. Chinook average in size from 20 to 25 pounds, but some weighing 100 pounds have been taken. The size varies with the apparatus used. The average size of those taken in gill nets is probably less than those taken with some of the other apparatus, as a gill net with an extra

mesh, say from 8½ to 10½ inches, is necessary for the larger chinook, and comparatively few fishermen have these extra nets. Fishermen sometimes call the chinook "springs" until they are ready to spawn; after that they turn dark in color and are called "jacks." Large numbers of chinook are caught by trolling, but in 1915 the silver salmon replaced that species in importance. While large quantities of chinook are smoked, mild cured, and frozen, more than one-half of the entire catch is utilized for canning. There has been an increase in the output of this species since 1904 of 2,976,377 pounds, but a decrease in value of $1,784.

*Silver salmon.*—Silver salmon are taken quite generally throughout the waters of the entire State, Columbia and Garfield Counties on the Snake River alone failing to report any catch. The total output of Puget Sound was 14,753,946 pounds, as compared with 1,871,673 pounds credited to the Columbia River. A small quantity was taken commercially in the Snake River as far up as Clarkston, Wash. More than two-thirds of the total output of the State was utilized for canning. Large quantities were also salted and frozen. Pound nets and lines are the most important forms of apparatus used in taking silver salmon, two-thirds of the catch being taken by this means. The greater part of the remainder were taken in gill nets. Silver salmon follow bluebacks and run mainly from September 1 to the end of the year, but are scarce in December. They are of a more uniform weight than chinook, an average for the entire State being from 6 to 8 pounds, though some weighing 30 pounds have been taken. The output for 1915 as compared with that for 1904 shows a decline of 7,390,885 pounds and an increase of $40,220 in value.

*Humpback.*—Humpback salmon are important only on account of the large catches made, as the average price in 1915, as already shown, was only 1½ cents per pound. The total output was nearly one-third of that of all species of salmon combined. In 1915 this species constituted about one-half of the purse-seine catch, which is the most important apparatus used in their capture. Practically the entire catch is taken in the Puget Sound region and is utilized almost exclusively for canning. The average weight of the humpback is about 4 pounds. They are taken mainly in the summer and fall and appear in increased numbers every two years.

*Blueback or sockeye.*—This is the most valuable of all the salmon, as the average price, 6¾ cents per pound, paid in 1915, indicates. By reason of the bright-red color of the meat and its rich flavor it is the most highly prized of the salmon for canning. More than one-half the catch was taken in the Puget Sound region, but the Quinault River in Grays Harbor County contributed most of the remainder. The blueback run extends from July 15 to the latter part of August. During this time they are being followed by purse-seiners through the Strait of Juan de Fuca to the south side of San Juan County and thence up the Rosario Strait northward to the Canadian line. The blueback is termed a Canadian fish by reason of being taken by American fishermen on its way to its spawning grounds in the Fraser River, Canada. Bluebacks sometimes reach a weight of 12 pounds, but the average weight is about 5 pounds. Heavy runs of this species occur periodically every four years, the last one being in 1913. It will thus be seen that 1915 would naturally be a slack year. The years of these large runs are called "big years." As compared with

1904, the canvass for 1915 shows a decline in the output of this species of 6,464,036 pounds in quantity and $181,678 in value.

*Chum.*—Next to the humpback, this species commands the lowest price of any of the salmon. The average price per pound in 1915 was 1⅔ cents. They are taken mostly in the Puget Sound region, purse seines being the chief means of capture, though large quantities are also taken with gill nets and pound nets. The run begins about September 20 and continues until the end of the year. Most of the catch is utilized for canning, but considerable quantities are sold frozen. The average weight of the chum salmon is about 8 pounds, though some weighing as much as 12 pounds have been taken. There has been an increase in this species since 1904 of 3,504,056 pounds, valued at $151,402.

*Steelhead trout.*—This species is taken very generally in the waters of Washington but is much more plentiful in the Columbia River, more than one-half of the State's entire catch being credited to that river. More than one-half of the catch was taken in pound nets and most of the remainder in gill nets. This fish is found in the Snake River as far up as Clarkston, Wash., and constitutes the most important part of the catch at that locality. It is more plentiful during the winter and until March 15, which accounts in a measure for the good price received. It is said to be not so attractive for eating during part of the spring and summer seasons. The skin then is dark in color, though the flesh is white. It is also quite thin at this time, following the spawning season. In 1915 the fishermen received on an average about 4 3/10 cents per pound. Only a small proportion of the catch is used for canning, as the steelheads are taken in largest quantities when the canneries are closed. Some are frozen, but the demand for the fresh fish usually equals the supply. Steelhead, like chinook salmon, vary much in weight, but an average would be about 12 pounds, though some reach a weight of as much as 45 pounds. There has been a fair increase, both in pounds and value, of this species since the last canvass for 1904.

*Cod.*—Eight schooners owned in Washington, with a combined crew of 268 men and 156 dories, made their annual trip to Alaskan waters in 1915 to prosecute the cod fishery. These vessels ranged from 138 to 413 tons net tonnage. The result of the trip was 5,498,284 pounds of salt cod, valued at $180,934, and 30,000 pounds of cod tongues, valued at $2,090. The round weight of the fish was 13,745,710 pounds. Four of these schooners were from King and four from Skagit Counties. The catch, which was taken entirely with hand lines, was dry-salted in Alaska and taken to Seattle and Anacortes, the hailing places of the vessels, where the fish were resalted and otherwise prepared for market.

The vessels usually leave their home ports about the middle of March, and after three weeks sailing arrive in the neighborhood of Shumagin Islands, in the North Pacific. They are then approximately 1,553 nautical miles from Seattle. As the fishing is followed mostly during the summer season, they have the advantage of long hours of daylight. The period of darkness during the fishing season rarely exceeds four hours, and is even less during June and July. Fishing with trawl lines for cod has been followed to some extent in the past, but very seldom now. The fishermen seem to prefer the

use of hand lines. The catch of cod has more than doubled, and the value nearly trebled since 1904.

*Smelt.*—Smelt are taken in most of the counties bordering on Puget Sound, but the fishing is usually incidental to the salmon fisheries of this region. The fishing season is from August 1 to April 30; during May, June, and July the season is closed. Until recent years the fishing season extended throughout the entire year. Short seines are used, the length ranging from 80 to 100 yards on an average and the depth from 200 to 400 meshes. The bunt is 25 yards long and is of 6 or 9 thread cotton twine with 1-inch mesh, while the wings are of 6-thread twine with 1¼-inch mesh. A seine is usually fished by two men.

Under smelt in this report are included eulachon, or candlefish, which are usually taken in the Cowlitz River near Kelso. In 1915, however, that river was so muddy that they continued up the Columbia to the Lewis River, where practically the entire catch was made. The fishing season is from January 1 to April 1, and they are taken in such large quantities that they soon glut the market. The price usually varies from $5 a box of 50 pounds, early in the season, to 10 cents a box after the season is well advanced. The output goes largely to Portland. Dip nets are the only form of apparatus used in the fishery. Since 1904 there has been an increase in the catch of 788,049 pounds, but there has been a decrease of $1,570 in value.

*Grayfish.*—This species in 1915 was used exclusively in the manufacture of fertilizer and oil. The total output used for this purpose amounted to 7,093,996 pounds, valued at $15,959. This is a new industry, as no grayfish were reported in the last canvass of this region by the Bureau covering the year 1904. They were taken mainly with seines and set lines, and often by men not regularly engaged in fishing.

*Herring.*—Herring are used almost exclusively for halibut bait. Practically the entire catch is taken in haul seines, principally in the vessel fisheries. Many purse-seine fishermen also have short-haul seines, which they use whenever the opportunity offers for making a good haul of herring. Some are sold to the halibut vessels direct and the remainder to dealers, mainly in Seattle, who freeze them for use later in the season. The increase in the herring output from 531,750 pounds, valued at $3,155 in 1904, to 2,129,149 pounds, valued at $9,655 in 1915, is due to the growth of the halibut fishery.

*Sturgeon.*—Sturgeon are found in small quantities in most of the waters of the State but are more frequent in the Columbia River. Pacific County, on the latter stream, with a catch of 17,100 pounds, valued at $784, and 300 pounds of caviar, valued at $75, leads all other counties in this fishery. This species, as in eastern waters, shows quite a marked decline. The total catch for Washington in 1915 amounted to 43,656 pounds, valued at $2,151, as compared with 125,127 pounds, valued at $4,050, in 1904.

*Rockfishes.*—Puget Sound is the northern limit for the black rockfish, the most important catches being made by Indians fishing with hand lines in the vicinity of Neah Bay. Considerable quantities are also taken in that region by troll fishermen, and small quantities with set lines in various localities. Red rockfish are not taken com-

mercially as far north as Washington. The total catch of rockfishes for the State in 1915 was 101,351 pounds, valued at $2,995, as compared with 82,700 pounds, valued at $3,498, in 1904.

*Sole.*—Sole are found in only small quantities as far north as Washington. Practically the entire catch was made with beam trawls, a few men in Kitsap County making a special fishery of it. This species is taken commercially in only four counties of the State, all on Puget Sound. The catch increased from 9,000 pounds, valued at $180, in 1904, to 68,062 pounds, valued at $1,951, in 1915.

*Carp.*—No commercial fishing for carp is followed in any of the streams of Washington, except the Columbia River, and in only one locality on that river. The total output in 1915 amounted to 200,000 pounds, valued at $4,000, which were shipped mainly to Seattle and Portland. Some were sent as far east as Butte, Mont. It is likely that the output could be increased were the markets to justify it.

*Clams.*—There has been quite a decline in the output of hard clams in Washington since 1904. The catch in 1915 was 21,968 bushels, valued at $12,191, as compared with 96,821 bushels, valued at $54,512 in 1904. The counties leading in the production of hard clams are, in the order of their importance, Mason, Thurston, Kitsap, and Jefferson. Several other counties produced small quantities. Olympia is the center of the hard-clam industry of the State. The hard clams are packed there in hermetically sealed cans of many sizes from 1 pint to 5 gallons and shipped as far east as Chicago. They are always shipped raw. The output of soft clams in the State in 1915 was insignificant. In the report for 1904 razor clams were tabulated with the soft clams, but in this report they are separated.

The output of razor clams in 1915 was 37,275 bushels, valued at $56,446. While the returns for 1915 show a substantial increase as compared with 1904, it is likely that the industry has been overworked, as some firms have dismantled their canneries and moved the machinery to Alaska for operation there.

Razor clams are found exclusively along the ocean beach of Grays Harbor and Pacific Counties. In Oregon they are found for only a short distance along the ocean beach from the mouth of the Columbia River south. They are taken between tides at extreme low water, the width of the beach on which they are taken being about 50 yards. The fishing can be done only on "minus" tides; that is, tides running below mean low water. Considerable skill and dexterity are required in capturing them, as they are very quick in their movements. If the first effort with the shovel to catch one is not successful, all chances of getting it at that time are gone. The method followed is to insert the shovel quickly in the sand below the clam and make a quick upward movement, the fisherman placing his hand under the shovel to catch the clam in its efforts to retreat. The legal season for taking razor clams is from September 1 to May 31, the remainder of the year constituting a closed season except for family use. But it is not always possible during the open season to catch them, as the particular stages of the tide when they can be taken occur at only certain intervals.

A brief description of canning razor clams follows: The clams are first put in a hot bath to loosen the shells. After going through the bath, the shells are removed either by hand or by a shelling machine, consisting of an endless chain or pulley. Both methods are fol-

lowed. The shells being removed, the clams then go to women who remove the intestines, after which they are sent to the chopper. From the chopper they are fed into the cans, and the latter are sent to the sealing machines and thence to the retort, which completes the operation, except labeling. The approximate time the cans are left in the retort varies from 45 minutes to 2 hours and 20 minutes, according to the temperature. The first clam cannery in Washington was established in Seattle in 1875, and had a capacity of two hundred 2-pound cans a day.

*Oysters, native and eastern.*—The total production of oysters in Washington in 1915 amounted to 64,342 bushels of native oysters, valued at $250,298, and 37,859 bushels of eastern oysters, valued at $140,028. This indicates an average price per bushel of $3.89 for native and $3.69 for eastern oysters. Comparing the production of native oysters in 1915 with that of 1904, we find a loss of 58 per cent in quantity but only 10 per cent in value. The eastern oysters during the same period show a decrease of less than 2 per cent in quantity and an increase of 14 per cent in value. An illustration of the decrease in the output of native oysters is shown in Pacific County. In 1904 the production in that county amounted to 60,000 bushels, while in 1915 it had dwindled to 1,412 bushels. This has contributed to increasing the price of native oysters along the entire Pacific coast.

Olympia is the center of the native oyster industry of the State, and Shelton, in Mason County, also has a thriving oyster industry. Many of the inlets near these two towns are utilized for oyster-planting purposes. More native oysters are produced in the vicinity of these two towns than in all the remaining towns of the Pacific coast combined. Conditions seem well adapted here to their cultivation. Very few eastern oysters are handled at these places. The oyster season of this region in 1915 suffered a handicap by reason of a freeze occurring toward the end of the season, which killed large numbers of oysters. In the earlier days of the industry the grounds were always bare at low water, and many oysters died during the cold weather. To prevent this, dykes were built to hold the water and lessen the exposure of the oysters to the weather. Another and probably the main reason for building the dykes, however, was to establish a seed-producing area, as the public reserves had then become very much depleted, and it was difficult to secure seed with which to stock the grounds.

It is said that the first attempt at native-oyster cultivation in the vicinity of Olympia was about 1880, and the business has been continued ever since. The supply does not meet the demand, and for this reason the oysters are often sold before reaching maturity. Another probable reason, however, for early marketing is to avoid the danger of freezing when the tide is out. The dykes have to a considerable extent lessened this danger. Shells have been planted within the dykes for the collection of spat and also to prevent the oysters settling in the mud.

The average oyster season is from early in September to early in May. Some of the oysters are shipped in the shell, but a majority are shucked and shipped in cans of various sizes, holding from 1 pint to 5 gallons. The cans are hermetically sealed, but the oysters are not cooked. Shipments are made as far east as Chicago. It is likely

that about one-half the output goes out of the State, mostly to California, Oregon, Idaho, Utah, Montana, and some to British Columbia. As is well known, this native oyster is very much smaller than the eastern one.

The eastern oyster is produced in several counties of the State from Samish Bay, in Skagit County, to Willapa Harbor, in Pacific County, but 84 per cent of the output is from the latter water. Shoalwater Bay, an arm of Willapa Harbor, is especially suitable for the culture of the eastern oyster, and it is said that so far as known the southern part of this bay is the only place on the Pacific coast where the eastern oyster will propagate and successfully develop. The most important oyster centers in this region are Nahcotta, Tokeland, South Bend, and Bay Center. Little attention is paid now to the native oyster at these localities as compared with times past. It is authoritatively stated that the first eastern oyster was brought to Willapa Harbor for planting in 1894. The shipment was made by J. & J. W. Ellsworth Co., of New York, under the direction of the U. S. Fish Commission. Although conditions seemed favorable for the continued planting of eastern oysters in this region, practically nothing more was done for several years, due largely to the freight rates, which were almost prohibitory. About the year 1900 the business took on new life and continued to grow until 1907, when it slacked up from lack of demand. Little planting was done during the following years until the spring of 1912, when six carloads of seed oysters were brought from the east and planted. Allowing the usual time for maturing, these oysters were probably marketed in 1914 and 1915. The planters seem to prefer "set" for planting, as they can get more out of a bushel and they develop into a better oyster than older stock. The demand for eastern oysters is now so great that they are rarely left on the beds after reaching 3 years of age. The high freight rates and heavy mortality contribute largely to the high price of these oysters. Some Japanese oysters have been planted in Willapa Harbor, but they did not meet with sufficient favor to justify further planting.

The oyster grounds occupied by planters in Washington have been purchased and deeded by the State to the owners. This deed holds good only so long as the land is devoted to oyster culture.

*Seed oysters.*—During the year 1915, 3,544 bushels of seed oysters, with an estimated value of $8,619, were taken by planters from State reserves. The reserves are tidewater grounds owned by the State, certain portions of which are opened up to planters each year between April 1 and June 15 for taking seed stock. Each planter is allowed 500 sacks of 120 pounds each for every acre prepared by him for seeding, and no seed stock can be sold.

*Crabs.*—Crabs are taken entirely with hoop nets and pots, the total catch with both forms of apparatus in 1915 amounting to 1,734,401 pounds, having a value to the fishermen of $54,526, showing an increase since 1904 of 174 per cent in quantity, and 102 per cent in value. All but 92,231 pounds, valued at $3,104, were taken in the shore fisheries. Crabs are taken commercially in almost all of the counties bordering on Puget Sound and in Grays Harbor and Pacific Counties bordering on the ocean. In the two last-named counties the fishing is followed almost entirely in the ocean. The most important coast centers in the State are Bay Center, Tok-

land, and South Bend, in Pacific County; Westport, in Grays Harbor County; Utsaladdy, in Island County, and Dungeness, in Clallam County.

*Shrimp.*—The total catch of shrimp in 1915 amounted to 386,420 pounds, valued at $18,719, taken entirely with beam trawls. Nearly three-fourths were taken in the vessels fisheries and the remainder in the shore fisheries. They were taken in all parts of Puget Sound, but the greater part of the shrimp fleet was owned and operated from Olympia and Tacoma and vicinities. An important industry in Olympia is the picking out and shipment of shrimp meat.

*Whales.*—The whaling industry of Washington, aside from some work done in Bering Sea by a coasting steamer owned in Seattle, was confined entirely to one locality in Pacific County. Three steamers are employed from the latter place and a plant is located there for the manufacture of fertilizer and oil from the whales.

These steamers go from 20 to 150 miles from port in search of whales. Four species of whales are taken; finbacks, sperm, humpbacks, and sulphur-bottom. In 1915, 252 humpbacks, 66 finbacks, 15 sperm, and 1 sulphur-bottom were taken. Some whalebone was taken by the whaling steamer out of Seattle, working in Bering Sea, but that taken from the whales captured by the steamers from Pacific County was not of sufficient length to give it any commercial value.

Practically every part of the whales taken by the Pacific County steamers was utilized, except the water extracted from them. The flesh, blood, and bones contributed to the manufacture of fertilizer. As soon as the whale is brought in, unless it be at night, the blubber is stripped off and the meat cut into chunks of about 10 pounds each. The bone is then chopped up and put into tanks, after which the cooking process begins. The meat is put into vats holding 6 tons each, where it is boiled until thoroughly cooked, the oil being extracted while cooking by dipping it off by hand with long-handled dippers. This applies to oils Nos. 2 and 3, known as whale oil. The meat is then put into a press and the residue of oil extracted, after which it passes through a drier and comes out as dry scrap, in which shape it is sold; as it contains 15 per cent of ammonia it is considered a high-grade material for fertilizer.

After stripping off the blubber it is passed through a slicer into boiling tanks, having a capacity of 20 tons each, where it is cooked in the same manner as the meat. After cooking, it is allowed to stand until the following day, when the oil is run off into oil coolers or collectors, when it is ready for market. Practically all of the oil from the blubber is No. 1. The different kinds, or grades of oil are all manufactured in exactly the same manner, the difference in grades being determined by the colors. No. 1 is white, No. 2 is dark straw color, No. 3 is still darker, and No. 4 is almost black. The fresher the whale, or the more quickly it is utilized after killing, the better the oil secured. The latter gets dark by holding the whale.

Most of the oil is sold to soap manufacturers, one large firm in the Middle West getting the greater part of it. It is all shipped in tank cars. The best grade is an excellent machine oil.

In the case of the sperm whale the oil is extracted by tapping the head of the whale and letting the oil run out into a vat.

The bone of the whale is boiled in the same manner as the meat. After the oil is extracted, the bone is taken out into an open yard and allowed to remain there for several months, or until the end of the season, in October, when it is ground and put through a drier and then through a mill, when it is ready for market as bone meal. This is considered a good fertilizer without other ingredients and is so sold. An analysis has shown that it contains 23.79 per cent of phosphoric acid, which places it among the high-grade fertilizers.

*Ratfish.*—This fish is quite common along the Pacific coast, but as yet no commercial use has been made of it. It is often found by men fishing for grayfish. The liver of this fish is said to furnish an oil better even that cod-liver oil for tuberculosis and kindred ailments, and is quite extensively used in the Scandinavian countries and in Germany.

## WHOLESALE FRESH-FISH TRADE.

The most important wholesale firms of the State, aside from canneries, are located at Seattle, though a considerable fresh-fish trade is done at Tacoma and Everett, especially the former city. In 1915 there were 14 firms in the State handling fresh fishery products only. The value of these establishments was $153,075, the cash capital invested was $26,100, the number of persons engaged was 79, and the wages paid amounted to $50,350. Three of these firms, which handled crabs, cooked a few of the crabs before shipment.

## FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING.

The total amount of fish frozen in the State was 8,812,127 pounds, valued at $371,854. This includes fish frozen by refrigerator plants for wholesale dealers. The most important species frozen, based on their value, were halibut, chum, silver, and chinook salmon, and herring, the latter being utilized mostly for halibut bait. Sablefish and smelt were also frozen in considerable quantities.

The mild-cured trade in Washington was confined to chinook and chum salmon, divided as follows: 1,208,800 pounds of chinook salmon, valued at $130,052, and 83,000 pounds of chum salmon, valued at $2,060. The mild curing was all done at Seattle, Tacoma, and Altoona, Wash.

The wholesale salting trade in 1915 amounted to 1,788,200 pounds, valued at $106,493, most of it being silver salmon. Considerable quantities of halibut and sablefish and small quantities of several other species were also salted. Seattle and Tacoma were the headquarters for the salting trade.

The smoking of fish was quite an important industry in the State. The total quantity smoked in 1915 was 2,058,210 pounds, having a value of $193,301. The principal smoking centers are Seattle, Tacoma, Everett, and Bellingham. Chinook salmon and sablefish were the most valuable smoked fish, though halibut, cod, chum salmon, and herring also were smoked in considerable quantities.

The following is a brief description of a smokehouse and method of smoking: A smokehouse is approximately 15 by 30 feet and 3 stories

high from the basement to the roof. A square or round building is preferable, so as to insure a more even distribution of heat and smoke. The fire is maintained in the center of the building, in the basement or on the first floor. Each fish is hung on three sticks, or on metallic hangers, depending upon the size to be smoked. Small fish are placed on sticks and large ones on metallic hangers. They are suspended from the second and third floor levels. A slow fire is maintained from four to seven days, depending upon the kind of fish to be smoked. Alder wood and hardwood sawdust are used entirely. Sawdust is used to make a smoldering fire with a great deal of smoke but little heat. The kippering process differs from the regular smoking process only in that the fish are placed on trays similar to a broiler in the oven at home, and the alder-wood fire is maintained up to the neighborhood of 300° F. for two hours. By this time the fish is thoroughly cooked from the heat and cured by the smoke. It is then ready to eat.

Among the miscellaneous fishery products prepared were 1,927 tons of fertilizer from fish and fish offal, valued at $77,560; 171,245 gallons of oil, valued at $50,555; 41,038 gallons of glue, valued at $36,200; 212 tons of poultry feed, valued at $10,370, from the same source; 133,689 pounds of shrimp meat, valued at $38,303; 5,000 pounds of potash, valued at $1,125, from kelp; and 150 tons of ground clam shells, valued at $1,500. The oil mentioned above is used largely for tanning leather, while some made from grayfish livers is used in the manufacture of fine grades of soap. It is also said to be good for medicinal purposes, but no such trade has yet been established.

Statistics for products prepared, exclusive of canning, in Washington in 1915 are shown in table, page 54.

## CANNING INDUSTRY.

In 1915 there were in Washington 76 canneries, distributed by districts as follows: Forty-nine, valued at $4,541,103, in the Puget Sound region; 15, valued at $318,685, in the Grays Harbor district; 7, valued at $164,900, in the Willapa Harbor district; and 5, valued at $293,329, on the Columbia River. A total of $424,000 working cash capital was employed, 4,525 persons were engaged, and $1,279,787 were paid in wages. Of these canneries all but a few were engaged in canning salmon. The remainder handled clams, clam juice, oysters not cooked, oyster cocktails not cooked, and shrimp cocktails. Some of the salmon canneries included in their output a few cases of canned shad, shad roe, clams, and clam juice. The total pack of salmon in the State was as follows: 590,378 cases of humpback, valued at $1,772,565; 178,464 cases of chinook, valued at $1,400,220; 450,409 cases of chum, valued at $1,219,061; 206,508 cases of silver, valued at $1,036,859; 91,720 cases of blueback, valued at $932,394; and 10,270 cases of steelhead trout, valued at $64,860. The other canned products consisted of 49,337 cases of clams, valued at $211,008; 270 cases of clam juice, valued at $1,050; 7,505 gallons of clams not cooked, valued at $4,066; 4,944 gallons of clam juice not cooked, valued at $2,427; and 49,103 gallons of oysters not cooked, valued at $120,513. A case of salmon represents 48 pounds, but there is no uniform weight to a case of clams. The clams indicated as not cooked

are put up in hermetically sealed cans, which, if stored on ice, will keep from one to three weeks and are sometimes shipped as far east as Chicago. This applies also to the clam juice and oysters.

As the heaviest runs of salmon in the Puget Sound region occur during the warmer weather, it is difficult to keep the fish in good condition very long, and for this reason it was soon recognized as necessary that the canneries be located as near the salmon grounds as possible. In the early stages of the industry some canning was done at West Seattle, but it was discontinued after the buildings were twice destroyed by fire. The most important salmon-canning centers of Washington now are Anacortes, Blaine, Everett, and Bellingham, all being favorably located to the fishing grounds. Many of the canning companies still maintain offices in Seattle.

In 1915 a company in Whatcom County smoked the salmon before canning. The following is a brief description of the process through which the salmon passed before being canned: The salmon are first placed in a concrete tank, from which they are taken and passed through a machine which cleans and eviscerates them and cuts off the heads and tails. The fish, after being cut into sizes suitable to the size of the can, are taken to the smokehouse, where they are put on trays. Extending lengthwise down the middle of the smokehouse from floor to ceiling are 12 inclosed compartments or chambers, 8 by 12 feet in size. Each of these chambers holds 56 wire trays, 2 by 3½ feet in size, divided into groups of 14, placed one above the other. The bottom tray is 27 feet above the fire and 20 feet below the top of the building. That part of the chamber holding the trays is about 6 feet in height. There is a ventilator over each chamber extending out through the roof of the building. A draft hole near the bottom of each chamber or floor of the building enters the space where the fire is located. The salmon remain in the chambers about 24 hours, or a trifle less. The capacity of this smokehouse is 35,000 pounds. Alder wood was at first used, but it has since been replaced by oak. This building was built only recently, and it is therefore believed to possess the most modern ideas.

An advantage to the dealer in smoking the salmon before canning is that it gives the inferior grades of fish the same color as those of a higher grade, such as the blueback. The dealers claim that there is not nearly so much difference in the quality of salmon meat as the color would seem to imply. In proof of this statement it is said that fish brokers have been unable to distinguish between smoked chum and smoked blueback.

