

REPORT OF THE
" BUREAU
OF
COMMERCIAL FISHERIES
FOR THE
CALENDAR YEAR 1961

MARINE AND EARTH
SCIENCES LIBRARY

OCT 31 1972

N.O.A.A.
U. S. Dept. of Commerce

UNITED STATES DEPARTMENT OF THE INTERIOR
Stewart L. Udall, *Secretary*
FISH AND WILDLIFE SERVICE, Clarence F. Pautzke, *Commissioner*
BUREAU OF COMMERCIAL FISHERIES, Donald L. McKernan, *Director*

National Oceanic and Atmospheric Administration

Report of the United States Commissioner of Fisheries

ERRATA NOTICE

One or more conditions of the original document may affect the quality of the image, such as:

Discolored pages

Faded or light ink

Binding intrudes into the text

This has been a co-operative project between the NOAA Central Library and the Climate Database Modernization Program, National Climate Data Center (NCDC). To view the original document contact the NOAA Central Library in Silver Spring, MD at (301) 713-2607 x124 or Library.Reference@noaa.gov.

HOV Services
12200 Kiln Court
Beltsville, MD 20704-1387
September 30, 2008

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES



CONTENTS

	Page
INTRODUCTION.....	1
CONDITION AND TRENDS OF THE FISHERIES.....	1
DEVELOPMENTS IN THE FISHERIES.....	4
Domestic fisheries.....	4
Federal legislation.....	7
International developments.....	8
ACCOMPLISHMENTS AND OPERATIONS.....	11
Principal accomplishments.....	11
Fisheries financial assistance programs.....	28
New programs.....	29
Meetings.....	30
Cooperation and coordination with International, Federal, State, and other agencies.....	32
Organization, employment, budget, and physical property.....	35
Publications.....	41
APPENDIXES	
A. Fisheries of the United States.....	43
B. New legislation.....	46
C. Fisheries loan fund.....	47
D. Organizations with which the Bureau had contracts in 1961.....	49
E. Organization chart.....	50
F. Budget for fiscal year 1961.....	51
G. Physical properties.....	52
H. Fish and Wildlife Service series and a 1961 list of publications by Bureau personnel.....	56

Report of the Bureau of Commercial Fisheries for the Calendar Year 1961

This is the fifth report of the Bureau of Commercial Fisheries, an agency of the U.S. Department of the Interior's Fish and Wildlife Service. Section 9(a) of the Fish and Wildlife Act of 1956 requires that the Bureau make such a report annually in order to record the progress of its activities and make an account of administrative actions.

During the calendar year 1961, the Bureau continued its efforts to provide the research and services that will assist the Nation to utilize fully and wisely its fishery resources. These efforts cover a wide spectrum of activities, from basic research in such fields as fishery biology or fish oil technology to such practical applications as demonstrations of fish cookery in schools or the dissemination of news of the daily prices for fish landed in our principal ports.

This annual report serves as a summary of the principal activities of the Bureau during 1961; consequently it touches but briefly on phases of biological, economic, engineering, oceanographic, and technological research. It also discusses briefly the many service programs, such as those involved in fishery products inspection, fishery market promotion, market news reporting, statistics collection, vessel loans, and vessel safety promotion.

As in the previous 4 years, the Bureau continued to make steady progress toward its goal of providing the fishing industry and the Nation the maximum assistance in maintaining a thriving fishing industry.

Condition and Trends of the Fisheries

The commercial fisheries of the United States in 1961 yielded a catch of 5.2 billion pounds—the Nation's second largest on record

(Appendix A). Fishermen received about \$364 million for the catch—\$10 million more than in the previous year but about \$9 million less than the record amount of \$373 million received in 1958. Total landings in 1961 were 0.3 billion pounds more than in 1960 but were about 0.1 billion pounds less than the 1956 record catch of 5.3 billion pounds. Record catches of menhaden and king crabs and substantial gains in the landings of Pacific salmon, tuna, and mackerel accounted for the increase in volume of the 1961 catch. There were sharp declines in landings of shrimp and Alaska and Maine herring.

The Atlantic Coast States accounted for 47 percent of the catch, followed by the Gulf States with 27 percent; the Pacific Coast States, including Hawaii, 23 percent; and the Great Lakes and Mississippi River States, 3 percent. San Pedro, Calif.,—with landings of 416 million pounds, valued at \$36 million—was again the principal U.S. fishing port in both volume and value. Other leading ports in order of the volume of fish caught were Pascagoula, Miss.; Lewes, Del.; Reedville, Va.; Cameron, La.; and Empire, La. New Bedford, Mass., was second with respect to value of the catch, with landings valued at nearly \$15 million.

Approximately 8 percent of the catch was taken on the high seas off foreign coasts. Landings from international waters were principally ocean perch and haddock taken off the east coast of Canada, shrimp off the east coast of Mexico, tuna off the Pacific coast of Central and South America, and troll-caught bottomfish and halibut off British Columbia.

Of the total volume of fish caught in 1961, about 47 percent was used directly in the manufacture of industrial products—principally meal and oil—and for bait. Thirty percent was marketed fresh or frozen, and 21 percent was canned. Somewhat less than 2 percent was cured. Besides whole fish used for reduction, about 550 million pounds of fillet and cannery waste were also manufactured into oil and meal. Therefore, about 56 percent of the total catch was used to produce meal and oil and for bait.

Imports provided over 44 percent of the total U.S. supply of fishery products in 1961. Nearly 44 percent of the supply of edible fishery products received during the year came from imports, while nearly 45 percent of the industrial fishery products were obtained from foreign countries. The 1961 imports of edible fishery products were 1.06 billion pounds—only slightly below the record 1.11 billion pounds received in 1959 and almost as much as the 1.07 billion pounds received in 1960. The rapid growth in imports of fishery products is indicated by the fact that in 1950 only one-fourth of the domestic supply of fishery products came from foreign countries and not until

1957 did imports account for one-third of the supply. In contrast, exports declined substantially during 1961, largely as a result of reduced export trade in canned salmon, sardines, shrimp, squid, and fish oils.

The per capita consumption of fishery products in the United States was 10.7 pounds in 1961—an increase of one-half pound over the previous year. Consumption of canned tuna and fresh and frozen groundfish fillets, sticks, and portions was at record levels. Consumption of shrimp declined because of the small catch. There was no change evident in the consumption of cured products.

Some of the highlights of the fisheries in 1961 were:

1. Menhaden continued to rank first in volume with a record catch of 2.3 billion pounds—45 percent of the total catch of all species taken by U.S. fishermen.

2. Salmon yielded a catch of 310 million pounds valued at \$52 million. The catch was 75 million pounds larger than in 1960, but was still 481 million pounds less than the record landings in 1936. Salmon was the most valuable item taken by domestic fishermen in 1961, replacing shrimp, which had held first place since 1951.

3. The U.S. catch of shrimp was only 175 million pounds (heads-on weight). This was 30 percent less than in 1960 and 93 million pounds less than the record 268 million pounds taken in 1954. The decline occurred in the South Atlantic and Gulf States where a failure of brown and white species of shrimp to appear in normal quantities was a near disaster to the fishery. The catch for these States amounted to 153 million pounds, which was 84 million pounds, or 35 percent, less than in 1960 and the smallest since 1940. The catch of shrimp in Alaska was more than double that in 1960, and production in other Pacific Coast States remained relatively stable.

4. Maine landings of herring used principally for canning sardines was only 54 million pounds—a decline of 98 million pounds compared with the previous year. In Alaska, where herring are used for manufacture into meal and oil, the catch was only 49 million pounds—29 million pounds less than in the previous year.

5. The Pacific sardine fishery continued at a low level. The catch was only 43 million pounds—15 million pounds less than in 1960 and less than 3 percent of the record 1.5 billion pounds taken in 1936. The pack of canned sardines was the fourth smallest since World War I.

6. The Alaska catch of king crabs expanded greatly during the year, yielding a catch of 43 million pounds—over 14 million pounds more than in 1960.

7. Louisiana, with a catch of 643 million pounds, led all other States in volume in 1961. The catch, however, was only about a third of the

alltime record State landings, which occurred in California in 1936 when 1.76 billion pounds of fish and shellfish were landed.

8. The 15.8-million standard case pack of canned tuna was the largest in history. The 1961 U.S. catch of tuna (326 million pounds) was 28 million pounds greater than the 1960 catch and the largest since 1956. Imports of fresh and frozen tuna and cooked loins, round weight basis, amounted to 243 million pounds—9 percent less than in 1960.

9. Production of fish sticks and portions established a new record, 130 million pounds—16 million pounds more than in the previous year. Expansion of the industry, however, has not affected the domestic catch of groundfish since imported blocks of groundfish fillets are used almost entirely in the manufacture of sticks and portions.

10. Menhaden meal accounted for over 80 percent of the record 311,000 tons of fish meal manufactured in 1961.

Developments in the Fisheries

Domestic Fisheries

The fisheries are continually undergoing change. This is typical of any dynamic industry. Such factors as fluctuating fish supplies, new technological developments, changes in marketing and merchandising techniques, and the public's changing food preferences, all affect the industry. Some of these effects may be immediate and dramatic, and others gradual and less noticeable. During the past year, significant changes occurred in the domestic fisheries. Adjustment to these changes has not always been an easy task for the commercial fishing industry. Some of the fisheries undergoing changes are discussed here.

Tuna

The domestic tuna industry, stimulated by the success of converted seiners and the ever-rising consumption of canned tuna, continued to display its spectacular economic progress in 1961. The California tuna fleet, changed by conversion from a predominantly clipper fleet fishing with hook and line to a purse seine fleet fishing with huge nets, again took large quantities of yellowfin tuna. There were indications, however, that this species was being overfished, and considerable effort was devoted to fishing for skipjack tuna by the purse seine fleet. In 1961 the Inter-American Tropical Tuna Commission recommended that a limit be placed on the catch of yellowfin in order to maintain

stocks at the maximum sustainable yield level. Legislation providing a legal basis for imposing a catch quota was introduced into the U.S. Congress and at the end of the year was still being reviewed. The Commission recommended that in 1962 an overall catch quota of 83,000 tons be placed on the fishery in the entire convention area. In 1960 the catch of yellowfin was 117,000 tons and in 1961, 120,000 tons. An enforced quota of 83,000 tons should make it possible to maintain the resource at a high level of productivity.

Salmon

Salmon displaced shrimp as the most valuable species taken by domestic fishermen in 1961. Although the 1961 catch was greater than in 1960, it was still 61 percent less than the record landed in 1936. Most of the increase occurred in Alaska. The catch of red salmon in Western Alaska was the best since 1948, and the pink salmon catch in the northern waters of Southeastern Alaska was the largest since 1951. Prince William Sound had an excellent run of pink salmon which had not been expected. The Puget Sound catch was disappointing due to poor runs of red and pink salmon to the Fraser River.

Menhaden

The record menhaden catch in 1961 was the largest annual landings of a single item in the history of the U.S. fisheries. The 1959 menhaden catch had previously held this record. Receipts for 1961 were 297 million pounds above those of the previous year and smashed the 1959 record by 112 million pounds. This was the 16th consecutive year in which menhaden was the leading species. Although landings were down in New England, they increased in all other areas where the fishery is prosecuted. The tremendous expansion of menhaden operations in the Gulf of Mexico caused the total catch of all species from these waters to increase from only 4 percent of the U.S. catch in 1936 to 27 percent in 1960.

North Atlantic Groundfish

Despite a small overall increase in catch, the North Atlantic groundfish fishery continued in the depressed condition that has characterized this industry for the past decade. The combined 1961 catch of cod, haddock, hake, pollock, cusk, and ocean perch was 3 percent more than in 1960. Landings of haddock increased slightly, while receipts of ocean perch were somewhat less. Prices remained low, and 68 per-

cent of the supply of groundfish fillets was derived from imports. Haddock prospects for 1962 appear dim. Bureau scientists predict poor scrod landings in 1962 because of poor year class recruitment.

Herring

The herring fishery of the Atlantic Coast and also that of Alaska had a bad year financially. Maine landings of herring decreased drastically over those of the previous year. Imports of herring into Maine from Canada also declined. There was no clear-cut explanation for the shortage of the small Atlantic herring that are used for sardines. The sardine industry was staggered by the shortest pack in 23 years. As a result of scarce supply, the Maine State Legislature extended the fishing season an additional 5½ months. Fish remained fairly scarce, so the extended season had little effect. In Alaska the catch was the lowest since 1954 and one of the half-dozen smallest catches since the early 1920's when there was a large expansion in the Alaska herring-reduction industry.

Sardines

The 1961 sardine season was one of the poorest on record. Cannermen were anxious for fish and prices were stable, but sardines failed to appear in volume off southern California. Fishermen reported the fish to be wild, making it impossible to take large catches on single sets.

Halibut

Receipts of halibut landed by U.S. fishermen at West Coast ports showed a slight increase over 1960. Canadians took less fish than in the previous year. The U.S.-Canadian North Pacific landings of 93 million pounds (round weight) were 3 million less than the 1960 record production.

Mackerel

The catch of jack mackerel increased over the 1960 catch by 31 percent and Pacific mackerel by 19 percent. Mackerel was relatively plentiful, although fishermen found them in waters well offshore rather than in the customary inshore areas. Cannermen found it necessary to set catch quotas during virtually the entire season.

Oysters

Production of oysters amounted to only 62 million pounds of meats—2 million pounds more than in 1960 but only 41 percent of the 1908 production of 152 million pounds. Production was down in the New England, Chesapeake, and South Atlantic States. The harvest increased in the Gulf States, and a further heartening development was the increased harvest in New Jersey where a few years previously the fishery had nearly been wiped out by disease. It is hoped that similar comebacks can be realized in other areas where present oyster production is at a low level.

Crabs

The catch of crabs improved slightly. The Alaska king crab was responsible for the gain. The 1961 catch of these crabs and the canned pack were both 51 percent greater than in 1960. The development of the king crab fishery has been truly remarkable.

Inland Fisheries

The 1961 U.S. catch in the Great Lakes and Mississippi River area was about the same as in 1960. The more desirable food fish, however, continued to decline, and for a livelihood the industry was forced to rely increasingly on species often considered as the less desirable rough fish. The trend toward the development of industrial fisheries to offset losses in food fisheries continued.

Federal Legislation

Each year the Congress considers bills that propose actions that would affect the fishing industry. As with most bills submitted to the Congress, only a few are finally enacted into law. During calendar year 1961 four bills pertaining to fishery matters were passed by the Congress. A brief description of each act follows.

The Act of August 30, 1961, concerns documentation and inspection of vessels of the United States. It provides that a vessel licensed to engage in the fishery shall not be deemed to be used in employment for which it was not licensed and shall not be considered as engaged in the transportation of freight for hire solely because such vessel occasionally takes on board on the high seas and transports without a monetary consideration to a port of the United States the catch of another U.S. fishing vessel.

The second act, signed on August 30, 1961, authorizes the Secretary of the Interior to construct at Milford, Conn., a research center for shellfisheries production and there to conduct a research program and training school. The Secretary is authorized to acquire such real property as may be necessary for the purpose. The act provides that the research center shall consist of research facilities, a pilot hatchery including rearing tanks and ponds, and a training school. The research center is to be used to perform basic research on the physiology and ecology of commercial shellfish; to develop hatchery methods for cultivation of mollusks, including the development of principles that can be applied in the use of artificial and natural salt-water ponds for shellfish culture; and to train persons in the most advanced methods of shellfish culture.

A sum not to exceed \$1,325,000 is appropriated to carry out the provisions of the act.

Two acts were signed on September 13, 1961. The first is for the purpose of facilitating administration of and protecting the interest of the Government in the fishery loan fund. It authorizes the Secretary to administer, complete, recondition, reconstruct, renovate, repair, maintain, operate, charter, assign or sell any vessel, plant, or other property acquired and arising out of any fishery loan. For the aforesaid purposes, any of the applicable funds in each particular instance are authorized.

The second act signed on September 13, 1961, permits the landings of catches of fresh fish from foreign-flag vessels not over 50 feet long in any port of the Virgin Islands of the United States as long as the fish are sold or transferred for immediate consumption and not to an agent, representative, or employee of a cannery, freezer, or other processor. It does not preclude the freezing, smoking, or other processing of such fresh fish by the ultimate consumer thereof. The act authorizes the forfeiture of such fish not sold or transferred under such conditions and the payment of a fine of \$1,000 by anyone retaining, selling, transferring, receiving, and purchasing such fish, in addition to any other penalty provided in the law.

The Secretary of the Treasury is authorized to issue any regulations he deems necessary for the enforcement of the provisions of the act.

The four acts described above are listed in Appendix B.

International Developments

Developments in foreign fisheries often create problems for the U.S. fishing industry. It is the Bureau's responsibility to assist in

solving these problems. This assistance may be in the form of reporting foreign fishery developments to the U.S. industry so that its members can better meet changed conditions; of enforcing international treaties with respect to resources; or of participating in international meetings that consider the conservation and wise utilization of marine fishery resources or that negotiate international trade agreements to protect or broaden our markets.

Foreign fishery developments have made problems for the U.S. fishing industry in recent years. The Bureau has expended considerable effort to assist the industry to cope with these problems.