## EXTENT OF THE CANNING INDUSTRY OF WASHINGTON IN 1915, BY DISTRICTS.

| Items. | Puget Sound. | | Columbia River. | | Grays Harbor. | | Willapa Harbor. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Establishments | 49 | $4,541,103 | 5 | $293,329 | 15 | $318,685 | 7 | $164,900 | 76 | $5,318,017 |
| Cash capital | ..... | 279,700 | ..... | 26,000 | ..... | 73,700 | ..... | 44,600 | ..... | 424,000 |
| Persons engaged | 3,494 | ..... | 209 | ..... | 682 | ..... | 140 | ..... | 4,525 | ..... |
| Wages paid | ..... | 1,042,338 | ..... | 107,290 | ..... | 95,509 | ..... | 34,650 | ..... | 1,279,787 |
| PRODUCTS.[a] | | | | | | | | | | |
| Salmon: | | | | | | | | | | |
| Chinook— | | | | | | | | | | |
| 1-pound tall ..... cases | 11,553 | 54,726 | 17,697 | 134,069 | 2,997 | 13,585 | 6,030 | 36,620 | 38,277 | 239,000 |
| 1-pound flat ..... do | [b]7,104 | 37,872 | 55,240 | 436,004 | 3,084 | 11,147 | 9,723 | 76,408 | 75,151 | 561,431 |
| 1-pound oval ..... do | ..... | ..... | ..... | ..... | ..... | ..... | 192 | 1,632 | 192 | 1,632 |
| ½-pound flat ..... do | 4,999 | 47,896 | 47,710 | 438,461 | 1,999 | 16,583 | 10,135 | 95,217 | 64,844 | 598,157 |
| Blueback or sockeye— | | | | | | | | | | |
| 1-pound tall ..... do | 579 | 4,429 | 550 | 4,290 | 968 | 6,776 | ..... | ..... | 2,097 | 15,495 |
| 1-pound flat ..... do | 8,350 | 71,542 | ..... | ..... | 2,073 | 16,584 | 8 | 64 | 10,431 | 88,190 |
| ½-pound flat ..... do | 55,384 | 594,999 | 1,267 | 11,735 | 22,323 | 219,795 | 218 | 2,180 | 79,192 | 828,709 |
| Silver— | | | | | | | | | | |
| 1-pound tall ..... do | 116,694 | 551,760 | 1,985 | 9,925 | 9,925 | 39,947 | 4,932 | 19,799 | 133,536 | 621,431 |
| 1-pound flat ..... do | 27,884 | 142,766 | 200 | 920 | 1,693 | 7,701 | ..... | ..... | 29,777 | 151,387 |
| ½-pound flat ..... do | 38,005 | 231,539 | 1,794 | 12,913 | 1,779 | 8,315 | 1,617 | 11,274 | 43,195 | 264,041 |
| Humpback— | | | | | | | | | | |
| 1-pound tall ..... do | 551,516 | 1,608,153 | ..... | ..... | 525 | 1,940 | ..... | ..... | 552,041 | 1,610,093 |
| 1-pound flat ..... do | [c]11,128 | 37,243 | ..... | ..... | ..... | ..... | ..... | ..... | 11,128 | 37,243 |
| ½-pound flat ..... do | 27,094 | 124,631 | ..... | ..... | 115 | 598 | ..... | ..... | 27,209 | 125,229 |
| Chum— | | | | | | | | | | |
| 1-pound tall ..... do | 407,706 | 1,105,465 | 9,575 | 23,956 | 25,450 | 66,138 | 6,243 | 18,325 | 448,974 | 1,213,884 |
| 1-pound flat ..... do | 733 | 2,345 | ..... | ..... | 27 | 50 | ..... | ..... | 760 | 2,395 |
| ½-pound flat ..... do | 657 | 2,710 | ..... | ..... | 18 | 72 | ..... | ..... | 675 | 2,782 |
| Shad: | | | | | | | | | | |
| 1-pound tall ..... do | ..... | ..... | 1,228 | 3,684 | ..... | ..... | ..... | ..... | 1,228 | 3,684 |
| ½-pound flat ..... do | ..... | ..... | 335 | 1,882 | ..... | ..... | ..... | ..... | 335 | 1,882 |
| Shad roe: ½-pound flat ..... do | ..... | ..... | 46 | 460 | ..... | ..... | ..... | ..... | 46 | 460 |
| Steelhead trout: | | | | | | | | | | |
| ½-pound tall ..... do | ..... | ..... | 6,682 | 39,792 | ..... | ..... | 1,698 | 11,500 | 8,380 | 51,292 |
| 1-pound flat ..... do | ..... | ..... | ..... | ..... | ..... | ..... | 500 | 4,000 | 500 | 4,000 |
| ½-pound flat ..... do | ..... | ..... | 494 | 3,177 | ..... | ..... | 896 | 6,391 | 1,390 | 9,568 |
| Clams: | | | | | | | | | | |
| No. 1, whole ..... do | 264 | 1,046 | ..... | ..... | 1,057 | 4,306 | ..... | ..... | 1,321 | 5,352 |
| No. 1, minced ..... do | 1,632 | 6,528 | ..... | ..... | 16,375 | 76,407 | 2,662 | 9,180 | 20,669 | 92,115 |
| No. 2, whole ..... do | 2,450 | 6,615 | ..... | ..... | ..... | ..... | ..... | ..... | 2,450 | 6,615 |
| No. 2, minced ..... do | 4,249 | 12,322 | ..... | ..... | 1,672 | 12,100 | 168 | 504 | 6,089 | 24,926 |
| Halves, minced ..... do | 50 | 220 | ..... | ..... | 18,414 | 80,747 | 138 | 564 | 18,652 | 81,531 |

[a] All products except clams and clam juice, which have no uniform weight, represent 48 pounds to the case.

[b] Includes 553 cases smoked before canning

[c] Includes 656 cases smoked before canning.

EXTENT OF THE CANNING INDUSTRY OF WASHINGTON IN 1915, BY DISTRICTS—Continued.

| Items. | Puget Sound. | | Columbia River. | | Grays Harbor. | | Willapa Harbor. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| Clams—Continued. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Nuuuber.* | *Value.* | *Number.* | *Value.* |
| Quarters, minced.....cases | ..... | ..... | ..... | ..... | 156 | $468 | ..... | ..... | 156 | $468 |
| No. 10, whole (not cooked).....gallons | 6,012 | $3,506 | ..... | ..... | 1,494 | 560 | ..... | ..... | 7,506 | 4,066 |
| Clam juice: | | | | | | | | | | |
| No. 1.....cases | 30 | 104 | ..... | ..... | ..... | ..... | ..... | ..... | 30 | 104 |
| No. 2.....do | 75 | 187 | ..... | ..... | 165 | 759 | ..... | ..... | 240 | 946 |
| No. 10 (not cooked).....gallons | 1,200 | 400 | ..... | ..... | 3,744 | 2,027 | ..... | ..... | 4,944 | 2,427 |
| Oysters (not cooked).....do | 49,103 | 120,513 | ..... | ..... | ..... | ..... | ..... | ..... | 49,103 | 120,513 |
| Oyster cocktails (not cooked).....4-ounce bottles | 2,184 | 212 | ..... | ..... | ..... | ..... | ..... | ..... | 2,184 | 212 |
| Shrimp cocktails.....do | 2,196 | 213 | ..... | ..... | ..... | ..... | ..... | ..... | 2,196 | 213 |

## FISHERIES OF OREGON.

While not the least of the three States on the Pacific coast in point of area, Oregon presents the shortest water front and ranks third in the extent of its fisheries.

The number of persons employed in the fisheries and fishery industries of Oregon during the year 1915 was 5,900; of these 23 were engaged on fishing vessels of 5 tons net or more; 60 on vessels engaged in transporting fish and fishery products; 4,472 in the shore, or boat, fisheries; and 1,345 on shore, in canneries, fish houses, etc.

The investment in the fishery industries during the year was $4,064,151, of which $25,935 was credited to 5 fishing vessels; $96,034, to 30 transporting vessels; $582,485 to 1,382 gasoline boats; $69,805 to 1,264 other small boats of various descriptions; $757,170, to all apparatus used in the fisheries of the State; $2,083,913, to shore and accessory property; and $448,809, to working cash capital.

The products of the fisheries of the State in 1915 amounted to 34,692,863 pounds, valued at $1,479,021. The various regions contributing to this total are, in the order of their importance, as follows: Columbia River district, 27,879,438 pounds, valued at $1,271,357; Rogue River, 1,133,331 pounds, valued at $66,298; Pacific Ocean, 596,059 pounds, valued at $30,415; Tillamook Bay, 1,191,488 pounds, valued at $24,516; Nehalem River, 893,630 pounds, valued at $17,493; Umpqua River, 669,663 pounds, valued at $12,425; Coquille River, 549,804 pounds, valued at $10,914; Siletz River, 310,454 pounds, valued at $9,994; Coos Bay, 348,881 pounds, valued at $8,411; Nestucca River, 353,059 pounds, valued at $8,207; Alsea Bay, 391,562 pounds, valued at $7,346; Yaquina Bay, 169,560 pounds, valued at $6,071; Siuslaw River, 117,526 pounds, valued at $2,530; Chetco River, 43,130, pounds, valued at $2,149; and Necanicum River, 45,278 pounds, valued at $895.

The Columbia River catch is so far in excess of all the other regions combined as to render it worthy of special mention. The catch in that river in 1915 amounted to 27,879,438 pounds, valued at $1,271,357. Of this quantity 27,036,808 pounds, valued at $1,239,001, over 96 per cent of the total, were salmon, and the greater part of these, or 20,454,002 pounds, valued at $1,091,156, were chinook salmon. The remainder of the salmon catch was blueback, chum, silver, and steelhead. Humpback salmon are rarely seen this far south. Columbia River has what is known as a "spring" run and a "fall" run of salmon, though the interval between the two seasons is very limited, the closed period extending only from August 25 to September 10. The spring run of chinook was better in 1915 than for several years, and the fall run was very good for the first week or two after the opening of the season, but after that it seemed to diminish. The bluebacks, which accompany the spring run of chinooks, were so few in 1915 as to be almost a failure; they seem to have been very scarce for two years. The chum salmon, which run from about the middle of August until late in November, show a fairly good catch for the year under consideration. The silver salmon usually appear about midsummer and continue until some time in November; the catch of silvers was not so good as in past years. The run of steelhead was about normal.

Commercial fishing in this river covers a distance of 200 miles or more from the mouth of the river to Celilo Falls, in Wasco County, but the major portion of the work is done within 40 or 50 miles of the mouth and chiefly with gill nets. Important seine fisheries are located on the sand bars near Astoria, these grounds being leased from the Government. Comparativly little pound-net fishing is done on the Oregon side of the river, this method being used principally on the Washington side in a widened portion of the river known as Bakers Bay, located just within the mouth of the river. Fish wheels are of both the scow and stationary type and are located at various points on the upper river above the mouth of the Willamette River.

Considered as a whole, the 1915 pack was slightly above the normal, but the fall pack was light, due to the fact, above stated, that the fall run of chinook salmon dropped off early.

Considerable quantities of salmon have been mild cured on this as well as other rivers of Oregon in the past years, mostly for export to the German trade, but this demand has decreased to such an extent since the beginning of the European war that the output of this product has suffered a marked decline. The loss of the foreign trade, however, has been partly offset by an increased domestic demand, and it is believed that with proper effort this business can be made independent of the export trade.

During the last year or two a very important troll-line fishery has been established by the fishermen of Columbia River. This work is carried on chiefly during the interval between the spring and fall seasons, when gill-net fishing is prohibited, though some follow it prior and subsequent to that period. The boats are of an especially good type, propelled by gasoline engines of sufficient power to enable them to go out in very rough seas; the fishing is done in the ocean about 5 or 6 miles from the mouth of Columbia River and sometimes down as far as Tillamook Head. One boat will sometimes fish as many as five to seven lines, fixed on outriggers. The troll-line catch is practically all chinook salmon.

The statistics as to number of persons employed, investment, and products of the fisheries of Oregon in 1915 are given in the table, page 51. The yield of the fisheries of the coastal waters of the State is given in the following table:

YIELD OF THE FISHERIES OF THE COASTAL WATERS OF OREGON IN 1915.

| Species. | Columbia River. | | Necanicum River. | | Nehalem River. | | Tillamook Bay. | | Nestucca River. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | 50,000 | $750 | | | | | | | | |
| Salmon: | | | | | | | | | | |
| Blueback | 337,027 | 16,848 | | | | | | | | |
| Chinook | 20,454,002 | 1,091,156 | | | 371,024 | $9,212 | 479,923 | $11,988 | 161,901 | $4,047 |
| Chum | 1,454,024 | 8,391 | 3,220 | $45 | 176,330 | 883 | 290,230 | 1,454 | | |
| Silver | 2,500,766 | 50,248 | 42,058 | 850 | 322,632 | 6,453 | 347,514 | 6,953 | 174,268 | 3,485 |
| Shad | 488,625 | 4,945 | | | | | | | | |
| Steelhead trout | 2,290,989 | 72,358 | | | 23,644 | 945 | 5,261 | 211 | 16,890 | 675 |
| Sturgeon | 97,785 | 5,014 | | | | | | | | |
| Tomcod | 22,500 | 900 | | | | | | | | |
| Clams, soft | | | | | | | 16,560 | 2,285 | | |
| Crabs | | | | | | | 52,000 | 1,625 | | |
| Crawfish | 183,720 | 20,747 | | | | | | | | |
| Total | 27,879,438 | 1,271,357 | 45,278 | 895 | 893,630 | 17,493 | 1,191,488 | 24,516 | 353,059 | 8,207 |

| Species. | Siletz River. | | Yaquina Bay. | | Alsea Bay. | | Siuslaw River. | | Umpqua River. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Flounders | | | 1,965 | $40 | | | | | | |
| Herring | | | 10,500 | 263 | | | | | | |
| Perch | | | 11,930 | 360 | | | | | | |
| Salmon: | | | | | | | | | | |
| Chinook | 167,064 | $8,197 | 44,328 | 1,601 | 206,615 | $4,124 | 33,180 | $829 | 112,923 | $2,265 |
| Chum | 36,720 | 185 | | | 16,225 | 83 | | | 5,130 | 40 |
| Silver | 106,670 | 1,612 | 43,420 | 1,085 | 99,960 | 1,500 | 83,306 | 1,670 | 548,610 | 10,000 |
| Smelts | | | 8,500 | 175 | | | | | | |
| Steelhead trout | | | | | 1,200 | 48 | 1,040 | 31 | 3,000 | 120 |
| Clams, soft | | | 330 | 49 | 430 | 64 | | | | |
| Oysters, native, market | | | 1,547 | 725 | | | | | | |
| Crabs | | | 52,040 | 1,773 | 67,132 | 1,527 | | | | |
| Total | 310,454 | 9,994 | 169,560 | 6,071 | 391,562 | 7,346 | 117,526 | 2,530 | 669,663 | 12,425 |

| Species. | Coos Bay. | | Coquille River. | | Rogue River. | | Chetco River. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | | | | | 50,000 | $750 |
| Flounders | | | | | | | | | 1,965 | 40 |
| Herring | | | | | | | | | 10,500 | 263 |
| Perch | | | | | | | | | 11,930 | 360 |
| Salmon: | | | | | | | | | | |
| Blueback | | | | | | | | | 337,027 | 16,848 |
| Chinook | 132,177 | $3,304 | 207,138 | $5,467 | 1,081,457 | $65,001 | 30,560 | $1,833 | 23,482,292 | 1,209,024 |
| Chum | | | | | | | | | 1,081,879 | 11,081 |
| Silver | 181,450 | 3,629 | 330,046 | 5,049 | 51,874 | 1,297 | 12,270 | 306 | 4,844,844 | 94,137 |
| Shad | | | | | | | | | 488,625 | 4,945 |
| Smelts | | | | | | | | | 3,500 | 175 |
| Steelhead trout | 10,914 | 435 | 12,620 | 398 | | | 300 | 10 | 2,365,858 | 75,231 |
| Sturgeon | | | | | | | | | 97,785 | 5,014 |
| Tomcod | | | | | | | | | 22,500 | 900 |
| Clams, soft | 5,140 | 643 | | | | | | | 22,460 | 3,041 |
| Oysters, native, market | | | | | | | | | 1,547 | 725 |
| Crabs | 19,200 | 400 | | | | | | | 190,372 | 5,325 |
| Crawfish | | | | | | | | | 183,720 | 20,747 |
| Total | 348,881 | 8,411 | 549,804 | 10,914 | 1,133,331 | 66,298 | 43,130 | 2,149 | 34,096,804 | 1,448,606 |

## FISHERIES BY COUNTIES.

The commercial fisheries of Oregon were prosecuted in 15 counties during the year 1915. This number includes every county on Columbia River from the mouth up to and including Wasco County at Celilo Falls, several counties on Willamette River, a tributary of Columbia River, every county on the coast, and also Josephine County, which, though located inland, has a run of salmon in Rogue River

which passes through the county en route to the ocean. In considering the fisheries of the various counties they will be taken up according to their rank as regards the value of the catch.

*Clatsop County.*—This county, with its extensive salmon-canning industry, located at Astoria, ranks far above any other in the State. The catch for the year was 22,676,724 pounds, valued at $1,039,955. The great bulk of this catch was salmon, with chinook far in excess of the others; the catch of chinook was 16,167,867 pounds, valued at $886,585. Next to the salmon, the most important catch was razor clams, of which 77,200 pounds, valued at $10,900, were taken on the coast. The fisheries here support five canneries, all located at Astoria, on Columbia River; four of them also canned small quantities of shad and shad roe in 1915.

Several of the firms also froze small quantities of salmon, shad, shad roe, and sturgeon. Six clam canneries were operated on the ocean side of this county in 1915, but the pack was not up to normal because the clams seem to have been on the decrease for several years. One of the canneries also packed a very small lot of salmon. Considerable crab fishing has been done from Astoria during the last few years. The greater part of this work is done from January to June, and during the early part of this period it is frequently too rough for the boats to reach the crab-fishing grounds, which are located principally beyond the Columbia River bar at the mouth of the river; they often go as far as 15 to 20 miles when crab fishing. But for this obstacle greater effort would undoubtedly have been made in this line. The crabs are taken with a sort of dip net or hoop net, made of cotton twine, hung on iron hoops, two hoops to each net, placed one above the other, about a foot apart; the nets are sunk and buoyed so that they may be located easily.

The most important form of apparatus in Clatsop County is the gill net, the catch of which was 14,607,184 pounds, valued at $641,041; the great bulk of this was salmon, with small quantities of shad and sturgeon. Seines occupy the next place in point of importance, the catch with these being 6,024,288 pounds, valued at $302,764. The line and pound-net fisheries also add considerable quantities to the salmon catch of this county.

The investment of Clatsop County was $2,076,577, an amount greater than that of all the other counties combined.

*Columbia County.*—This county ranked second in the value of the catch, but the amount invested was less than in some other counties. This is probably due to the fact that some of the other counties have canneries, and these buildings add considerably to the investment, while Columbia County has no canneries or fish houses of any kind, except a small wholesale fresh-fish house at Rainier. Practically all the fish caught by the fishermen of this county are sold to the canneries at Astoria. The catch amounted to 2,711,569 pounds, valued at $114,911. The investment for the year was $176,162, this amount consisting chiefly of the value of gasoline boats and gill nets.

This county adjoins Clatsop County and borders on that part of the Columbia River where the fishing grounds are especially prolific, and, as in the latter county, owes its importance principally to the gill-net fisheries, the catch by these nets being 2,317,982 pounds, valued at $83,179. Of this amount 1,835,441 pounds, valued at $76,154, represent chinook salmon alone, the remainder being made up of

other salmon and small quantities of shad and sturgeon. The pound-net catch of this county consisted entirely of salmon. The seine catch ranked next to that of the pound nets and was made up of salmon and carp. The only carp fishery in the State during 1915 was located in this county on Willamette River Slough. The catch of carp amounted to 50,000 pounds, valued at $750, and a part of it was sent to New York. These fishes are said to be very plentiful in this section, but there is very little demand for them. Some crawfish are also taken from this slough, though this fishery has suffered a decrease during the last year or two.

*Curry County.*—The total catch of the fisheries of this county during 1915 was 1,086,283 pounds, valued at $63,035, this being the third county in point of importance. This position is due to the fact that Rogue River, which produces the great bulk of the catch, has both a spring and fall run of salmon. Small catches are also taken from Chetco River, but this stream is comparatively unimportant. Rogue River flows from Crater Lake in the western part of Klamath County, entirely through Jackson and Josephine Counties, and enters Curry County at the northeastern corner, flowing in a southwesterly direction through the center of the county to the ocean, and, with the exception of Columbia River, is the longest stream which we have to consider. Commercial fishing extends from the mouth up to Grants Pass, located in Josephine County. The fishermen on the lower river are handicapped because of the lack of shipping facilities and are compelled to depend entirely on vessels; the two canneries located just within the mouth of the river get practically the entire catch of the lower-river fishermen, but those fishing the upper reaches in Josephine County have access to the railroad at Grants Pass and considerable quantities go from that point in the fresh state. The catch of the county consisted entirely of salmon, all of which were taken with gill nets and seines, the gill-net catch being 660,523 pounds, valued at $38,992, and the seine catch, 425,760 pounds, valued at $24,043. The Chetco River catch usually goes to a small cannery located in northern California, as this is more accessible than the plants in Oregon. The investment in the fisheries of Curry County during the year was $111,891. In addition to canned salmon this county produced a small quantity of mild-cured chinook.

*Multnomah County.*—This county, with a catch of 1,165,488 pounds, valued at $62,232, ranked fourth in the value of its fisheries and presents a variety of fish exceeded only by Clatsop and Lincoln Counties, although it is located a considerable distance up Columbia River. Several fishing vessels operated by a firm located in Portland added a number of species to the list, as cod, halibut, sablefish, and rockfish, all of which were taken by lines. The chief form of apparatus used by the fishermen of this county was the gill net, with a catch of 746,724 pounds, valued at $36,577, consisting mostly of chinook salmon. The catch of crawfish, amounting to 95,000 pounds, valued at $10,735, was the next in importance. These fishes were taken in small traps similar in construction to an eelpot. The wheel fisheries of this county have been quite important in past years, though the catch was rather light in 1915; the 18 wheels owned in the county, valued at $64,800, show a catch of only 161,411 pounds, valued at $7,543.

The investment during the year was $870,944; this is exceeded only by Clatsop County, and the large amount is invested chiefly in the buildings used in the wholesale fishery trade, the cannery located on the Willamette River in Portland, and three canneries on the Columbia River side of the county. The amount invested in fishing apparatus is comparatively small. This county has quite important seine fisheries on Columbia River, but the catch in the year under consideration was negligible. One of the canneries on the Columbia packed some shad and shad roe, and some salmon was mild cured, salted, and smoked in Portland.

*Tillamook County.*—Although this county has three bodies of water in which commercial fisheries are prosecuted, the catch during 1915 was sufficient to give it only fifth place in the value of its fishery products as compared with other counties. The catch amounted to 2,438,177 pounds, valued at $50,216, and was made up chiefly of chinook salmon, the bulk of which were taken in gill nets. The run of chum and silver salmon was also very good in this county. Tillamook Bay is the most productive body of water in the county, having a catch of 1,191,488 pounds, valued at $24,516; this catch consisted of salmon, soft clams, and crabs, the bulk of it being salmon. Two salmon canneries are located at Bay City and one at Tillamook; a small clam cannery has recently been established at the latter place and handles practically all the clams taken at this point. There is also a mild-curing establishment at Bay City. Nehalem River is the second in importance in the county; the catch was entirely salmon and amounted to 893,630 pounds, valued at $17,492. It is practically all handled at the two canneries on the river at Wheeler and Nehalem. One plant put up a small quantity of mild-cured chinook salmon. The remaining cannery of this county is located on Nestucca River, where the catch is wholly salmon and amounted to 353,059 pounds, valued at $8,207, in 1915. The fishing on this, as well as Nehalem River, is all done with gill nets. One of the plants on the Nestucca put up a very small lot of mild-cured chinook salmon.

Although Tillamook County has six salmon canneries and one clam cannery, the investment is comparatively small, because the buildings are inexpensive, the total investment for the year being $269,938.

*Wasco County.*—This county, though located a considerable distance up the Columbia River, occupies a prominent position among the fishing counties of the State. It ranked sixth in the value of its fisheries and supports quite an important salmon cannery. The catch amounted to 973,475 pounds, valued at $44,757, mostly salmon, with chinooks predominating. Of this catch 838,888 pounds, valued at $40,871, which is 86 per cent of the total quantity, were taken in fish wheels, 9 of which, valued at $43,000, were operated by the fishermen of this county. In addition to salmon, the wheels took a small quantity of sturgeon. The seine fishing of this county is comparatively light and the gill-net fishing is negligible.

As previously stated, commercial fishing on the Oregon side of Columbia River does not extend above Celilo Falls, which is located in this county. Some of the fish wheels are located here, and the catch is usually very good. A considerable number of salmon are caught by the Indians, who stand on the rocks at the falls and spear

the fish en route up the river for spawning. The Indians become very expert at this work, and many of them secure a sufficient supply of fish to last them through the winter. The fish are hung in the open and cured by the simple process of drying. The preservation of fish thus cured by the Indians is generally assured, and is said to be superior to any dried fish produced by the white man. The greater part of the salmon taken by the fishermen of this county were canned, and a small lot was mild-cured. The investment of the county for the year was $139,125, the value of the cannery and the value of the wheels making up the major portion of the amount.

*Clackamas County.*—This county, located on Willamette River, had a catch of 397,398 pounds, valued at $26,744, during the year 1915. Although it is located quite a distance inland and supports no canneries or wholesale fish houses, it ranked seventh among the fishery counties of the State, which is due to the very extensive run of salmon in Willamette River. The greater part of the salmon are taken with gill nets, but a considerable number are taken by trolling below the falls at Oregon City. This is a comparatively recent industry, having been established only about six years ago. It is said that hundreds of small rowboats may be seen some days during the season, a considerable number of them being sportsmen coming from Portland and other points along the river for a day's outing. The law permits them to take only three fish to a man during one day, and the fish are so numerous that it is very easy to secure this number. The trolling season is in the spring, beginning early in March and continuing until early May, when the gill-net season is on. The catch, however, is negligible prior to April, and the fish do not seem to "strike" well after the first week in May. Practically no fishing is done above the falls, although some fish go over the fishway located there. The line catch is all chinook salmon. Some few silver and steelhead are found in this river in the fall, but only a very small catch of the latter is reported for the year, these being taken in gill nets. The sportsmen sometimes catch a few steelhead by line fishing in the fall. The only other species taken in this county is the crawfish; some of these are taken in Tualatin River, a small stream tributary to the Willamette River. The investment of the county for the year was $10,456. About 50 per cent of the gill-net catch is taken to Columbia River canneries by run boats, and the remainder goes to the wholesale fish trade in Portland. A considerable part of the line catch also goes to Portland.

*Lincoln County.*—The commercial fisheries of this county are supported by three waters, Alsea Bay, Siletz River, and Yaquina Bay. The total catch amounted to 931,931 pounds, valued at $25,496, this value giving it eighth place among the fishing counties of the State. The Alsea Bay catch was 391,562 pounds, valued at $7,346. The great bulk of this was salmon, taken in gill nets, and practically all handled at the two canneries at Lutgens and Waldport, one of which also packed some of the crabs caught here. The Siletz River catch amounted to 310,454 pounds, valued at $9,994, and consisted wholly of salmon, the greater part of which was taken with gill nets and a small portion with seines. Practically all of this salmon is handled at the cannery located at Taft, near the mouth of the river. The fisheries of Yaquina Bay region present a greater variety than the

other sections of the county. The total for this region amounted to 169,560 pounds, valued at $6,071, and, in addition to salmon, included soft clams and crabs and small quantities of flounders, herring, perch, smelt, and oysters, this being the only place in the State where the last-named five species are taken commercially. The output of oysters, which were all native, market stock, was only 221 bushels, with a value of $725. Attempts have been made to cultivate the eastern oyster in this bay, but the results were rather discouraging. The fishermen of this region are fortunate in having good shipping facilities to Portland and other inland cities, and practically the entire catch is sent out by rail.

This is one of the three counties of the State maintaining fishing vessels, although only two of these were operated in 1915, their catch consisting of halibut and "lingcod." The investment of this county amounted to $141,553.

*Coos County.*—The fishery products of this county during 1915 amounted to 936,445 pounds, valued at $21,408; thus it ranked ninth in the value of the catch. The bulk of this was salmon taken by gill nets, the quantity being 684,439 pounds, valued at $14,519; 189,906 pounds of salmon, valued at $3,763, were taken by seines. The fisheries of the county are located on Coos Bay and Coquille River. One salmon cannery is located on the bay at Marshfield, and, in addition to the canning, it also prepared a small quantity of mild-cured salmon. Some soft clams and crabs are also taken in this region. Several small boats from Coos Bay were engaged in ocean fishing with trawl lines for halibut, rockfishes, "lingcod," and sea bass, but this fishery was not extensive. Only gill nets and seines are used on Coquille River, and the catch was wholly salmon, which were packed at the canneries located at Prosper and Bandon, one at each place. This region is without railroad service and is therefore handicapped in regard to shipping facilities, depending entirely on vessels. The investment of Coos County during the year was $116,227.

*Hood River County.*—This county is located quite a distance up Columbia River, between Multnomah and Wasco Counties, and owes its importance as a fishing center to the seine fishery located at Cascade Locks. It ranked tenth among the counties in the value of the fisheries for the year; the total catch amounted to 459,046 pounds, valued at $20,311, all salmon with the exception of 1,500 pounds of sturgeon, valued at $50. The seine catch amounted to 422,046 pounds, valued at $18,501, which was nearly 92 per cent of the total catch for the county. Some gill nets are fished in this county, but this apparatus is of minor importance. This county has no canneries or fish houses, and the salmon are sold to canneries located in other counties on the river. The investment of this county for the year was $5,070.

*Douglas County.*—This county, although the sixth largest in the State, has less than 20 miles of coast line, but the largest river in the State, with the exception of Columbia River, is located entirely within its confines. This river, the Umpqua, is formed by the junction of the north and south forks near Roseburg and is the only water in the county furnishing commercial fishing. The entire catch was salmon, taken in gill nets, and amounted to 669,663 pounds, valued

at $12,425. Two salmon canneries were operated on the Umpqua River in 1915, one at Gardiner and the other at Reedsport, and these handled practically all the salmon taken from the river; only a few tierces being mild cured. The investment during the year was $93,444.

*Washington County.*—This county ranked twelfth in the value of its fisheries in 1915. The total catch was 48,420 pounds, valued at $5,474, and consisted entirely of crawfish, all of which were taken in traps fished in Tualatin River, which is a branch of the Willamette River. The traps are very similar to an eelpot; they are made of cotton twine, about 1½-inch mesh, covering a small, round iron frame. The demand for crawfish is said to have decreased considerably since the prohibition law went into effect, as most of them were handled by the saloon trade. The season is from March 1 to November 1, and the best catches are made during June and again in September and October. The crawfish buries itself in the mud during the winter. The investment in this county was only $640, the least, with one exception, in the State.

*Josephine County.*—This is the only county in the State not bordering on the productive waters of Columbia River or on the coast that supports commercial fisheries. It owes its place among the fishing counties to the fact that Rogue River passes entirely through it before entering Curry County. The fishing extends up as far as Grants Pass, near the eastern border of Josephine County, and a considerable part of the catch of the county is shipped by rail from that point in the fresh state. The catch was all salmon, amounted to 90,178 pounds, valued at $5,412, and was all taken in gill nets. The investment was all in gill nets and boats and amounted to $3,278.

*Lane County.*—This county has considerable area, but, like Douglas County, has a very short coast line, and the catch of fish is comparatively small. It was all taken from Siuslaw River and amounted to 117,526 pounds, valued at $2,530. The only form of apparatus used was gill nets. One cannery, located at Florence on the Siuslaw, handles practically all the salmon. The investment of $48,590 was mostly in the cannery building.

*Yamhill County.*—The output of this county was the least of all the fishing counties of the State. The product consisted entirely of crawfish, amounting to 5,300 pounds, valued at $588. All were taken from Yamhill River, tributary to the Willamette, in traps similar to those noted under Washington County. The investment for the county was only $256.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES.

| | Clackamas. | | Clatsop. | | Columbia. | | Coos. | |
|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | | | 3 | | | | | |
| On vessels transporting | | | 34 | | 2 | | 4 | |
| In shore fisheries | 120 | | 2,393 | | 271 | | 288 | |
| On shore, in canneries, etc. | | | 680 | | 20 | | 86 | |
| Total | 120 | | 3,110 | | 293 | | 378 | |
| INVESTMENT. | | | | | | | | |
| Vessels fishing | | | 1 | $5,000 | | | | |
| Tonnage | | | 18 | | | | | |
| Outfit | | | | 300 | | | | |
| Vessels transporting | | | 17 | 51,300 | 1 | $4,000 | 2 | $6,500 |
| Tonnage | | | 152 | | 10 | | 21 | |
| Outfit | | | | 7,600 | | 300 | | 400 |
| Boats: | | | | | | | | |
| Gasoline | | | 843 | 396,900 | 221 | 77,700 | 53 | 11,100 |
| Sail, row, etc. | 104 | $3,600 | 220 | 22,695 | 74 | 18,705 | 119 | 2,875 |
| Apparatus, vessel fisheries: | | | | | | | | |
| Lines | | | | 90 | | | | |
| Apparatus, shore fisheries: | | | | | | | | |
| Seines | | | 43 | 23,500 | 5 | 1,150 | 8 | 3,025 |
| Length in yards | | | 21,430 | | 1,100 | | 2,460 | |
| Gill nets | 210 | 5,950 | 1,605 | 389,325 | 238 | 55,600 | 195 | 13,110 |
| Length in yards | 13,900 | | 750,490 | | 86,020 | | 25,000 | |
| Pound nets | | | 28 | 19,600 | 8 | 2,300 | | |
| Hoop nets | | | 620 | 905 | | | 60 | 90 |
| Pots and traps | 240 | 156 | 8 | 160 | 780 | 507 | | |
| Lines | | 250 | | 1,000 | | | | 120 |
| Tongs, hoes, etc. | | | | 320 | | | | 12 |
| Shore and accessory property | | 500 | | 1,020,082 | | 7,900 | | 56,495 |
| Cash capital | | | | 137,800 | | 8,000 | | 22,500 |
| Total | | 10,456 | | 2,076,577 | | 176,162 | | 116,227 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | 50,000 | $750 | | |
| Halibut | | | 98,000 | $2,940 | | | 10,000 | $1,000 |
| Herring | | | 2,000 | 120 | | | | |
| "Lingcod" | | | 6,000 | 75 | | | 5,000 | 250 |
| Rockfishes | | | 5,000 | 125 | | | 6,000 | 300 |
| Salmon: | | | | | | | | |
| Blueback | | | 150,447 | 7,522 | 7,577 | 378 | | |
| Chinook | 390,420 | $26,125 | 16,167,867 | 880,585 | 2,073,921 | 102,727 | 354,075 | 9,140 |
| Chum | | | 1,150,965 | 6,832 | 306,279 | 1,604 | | |
| Silver | | | 2,391,953 | 47,811 | 67,485 | 1,355 | 511,496 | 8,681 |
| Sea bass | | | | | | | 2,000 | 60 |
| Shad | | | 446,093 | 4,512 | 32,385 | 331 | | |
| Steelhead trout | 1,978 | 59 | 1,858,510 | 59,507 | 136,007 | 3,979 | 23,534 | 934 |
| Sturgeon | | | 75,289 | 3,698 | 7,915 | 397 | | |
| Tomcod | | | 22,500 | 900 | | | | |
| Clams: | | | | | | | | |
| Soft | | | | | | | 5,140 | 643 |
| Razor | | | 77,200 | 10,900 | | | | |
| Crabs | | | 224,900 | 8,430 | | | 19,200 | 400 |
| Crawfish | 5,000 | 560 | | | 30,000 | 8,390 | | |
| Total | 397,398 | 26,744 | 22,676,724 | 1,039,955 | 2,711,569 | 114,911 | 936,445 | 21,408 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES—Continued.

| | Curry. | | Douglas. | | Hood River. | | Josephine. | |
|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels transporting | | | 2 | | | | | |
| In shore fisheries | 163 | | 159 | | 31 | | 22 | |
| On shore, in canneries, etc. | 62 | | 52 | | 2 | | | |
| Total | 225 | | 213 | | 33 | | 22 | |
| INVESTMENT. | | | | | | | | |
| Vessels transporting | | | 1 | $2,000 | | | | |
| Tonnage | | | 7 | | | | | |
| Outfit | | | | 400 | | | | |
| Boats: | | | | | | | | |
| Gasoline | 5 | $1,700 | 36 | 9,300 | 4 | $1,500 | | |
| Sail, row, etc. | 82 | 2,557 | 75 | 1,875 | 14 | 1,420 | 22 | $638 |
| Apparatus, shore fisheries: | | | | | | | | |
| Seines | 6 | 2,900 | | | 2 | 600 | | |
| Length in yards | 2,100 | | | | 1,000 | | | |
| Gill nets | 159 | 8,680 | 276 | 13,070 | 23 | 1,550 | 22 | 2,640 |
| Length in yards | 15,310 | | 28,140 | | 2,720 | | 5,500 | |
| Shore and accessory property | | 68,054 | | 51,799 | | | | |
| Cash capital | | 28,000 | | 15,000 | | | | |
| Total | | 111,891 | | 93,444 | | 5,070 | | 3,278 |
| PRODUCTS. | | | | | | | | |
| Salmon: | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Blueback | | | | | 6,760 | $338 | | |
| Chinook | 1,021,839 | $61,422 | 112,923 | $2,265 | 324,780 | $16,279 | 90,178 | $5,412 |
| Chum | | | 5,130 | 40 | | | | |
| Silver | 64,144 | 1,603 | 548,610 | 10,000 | 13,614 | 273 | | |
| Steelhead trout | 300 | 10 | 3,000 | 120 | 112,392 | 3,371 | | |
| Sturgeon | | | | | 1,500 | 50 | | |
| Total | 1,086,283 | 63,035 | 669,663 | 12,425 | 459,046 | 20,311 | 90,178 | 5,412 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES—Continued.

| | Lane. | | Lincoln. | | Multnomah. | | Tillamook. | |
|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | | | 5 | | 15 | | | |
| On vessels transporting | 2 | | | | 16 | | | |
| In shore fisheries | 107 | | 342 | | 154 | | 339 | |
| On shore, in canneries, etc. | 24 | | 73 | | 168 | | 128 | |
| Total | 133 | | 420 | | 353 | | 467 | |
| INVESTMENT. | | | | | | | | |
| Vessels fishing | | | 2 | $3,200 | 2 | $14,450 | | |
| Tonnage | | | 22 | | 34 | | | |
| Outfit | | | | 485 | | 2,500 | | |
| Vessels transporting | 1 | $2,000 | | | 8 | 18,384 | | |
| Tonnage | 12 | | | | 65 | | | |
| Outfit | | 200 | | | | 2,950 | | |
| Boats: | | | | | | | | |
| Gasoline | 16 | 2,400 | 10 | 4,935 | 110 | 42,750 | 81 | $31,900 |
| Sail, row, etc. | 33 | 990 | 242 | 6,630 | 43 | 1,235 | 204 | 5,395 |
| Apparatus, vessel fisheries: | | | | | | | | |
| Lines | | | | 255 | | 660 | | |
| Apparatus, shore fisheries: | | | | | | | | |
| Seines | | | 4 | 550 | 2 | 1,500 | 2 | 1,000 |
| Length in yards | | | 640 | | 500 | | 360 | |
| Gill nets | 142 | 5,500 | 318 | 23,240 | 138 | 32,600 | 542 | 31,090 |
| Length in yards | 11,000 | | 47,530 | | 48,320 | | 59,640 | |
| Pound nets | | | | | 1 | 200 | | |
| Pots and traps | | | 1,800 | 1,800 | 1,860 | 1,209 | 240 | 450 |
| Wheels | | | | | 18 | 64,800 | | |
| Lines | | | | 68 | | | | |
| Tongs, hoes, etc. | | | | 180 | | | | 27 |
| Shore and accessory property | | 27,500 | | 62,710 | | 569,397 | | 149,076 |
| Cash capital | | 10,000 | | 37,500 | | 118,309 | | 51,000 |
| Total | | 48,590 | | 141,553 | | 870,944 | | 269,938 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Cod | | | | | 14,400 | $288 | | |
| Flounders | | | 1,965 | $40 | | | | |
| Halibut | | | 58,485 | $2,056 | 68,684 | 3,434 | | |
| Herring | | | 10,500 | 263 | | | | |
| "Lingcod" | | | 1,870 | 20 | | | | |
| Perch | | | 11,930 | 360 | | | | |
| Rockfishes | | | | | 1,000 | 20 | | |
| Sablefish | | | | | 15,520 | 388 | | |
| Salmon: | | | | | | | | |
| Blueback | | | | | 105,443 | 5,270 | | |
| Chinook | 33,180 | $829 | 418,007 | 13,922 | 764,834 | 38,826 | 1,012,848 | $25,247 |
| Chum | | | 52,945 | 268 | | | 466,560 | 2,337 |
| Silver | 83,306 | 1,670 | 250,050 | 4,197 | 3,702 | 78 | 844,414 | 16,891 |
| Shad | | | | | 10,147 | 102 | | |
| Smelt | | | 3,500 | 175 | | | | |
| Steelhead trout | 1,040 | 31 | 1,200 | 48 | 77,442 | 2,558 | 45,795 | 1,831 |
| Sturgeon | | | | | 9,220 | 533 | | |
| Clams: Soft | | | 760 | 113 | | | 16,560 | 2,285 |
| Oysters, native, market | | | 1,547 | 725 | | | | |
| Crabs | | | 119,172 | 3,300 | | | 52,000 | 1,625 |
| Crawfish | | | | | 95,000 | 10,735 | | |
| Total | 117,526 | 2,530 | 931,931 | 25,496 | 1,165,488 | 62,232 | 2,438,177 | 50,216 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES—Continued.

| | Wasco. | | Washington | | Yamhill | | Total. | |
|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | | | | | | | 23 | |
| On vessels transporting | | | | | | | 60 | |
| In shore fisheries | 69 | | 10 | | 4 | | 4,472 | |
| On shore, in canneries, etc. | 50 | | | | | | 1,345 | |
| Total | 119 | | 10 | | 4 | | 5,900 | |
| INVESTMENT. | | | | | | | | |
| Vessels fishing | | | | | | | 5 | $22,650 |
| Tonnage | | | | | | | 74 | |
| Outfit | | | | | | | | 3,285 |
| Vessels transporting | | | | | | | 30 | 84,184 |
| Tonnage | | | | | | | 267 | |
| Outfit | | | | | | | | 11,850 |
| Boats: | | | | | | | | |
| Gasoline | 3 | $2,300 | | | | | 1,382 | 582,485 |
| Sail, row, etc. | 18 | 840 | 10 | $250 | 4 | $100 | 1,264 | 69,805 |
| Apparatus, vessel fisheries: | | | | | | | | |
| Lines | | | | | | | | 1,005 |
| Apparatus, shore fisheries: | | | | | | | | |
| Seines | 3 | 900 | | | | | 75 | 35,125 |
| Length in yards | 1,500 | | | | | | 31,000 | |
| Gill nets | 9 | 385 | | | | | 3,877 | 582,740 |
| Length in yards | 720 | | | | | | 1,094,200 | |
| Pound nets | 2 | 600 | | | | | 39 | 22,700 |
| Hoop nets | | | | | | | 680 | 995 |
| Pots and traps | | | 600 | 390 | 240 | 156 | 5,768 | 4,828 |
| Wheels | 9 | 43,000 | | | | | 27 | 107,800 |
| Lines | | | | | | | | 1,438 |
| Tongs, hoes, etc. | | | | | | | | 539 |
| Shore and accessory property | | 70,400 | | | | | | 2,083,913 |
| Cash capital | | 20,700 | | | | | | 448,809 |
| Total | | 139,125 | | 640 | | 256 | | 4,064,151 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | | | 50,000 | $750 |
| Cod | | | | | | | 14,400 | 288 |
| Flounders | | | | | | | 1,965 | 40 |
| Halibut | | | | | | | 235,169 | 9,430 |
| Herring | | | | | | | 12,500 | 383 |
| "Lingcod" | | | | | | | 12,870 | 354 |
| Perch | | | | | | | 11,930 | 360 |
| Rockfishes | | | | | | | 12,000 | 445 |
| Sablefish | | | | | | | 15,520 | 388 |
| Salmon: | | | | | | | | |
| Blueback | 66,800 | $3,340 | | | | | 337,027 | 16,848 |
| Chinook | 732,180 | 36,614 | | | | | 23,497,052 | 1,225,393 |
| Chum | | | | | | | 1,981,879 | 11,081 |
| Silver | 65,980 | 1,581 | | | | | 4,844,844 | 94,140 |
| Sea bass | | | | | | | 2,000 | 60 |
| Shad | | | | | | | 488,625 | 4,945 |
| Smelt | | | | | | | 3,500 | 175 |
| Steelhead trout | 104,660 | 2,884 | | | | | 2,365,858 | 75,332 |
| Sturgeon | 3,855 | 338 | | | | | 97,785 | 5,014 |
| Tomcod | | | | | | | 22,500 | 900 |
| Clams: | | | | | | | | |
| Soft | | | | | | | 22,460 | 3,041 |
| Razor | | | | | | | 77,200 | 10,900 |
| Oysters, native, market | | | | | | | 1,547 | 725 |
| Crabs | | | | | | | 415,272 | 13,755 |
| Crawfish | | | 48,420 | $5,474 | 5,300 | $588 | 183,720 | 20,747 |
| Total | 973,475 | 44,757 | 48,420 | 5,474 | 5,300 | 588 | 34,707,623 | 1,495,494 |

## PRODUCTS BY APPARATUS.

In the vessel fisheries of Oregon the catch was all taken with lines, and amounted to 262,959 pounds, valued at $9,055. In the shore or boat fisheries gill nets were the most productive forms of apparatus, the catch amounting to 23,256,052 pounds, valued at $918,946. The catch with seines was 7,500,793 pounds, valued at $363,280. Pounds nets took 1,263,561 pounds, valued at $45,198; lines, 686,500 pounds, valued at $44,060; wheels, 1,000,299 pounds, valued at $48,414; tongs, hoes, etc., 101,207 pounds, valued at $14,666; pots and traps, 377,392 pounds, valued at $26,572; and hoop nets, 244,100 pounds, valued at $8,830.

The following tables give statistics by apparatus of the quantity and value of fishery products taken in the fisheries of Oregon in 1915:

YIELD OF THE VESSEL FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

| Apparatus and species. | Clatsop. | | Lincoln. | | Multnomah. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| Lines: | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Cod | | | | | 14,400 | $288 | 14,400 | $288 |
| Halibut | 98,000 | $2,940 | 52,485 | $1,756 | 68,684 | 3,434 | 219,169 | 8,130 |
| "Lingcod" | 6,000 | 75 | 1,870 | 29 | | | 7,870 | 104 |
| Rockfishes | 5,000 | 125 | | | 1,000 | 20 | 6,000 | 145 |
| Sablefish | | | | | 15,520 | 388 | 15,520 | 388 |
| Total | 109,000 | 3,140 | 54,355 | 1,785 | 99,604 | 4,130 | 262,959 | 9,055 |

STATISTICS OF YIELD IN THE SHORE FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

BY SEINES.

| Species. | Clatsop. | | Columbia. | | Coos. | | Curry. | | Hood River. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | 50,000 | $750 | | | | | | |
| Herring | 2,000 | $120 | | | | | | | | |
| Salmon: | | | | | | | | | | |
| Blueback | 109,645 | 5,483 | | | | | | | 2,760 | $138 |
| Chinook | 4,609,415 | 264,150 | 98,460 | 4,923 | 60,358 | $1,797 | 382,820 | $22,968 | 295,780 | 14,789 |
| Chum | 133,573 | 672 | | | | | | | | |
| Silver | 64,810 | 1,264 | 11,436 | 230 | 129,548 | 1,966 | 42,640 | 1,065 | 13,614 | 273 |
| Shad | 227,069 | 2,277 | | | | | | | | |
| Steelhead trout | 875,531 | 28,695 | | | | | 300 | 10 | 108,392 | 3,251 |
| Sturgeon | 2,245 | 103 | | | | | | | 1,500 | 50 |
| Total | 6,024,288 | 302,764 | 159,896 | 5,903 | 189,906 | 3,763 | 425,760 | 24,043 | 422,046 | 18,501 |

| Species. | Lincoln. | | Multnomah. | | Tillamook. | | Wasco. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | | | | | 50,000 | $750 |
| Herring | | | | | | | | | 2,000 | 120 |
| Perch | 11,930 | $360 | | | | | | | 11,930 | 360 |
| Salmon: | | | | | | | | | | |
| Blueback | | | 4,828 | $241 | | | | | 117,233 | 5,862 |
| Chinook | 5,200 | 104 | 33,461 | 2,195 | 79,340 | $1,973 | | | 5,564,834 | 312,899 |
| Chum | | | | | 5,580 | 30 | | | 139,153 | 702 |
| Silver | 1,100 | 22 | | | 26,829 | 540 | 50,000 | $1,250 | 339,977 | 6,610 |
| Shad | | | 5,584 | 56 | | | | | 232,653 | 2,333 |
| Steelhead trout | | | 778 | 23 | | | 50,000 | 1,250 | 1,035,001 | 33,229 |
| Sturgeon | | | 3,442 | 172 | | | 825 | 90 | 8,012 | 415 |
| Total | 18,230 | 486 | 48,093 | 2,687 | 111,749 | 2,543 | 100,825 | 2,590 | 7,500,793 | 363,280 |

STATISTICS OF YIELD IN THE SHORE FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS.

| Species. | Clackamas. | | Clatsop. | | Columbia. | | Coos. | | Curry. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value* | *Pounds.* | *Value.* |
| Salmon: | | | | | | | | | | |
| Blueback | | | 39,117 | $1,954 | 7,577 | $378 | | | | |
| Chinook | 322,920 | $19,375 | 10,387,488 | 558,001 | 1,835,441 | 76,154 | 278,957 | $6,974 | 639,019 | $38,454 |
| Chum | | | 865,922 | 5,028 | 265,304 | 1,336 | | | | |
| Silver | | | 2,237,709 | 44,731 | 40,061 | 805 | 381,948 | 6,712 | 21,504 | 538 |
| Shad | | | 158,805 | 1,627 | 32,385 | 331 | | | | |
| Steelhead trout | 1,978 | 59 | 845,274 | 26,119 | 129,299 | 3,778 | 23,534 | 833 | | |
| Sturgeon | | | 72,869 | 3,581 | 7,915 | 397 | | | | |
| Total | 324,898 | 19,434 | 14,607,184 | 641,041 | 2,317,982 | 83,179 | 684,439 | 14,519 | 660,523 | 38,992 |

| Species. | Douglas. | | Hood River. | | Josephine. | | Lane. | | Lincoln. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Flounders | | | | | | | | | 1,965 | $40 |
| Herring | | | | | | | | | 10,500 | 263 |
| Salmon: | | | | | | | | | | |
| Blueback | | | 4,000 | $200 | | | | | | |
| Chinook | 112,923 | $2,265 | 29,000 | 1,490 | 90,178 | $5,412 | 83,180 | $829 | 412,807 | 13,818 |
| Chum | 5,130 | 40 | | | | | | | 52,945 | 268 |
| Silver | 548,610 | 10,000 | | | | | 83,306 | 1,670 | 248,950 | 4,175 |
| Smelt | | | | | | | | | 3,500 | 175 |
| Steelhead trout | 3,000 | 120 | 4,000 | 120 | | | 1,040 | 31 | 1,200 | 48 |
| Total | 669,663 | 12,425 | 37,000 | 1,810 | 90,178 | 5,412 | 117,526 | 2,530 | 731,867 | 18,787 |

| Species. | Multnomah. | | Tillamook. | | Wasco. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Flounders | | | | | | | 1,965 | $40 |
| Herring | | | | | | | 10,500 | 263 |
| Salmon: | | | | | | | | |
| Blueback | 36,784 | $1,837 | | | 800 | $40 | 88,278 | 4,409 |
| Chinook | 665,800 | 33,250 | 933,508 | $23,274 | 4,600 | 235 | 15,745,821 | 779,531 |
| Chum | | | 460,980 | 2,307 | | | 1,650,281 | 8,979 |
| Silver | | | 817,585 | 16,351 | 1,600 | 43 | 4,381,273 | 85,025 |
| Shad | 3,500 | 35 | | | | | 194,690 | 1,993 |
| Smelt | | | | | | | 3,500 | 175 |
| Steelhead trout | 37,340 | 1,280 | 45,795 | 1,831 | 1,500 | 40 | 1,093,960 | 34,259 |
| Sturgeon | 3,300 | 175 | | | 1,700 | 119 | 85,784 | 4,272 |
| Total | 746,724 | 36,577 | 2,257,868 | 43,763 | 10,200 | 477 | 23,256,052 | 918,946 |

BY POUND NETS.

| Species. | Clatsop. | | Columbia. | | Multnomah. | | Wasco. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Salmon: | | | | | | | | | 1,085 | $85 |
| Blueback | 1,085 | $85 | | | | | | | | |
| Chinook | 580,964 | 29,034 | 140,020 | $5,650 | 7,300 | $365 | 8,320 | $416 | 736,604 | 35,465 |
| Chum | 151,470 | 1,132 | 40,975 | 268 | | | | | 192,445 | 1,400 |
| Silver | 89,434 | 1,816 | 15,988 | 320 | 2,892 | 60 | 7,132 | 143 | 115,446 | 2,339 |
| Shad | 60,219 | 608 | | | | | | | 60,219 | 608 |
| Steelhead trout | 137,705 | 4,093 | 6,708 | 201 | 4,464 | 135 | 7,680 | 230 | 156,557 | 5,259 |
| Sturgeon | 175 | 12 | | | | | 430 | 30 | 605 | 42 |
| Total | 1,021,652 | 37,380 | 203,691 | 6,439 | 14,656 | 560 | 23,562 | 819 | 1,263,561 | 45,198 |

BY HOOP NETS.

| Species. | Clatsop. | | Coos. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | 224,900 | $8,430 | 19,200 | $400 | 244,100 | $8,830 |

STATISTICS OF YIELD IN THE SHORE FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY POTS AND TRAPS.

| Species. | Clackamas. | | Clatsop. | | Columbia. | | Lincoln. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | | | | | | | 119,172 | $3,300 |
| Crawfish | 5,000 | $560 | | | 30,000 | $3,390 | | |
| Tomcod | | | 22,500 | $900 | | | | |
| Total | 5,000 | 560 | 22,500 | 900 | 30,000 | 3,390 | 119,172 | 3,300 |

| Species. | Multnomah. | | Tillamook. | | Washington. | | Yamhill. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | | | 52,000 | $1,625 | | | | | 171,172 | $4,925 |
| Crawfish | 95,000 | $10,735 | | | 48,420 | $5,474 | 5,300 | $588 | 183,720 | 20,747 |
| Tomcod | | | | | | | | | 22,500 | 900 |
| Total | 95,000 | 10,735 | 52,000 | 1,625 | 48,420 | 5,474 | 5,300 | 588 | 377,392 | 26,572 |

BY WHEELS.

| Species. | Multnomah. | | Wasco. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Salmon: | | | | | | |
| Blueback | 63,831 | $3,192 | 66,000 | $3,300 | 129,831 | $6,492 |
| Chinook | 58,273 | 3,016 | 719,260 | 35,963 | 777,533 | 38,979 |
| Silver | 900 | 18 | 7,248 | 145 | 8,148 | 163 |
| Shad | 1,063 | 11 | | | 1,063 | 11 |
| Steelhead trout | 34,860 | 1,120 | 45,480 | 1,364 | 80,340 | 2,484 |
| Sturgeon | 2,484 | 186 | 900 | 99 | 3,384 | 285 |
| Total | 161,411 | 7,543 | 838,888 | 40,871 | 1,000,299 | 48,414 |

BY LINES.

| Species. | Clackamas. | | Clatsop. | | Coos. | | Lincoln. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Halibut | | | | | 10,000 | $1,000 | 6,000 | $300 | 16,000 | $1,300 |
| "Lingcod" | | | | | 5,000 | 250 | | | 5,000 | 250 |
| Rockfishes | | | | | 6,000 | 300 | | | 6,000 | 300 |
| Salmon: Chinook | 67,500 | $6,750 | 590,000 | $35,400 | | | | | 657,500 | 42,150 |
| Sea bass | | | | | 2,000 | 60 | | | 2,000 | 60 |
| Total | 67,500 | 6,750 | 590,000 | 35,400 | 23,000 | 1,610 | 6,000 | 300 | 686,500 | 44,060 |

BY TONGS, HOES, ETC.

| Species. | Clatsop. | | Coos. | | Lincoln. | | Tillamook. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Clams: | | | | | | | | | | |
| Razor | 77,200 | $10,900 | | | | | | | 77,200 | $10,900 |
| Soft | | | 5,140 | $643 | 760 | $113 | 16,560 | $2,285 | 22,460 | 3,041 |
| Oysters, native, market | | | | | 1,547 | 725 | | | 1,547 | 725 |
| Total | 77,200 | 10,900 | 5,140 | 643 | 2,307 | 838 | 16,560 | 2,285 | 101,207 | 14,666 |

## FISHERY INDUSTRIES.

For statistics of the quantity and value of fishery products prepared in Oregon in 1915, exclusive of canning, see table, page 54. The following table contains statistics of the extent of the canning industry of the State, by districts, in 1915:

EXTENT OF THE CANNING INDUSTRY OF OREGON IN 1915, BY DISTRICTS.

| Items | Columbia River. | | Pacific coast. | | Total. | |
|---|---|---|---|---|---|---|
| | Number. | Value. | Number. | Value. | Number. | Value. |
| Establishments | 10 | $772,235 | 24 | $336,131 | 34 | $1,108,366 |
| Cash capital | ..... | 180,309 | ..... | 175,300 | ..... | 355,609 |
| Persons engaged | 561 | ..... | 467 | ..... | 1,028 | ..... |
| Wages paid | ..... | 283,609 | ..... | 91,830 | ..... | 375,439 |
| PRODUCTS.[a] | | | | | | |
| Salmon: | | | | | | |
| Blueback— | | | | | | |
| 1 pound, flat.....cases.. | 11 | 88 | ..... | ..... | 11 | 88 |
| ½ pound, flat.....do.... | 4,499 | 24,827 | ..... | ..... | 4,499 | 24,827 |
| Chinook— | | | | | | |
| 1 pound, tall.....do.... | 23,828 | 155,185 | 9,908 | 47,654 | 33,736 | 202,839 |
| 1 pound, flat.....do.... | 103,108 | 801,122 | 18,749 | 139,289 | 121,857 | 940,411 |
| 1 pound, oval.....do.... | 2,388 | 21,496 | ..... | ..... | 2,388 | 21,496 |
| ½ pound, flat.....do.... | 125,296 | 1,024,727 | 7,959 | 52,514 | 133,255 | 1,077,241 |
| ¼ pound, flat.....do.... | 1,529 | 4,578 | ..... | ..... | 1,529 | 4,578 |
| Chum— | | | | | | |
| 1 pound, tall.....do.... | 25,158 | 66,122 | 8,991 | 23,170 | 34,149 | 89,292 |
| 1 pound, flat.....do.... | 2,291 | 6,558 | ..... | ..... | 2,291 | 6,558 |
| ½ pound, flat.....do.... | 4,288 | 8,848 | ..... | ..... | 4,288 | 8,848 |
| Silver— | | | | | | |
| 1 pound, tall.....do.... | 11,332 | 78,530 | 23,170 | 101,229 | 34,502 | 179,759 |
| 1 pound, flat.....do.... | 2,093 | 14,160 | 3,949 | 18,059 | 6,042 | 32,219 |
| ½ pound, flat.....do.... | 8,652 | 27,490 | 4,209 | 18,570 | 12,861 | 46,060 |
| Steelhead— | | | | | | |
| 1 pound, tall.....do.... | 3,955 | 20,791 | ..... | ..... | 3,955 | 20,791 |
| 1 pound, flat.....do.... | 8,710 | 56,682 | ..... | ..... | 8,710 | 56,682 |
| ½ pound, flat.....do.... | 6,118 | 35,127 | ..... | ..... | 6,118 | 35,127 |
| Shad: | | | | | | |
| 1 pound, tall.....do.... | 1,281 | 3,184 | ..... | ..... | 1,281 | 3,184 |
| ½ pound, flat.....do.... | 1,145 | 3,435 | ..... | ..... | 1,145 | 3,435 |
| Shad roe: | | | | | | |
| ½ pound, flat.....do.... | 171 | 1,702 | ..... | ..... | 171 | 1,702 |
| ½ pound, oval.....do.... | 93 | 1,153 | ..... | ..... | 93 | 1,153 |
| Clams: | | | | | | |
| No. 1, whole.....do.... | ..... | ..... | 400 | 1,760 | 400 | 1,760 |
| No. 1, minced.....do.... | ..... | ..... | 4,574 | 20,145 | 4,574 | 20,145 |
| No. 2, minced.....do.... | ..... | ..... | 1,320 | 5,134 | 1,320 | 5,134 |
| Halves, minced.....do.... | ..... | ..... | 3,248 | 12,660 | 3,248 | 12,660 |
| Clam juice: No. 1.....do.... | ..... | ..... | 225 | 810 | 225 | 810 |
| Crabs: ½ pound, flat.....do.... | ..... | ..... | 252 | 3,169 | 252 | 3,169 |

[a] All products except clams and clam juice, which have no uniform weight, represent 48 pounds to the case.

## FISHERIES OF CALIFORNIA.

California in 1915 ranked second among the Pacific Coast States in the number of persons engaged, in the value of its investment, and in the amount and value of its fishery products. There were 4,282 persons engaged in the shore fisheries, 551 in the vessel fisheries, 35 in vessels transporting, and 3,584 persons engaged on shore in canneries, etc., making a total of 8,452 persons connected with the fisheries, as compared with 5,530 in 1904. The increase can be traced mainly to the shore industries.