Developments in Foreign Fisheries

At the turn of the last decade, several countries were placing great emphasis on fishery expansion. Long-range catch goals that had been previously established 5 years or so in advance were being achieved. In 1961, for the first time, the fishery production of the Soviet Union, Peru, and Communist China surpassed that of the United States. In addition many other developed and developing countries had made rapid strides in expanding marine fishery production. Soviet, Polish, and Japanese fishing craft were operating closer to Alaskan and New England shores. Many nations have placed increased emphasis on harvesting marine fishery resources, often at great distances from home bases. This greater exploitation has pointed out the need for more adequate conservation measures.

Increased world production of fishery commodities has resulted in keen competition for the U.S. fishing industry, both in domestic and in world markets.

Reporting on Foreign Operations

The Bureau, in collaboration with the Department of State, provided industry and Government leaders with information necessary to cope with marketing and conservation matters. During the year expanded coverage of the fishing activities of foreign countries was obtained, especially with regard to the fishery development plans of many countries. The number of fishery attachés assigned to U.S. embassies was increased to three by the establishment of an attaché post in Copenhagen. Through the creation of this post, European fishery reporting improved tremendously during the year and now is achieved on a regional basis as it is for Latin America through the fishery attaché in Mexico City; the fishery attaché in Tokyo reports exclusively on the fisheries of Japan. Because of the new post at Copenhagen, U.S. representation has been bolstered in organizations such as the

Fisheries Committee of the Organization for Economic Cooperation and Development.

Since April 1961 the Bureau has issued monthly briefs to inform members of industry and Government on Soviet fishery developments, especially in the Bering Sea. With African countries rapidly expanding their fisheries and Japan and other countries expanding theirs to the waters off Central Africa, a new series of monthly briefs was started to cover developments in that area.

International Law Enforcement and Surveillance

Regional enforcement activities in Alaska, the Pacific Northwest, and New England carried out the responsibilities required by international treaties. Because of the continued expansion of fishing activities by foreign vessels operating off the coasts of the United States, particularly Alaska and the New England States, the Bureau increased its efforts during 1961 to maintain surveillance over these operations for the purpose of determining their scope and possible effects upon those fishery resources historically exploited or potentially subject to exploitation by American fishermen. It appears that the Soviet Union fishing fleets in the eastern North Pacific Ocean and the Northwest Atlantic Ocean will continue their large-scale expansion, so evident during the past 2 years. While the fishing methods used by the Soviet vessels on Georges Bank appear to follow the regulations prescribed by the International Commission for the Northwest Atlantic Fisheries (ICNAF), the Bureau is concerned about possible increased fishing of the haddock stocks, which have been fished almost to productive capacity by U.S. fishermen.

International Meetings

Bureau officials participated at numerous international fishery meetings to guide rational exploitation of valuable oceanic species and, simultaneously, to protect the rights of U.S. fishermen. At the meetings they worked to implement carefully determined positions protecting the salmon, halibut, tuna, and fur seal resources of the Pacific Ocean, as well as the cod, haddock, flounder, and scallop resources in the Northwest Atlantic. International commissions holding meetings where fishery issues were resolved included: the International Pacific Salmon Fisheries Commission; the International Commission for the Northwest Atlantic Fisheries; the Inter-American Tropical Tuna Commission; the International Pacific Halibut Commission; the International North Pacific Fisheries Commission; the North Pacific Fur Seal Commission; and the International Whaling Commission.

Fisheries advisers from the Bureau were on the U.S. delegation to the 11th Food and Agriculture Organization of the United Nations (FAO) Conference, held in Rome from October 30 to November 24, 1961. Fishery programs were formulated to improve the economic condition of the fisheries of both developed and developing nations. Among many actions taken of importance to the United States were those dealing with (1) the fishery aspects of intergovernmental oceanographic programs; (2) test programs to be conducted by FAO to increase world consumption of fish protein concentrates; (3) the establishment of a Regional Fisheries Commission for Western Africa; (4) the establishment of a Regional Fisheries Advisory Commission for the Southwest Atlantic; (5) and the establishment of an FAO Advisory Committee on Marine Resources, including provisions for the advice of technologists, economists, and biologists in the Fisheries Division. Expansion of the FAO's program to combat the harmful effects of the increased use of pesticides was also discussed.

The Bureau sent representatives to the 1960-61 tariff negotiations held in Geneva under the General Agreement on Tariffs and Trade (GATT). The United States and other members of GATT entered into tariff negotiations with members of the European Common Market. The U.S. delegation sought and achieved tariff concessions benefiting the sale of certain U.S. fishery products in European markets.

Accomplishments and Operations

Principal Accomplishments

In 1961 the Bureau's activities were more numerous than ever before. A wider scope of activities and accelerated programs in certain areas were responsible for the increase. As a result there have been more accomplishments than in previous years.

North Pacific

Whale resource management and harvest.—In the North Pacific area, licenses were issued to whaling companies and their operations were inspected. The three commercial companies operating in California and Oregon took a total of 344 whales. This is the largest number harvested since the rebirth of the whaling industry along the Pacific Coast in 1956. The Bureau also carried on whale research and participated in the activities of the International Whaling Commission.

Fur seal resource management and research.—The Bureau continued with the administration of the Pribilof Islands and the fur seal resource in accordance with the provisions of the Alaska Statehood Act. Secretarial services were supplied to the North Pacific Fur Seal Commission.

During the fiscal year 1961 two construction contracts were awarded. One is for a combination powerhouse and cold storage building on St. George Island, complete with diesel electric generating units and refrigeration equipment. The new generating units will provide prime electrical power for the Island. The other contract is for a diesel fuel oil storage tank on St. Paul Island. This tank will facilitate delivery of fuel oil to the Island by means of a cargo line for ship-to-shore delivery.

The Pribilof Island fur seal herds were calculated to have about 1,500,000 animals. Although this number represents an alltime peak, hookworm infection continues to cause a heavy mortality among fur seal pups. It has recently been discovered that the infection is carried by adult animals during their extended ocean migrations; therefore, it is apparent that efforts to control the infection by disinfecting the rookeries will not be effective.

Studies of the ocean migrations and feeding habits of fur seal show that in northern waters herring, capelin, Walleye pollock, and sand lance are the principal food items, while near the southern limit of their range off California, anchovies, saury, hake, and squid form 90 percent of the fur seal diet.

Fur seal harvest.—The 1961 take of fur seals on the Pribilofs was the largest harvest since 1956. On St. Paul Island, 67,169 male seals were taken from July 2 through August 15, while 10,495 females were taken in continuation of the program inaugurated in 1956 to reduce the herds through the harvest of female seals as well as males. The take of seals on St. George Island during a comparable period yielded 15,028 males and 3,623 females, making a total harvest on both Islands of 82,197 males and 14,118 females. Under the terms of the Interim Convention on Conservation of North Pacific Fur Seals, 15 percent of the sealskins taken, plus 375 additional skins, respectively, were delivered to the Governments of Canada and Japan.

At two public auctions held in the spring and fall of 1961, 53,802 sealskins were sold for the account of the United States. Gross sales of these skins totaled \$4,142,378 and netted the U.S. Treasury \$2,574,933. Special sales of 4,243 sealskins brought a gross of \$44,176.

Exploratory fishing.—The Bureau's exploratory fishing vessel *John N. Cobb* delineated several trawlable localities off the coast of Oregon within rocky areas normally avoided by commercial fishermen. Tech-

niques developed during the 1960 explorations on "bad bottom" areas off the coast of Washington were used. The trawlable bottom covered some 100 square miles at depths ranging from 75 to 200 fathoms. Good catches of Dover sole, sablefish, and red rockfish were taken in the area off Newport, Oreg. In one of the smaller areas, 40,000 pounds of Pacific ocean perch were caught in 20 minutes of trawling. This was the largest catch ever made by the *John N. Cobb* in over 10 years of exploratory work.

Utilizing the chartered vessel *Tordenskjold*, the Alaska exploratory operations yielded good catches of Dungeness crabs at depths of 20 to 50 fathoms in offshore waters between Lituya and Icy Bay. Commercial fishing on these previously unknown stocks commenced soon after their presence was determined.

Emergency salmon research programs.—Efforts to restore and protect valuable runs of Pacific salmon increased during the past year. A 2-year emergency research program in Alaska is nearing completion. The major objective is to get information necessary for the successful renegotiation in 1963 of the International Convention for the High Seas Fisheries of the North Pacific Ocean, to which the United States, Canada, and Japan are parties. If any one of the three signatory nations does not wish to renegotiate, the convention will end in 1964. The research program is concentrated on the valuable Bristol Bay red salmon runs, which are not fully protected by the terms of the convention. Research has provided increased knowledge of the optimum spawning escapements required to support the red salmon runs in rivers flowing into Bristol Bay. There is increasing evidence that the ability of lakes and streams to support populations of young salmon, rather than the extent of the spawning areas, may be the limiting factor in red salmon production. The studies have shown that red salmon spawn to a depth of 100 feet in some lakes and that the fish-carrying capacity of the lakes varies widely. Ability to predict the size of the salmon runs has improved with the expansion of tagging and sampling programs in the central North Pacific and Gulf of Alaska.

In the Columbia River Basin, the proposed development of the Middle Snake River called for an immediate and intensive effort to find answers to the special problems of fish resource conservation and development posed by the construction of high dams. Essential answers must be found by 1964 to guide the future development of this important salmon producing tributary. The runs that pass through this section of the Middle Snake River are so large a proportion of the spawning escapement in the Columbia River upstream from Bonneville Dam that any project affecting them will have an effect

upon the entire resource. A short-range emergency research program to find better means of fish passage at high dams has been initiated. With the cooperation of the State fisheries agencies of California, Idaho, Oregon, and Washington, studies of juvenile salmon behavior are in progress on several large impoundments. "Gulpers" and "skim-mers" are being developed as a means of collecting the downstream migrants above the dams. Louvers and electrical fields show promise of deflecting migrants to safe avenues of passage. In studies of endurance, steelhead trout and salmon have ascended an experimental fishway for more than 1,000 feet, and one sockeye salmon for more than a mile. Modification of conventional fishway design, a result of experiments in the fish passage laboratory, has saved thousands of dollars in the construction of fishways at Ice Harbor Dam. Further savings will accrue in the construction of fishways at other dams on the lower Snake River.

The Columbia River Fishery Development Program.—In 1961 this program began its 13th year. Operation and maintenance of hatcheries, screens, fishways, and stream-improvement projects continued. Grays River hatchery, the last of the 21 hatcheries constructed under the program, was accepted and placed in operational status by the Washington State Department of Fisheries. Final detailed plans for an evaluation of the hatcheries were prepared. The program is to be initiated in 1962 with the marking by excision of certain fins of several million juvenile salmon. Recovery of marked adult salmon from sport and commercial fisheries and at the hatcheries will provide data upon which production from the hatcheries and contribution to the fisheries may be determined. During the year over 67 million eggs from fall chinook salmon and nearly 33 million eggs from silver salmon were taken at program hatcheries. Young fish released from the hatcheries included 51 million chinook salmon and 12 million silver salmon which had been reared for approximately 1 year.

During the year 71 new screens were constructed and placed in operation at water diversions in the Salmon River basin in Idaho. Emplacement of such screens at points of irrigation diversions prevents entry, and subsequent loss, of young salmon and steelhead. A total of 131 screens have been constructed and now are in operation in Idaho.

The operational studies program, begun in 1960, continued. Several techniques showed promise for developing better methods of fish culture, controlling predators, and improving natural habitat for spawning. Evaluation of artificial impoundments continued, with construction of ponds and stocking of fish in Washington and Oregon. As a part of the study program, approximately 900,000 spring chinook

salmon eggs were planted in the gravel in the main stem of the Upper Selway River in Idaho, while another 700,000 eggs were planted in a tributary to the Selway River. The eggs were obtained from salmon trapped in the Salmon River in Idaho and from Carson Hatchery on the Wind River in Washington. These transplantations of eggs were made in an effort to produce spring chinook salmon runs in the Selway River.

The Shipperd Falls fishway on the Wind River in Washington was constructed several years ago under the auspices of the Columbia River program. Since then the numbers of fish passing this structure to upstream spawning grounds and to the Carson Hatchery of the U.S. Fish and Wildlife Service has increased each year. During 1961 over 4,000 salmon and steelhead ascended the ladder, thus giving demonstrative proof of its success in passing fish.

Proposed water-development projects were studied, and reports were prepared in which analyses of the probable effects of the projects upon fishery resources were made, along with recommendations for protection and maintenance of those resources. Thirty-four reports were prepared on major water projects for conservation of fish resources, and 54 projects were under investigation or review at the end of the year. In some instances, special studies were made of projects completed in prior years in order to analyze the success of facilities or measures that were recommended and adopted. In addition, technical services were supplied to construction agencies designing functional fish-passage facilities at new water-development projects and providing inspection services for the completed facilities.

California

Sardine population studies.—Recent investigations on the serology of the Pacific sardine in California-Mexican waters have shown that there is a genetically distinct stock in the Gulf of California. This is the third sardine subpopulation to be found in the eastern Pacific. Of the two subpopulations defined earlier, one occurs off southern California and the other off Baja California. The large subpopulation in the Gulf of California will probably contribute little or no fish to the present industry operating on the outer coasts.

Albacore abundance prediction.—Increased efficiency in the albacore fishery has resulted from a new program for forecasting albacore abundance. This forecast is made by the Bureau's Biological Laboratory at San Diego. A careful study of historical and current data on the occurrence of albacore in relation to sea surface temperature has revealed a high degree of correlation. In "cold" years albacore move farther south than usual, resulting in high catches south of the

border. Monthly and semimonthly maps of sea surface temperatures in the South Pacific are now being published for use by fishermen in determining the areas where albacore are most likely to be caught. Topographic information is also supplied on these maps, showing the occurrence of seamounts and banks where tuna are known to congregate for feeding.

Hawaii

Albacore subpopulations.—Blood samples from albacore caught in the eastern North Pacific have been compared serologically with samples from the Samoan longline fishery. Because of marked differences in blood types of these fish, biologists have concluded that the albacore from these South Pacific areas represent genetically isolated stocks. This means that the albacore in the northern hemisphere are from distinctly different subpopulations than those south of the Equator. It remains to be determined whether a single, oceanwide subpopulation exists in the southern hemisphere as is known to exist to the north of the Equator.

Skipjack predictions.—The Bureau's Biological Laboratory at Honolulu has developed a method for predicting the seasonal catch of skipjack for the Hawaiian Islands. The method is based upon the time of "zero" rate of temperature change of the ocean climate—the time and rate of warming and salinity change—occurring during late February and early March of each year. If the change occurs in February or before, then the coming season's catch of skipjack can be expected to be good. This relationship between the availability of skipjack in the fishing season and the time of critical change in environmental conditions in the preceding months was discovered in 1959 by the Laboratory staff in their study of the ocean climate around Hawaii. In that year a good fishing season was predicted and came to pass. In 1961 the method was again tested. The change took place earlier than ever before recorded, and so in March it was predicted that the 1961 fishing season for skipjack would be better than average. The June landings were the second highest on record for that area, and the landings for the year were 11 million pounds, which is about 1.7 million above average.

Drift bottle studies.—In a study of the ocean currents in the region of the Hawaiian Islands, approximately 8,000 drift bottles were released from the research vessel *Charles H. Gilbert*. About 5 percent of them have been recovered, mostly in the Hawaiian Islands. In a large number of instances, the bottles had been carried distances of over a hundred miles, at speeds of about 10 miles per day. One bottle traveled about 1,800 miles at a speed in excess of 27 miles per day.

Frequently, several bottles from a single release traveled a considerable distance to wash ashore close together at about the same time. Eleven of 40 bottles from one release in the western Pacific were reported found on Maiana Island in the Gilberts almost 300 miles away. This implies surprisingly little dispersion in the open ocean due to turbulent mixing and suggests the existence of a mechanism, such as convergence of the surface waters, which tends to keep the drift bottles together as they move with the currents. The returns provide evidence of seasonal variations in the surface currents near the Hawaiian Islands. In the winter the recoveries were from the releases south and west of the Islands; in the spring, the movement was generally to the north and west; and later in the year, the pattern showed a westerly movement, with a few recoveries from the south.

Gulf of Mexico

Midwater trawling explorations and gear research.—Midwater trawling explorations for sardinelike fishes in the Gulf of Mexico were continued by the Bureau's exploratory fishing vessel *Oregon*. Although vast numbers of midwater-schooling fishes were encountered, catches were erratic. Coincidental with these explorations, performance tests were made of experimental midwater trawl designs and various types of trawl doors, depressors, and elevators. Electronic instruments were designed and developed to record gear performance and fish behavior patterns. Of particular significance was the development of remote-controlled, underwater movie camera apparatus to record fish performance under conditions not suitable for scuba divers.

Shrimp explorations.—The *Oregon* also carried out shrimp explorations in areas of the Gulf of Mexico not fished by the commercial fleet. These explorations proved conclusively that the absence of shrimp from known grounds was caused by reduced stocks rather than a change of habitat of the common commercial species of shrimp.

Shrimp trawl gear tests.—In the course of underwater shrimp trawl studies on the Bureau's exploratory fishing vessel *George M. Bowers*, instruments for measuring significant mechanical parameters of shrimp trawl gear were designed and tested. These included a trawl door angle-of-attack indicator, a door-to-net leg angle indicator, a trawl and door spread indicator, and a towing warp angle indicator. These instruments, and others being developed, should be of tremendous help in future experiments on shrimp trawl mechanics.

Shrimp research.—The Bureau of Commercial Fisheries' shrimp research is centered at the Biological Laboratory, Galveston, Tex. The aim of this research is to determine the biological conditions

responsible for fluctuations in the number of shrimp available and the facility with which they can be caught. To accomplish this aim, knowledge must be acquired on the entire life of shrimp from egg to adult, on spawning and nursery areas, on shrimp movements, and on the physical and chemical conditions of the sea.

Through studies of shrimp biology, methods for distinguishing the larval forms of the different species have been developed. This is important because shrimp spawn offshore. After the egg hatches, the larvae undergo several transformations as they moult and grow. These young shrimp migrate to the coast and enter the protected estuaries where they grow rapidly. Three years ago, research was started to collect these postlarvae to determine how they vary in abundance from week to week and year to year. The numbers entering the estuaries in the spring of 1961 were very much less than in 1960. This suggests that to discover the causes of changes in survival more knowledge is needed of conditions in the offshore areas between the spawning grounds and the shore.

Simultaneous sampling of shrimp populations and water conditions on the Continental Shelf between the Rio Grande and the Mississippi Rivers was begun in 1961. The object of these studies is to discover how environmental conditions (temperature, salinity, and ocean currents) influence the survival of shrimp.

Variations in ocean currents may affect the success with which larvae move from the offshore spawning grounds to the estuaries. Once a month measurements are made of the speed and direction of currents at several depths at 60 locations on the Continental Shelf. Drift bottles are released to determine surface currents. Seabed drifters are used to study bottom currents. These are made of colored plastic and closely resemble a small umbrella. The handle tip slides along the bottom while the umbrella is towed by the current. They are caught by the shrimp fishermen in their nets, and the position of capture reported.

These studies require very exact measurements, and it will be several years before data on the annual variations in temperature, salinity, and currents can be accumulated and compared for their effects on shrimp.

The technique of staining shrimp with colored dyes has been an important development. Recapture on the fishing grounds of dyed shrimp released in the estuaries has proven that shrimp may migrate long distances, that these estuaries are necessary to the maintenance of the shrimp populations, and that this migration is a long and hazardous journey.

During fall 1961 the first successful release of stained shrimp at sea was accomplished. Live stained shrimp were lowered to the bottom in a large closed box. Scuba divers observed them leaving the box and burrowing into the soft bottom. For the first time actual measurements of growth and mortality rates on shrimp of known size at release were possible. Preliminary results with pink shrimp on the Tortugas and Sanibel grounds indicate rapid growth and high mortality. Similar experiments with brown and white shrimp are underway. Such studies should assist in determining what are the correct sizes for harvesting.

New sea-water facilities completed.—During the year a circulating sea-water system was completed at the main Laboratory at Galveston and a sea-water laboratory was constructed at East Lagoon. Studies of shrimp behavior and physiology are underway. Full knowledge of the effects of hydrographic conditions on shrimp depends upon laboratory experiments as well as field observations. Studies of artificial culture of shrimp will also be possible with these running sea-water systems, so that commercial quantities of shrimp may eventually be raised under controlled conditions. The new laboratory at East Lagoon will be used primarily to hold for experimental purposes shrimp, crab, and other shellfish and both larval and adult fish as well as numerous other marine animals.

Shrimp industry study completed.—The Bureau contracted with the University of Florida for a study on the economic utilization of shrimp vessels. During the past year the study was completed. The report presents an analysis of factors influencing productivity in the domestic industry and suggests corrective measures to strengthen the industry's position with respect to foreign competition.

Atlantic Coast

Calico scallop bed commercially productive.—The Bureau's chartered exploratory fishing vessel *Silver Bay* further delineated the calico scallop bed discovered in 1960 off the east coast of Florida and obtained information on the seasonal occurrence of this species. It was demonstrated that calico scallops are available in commercial quantities and that a year-round fishery is possible. This may be one of the largest scallop beds in the world. A 100-foot North Atlantic trawler with automatic shucking machines aboard was readied for harvesting this resource and sailed on its initial voyage in December.

Exploratory fishing off the Carolinas.—The *Silver Bay* also located promising fishing grounds off Cape Fear, N.C., and Charleston, S.C. Commercially significant catches of vermilion snapper, grouper, and

scup were made. As a result, a small fishery began off South Carolina.

Trawling for herring.—The Bureau's vessel *Delaware*, utilizing midwater trawls rigged with instrumentation similar to that employed by the *Oregon* in its operations in the Gulf of Mexico, carried out successful herring explorations off the New England coast. Good catches of herring were consistently made off the northern edge of Georges Bank. The methods and techniques for midwater trawling perfected during these exploratory fishing operations should be useful to the Maine sardine industry, particularly in years similar to the year 1961 when the fish were not available in inshore waters.

Polypropylene trawl net demonstrations.—To determine the effectiveness of trawls with various parts made of polypropylene, comparative fishing tests with trawls of this material and standard manila trawls were made by the Bureau's exploratory fishing vessel *Delaware*. Polypropylene trawls appeared to be more efficient than the standard manila trawls. This is probably attributable to both the buoyancy of the polypropylene top sections and ropes, which allows the headrope to rise higher, and the reduced water resistance, which allows the trawls to be dragged more easily.

Shellfish culture and predator control.—The Bureau's research program for the development of artificial culture of oysters and clams and the control of their enemies took major steps forward during 1961.

Scientists at the Bureau's Laboratory at Milford, Conn., have been engaged in this work. During the past year they have been studying methods for raising the microscopic plants that are the oyster's food. Artificial culture of oysters and clams will depend largely on supplying food to the larvae, juveniles, and adult bivalves; therefore finding the best, most easily handled, and cheapest foods is an important goal in the program. This research has been successful, and food can be grown in sufficient quantity to feed our experimental larvae and juveniles in the laboratory.

Work also began on the development of a processed food for bivalves. A dried product that can be stored satisfactorily until needed will be of great advantage. Through the freeze-drying technique, a food was produced that can be fed to clams and will cause growth comparable to that when fed natural foods.

Part of the research at Milford was on the control of diseases that are known to develop when oysters and clams are crowded together, as is necessary in artificial culture. Prophylactic treatments of antibiotics were found to effectively control these diseases.

Studies are being made to determine what makes a good cultch for oysters that are being cultured artificially. A clean, hard substance is needed for the attachment of the young oysters. The best and most commonly used is the old oyster shell, which, however, is scarce, odd

shaped, bulky, and heavy. The disadvantages of oyster shell become more important in artificial culture, for space and cost must be considered more closely. Many kinds of materials such as rubber, plastics, and cement have been tested. Compared with natural oyster shell, cement panels have proved the best.

At the Laboratory at Milford certain chemicals were found to control effectively oyster drills, and methods were developed for applying these chemicals to oyster beds. After controlled laboratory experiments, tests were made on several acres of natural oyster grounds. The chemicals, applied by broadcasting sand treated with these chemicals over the beds, will cause marked reductions in the number of predators. Experiments and tests are now underway to determine if the chemicals are accumulated by the oysters. It is known that these chemicals will not harm oysters or other marine life when used according to the methods developed at Milford. The question is: Can the oysters store the chemicals so they may not be safe human foods? The Bureau is working closely with the U.S. Food and Drug Administration to insure that when the method is recommended for use by the oyster industry, the oysters will be safe.

Woods Hole Aquarium.—The aquarium at Woods Hole was completed and opened to the public during the summer. More than 200,000 persons visited it in 1961. Throughout the year it also functions as an aquarium for experiments on marine fishes. Construction of a maintenance building was also completed.

Economic studies contracted to Boston College.—In the interest of the fishing industry, the Bureau contracted with Boston College for several economic studies. One of them deals with the basic differences that account for the competitive advantage enjoyed by the Canadian groundfish industry over the domestic industry. Results of the study show the differences to be the greater proximity of the Canadian fishermen to the more productive Northwest Atlantic grounds, vertical integration of the Canadian industry, and a large Canadian labor pool. In addition to making cost comparisons, the study also contains an analysis of the groundfish resources of the Northwest Atlantic with special reference to vessel productivity.

The economic factors affecting the demand for New England cod and haddock have also been studied by Boston College. The report shows that the demand for haddock is quite elastic although the degree of elasticity has declined somewhat in recent years because of the increasing importance of the fresh market to the domestic industry. Since the wholesale price for haddock is relatively insensitive to changes in supply, this attribute has considerable significance from a marketing standpoint.

In process of preparation by Boston College is a comparative analysis of the scallop fishing industries of New England and Canada in order to determine the long-term competitive advantages and disadvantages of each area. Data on the cost of production are being analyzed in an effort to explore present and future alternative economic opportunities available to capital and labor.

Scallop promotion.—The Bureau cooperated with the New England sea scallop industry in an August sales push to facilitate the movement of sizeable scallop inventories into normal market channels. The Bureau arranged promotional tie-ins with the ripe olive and cranberry industries. As a result of this cooperative industry-Government effort, normalcy was restored to the scallop market.

Great Lakes

Kaho commissioned.—The Bureau's new 65-foot exploratory fishing and gear research vessel *Kaho* was commissioned in late October. It will be based at Saugatuck, Mich., and will start exploratory work in the Great Lakes early in 1962.

Great Lakes lamprey-control and lake trout-rehabilitation programs.—The Great Lakes lamprey-control program, a cooperative effort of the Bureau and the Fisheries Research Board of Canada, progressed during the year, as did the related program to rehabilitate lake trout.

In Lake Superior sea lamprey larvae were destroyed in streams entering the lake. The chemical treatment of all the lamprey-producing streams, which started in 1958 and was completed in 1960, destroyed the larvae before they reached the parasitic adult stage when they had been rapidly decimating the valuable lake trout stocks. The selective treatment did virtually no harm to fish but eradicated the larval population. This led to a sharp reduction in sea lamprey wounds on lake trout in the fall of 1961, giving evidence that control was being achieved.

Rehabilitation of the highly prized lake trout is well under way in Lake Superior. Nearly 6 million hatchery-reared lake trout were stocked in the lake from 1958 to 1962. Millions more are to be planted each year until the population is restored. Survival has been excellent, and in many areas of the lake, the hatchery-reared lake trout, marked by clipped fins, outnumber the natural lake trout. Now that control of the sea lamprey is a reality, protective measures are being initiated to conserve the small spawning stock that remains in the lake.

The success in controlling the sea lamprey in Lake Superior has brought renewed hope for Lake Michigan where lake trout have be-

come virtually extinct and other commercial species strongly affected. After the disappearance of the lake trout, the sea lamprey turned to the larger species of chubs for food. A 2-year survey of the chub stocks of Lake Michigan was completed in 1961 and showed that two of the larger species of chubs have become extinct and the abundance of others greatly reduced. The small, slow-growing bloater chub, which once was the main food of lake trout, now constitutes over 90 percent of the chub population. Limited markets for bloater chubs, as well as the small alewives and smelt, which have recently become abundant in the lake, have brought severe hardship to the fishing industry.

Restoration of a balanced fish population in Lake Michigan has begun. Sea lamprey larvae were eradicated in 26 tributary streams during 1960-61. Small trial plantings of hatchery-reared lake trout have had excellent survival. These fish have dispersed throughout the lake and have shown rapid growth.

In Lake Huron, 13 streams have been treated and lamprey eradicated.

Studies on decline of fish stocks in Lake Erie.—Studies to find causes for the drastic declines of the blue pike and walleye fisheries of Lake Erie have produced evidence of marked environmental changes. Various chemicals related to domestic and industrial wastes flowing into the lake have increased steadily in recent years. The resulting enrichment of the environment has caused severe oxygen depletion of the bottom water over thousands of square miles of the lake. Dramatic changes occurred in the abundance of fish-food organisms living on the bottom. The resultant influence of these factors has led toward declines in the stocks of high-value species of the lake and increased abundance of less desirable species of limited market potential.

Assistance to Arkansas fish farmers.—The Bureau intensified its market-development and technical assistance efforts to aid the Arkansas fish-farming industry in the commercial production and utilization of fish produced in flooded rice acreage in rotation with rice field crops. The one to two million acres of lowland farms in Arkansas and adjacent States offer a tremendous potential, estimated to be as high as 250 million pounds annually, for commercial fish production for human and animal food. This represents a vast potential reservoir to meet the future food needs of our expanding population. At present, only a very small portion is being utilized. The new facilities at the Laboratory in Ann Arbor, Mich., have enabled technological studies to be made on problems related to fish farming. Buffalofish and other pond-reared fish have been processed into marketable forms as frozen breaded portions and filets. Product de-

velopment, testing of packaging materials, and storage tests of products will be continued.

General

Oceanography program.—During the past 3 years the Bureau of Commercial Fisheries has been working closely with other Government agencies, universities, and private research institutions to plan and carry out a coordinated national program in oceanography. The principal coordinating agencies have been the Interagency Committee on Oceanography (ICO) of the Federal Council for Science and Technology and the National Academy of Sciences Committee on Oceanography.

The Bureau's responsibility in the national program in oceanography is particularly for biological studies. In this connection the Bureau has continued studies to increase men's basic knowledge about the oceans and also has supported programs concerned with the development of particular fisheries. Research has been directed toward gaining a better understanding of the ocean environment in order to develop better methods for predicting places and times of fish concentration. Other programs have been concerned with the discovery of unexploited stocks; development of new and more efficient means to capture marine organisms; control of environment to increase natural production—"farming" the sea, so to speak; and use of new sources of protein not previously taken from the sea.

Budget increases for oceanography were used during the past year to support new programs for education and for training grants and fellowships, to increase efforts in fish and invertebrate taxonomy, to contribute to the operation of the National Oceanographic Data Center, to make basic studies of estuaries and coastal waters, and to learn more about the behavior patterns of fishes in order to increase the efficiency of the fishing process.

In March 1961 plans for fishery investigations of tropical Atlantic waters off Central Africa were drafted and proposed as The Tropical Atlantic Oceanography Fishery Program by the Bureau to ICO. The program was endorsed by that agency. Until recently this fertile marine region has been unexploited; however, for the past several years it has been fished intensively by fishermen from Japan and other countries. Besides making these sources of protein known and available to the undernourished people of the world, the investigations, if carried out after they are formally recommended by the Bureau, will enable this country to gain a thorough knowledge of the oceans of the world and to participate in the exploitation of these waters.

Major progress was made in the funding of new research vessels and shoreside facilities, including: a new oceanographic-fishery research vessel, the *Townsend Cromwell*, for use in the central Pacific; an exploratory fishing vessel to replace the *Delaware*; a new fishery research vessel to replace the *Albatross III* for use in the New England area; a new fishery laboratory to be located on the Scripps Institution of Oceanography campus; and badly needed improvements to existing facilities at the Bureau's Biological Laboratories at Boothbay Harbor, Maine, Oxford, Md., and Auke Bay, Alaska. The Laboratory at Auk Bay was just completed in December 1960.

Fish oil research.—Bureau researchers developed new analytical techniques to produce better fish oil fractions and devised new methods to determine rapidly the chemical components of such fractions. The Bureau's molecular still at the Technological Laboratory in Seattle is being used to produce special fractions for many researchers outside the fisheries, especially in the fields of medicine and nutrition, and in the paint industry. Researchers in these specialized fields are being supplied with tailormade fish oil fractions. Using the newly developed methods, Bureau researchers found that the body oils of the dogfish shark contain a high amount of mono-enoic acids. These acids have special properties that may create a demand to reactivate the dogfish industry.

Radiation preservation studies.—Significant advances were reported for 1961 in the program of low-level radiation (pasteurization) of fishery products. Studies on fresh clams and haddock demonstrated that the shelf life of these products can be increased as much as 2 weeks. This means that the products may be held as long as 30 days before they are unfit for human consumption. The program was expanded to include species native to the Northwest Pacific. Initial studies are underway on low-level radiation preservation of fresh flounder and rockfish. Low-level radiation must be used with good refrigeration practices to derive the full benefit of the process.

Frozen foods studies.—Several studies are in progress on the effects of time and temperature on frozen fish and shellfish. They were requested by industry because of the increased interest shown in the proper handling and marketing of frozen fish and shellfish. One study is on the effects of time and fluctuating temperatures on the quality of frozen fishery products in the commercial distribution chain. Other studies concern the effects of controlled temperature fluctuation on product quality and the development of objective tests for measuring time-temperature history. The Bureau has also started

microbiological studies of frozen fishery products. The results of these studies will be compiled in a manual on all phases of production and handling of frozen fish and shellfish.

U.S. standards for fishery products and certification service.—U.S. standards were developed for grades of two more fishery products—frozen fried scallops and frozen sole and flounder fillets. There are now 12 quality standards upon which the Bureau bases its inspection and certification service. In addition, three other standards are being revised. Technical assistance was also provided by the Bureau in the development of specifications for ocean perch, cod, and haddock fillets for use of State Purchasing Officials and on a revision of a Federal specification for frozen raw breaded shrimp. These standards and specifications are tools by which the industry or other interested parties can measure product quality. The consumer benefits, because such standards and specifications tend to raise the quality level of the product.