The total investment in the fisheries of the State amounted to $5,824,263, showing an increase of nearly 55 per cent since 1904. The items making up this total are 73 fishing vessels valued, with

their outfit, at $354,375; 20 transporting vessels with a value, including their outfit, of $72,000; 1,429 gasoline boats valued at $1,351,110; 1,169 other boats valued at $104,816; apparatus, in the shore and vessel fisheries, valued at $606,944; shore and accessory property with a value of $2,731,390 and working cash capital amounting to $448,809.

The products of the fisheries of California in 1915 aggregated 93,338,703 pounds, with a value to the fishermen of $2,506,702. This is an increase of about 44 per cent in quantity, but a decrease of about three-fifths of 1 per cent in value as compared with 1904. Among the items in the products of special importance may be mentioned 7,303,933 pounds of chinook salmon, valued at $340,949; 21,024,190 pounds of albacore, or tuna, valued at $316,103; 6,923,563 pounds of flounders, valued at $209,766; 375,774 pounds, or 53,682 bushels, of eastern oysters, valued at $165,573; 4,952,692 pounds of salted cod, valued at $161,695; 1,784,488 pounds of striped bass, valued at $146,928; 4,344,254 pounds of rockfishes, valued at $146,216; 892,392 pounds of spiny lobsters, valued at $130,119; 1,414,155 pounds of crabs, valued at $128,434; 3,592,646 pounds of barracuda, valued at $124,870, and 5,761,929 pounds of sole, valued at $108,254.

For statistics as to number of persons engaged, investment, and products of the fisheries of California in 1915, see table, page 51.

### FISHERIES BY COUNTIES.

*San Francisco County.*—The fisheries of San Francisco County in 1915 were more valuable than those of any other county in the State, the output amounting to 17,602,489 pounds, valued at $649,864. Among the leading species were codfish, eastern oysters, crabs, sole, rockfishes, flounders, striped bass, and chinook salmon. The codfish, amounting to 4,952,692 pounds, valued at $161,695, were taken by three vessels owned in San Francisco and fishing in Alaskan waters. Practically all of the fishermen of this county live within the corporate limits of San Francisco. In 1915, 552 men were engaged in the shore fisheries and 116 on vessels of 5 net tons and over. A majority of the fishermen, as well as wholesale dealers, are Italians. There were 290 gas boats, valued at $259,710; 35 rowboats, valued at $705; 68 house boats and scows, valued at $7,600; and 2 sailboats, valued at $500, employed in the fisheries of this county. Practically all of these boats were docked at Fishermens Wharf, San Francisco, the headquarters of the several fishery unions to which the owners of the boats belonged.

The fishing from San Francisco is prosecuted both in the ocean and in San Francisco Bay. The trawl-line fishing for rockfishes and other species and the hoop-net fishing for crabs are followed entirely in the ocean, while the gill nets are fished both in the ocean and San Francisco Bay, and occasionally fishermen go as far as Suisun Bay. The leading species taken with this apparatus are sea bass, smelt, shad, chinook salmon, herring and carp. Seines are also fished in San Francisco Bay for white bait, anchovies, and sardines. Among other forms of apparatus used are lampara nets and bag nets, the catch consisting mainly of squid and shrimp. The shrimp are taken mainly by Chinese fishermen.

San Francisco is the headquarters of an important oyster fishery prosecuted in San Francisco Bay. This industry, however, has suffered a noticeable decline within recent years. In 1904, the output amounted to 138,667 bushels of eastern oysters, valued at $514,399, and 42,932 bushels of native oysters, valued at $91,770. In 1915 the output had dwindled to 51,556 bushels of eastern oysters, valued at $156,745. No native oysters have been taken from San Francisco Bay for several years, the result being that most of those now consumed have to be brought from Washington, the price being very much greater than formerly, when there was a local supply.

A small quantity of soft clams are taken from the flats of San Francisco Bay near San Francisco by fishermen from that city. In 1915 the output was 2,300 bushels, with a value of $5,300, a decline of 914 bushels since 1904, but an increase in value of $1,550. The clams are handled mostly by Chinese dealers, and many of the fishermen are also Chinese.

Mussels to the amount of 600 bushels, with a value of $1,200, were scraped from the pilings of the city wharves and disposed of for food.

*Contra Costa County.*—The fishery products of this county in 1915 amounted to 7,395,328 pounds, valued at $229,550. The most important species were chinook salmon, striped bass, and shad. A few other species were taken in small quantities. Most of the fishing was done in Suisun and San Pablo Bays and the Sacramento River. A little fishing was also done in San Francisco Bay and San Joaquin River. With the exception of a few seines used mainly for carp and smelt, gill nets are the only apparatus used in this county. Pittsburg is the most important fishing center, not only in this county, but on the entire Sacramento River. In 1915 a total of 305 fishermen and 5 shoremen were engaged in this town, almost all of whom were Italians. These men employed 100 sailboats, valued at $13,000; 51 gas boats, valued at $29,000; and 8 house boats, worth $1,600. Gill nets were the only form of apparatus used. This town in 1915 was the center of an important canning trade in shad, shad roe, and chinook salmon. In addition, immense quantities of shad were salted and mild cured, and large supplies of chinook salmon were mild cured and pickled. Most of the salted shad were sent to China. During this year the first shipments east of shad in large quantities were begun. They were sent by express in refrigerator cars. The consignments were made in carload lots, and were sent mostly to Chicago and New York. The first large shipments of shad to the east were made in 1914.

One-half or more of the fishermen of this town yearly make a practice of going to Alaska to fish under contract for one of the salmon-canning firms of that territory. They usually leave Pittsburg between April 1 and 15 and remain away about five months. The trip is made on one of the companies' steamers from San Francisco.

Martinez, also in Contra Costa County, has very important gill-net fisheries, the catch in 1915 amounting to 672,000 pounds of striped bass, valued at $57,120; 414,000 pounds of chinook salmon, valued at $21,390; and 153,355 pounds of shad, valued at $2,300. A total of 105 men were engaged in fishing and 7 in transporting fish. These men employed 22 gas boats, valued at $10,200; 34

sailboats, valued at $5,000; and 7 house boats, worth $1,400. A branch of a firm in Pittsburg salted large quantities of shad here.

*Solano County.*—There are several important fishing localities in this county, the most important of which is Rio Vista. The greater part of the fishing is done in the Sacramento River, but a considerable amount is also done in San Pablo and Suisun Bays and San Joaquin River. The catch consists mainly of chinook salmon and striped bass. Large quantities of shad are taken, but the price is too low to afford much profit. Gill nets are the only form of apparatus used in the county. One cannery at Benicia and a mild-curing establishment at South Vallejo utilized large quantities of chinook salmon. Most of the catch, however, as in Contra Costa County, was handled by local buy boats working on commission for San Francisco firms.

*Marin County.*—Considering the extent of its fisheries as compared with some of the more important counties, the variety of fishery products in this county is rather noticeable. The greater part of the fishing is done in Tomales Bay, but some of the fishermen along that bay also fish in the ocean. Many kinds of apparatus are used, but the most important forms are seines and gill nets. The leading species taken with seines are surf fish, herring, and perch, and with gill nets sea bass, smelt, and striped bass. Considerable quantities of clams are taken in Tomales Bay, but the industry is far less important than that of the oyster, which has been developing to some extent during the past few years through private planting. The cultivation of clams on private beds has also been undertaken recently. As Tomales Bay is comparatively free from impurities, it is thought that both the oyster and clam industries should improve with attention. A few men were engaged for a short time in 1915 in taking abalone, the resultant products consisting of $450 worth of shells, $158 worth of abalone meat, and $40 worth of pearls.

Sausalito is situated on Richardson Bay, but its leading fishery industry is that for crabs, conducted in the Pacific Ocean. The output in 1915 amounted to 163,800 pounds, valued at $16,134.

*San Joaquin County.*—The total output of the fisheries of this county in 1915 amounted to 1,330,674 pounds, valued at $44,236, showing an increase since 1904 of 803,853 pounds in quantity and $21,960 in value. Catfish was the leading species, two-thirds of the State's catch being credited to this county. They were taken in the San Joaquin River in fyke nets and seines, but mainly in the former. Next in importance to the catfish is the chinook salmon. Shad exceed all other species in abundance, but its importance is much lessened by the low price received by the fishermen. More than one and a quarter million pounds of this species were salted at different points in the county during the year, many of the fish coming from points outside of the county. Of the firms engaged in salting, one was American and the other two Chinese. Practically all of the salted shad were shipped to China. Stockton is the center of the wholesale trade of the county.

*Humboldt County.*—The output of the fisheries of this county in 1915 amounted to 829,630 pounds, valued at $32,796, more than one-half of the value being credited to chinook salmon. Among other species worthy of mention are silver salmon, flounders, smelt, steelhead trout, soft clams, and crabs. This county borders on the Pacific Ocean,

but its most important fisheries are those prosecuted in the Eel River. The output of this river in 1915 amounted to 558,893 pounds, valued at $22,246, which was less than one-fourth of the catch made in 1904. Chinook salmon constituted 80 per cent of the catch, the remainder consisting of silver salmon, steelhead, and sturgeon. The catch was handled by local buyers and shipped mainly to San Francisco. Eureka is the center of the county's wholesale trade, two firms located there handling most of the fish taken in Humboldt Bay and the Pacific Ocean. Besides those taken in Eel River some salmon are also taken in Mad River and Redwood Creek. Several men follow clamming in Humboldt Bay at times during the year, the catch being disposed of locally in Eureka. Crab nets are set both in Humboldt Bay and the Pacific Ocean. The catch would probably be greater than at present if it were not that the law prohibits the shipping of crabs out of the county. Some trawl-line fishing is followed from Eureka in the Pacific Ocean, the catch consisting mainly of flounders and rockfishes.

*Sacramento County.*—This county is situated entirely on the Sacramento River. The total catch in 1915 amounted to 447,167 pounds, valued at $23,132, which was less than one-half of the catch shown for 1904. Nearly 45 per cent of the catch consisted of chinook salmon. The catfish ranks as one of the important species of the county. Gill nets and fyke nets are the only kinds of apparatus used. Sacramento is the most important fishing center in the county. In 1915 three wholesale firms, one of them Chinese, located in this city, together with one in Yolo County across from Sacramento, handled large quantities of fresh fish taken in the vicinity and from a long distance up the river. While many of these fish were shipped to States to the eastward, the major portion probably reached San Francisco. The fishery resources of the Sacramento River are much greater below than above Sacramento. A Chinese firm opposite Antioch salted a large quantity of shad during the year, the product being shipped to China. The European war caused a discontinuation of this work.

*Alameda County.*—This county is situated on San Francisco Bay, in which waters most of its fishing is done. The total output in 1915 amounted to 1,092,180 pounds, valued at $22,598, as compared with 116,958 pounds, valued at $29,804 in 1904. The noticeable increase in quantity in 1915 was due to a large catch of stingray and shark, disposed of to a nearby plant manufacturing poultry feed and oil. Owing to the low price received, these two species did not add materially to the total value of products. The decrease in value of products since 1904 can be traced mainly to the decline of the oyster industry. Both the clam and shrimp industries are of importance in this county. There are several wholesale firms in Oakland, but most of the fish handled by them were brought from San Francisco and more distant points. One firm of Chinese handled clams only.

*Del Norte County.*—This is the most northern of the coastal counties of California. Requa, though a mere village, is the leading fishing center of the county, owing its importance in this particular to the location there of a salmon cannery, which handles most of the fish taken in the Klamath River, on which the village is located. A salmon cannery at Smith River, on the river of that name, utilizes practically all of the salmon from that stream. The total output of Del Norte County in 1915 amounted to 924,135 pounds, valued

at $21,912, consisting mostly of chinook and silver salmon. At Crescent City, situated on the Pacific Ocean, some fishing for crabs was followed, most of the men belonging in San Francisco. The output of salmon since 1904 shows a noticeable increase for the county. The lack of railroads in the county, however, serves as a bar to any great extension of the fishery industries.

*Tehama County.*—The fishing in this vicinity is done entirely in the Sacramento River, the latter flowing through the central part of the county. Aside from a couple of drift gill nets at Corning, seines are the only form of apparatus used. The total output of the county in 1915 was 186,839 pounds, valued at $13,221, as compared with 176,079 pounds, valued at $7,003 in 1904. The fishing is followed entirely for chinook salmon, a few other species, such as striped bass, catfish, shad, and sturgeon, being taken incidentally.

*Mendocino County.*—The fishing in this county is centered mainly at Fort Bragg, the only coast town of the county situated on a railroad. The output of the county in 1915 amounted to 185,535 pounds, valued at $10,512. No returns are shown for this county in 1904, as the railroad to Fort Bragg had not then been constructed. The leading species are chinook and silver salmon, rockfishes, and flounders. Some abalone and mussels are also taken. Trolling is followed to a considerable extent in the ocean off Fort Bragg from June to the middle of September, men from other counties also engaging in the fishery. Some trawl-line fishing for rockfishes, flounders, and "lingcod" is followed in the ocean during March, April, and May whenever the weather permits the men to get out. During the fall and winter of 1915 some silver salmon were taken with gill nets in a few of the small rivers of the county, but net fishing was prohibited in these streams after that year.

*Yolo County.*—The decline in the fisheries of this county between 1904 and 1915 was from 341,500 pounds, valued at $12,030, to 249,553 pounds, valued at $10,448, showing a greater proportionate decline in quantity than in value. Considerably more than one-half the catch was made with drift gill nets and the remainder with fyke nets and seines. The most important species are chinook salmon, catfish, shad, hardhead, and striped bass. The first-named species made up about 45 per cent of the value of the entire catch. Broderick, across the Sacramento River from Sacramento, is the most important fishing locality in the county. One wholesale firm located there buys a considerable proportion of the catch, the remainder being sold to dealers in Sacramento.

*Sonoma County.*—There is a greater variety of fishing at Bodeja than at any locality in the county, several different forms of apparatus being used. Among the important products taken in the county are abalone, including pearls and blisters, surf fish, rockfishes, chinook salmon, soft clams, crabs, perch, hard clams, and crawfish, the last named being taken in the Russian River several miles above its mouth. The total output of the county in 1915 amounted to 243,150 pounds, valued at $9,325. No fishing was reported in this county in 1904. Lack of railroad facilities to the coast probably accounts for the slow growth of the fisheries of the county.

*Butte County.*—The output of this county in 1915 amounted to 82,800 pounds, valued at $6,720, or less than one-half in quantity and

slightly over 75 per cent in value of the catch shown for 1904. Seines were the only form of apparatus used. Aside from a few hundred pounds of striped bass and sturgeon the catch was confined to chinook salmon. Most of the catch was shipped from Chico.

*Glenn County.*—The total fishery output of this county in 1915 amounted to 86,100 pounds, having a value of $6,705. No catch was shown for this county in 1904. Willow is the most important fishing center in the county. Aside from a few chinook taken with drift gill nets the entire catch was taken with seines. Chinook salmon constituted about 94 per cent of the catch, the remainder consisting of sturgeon and striped bass.

*Colusa County.*—With the exception of a few fykes and hand lines, seines were the only form of apparatus used in the county. The output in 1915 amounted to 58,456 pounds, valued at $4,214. Several species were taken, but chinook salmon constituted about three-fourths of the catch. Colusa, the county seat, is the most important fishing center. No fisheries were shown for this county for 1904.

*Sutter County.*—The fishery resources of this county show a decline from 148,000 pounds, valued at $6,440, in 1904, to 73,645 pounds, valued at $2,921, in 1915. In 1904 the catch consisted largely of chinook salmon, but in 1915 nearly 70 per cent of the catch was catfish. Most of the fishing is confined to the southern part of the county, from Knights Landing down, and is sold to dealers in Sacramento and Broderick.

*San Mateo County.*—The output of this county in 1915 amounted to 26,500 pounds, valued at $1,910, as compared with 216,140 pounds, valued at $6,405, in 1904. This difference is due mainly to the decline of the shrimp industry through restrictive legislation. The output consisted of soft clams, crabs, rockfishes, and a few smelt. Aside from a small local consumption, the entire catch was landed and sold in San Francisco, which is not far distant from the fishing grounds of the county.

*Shasta County.*—This county is the uppermost one on the Sacramento River in which commercial fishing is prosecuted. The output in 1915 amounted to 20,997 pounds, valued at $1,289, which is about one-half of the value of the output in 1904. Aside from a few fish taken with spears, the catch is credited entirely to seines. Chinook salmon and a few striped bass were the only species taken. Cottonwood and Anderson were the principal fishing localities. As in the case of most of the counties on the Sacramento River above Sacramento, the fish are shipped mainly to Sacramento and San Francisco. A few are shipped by the buyers north to Seattle and Portland and to neighboring States eastward. Owing to the current, seines are best adapted for the fisheries of the Sacramento River above Yolo County, and in most instances a horse is necessary in hauling the seine. A law passed by the California legislature in 1916 prohibits all fishing in the Sacramento River above Vina, Tehama County. Previously there was no limit to the fishing in the river.

*Los Angeles County.*—This is the most thickly settled county in the State and far exceeded any other in the number of persons employed, the amount of capital invested in the fisheries, and the quantity of fishery products taken during the year 1915, but the value of the products was less than in San Francisco County. There were 2,428 persons engaged either as active fishermen or in the various

fishery industries on shore; the value of shore property, fishing apparatus, boats, etc., was $2,041,401; and the products amounted to 27,420,247 pounds, valued at $515,863. Including some chinook, chum, and silver salmon taken from Columbia River by a vessel from San Pedro, there were 33 species.

The fisheries are centered in the southern part of the county, in Los Angeles Harbor at San Pedro, East San Pedro, and Wilmington, and at Long Beach.

Some fishing is also done from Redonda Beach, Santa Monica, and Venice, and a little from Catalina Island, although the greater part of that done at the last-named place is for sport. The present importance of the county as a fishing center is due to the rapid growth of the tuna industry during recent years, although it has occupied a prominent place among the fishing counties of the State for a number of years because of the quantity of barracuda, flounders, rockfishes, and other species taken. The bulk of the tuna is sold to the canneries, though at times some go to the wholesale dealers, who handle the other species, shipping them to various inland points.

During the year 1915 there were 10 wholesale fresh-fish houses and 1 tuna cannery at San Pedro, 3 tuna canneries at East San Pedro, 1 at Wilmington, and 5 at Long Beach. There were also a number of wholesale fresh-fish dealers at Los Angeles. A large percentage of the fishermen are Austrians, some Americans, and, in the tuna fishery especially, many are Japanese.

Of the total catch 17,367,259 pounds, or nearly 63 per cent, were albacore or tuna, valued at $260,667. Other important catches were barracuda, 1,555,162 pounds, valued at $59,256; flounders, 1,349,103 pounds, valued at $51,731; rockfishes, 690,131 pounds, valued at $21,882; yellowtail, 679,868 pounds, valued at $18,976; sea bass, 446,064 pounds, valued at $16,953, and bonito, 370,844 pounds, valued at $10,840.

Owing to the fact that the large catch of albacore is practically all taken by lines, these are by far the most important form of apparatus. The total catch of all species by lines was 18,518,522 pounds, valued at $300,417, of which 17,339,499 pounds, valued at $260,223, were albacore. Other important species in the line fishery are the rockfishes, amounting to 690,131 pounds, valued at $21,882.

The gill-net catch ranked next to that of the lines, amounting to 1,911,649 pounds, valued at $66,996, of which 893,960 pounds, valued at $34,738, were barracuda. Considerable quantities of bonito, sea bass, and yellowtail were also taken by the gill nets. The lampara net also occupies a prominent place in the fisheries of the county, the catch amounting to 1,745,777 pounds, valued at $52,935, consisting chiefly of yellowtail and barracuda. The trammel net was next in importance, with a catch of 1,069,496 pounds, valued at $40,454, mostly flounders, known locally as "California halibut." There has been quite an increase in the number of small fishing vessels hailing from Los Angeles County. During the year there were 38 of these of 5 tons net or more, with a total net tonnage of 343 and a value of $85,700, the majority being engaged in line fishing for albacore. The only seines fished from the county were purse seines, operated from six of these vessels, the catch consisting chiefly of barracuda and yellowtail, with some bonito, mackerel, sea bass, Spanish mackerel, and albacore. The gill-net catch of the vessel fisheries was chiefly barracuda, and the trammel nets took only flounders.

The kelp, which grows in abundance along the Pacific coast, has not been utilized commercially in the past, though it has long been known to contain a large percentage of potash. This country has heretofore depended almost entirely on Germany for its supply of potash, but since the beginning of the European war there has been such a decrease in the importation of this product that the Department of Agriculture deemed it expedient to make investigations to determine the feasibility of harvesting the kelp for the purpose of extracting the potash and other ingredients of commercial value. It was found to be entirely practicable and, though the actual work was yet in its incipiency in 1915, extensive preparations were being made in Los Angeles and San Diego Counties for future effort in this important industry, and a number of plants were in operation in 1916. One company operated in Los Angeles County during 1915 and cut 1,500 tons of kelp.

*San Diego County.*—This county ranked fourth in the State in the quantity of products taken during the year. The total catch was 12,652,996 pounds, valued at $343,919. In the amount of the capital invested, which was $625,021, and the number of persons employed, which was 1,026, it occupied third place. The products included 21 different species, and a number of these were sold both fresh and salted. As in Los Angeles County, the leading species was albacore, with a total catch of 3,630,931 pounds, valued at $54,505, used fresh, and 25,000 pounds, valued at $481, salted. Other species taken in large quantities were flounders, 2,182,658 pounds, valued at $83,826; barracuda, fresh, 1,415,904 pounds, valued at $41,121, and salted, 330,000 pounds, valued at $13,180; rockfishes, 734,464 pounds, valued at $16,703; spiny lobsters, 500,313 pounds, valued at $84,726; rock bass, fresh, 489,450 pounds, valued at $10,032, and salted, 2,750 pounds, valued at $97; yellowtail, fresh, 337,898 pounds, valued at $4,954, and salted, 124,500 pounds, valued at $4,743.

The fisheries of this county are centered at San Diego, where four tuna canneries, one of which also canned a small lot of abalone taken from Mexican waters, and six wholesale fresh-fish houses are located. The abalone canning was somewhat in the nature of an experiment and was discontinued when found to be unprofitable because of the excessive cost of getting abalone from foreign waters.

Many of the fishermen of southern California have been going to Mexican waters during the last eight years or more because they thought those waters more productive than those where they had been fishing nearer their home ports. To do this, they are required to secure a permit from the representatives of the government of Lower California and also to pay a tax of 2 cents per pound on all fish taken from what are claimed as Mexican waters, and it has been stated that this tax is levied even though the fish in question have been taken beyond the 3-mile limit. The bulk of the halibut or flounders and a considerable portion of the barracuda, lobsters, and other species brought to the San Diego market are from fishing grounds off Lower California. It is said that some of the San Diego boats often go as far as 100 miles or more from home when fishing in southern waters.

Line fishing is the most important, because the great bulk of the albacore is taken by that apparatus. The total catch by lines was 5,580,946 pounds, valued at $101,381, of which 3,628,560 pounds,

valued at $54,429, were albacore, the greater part of the remainder consisting of rockfishes, rock bass, and yellowtail.

The rockfish fishery is one of the most important in this county, as well as in Los Angeles County, the catch being all by lines and especially good. A great deal of the fishing is done about San Clemente Island, located 65 or 70 miles off San Diego. The rockfishes are often taken in 100 fathoms or more of water. The season for fishing is mostly in winter, though the fish may be found in these waters practically the entire year. It is said to be almost impossible to work the gear during summer because of the presence of the sharks which do considerable damage to the lines. Either a "hand line" or "set line" is used. The former has about 125 hooks, which are attached to snoods hung from the main line at intervals of about 9 inches. The line is laid out on the bottom with a stone made fast to one end, and to the other end is attached a line which extends up to the boat. The crew usually consists of three men, and one man is assigned to tend a single line. The main line is No. 156 hard-laid cotton, and the snoods are No. 24 cotton twine. If the fish are not biting readily, the lines are sometimes buoyed, and the men move about in search of more productive grounds.

The set lines are much more extensive and are made of a number of lengths of 200 hooks each, tied together to make one string. Sometimes as many as 15 to 20 of these pieces are fished as one line. The line is weighted at each end with a stone or piece of iron, and a buoy line attached. When fishing a bottom that is especially rocky, or when the water is rough, additional buoys are attached between the end ones to prevent the line becoming entangled. The main line is No. 240 hard-laid cotton, and the snoods are No. 24 cotton twine. The snoods are about 3½ feet long and are attached to the main line at intervals of from 5 to 5½ feet. The buoy lines are manila. It is often difficult to raise these set lines, especially if the water is rough, and it sometimes requires the combined effort of two or three men to accomplish this. The bait for the lines is sardines or fish cuttings. These lines are practically the same as those used in the other counties of southern California.

The lobster pots ranked next to the lines in importance. The catch, which consisted entirely of spiny lobsters, amounted to 500,313 pounds, valued at $84,726. Spiny lobsters are not taken north of Santa Barbara County, but are found in considerable numbers from that county southward. The State law prohibits fishing for them in California waters during the summer when they are spawning, but there seems to be no State prohibition against the importation of the Mexican lobster during that period, and as a result of this lack of restriction many of the fishermen from San Diego have been going to the coast of Lower California during recent years, establishing camps for the summer season, and sending great quantities of lobsters to the California market. Many are opposed to this practice, because they are of the opinion that the lobster should be protected when spawning in Mexican waters as well as in California, and are anxious to have legislation to prohibit importing them during the closed season. The best lobster-fishing grounds in the early fall are on the kelp beds near the shore, where the lobsters seem to gather for protection, but as cold weather advances they go out to deeper water. It is often very difficult to raise the pots because of the heavy swell, and at times the men

have to attach the buoy line to the moving boat in order to get them up. The pots are made of laths and are mostly about 3 feet long, 30 to 32 inches wide at the bottom, narrowing to about 12 inches at the top, and are 12 inches high. They are set singly with a buoy line attached to each pot in water varying in depth from 3 to 20 fathoms. When fishing in deep water, it is often necessary to use 40 to 60 pounds of ballast to a single pot.

The trammel-net fishery is also quite important. The catch consisted entirely of flounders and amounted to 2,182,408 pounds, valued at $83,816. Trammel nets are made very much on the plan of a gill net, though they have three webs instead of one. A web of small-mesh netting is hung between two webs of larger mesh, the middle one hanging deeper than the two outside ones, so that the fish striking from either side and forcing the small mesh net through the larger mesh forms a bag from which it is impossible to escape. The two outside webs are 23-inch mesh, No. 12 cotton twine, and about 12 feet deep, and the center one is 9-inch mesh, No. 9 cotton twine, and about 16 feet deep. One net is 36 to 40 fathoms long, and a number are usually tied in a string and fished as one net, sometimes as many as 20 being used to one string.

The gill net ranks next in importance. The catch amounted to 2,260,329 pounds, valued at $68,388. This net is used chiefly for fishing barracuda, and over 69 per cent of the total catch consisted of that species, the number of pounds being, fresh, 1,362,441, valued at $39,957, and salted, 198,000 pounds, valued at $7,900. Sea bass and yellowtail also figure quite prominently in the gill-net catch, the former amounting to 261,703 pounds, valued at $8,351, and the latter to 212,645 pounds, fresh, valued at $3,389, and 55,500 pounds, salted, valued at $1,983.

The quantity of kelp harvested during 1915 was about 1,000 tons, valued at $1,000.

The fishing vessels of 5 tons net or more hailing from San Diego County numbered 13, with a total net tonnage of 112 tons and a total value of $34,550. Several of these are from La Playa, located on San Diego Bay opposite San Diego, and are fished by Portuguese, who fish mostly in Mexican waters and sometimes go several hundred miles from their home port. The greater part of their catch is salted in the hold of the vessel and consists chiefly of barracuda, jewfish, Spanish mackerel, and rockfishes. Other vessels take considerable quantities of albacore.

*Monterey County.*—The products of the fisheries of this county in 1915 amounted to 14,085,399 pounds, valued at $183,806, and the investment was $455,887. The number of persons employed in the fisheries and various shore industries was 694. Monterey, located on Monterey Bay, is the center of the fisheries of the county. There are located here 13 wholesale fresh-fish houses and two canneries, where the only sardines canned in the State were canned during the year. In addition to these species, one of these houses also prepared canned, mild-cured, and salted salmon. One firm also was engaged in drying squid, which was mostly for export to China. The only real abalone cannery operated in the State during 1915 was located at Point Lobas, about 5 miles south of Monterey. Monterey Bay is the southern limit of salmon, and the major portion of those found there are chinook, a comparatively small number of silver salmon also being taken.

Salmon usually appear in this region in large numbers, and most of the catch is taken in the spring and early summer. The salmon are taken entirely with troll lines, and practically all in the bay. The anchovies, kingfish, mussels, perch, sardines, and squid are also practically all taken in the bay, and the rockfishes, "lingcod," jewfish, sablefish, and sole are all taken in the ocean. Sardines come in June and from that time until early in August are rather small in size. After this they run larger and continue so until winter. During December and January they are especially large. From March until late in May there are no sardines of any consequence. The catch for the year was rather poor.

In quantity the catch of squid was greater than any other, but in value the catch of chinook salmon was more than double that of any other species. The amount of squid taken was 6,140,000 pounds, valued at $30,700. The next in quantity were sardines, with a catch of 4,006,200 pounds, valued at $20,031. The catch of chinook salmon and rockfishes, all of which were taken by lines, was 1,694,660 pounds, valued at $67,786, and 1,306,816 pounds, valued at $41,818, respectively. Some silver salmon and other species were also taken with lines, but in minor quantities.