A meeting was held by the Bureau in June 1961 with representatives of the fishing industry and other interested parties to discuss the existing inspection program for fishery products and the changes in the program that are needed to satisfy better the industry and the U.S. consumer. Suggestions made by the industry were carefully evaluated and are now being put into effect.

Rough-fish market development.—The Bureau's intensive program of developing markets for underutilized fish continued. Markets were further expanded in the pet-food and mink-food industries, with a salutary effect on a number of fresh-water and marine fisheries. As the result of Bureau efforts, a number of major pet-food concerns are contemplating expansion of existing production facilities and construction of new pet-food plants in the Great Lakes and Gulf of Mexico areas.

Fish-cooking demonstrations.—To stimulate fish use at the institutional and the homemaker level, Bureau home economists presented 198 fish-cookery demonstrations for school-lunch and other institutional supervisory food-preparation personnel, participated in 10 national food trade and professional conventions, and appeared on numerous television and radio food shows throughout the United States. They developed kitchen-tested recipes for institutional and homemaker use, distributing them through booklets, recipe folders, and copy for radio, television, and newspaper and magazine food publicists.

Consumer education.—The Bureau again cooperated with the commercial fishing industry in a number of industrywide, national, market-promotion efforts. Public-service, consumer-education mate-

rials were distributed to newspaper and magazine food editors, radio and television food personalities and public-service directors, extension specialists, the mass-feeding industry, the retail food trade, and others in a position to publicize and merchandise fishery products. Bureau home economists and marketing specialists also appeared on radio and television food shows. They stressed the nutritional value, ease of preparation, and variety of fishery products. As an example of the cooperation received from newspaper food editors, during the 1961 Lenten period, February to April, over 222,000 column inches of food-column space were devoted to fish. This represented an advertising value of about two million dollars to the industry. Over one-third of this publicity was based on Bureau consumer-education releases.

Bureau-produced motion pictures.—An industry-financed educational motion picture, "Fishing Five Great Lakes," was completed and another, "Watermen of Chesapeake," was started during the year. Twenty Bureau-produced, and for the most part industry-financed, fishery educational motion pictures are now in national distribution through some 180 cooperating film libraries and Government distribution channels. An audience of over two million persons, exclusive of the audience viewing public service television showings, annually see these films. Bureau motion pictures received two international and three national film festival awards during the year. Since 1946, 18 international and national film festival awards have accrued to the Department as the result of Bureau-produced educational motion pictures.

Market News Service reporting.—During the past year the fishing industry continued to be provided with current information on landings, receipts, prices, market demand, stocks, imports and exports, and new developments in domestic and foreign fisheries in order to aid in the orderly marketing of edible fishery products as well as industrial fishery products. Reports again were issued daily by the seven Market News Service offices at Boston, New York City, Hampton, Va. (includes data from Baltimore, Md.), New Orleans, San Pedro, Calif., Seattle, and Chicago. Coverage of the fish meal, oil, and solubles market proved vital to the industry when it encountered marketing problems during the year.

Fishery statistics.—For each of the 42 States supporting commercial fisheries, data were assembled on employment of fishermen, fishing craft, and gear used in the capture of fish and shellfish; on the volume and value of the catch; and on the production of manufactured fishery commodities. Monthly fish and shellfish landing bulletins for 22 States were issued in cooperation with the State fishery departments.

Information was released each month on freezings and cold storage holdings of fish and shellfish and on the production of fish meal, oil, and solubles. A report containing definitions and sketches of the principal types of fishing gear was published as a guide in the reporting and tabulating of information on fishery operating units and the catch by gear.

Fisheries Financial Assistance Programs

The Bureau administers three programs that give direct financial assistance to the fisheries.

Fisheries Loan Program

Under the Fisheries Loan Program, operations that began in the latter part of 1956 were continued. In August 1961 a memorandum of understanding with the Small Business Administration was terminated. The agreement had provided that SBA make financial investigations of applications for loans and also close and service approved loans on a reimbursable basis. By the end of September all of this work was taken over by the Bureau of Commercial Fisheries.

During the fiscal year 184 applications totaling \$4,718,050 were received, bringing the total since the program began to 961 for \$28,949,169 (Appendix C). Eighty-nine applications for \$2,080,552 were approved during the year while 45 applications for \$753,560 were declined. Approximately 50 percent of the funds loaned were to California fishermen primarily for the purpose of converting tuna clippers to tuna purse seiners. The loans were large because tuna clippers are among the largest vessels used in the U.S. fisheries and the conversion required considerable structural changes as well as expensive nets. The conversion of these vessels revived this segment of the industry to a point where instead of being one of the least profitable U.S. fisheries, it became one of the most profitable.

Fishing Vessel Mortgage Insurance Program

The Bureau assumed the responsibility for this program after the passage of the Act of July 5, 1960. The program provides for insurance of mortgages given for the construction, reconstruction, or reconditioning of fishing vessels. During the fiscal year 1961 there were four applications for insurance on \$229,500, and all of them were approved. Banks and insurance companies began to appear interested by the end of the year. Previously, they had shown little or no desire to provide funds because of the tight money market.

Fishing Vessel Construction Differential Subsidy Program

This Bureau program was authorized by the Act of June 12, 1960. It provides for the payment, under certain very restrictive conditions, of a subsidy equal to the difference between the cost of construction of a fishing vessel in a domestic shipyard and the cost of construction in a foreign shipyard, with a maximum limitation of 33 $\frac{1}{3}$ percent of the cost of construction in a domestic shipyard. One of the restrictions is that the vessel must be designed to operate in a fishery which has received a finding of injury or threat of injury by reason of increased imports. In effect this has confined the program to those vessels designed for fishing for groundfish in New England. Relief for this fishery has been recommended by the Tariff Commission under the Escape Clause of the Trade Agreements Extension Act of 1951, but relief was denied under Section 7(c) of the act. During the fiscal year three applications totaling \$184,887 for subsidies for construction of fishing vessels were received from this fishery. All of these cases were in various stages of processing at the end of the year.

New Programs

In 1961 the Bureau began two new programs that will benefit the U.S. fishing industry. One eventually should benefit also the fishing industries of many countries and affect populations all over the world. The other program concerns only one of our fishing industries and should produce direct and immediate effects on it.

Manufacture of Fish Protein Concentrate (FPC)

The Bureau started a study on the manufacture of fish protein concentrate. Processed from whole fish, FPC is a fine powder that contains the essential amino acids and the minerals and vitamins needed by man to maintain body health. This product, which can be odorless and tasteless, is being considered as a protein supplement, particularly in those areas of the world that have a deficiency of animal protein. The Food and Agriculture Organization recommended that an inexpensive, edible, fish-protein-concentrate food product be found to combat world malnutrition. This recommendation stimulated the Bureau to begin the first phase of the overall study. The Bureau also felt that the manufacture of FPC would create new markets for domestic fish and fish meal, which will expand and help to stabilize the U.S. fishing industry. The first phase of the overall study is a world survey of the processes now being used

to manufacture FPC. Studies of the processes under development in South America, Europe, and the United States have already been finished. Upon completion of the first phase of the program, the survey results will be reviewed by a panel of scientific experts of the National Academy of Sciences to determine which of the many processes are worthy of further intensive research by the U.S. Government. Based on these recommendations, pilot processing studies will be undertaken by the Bureau to develop methods for manufacturing an inexpensive, high-quality fish protein concentrate.

Mechanization of Blue Crab-Processing Industry

The Bureau began a study on the possible mechanization of the blue crab-processing industry. Since the blue crab industry relies largely on hand labor, particularly in removing the meat from the cooked crabs, passage of the minimum wage law doubled labor costs. Were such increased costs passed on to the consumer, the product might be priced out of the market. Recognizing that immediate assistance was necessary, the Bureau contracted with a private consulting firm to develop emergency stopgap improvements to reduce costs under present processing methods. This study has been completed, and the results have been made available to industry. As a second step, a contract has been approved to develop a model mechanized processing unit to meet the needs of this industry.

Meetings

The Bureau of Commercial Fisheries sends representatives to many meetings each year to help form international policy on marine fishery resource conservation and on trade in fishery products and to contribute the findings of Bureau scientists to international groups of scientists and to learn of others' findings. Bureau representatives also attend national meetings that concern our fishery resources and our fishing industry. They attend meetings, many with Federal, State, and private fishery organizations.

Some of the international meetings of interest are discussed in the section International Developments. Two others of particular significance were the Government-Industry Oceanographic Instrumentation Symposium and the International Meeting on Fish Meal.

Oceanographic Instrumentation Symposium

One of the most critical needs in the national oceanographic program of research and exploration is for new and improved instruments. To define the needs and to encourage industry to help develop them, the Government-Industry Oceanographic Instrumentation Symposium was held in Washington, D.C., in August 1961. The Symposium was sponsored by the Interagency Committee on Oceanography (ICO) of the Federal Council for Science and Technology. The Bureau of Commercial Fisheries played a prominent role in the planning for the meeting, which was held in the Department of the Interior Auditorium.

The Symposium was attended by 540 representatives from industrial concerns with an interest in oceanographic instrumentation, 139 representatives from Government, 32 from nonprofit institutions, 22 from the press, 4 from embassies of foreign countries, making a total of 737 attendees. Since the meeting there has been a continued flow of proposals from the industry for the development of new instruments. Judging by this keen interest on the part of the industry, the meeting was successful.

International Meeting on Fish Meal

The FAO International Meeting on Fish Meal was held in Rome in March 1961 at the request of member governments because of the adverse market conditions for the product. The purposes of the meeting were to assess the world demand for fish meal in relation to resources and productive capacity, to consider ways of increasing the demand, and to explore possibilities of ensuring stable conditions in the international market for fish meal. Bureau participants were among those from 27 nations, as well as observers from several international organizations, attending the meeting.

The survey made of the world situation for fish meal showed that (1) there are large stocks of fish which are relatively unexploited; (2) the long-range production of fish meal depends upon demand rather than supply; and (3) there is a pressing need for research leading to the development and use of fish protein concentrate for human feeding. As a result of the survey, industry organizations and member governments are taking steps to effect market stabilization of fish meal in quality and production.

Cooperation and Coordination With International, Federal, State, and Other Agencies

The Bureau cooperates with and coordinates its programs with those of various foreign governments, other Federal agencies, States, universities, and private agencies. This cooperation and coordination takes the form of international agreements and treaties, formal and informal agreements with Federal and State agencies, and contracts and informal agreements with State conservation departments, universities, and private associations. Such cooperation and coordination not only fosters the exchange of ideas and research results but also ensures the best use of available manpower and facilities.

Through cooperation with other countries, information basic to solving mutual problems is developed and exchanged. The research efforts of a number of countries are coordinated by such international organizations as the Food and Agriculture Organization of the United Nations (FAO), the International Commission for the Northwest Atlantic Fisheries (ICNAF), the International North Pacific Fisheries Commission (INPFC), the Great Lakes Fishery Commission, and the Commission for Conservation of Shrimp in the Eastern Gulf of Mexico.

In September 1961 the Bureau, representing the United States, was host to the FAO International Conference on Fish in Nutrition in Washington, D.C. The main objectives of the Conference were to bring together the leading scientists in the fields of nutrition and fishery technology to evaluate the total knowledge available and to direct future research. The Conference, the first meeting of its kind, was attended by over 300 scientists from 35 countries and international organizations. A survey of our present knowledge in different fields was presented in 33 review papers, supported by 35 original scientific and technical papers. Discussions concerned the nutritional qualities of fish for human and animal diets and ways of disseminating this knowledge and making more available good quality fish and fishery products to the people of the world, particularly to those in underdeveloped areas where hunger and malnutrition are prevalent.

The Bureau cooperates closely with a number of national, regional, and local fishery and allied trade associations. These embrace virtually all research, development, and service functions of the Bureau.

Interstate commissions are the media through which the Bureau functions in formal agreements with States. Two of these commissions are the Gulf States Marine Fisheries Commission and the Atlantic States Marine Fisheries Commission. Interstate commissions coordinate the research efforts and conservation actions of the States

involved in such compacts. Much of the scientific data upon which these interstate commissions act is provided by Bureau researchers.

Informal agreements between the Bureau and State agencies and universities are represented in a number of cooperative efforts.

In the summer of 1961, the Bureau's Biological Laboratory at Honolulu and the State of Hawaii jointly started a program of experimental gill net fishing for tunas. The first summer's work yielded rather inconclusive results, so the tests are being continued during 1962. If the experiments should prove successful, the results can add greatly to the efficiency of the Hawaiian tuna fishermen.

The Bureau and the State of Michigan cooperated closely during 1961 in developing a trawl fishery in Lake Michigan. By agreement, Michigan requires holders of experimental trawl permits to keep detailed catch records that Bureau biologists can use in studies of abundance, distribution, and species composition of fish stocks in the trawling areas. The Bureau biologists, in turn, provide analyses useful to the State for development and regulation of the fishery.

For the past 10 years the Bureau's Biological Laboratory at La Jolla has taken part in the California Cooperative Fishery Investigations (CALCOFI). These investigations have been studying the physical, chemical, and biological environment in the eastern Pacific with particular attention to factors contributing to the varying abundance of the sardine and ecologically associated species. Other agencies participating in this program are the California Department of Fish and Game, Scripps Institution of Oceanography, the California Academy of Sciences, and Stanford University. Recent interpretations of the data collected by CALCOFI show a possible reciprocal relation between the abundances of the Pacific sardine and the anchovy. The drastic decline in the abundance of the sardine since 1945 has been accompanied by a marked increase in the anchovy. Details of the relationship are yet to be defined, however.

Formal and informal agreements exist between the Bureau and other Government agencies—the Atomic Energy Commission (AEC); Federal Trade Commission; Department of State; Department of Health, Education, and Welfare; Department of Agriculture; Department of Labor; Department of the Treasury; Department of Commerce; Weather Bureau; and various defense agencies.

Twice during 1961 at the request of the International Cooperation Administration, the Bureau made surveys of fishing industries in foreign countries. The first was in certain underdeveloped West African countries. These countries were Ghana, Nigeria, Ivory Coast, and Sierra Leone. Brief studies were made in Liberia and Senegal. Study was made of facilities for production, processing, marketing, and utilization of fishery products. The survey team of three fishery

specialists recommended to these countries fishery programs designed to utilize their fishery resources as a source of high-quality protein food and thereby increase the supply and demand within the countries.

The second survey was of the fishing industry in Panama. Sufficiently detailed field studies were made to provide perspective for establishing the existing level of the fisheries industry activities. On the basis thus established, the Bureau made recommendations on the direction, locality, and extent of specific activities which would produce greater catches and more effective processing.

For the past 2 years, the Bureau's Biological Laboratory at San Diego has sponsored a cooperative albacore-trolling program aboard the picket vessels of the U.S. Navy off the southern California coast. These vessels are a part of the radar early warning surveillance network, operated by the Navy since 1956 off the west coast of the United States. The surveillance system includes five continuously occupied stations up to 200 miles offshore from the Cobb Seamount on the north to latitude 32° N., longitude 124° W. off San Diego, Calif., on the south. This program in cooperation with the Navy has proven highly successful for it has offered a unique recreational opportunity to crew members where previously there was none. Each vessel is supplied with a kit of fishing gear. Each kit consists of a 30-fathom line, a shock-cord assembly, and a standard Japanese-type feather trolling jig. The catches and surface temperatures are recorded, along with the length of time each line is fished, on special log sheets provided by the Bureau. The resulting data are useful in plotting the distribution of albacore in relation to temperature. They have also contributed information on albacore migrations and seasonal variations in abundance.

The Bureau in cooperation with the AEC began a study on the deepwater marine resources off the coasts of Oregon and Washington in 1961. Initial operations by the Bureau's exploratory fishing vessel *John N. Cobb* resulted in the establishment of a track line and standard sampling stations off the Columbia River. These stations were surveyed during the summer and fall by the research vessel *Commando*, chartered from the University of Washington. Drags were successfully made at depths to 475 fathoms. Several marketable species were taken in commercial quantities. This cooperative work will continue in 1962.

In connection with its responsibilities for management of the Pribilof Islands fur seal herds and the maintenance of the two Aleut communities on those islands, in 1961 the Bureau had cooperative agreements with the Public Health Service in providing medical and dental services, with the Alaska Department of Education in operating the school system, with the Department of the Navy in

conducting an annual resupply operation, and with the Bureau of Indian Affairs in relocating Aleut residents.

The Coast Guard assists the Bureau in carrying out its enforcement responsibilities under the Fur Seal Act of 1944, the Northwest Atlantic Fisheries Act, the North Pacific Fisheries Act, the Northern Pacific Halibut Act, and the Sockeye Salmon Fishing Act. The State of Washington also assists in enforcing the laws and regulations issued pursuant to the Sockeye Salmon Fishing Act. Likewise, the Bureau cooperates with the Bureau of Indian Affairs in maintaining an overview of the operation of fish traps in three native communities in Alaska.

The Columbia River Fishery Development Program is a cooperative endeavor with the fish and game agencies of the States of Washington, Oregon, and Idaho and the two component Bureaus of the U. S. Fish and Wildlife Service. The Bureau of Commercial Fisheries, in meeting its responsibilities for the general administration and coordination of this program at the Federal level, has developed cooperative arrangements with the Bureau of Reclamation, Corps of Engineers, and other Federal and State agencies.

The Bureau also made extensive use of the professional talent and research facilities of a number of universities, State agencies, trade associations, and private organizations by contracting with such groups to supplement Government research and service activities. A substantial part of the 2-year emergency research program now in progress in Alaska is performed under contract to the Bureau by the Fisheries Research Institute of the University of Washington and the Alaska Department of Fish and Game. Studies by the Fisheries Research Institute have provided important new information on the optimum spawning requirements of Bristol Bay red salmon runs. The Alaska Department of Fish and Game made a substantive contribution in their studies on the growth and survival of red salmon. Appendix D lists the organizations with which the Bureau had formal contractual arrangements in 1961.

Organization, Employment, Budget, and Physical Property

Organization

In 1961 the position of Program Development Officer was added to the Director's Office of the Bureau of Commercial Fisheries in Washington, D.C. During the latter half of the year there was a complete restructuring of the Branch of Marketing both in the Headquarters Office in Washington, D.C., and in the field. A number of Bureau marketing personnel were relocated and seven marketing offices were

opened in new locations to permit increased program emphasis on the 50 major metropolitan marketing centers in the United States. A chart of the Bureau's organization is shown in Appendix E, and a map of the five regional and two area offices and the territory under each is shown in figure 1.

Employment

The total employment for the Bureau of Commercial Fisheries averaged 1,735 throughout calendar year 1961. Of this total average, 1,525 were permanent and 210 were seasonal employees. The peak employment for the year was reported at the end of July, at which time the staff had 1,533 permanent and 437 seasonal employees, making a total of 1,970. The variations in the number of employees throughout the year and the relationship between the total number and the number of permanent employees and seasonal, or temporary, employees are shown in figure 2.

Bureau employees fall generally into four broad categories. Of the total of 1,652 full-time employees reported as of October 31, 1961, 740 were classified in approximately 36 professional and technical series; 179 in 20 subprofessional series; 371 in 33 administrative and clerical series; and 362 were in positions, the pay of which is determined outside of the Classification Act (105 vessel employees, 101 custodial employees, and 156 Aleuts). Figures 3, 4, and 5 show the grade structures for the professional and technical series, subprofessional series, and the administrative and clerical series and the number of employees in each grade for these three classifications.

Budget

For the fiscal year 1961, \$25.5 million were available to carry out the Bureau's program (Appendix F). Of this amount, \$13.6 million were from annual appropriations; \$5.4 million from Public Law 466 (known as the Saltonstall-Kennedy Act) funds; \$3.3 million from funds transferred by the Corps of Engineers, and \$0.8 million made available to the Bureau by the Great Lakes Fishery Commission.

Figure 6 shows the available funds to carry out the Bureau's program for each year from 1957 to 1961.

Physical Property

Field laboratories and stations, vessels, and installations on the Pribilof Islands are the principal properties of the Bureau (Appendix

G). In the calendar year 1961 there were 27 large laboratories and installations, 73 smaller stations and offices, and 28 vessels of 40 feet and longer. One new major laboratory was acquired during the year. That was the Biological Laboratory at Auke Bay, Alaska. The construction of this Laboratory was completed in December 1960, the award for which had been granted in May 1959 in the amount of \$405,647. Two major Branch Loans and Grants Offices were established at St. Petersburg Beach, Fla., and Boston, Mass. Five new field research stations were put into operation at Olsen Bay and Traitors Cove, Alaska; Green Cove Springs, Fla.; Hammond Bay, Mich.; and Portland, Oreg. An exploratory fishing and gear research station was opened in Panama City, Fla. Two market news and statistical field offices were opened at Port Arthur and Port Isabel, Tex.; two statistical field offices at La Crosse, Wis., and Portsmouth, Va.; and seven marketing offices at Dumas, Ark.; San Francisco, Calif.; Atlanta, Ga.; Chicago, Ill.; Baltimore, Md.; St. Louis, Mo.; and Cleveland, Ohio. A number of stations and offices were closed: six field research stations at Decatur, Ala.; Pribilof Islands, Alaska; Eastport, Maine; Vineyard Haven, Mass.; Rogers City, Mich.; and Aconto, Wis.; one exploratory fishing and gear research station at Erie, Pa.; three statistical field offices at Galiano, La.; Astoria, Oreg.; and Milan, Tenn.; one marketing office at Jacksonville, Fla.; three market news offices at Port Sulphur, La.; Freeport, Tex.; and Portsmouth, Va.; and one fishery products inspection office at Seattle, Wash. Besides the exploratory fishing and gear research vessel *Kaho* which was commissioned during the year, the Bureau acquired four other vessels—*J-3486*, *Q-91*, *Q-100*, and *T-19*, which are on loan to the States of North and South Carolina.

In fiscal year 1961 construction contracts were awarded for the replacement or improvement of several Bureau research facilities and a vessel. The award for the construction of the sea-water laboratory at the East Beach Lagoon unit of the Biological Laboratory in Galveston, Tex., was made in December 1960, in the amount of \$120,320. This laboratory was completed and is now in operation. Two awards were given for construction in the Pribilof Islands, one in the amount of \$176,700 for a combination power house and cold storage building on St. George Island and the other in the amount of \$178,036 for a diesel fuel oil storage tank on St. Paul Island. The design of a new fisheries research vessel to replace the *Albatross III* was completed, and the construction contract was awarded in May 1961 in the amount of

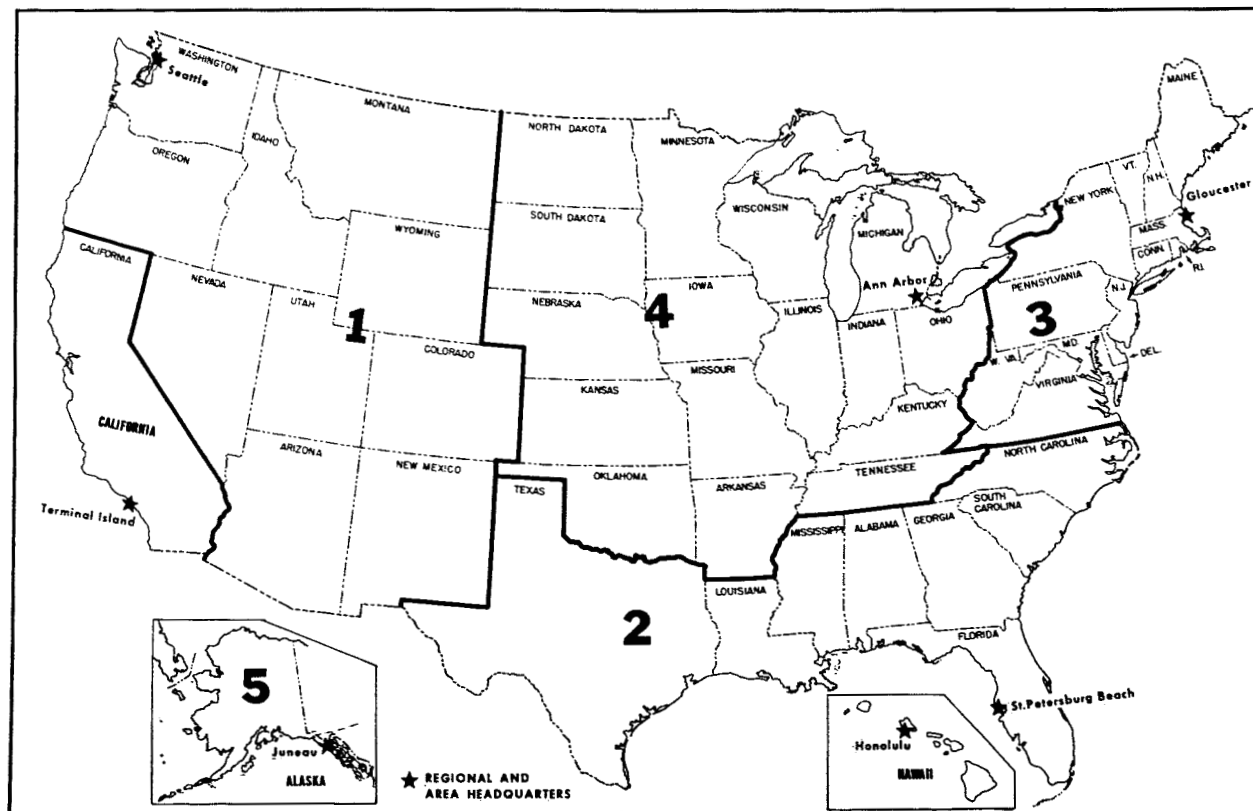


FIGURE 1.—Regions and areas, Bureau of Commercial Fisheries.

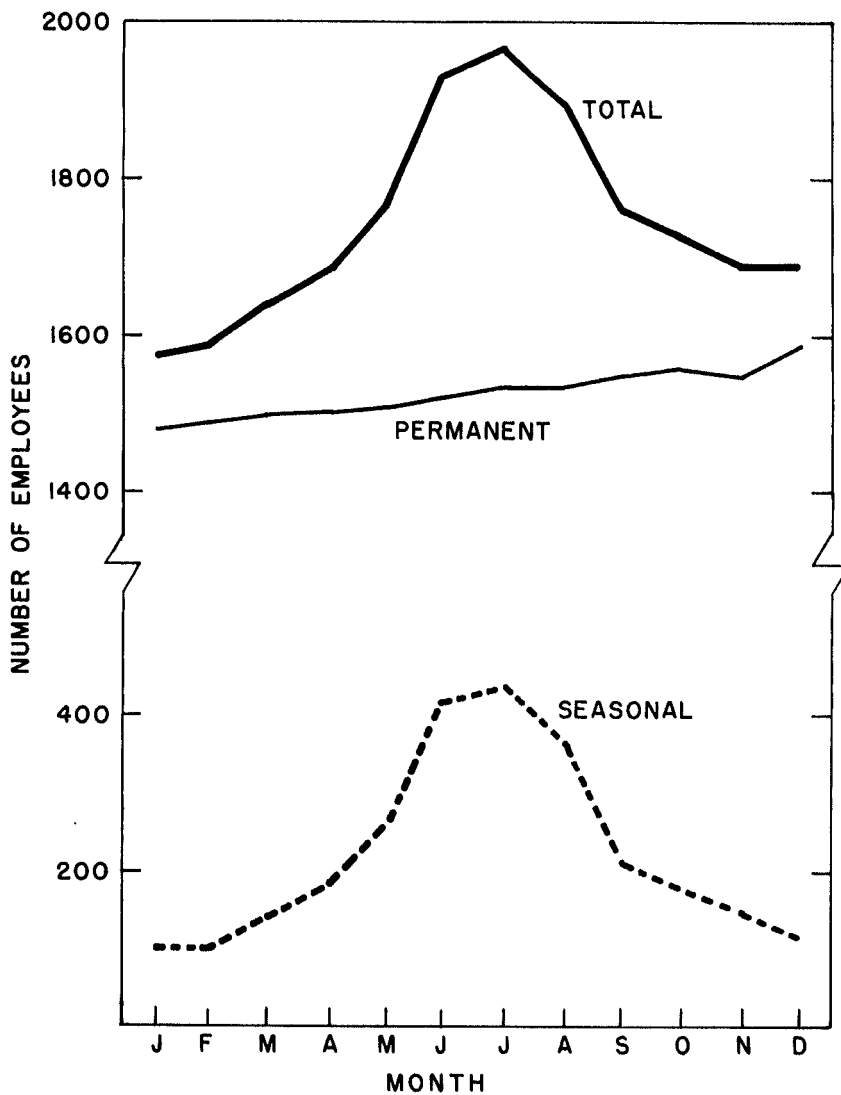


FIGURE 2.—Bureau of Commercial Fisheries employment totals, calendar year 1961.

BUREAU OF COMMERCIAL FISHERIES

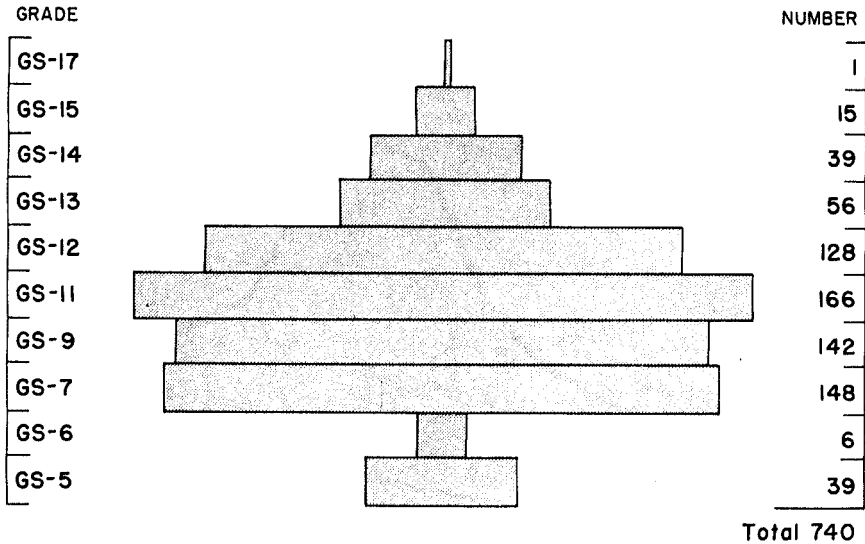


FIGURE 3.—Distribution by grade of professional and technical employees, Bureau of Commercial Fisheries, October 31, 1961.

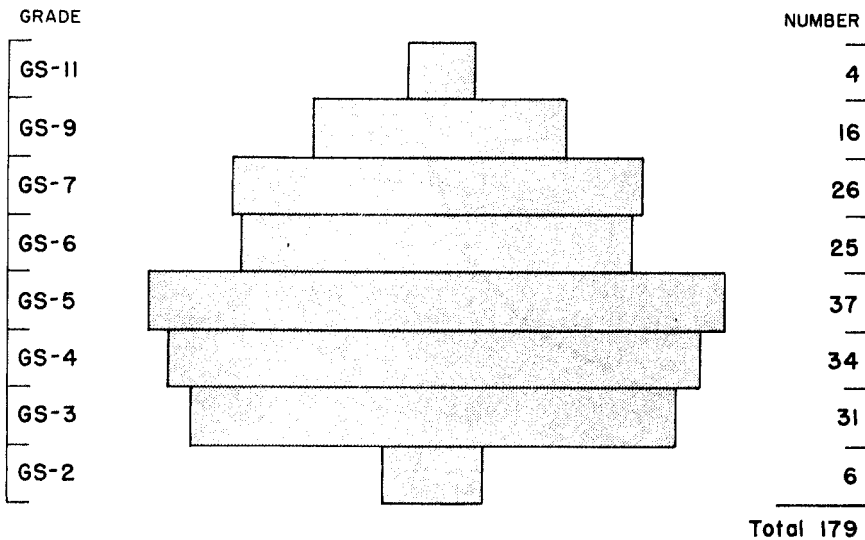


FIGURE 4.—Distribution by grade of subprofessional employees, Bureau of Commercial Fisheries, October 31, 1961.

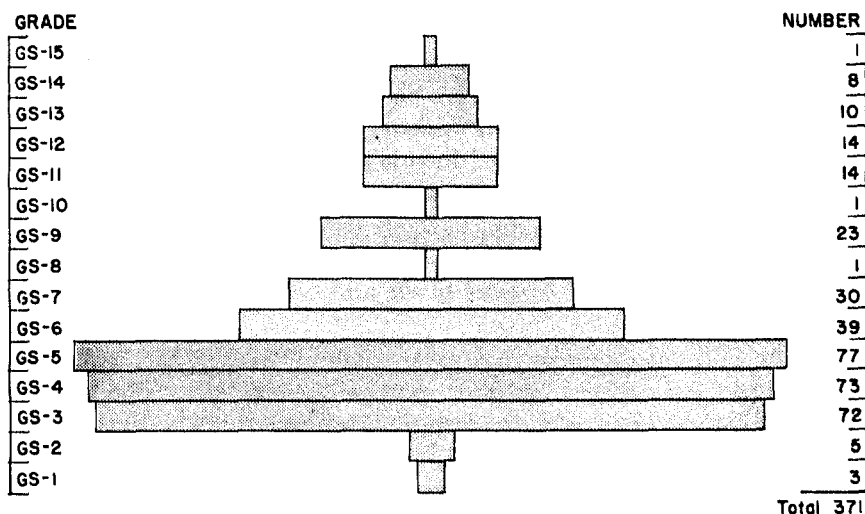


FIGURE 5.—Distribution by grade of administrative and clerical employees, Bureau of Commercial Fisheries, October 31, 1961.

\$1,773,948. The construction of a laboratory building at Oxford, Md., was completed during fiscal year 1961, the contract for which had been awarded in the amount of \$152,173 in September 1959. The aquarium at Woods Hole, Mass., was also completed at a cost of \$454,000. This contract had been awarded in June 1959.

Publications

Reflecting the wide range of the Bureau's interests, the 1961 publications covered activities in numerous fields that relate to fisheries: biology, chemistry, economics, engineering, marketing, and statistics. There was continued emphasis on publishing material of value to the fishing industry and the general public.