The lampara net fishery produced the greatest quantity; the total catch of this apparatus was 8,923,200 pounds, valued at $46,151. The low value of the lampara catch is explained by the fact that nearly two-thirds of the amount taken were squid, which sold for about $10 per ton, practically all of them being handled by one firm for drying for the Chinese trade.

Squid are dried by the sun-and-air process. A suitable plat is selected beyond the city limits, because the city authorities prohibit the work within the limits on account of the disagreeable odor and the burning off of the grass which is necessary, because the phosphoric acid and salt water in the squid would kill it and cause it to rot, thus rendering the ground unsuitable for drying. The squid are spread on the ground, turned and worked over every day until thoroughly dried. Under favorable conditions 10 to 12 days are sufficient time for drying. Under normal conditions the quantity of fresh squid reported would have yielded a larger percentage of the dried product, but certain conditions were unfavorable during the season, and some were lost.

Other species taken by lampara nets were sardines, 2,906,200 pounds, valued at $14,531, and a small lot of anchovies and herring.

The seine catch was largely made up of sardines, which amounted to 1,100,000 pounds, valued at $5,500. Small quantities of barracuda and squid were also taken with seines.

As stated above, this is the only county in the State in which abalone canning was done in 1915, except a small lot brought from Mexico and packed at a San Diego tuna plant. The catch, including those taken for the cannery and some by independent fishermen from Monterey, amounted to 547,424 pounds, valued at $10,939. The abalone subsist on vegetable matter and are found only on rock bottom where there is a sufficient growth of vegetation to maintain them. Several varieties are found on the California coast, but the red abalone is the one with which we have to deal chiefly, as that is utilized for canning at Point Lobas. Other varieties are the green, black, pink, and corrugated. The red abalone is found from northern California to the Santa Barbara Island region. Only about 10 per

cent of the red shells are suitable for commercial purposes. They are sold for manufacture into novelties and various kinds of ornaments.

As very few red abalones are exposed at low tide, and as they are not found in water deeper than will permit of the penetration of sufficient sunlight to support the vegetable growth on which the abalone depends for subsistence, they are mostly taken by divers, who use a regular diving outfit such as is employed by wreckers and other workers under water. A diving outfit, including the helmet, suit, air pumps, etc., costs about $800. The divers are all Japanese, and they require that the pumps and life lines be operated by men of their own selection, who are generally some of their own people. The depth of the water in which they operate does not often exceed 125 feet, but they have worked at a depth of 150 feet. The greater the depth the more difficult it is to furnish air to the men, and it is not necessary to take risks, as there seems to be a sufficient supply of abalone at less depth. The divers rarely get out of sight of land, work only when the water is smooth, and frequently go out and return without making a descent or with only a part of a day's work done because of rough seas. A diver usually remains under water 2½ to 3 hours and uses a short pointed iron, similar to a crowbar, to pry the abalone from the rocks. If one is expert enough to get the iron under the shell before the abalone has been disturbed and has had an opportunity to take hold of the rock, it is comparatively easy to capture it; otherwise it can take such a firm grip that it is very difficult to get it up with the iron and impossible to break the hold with the hands alone. The abalone are hauled up to the boat in carriers made with manila rope of about one-fourth inch diameter, one of which is attached to each end of a line suspended from the boat; as one carrier is raised the other is lowered. From one to two dozen are placed in a carrier, the weight averaging 45 pounds to a dozen.

For shoal-water fishing the fishermen use a small boat and hooked pole. To aid in locating the abalone they have a wooden box averaging about 8 by 11 inches at the top, widening toward the bottom to about 16 by 19 inches, and about 19 to 20 inches deep, the top being open and the bottom fitted with a glass. This box is attached to the side of the boat by strings, so that it may be easily removed when returning to port, with the bottom immersed so that the fisherman can get a good view of the ocean bottom as he peers through the glass. The poles vary in length from 1 to about 4 fathoms, as that is about the maximum depth of water fished in this way. The lower end is fitted with an iron hook, and the fisherman holding the pole in his hand can by a quick movement insert the hook under the edge of the shell and jerk it loose from the rock.

The law permits abalone fishing in this county at any time except during the month of February, when the abalone are protected because of spawning. The spawning period, however, is said to extend from about the middle of January until about the middle of March. It is estimated that an adult female will produce upward of one million eggs during the season. When liberated and fertilized, the eggs are said to float about for a time and then settle on the bottom for reproduction, and there is no doubt that many of them settle on sandy or soft bottom and are lost.

One hundred pounds of abalone in the shell will yield about 60 pounds of meat. When preparing for canning only about 30 per cent of the meat is used, the remainder being discarded as unfit for

packing. The meat as it comes from the shell is very tough, and it is necessary to pound it well with sticks in order to break the fiber. Abalone were not taken in the southern counties of California during 1915 for commercial purposes, the law prohibiting having more than 10 of them in one's possession at one time, precluding any effort toward commercializing the fishery. In past years considerable quantities were taken in Los Angeles County.

*Santa Cruz County.*—The aggregate product of the fisheries of this county in 1915 was 3,952,257 pounds, valued at $125,077. Nearly 50 per cent of this amount was sole, the catch of that species amounting to 1,892,600 pounds, valued at $52,315. Flounders also contributed largely to this total, the catch being 746,935 pounds, valued at $21,596. The entire catch of sole and flounders was taken in paranzella nets. "Lingcod," hake, kingfish, and other species are also taken in these nets.

With the exception of crabs, the gill-net catch of this county is of minor importance. The crab gill nets do not differ in general construction from any other. They are made of No. 6 cotton twine, about 45 fathoms long, 15 feet deep, and 7½-inch mesh. They are put out in the evening, usually about six of the 45-fathom lengths in a string, and sunk so that the lead line is near the bottom, with a buoy line attached to each end. They are permitted to drift during the night and are taken up in the morning. This method of fishing crabs has been in vogue for about four years and is usually quite remunerative. Crab lines are not used here, but a small number of crabs are taken in paranzella nets. The catch of crabs in 1915 was 233,473 pounds, valued at $15,917.

Rockfishes and salmon constituted the bulk of the line catch. The rockfishes taken amounted to 378,478 pounds, fresh, valued at $11,355, and 8,000 pounds, salted, valued at $400. The catch of chinook salmon amounted to 100,592 pounds, valued at $4,023, and that of silver salmon to 28,697 pounds, valued at $1,147. Some "lingcod," sablefish, and kingfish were also taken by lines.

Octopi have been known to exist in this region for some time and have been taken in paranzella nets, but no special effort has been made to capture them until recently. A Santa Cruz fisherman constructed some traps for the purpose of catching crabs, but on lifting the traps found them filled with octopi instead of crabs and decided they could be taken in sufficient quantities to justify further efforts. These traps are made of galvanized wire of 1-inch mesh and are about 3 feet long, 2½ feet wide, and 1½ feet high. They have openings in the top about 8 inches square for the entrance of the octopi, and doors in the end for the removal of the catch. The traps are baited with skates or any fish offal that is available, and are set singly with a buoy line attached to each. The season is chiefly during the winter and spring. The catch is shipped to San Francisco, where there is quite a demand from the Orientals, who consider this fish a delicacy. Only 6,000 pounds, valued at $600, were taken during 1915, but there is every reason to believe that subsequent years will show a considerable increase in this business. Practically all the catch of this county is shipped to San Francisco, by several wholesale dealers in Santa Cruz, and practically all the fishermen of the county hail from that point. The investment in the fisheries of the county for the year was $71,275, and the total number of persons employed was 65.

*Santa Barbara County.*—The fisheries of this county produced 638,600 pounds, valued at $41,130, in 1915 and are centered at Santa Barbara, where the only wholesale market in the county is located.

Santa Barbara Channel, located off this county, is the northern limit of spiny lobsters. They are taken in considerable numbers by fishermen camping on the islands in the channel, chiefly Ana Capa and Santa Cruz, and also by some fishing from Santa Barbara. This fishery contributed about 50 per cent of the total value of the products for the county, the catch amounting to 158,300 pounds, valued at $20,729. The gill-net fishery contributed about 49 per cent of the total catch of the county.

*Orange County.*—This county, located on the southern coast of the State, between the two important fishing counties of Los Angeles and San Diego, is much more thinly settled and is comparaatively unimportant in its fisheries. The fisheries are conducted from only two localities, Newport and Laguna Beach, and the products amounted to 988,980 pounds, valued at $38,702. The most important form of apparatus was seines, the catch of which was over 25 per cent of the total quantity, and over 30 per cent of the total value for the county. Smelt constituted the bulk of the catch with this apparatus, the catch of this species amounting to 226,000 pounds, valued at $11,300. The catch by lines, amounting to 261,380 pounds, valued at $8,356, ranked next in both quantity and value, and barracuda and rockfishes were the most important species. The gill-net fishery, which amounted to 132,950 pounds, valued at $4,795, was next in importance in value, with sea bass and barracuda the leading species. The catch with lampara nets was 198,000 pounds, valued at $4,920, and consisted chiefly of rock bass and yellowtail. The trammel-net catch was all flounders and amounted to 132,250 pounds, valued at $6,308. Spiny lobsters, worth $2,093, and a small lot of hard clams were also taken by the fishermen of this county.

*San Luis Obispo.*—Although this county has quite an extensive coast line, it is very sparsely settled, and the commerical fisheries are of little importance when compared with some of the other coastal counties. Pismo and Morro are the only localities from which commercial fisheries are prosecuted. Clam forks, gill nets, and lines were the only forms of apparatus used. The total catch amounted to 197,856 pounds, valued at $16,420. The catch taken with lines was 85,000 pounds of rockfishes, valued at $3,400, which was greater in quantity than that with any other apparatus, but the value of the hard clams, taken with forks, amounted to more than 55 per cent of the total value of that species for the State. The quantity of hard clams taken was 34,856 pounds, valued at $9,150.

*Ventura County.*—The product of the fisheries of this county amounted to 106,765 pounds, valued at $5,443. Of the 27 counties in which commercial fisheries are conducted in California, this county is among the least important; there are only three counties in which the value of the catch was less than in Ventura, two of them being located on Sacramento River and one on the coast. The fishing is all done from Ventura, a small town of only a few thousand inhabitants, and the bulk of the catch consisted of smelt, taken with seines; flounders, taken with trammel nets; rockfishes and flounders, taken with lines; and spiny lobsters, which are always caught in pots.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES.

| | Alameda. | | Butte. | | Colusa. | | Contra Costa. | | Del Norte. | | Glenn. | | Humboldt. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels transporting | | | | | | | 4 | | | | | | | |
| In shore fisheries | 58 | | 40 | | 58 | | 444 | | 141 | | 26 | | 208 | |
| On shore, in canneries, etc | 47 | | 15 | | 9 | | 279 | | 89 | | 6 | | 7 | |
| Total | 105 | | 55 | | 67 | | 727 | | 230 | | 32 | | 215 | |
| INVESTMENT. | | | | | | | | | | | | | | |
| Vessels transporting | | | | | | | 2 | $5,500 | | | | | | |
| Tonnage | | | | | | | 12 | | | | | | | |
| Outfit | | | | | | | | 425 | | | | | | |
| Boats: | | | | | | | | | | | | | | |
| Gasoline | 12 | $14,900 | | | 1 | $400 | 84 | 51,700 | 9 | $4,050 | 1 | $200 | 14 | $7,200 |
| Sail, row, etc | 32 | 1,025 | 15 | $375 | 15 | 1,655 | 160 | 21,900 | 65 | 2,490 | 6 | 400 | 145 | 3,430 |
| Apparatus, shore fisheries: | | | | | | | | | | | | | | |
| Seines | | | 13 | 1,300 | 9 | 675 | 6 | 625 | 2 | 700 | 5 | 425 | 9 | 750 |
| Length in yards | | | 1,755 | | 825 | | 1,170 | | 440 | | 550 | | 1,570 | |
| Gill nets | 9 | 1,585 | | | | | 395 | 109,650 | 114 | 26,150 | 1 | 125 | 275 | 18,205 |
| Length in yards | 7,080 | | | | | | 211,050 | | 22,320 | | 150 | | 39,450 | |
| Beam trawls | 9 | 400 | | | | | | | | | | | | |
| Hoop nets | | | | | | | | | 200 | 500 | | | 145 | 250 |
| Dip nets | | | | | | | | | | | | | 5 | 50 |
| Lines | | 80 | | | | 1 | | | | | | | | 25 |
| Dredges, tongs, hoes, etc | | 30 | | | | | | | | 1 | | | | 3 |
| Fyke nets | | | | | 35 | 330 | | | | | | | | |
| Shore and accessory property | | 80,850 | | 2,200 | | 1,625 | | 136,200 | | 51,680 | | 800 | | 400 |
| Cash capital | | 16,500 | | | | | | 18,000 | | 25,000 | | | | |
| Total | | 115,370 | | 3,875 | | 4,686 | | 344,000 | | 110,571 | | 1,950 | | 30,313 |
| PRODUCTS. | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | | | 2,800 | $80 | 97,000 | $1,530 | | | | | | |
| Catfish | | | | | 6,700 | 264 | | | | | | | | |
| Flounders: Fresh | 5,000 | $150 | | | | | 16,000 | 238 | | | | | 51,548 | $1,858 |
| Herring: Fresh | | | | | | | 7,000 | 34 | | | | | 25,494 | 503 |
| "Lingcod:" Fresh | | | | | | | | | | | | | 2,609 | 104 |
| Perch | 2,000 | 180 | | | | | 12,000 | 400 | | | | | 15,000 | 410 |
| Pike, Sacramento | | | | | 400 | 20 | 4,600 | 90 | | | | | | |
| Rockfishes: Fresh | | | | | | | | | | | | | 16,905 | 577 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Salmon: | | | | | | | | | | | | | | |
| Chinook, fresh | 300 | 18 | 81,500 | $6,520 | 44,000 | 3,360 | 1,860,425 | 95,974 | 704,420 | $16,002 | 81,300 | $6,095 | 499,196 | 19,501 |
| Silver | | | | | | | | | 190,398 | 3,730 | | | 86,072 | 3,304 |
| Steelhead trout | | | | | | | | | | | | | 32,405 | 1,288 |
| Shad: | | | | | | | | | | | | | | |
| Fresh | | | | | | | 4,348,640 | 45,800 | | | | | | |
| Roe | | | | | | | | | | | | | | |
| Sharks | 65,000 | 163 | | | 1,500 | 145 | | | | | | | | |
| Smelts | 31,500 | 2,175 | | | | | | | | | | | | |
| Sting-ray | 605,000 | 1,512 | | | | | 12,000 | 780 | | | | | 39,889 | 1,688 |
| Striped bass | 99,000 | 7,565 | 500 | 40 | 700 | 63 | 1,036,263 | 84,676 | | | 1,500 | 120 | | |
| Sturgeon | | | 600 | 40 | 2,030 | 135 | | | | | 3,000 | 310 | 8,010 | 250 |
| Sturgeon roe | | | 200 | 120 | 326 | 147 | | | | | 300 | 180 | | |
| Surf fish | | | | | | | | | | | | | 20,000 | 600 |
| Miscellaneous fishes | | | | | | | 1,400 | 28 | | | | | | |
| Clams: | | | | | | | | | | | | | | |
| Hard | | | | | | | | | | | | | 1,760 | 427 |
| Soft | 21,250 | 5,950 | | | | | | | | | | | 6,280 | 1,250 |
| Mussels | 130 | 35 | | | | | | | 2,650 | 180 | | | | |
| Oysters: Eastern, market | | | | | | | | | | | | | 42 | 14 |
| Crabs | | | | | | | | | 26,667 | 2,000 | | | 24,420 | 1,022 |
| Shrimp | 263,000 | 4,850 | | | | | | | | | | | | |
| Total | 1,092,180 | 22,598 | 82,800 | 6,720 | 58,456 | 4,214 | 7,395,328 | 229,550 | 924,135 | 21,912 | 86,100 | 6,705 | 829,630 | 32,796 |

| | Los Angeles. | | Marin. | | Mendocino. | | Monterey. | | Orange. | | Sacramento. | | San Diego. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | 114 | | | | | | 6 | | | | | | 37 | |
| On vessels transporting | 9 | | | | | | | | | | | | | |
| In shore fisheries | 825 | | 166 | | 40 | | 171 | | 56 | | 162 | | 336 | |
| On shore, in canneries, etc | 1,480 | | 29 | | | | 517 | | 2 | | 33 | | 653 | |
| Total | 2,428 | | 195 | | 40 | | 694 | | 58 | | 195 | | 1,026 | |
| INVESTMENT. | | | | | | | | | | | | | | |
| Vessels fishing: | | | | | | | | | | | | | | |
| Tonnage | 38 | $85,700 | | | | | | | | | | | 13 | $34,550 |
| Outfit | 343 | 9,175 | | | | | | | | | | | 112 | |
| Vessels transporting | [a] 6 | 21,800 | | | | | 3 | $12,500 | | | | | | 5,766 |
| Tonnage | 203 | | | | | | 21 | | | | | | | |
| Outfit | | 1,190 | | | | | | 785 | | | | | | |
| Boats: | | | | | | | | | | | | | | |
| Gasoline | 324 | 521,800 | 52 | $20,900 | 11 | $4,300 | 124 | 76,000 | 19 | $17,150 | 68 | $16,000 | 135 | 196,250 |
| Sail, row, etc | 40 | 1,115 | 53 | 3,350 | 41 | 925 | 19 | 5,700 | 10 | 290 | 83 | 11,340 | 27 | 721 |

[a] Includes 2 scows of 146 net tons, valued at $5,500.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

| | Los Angeles. | | Marin. | | Mendocino. | | Monterey. | | Orange. | | Sacramento. | | San Diego. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INVESTMENT—continued. | | | | | | | | | | | | | | |
| Apparatus, vessel fisheries: | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Seines | 6 | $8,400 | | | | | | | | | | | | |
| Length in yards | 3,600 | | | | | | | | | | | | | |
| Gill nets | 153 | 4,255 | | | | | | | | | | | | |
| Length in yards | 10,600 | | | | | | | | | | | | | |
| Pots | 20 | 50 | | | | | | | | | | | 60 | $150 |
| Lines | 392 | | | | | | | | | | | | | 375 |
| Lampara nets | 1 | 400 | | | | | | | | | | | | |
| Paranzella nets | 1 | 250 | | | | | | | | | | | | |
| Trammel nets | 95 | 2,325 | | | | | | | | | | | 30 | 750 |
| Length in yards | 7,600 | | | | | | | | | | | | 2,400 | |
| Apparatus, shore fisheries: | | | | | | | | | | | | | | |
| Seines | | | 18 | $1,425 | | | 1 | $1,600 | 16 | $4,120 | | | | |
| Length in yards | | | 2,220 | | | | 320 | | 4,800 | | | | | |
| Gill nets | 1,244 | 35,870 | 47 | 6,510 | 25 | $500 | 7 | 2,250 | 150 | 4,200 | 111 | $13,525 | 486 | 12,150 |
| Length in yards | 71,680 | | 20,195 | | 875 | | 5,580 | | 8,400 | | 24,010 | | 26,640 | |
| Hoop nets | | | 630 | 1,260 | | | | | | | | | | |
| Pots and traps | 1,432 | 3,164 | | | | | | | 250 | 620 | | | 1,053 | 2,333 |
| Lines | | 2,742 | | 95 | | 750 | | 1,980 | | 213 | | | | 1,795 |
| Dredges, tongs, hoes, etc | | | | 281 | | 5 | | | | 5 | | | | |
| Lampara nets | 37 | 14,800 | | | | | 20 | 11,200 | 1 | 400 | | | | |
| Paranzella nets | 32 | 4,800 | | | | | | | | | | | | |
| Trammel nets | 1,401 | 39,000 | 1 | 100 | | | | | 180 | 4,500 | | | 520 | 10,400 |
| Length in yards | 67,440 | | 320 | | | | | | 14,400 | | | | 41,000 | |
| Fyke nets | | | | | | | | | | | 280 | 2,725 | | |
| Abalone outfit | | | | 1 | | 1 | | 1,636 | | | | | | 800 |
| Shore and accessory property | | 1,097,101 | | 119,740 | | 200 | | 274,081 | | 1,850 | | 42,250 | | 241,661 |
| Cash capital | | 187,072 | | 7,000 | | | | 68,155 | | 2,000 | | 7,800 | | 117,500 |
| Total | | 2,041,401 | | 160,662 | | 6,681 | | 455,887 | | 35,348 | | 93,640 | | 625,201 |
| PRODUCTS. | | | | | | | | | | | | | | |
| Albacore (or tuna): | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Fresh | 17,367,259 | $260,667 | | | | | | | 6,000 | $150 | | | 3,630,931 | $54,505 |
| Salted | | | | | | | | | | | | | 25,000 | 481 |
| Anchovies: | | | | | | | | | | | | | | |
| Fresh | 12,585 | 130 | | | | | | | | | | | | |
| Salted | | | | | | | 16,000 | $1,600 | | | | | | |
| Barracuda: | | | | | | | | | | | | | | |
| Fresh | 1,555,162 | 59,256 | | | | | 34,000 | 680 | 81,800 | 3,872 | | | 1,415,904 | 41,121 |
| Salted | | | | | | | | | | | | | 330,000 | 13,180 |
| Bonito | 370,844 | 10,840 | | | | | 2,000 | 50 | 2,950 | 88 | | | 42,462 | 774 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carp | | | | | | | | | | | 43,201 | $554 | | |
| Catfish | | | | | | | | | | | 91,646 | 3,888 | | |
| Croaker | 3,150 | 65 | | | | | | | | | | | | |
| Flounders: | | | | | | | | | | | | | | |
| Fresh | 1,349,103 | 51,731 | 7,500 | $150 | 13,000 | $590 | 51,000 | 1,275 | 135,150 | 6,391 | | | 2,182,158 | 83,826 |
| Salted | | | | | | | 9,500 | 475 | | | | | | |
| Hake: | | | | | | | | | | | | | | |
| Fresh | 17,322 | 571 | | | | | | | 3,300 | 107 | | | | |
| Salted | | | | | | | | | | | | | 24,000 | 960 |
| Hardhead | | | | | | | | | | | 42,237 | 2,122 | | |
| Herring: | | | | | | | | | | | | | | |
| Fresh | | | 210,000 | 1,390 | | | 1,000 | 20 | | | | | | |
| Salted | | | 50,000 | 1,000 | | | | | | | | | | |
| Jewfish: | | | | | | | | | | | | | | |
| Fresh | 20,890 | 414 | | | | | 300 | 10 | 4,200 | 84 | | | 87,071 | 1,271 |
| Salted | | | | | | | | | | | | | 138,000 | 5,020 |
| Kingfish | 335,255 | 8,904 | | | | | 38,350 | 958 | 18,500 | 370 | | | 2,156 | 50 |
| "Lingcod:" Fresh | | | | | 1,000 | 40 | 103,000 | 2,060 | | | | | | |
| Mackerel: | | | | | | | | | | | | | | |
| Fresh | 174,481 | 5,031 | | | | | | | 63,500 | 1,270 | | | 10,805 | 216 |
| Salted | | | | | | | | | | | | | 6,450 | 259 |
| Mullet | | | | | | | | | 3,000 | 300 | | | | |
| Perch | 44,268 | 1,014 | 97,500 | 1,965 | | | 6,000 | 300 | 5,500 | 165 | | | 217 | 5 |
| Pike, Sacramento | | | | | | | | | | | 4,887 | 171 | | |
| Pompano | 15,690 | 1,568 | | | | | | | 850 | 85 | | | 229 | 27 |
| Rock bass: | | | | | | | | | | | | | | |
| Fresh | 258,334 | 10,331 | | | | | | | 143,500 | 3,587 | | | 489,450 | 10,032 |
| Salted | | | | | | | | | | | | | 2,750 | 97 |
| Rockfishes: Fresh | 690,131 | 21,882 | 3,000 | 125 | 35,000 | 1,750 | 1,306,816 | 41,818 | 141,280 | 4,235 | | | 734,464 | 16,703 |
| Sablefish | | | | | | | 17,560 | 878 | | | | | | |
| Salmon: | | | | | | | | | | | | | | |
| Chinook— | | | | | | | | | | | | | | |
| Fresh | 66,000 | 3,330 | 6,900 | 330 | 80,500 | 4,190 | 1,694,660 | 67,786 | | | 214,346 | 12,441 | | |
| Salted | | | | | 20,000 | 2,400 | | | | | | | | |
| Chum | 38,093 | 190 | | | | | | | | | | | | |
| Silver | 12,330 | 370 | | | 26,500 | 1,060 | 70,000 | 2,800 | | | | | | |
| Sardines: | | | | | | | | | | | | | | |
| Fresh | 305,150 | 6,103 | | | | | 4,006,200 | 20,031 | 22,500 | 225 | | | | |
| Salted | | | 1,400 | 80 | | | | | | | | | | |
| Sculpin | 6,613 | 263 | | | | | | | 1,850 | 75 | | | | |
| Sea bass | 446,064 | 16,953 | 70,500 | 3,500 | | | 13,360 | 547 | 35,200 | 1,735 | | | 261,703 | 8,351 |
| Sea trout | 464 | 23 | | | | | | | 3,500 | 105 | | | 119 | 5 |
| Shad: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | 16,826 | 313 | | |
| Salted | | | | | | | | | | | 10,000 | 125 | | |
| Roe | | | | | | | | | | | 2,940 | 287 | | |
| Sharks | 2,500 | 50 | | | | | | | | | | | | |
| Skates | 6,000 | 120 | | | | | | | | | | | | |
| Smelts | 97,737 | 4,168 | 78,600 | 3,900 | | | 5,314 | 425 | 226,000 | 11,300 | | | 115,707 | 5,597 |
| Sole | 19,692 | 591 | 50 | 2 | | | | | | | | | 679 | 19 |
| Spanish mackerel | 295,571 | 9,348 | | | | | | | | | | | 60,034 | 1,381 |
| Split-tail | | | | | | | | | | | 15,475 | 328 | | |
| Striped bass | | | 26,900 | 2,165 | | | | | | | 34,354 | 2,839 | | |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

| PRODUCTS—continued. | Los Angeles. | | Marin. | | Mendocino. | | Monterey. | | Orange. | | Sacramento. | | San Diego. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Sturgeon | | | | | | | | | | | 620 | $49 | | |
| Surf fish | | | 68,500 | $4,795 | | | | | | | | | | |
| Yellowtail: | | | | | | | | | | | | | | |
| Fresh | 679,868 | $18,876 | | | | | | | 73,500 | $2,205 | | | 337,898 | $4,954 |
| Salted | | | | | | | | | | | | | 124,500 | 4,743 |
| Miscellaneous fishes | 1,972 | 42 | 5,300 | 225 | | | | | | | 635 | 15 | 496 | 8 |
| Abalone: | | | | | | | | | | | | | | |
| Alive | | | | | 3,035 | $97 | | | | | | | | |
| Meat | | | 4,550 | 158 | 3,000 | 185 | 547,424 | $10,939 | | | | | 57,000 | 3,168 |
| Shells | | | 2,000 | 450 | | | | | | | | | 72,000 | 1,440 |
| Pearls and blisters | | | | 40 | | | | | | | | | | |
| Clams: | | | | | | | | | | | | | | |
| Hard | 296 | 104 | 26,416 | 7,070 | | | 96 | 25 | 800 | 260 | | | | |
| Soft | | | 11,880 | 4,422 | | | | | | | | | | |
| Mussels | 4,820 | 578 | 120 | 8 | 3,500 | 200 | 1,810 | 110 | | | | | | |
| Oysters: | | | | | | | | | | | | | | |
| Eastern, market | | | 14,840 | 8,814 | | | | | | | | | | |
| Native, market | | | 8,435 | 6,513 | | | | | | | | | | |
| Squid | 21,325 | 426 | | | | | 6,140,000 | 30,700 | | | | | | |
| Crabs | | | 168,600 | 16,494 | | | 17,210 | 129 | | | | | | |
| Spiney lobsters | 201,094 | 20,415 | | | | | | | 16,100 | 2,093 | | | 500,313 | 84,726 |
| Turtles | 184 | 9 | | | | | | | | | | | | |
| Kelp | 3,000,000 | 1,500 | | | | | | | | | | | 20,000,000 | 1,000 |
| Other seaweeds | | | | | | | 3,799 | 190 | | | | | | |
| Total | 27,420,247 | 515,863 | 862,991 | 63,596 | 185,535 | 10,512 | 14,085,399 | 183,806 | 988,980 | 38,702 | 477,167 | 23,132 | 12,652,996 | 343,919 |

| PERSONS ENGAGED. | San Francisco. | | San Joaquin. | | San Luis Obispo. | | San Mateo. | | Santa Barbara. | | Santa Cruz. | | Shasta. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | 392 | | | | | | | | | | 4 | | | |
| On vessels transporting | 9 | | | | | | | | 2 | | | | | |
| In shore fisheries | 552 | | 137 | | 54 | | 8 | | 74 | | 55 | | 20 | |
| On shore, in canneries, etc | 261 | | 29 | | | | 32 | | 8 | | 6 | | | |
| Total | 1,214 | | 166 | | 54 | | 40 | | 84 | | 65 | | 20 | |