Exclusive of the 5 times-a-week Fishery Products Reports issued by the seven Market News Service field offices, a total of 696 publications (11,305 p.) were sponsored by the Bureau in 1961. In the Fish and Wildlife Service series were published 468 reports (9,574 p.); the remaining 228 (1,731 p.) appeared in nonservice journals and series. Bureau personnel wrote most of the articles; some were written by unpaid collaborators or members of research institutes under contract.

The 1961 publications can be divided into four principal classes which reflect the audiences for which they were written. First, there

are the statistical reports of special interest to the fishing industry and fishery research workers. More than 38 percent of the 1961 publications were statistical in nature. Secondly, there are the contributions to scientific knowledge, particularly relating to fisheries; 40 percent of the 1961 publications fell in this class. Thirdly, there are the reports written especially for commercial and industrial fishery audiences; 14 percent were aimed at those groups. Fourthly, the popular audience was the object of 8 percent of the Bureau's publications.

Appendix H presents a description and partial list of the 1961 publications.

MILLION
DOLLARS

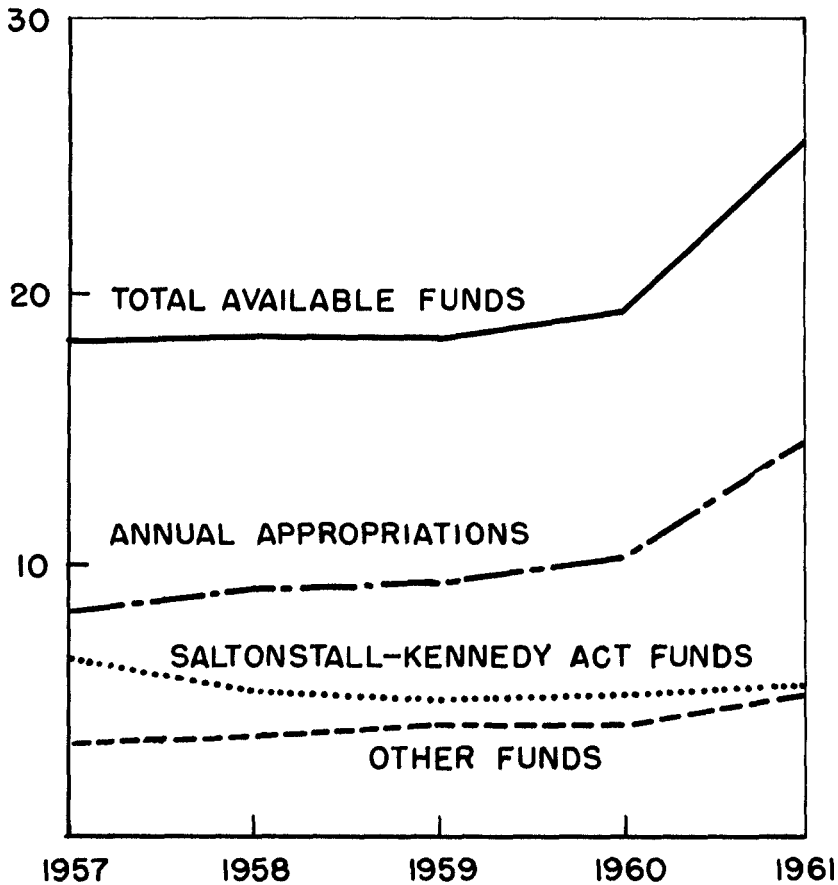


FIGURE 6.—Funds available to the Bureau of Commercial Fisheries, fiscal years 1957-61.

Appendix A—Fisheries of the United States

A-1.—Employment, fishing craft, and establishments, calendar years, 1961 and 1960

Item	1961	1960
Persons employed:	<i>Number</i>	<i>Number</i>
Direct:		
Fisherman.....	129,693	130,481
Shoreworkers.....	92,115	93,625
Indirect:		
Allied industries (gear, manufacture, boat building, processing equipment, etc.).....	310,000	313,000
Total.....	631,808	637,056
Craft utilized:		
Fishing:		
Vessels (6 net tons and over).....	11,964	12,018
Motor boats.....	60,118	56,889
Other boats.....	5,405	8,150
Total.....	77,487	77,057
Vessels documented for fishing:		
First documentation.....	409	408
Redocumentation.....	20	24
Total.....	429	432
Fishery shore establishments:		
Pacific Coast States.....	558	515
Atlantic Coast and Gulf States.....	2,870	2,898
Great Lakes and Mississippi River States.....	680	772
Hawaii.....	20	22
Total.....	4,188	4,207

A-2.—U.S. catch, calendar years, 1961, 1960, and record year

Species	1961		1960		Record catch	
	<i>Million pounds</i>	<i>Million dollars</i>	<i>Million pounds</i>	<i>Million dollars</i>	Year	<i>Million pounds</i>
Menhaden.....	2,315	26	2,018	20	1961	2,315
Tuna.....	326	45	298	38	1950	402
Shrimp.....	175	52	249	67	1954	268
Herring, sea:						
Atlantic.....	58	1	155	3	1902	201
Pacific.....	54	1	84	1	1937	263
Salmon.....	310	52	235	45	1936	791
Crabs.....	282	17	222	17	1961	232
Ocean perch, Atlantic.....	132	6	141	5	1951	258
Industrial fish ¹	143	2	137	2	1959	248
Flounders.....	133	12	127	13	1948	189
Haddock.....	134	10	119	9	1929	294
Whiting.....	101	2	112	3	1957	133
Jack mackerel.....	98	2	75	2	1952	147
Oysters.....	62	33	60	29	² 1908	152
Sardine, Pacific.....	43	1	58	1	1936	1,602
Alewives.....	55	1	54	1	1908	90
Halibut, Pacific.....	53	8	51	6	1915	67
Clams.....	60	12	50	12	1961	50
Cod.....	50	3	46	3	1880	294
Mullet.....	43	3	41	2	1902	43
Mackerel, Pacific.....	44	1	37	1	1935	146
Anchovies.....	8	(*)	5	(*)	1953	80
Other.....	562	75	568	74		
Total.....	5,181	364	4,942	364		

¹ Unclassified species used for bait, reduction, and animal food.

² First year in which an oyster survey was made in all regions.

³ Less than one-half million dollars.

BUREAU OF COMMERCIAL FISHERIES

A-3.—Summary of manufactured fishery products by quantity and value, calendar years 1961 and 1960

Item	1961		1960	
	Quantity	Value	Quantity	Value
Packaged products, fresh and frozen:				
Fish:	<i>Thousands pounds</i>	<i>Thousands dollars</i>	<i>Thousands pounds</i>	<i>Thousands dollars</i>
Not breaded:				
Fillets and steaks, raw	158,112	51,764	153,166	48,437
Other (includes whale meat for animal feeding)	7,472	1,533	6,166	1,282
Breaded, raw and cooked:				
Sticks	69,824	30,100	65,142	28,671
Fillets and portions	63,686	23,823	51,924	18,965
Shellfish:				
Not breaded	162,497	129,298	191,749	138,022
Breaded	88,899	66,453	84,221	67,412
Fish and shellfish specialties	32,834	23,887	31,852	23,043
Total fresh and frozen	583,024	326,858	584,220	315,812
Canned:				
Fish and shellfish for human consumption:				
Tuna	310,612	189,173	301,388	172,679
Salmon	177,443	116,955	136,049	88,197
Sardines:				
Maine (sea herring)	17,635	7,560	46,744	16,700
Pacific	18,859	3,664	27,714	4,659
Mackerel	62,026	8,529	42,064	5,804
Clam products and specialties	52,581	16,520	44,956	14,183
Shrimp and specialties	9,573	11,862	14,489	17,294
Oysters and specialties	13,026	7,853	11,783	7,315
Squid	5,510	567	751	74
Other	41,441	20,126	33,091	15,842
Total for human consumption	708,706	382,809	659,009	342,747
Bait and animal food:				
Animal food	333,349	39,072	421,772	43,979
Salmon eggs for bait	684	955	718	869
Total bait and animal food	334,033	40,027	422,490	44,848
Total canned	1,042,739	422,836	1,081,499	387,595
Cured fish and shellfish:				
Salted	39,612	17,687	34,760	14,104
Smoked	33,044	33,551	31,512	27,557
Dried fish and shellfish, and lutefisk (from dried cod)	1,797	1,158	2,047	1,184
Total cured	74,453	52,396	68,319	42,845
Industrial products				
Meal and scrap	622,530	31,940	580,274	25,282
Oil, body and liver	258,118	14,373	209,143	13,385
Fish solubles and homogenized-condensed fish	224,508	5,489	197,858	4,021
Oyster shell lime and poultry grit	885,670	6,342	941,650	6,821
Marine pearl shell and mussel shell buttons	¹ 1,842	3,020	¹ 1,949	3,253
Other		13,425		13,832
Total industrial products		74,569		60,595
Grand total		876,659		812,847

¹ Number of gross.

A-4.—Foreign trade in fishery products, by quantity and value, calendar years 1961 and 1960

Item	1961		1960	
	Quantity	Value	Quantity	Value
Imports:				
Edible:				
Fresh or frozen:				
Fresh-water (not fillets).....	41,070	14,253	39,655	13,865
Salt-water (not fillets).....	310,877	49,874	384,654	53,140
Groundfish and ocean perch fillets.....	195,099	42,595	155,550	33,265
Other fillets.....	67,167	23,593	61,713	20,955
Shrimp.....	126,268	68,638	113,418	56,406
Lobsters:				
Common.....	21,299	14,671	21,403	14,018
Spiny.....	32,610	34,468	32,340	30,750
Other shellfish.....	16,715	5,949	14,616	5,534
Canned:				
Salmon.....	7,167	3,545	19,113	7,641
Sardines.....	42,488	12,543	27,377	9,115
Tuna.....	58,663	22,175	51,755	19,142
Crabmeat.....	4,237	5,780	4,607	5,514
Other.....	53,813	22,309	52,185	21,306
Cured, dried, pickled, or salted.....	77,480	13,703	61,873	14,890
Smoked or kippered.....	4,626	1,137	4,795	1,104
Other.....	2,083	724	2,500	835
Total edible.....	1,061,662	335,757	1,067,460	307,380
Nonedible:				
Fish and marine animal oils.....	10,102	8,475	7,378	6,717
Fish meal and scrap.....	218	16,740	132	11,068
Other.....		36,086		34,900
Total nonedible.....		61,301		52,685
Grand total, imports.....		397,058		360,065
Exports:				
Edible:				
Fresh or frozen.....	11,588	6,348	12,765	5,962
Canned:				
Mackerel.....	3,908	581	1,305	211
Salmon.....	7,186	5,580	11,924	9,830
Sardines.....	7,660	1,397	21,219	3,508
Other.....	8,296	4,573	12,630	5,161
Total canned.....	27,050	12,131	47,078	18,710
Cured.....	976	756	1,061	701
Other.....	553	359	650	259
Total edible.....	40,137	19,594	61,454	25,622
Nonedible:				
Fish and marine animal oil.....	122,486	8,908	143,659	10,688
Other.....		6,208		7,855
Total Nonedible.....		15,116		18,543
Grand total, exports.....		34,710		44,165

¹ In thousand gallons.
² In thousand tons.

Appendix B—New Legislation

Fishing Vessels; Transfer and Transportation of Catch of Other Vessels

46 U.S.C., 1958 Ed., Supp. III, 404a

Legalizes the transfer of the catch of one fishing vessel to another on the high seas and the transportation of it without charge to a port of the United States.

75 Stat. 410-411; Public Law 87-177; Act of August 30, 1961.

Shellfisheries Research Center; Establishment; Purpose

16 U.S.C., 1958 Ed., Supp. III, 760h-760i

Authorizes the Secretary to construct a research center for shellfish production at Milford, Conn., and to acquire such real property as necessary. The purpose for the research center is to conduct research on physiology and ecology of commercial shellfish, develop hatchery methods for cultivation of mollusks, and train persons in the most advanced methods of shellfish culture.

75 Stat. 409; Public Law 87-173; Act of August 30, 1961.

Management and Disposition of Vessels and Other Property Acquired and Arising Out of Fishery Loans

16 U.S.C., 1958 Ed., Supp. III, 742k

Empowers the Secretary to dispose of vessels and property acquired through foreclosure under the fishery loan program; to complete, recondition, reconstruct, renovate, repair, maintain, operate, charter, assign, or sell upon such terms and conditions as he may deem most advantageous to the United States.

75 Stat. 493; Public Law 87-219; Act of September 13, 1961.

Landing of Catches of Fish from Foreign-Flag Vessels in the Virgin Islands

46 U.S.C., 1958 Ed., Supp. III, 251, 251a, 251b

Permits fish catches of small foreign-flag boats to be landed in the Virgin Islands as long as the landings are for immediate consumption. Sale of the landings to any agent, representative, or employee of a freezer or cannery is prohibited in the absence of satisfactory evidence that such sale or transfer is for immediate consumption.

75 Stat. 493; Public Law 87-220; Act of September 13, 1961.

Appendix C—Fisheries Loan Fund

C-1.—Status of fisheries loan fund, June 30, 1961

Funds appropriated.....		\$13,000,000
Principal collected.....	\$3,060,000	
Interest collected and accrued.....	818,000	
Total collected.....		3,878,000
Total.....		16,878,000
All expenses to end of fiscal year 1961.....	685,784	
Limit on expenses fiscal year 1961.....	250,000	
Loans approved.....	10,239,134	
Total.....		11,174,918
Balance.....		5,703,082

C-2.—Cumulative totals, fiscal years 1960 and 1961, and totals, fiscal year 1961

	Cumulative total				Total	
	As of June 30, 1960		As of June 30, 1961		Fiscal year 1961	
	Number	Amount	Number	Amount	Number	Amount
Applications received.....	777	\$24,231,119	961	\$28,949,169	184	\$4,718,050
Applications approved.....	422	9,933,257	511	12,013,809	89	2,080,552
Applications declined.....	201	5,872,043	246	6,625,603	45	753,560
Applications ineligible.....	60	1,497,459	82	1,980,879	16	483,420
Being processed.....	22	1,622,687	32	1,961,455		

C-3.—Cumulative totals, fiscal years 1960 and 1961, and totals, fiscal year 1961, by area

	Cumulative total				Total	
	As of June 30, 1960		As of June 30, 1961		Fiscal year 1961	
	Number	Amount	Number	Amount	Number	Amount
Northeast:						
Applications received.....	235	\$3,483,272	262	\$9,073,666	27	\$590,394
Applications approved.....	126	3,714,060	140	4,080,774	14	365,824
California:						
Applications received.....	120	7,744,104	145	9,306,083	25	1,561,979
Applications approved....	67	2,378,628	82	3,828,573	15	949,947
Gulf:						
Applications received.....	156	4,415,503	223	5,932,983	67	1,517,480
Applications approved....	62	1,593,390	82	1,980,288	20	386,898
Pacific Northwest:						
Applications received.....	142	2,550,675	166	3,101,506	24	550,831
Applications approved....	86	1,198,965	104	1,440,912	18	241,947
Alaska:						
Applications received.....	90	632,735	119	887,498	19	254,763
Applications approved....	63	400,600	83	527,130	20	126,536
Great Lakes:						
Applications received.....	21	245,341	28	332,025	7	86,684
Applications approved....	8	58,420	8	58,420	0	0
Hawaii:						
Applications received.....	12	157,489	17	313,408	5	155,919
Applications approved....	9	80,506	11	95,906	2	9,400
Puerto Rico:						
Applications received.....	1	2,000	1	2,000	0	0
Applications approved....	1	1,800	1	1,800	0	0

BUREAU OF COMMERCIAL FISHERIES

C-4.—Authorized use of loan proceeds, percentage by area

(From beginning of program through fiscal year 1961)

	Debt payment	Improvements	Other
	Percent	Percent	Percent
New England and Middle Atlantic.....	55	43	2
South Atlantic and Gulf.....	65	32	3
California.....	37	58	5
Pacific Northwest.....	30	68	2
Great Lakes.....	13	87	0
Alaska.....	30	69	1
Hawaii and Puerto Rico.....	38	52	10
Total.....	47	50	3

C-5.—Number of loan applications received monthly, fiscal years 1957-61

	1957	1958	1959	1960	1961
July.....		17	9	15	8
August.....		17	12	13	10
September.....		14	10	9	7
October.....		12	7	18	6
November.....		18	13	9	19
December.....	88	11	13	15	21
January.....	10	14	10	10	18
February.....	41	18	12	27	26
March.....	40	22	15	28	13
April.....	22	22	14	13	18
May.....	28	11	10	19	31
June.....	30	9	12	10	7
Total.....	265	185	137	190	184