| INVESTMENT. | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vessels fishing | 19 | $223,625 | | | | | | | | | 1 | $6,000 | | |
| Tonnage | 2,721 | | | | | | | | | | 11 | | | |
| Outfit | | 36,050 | | | | | | | | | | 1,500 | | |
| Vessels transporting | 5 | 19,500 | | | | | | | 1 | $2,000 | | | | |
| Tonnage | 68 | | | | | | | | 6 | | | | | |
| Outfit | | 1,525 | | | | | | | | 100 | | | | |
| Boats: | | | | | | | | | | | | | | |
| Gasoline | 290 | 259,710 | 57 | $25,825 | 5 | $1,400 | 3 | $2,275 | 14 | 17,400 | 45 | 37,775 | | |
| Sail, row, etc | 105 | 8,805 | 60 | 5,950 | 4 | 200 | | | 31 | 1,295 | 8 | 245 | 6 | $110 |
| Apparatus, vessel fisheries: | | | | | | | | | | | | | | |
| Lines | | 775 | | | | | | | | | | | | |
| Paranzella nets | 6 | 2,250 | | | | | | | | | 1 | 400 | | |
| Apparatus, shore fisheries: | | | | | | | | | | | | | | |
| Seines | 21 | 2,025 | 12 | 1,335 | | | 1 | 5 | | | | | 3 | 350 |
| Length in yards | 1,075 | | 1,575 | | | | 5 | | | | | | 420 | |
| Gill nets | 271 | 54,450 | 130 | 25,120 | 28 | 1,072 | | | 156 | 5,004 | 180 | 5,000 | | |
| Length in yards | 38,300 | | 41,550 | | 2,144 | | | | 10,018 | | 14,400 | | | |
| Hoop nets | 3,800 | 11,400 | | | | | 20 | 60 | | | | | | |
| Pots and traps | | | | | | | | | 1,310 | 2,720 | 12 | 60 | | |
| Lines | | 2,300 | | | | 75 | | 4 | | 20 | | 460 | | |
| Dredges, tongs, hoes, etc | | 776 | | | | 52 | | 3 | | | | | | 3 |
| Lampara nets | 6 | 2,700 | | | | | | | | | | | | |
| Paranzella nets | | | | | | | | | | | 4 | 1,300 | | |
| Trammel nets | | | | | | | | | 85 | 2,125 | | | | |
| Length in yards | | | | | | | | | 2,800 | | | | | |
| Bag nets | 70 | 2,000 | | | | | | | | | | | | |
| Fyke nets | | | 1,900 | 16,585 | | | | | | | | | | |
| Abalone outfit | | | | | | | | | | | | 20 | | |
| Shore and accessory property | | 499,450 | | 29,875 | | 300 | | 58,632 | | 10,950 | | 11,015 | | 500 |
| Cash capital | | 57,000 | | 8,300 | | | | 5,000 | | 5,000 | | 7,500 | | |
| **Total** | | 184,341 | | 112,990 | | 3,099 | | 65,979 | | 46,614 | | 71,275 | | 963 |
| **PRODUCTS.** | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Anchovies: Fresh | 68,800 | $1,600 | | | | | | | | | | | | |
| Barracuda: Fresh | 5,000 | 200 | | | 3,000 | $120 | | | 162,000 | $6,210 | 5,780 | $231 | | |
| Bonito | | | | | | | | | 30,000 | 870 | | | | |
| Carp | 120,000 | 2,400 | 63,286 | $1,474 | | | | | | | | | | |
| Catfish | | | 328,787 | 16,338 | | | | | | | | | | |
| Cod, salted | 4,952,692 | 161,695 | | | | | | | | | | | | |
| Flounders: Fresh | 2,227,919 | 37,217 | | | | | | | 115,500 | 3,855 | 746,935 | 21,596 | | |
| Hake: Fresh | 160,350 | 704 | | | | | | | 6,650 | 219 | 33,630 | 336 | | |
| Hardhead | | | 4,674 | 146 | | | | | | | | | | |
| Herring: Fresh | 500,000 | 5,000 | | | | | | | | | 890 | 19 | | |
| Jewfish: Fresh | | | | | | | | | 4,000 | 80 | | | | |
| Kingfish | 91,785 | 2,057 | | | | | | | 2,000 | 40 | 162,457 | 4,873 | | |
| "Lingcod:" | | | | | | | | | | | | | | |
| Fresh | 340,151 | 8,721 | | | | | | | | | 121,400 | 3,642 | | |
| Salted | | | | | | | | | | | 3,500 | 175 | | |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

| PRODUCTS—continued. | San Francisco. | | San Joaquin. | | San Luis Obispo. | | San Mateo. | | Santa Barbara. | | Santa Cruz. | | Shasta. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Mackerel: Fresh | | | | | | | | | 5,000 | $145 | 113 | $6 | | |
| Perch | 16,450 | $1,250 | | | | | | | 1,000 | 20 | 6,000 | 300 | | |
| Pike, Sacramento | | | 4,960 | $129 | | | | | | | | | | |
| Pompano | 1,894 | 284 | | | | | | | | | 687 | 68 | | |
| Rock bass: Fresh | | | | | | | | | 4,000 | 160 | | | | |
| Rockfishes: | | | | | | | | | | | | | | |
| Fresh | 852,300 | 40,519 | | | 85,000 | $3,400 | 18,000 | $550 | 24,000 | 768 | 388,278 | 11,649 | | |
| Salted | | | | | | | | | | | 8,000 | 400 | | |
| Sablefish | 39,920 | 130 | | | | | | | | | 7,023 | 351 | | |
| Salmon: | | | | | | | | | | | | | | |
| Chinook, Fresh | 136,000 | 7,500 | 200,409 | 10,390 | | | | | | | 119,592 | 4,783 | 19,750 | $1,147 |
| Silver | | | | | | | | | | | 29,897 | 1,195 | | |
| Sardines: Fresh | 30,925 | 1,052 | | | | | | | 1,000 | 20 | 21,931 | 220 | | |
| Sculpin | | | | | | | | | | | 350 | 7 | | |
| Sea bass | 256,325 | 12,871 | 1,250 | 50 | | | | | 50,000 | 1,900 | 86,860 | 3,474 | | |
| Sea trout | | | | | | | | | 2,000 | 80 | | | | |
| Shad: | | | | | | | | | | | | | | |
| Fresh | 1,600,000 | 9,000 | 636,820 | 8,047 | | | | | | | 478 | 24 | | |
| Roe | | | 17,898 | 1,619 | | | | | | | | | | |
| Sharks | 472 | 23 | | | | | | | | | | | | |
| Skates | 164,050 | 672 | | | | | | | | | 7,600 | 76 | | |
| Smelts | 374,000 | 15,295 | | | 75,000 | 3,750 | 1,500 | 60 | 16,325 | 865 | 30,000 | 1,200 | | |
| Sole | 3,848,908 | 55,327 | | | | | | | | | 1,892,600 | 52,315 | | |
| Spanish mackerel | | | | | | | | | 41,300 | 826 | | | | |
| Splittail | | | 1,466 | 55 | | | | | | | | | | |
| Striped bass | 283,000 | 24,000 | 69,646 | 5,898 | | | | | | | 350 | 17 | 1,247 | 142 |
| Sturgeon | | | 59 | 5 | | | | | | | | | | |
| Sturgeon roe | | | 22 | 11 | | | | | | | | | | |
| Tomcod | 33,112 | 587 | | | | | | | | | 8,800 | 352 | | |
| Whitebait | 56,250 | 2,250 | | | | | | | | | | | | |
| Yellowtail: Fresh | | | | | | | | | 3,150 | 88 | | | | |
| Miscellaneous fishes | 6,000 | 150 | 1,375 | 70 | | | | | | | | | | |
| Abalone: Alive | | | | | | | | | | | 20,991 | 420 | | |
| Clams: | | | | | | | | | | | | | | |
| Hard | | | | | 34,856 | 9,150 | | | | | 1,032 | 272 | | |
| Soft | 23,000 | 5,300 | | | | | 2,200 | 700 | | | | | | |
| Mussels | 6,000 | 1,200 | | | | | | | | | 210 | 15 | | |
| Oysters: Eastern, market | 360,892 | 156,745 | | | | | | | | | | | | |
| Octopus | 18,909 | 1,573 | | | | | | | | | 13,400 | 1,144 | | |
| Squid | 50,000 | 1,500 | | | | | | | | | | | | |
| Crabs | 934,985 | 91,972 | | | | | 4,800 | 600 | | | 233,473 | 15,917 | | |
| Spiney lobsters | | | | | | | | | 158,300 | 20,729 | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shrimp | 35,000 | 700 | | | | | | | | | | | | |
| Turtles | | | 22 | 4 | | | | | | | | | | |
| Sea lion | | | | | | | | | | | | | | |
| Cod tongues | 7,400 | 370 | | | | | | | 9,375 | 4,120 | | | | |
| Other seaweeds | | | | | | | | | 3,000 | 135 | | | | |
| Total | 17,602,489 | 649,864 | 1,330,674 | 44,236 | 197,856 | 16,420 | 26,500 | 1,910 | 638,600 | 41,130 | 3,952,257 | 125,077 | 20,997 | 1,289 |

| | Solano. | | Sonoma. | | Sutter. | | Tehama. | | Ventura. | | Yolo. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERSONS ENGAGED. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| On vessels fishing | | | | | | | | | 4 | | | | 551 | |
| On vessels transporting | 5 | | | | | | | | | | | | 35 | |
| In shore fisheries | 384 | | 35 | | 20 | | 110 | | 10 | | 92 | | 4,282 | |
| On shore, in canneries, etc | 39 | | | | | | 39 | | | | 4 | | 3,584 | |
| Total | 428 | | 35 | | 20 | | 149 | | 14 | | 96 | | 8,452 | |
| INVESTMENT. | | | | | | | | | | | | | | |
| Vessels fishing | | | | | | | | | 2 | $4,500 | | | 73 | $354,375 |
| Tonnage | | | | | | | | | 11 | | | | 3,198 | |
| Outfit | | | | | | | | | | 300 | | | | 52,791 |
| Vessels transporting | 3 | $10,700 | | | | | | | | | | | 20 | 72,000 |
| Tonnage | 20 | | | | | | | | | | | | 330 | |
| Outfit | | 1,485 | | | | | | | | | | | | 5,510 |
| Boats: | | | | | | | | | | | | | | |
| Gasoline | 110 | 61,200 | 8 | $5,475 | 5 | $1,200 | | | | | 38 | $8,000 | 1,429 | 1,351,110 |
| Sail, row, etc | 163 | 28,500 | 12 | 275 | 8 | 180 | 24 | $545 | 5 | 250 | 32 | 3,745 | 1,169 | 104,816 |
| Apparatus, vessel fisheries: | | | | | | | | | | | | | | |
| Seines | | | | | | | 1 | 150 | | | | | 7 | 8,550 |
| Length in yards | | | | | | | 100 | | | | | | 3,700 | |
| Gill nets | | | | | | | | | | | | | 153 | |
| Length in yards | | | | | | | | | | | | | 10,600 | 4,255 |
| Pots | | | | | | | | | 40 | 80 | | | 120 | 280 |
| Lines | | | | | | | | | | 20 | | | | 1,562 |
| Lampara nets | | | | | | | | | | | | | 1 | 400 |
| Paranzella nets | | | | | | | | | | | | | 8 | 2,900 |
| Trammel nets | | | | | | | | | | | | | 125 | 3,075 |
| Length in yards | | | | | | | | | | | | | 10,000 | |
| Apparatus, shore fisheries: | | | | | | | | | | | | | | |
| Seines | | | 1 | 200 | 3 | 375 | 22 | 2,925 | 2 | 300 | 3 | 350 | 147 | 19,485 |
| Length in yards | | | 150 | | 450 | | 3,235 | | 200 | | 435 | | 21,195 | |
| Gill nets | 259 | 82,450 | 6 | 1,800 | 12 | 1,500 | 2 | 225 | | | 60 | 6,250 | 950 | 413,591 |
| Length in yards | 39,200 | | 3,000 | | 2,040 | | 300 | | | | 11,080 | | 799,552 | |
| Beam trawls | | | | | | | | | | | | | 9 | 400 |
| Hoop nets | | | 65 | 115 | | | | | | | | | 4,860 | 13,585 |
| Dip nets | | | 6 | 14 | | | | | | | | | 11 | 64 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

| | Solano. | | Sonoma. | | Sutter. | | Tehama. | | Ventura. | | Yolo. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INVESTMENT—continued. | | | | | | | | | | | | | | |
| Apparatus, shore fisheries—Contd. | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Pots and traps | | | | | | | | | 130 | $260 | | | 4,187 | $9,157 |
| Lines | | | | $255 | | | | | | 50 | | | | 10,849 |
| Dredges, tongs, hoes, etc | | | | 11 | | | | | | | | | | 1,170 |
| Lampara nets | | | | | | | | | | | | | | 29,100 |
| Paranzella nets | | | | | | | | | | | | | 64 | 6,100 |
| Trammel nets | | | | | | | | | | | | | 36 | 56,325 |
| Length in yards | | | | | | | | | 8 | 200 | | | 2,195 | |
| Bag nets | | | | | | | | | 640 | | | | 126,600 | 2,000 |
| Fyke nets | | | | | | | | | | | | | 70 | 21,640 |
| Abalone outfit | | | | | 50 | $350 | | | | | 220 | $1,650 | 2,485 | 2,460 |
| Shore and accessory property | | $60,625 | | 2 | | | | | | | | | | 2,731,390 |
| Cash capital | | 10,000 | | 585 | | 200 | | $3,170 | | | | 5,450 | | 545,327 |
| | | | | | | | | | | | | 3,500 | | |
| Total | | 254,960 | | 8,732 | | 3,805 | | 6,865 | | 6,610 | | 28,945 | | 5,824,263 |
| PRODUCTS. | | | | | | | | | | | | | | |
| Albacore (or tuna): | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Fresh | | | | | | | | | 20,000 | 300 | | | 21,024,190 | $315,622 |
| Salted | | | | | | | | | | | | | 25,000 | 481 |
| Anchovies: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 81,385 | 1,730 |
| Salted | | | | | | | | | | | | | 16,000 | 1,600 |
| Barracuda: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 3,262,646 | 111,690 |
| Salted | | | | | | | | | | | | | 330,000 | 13,180 |
| Bonito | | | | | | | | | | | | | 448,256 | 12,622 |
| Carp | | | | | 11,802 | $131 | | | | | 12,726 | $197 | 350,815 | 6,366 |
| Catfish | | | | | 49,346 | 2,021 | 275 | $11 | | | 40,300 | 1,777 | 517,054 | 24,299 |
| Cod, salted | | | | | | | | | | | | | 4,952,692 | 161,695 |
| Croaker | | | | | | | | | | | | | 3,150 | 65 |
| Flounders: | | | | | | | | | | | | | | |
| Fresh | | | 1,500 | $60 | | | | | 11,250 | $354 | | | 6,914,063 | 209,291 |
| Salted | | | | | | | | | | | | | 9,500 | 475 |
| Hake: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 221,252 | 1,937 |
| Salted | | | | | | | | | | | | | 24,000 | 960 |
| Hardhead | | | | | 1,724 | 126 | | | | | 24,788 | 1,228 | 73,423 | 3,622 |
| Herring: | | | | | | | | | | | | | | |
| Fresh | | | 20,006 | 150 | | | | | | | | | 764,384 | 7,116 |
| Salted | | | | | | | | | | | | | 50,000 | 1,000 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jewfish: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 116,461 | 1,859 |
| Salted | | | | | | | | | | | | | 138,000 | 5,020 |
| Kingfish | | | | | | | | | 5,500 | 110 | | | 656,003 | 17,362 |
| "Lingcod:" | | | | | | | | | | | | | | |
| Fresh | | | 2,700 | 120 | | | | | | | | | 570,860 | 14,687 |
| Salted | | | | | | | | | | | | | 3,500 | 175 |
| Mackerel: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 253,899 | 6,668 |
| Salted | | | | | | | | | | | | | 6,450 | 259 |
| Mullet | | | | | | | | | | | | | 3,000 | 300 |
| Perch | | | 10,000 | 300 | | | | | 850 | 18 | | | 216,785 | 6,327 |
| Pike, Sacramento | 25 | $1 | | | 523 | 19 | | | | | 489 | 19 | 15,884 | 449 |
| Pompano | | | | | | | | | | | | | 19,350 | 2,032 |
| Rock bass: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 895,284 | 24,110 |
| Salted | | | | | | | | | | | | | 2,750 | 97 |
| Rockfishes: | | | | | | | | | | | | | | |
| Fresh | | | 22,000 | 1,110 | | | | | 19,080 | 730 | | | 4,336,254 | 145,816 |
| Salted | | | | | | | | | | | | | 8,000 | 400 |
| Sablefish | | | | | | | | | | | | | 64,503 | 1,359 |
| Salmon: | | | | | | | | | | | | | | |
| Chinook— | | | | | | | | | | | | | | |
| Fresh | 1,179,244 | 60,524 | 18,000 | 560 | 3,071 | 173 | 185,760 | 13,165 | | | 88,560 | 4,760 | 7,283,933 | 338,549 |
| Salted | | | | | | | | | | | | | 20,000 | 2,400 |
| Chum | | | | | | | | | | | | | 38,053 | 190 |
| Silver | | | | | | | | | | | | | 415,191 | 12,459 |
| Steelhead trout | | | | | | | | | | | | | 32,405 | 1,288 |
| Sardines: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 4,387,706 | 27,651 |
| Salted | | | | | | | | | | | | | 1,400 | 80 |
| Sculpin | | | | | | | | | | | | | 8,813 | 345 |
| Sea bass | | | | | | | | | | | | | 1,221,262 | 49,381 |
| Sea trout | | | | | | | | | | | | | 6,083 | 213 |
| Shad: | | | | | | | | | | | | | | |
| Fresh | 176,827 | 2,650 | | | 1,245 | 36 | 210 | 4 | | | 64,962 | 1,108 | 6,846,008 | 66,982 |
| Salted | | | | | | | | | | | | | 10,000 | 125 |
| Roe | | | | | 61 | 6 | | | | | 4,634 | 434 | 27,033 | 2,491 |
| Sharks | | | | | | | | | | | | | 67,972 | 236 |
| Skates | | | | | | | | | | | | | 177,650 | 868 |
| Smelts | | | | | | | | | 33,500 | 1,775 | | | 1,137,072 | 52,978 |
| Sole | | | | | | | | | | | | | 5,761,929 | 108,254 |
| Spanish mackerel | | | | | | | | | | | | | 396,905 | 11,555 |
| Split-tail | | | | | 75 | 1 | | | | | | | 17,016 | 384 |
| Stingray | | | | | | | | | | | | | 605,000 | 1,512 |
| Striped bass | 208,544 | 17,787 | 3,250 | 260 | 5,744 | 407 | 539 | 38 | | | 12,911 | 911 | 1,784,448 | 146,928 |
| Sturgeon | 2,367 | 181 | | | | | 55 | 3 | | | 183 | 14 | 16,924 | 987 |
| Sturgeon roe | 427 | 250 | | | | | | | | | | | 1,275 | 708 |
| Surf fish | | | 39,000 | 1,860 | | | | | | | | | 127,500 | 7,255 |
| Tomcod | | | | | | | | | | | | | 41,912 | 939 |
| Whitebait | | | | | | | | | | | | | 56,250 | 2,250 |

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

| | Solano. | | Sonoma. | | Sutter. | | Tehama. | | Ventura. | | Yolo. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTS—continued. | | | | | | | | | | | | | | |
| | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* | *Number.* | *Value.* |
| Yellowtail: | | | | | | | | | | | | | | |
| Fresh | | | | | | | | | | | | | 1,094,416 | $26,123 |
| Salted | | | | | | | | | | | | | 124,500 | 4,743 |
| Miscellaneous fishes | | | | | 54 | $1 | | | | | | | 17,232 | 539 |
| Abalone: | | | | | | | | | | | | | | |
| Alive | | | | | | | | | | | | | 24,026 | 517 |
| Meat | | | 119,000 | $2,380 | | | | | | | | | 730,974 | 16,830 |
| Shells | | | | | | | | | | | | | 74,000 | 1,890 |
| Pearls and blisters | | | | 1,200 | | | | | | | | | | 1,240 |
| Clams: | | | | | | | | | | | | | | |
| Hard | | | 600 | 275 | | | | | | | | | 65,856 | 17,583 |
| Soft | | | 2,550 | 485 | | | | | | | | | 67,160 | 18,107 |
| Mussels | | | | | | | | | | | | | 19,240 | 2,326 |
| Oysters: | | | | | | | | | | | | | | |
| Eastern, market | | | | | | | | | | | | | 375,774 | 165,573 |
| Native, market | | | | | | | | | | | | | 8,435 | 6,513 |
| Octopus | | | | | | | | | | | | | 32,309 | 2,717 |
| Squid | | | | | | | | | | | | | 6,211,325 | 32,626 |
| Crabs | | | 4,000 | 300 | | | | | | | | | 1,414,155 | 128,434 |
| Crawfish | | | 550 | 265 | | | | | | | | | 550 | 265 |
| Spiney lobsters | | | | | | | | | 16,585 | $2,156 | | | 892,392 | 130,119 |
| Shrimp | | | | | | | | | | | | | 298,000 | 5,550 |
| Turtles | | | | | | | | | | | | | 206 | 13 |
| Sea lion | | | | | | | | | | | | | 9,375 | 4,120 |
| Cod tongues | | | | | | | | | | | | | 7,400 | 370 |
| Kelp | | | | | | | | | | | | | 5,000,000 | 2,500 |
| Other seaweed | | | | | | | | | | | | | 6,799 | 325 |
| Total | 1,567,434 | $81,393 | 243,150 | 9,325 | 73,645 | 2,921 | 186,839 | $13,221 | 106,765 | 5,443 | 249,553 | $10,448 | 93,338,703 | 2,506,702 |

PRODUCTS BY APPARATUS.

Many different forms of apparatus are used in the fisheries of California. Some of these, introduced by Italians, are similar to those used by them in their native country. Among these may be mentioned the paranzella net and lampara net, with which large catches are made. The different forms of apparatus will be described briefly in the order of their importance, based on the value of the catch. While pound nets rank as one of the important forms of apparatus used in the fisheries of Washington and Oregon, none was used in California in either 1915 or 1904.

*Lines.*—Lines rank first both in the quantity and value of the catch which, in 1915, amounted to 34,872,139 pounds, with a value to the fishermen of $681,825. Of this output 28,431,372 pounds were taken in the shore, and the remainder in the vessel, fisheries. As compared with the last canvass by this Bureau for 1904, there is shown an increase of nearly 235 per cent in quantity and 149 per cent in value. This extraordinary increase may be traced mainly to the development of the albacore, or tuna, canning industry, which was in its infancy in 1904. A noticeable increase is also shown in the output of rockfishes and chinook salmon. The albacore fishery is confined almost exclusively to Los Angeles and San Diego Counties, the former furnishing more than 82 per cent of the State's catch. The line fisheries of Monterey County are of noticeable importance and are divided between the hand-line or trolling fishery for chinook salmon and the trawl-line fishery for rockfishes. Most of the other species are taken incidentally along with the two just named. Trolling for chinook salmon in Monterey Bay has developed into an important industry within recent years. Power boats are commonly used in this fishery. Two poles, one a little longer than the other, are generally set in sockets on each side of the boat, while two lines are set from the stern. As the boat moves slowly forward these lines are put out and in the above positions are clear of each other. To the other end of each pole is suspended a small tin can with a few pebbles in it. When a fish is hooked its struggles cause the pebbles in the can to rattle, and the fisherman then takes in the pole and pulls the fish in hand over hand.

The trolling in Santa Cruz and Mendocino Counties also is worthy of mention. The trolling, as well as most of the other fishing from these two counties, is followed from Santa Cruz and Fort Bragg, respectively.

*Gill nets.*—Gill nets rank next to lines in the value of their catch, the latter in 1915 amounting to 21,317,668 pounds, valued at $676,062, credited mostly to the shore fisheries. As compared with 1904, an increase of 4,280,643 pounds in quantity and $54,974 in value is shown, the increase in quantity being traced mainly to the shad fishery of the Sacramento River. This species, however, did not give a proportionately increased value to the fisheries. There was a decided decline in the catch of chinook salmon with gill nets, but this was made up by increased catches of other species. Notwithstanding its decline, chinook salmon was still the most valuable species taken with gill nets in California, followed in importance by the striped bass, barracuda, shad, sea bass, and smelt. About 32 species were taken with this apparatus, but those already mentioned

constituted the bulk of the catch. The Sacramento River, together with San Pablo and Suisun Bays, furnished the bulk of the gill-net catch of the State. While drift gill nets were used in a small way as far up the Sacramento River as Corning, Tehama County, they ceased to be important as an apparatus above Verona in Sutter County. The length of drift gill nets varies from those measuring 170 yards each, used for chinook salmon along the upper portion of the river, to those measuring 450 yards each, used for shad near the mouth of the river. The nets used for chinook salmon and striped bass near the mouth of the river average about 385 and 420 yards, respectively. In Suisun and San Pablo Bays, nets as long as 800 yards are used for striped bass, shad, and chinook salmon. Those for chinook salmon are from 40 to 45 meshes deep; those for striped bass from 30 to 65 meshes, and those for shad from 60 to 65 meshes. The size of mesh varies in the salmon net from 7½ inches to 9¾ inches; in the striped-bass net it is commonly about 5½ inches; and in the shad net from 5½ to 6½ inches, but more often of the latter size.

The bulk of the gill netting credited to Del Monte County was done in the Klamath River, from its mouth to a point 6 miles above. A cannery at Requa utilizes most of the catch. The chinook salmon run from March 1 to September 1, with a few in October, while the silver salmon run from September 20 to the last week in October. The nets on this river average 200 yards in length and 30 to 35 meshes deep. The mesh varies from 6½ to 9 inches, but more of the smaller size are used.

Gill nets constitute the most valuable apparatus used in Humboldt County, a very large percentage of the catch being taken with them. The Eel River is the only stream of any importance in the county. Practically all of the fishing in this river is done between the mouth and 3½ miles above. The drift gill nets used on the river average about 150 yards in length, and from 28 to 32 meshes deep. The mesh for chinook is 9½ to 9¾ inches, while that for silver salmon and steelhead is 6½ inches. The fishing is done from October 7 to December 7. The same fishermen in some instances fish in both the Klamath and Eel Rivers.

*Paranzella nets.*—Paranzella or trawl nets are used both in the vessel and shore fisheries of California, but the catch in the former is much more important. The fishing is confined to the Pacific Ocean from San Francisco, Santa Cruz, and Los Angeles Counties, that from the first-named county being much the more important. In 1915 the total catch amounted to 9,707,373 pounds, valued at $193,368, as compared with 5,637,561 pounds, valued at $104,602, in 1904. Many species are taken, but sole and flounders constitute more than 90 per cent of the catch.

The paranzella, a somewhat primitive style of net, was introduced in California by Italian fishermen in 1877. It consists of a flat, triangular bag of webbing, doubtless developed from a beach seine or bag net, with a wide but low mouth. The net rapidly narrows from the wide mouth to the cod end of the bag, which is so arranged that it can be unlaced to discharge the catch when it is hoisted aboard the boat. The nets are constructed of heavy cotton twine. The forward part of the bag is of about 4-inch mesh, the middle part still smaller, and the cod end of much heavier twine,

has a 1½-inch mesh. The mouth of the net when fishing has a spread of about 50 feet.

When the nets were first introduced they were operated with small sailboats, were necessarily of small dimensions, and dragged within San Francisco Bay and in the shallow water alongshore just outside the harbor. Later, or about 1888, steam tugs, with larger nets were employed, and the San Francisco paranzella fishery was soon in the hands of a few companies, constituting the principal wholesale fish dealers of the city.

In fishing a paranzella the steamers work in pairs and follow parallel courses about one-half mile apart, each towing one end of the net. Occasionally two nets were towed by three steamers, the center one towing an end of two nets. The drags are made either with or against the current; otherwise the net would drift sidewise and not fish properly. Two drags are usually made each day, frequently only one, the duration of a drag being 1½ to 2 hours. A crew of 4 or 5 men is carried on one of the steamers, and from 10 to 14 on the other, the latter being the one on which the net is lifted. When a drag is completed the net is hauled in by steam winches and lifted aboard by means of a derrick. Frequently the weight of the fish is so great that some of them have to be removed with a long-handled dip net before the net is lifted aboard, to prevent tearing it. Several extra nets are always carried aboard the boat.

The fishing is practically all done outside the 3-mile limit and in from 25 to 55 fathoms of water. Of the two grounds most resorted to by San Francisco vessels one lies 4 to 8 miles southwest of Point Rizes and the other about 8 miles south of the lightship off the entrance to San Francisco Harbor. The catches are not so large during the winter, the supposition being that the fish have moved out into deeper water during the period of rough weather.

While steamers are used almost entirely from San Francisco, in Santa Cruz and Los Angeles Counties only gasoline boats are used.

*Trammel nets.*—The catch with trammel nets in 1915 amounted to 3,510,154 pounds, valued at $134,766, showing a decline in quantity since 1904 of 261,357 pounds, but an increase in value of $59,301. The catch was made up of flounders, barracuda, and perch, but flounders comprised 88 per cent of the total. The use of these nets is confined mainly to the counties in southern California, San Diego County furnishing the largest quantity. The fishing is all done in the Pacific Ocean, nearly nine-tenths of the catch being credited to the shore fisheries.

The trammel nets used in this State are similar in construction to those in general use elsewhere, consisting of three nets instead of one, as in a gill net. The two outer nets have a 23-inch mesh and hang about 12 feet deep. The inner web has a 9-inch mesh and hangs about 16 feet deep. The two outer nets are of No. 12 cotton twine and the middle one of No. 9. The nets are from 72 to 80 yards long, and about 20 are usually tied together and fished as one net. They are set at right angles but not immediately adjoining the shore. An anchor weighing 25 pounds and a buoy, usually a 4-gallon keg, are placed at each end of the net. The lead line, weighted with about 25 pounds of lead, rests on the bottom. The nets are set either during the day or night and ordinarily remain out about 24 hours before lifting. They are commonly set a short distance from shore in from

12 to 15 fathoms of water, but occasionally they are set as far out as 4 or 5 miles in 25 fathoms. The fishing is done at almost any time during the year.

*Pots and traps.*—The catch with pots and traps in 1915 amounted to 909,426 pounds, having a value to the fishermen of $131,111. More than 98 per cent of the output was spiny lobsters, the remainder consisting of a few perch, rock bass, sea bass, and octopi. The use of these forms of apparatus is confined to the more southern counties of the State. The lobster pots are set on the kelp beds near the shore, where the lobsters seem to gather for protection during warm weather; but when it gets colder they move into deeper water, and the fishermen follow them with their pots. The pots are made of laths, usually about 3 feet long, 30 to 32 inches wide at the bottom, narrowing to about 12 inches at the top, and about 12 inches high. They are set singly, with a buoy line attached to each pot, in water varying in depth from 3 to 20 fathoms. When fishing in the deeper water it is often necessary to use from 40 to 60 pounds of ballast to a single pot.

*Hoop nets.*—With the exception of a few crawfish taken in a small stream in Sonoma County, the use of hoop nets was confined exclusively to taking crabs, the catch of which in 1915 amounted to 1,157,567 pounds, valued at $111,930, all of which were taken in the shore fisheries. Crabs are taken as far north as Del Monte County, but practically none were taken commercially south of San Francisco, from which place and vicinity most of the fishing was done. The nets are similar to those used in Washington. They are set in the Pacific Ocean, usually within a mile offshore, but a few are set as far as 9 miles out. It is customary to have an interval of 150 yards between the nets. Herring, perch, or shiners are used for bait and are placed in a small, brass-wire cage fastened to the center of the net. The hoops of the net are painted to prevent them from rusting and rotting the twine.

*Lampara nets.*—The total catch with lampara nets in 1915 amounted to 10,989,512 pounds, valued at $106,906, of which squid contributed about 55 per cent and sardines nearly 30 per cent of the weight. The remainder of the catch was made up of 16 other species. Lampara nets were used in San Francisco, Monterey, Los Angeles, and Orange Counties only. This net is said to have originated in Italy and was introduced into California by fishermen from that country. It is constructed somewhat on the principle of a common haul, or beach, seine, except that the lead line is shorter than the cork line, which creates a bag or bunt in the back of the net for the collection of the fish. The average length of this net is about 120 yards and the depth 35 to 50 feet. The bag, which is about 100 feet long, is made of No. 20–6 cable-laid twine, and the remainder of No. 6 cotton thread. The bunt has a 1-inch mesh, the next 50 feet of the net have a 4-inch mesh, the next 120 feet an 8-inch mesh, and the remainder an 18-inch mesh. A line, 15 fathoms long, of No. 15 manila rope, is attached to each end of the net. The twine used, the size of mesh, and also the manner of construction differ according to the individual ideas of the fishermen.

A lampara net is always hauled into a boat instead of on the beach. The fishing is usually done in shallow water, as it is desired that the lead line be on or close to the bottom. From three to five men,

with one and sometimes two skiffs are necessary to operate the net. When operated with one boat, the method is as follows: When a school of fish is sighted one end of the net, with a buoy and sometimes an anchor attached, is thrown out. The boat is then rowed in a circle around the fish, the net in the meanwhile being let out as the boat moves. When the buoy or starting point is reached an anchor is thrown out from the side of the boat away from the net to prevent the latter from being interfered with by the boat. Some of the men then begin pulling in from the bow and others from the stern of the boat until the bag is alongside, when the fish are dipped out. The net is then overhauled and made ready for another layout. It is sometimes fished from two boats by first dropping the bag of the net overboard, then the boats, each with its share of the net, being rowed in opposite directions, until the boats meet after making a circle. The men in the boats then exchange ends of the net and anchor the boats, after which they begin pulling in, keeping the wings crossed as they pull, until the bag reaches the space between the two boats. It takes at least four men with two boats to haul the net in this manner, which is followed mostly by the Japanese in the lower part of California.

*Seines.*—The output with seines in 1915 amounted to 3,537,965 pounds, with a value to the fishermen of $98,394. Of this amount, 2,968,737 pounds were taken in the shore, and the remainder in the vessel, fisheries. As compared with 1904, there was a decrease of 551,446 pounds in quantity, but an increase of $5,030 in value. Seines were operated in 19 of the 27 counties of the State having fisheries, but sardines taken in the shore fisheries of Monterey County constituted more than 31 per cent of the total seine catch. Chinook salmon taken in the counties bordering on the Sacramento River and smelt taken mainly in the ocean are also worthy of mention. Besides those mentioned, 30 other species were taken with seines. The seines used in the vessel fisheries were mostly purse seines, and averaged about 528 yards each in length, while those in the shore fisheries were mostly haul seines and averaged only 132 yards each in length.

*Fyke nets.*—Fyke nets are fished only in five counties of the State, all located on the Sacramento River and its tributary, the San Joaquin River. The latter river was much the more important of the two. The total catch in 1915 amounted to 598,776 pounds, valued at $26,327, as compared with a catch in 1904 of 541,123 pounds, valued at $15,285, showing an increase both in quantity and value, but especially the latter. In both years the catch consisted mainly of catfish, though small quantities of five other species were taken. The fyke net commonly used has five hoops, the largest being 5 feet and the smallest 2 feet in diameter, the total length of the net being 10 feet. The bait, which in fishing for catfish commonly consists of salt shad, is placed in a small knit bag at the end of the fyke net.

*Abalone outfit.*—The output with abalone outfits in 1915 consisted of 24,026 pounds of live abalone, valued at $517; 730,974 pounds of abalone meat, valued at $16,830; 74,000 pounds of abalone shells valued at $1,890; and $1,240 worth of pearls and blisters, the total quantity amounting to 829,000 pounds, valued at $20,477, as compared with 833,678 pounds, valued at $10,873, in 1904. The tables show a very large decrease in abalone sold alive, but an increase in

abalone meat, as compared with 1904. There has been an increase in abalone shells, but a decrease in pearls sold. Los Angeles supported an abalone industry in 1904, but laws passed since then have practically prohibited a continuation of the industry.

*Kelp harvesters.*—Kelp harvesters were employed in only three counties—Los Angeles, San Diego, and Ventura. The total output of kelp in 1915 amounted to 5,000,000 pounds, having a value of $2,500. No comparison can be made with any previous report, as the industry has developed since the outbreak of the European war, when the importation of potash from Germany ceased.

*Dredges, tongs, rakes, forks, etc.*—These forms of apparatus were employed only in the shore fisheries, the catch consisting of clams, oysters, mussels, turtles, and seaweed. The total value of these products in 1915 amounted to $210,436. As compared with the output of corresponding apparatus used in 1904, there was a decrease of $453,655 in value, this being due mainly to the decline in both the native and eastern oysters.

*Miscellaneous apparatus.*—Under this heading are included beam trawls, spears, dip nets, and nets for catching sea lion. The total catch in 1915 with all of these forms of apparatus combined amounted to 365,125 pounds, with a value of $12,065. The output consisted of chinook salmon, surf fish, shrimp, and sea lion.

The beam trawls are used only in Alameda County, the output consisting entirely of shrimp, taken in San Francisco Bay. The total catch in 1915 amounted to 263,000 pounds, valued at $4,850. The beam trawls are ordinarily used from gasoline launches of about 6 horsepower and are similar in construction to those used in Washington, except that they are smaller. The beam is about 18 feet long, and the iron shoes upon which it rests raise it 18 inches above the bottom. The bag is made of flax twine knit by Chinese. The fishing is commonly done in about 2 fathoms of water.

The use of spears is confined to Shasta County, the catch of chinook salmon with this apparatus being unimportant.

Dip nets are used in Humboldt and Sonoma Counties, the catch in both counties consisting entirely of surf fish. The total output in 1915 amounted to 57,000 pounds, valued at $2,320. The fishing is done entirely in the ocean. The fisherman stands at the edge of the surf and holds his net under it as it is breaking, no boat being used. The net used in Humboldt County, when made to order, costs about $10. It is triangular in shape, two of the sides consisting of wooden strips 8 feet long connected at their outer ends by a string. The netting attached to this frame sags a little below it to hold the fish. A short distance from the point of intersection, and connecting the two strips of the frame, is nailed a short strip, which serves as a handle for the net.

YIELD OF THE VESSEL FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

| Apparatus and species. | Los Angeles. | | San Diego. | | San Francisco. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Seines: | | | | | | |
| Albacore (or tuna) | 25,000 | $375 | | | | |
| Barracuda | 158,700 | 6,045 | | | | |
| Bonito | 18,020 | 515 | | | | |
| Mackerel | 12,010 | 340 | | | | |
| Perch | 5,790 | 115 | | | | |
| Salmon:[a] | | | | | | |
| Chinook | 66,000 | 3,330 | | | | |
| Chum | 38,093 | 190 | | | | |
| Silver | 12,330 | 370 | | | | |
| Sea bass | 85,000 | 3,242 | | | | |
| Spanish mackerel | 23,285 | 658 | | | | |
| Yellowtail | 108,300 | 2,918 | | | | |
| Total | 552,528 | 18,104 | | | | |
| Gill nets: | | | | | | |
| Barracuda | 328,000 | 12,706 | | | | |
| Bonito | 825 | 24 | | | | |
| Perch | 1,500 | 30 | | | | |
| Mackerel | 4,400 | 122 | | | | |
| Sea bass | 7,900 | 291 | | | | |
| Smelt | 4,650 | 244 | | | | |
| Spanish mackerel | 32,100 | 925 | | | | |
| Total | 379,375 | 14,342 | | | | |
| Pots: Spiny lobsters | 4,020 | 520 | 20,000 | $2,630 | | |
| Lines: | | | | | | |
| Albacore (or tuna) | 820,845 | 12,295 | 179,000 | 2,675 | | |
| Barracuda, salted | | | 130,000 | 5,200 | | |
| Cod, salted | | | | | 4,952,692 | $161,695 |
| Hake, salted | | | 24,000 | 960 | | |
| Jewfish, salted | | | 88,000 | 3,520 | | |
| Rockfishes | 53,100 | 1,565 | 71,000 | 1,420 | | |
| Spanish mackerel | | | 11,000 | 400 | | |
| Yellowtail, salted | | | 69,000 | 2,760 | | |
| Cod tongues | | | | | 7,400 | 370 |
| Total | 873,945 | 13,860 | 572,000 | 16,935 | 4,960,092 | 162,065 |
| Paranzella nets: | | | | | | |
| Flounders | 21,185 | 605 | | | 2,027,919 | 36,617 |
| Hake | | | | | 160,350 | 704 |
| Kingfish | | | | | 78,385 | 1,657 |
| "Lingcod" | | | | | 39,048 | 971 |
| Pompano | | | | | 559 | 84 |
| Rockfishes | | | | | 26,800 | 864 |
| Sablefish | | | | | 39,920 | 130 |
| Sardines | | | | | 125 | 2 |
| Sea bass | | | | | 11,325 | 671 |
| Sharks | | | | | 472 | 23 |
| Skates | | | | | 164,050 | 672 |
| Sole | | | | | 3,830,050 | 54,950 |
| Tomcod | | | | | 33,112 | 587 |
| Octopus | | | | | 227 | 18 |
| Crabs | | | | | 5,905 | 458 |
| Total | 21,185 | 605 | | | 6,418,247 | 98,408 |
| Lampara nets: | | | | | | |
| Barracuda | 15,000 | 585 | | | | |
| Kingfish | 4,500 | 90 | | | | |
| Mackerel | 3,200 | 82 | | | | |
| Spanish mackerel | 7,000 | 200 | | | | |
| Yellowtail | 15,000 | 420 | | | | |
| Total | 44,700 | 1,377 | | | | |
| Trammel nets: Flounders | 251,500 | 8,485 | 81,500 | 2,403 | | |
| Kelp harvesters: Kelp | 3,000,000 | 1,500 | 2,000,000 | 1,000 | | |
| Grand total | 5,127,253 | 58,793 | 2,673,500 | 22,968 | 11,378,339 | 260,473 |

[a] The salmon were taken by a California vessel fishing in the Columbia River.

YIELD OF THE VESSEL FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

| Apparatus and species. | Santa Cruz. | | Ventura. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Seines: | | | | | | |
| Albacore (or tuna) | | | | | 25,000 | $375 |
| Barracuda | | | | | 158,700 | 6,045 |
| Bonito | | | | | 18,020 | 515 |
| Kingfish | | | 3,200 | $64 | 3,200 | 64 |
| Mackerel | | | | | 12,010 | 346 |
| Perch | | | | | 5,790 | 115 |
| Salmon:[a] | | | | | | |
| Chinook | | | | | 66,000 | 3,330 |
| Chum | | | | | 38,093 | 190 |
| Silver | | | | | 12,330 | 370 |
| Sea bass | | | | | 85,000 | 3,242 |
| Smelt | | | 13,500 | 715 | 13,500 | 715 |
| Spanish mackerel | | | | | 23,285 | 658 |
| Yellowtail | | | | | 108,300 | 2,918 |
| Total | | | 16,700 | 779 | 569,228 | 18,883 |
| Gill nets: | | | | | | |
| Barracuda | | | | | 328,000 | 12,706 |
| Bonito | | | | | 825 | 24 |
| Perch | | | | | 1,500 | 30 |
| Mackerel | | | | | 4,400 | 122 |
| Sea bass | | | | | 7,900 | 291 |
| Smelt | | | | | 4,650 | 244 |
| Spanish mackerel | | | | | 32,100 | 925 |
| Total | | | | | 379,375 | 14,342 |
| Pots: Spiny lobsters | | | 7,900 | 1,027 | 31,920 | 4,177 |
| Lines: | | | | | | |
| Albacore (or tuna) | | | 20,000 | 300 | 1,019,845 | 15,270 |
| Barracuda, salted | | | | | 130,000 | 5,200 |
| Cod, salted | | | | | 4,952,692 | 161,695 |
| Hake, salted | | | | | 24,000 | 960 |
| Jewfish, salted | | | | | 88,000 | 3,520 |
| Rockfishes | | | 14,730 | 471 | 138,830 | 3,456 |
| Spanish mackerel | | | | | 11,000 | 400 |
| Yellowtail, salted | | | | | 69,000 | 2,760 |
| Cod tongues | | | | | 7,400 | 370 |
| Total | | | 34,730 | 771 | 6,440,767 | 193,631 |
| Paranzella nets: | | | | | | |
| Flounders | 158,800 | $4,660 | | | 2,207,904 | 41,882 |
| Hake | 7,600 | 76 | | | 167,950 | 780 |
| Kingfish | 30,200 | 906 | | | 108,585 | 2,563 |
| "Lingcod" | 8,800 | 264 | | | 47,848 | 1,235 |
| Pompano | | | | | 559 | 84 |
| Rockfishes | 9,800 | 294 | | | 36,600 | 1,158 |
| Sablefish | 200 | 10 | | | 40,120 | 140 |
| Sardines | | | | | 125 | 2 |
| Sea bass | | | | | 11,325 | 671 |
| Sharks | | | | | 472 | 23 |
| Skates | 7,000 | 70 | | | 171,050 | 742 |
| Sole | 339,400 | 8,485 | | | 4,169,450 | 63,435 |
| Tomcod | 8,800 | 352 | | | 41,912 | 939 |
| Octopus | 2,400 | 144 | | | 2,627 | 162 |
| Crabs | 9,614 | 655 | | | 15,519 | 1,113 |
| Total | 582,614 | 15,916 | | | 7,022,046 | 114,929 |
| Lampara nets: | | | | | | |
| Barracuda | | | | | 15,000 | 585 |
| Kingfish | | | | | 4,500 | 90 |
| Mackerel | | | | | 3,200 | 82 |
| Spanish mackerel | | | | | 7,000 | 200 |
| Yellowtail | | | | | 15,000 | 420 |
| Total | | | | | 44,700 | 1,377 |
| Trammel nets: Flounders | | | | | 333,000 | 10,888 |
| Kelp harvesters: Kelp | | | | | 5,000,000 | 2,500 |
| Grand total | 582,614 | 15,916 | 59,330 | 2,577 | 19,821,036 | 360,727 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

BY SEINES.

| Species. | Butte. | | Colusa. | | Contra Costa. | | Del Norte. | | Glenn. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | ..... | ..... | 2,300 | $45 | 68,000 | $1,020 | ..... | ..... | ..... | ..... |
| Flounders | ..... | ..... | ..... | ..... | 9,000 | 133 | ..... | ..... | ..... | ..... |
| Herring: Fresh | ..... | ..... | ..... | ..... | 4,500 | 22 | ..... | ..... | ..... | ..... |
| Perch | ..... | ..... | ..... | ..... | 10,500 | 340 | ..... | ..... | ..... | ..... |
| Salmon: | | | | | | | | | | |
| Chinook | 81,500 | $6,520 | 44,000 | 3,360 | 600 | 18 | 49,420 | $1,235 | 80,000 | $6,000 |
| Silver | ..... | ..... | ..... | ..... | ..... | ..... | 15,552 | 233 | ..... | ..... |
| Shad roe | ..... | ..... | 1,500 | 145 | ..... | ..... | ..... | ..... | ..... | ..... |
| Shiners | ..... | ..... | ..... | ..... | 1,400 | 28 | ..... | ..... | ..... | ..... |
| Smelt | ..... | ..... | ..... | ..... | 10,000 | 680 | ..... | ..... | ..... | ..... |
| Striped bass | 500 | 40 | 700 | 63 | ..... | ..... | ..... | ..... | 1,500 | 120 |
| Sturgeon | 600 | 40 | 2,030 | 135 | ..... | ..... | ..... | ..... | 3,000 | 310 |
| Sturgeon roe | 200 | 120 | 326 | 147 | ..... | ..... | ..... | ..... | 300 | 180 |
| Total | 82,800 | 6,720 | 50,856 | 3,895 | 104,000 | 2,241 | 64,972 | 1,468 | 84,800 | 6,610 |

| Species. | Humboldt. | | Marin. | | Monterey. | | Orange. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Anchovies | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 32,800 | $1,375 |
| Barracuda | ..... | ..... | ..... | ..... | 34,000 | $680 | ..... | ..... | ..... | ..... |
| Flounders | 1,315 | $37 | 7,500 | $150 | ..... | ..... | ..... | ..... | ..... | ..... |
| Herring: | | | | | | | | | | |
| Fresh | 25,494 | 503 | 180,000 | 1,175 | ..... | ..... | ..... | ..... | ..... | ..... |
| Salted | ..... | ..... | 50,000 | 1,000 | ..... | ..... | ..... | ..... | ..... | ..... |
| Kingfish | ..... | ..... | ..... | ..... | ..... | ..... | 18,500 | $370 | 1,700 | 50 |
| Mullet | ..... | ..... | ..... | ..... | ..... | ..... | 3,000 | 300 | ..... | ..... |
| Perch | 15,000 | 410 | 85,000 | 1,710 | ..... | ..... | ..... | ..... | 15,000 | 1,200 |
| Salmon: Chinook | 29 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sardines: | | | | | | | | | | |
| Fresh | ..... | ..... | ..... | ..... | 1,100,000 | 5,500 | ..... | ..... | 15,200 | 725 |
| Salted | ..... | ..... | 1,400 | 80 | ..... | ..... | ..... | ..... | ..... | ..... |
| Shiners | ..... | ..... | 4,000 | 70 | ..... | ..... | ..... | ..... | 6,000 | 150 |
| Smelt | 15,524 | 674 | 13,600 | 775 | ..... | ..... | 226,000 | 11,300 | 1,000 | 45 |
| Striped bass | ..... | ..... | 2,500 | 200 | ..... | ..... | ..... | ..... | ..... | ..... |
| Surf fish | ..... | ..... | 65,000 | 4,550 | ..... | ..... | ..... | ..... | ..... | ..... |
| Turbot | ..... | ..... | 600 | 70 | ..... | ..... | ..... | ..... | ..... | ..... |
| White bait | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 51,250 | 2,050 |
| Squid | ..... | ..... | ..... | ..... | 140,000 | 700 | ..... | ..... | ..... | ..... |
| Total | 57,362 | 1,625 | 409,600 | 9,780 | 1,274,000 | 6,880 | 247,500 | 11,970 | 122,950 | 5,595 |

| Species. | San Joaquin. | | San Mateo. | | Shasta. | | Sonoma. | | Sutter. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | 63,286 | $1,474 | ..... | ..... | ..... | ..... | ..... | ..... | 9,802 | $106 |
| Catfish | 17,000 | 805 | ..... | ..... | ..... | ..... | ..... | ..... | 32,000 | 1,296 |
| Flounders | ..... | ..... | ..... | ..... | ..... | ..... | 1,500 | $60 | ..... | ..... |
| Hardhead | 4,674 | 146 | ..... | ..... | ..... | ..... | ..... | ..... | 1,500 | 110 |
| Herring: Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 20,000 | 150 | ..... | ..... |
| Perch | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | 300 | ..... | ..... |
| Pike, Sacramento | 4,960 | 129 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Salmon: Chinook | 7,000 | 360 | ..... | ..... | 19,000 | $1,072 | ..... | ..... | ..... | ..... |
| Sea bass | 1,250 | 50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Shad | 40,000 | 600 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Shad roe | 4,000 | 360 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Smelt | ..... | ..... | 1,500 | $60 | ..... | ..... | ..... | ..... | ..... | ..... |
| Split-tails | 1,466 | 55 | ..... | ..... | ..... | ..... | ..... | ..... | 75 | 1 |
| Striped bass | 5,301 | 449 | ..... | ..... | 1,247 | 142 | ..... | ..... | ..... | ..... |
| Suckers | 1,375 | 70 | ..... | ..... | ..... | ..... | ..... | ..... | 54 | 1 |
| Surf fish | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 | 140 | ..... | ..... |
| Turtles | 22 | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | 150,334 | 4,502 | 1,500 | 60 | 20,247 | 1,214 | 33,500 | 650 | 43,431 | 1,514 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY SEINES—Continued.

| Species. | Tehama. | | Ventura. | | Yolo. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Anchovies | | | | | | | 32,800 | $1,375 |
| Barracuda | | | | | | | 34,000 | 680 |
| Carp | | | | | 8,300 | $126 | 151,688 | 2,771 |
| Catfish | 275 | $11 | | | 984 | 58 | 50,259 | 2,170 |
| Flounders | | | | | | | 19,315 | 380 |
| Hardhead | | | | | 2,865 | 314 | 9,039 | 570 |
| Herring: | | | | | | | | |
| Fresh | | | | | | | 229,994 | 1,850 |
| Salted | | | | | | | 50,000 | 1,000 |
| Kingfish | | | 2,300 | $46 | | | 22,500 | 466 |
| Mullet | | | | | | | 3,000 | 300 |
| Perch | | | 850 | 18 | | | 136,350 | 3,978 |
| Pike, Sacramento | | | | | 39 | 1 | 4,999 | 130 |
| Salmon: | | | | | | | | |
| Chinook | 184,133 | 13,084 | | | | | 465,682 | 31,650 |
| Silver | | | | | | | 15,552 | 233 |
| Sardines: | | | | | | | | |
| Fresh | | | | | | | 1,115,200 | 6,225 |
| Salted | | | | | | | 1,400 | 80 |
| Sea bass | | | | | | | 1,250 | 50 |
| Shad | 200 | 3 | | | | | 40,200 | 603 |
| Shad roe | | | | | | | 5,500 | 505 |
| Shiners | | | | | | | 11,400 | 248 |
| Smelt | | | 20,000 | 1,060 | | | 287,624 | 14,594 |
| Split-tails | | | | | | | 1,541 | 56 |
| Striped bass | 539 | 38 | | | 400 | 28 | 12,687 | 1,080 |
| Sturgeon | | | | | | | 5,630 | 485 |
| Sturgeon roe | | | | | | | 826 | 447 |
| Suckers | | | | | | | 1,429 | 71 |
| Surf fish | | | | | | | 67,000 | 4,690 |
| Turbot | | | | | | | 600 | 70 |
| White bait | | | | | | | 51,250 | 2,050 |
| Squid | | | | | | | 140,000 | 700 |
| Turtles | | | | | | | 22 | 4 |
| Total | 185,147 | 13,136 | 23,150 | 1,124 | 12,588 | 527 | 2,968,737 | 79,511 |

BY GILL NETS.

| Species. | Alameda. | | Contra Costa. | | Del Norte. | | Glenn. | | Humboldt. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | 29,000 | $510 | | | | | | |
| Flounders | 5,000 | $150 | 7,000 | 105 | | | | | 15,458 | $455 |
| Herring | | | 2,500 | 12 | | | | | | |
| Perch | 2,000 | 180 | 1,500 | 60 | | | | | | |
| Pike, Sacramento | | | 4,600 | 90 | | | | | | |
| Salmon: | | | | | | | | | | |
| Chinook | 300 | 18 | 1,859,825 | 95,956 | 655,000 | $14,767 | 1,300 | $95 | 498,786 | 19,491 |
| Silver | | | | | 174,846 | 3,497 | | | 86,072 | 3,304 |
| Shad, fresh | | | 4,348,640 | 45,800 | | | | | | |
| Sharks | 65,000 | 163 | | | | | | | | |
| Smelt | 12,500 | 875 | 2,000 | 100 | | | | | 24,365 | 1,014 |
| Steelhead trout | | | | | | | | | 32,405 | 1,288 |
| Stingray | 605,000 | 1,512 | | | | | | | | |
| Striped bass | 99,000 | 7,565 | 1,036,263 | 84,676 | | | | | | |
| Sturgeon | | | | | | | | | 8,010 | 250 |
| Total | 788,800 | 10,463 | 7,291,328 | 227,309 | 829,846 | 18,264 | 1,300 | 95 | 665,096 | 25,802 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS—Continued.

| Species. | Los Angeles. | | Marin. | | Mendocino. | | Monterey. | | Orange. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Anchovies | 12,585 | $130 | | | | | | | | |
| Barracuda, fresh | 565,960 | 22,032 | | | | | | | 38,300 | $1,732 |
| Bonito | 270,687 | 7,842 | | | | | 2,000 | $50 | 1,600 | 48 |
| Flying fish | 245 | 6 | | | | | | | | |
| Herring | | | 30,000 | $215 | | | | | | |
| Kingfish | 120,891 | 2,617 | | | | | 23,000 | 575 | | |
| Mackerel, fresh | 47,570 | 1,372 | | | | | | | 51,500 | 1,030 |
| Perch | 35,278 | 835 | 10,000 | 180 | | | 6,000 | 30 | 5,500 | 165 |
| Pompano | 14,002 | 1,400 | | | | | | | 850 | 85 |
| Salmon: | | | | | | | | | | |
| Chinook | | | 6,900 | 330 | | | | | | |
| Silver | | | | | 26,000 | $1,040 | | | | |
| Sea bass | 146,951 | 5,584 | 70,500 | 3,500 | | | 8,800 | 365 | 35,200 | 1,735 |
| Sea trout | 400 | 20 | | | | | | | | |
| Smelt | 81,316 | 3,299 | 65,000 | 3,125 | | | 5,314 | 425 | | |
| Spanish mackerel | 73,031 | 2,970 | | | | | | | | |
| Striped bass | | | 23,400 | 1,865 | | | | | | |
| Surf fish | | | 3,500 | 245 | | | | | | |
| Swordfish | 360 | 8 | | | | | | | | |
| Turbot | | | 700 | 85 | | | | | | |
| Yellowtail, fresh | 162,998 | 4,539 | | | | | | | | |
| Crabs | | | | | | | 17,210 | 129 | | |
| Total | 1,532,274 | 52,654 | 210,000 | 9,545 | 26,000 | 1,040 | 62,324 | 1,574 | 132,950 | 4,795 |

| Species. | Sacramento. | | San Diego. | | San Francisco. | | San Joaquin. | | San Luis Obispo. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore or tuna | | | 2,371 | $76 | | | | | | |
| Barracuda: | | | | | | | | | | |
| Fresh | | | 1,362,441 | 39,957 | | | | | 3,000 | $120 |
| Salted | | | 198,000 | 7,900 | | | | | | |
| Bonito | | | 33,062 | 594 | | | | | | |
| Carp | 3,000 | $40 | | | 120,000 | $2,400 | | | | |
| Flounders | | | | | 200,000 | 600 | | | | |
| Herring | | | | | 500,000 | 5,000 | | | | |
| Horse mackerel | | | 295 | 6 | | | | | | |
| Kingfish | | | 2,156 | 50 | 6,500 | 200 | | | | |
| Mackerel: | | | | | | | | | | |
| Fresh | | | 400 | 8 | | | | | | |
| Salted | | | 6,450 | 259 | | | | | | |
| Perch | | | 217 | 5 | 1,450 | 50 | | | | |
| Pompano | | | 229 | 27 | | | | | | |
| Salmon: Chinook | 214,346 | 12,441 | | | 136,000 | 7,500 | 193,409 | $10,030 | | |
| Sardines | | | | | 3,600 | 250 | | | | |
| Sea bass | | | 261,703 | 8,351 | 240,000 | 12,000 | | | | |
| Sea trout | | | 119 | 5 | | | | | | |
| Shad: | | | | | | | | | | |
| Fresh | 16,826 | 313 | | | 1,600,000 | 9,000 | 596,820 | 7,447 | | |
| Salted | 10,000 | 125 | | | | | | | | |
| Roe | 2,940 | 287 | | | | | 13,898 | 1,259 | | |
| Smelt | | | 115,707 | 5,597 | 370,000 | 15,100 | | | 75,000 | 3,750 |
| Spanish mackerel | | | 9,034 | 181 | | | | | | |
| Striped bass | 34,354 | 2,839 | | | 283,000 | 24,000 | 64,345 | 5,449 | | |
| Sturgeon | 620 | 49 | | | | | 59 | 5 | | |
| Sturgeon roe | | | | | | | 22 | 11 | | |
| Yellowtail: | | | | | | | | | | |
| Fresh | | | 212,645 | 3,389 | | | | | | |
| Salted | | | 55,500 | 1,983 | | | | | | |
| Total | 282,086 | 16,094 | 2,260,329 | 68,388 | 3,460,550 | 76,100 | 868,553 | 24,201 | 78,000 | 3,870 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS—Continued.