C-6.—Amounts applied for monthly, fiscal years 1957-61

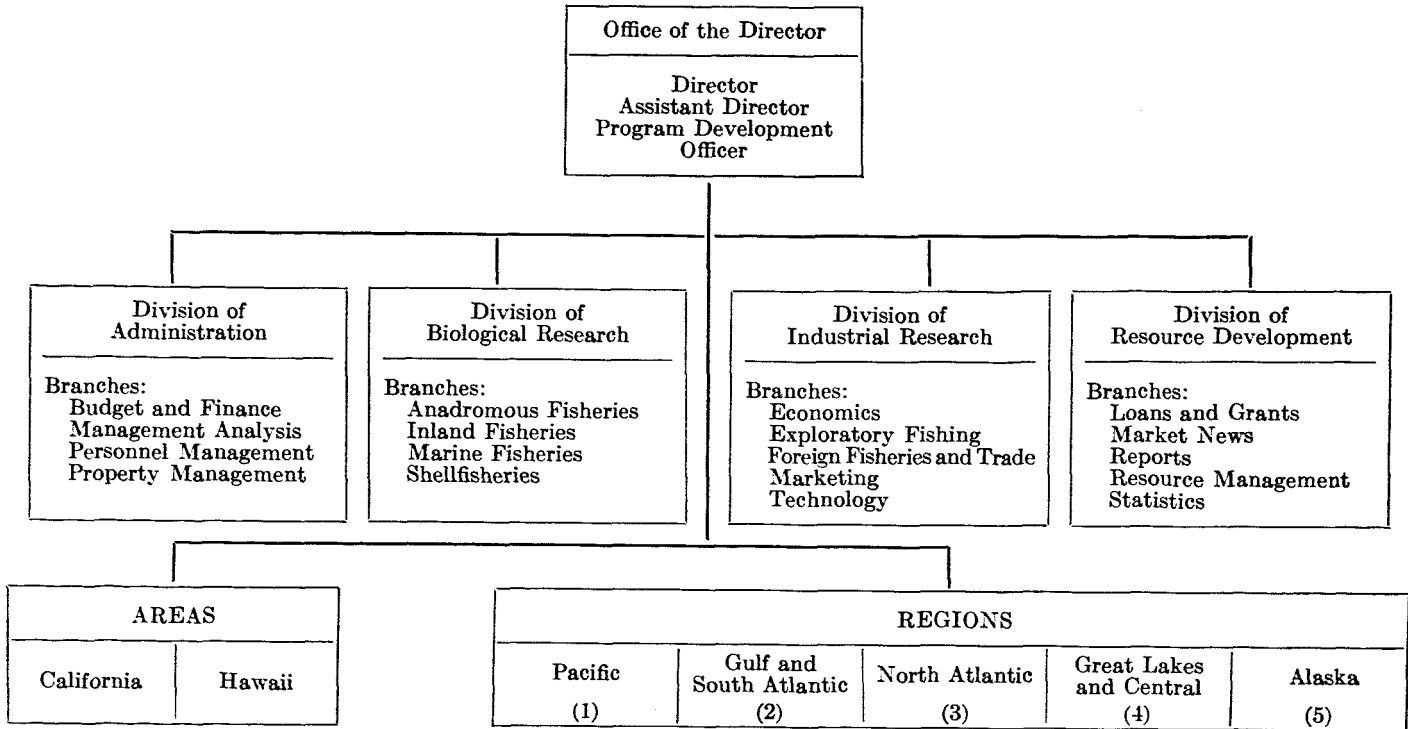
	1957	1958	1959	1960	1961
July.....		\$274,524	\$251,571	\$830,182	\$134,196
August.....		931,110	363,000	234,465	275,972
September.....		607,851	385,517	465,610	176,781
October.....		204,635	62,532	305,150	195,065
November.....		375,583	153,559	124,905	428,011
December.....	\$2,533,020	180,670	331,502	198,181	425,076
January.....	377,485	520,323	153,501	344,197	203,752
February.....	1,458,748	305,318	115,000	554,425	665,798
March.....	2,568,703	862,325	185,069	698,063	662,766
April.....	629,131	336,888	189,871	226,542	426,453
May.....	2,276,774	642,025	185,869	1,003,874	877,990
June.....	948,437	224,652	291,980	343,372	216,160
Total.....	10,787,298	5,445,904	2,668,971	5,328,946	4,718,050

Appendix D—Organizations With Which the Bureau Had Contracts in

1961

<i>Organization</i>	<i>Location</i>
A. C. I. Productions.....	New York, N.Y.
Alaska Department of Education.....	Juneau, Alaska
Alaska Department of Fish and Game.....	Juneau, Alaska
Barkley and Dexter Laboratories, Inc.....	Fitchburg, Mass.
Boston College.....	Boston, Mass.
California Department of Fish and Game.....	Sacramento, Calif.
California, University of.....	Davis, Calif.
Connecticut, University of.....	Storrs, Conn.
Delaware, University of.....	Newark, Del.
Duke University.....	Durham, N.C.
F. Mansfield and Sons Company.....	New Haven, Conn.
Florida State Board of Conservation.....	Tallahassee, Fla.
Florida, University of.....	Gainesville, Fla.
Great Lakes Fishery Commission.....	Ann Arbor, Mich.
Harvard University.....	Cambridge, Mass.
Idaho Department of Fish and Game.....	Boise, Idaho
Louisiana Wild Life and Fisheries Commission.....	New Orleans, La.
Mayo Association.....	Rochester, Minn.
Maine Department of Sea and Shore Fisheries.....	Augusta, Maine
Maryland Department of Tidewater Fisheries and National Resources Institute.	Annapolis, Md.
Maryland, University of.....	College Park, Md.
Miami, University of.....	Miami, Fla.
Minnesota, University of.....	Minneapolis, Minn.
Minnesota, University of (Hormel Institute).....	Austin, Minn.
National Fisheries Institute.....	Washington, D.C.
New Hampshire, University of.....	Durham, N.H.
North Carolina, University of.....	Chapel Hill, N.C.
Oregon Fish Commission.....	Portland, Ore.
Oregon State Game Commission.....	Portland, Ore.
Oregon State College.....	Corvallis, Ore.
Pennsylvania State University.....	University Park, Pa.
Reed Research, Inc.....	Washington, D.C.
Refrigeration Research Foundation.....	Colorado Springs, Colo.
Rhode Island, University of.....	Kingston, R.I.
Rutgers University.....	New Brunswick, N.J.
Scripps Institution of Oceanography.....	La Jolla, Calif.
United States Testing Company.....	Hoboken, N.J.
Washington State Department of Fisheries.....	Seattle, Wash.
Washington State Department of Game.....	Seattle, Wash.
Washington, University of.....	Seattle, Wash.
Washington, University of (Fisheries Research Institute).	Seattle, Wash.
Woods Hole Oceanographic Institution.....	Woods Hole, Mass.

Appendix E—Organization Chart



Appendix F—Budget for Fiscal Year 1961

Function	Appropriations							Transferred funds, Corps of Engineers		Contributed funds	Reimbursements	Total
	Management and investigations of resources	Construction	Construction of fishing vessels	General administrative expenses	Administration of Pribilof Islands	Payment to Alaska	Promote and develop fisheries ¹	Operation and maintenance	Construction			
Management.....	\$369,000										\$22,541	\$391,541
Marketing and technology.....	2,404,000						\$1,929,600			\$366,225	209,556	4,909,381
Research.....	4,799,000						2,815,000			826,462	498,992	8,939,454
Research on fish migration over dams.....	303,000						350,000				85,603	738,603
Fishing vessel mortgage insurance.....	51,000										51,000	51,000
Columbia River fishery facilities.....								\$1,849,800	\$1,368,100		4,206	3,222,106
Construction of fishery facilities.....		\$2,400,000										2,400,000
Construction of fishing vessels.....			\$750,000									750,000
General administrative services.....				\$385,000			314,400	\$65,200	31,900	31,967	21,028	849,495
Administration of Pribilof Islands.....					\$1,876,400						22,796	1,899,196
Fur seal research.....					222,600						1,299	223,899
Payment to Alaska from Pribilof Islands receipts.....						\$1,050,002						1,050,002
Fisheries Advisory Committee.....							31,600					31,600
Total.....	7,926,000	2,400,000	750,000	385,000	2,099,000	1,050,002	5,440,600	1,915,000	1,400,000	1,224,654	866,021	25,456,277

¹ Funds made available under Public Law 466, 83d Cong. (known as the Saltonstall-Kennedy Act of 1954).

² Includes \$318,700 from Great Lakes Fishery Commission, \$364,000 for inspection and grading of fishery products, and \$16,000 from Marine Research Committee of

California.

³ Reimbursements include funds from the following: \$67,000 CIA; \$189,000 AEC; \$267,100 Bureau of Sport Fisheries and Wildlife; \$157,500 Corps of Engineers.

Appendix G—Physical Properties

G-1.—Principal laboratories and installations, calendar year 1961

Location	Type	Principal use	Gross valuation ¹
Alaska:			
Auke Bay.....	Biological Laboratory.....	Biological research.....	\$405,647
Juneau.....	Exploratory Fishing and Gear Research Base, warehouse and shops.....	Exploratory fishing and gear research, vessel maintenance, loans and grants.....	\$436,000
Ketchikan.....	Technological Laboratory.....	Technological research.....	195,000
Pribilof Islands.....	Fur seal processing facilities and native villages.....	Management of Alaska fur seals.....	2,912,000
California:			
LaJolla.....	Biological Laboratory.....	Biological research.....	(2)
San Diego.....	do.....	do.....	(2)
Stanford.....	do.....	do.....	(2)
Connecticut, Milford.....	do.....	do.....	91,000
District of Columbia:			
Navy Yard Annex.....	do.....	do.....	(2)
U.S. National Museum.....	Ichthyological Laboratory.....	do.....	(2)
Florida:			
Gulf Breeze.....	Biological Laboratory.....	do.....	63,000
St. Petersburg Beach.....	Office of Loans and Grants.....	Loans and grants.....	(2)
Georgia, Brunswick.....	Biological Laboratory.....	Biological research.....	(2)
Hawaii, Honolulu.....	do.....	Biological research, loans and grants, statistics.....	314,000
Maine, Boothbay Harbor.....	do.....	Biological research.....	\$ 140,000
Maryland:			
College Park.....	Technological Laboratory.....	Technological research, home economics.....	83,000
Oxford.....	Biological Laboratory.....	Biological research, statistics.....	179,000
Massachusetts:			
Boston.....	Office of Loans & Grants.....	Loans and grants.....	(2)
Gloucester.....	Technological Laboratory.....	Technological research, fishery products inspection.....	320,000
Gloucester.....	Exploratory Fishing and Gear Research Base.....	Exploratory fishing and gear research.....	55,000
Woods Hole.....	Biological Laboratory.....	Biological research.....	1,029,000
Michigan, Ann Arbor.....	Biological Laboratory, Technological Station, Exploratory Fishing and Gear Research Station.....	Biological and technological research, exploratory fishing and gear research, market development, statistics.....	(2)
Mississippi, Pascagoula.....	Exploratory Fishing and Gear Research Base, Technological Laboratory.....	Exploratory fishing and gear research, market development, biological and technological research.....	86,000
North Carolina, Beaufort.....	Biological Laboratory.....	Biological research, statistics.....	201,000
Texas, Galveston.....	do.....	Biological research.....	285,000
Washington, Seattle.....	Biological Laboratories (3), Technological Laboratory, Exploratory Fishing and Gear Research Base, dock and warehouse.....	Biological and technological research, exploratory fishing and gear research, Pribilof Islands supply, fishery products inspection.....	\$ 142,000
Puerto Rico, Mayaguez.....	Technological Laboratory.....	On loan to University of Puerto Rico.....	27,000

¹ Figures shown are original acquisition or construction costs.

² Installations at this location are both owned and leased by Bureau of Commercial Fisheries.

³ Installation not owned by Bureau of Commercial Fisheries. Includes property held under leases, cooperative agreements, and use permits.

G-2.—Minor field research stations, market news offices, exploratory fishing stations, market development offices, and statistical offices, calendar year 1961—

Location	Type	Principal use	Gross valuation ¹
Alabama, Bayou LaBatre	Statistical and Market News Field Office.	Statistics and market news reporting.	(2)
Alaska:			
Brooks Lake	Field Research Station	Biological research	\$21,000
Juneau	Statistical Field Office	Statistics	(2)
Karluk Lake	Field Research Station	Biological research	27,000
Kustisna Bay	do	do	12,000
Little Port Walter	do	do	158,000
Olsen Bay	do	do	7,000
St. Paul Island	do	do	8,000
Traitors Cove	do	do	8,000
Arkansas, Dumas	Marketing Office	Marketing	(2)
California:			
Mill Creek	Field Research Station	Biological research	29,000
San Pedro	Market News and Statistics Office.	Market news and statistics reporting.	(2)
San Francisco	Marketing Office	Marketing	(2)
Terminal Island	Marketing Office and Technological Station.	Technological research, fishery products inspection.	(2)
Florida:			
Apalachicola	Statistical and Market News Field Office.	Statistics and market news reporting.	(2)
do	do	do	(2)
Fort Meyers	do	do	(2)
Green Cove Springs	Field Research Station	Biological research	(2)
Key West	Statistical and Market News Field Office.	Statistics and market news reporting.	(2)
Miami	Statistical Field Office	Statistics and biological research.	(2)
Panama City	Exploratory Fishing and Gear Research Station.	Exploratory fishing and gear research.	(2)
St. Petersburg Beach	Field Research Station and Fishery Products Inspection Office.	Biology research, fishery products inspection, marketing.	(2)
Tampa	Statistical and Market News Field Office.	Statistics and market news reporting.	(2)
Georgia:			
Atlanta	Marketing Office	Marketing	(2)
Brunswick	Statistical Field Office, Exploratory Fishing and Gear Research Station.	Statistics, exploratory fishing and gear research.	(2)
Illinois:			
Chicago	Market News Office, Fishery Products Inspection Office.	Market news reporting, fishery products inspection.	(2)
Chicago	Marketing Office	Marketing	(2)
Louisiana:			
Empire	Statistical Field Office	Statistics	(2)
Houma	Statistical and Market News Field Office.	Statistics and market news reporting.	(2)
Morgan City	do	do	(2)
New Orleans	Market News Office, Statistical Field Office.	Market news reporting, statistics.	(2)
Port Sulphur	Statistical Field Office	Statistics	(2)
Maine:			
Portland	Field Office	Statistics, market news, biological research.	(2)
Rockland	do	do	(2)
West Boothbay Harbor	Statistical Field Office	Statistics	(2)
Maryland:			
Baltimore	Market News Office, Marketing.	Market news reporting, marketing.	(2)
Sallsbury	Statistical Field Office	Statistics	(2)
Massachusetts:			
Boston	Market News Office, Marketing.	Market news reporting, statistics, biological and technological research, marketing.	(2)
Gloucester	Field Offices	Statistics, biological research, market news, fishery products inspection.	(2)
New Bedford	Field Office	Statistics, biological research, market news reporting.	(2)
Provincetown	Statistical Field Office	Statistics, market news reporting.	(2)
Michigan:			
Hammond Bay	Field Research Station	Biological research	(2)
Ludington	do	do	(2)
Marquette	do	do	(2)
Northville	do	do	(2)

See footnotes at end of table.

G-2.—*Minor field research stations, market news offices, exploratory fishing stations, market development offices, and statistical offices, calendar year 1961—*
Continued

Location	Type	Principal use	Gross valuation ¹
Mississippi:			
Ocean Springs.....	Statistical Field Office.....	Statistics and market news reporting.....	(?)
Pascagoula.....	Field Research Station.....	Biological research, marketing.....	(?)
Missouri, St. Louis.....	Marketing Office.....	Marketing.....	(?)
New Jersey, Toms River.....	Statistical Field Office.....	Statistics.....	(?)
New York:			
Bayport.....	do.....	do.....	(?)
New York City.....	Market News Office, Marketing, Fishery Products Inspection Office.....	Market news reporting, marketing, fishery products inspection.....	(?)
Ohio:			
Cleveland.....	Marketing Office.....	Marketing.....	(?)
Sandusky.....	Field Research Station.....	Biological research.....	(?)
Oregon, Portland.....	do.....	do.....	(?)
Rhode Island:			
Point Judith.....	Field Station.....	Statistics, biological research.....	(?)
Warren.....	Statistical Field Office.....	Statistics.....	(?)
South Carolina, Charleston.....	do.....	do.....	(?)
Texas:			
Aransas Pass.....	Market News and Statistical Field Office.....	Statistics and market news.....	(?)
Brownsville.....	Market News and Statistical Field Office, Fishery Products Inspection Office.....	Statistics and market news, fishery products inspection.....	(?)
Dallas.....	Marketing Office.....	Marketing.....	(?)
Freeport.....	Statistical Field Office.....	Statistics.....	(?)
Galveston.....	Market News and Statistical Field Office.....	Statistics and market news.....	(?)
Port Arthur.....	do.....	do.....	(?)
Port Isabel.....	do.....	do.....	(?)
Virginia:			
Franklin City.....	Field Research Station.....	Biological research.....	(?)
Hampton.....	Market News Office.....	Market news reporting.....	(?)
Portsmouth.....	Statistical Field Office.....	Statistics.....	(?)
Wicoms.....	do.....	do.....	(?)
Washington:			
North Bonneville.....	Field Research Station.....	Biological research.....	(?)
Seattle.....	Market News and Statistical Office.....	Market news reporting, statistics, loans and grants.....	(?)
Seattle.....	Marketing Office.....	Marketing.....	(?)
Wisconsin:			
Ashland.....	Field Research Station.....	Biological research.....	(?)
La Crosse.....	Statistical Field Office.....	Statistics.....	(?)