| Species. | Santa Barbara. | | Santa Cruz. | | Solano. | | Sonoma. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Barracuda, fresh | 162,000 | $6,210 | 5,780 | $231 | | | | |
| Bonito | 30,000 | 870 | | | | | | |
| Herring | | | 890 | 19 | | | | |
| Kingfish | 1,500 | 30 | | | | | | |
| Mackerel, fresh | 5,000 | 145 | | | | | | |
| Perch | 1,000 | 20 | 6,000 | 300 | | | | |
| Pike, Sacramento | | | | | 25 | $1 | | |
| Pompano | | | 687 | 68 | | | | |
| Salmon: Chinook | | | | | 1,179,244 | 60,524 | 6,000 | $200 |
| Sardines | 1,000 | 20 | 21,931 | 220 | | | | |
| Sea bass | 50,000 | 1,900 | 86,860 | 3,474 | | | | |
| Sea trout | 2,000 | 80 | | | | | | |
| Shad, fresh | | | 478 | 24 | 176,827 | 2,650 | | |
| Smelt | 16,325 | 865 | 30,000 | 1,200 | | | | |
| Spanish mackerel | 41,300 | 826 | | | | | | |
| Striped bass | | | | | 208,544 | 17,787 | 2,000 | 160 |
| Sturgeon | | | | | 2,367 | 181 | | |
| Sturgeon roe | | | | | 427 | 250 | | |
| Yellowtail, fresh | 3,150 | 88 | | | | | | |
| Crabs | | | 223,859 | 15,262 | | | | |
| Total | 313,275 | 11,054 | 376,485 | 20,798 | 1,567,434 | 81,393 | 8,000 | 360 |

| Species. | Sutter. | | Tehama. | | Yolo. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore or tuna | | | | | | | 2,371 | $76 |
| Anchovies | | | | | | | 12,585 | 130 |
| Barracuda: | | | | | | | | |
| Fresh | | | | | | | 2,137,481 | 70,282 |
| Salted | | | | | | | 198,000 | 7,900 |
| Bonito | | | | | | | 337,349 | 9,404 |
| Carp | | | | | 1,000 | $15 | 153,000 | 2,965 |
| Flounders | | | | | | | 227,458 | 1,310 |
| Flying fish | | | | | | | 245 | 6 |
| Herring | | | | | | | 533,390 | 5,246 |
| Horse mackerel | | | | | | | 295 | 6 |
| Kingfish | | | | | | | 154,047 | 3,472 |
| Mackerel: | | | | | | | | |
| Fresh | | | | | | | 104,470 | 2,555 |
| Salted | | | | | | | 6,450 | 259 |
| Perch | | | | | | | 68,945 | 1,825 |
| Pike, Sacramento | | | | | | | 4,625 | 91 |
| Pompano | | | | | | | 15,768 | 1,580 |
| Salmon: | | | | | | | | |
| Chinook | 3,071 | $173 | 1,627 | $81 | 88,560 | 4,760 | 4,844,368 | 226,366 |
| Silver | | | | | | | 286,918 | 7,841 |
| Sardines | | | | | | | 26,531 | 490 |
| Sea bass | | | | | | | 900,014 | 36,909 |
| Sea trout | | | | | | | 2,519 | 105 |
| Shad: | | | | | | | | |
| Fresh | 1,245 | 36 | 10 | 1 | 64,962 | 1,108 | 6,805,808 | 66,379 |
| Salted | | | | | | | 10,000 | 125 |
| Roe | 61 | 6 | | | 4,634 | 434 | 21,533 | 1,986 |
| Sharks | | | | | | | 65,000 | 163 |
| Smelt | | | | | | | 797,527 | 35,350 |
| Spanish mackerel | | | | | | | 123,365 | 3,977 |
| Steelhead trout | | | | | | | 32,405 | 1,288 |
| Stingray | | | | | | | 605,000 | 1,512 |
| Striped bass | 5,744 | 407 | | | 12,511 | 883 | 1,769,161 | 145,631 |
| Sturgeon | | | 55 | 3 | 183 | 14 | 11,294 | 502 |
| Sturgeon roe | | | | | | | 449 | 261 |
| Surf fish | | | | | | | 8,500 | 245 |
| Swordfish | | | | | | | 360 | 8 |
| Turbot | | | | | | | 700 | 85 |
| Yellowtail: | | | | | | | | |
| Fresh | | | | | | | 378,793 | 8,016 |
| Salted | | | | | | | 55,500 | 1,983 |
| Crabs | | | | | | | 241,069 | 15,391 |
| Total | 10,121 | 622 | 1,692 | 85 | 171,850 | 7,214 | 20,938,293 | 661,720 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY HOOP NETS.

| Species. | Del Norte. | | Humboldt. | | Marin. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | 26,667 | $2,000 | 24,420 | $1,022 | 168,600 | $16,494 | 929,080 | $91,514 |

| Species. | San Mateo. | | Sonoma. | | Total | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Crabs | 4,800 | $600 | 4,000 | $300 | 1,157,567 | $111,930 |
| Crawfish | | | 550 | 265 | 550 | 265 |
| Total | 4,800 | 600 | 4,550 | 565 | 1,158,117 | 112,195 |

BY POTS AND TRAPS.

| Species. | Los Angeles. | | Orange. | | San Diego. | | Santa Barbara. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Perch | 1,700 | $34 | | | | | | |
| Rock bass | 1,350 | 54 | | | | | | |
| Sea bass | 7,984 | 304 | | | | | | |
| Spiny lobsters | 197,074 | 19,895 | 16,100 | $2,093 | 480,313 | $82,096 | 158,300 | $20,729 |
| Total | 208,108 | 20,287 | 16,100 | 2,093 | 480,313 | 82,096 | 158,300 | 20,729 |

| Species. | Santa Cruz. | | Ventura. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Perch | | | | | 1,700 | $34 |
| Rock bass | | | | | 1,350 | 54 |
| Sea bass | | | | | 7,984 | 304 |
| Octopus | 6,000 | $600 | | | 6,000 | 600 |
| Spiny lobsters | | | 8,685 | $1,129 | 860,472 | 125,942 |
| Total | 6,000 | 600 | 8,685 | 1,129 | 877,506 | 126,934 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY LINES.

| Species. | Alameda. | | Colusa. | | Humboldt. | | Los Angeles. | | Marin. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore (or tuna): Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 16,518,654 | $247,928 | ..... | ..... |
| Barracuda: Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 36,657 | 1,362 | ..... | ..... |
| Bonito | ..... | ..... | ..... | ..... | ..... | ..... | 61,051 | 1,771 | ..... | ..... |
| Carp | ..... | ..... | 500 | $35 | ..... | ..... | ..... | ..... | ..... | ..... |
| Flounders: Fresh | ..... | ..... | ..... | ..... | 34,775 | $1,366 | 56,700 | 4,659 | ..... | ..... |
| Hake | ..... | ..... | ..... | ..... | ..... | ..... | 17,322 | 571 | ..... | ..... |
| Jewfish: Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 20,890 | 414 | ..... | ..... |
| "Lingcod": Fresh | ..... | ..... | ..... | ..... | 2,609 | 104 | ..... | ..... | ..... | ..... |
| Mackerel | ..... | ..... | ..... | ..... | ..... | ..... | 13,010 | 377 | ..... | ..... |
| Pike, Sacramento | ..... | ..... | 400 | 20 | ..... | ..... | ..... | ..... | ..... | ..... |
| Rock bass: Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 123,367 | 4,932 | ..... | ..... |
| Rockfishes: Fresh | ..... | ..... | ..... | ..... | 16,905 | 577 | 637,031 | 20,317 | 3,000 | $125 |
| Salmon: Chinook, fresh | ..... | ..... | ..... | ..... | 381 | 9 | ..... | ..... | ..... | ..... |
| Sculpin | ..... | ..... | ..... | ..... | ..... | ..... | 6,613 | 263 | ..... | ..... |
| Sea bass | ..... | ..... | ..... | ..... | ..... | ..... | 337 | 12 | ..... | ..... |
| Sea trout | ..... | ..... | ..... | ..... | ..... | ..... | 64 | 3 | ..... | ..... |
| Sharks | ..... | ..... | ..... | ..... | ..... | ..... | 2,500 | 50 | ..... | ..... |
| Skates | ..... | ..... | ..... | ..... | ..... | ..... | 6,000 | 120 | ..... | ..... |
| Sheepshead | ..... | ..... | ..... | ..... | ..... | ..... | 1,367 | 28 | ..... | ..... |
| Smelt | 19,000 | $1,300 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sole | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | 300 | 50 | 2 |
| Spanish mackerel | ..... | ..... | ..... | ..... | ..... | ..... | 16,250 | 481 | ..... | ..... |
| Striped bass | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,000 | 100 |
| Yellowtail | ..... | ..... | ..... | ..... | ..... | ..... | 106,764 | 2,969 | ..... | ..... |
| Total | 19,000 | 1,300 | 900 | 55 | 54,670 | 2,056 | 17,634,577 | 286,557 | 4,050 | 227 |

| Species. | Mendocino. | | Monterey. | | Orange. | | San Diego. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore (or tuna): Fresh | ..... | ..... | ..... | ..... | 6,000 | $150 | 3,449,560 | $51,754 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 25,000 | 481 |
| Barracuda: Fresh | ..... | ..... | ..... | ..... | 43,500 | 2,140 | 53,463 | 1,164 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 | 80 |
| Bonito | ..... | ..... | ..... | ..... | 1,350 | 40 | 9,400 | 180 |
| Flounders: Fresh | 13,000 | $590 | 51,000 | $1,275 | 2,900 | 83 | 250 | 10 |
| Salted | ..... | ..... | 9,500 | 475 | ..... | ..... | ..... | ..... |
| Hake | ..... | ..... | ..... | ..... | 3,300 | 107 | ..... | ..... |
| Jewfish: Fresh | ..... | ..... | 300 | 10 | 4,200 | 84 | 87,071 | 1,271 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 50,000 | 1,500 |
| Kingfish | ..... | ..... | 15,350 | 383 | ..... | ..... | ..... | ..... |
| "Lingcod:" Fresh | 1,000 | 40 | 102,000 | 2,060 | ..... | ..... | ..... | ..... |
| Mackerel | ..... | ..... | ..... | ..... | ..... | ..... | 10,405 | 208 |
| Rock bass: Fresh | ..... | ..... | ..... | ..... | 53,500 | 1,337 | 489,450 | 10,032 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 2,750 | 97 |
| Rockfishes: Fresh | 35,000 | 1,750 | 1,306,816 | 41,818 | 141,280 | 4,235 | 663,464 | 15,283 |
| Sablefish | ..... | ..... | 17,560 | 878 | ..... | ..... | ..... | ..... |
| Salmon: Chinook, fresh | 80,500 | 4,190 | 1,694,660 | 67,786 | ..... | ..... | ..... | ..... |
| Chinook, salted | 20,000 | 2,400 | ..... | ..... | ..... | ..... | ..... | ..... |
| Silver | 500 | 20 | 70,000 | 2,800 | ..... | ..... | ..... | ..... |
| Sculpin | ..... | ..... | ..... | ..... | 1,850 | 75 | ..... | ..... |
| Sea bass | ..... | ..... | 4,560 | 182 | ..... | ..... | ..... | ..... |
| Sea trout | ..... | ..... | ..... | ..... | 3,500 | 105 | ..... | ..... |
| Sheepshead | ..... | ..... | ..... | ..... | ..... | ..... | 201 | 2 |
| Sole | ..... | ..... | ..... | ..... | ..... | ..... | 679 | 19 |
| Spanish mackerel | ..... | ..... | ..... | ..... | ..... | ..... | 40,000 | 800 |
| Yellowtail | ..... | ..... | ..... | ..... | ..... | ..... | 125,253 | 1,565 |
| Total | 150,000 | 8,990 | 3,272,746 | 117,667 | 261,380 | 8,356 | 5,008,946 | 84,446 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY LINES—Continued.

| Species. | San Francisco. | | San Luis Obispo. | | San Mateo. | | Santa Barbara. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Hake | ..... | ..... | ..... | ..... | ..... | ..... | 6,650 | $219 |
| Jewfish: Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 4,000 | 80 |
| Kingfish | ..... | ..... | ..... | ..... | ..... | ..... | 500 | 10 |
| "Lingcod": Fresh | 301,103 | $7,750 | ..... | ..... | ..... | ..... | ..... | ..... |
| Rock bass: Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 4,000 | 160 |
| Rockfishes: Fresh | 825,500 | 39,655 | 85,000 | $3,400 | 18,000 | ..... | 24,000 | 768 |
| Sole | 18,858 | 377 | ..... | ..... | ..... | ..... | ..... | ..... |
| Octopus | 18,682 | 1,555 | ..... | ..... | ..... | $550 | ..... | ..... |
| Total | 1,164,143 | 49,337 | 85,000 | 3,400 | 18,000 | 550 | 39,150 | 1,237 |

| Species. | Santa Cruz. | | Sonoma. | | Ventura. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore (or tuna): | | | | | | | | |
| Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 19,974,214 | $299,832 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 25,000 | 481 |
| Barracuda: | | | | | | | | |
| Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 133,620 | 4,666 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 | 80 |
| Bonito | ..... | ..... | ..... | ..... | ..... | ..... | 71,801 | 1,991 |
| Carp | ..... | ..... | ..... | ..... | ..... | ..... | 500 | 35 |
| Flounders: | | | | | | | | |
| Fresh | ..... | ..... | ..... | ..... | 3,250 | $96 | 161,875 | 8,079 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 9,500 | 475 |
| Hake | ..... | ..... | ..... | ..... | ..... | ..... | 27,272 | 897 |
| Jewfish: | | | | | | | | |
| Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 116,461 | 1,859 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 50,000 | 1,500 |
| Kingfish | 32,757 | $982 | ..... | ..... | ..... | ..... | 48,607 | 1,375 |
| "Lingcod:" | | | | | | | | |
| Fresh | 98,000 | 2,940 | 2,700 | $120 | ..... | ..... | 508,412 | 13,014 |
| Salted | 3,500 | 175 | ..... | ..... | ..... | ..... | 3,500 | 175 |
| Mackerel | 113 | 6 | ..... | ..... | ..... | ..... | 23,528 | 591 |
| Pike, Sacramento | ..... | ..... | ..... | ..... | ..... | ..... | 400 | 20 |
| Rock bass: | | | | | | | | |
| Fresh | ..... | ..... | ..... | ..... | ..... | ..... | 670,317 | 16,461 |
| Salted | ..... | ..... | ..... | ..... | ..... | ..... | 2,750 | 97 |
| Rockfishes: | | | | | | | | |
| Fresh | 378,478 | 12,355 | 22,000 | 1,110 | 4,350 | 259 | 4,160,824 | 141,202 |
| Salted | 8,000 | 400 | ..... | ..... | ..... | ..... | 8,000 | 400 |
| Sablefish | 2,223 | 111 | ..... | ..... | ..... | ..... | 19,783 | 989 |
| Salmon: | | | | | | | | |
| Chinook, fresh | 119,592 | 4,783 | 12,000 | 360 | ..... | ..... | 1,907,133 | 77,128 |
| Chinook, salted | ..... | ..... | ..... | ..... | ..... | ..... | 20,000 | 2,400 |
| Silver | 29,897 | 1,195 | ..... | ..... | ..... | ..... | 100,397 | 4,015 |
| Sculpin | 350 | 7 | ..... | ..... | ..... | ..... | 8,813 | 345 |
| Sea bass | ..... | ..... | ..... | ..... | ..... | ..... | 4,897 | 194 |
| Sea trout | ..... | ..... | ..... | ..... | ..... | ..... | 3,564 | 108 |
| Sharks | ..... | ..... | ..... | ..... | ..... | ..... | 2,500 | 50 |
| Skates | ..... | ..... | ..... | ..... | ..... | ..... | 6,000 | 120 |
| Sheepshead | ..... | ..... | ..... | ..... | ..... | ..... | 1,568 | 30 |
| Smelt | ..... | ..... | ..... | ..... | ..... | ..... | 19,000 | 1,300 |
| Sole | ..... | ..... | ..... | ..... | ..... | ..... | 29,587 | 698 |
| Spanish mackerel | ..... | ..... | ..... | ..... | ..... | ..... | 56,250 | 1,281 |
| Striped bass | 350 | 17 | 1,250 | 100 | ..... | ..... | 2,600 | 217 |
| Yellowtail | ..... | ..... | ..... | ..... | ..... | ..... | 232,017 | 4,534 |
| Octopus | ..... | ..... | ..... | ..... | ..... | ..... | 18,682 | 1,555 |
| Total | 673,260 | 21,971 | 37,950 | 1,690 | 7,600 | 355 | 28,431,372 | 588,194 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY DREDGES, TONGS, RAKES, FORKS, ETC.

| Species. | Alameda. | | Del Norte. | | Humboldt. | | Los Angeles. | | Marin. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Clams: | | | | | | | | | | |
| Hard | | | | | 1,760 | $427 | 296 | $104 | 26,416 | $7,070 |
| Soft | 21,250 | $5,950 | | | 6,280 | 1,250 | | | 11,880 | 4,422 |
| Oysters: | | | | | | | | | | |
| Eastern, market | | | | | 42 | 14 | | | 14,840 | 8,814 |
| Native, market | | | | | | | | | 8,435 | 6,513 |
| Mussels | 130 | 35 | 2,650 | $180 | | | 4,820 | 578 | 120 | 8 |
| Turtles | | | | | | | 184 | 9 | | |
| Total | 21,380 | 5,985 | 2,650 | 180 | 8,082 | 1,691 | 5,300 | 691 | 61,691 | 26,827 |

| Species. | Mendocino. | | Monterey. | | Orange. | | San Francisco. | | San Luis Obispo. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Clams: | | | | | | | | | | |
| Hard | | | 96 | $25 | 800 | $260 | | | 34,856 | $9,150 |
| Soft | | | | | | | 23,000 | $5,300 | | |
| Oysters: | | | | | | | | | | |
| Eastern, market | | | | | | | 360,892 | 156,745 | | |
| Mussels | 3,500 | $200 | 1,810 | 110 | | | 6,000 | 1,200 | | |
| Seaweed | | | 3,799 | 190 | | | | | | |
| Total | 3,500 | 200 | 5,705 | 325 | 800 | 260 | 389,892 | 163,245 | 34,856 | 9,150 |

| Species. | San Mateo. | | Santa Barbara. | | Santa Cruz. | | Sonoma. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Clams: | | | | | | | | | | |
| Hard | | | | | 1,032 | $272 | 600 | $275 | 65,856 | $17,583 |
| Soft | 2,200 | $700 | | | | | 2,550 | 485 | 67,160 | 18,107 |
| Oysters: | | | | | | | | | | |
| Eastern, market | | | | | | | | | 375,774 | 165,573 |
| Native, market | | | | | | | | | 8,435 | 6,513 |
| Mussels | | | | | 210 | 15 | | | 19,240 | 2,326 |
| Turtles | | | | | | | | | 184 | 9 |
| Seaweed | | | 3,000 | $135 | | | | | 6,799 | 325 |
| Total | 2,200 | 700 | 3,000 | 135 | 1,242 | 287 | 3,150 | 760 | 543,448 | 210,436 |

BY LAMPARA NETS.

| Species. | Los Angeles. | | Monterey. | | Orange. | | San Francisco. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Albacore (or tuna) | 2,760 | $69 | | | | | | | 2,760 | $69 |
| Anchovies: | | | | | | | | | | |
| Fresh | | | | | | | 36,000 | $225 | 36,000 | 225 |
| Salted | | | 16,000 | $1,600 | | | | | 16,000 | 1,600 |
| Barracuda | 268,597 | 9,476 | | | | | 5,000 | 200 | 273,597 | 9,676 |
| Bonito | 20,261 | 688 | | | | | | | 20,261 | 688 |
| Croaker | 3,150 | 65 | | | | | | | 3,150 | 65 |
| Herring | | | 1,000 | 20 | | | | | 1,000 | 20 |
| Kingfish | 209,864 | 6,197 | | | | | 5,200 | 150 | 215,064 | 6,347 |
| Mackerel | 94,291 | 2,732 | | | 12,000 | $240 | | | 106,291 | 2,972 |
| Pompano | 1,688 | 168 | | | | | 1,335 | 200 | 3,023 | 368 |
| Rock bass | 133,617 | 5,345 | | | 90,000 | 2,250 | | | 223,617 | 7,595 |
| Sardines | 305,150 | 6,103 | 2,906,200 | 14,531 | 22,500 | 225 | 12,000 | 75 | 3,245,850 | 20,934 |
| Sea bass | 197,892 | 7,520 | | | | | 5,000 | 200 | 202,892 | 7,720 |
| Smelt | 11,771 | 625 | | | | | 3,000 | 150 | 14,771 | 775 |
| Spanish mackerel | 143,905 | 4,114 | | | | | | | 143,905 | 4,114 |
| Whitebait | | | | | | | 5,000 | 200 | 5,000 | 200 |
| Yellowtail | 286,806 | 8,030 | | | 73,500 | 2,205 | | | 360,306 | 10,235 |
| Squid | 21,325 | 426 | 6,000,000 | 30,000 | | | 50,000 | 1,500 | 6,071,325 | 31,926 |
| Total | 1,701,077 | 51,558 | 8,923,200 | 46,151 | 198,000 | 4,920 | 122,535 | 2,900 | 10,944,812 | 105,529 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY PARANZELLA NETS.

| Species. | Los Angeles. | | Santa Cruz. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Flounders | 383,970 | $13,063 | 588,135 | $16,936 | 972,105 | $29,999 |
| Hake | | | 26,030 | 260 | 26,030 | 260 |
| Kingfish | | | 99,500 | 2,985 | 99,500 | 2,985 |
| "Lingcod" | | | 14,600 | 438 | 14,600 | 438 |
| Sablefish | | | 4,600 | 230 | 4,600 | 230 |
| Skate | | | 600 | 6 | 600 | 6 |
| Sole | 9,692 | 291 | 1,553,200 | 43,830 | 1,562,892 | 44,121 |
| Octopus | | | 5,000 | 400 | 5,000 | 400 |
| Total | 393,662 | 13,354 | 2,291,665 | 65,085 | 2,685,327 | 78,439 |

BY TRAMMEL NETS.

| Species. | Los Angeles. | | Marin. | | Orange. | | San Diego. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Barracuda | 182,248 | $7,050 | | | | | | |
| Flounders | 635,748 | 24,919 | | | 132,250 | $6,308 | 2,100,908 | $81,413 |
| Perch | | | 2,500 | $75 | | | | |
| Total | 817,996 | 31,969 | 2,500 | 75 | 132,250 | 6,308 | 2,100,908 | 81,413 |

| Species. | Santa Barbara. | | Ventura. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Barracuda | | | | | 182,248 | $7,050 |
| Flounders | 115,500 | $3,855 | 8,000 | $258 | 2,992,406 | 116,753 |
| Perch | | | | | 2,500 | 75 |
| Total | 115,500 | 3,855 | 8,000 | 258 | 3,177,154 | 123,878 |

BY FYKE NETS.

| Species. | Colusa. | | Sacramento. | | San Joaquin. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | | | 40,201 | $514 | | |
| Catfish | 6,700 | $264 | 91,646 | 3,888 | 311,787 | $15,533 |
| Hardhead | | | 42,237 | 2,122 | | |
| Pike, Sacramento | | | 4,887 | 171 | | |
| Split-tails | | | 15,475 | 328 | | |
| Suckers | | | 635 | 15 | | |
| Total | 6,700 | 264 | 195,081 | 7,038 | 311,787 | 15,533 |

| Species. | Sutter. | | Yolo. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Carp | 2,000 | $25 | 3,426 | $56 | 45,627 | $595 |
| Catfish | 17,346 | 725 | 39,316 | 1,719 | 466,795 | 22,129 |
| Hardhead | 224 | 16 | 21,923 | 914 | 64,384 | 3,052 |
| Pike, Sacramento | 523 | 19 | 450 | 18 | 5,860 | 208 |
| Split-tails | | | | | 15,475 | 328 |
| Suckers | | | | | 635 | 15 |
| Total | 20,093 | 785 | 65,115 | 2,707 | 598,776 | 26,327 |

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY ABALONE OUTFITS.

| Species. | Marin. | | Mendocino. | | Monterey. | | San Diego. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Abalone: | | | | | | | | |
| Alive | | | 3,035 | $97 | | | | |
| Meat | 4,550 | $158 | 3,000 | 185 | 547,424 | $10,939 | 57,000 | $3,168 |
| Shells | 2,000 | 450 | | | | | 72,000 | 1,440 |
| Pearls and blisters | | 40 | | | | | | |
| Total | 6,550 | 648 | 6,035 | 282 | 547,424 | 10,939 | 129,000 | 4,608 |

| Species. | Santa Cruz. | | Sonoma. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Abalone: | | | | | | |
| Alive | 20,991 | $420 | | | 24,026 | $517 |
| Meat | | | 119,000 | $2,380 | 730,974 | 16,830 |
| Shells | | | | | 74,000 | 1,890 |
| Pearls and blisters | | | | 1,200 | | 1,240 |
| Total | 20,991 | 420 | 119,000 | 3,580 | 829,000 | 20,477 |

BY MISCELLANEOUS APPARATUS.

| Species. | Alameda. | | Humboldt. | | San Francisco. | | Santa Barbara. | |
|---|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Surf fish | | | 20,000 | $600 | | | | |
| Shrimp | 263,000 | $4,850 | | | 35,000 | $700 | | |
| Sea lion | | | | | | | 9,375 | $4,120 |
| Total | 263,000 | 4,850 | 20,000 | 600 | 35,000 | 700 | 9,375 | 4,120 |

| Species. | Shasta. | | Sonoma. | | Total. | |
|---|---|---|---|---|---|---|
| | *Pounds.* | *Value.* | *Pounds.* | *Value.* | *Pounds.* | *Value.* |
| Salmon: Chinook | 750 | $75 | | | 750 | $75 |
| Surf fish | | | 37,000 | $1,720 | 57,000 | 2,320 |
| Shrimp | | | | | 298,000 | 5,550 |
| Sea lion | | | | | 9,375 | 4,120 |
| Total | 750 | 75 | 37,000 | 1,720 | 365,125 | 12,065 |

## WHOLESALE FRESH-FISH TRADE.

San Francisco is by far the most important wholesale fresh-fish center in California. Large quantities of fresh fish are also handled by firms located in Los Angeles, Monterey, San Diego, and Sacramento, but a considerable proportion of these fish eventually reach San Francisco, from which city many are shipped to adjoining States to the east and north. In 1915 there were 64 wholesale fresh-fish establishments in the State, valued at $687,156, with a cash capital of $202,500, in which 394 persons were engaged and $310,897 paid in wages.

## FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING.

The preparation of various fishery products has an important bearing on the fisheries of California. Squid, amounting to 1,200,000 pounds, were dried and sold for $51,000. The mild-cured products

in 1915 consisted of 1,761,300 pounds of chinook salmon, valued at $187,220, and 105,000 pounds of shad, valued at $5,250. Chinook salmon, amounting to 245,000 pounds, were pickled and sold for $26,950. The salt-fish products amounted to 5,023,982 pounds, with a value of $83,138, the greater part of which was shad. The smoking of fish was comparatively unimportant, the output being only 34,600 pounds, with a value of $4,203. These consisted of halibut, chinook salmon, albacore, herring, and sablefish in the order of their importance. Among other products prepared from fish and fish offal were 599 tons of poultry feed, valued at $29,360; 65,567 gallons of oil, valued at $19,548; and 396 tons of fertilizer, valued at $14,145.

For statistics of products prepared, exclusive of canning, in California in 1915, see table, page 54.

## CANNING INDUSTRY.

In 1915 there were 21 establishments, valued at $1,443,613, engaged in the canning of various fishery products. The number of persons engaged was 2,676, and the wages paid amounted to $394,181. Among the more important species canned were albacore, or tuna, sardines, chinook and silver salmon, shad, shad roe, bonito, and yellowtail. The value of the tuna pack, however, far exceeds that of all the other products combined. The canning of tuna, bonito, and yellowtail is confined to Los Angeles and San Diego Counties. Sardines, shad, and shad roe were canned in Contra Costa County only by one firm. Salmon were packed in Contra Costa, Solano, and Monterey Counties. Considerable quantities of abalone were canned in San Diego and Monterey Counties. A few cases of rockfishes were canned in San Diego and Los Angeles Counties, and a small pack of mussels was put up in Del Norte County.

EXTENT OF THE CANNING INDUSTRY OF CALIFORNIA IN 1915.

| Items. | Number. | Value. | Items. | Number. | Value. |
|---|---|---|---|---|---|
| Establishments | 21 | $1,443,613 | Salmon—Continued. | | |
| Cash capital | | 253,727 | Silver— | | |
| Persons engaged | 2,676 | | 1 pound tall.....cases.. | 290 | $1,044 |
| Wages paid | | 394,181 | 1 pound flat.....do.... | 2,500 | 11,250 |
| PRODUCTS.[a] | | | ½ pound flat.....do.... | 788 | 4,097 |
| Bonito: | | | Albacore (tuna): | | |
| 1 pound flat.....cases.. | 145 | 725 | 1 pound flat.....do.... | 131,764 | 647,003 |
| ½ pound flat.....do.... | 2,403 | 15,861 | ½ pound flat.....do.... | 110,602 | 751,741 |
| Salmon: | | | ¼ pound flat.....do.... | 6,045 | 45,340 |
| Chinook— | | | ½ pound flat.....do.... | 10,016 | 73,774 |
| 1 pound tall.....do.... | 1,048 | 4,192 | Yellowtail: | | |
| 1 pound flat.....do.... | 15,994 | 85,201 | 1 pound flat.....do.... | 465 | 2,748 |
| ½ pound flat.....do.... | 2,466 | 19,998 | ½ pound flat.....do.... | 1,177 | 8,661 |
| | | | Oysters (not cooked)...galls.. | 29,420 | 75,804 |
| | | | Miscellaneous.....cases.. | 60,718 | 357,129 |

[a] All cases are on a basis of 48 pounds each.