¹ Figures shown are original acquisition or construction costs.

² Installation not owned by Bureau of Commercial Fisheries. Includes property held under leases, cooperative agreements, and use permits.

³ Installations at this location are both owned and leased by Bureau of Commercial Fisheries.

G-3.—Bureau of Commerical Fisheries vessel fleet, calendar year 1961

Name	Home Port	Length	Year built	Cost	Horse-power	Mission
Black Douglas..	San Diego, Calif..	162	1926	\$75,000	325	Biology, distribution, spawning of the Pacific sardine; abundance and life history studies of other commercial species.
Penguin II.....	Seattle, Wash.....	148	1943	533,532	875	Transportation of supplies and personnel to the Pribilof Islands fur seal stations.
Delaware.....	Gloucester, Mass..	147	1937	302,473	735	Exploratory fishing and biological studies on the ground fishes and sea scallops; gear research.
Hugh M. Smith.	Terminal Island, Calif.	128	1945	150,000	500	Pacific oceanography (since 1959 on loan to University of California Scripps Institution of Oceanography).
Charles H. Gilbert.	Honolulu, Hawaii.	123	1952	409,890	640	Pacific oceanography; tuna biology, behavior, and distribution.
Oregon.....	Pascagoula, Miss..	100	1950	300,000	600	Exploratory fishing for shrimp, tuna and other potentially commercial species; gear research.
Alaska.....	California.....	100	(¹)	300,000	600	On loan to the California Department of Fish and Game.
John N. Cobb..	Seattle, Wash.....	93	1950	235,302	500	Exploratory fishing for pelagic and bottom fish, shrimp, and crabs; gear research.
Murro II.....	Juneau, Alaska...	86	1943	64,000	115	Oceanographic studies in coastal waters of south-eastern Alaska with limited use for servicing shore facilities.
John R. Manning.	Juneau, Alaska...	86	1950	181,600	320	Bottom surveys for halibut; patrol work; observations on foreign fishing activities in Bering Sea.
Pelican.....	do.....	75	1930	50,200	500	On loan to the Washington Department of Fish and Game.
Geo. M. Bowers.	Panama City, Fla.	73	1956	93,800	210	Primarily gear research.
Kaho.....	Saugatuck, Mich..	65	1961	85,000	-----	Exploratory fishing and gear research on industrial fishes, chubs, alewives, sheephead, gizzard shad, and smelt.
T-19.....	South Carolina....	64	1942	187,000	-----	On loan to State of South Carolina.
Rorqual.....	Gloucester, Mass..	64	1941	187,000	230	Gear research and inshore exploration on herring and shellfish.
Q-91.....	North Carolina....	60	1943	40,000	-----	On loan to State of North Carolina.
Q-100.....	do.....	60	1943	40,000	-----	Do.
Cisco.....	Saugatuck, Mich..	60	1950	85,000	175	Research on deepwater fish species, their distribution, abundance, and ecology; limnology.
Heron.....	Juneau, Alaska....	58	1940	19,000	135	Salmon and herring research.
Musky II.....	Sandusky, Ohio....	53	1931	3,666	170	Studies on warm-water fishes of Lake Erie; limnology; pollution studies.
Siscowet.....	Ashland, Wis.....	52	1946	81,000	170	Research on deepwater fish species, their distribution, abundance, and ecology; limnology.
Shang Wheeler.	Milford, Conn....	50	1951	45,840	140	Shellfish research; oyster and clam propagation; predator control.
Alosa.....	Oxford, Md.....	48	1941	6,500	82	Shellfish research; oyster propagation and disease studies.
Kingfish.....	St. Petersburg Beach, Fla.	43	1954	24,500	150	Estuarine investigations.
J-3486.....	North Carolina....	43	1942	28,000	-----	On loan to State of North Carolina.
J-1110.....	Beaufort, N.C....	40	1934	15,000	200	Research on shellfish, striped bass, and other.
Phalarope II...	Boothbay Harbor, Maine.	40	1932	8,000	225	Clam and herring studies.
Sookeye.....	King Salmon, Alaska.	40	1946	11,250	175	Salmon research work.

¹ Year vessel was built is unknown.

Appendix H—Fish and Wildlife Service Series and a 1961 List of Publications by Bureau Personnel

The regular, established series of the Fish and Wildlife Service in which Bureau of Commercial Fisheries publications appear are:

Fishery Bulletin.—Technical reports of scientific investigations of fishery biology. The Bulletin of the United States Fish Commission was begun in 1881; it became the Bulletin of the Bureau of Fisheries in 1904 and the Fishery Bulletin of the Fish and Wildlife Service in 1941. Through volume 46, separates were issued as Documents. (The last Document was No. 1103.) Beginning with volume 47 in 1931, each separate was issued as a numbered Bulletin. Fishery Bulletin Nos. 181 to 191 (333 p.) of volume 61 were issued in 1961. Bulletins are for sale by the Superintendent of Documents; they are distributed free to libraries and to a limited number of scientific cooperators.

Research Report.—Technical papers reporting the results of scientific investigations with emphasis on their practical application. Included are biological, technological, and economic subjects. These succeeded the Investigational Reports series. Only one dealing with Bureau of Commercial Fisheries projects was published in 1961 (No. 53, 39 p.). They are for sale by the Superintendent of Documents but are distributed free to libraries and to a limited number of cooperators.

Special Scientific Report—Fisheries.—Preliminary or progress reports and reports on scientific investigations of restricted scope. Established as Special Scientific Reports in 1940, Nos. 1 to 67 were issued from that date to 1949, when the new series, Special Scientific Report—Fisheries, with new serial numbering was started. In 1961 there were 26 (2,056 p.) of these reports published, No. 398 being the last. They are processed from typewritten text to speed publication and are distributed free to libraries and cooperators on a limited mailing list.

Commercial Fisheries Abstracts.—A monthly abstract of world literature (chiefly English language) on fishery technology. Volume 14 in 1961 had 12 issues (326 p.). They have free, but limited distribution.

Commercial Fisheries Review.—A monthly presentation of developments and news of domestic and foreign fishery industries and trends. Volume 23 in 1961 had 12 issues (1,417 p.). For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Subscription price \$5.50 a year; \$2 additional for foreign mailing; single copies 60 cents each.

Circular.—Popular and semitechnical publications of general and regional interest intended to aid conservation and management. Fourteen circulars (812 p.) were issued in 1961. They are usually distributed to depository libraries.

Fishery Leaflet.—Popular information on fishery subjects intended primarily for use in correspondence. Thirty-two leaflets (491 p.) were published during the year. They are distributed free on request.

Statistical Digest.—Annual statistics with detailed tabulations relating to fishery production, manufacture, and commerce. These succeeded the Ad-

ministrative Report series. One (459 p.) was published in 1961. They are for sale by the Superintendent of Documents; some are distributed free on a limited mailing list.

Current Fishery Statistics.—Current statistical information on fishery production, manufacture, and domestic or foreign trade, issued monthly, quarterly, or annually, by States, regions, or larger units. In 1961 there were 235 monthly landing reports (811 p.) for 20 States; 25 monthly reports of manufactured products (121 p.); and 36 annual reports of sectional and State operating units, catch statistics, manufactured products, and foreign trade (304 p.).

Fishery Products Report.—Daily (5 times a week), monthly, and annual—data on landings, receipts, supplies, prices, imports, movements of fish and fish products in local areas; market conditions; fishery developments in the United States and foreign countries. Also special Market News data reports are issued sporadically. Seven Market News Service field offices prepare and mail these free reports. During 1961 the daily reports totaled 6,354 pages; the monthly and annual, 1,741 pages; and supplementary, 129 pages.

Miscellaneous papers.—Forty-one miscellaneous papers, totaling 535 pages, were issued.

Audiovisual material.—In addition to the regular series of publications, the Bureau also produced one 16 mm. sound color motion picture. The film was *Fishing Five Great Lakes*.

A detailed list of publications of the Bureau of Commercial Fisheries and its personnel or contractors during 1961 follows. The articles are listed by authors.

Publications¹

ABRAHAMSON, JOHN D.

Economic aspects of markets for Middle Atlantic oysters. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 128-131.

ABRAHAMSON, JOHN D., and CARL P. HOFFMAN, JR.

Exempt trucking of fresh and frozen fish and shellfish in interstate commerce. U.S. Fish and Wildlife Service, Circular 133, iv+55 p. ✓

AHLSTROM, ELBERT H.

Distribution and relative abundance of rockfish (*Sebastes* spp.) larvae off California and Baja California. Conseil Permanent International pour l'Exploration de la Mer, Rapports et Procès-Verbaux des Réunions, vol. 150, p. 169-176. ✓

ALBANO, G. A.

Receipts and prices of fresh and frozen fishery products at Chicago, 1960. U.S. Fish and Wildlife Service, Chicago Market News Service, 67 p.

ALVERSON, DAYTON L.

Fishing vessels around the world. United States Naval Institute Proceedings, vol. 87, no. 1, p. 98-109.

Ocean temperatures and their relation to albacore tuna (*Thunnus germo*) distribution in waters off the coasts of Oregon, Washington and British Columbia. Journal of the Fisheries Research Board of Canada, vol. 18, no. 6, p. 1145-1152. ✓

¹This list does not include Commercial Fisheries Abstracts, Current Fishery Statistics, and Commercial Fisheries Review, except a few articles for which the authors' names are given.

Alverson, Dayton L.—Continued

- Pacific coast groundfish. *Western Fisheries*, vol. 62, no. 3, p. 11-14, 53-57.
 Un grand petit bateau (a grand little boat). *France Pêche*, vol. 2, 50 NF
 No. 47, p. 21-23.

ALVERSON, DAYTON L., and SIGURD J. WESTHEIM.

- A review of the taxonomy and biology of the Pacific ocean perch and its fishery. *Conseil Permanent International pour l'Exploration de la Mer, Rapports et Procès-Verbaux des Réunions*, vol. 150, p. 12-27.

ANDERSON, WILLIAM W., JOSEPH E. MOORE, and HERBERT R. GORDY.

- Oceanic salinities off the South Atlantic coast of the United States, *Theodore N. Gill* cruises 1-9, 1953-54. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 389, v+207 p.

- Water temperatures off the South Atlantic coast of the United States, *Theodore N. Gill* cruises 1-9, 1953-54. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 380, v+206 p.

APPLEGATE, VERNON C.

- Downstream movement of lampreys and fishes in the Carp Lake River, Michigan. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 387, iv+71 p.

APPLEGATE, VERNON C., JOHN H. HOWELL, JAMES W. MOFFETT, B. G. H. JOHNSON, and MANNING A. SMITH.

- Use of 3-trifluoromethyl-4-nitrophenol as a selective sea lamprey larvicide. Great Lakes Fishery Commission, Technical Report No. 1, 35 p.

BARKLEY, RICHARD A., and THOMAS S. AUSTIN.

- Distribution of properties about the equatorial undercurrent. [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961, Abstracts of Symposium Papers, p. 339-340.

BARRETT, IZADORE, and GERALD V. HOWARD.

- Studies of the age, growth, sexual maturity and spawning of populations of Anchoveta (*Cetengraulis mysticetus*) of the coast of the eastern tropical Pacific Ocean. *In* Inter-American Tropical Tuna Commission, Bulletin, vol. 5, no. 2, ii+p. 115-216.

BATES, DANIEL W., and STANLEY G. JEWETT, JR.

- Louwer efficiency in deflecting downstream migrant steelhead. *Transactions of the American Fisheries Society*, vol. 90, no. 3, p. 336-337.

BEETON, ALFRED M.

- Environmental changes in Lake Erie. *Transactions of the American Fisheries Society*, vol. 90, no. 2, p. 153-159.

BEETON, ALFRED M., and FRANK F. HOOPER.

- The hydrography of Saginaw Bay. [Abstract.] *Proceedings of the Fourth Conference on Great Lakes Research*, April 17-18, 1961, p. 111. Great Lakes Research Division, Publication No. 7. Institute of Science and Technology, University of Michigan, Ann Arbor, Mich.

BERRY, FREDERICK H.

- Review of *Studies on the eggs, larvae and juveniles of Japanese fishes, Series I*, by Keitaro Uchida and others. *Copeia*, 1961, no. 4, p. 508.

BERRY, FREDERICK H., and WILLIAM W. ANDERSON.

- Stargazer fishes from the western North Atlantic (family Uranoscopidae). *Proceedings of the United States National Museum*, vol. 112, no. 3448, p. 563-586.

BERRY, FREDERICK H., and MAX POLL.

- Synonymy of the Atlantic Ocean filefish *Alutera heudeloth* Hollard. *Copeia*, 1961, no. 3, p. 360-362.

- BERRY, FREDERICK H., and LOUIS E. VOGELE.
Filefishes (Monacanthidae) of the western North Atlantic. U.S. Fish and Wildlife Service, Fishery Bulletin 181, vol. 61, iv+p. 61-109.
- BETHEA, SAMMIE, and MARY E. AMBROSE.
Physical and chemical properties of shrimp drip as indices of quality. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 1, p. 9-14. [Also as Separate No. 610.]
- BLAHM, T. H.
Effect of tricaine methanesulfonate on oxygen consumption of juvenile sockeye salmon. Transactions of the American Fisheries Society, vol. 90, no. 2, p. 226-227.
- BOND, D. J.
Construction of a Widmark-flask shaker. U.S. Fish and Wildlife Service, Fishery Leaflet 530, 2 p.
- BOUCHARD, LOYAL G., and CHESTER R. MATTSOON.
Immersion staining as a method of marking small salmon. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 23, no. 1, p. 34-40.
- BOYAR, H. C.
Swimming speed of immature Atlantic herring with reference to the Passamaquoddy tidal project. Transactions of the American Fisheries Society, vol. 90, no. 1, p. 21-26.
- BRAEM, ROBERT A., and WESLEY J. EBEL.
A back-pack shocker for collecting lamprey ammocoetes. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 23, no. 2, p. 87-91.
- BRAWNER, JACK T.
The economic potential of the calico scallop fishery of the Gulf and South Atlantic with special reference to the east coast of Florida. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 90-94.
- BREEDLOVE, STELLA.
Review of Current bibliography for aquatic sciences and fisheries, compiled by Food and Agriculture Organization, Fisheries Biology Branch, Rome, Italy. Transactions of the American Fisheries Society, vol. 90, no. 1, p. 86.
- BROUILLARD, KEITH D.
Economic contribution of the trawl fishery to Michigan. Proceedings of The Fourth Conference on Great Lakes Research, April 17-18, 1961, p. 182-184. Great Lakes Research Division, Publication No. 7. Institute of Science and Technology, University of Michigan, Ann Arbor, Mich.
- BUETTNER, HOWARD J.
Recoveries of tagged, hatchery-reared lake trout from Lake Superior. Transactions of the American Fisheries Society, vol. 90, no. 4, p. 404-412.
- BULLIS, HARVEY R., JR.
A progress report on experimental fishing for sardine-like fishes in the Gulf of Mexico. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 94-97.
Observations on the feeding behavior of white-tip sharks on schooling fishes. Ecology, vol. 42, no. 1, p. 194-195.
- BULLIS, HARVEY R., JR., and ROBERT CUMMINS, JR.
An interim report of the Cape Canaveral calico scallop bed. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 10, p. 1-8. [Also as Separate No. 630.]

BULLIS, HARVEY R., JR., and TRAVIS D. LOVE.

Application of steaming and vacuum to shucking and cleaning scallops. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 5, p. 1-4. [Also as Separate No. 618.]

BULLIS, HARVEY R., JR., and PAUL STRUISSAKER.

Life history notes on the rougtail stingray, *Dasayatis centroura* (Mitchill). Copela, 1961, no. 2, p. 232-234.

BUMPUS, DEAN F.

Drift bottle records for the Gulf of Maine, Georges Bank and Bay of Fundy, 1956-58. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 378, ii + 127 p.

BUREAU OF COMMERCIAL FISHERIES.

A fall food feature. Special Fisheries Marketing Bulletin for food editors, 1 p.

Annual report of fisheries loan fund, fiscal year 1957. U.S. Fish and Wildlife Service, Circular 103, 21 p.

Annual report of fisheries loan fund, fiscal year 1958. U.S. Fish and Wildlife Service, Circular 106, 7 p.

Annual report of fisheries loan fund, fiscal year 1959. U.S. Fish and Wildlife Service, Circular 113, 14 p.

Annual report of fisheries loan fund, fiscal year 1960. U.S. Fish and Wildlife Service, Circular 123, 8 p.

August is sandwich month. Special Fisheries Marketing Bulletin for food editors, 12 p.

Fish 'n seafood parade. Special Fisheries Marketing Bulletin for food editors, 25 p.

Fish recipes for Lent. Special Fisheries Marketing Bulletin for food editors, 28 p.

Fish recipes for Lent. Special Fisheries Marketing Bulletin for institutions, 1 p.

Fish recipes for Lent. Five Special Fisheries Marketing Bulletins for school lunch, 1 p. each.

Fish recipes for Lent. Special Fisheries Marketing Bulletin for restaurants, 1 p.

Fishery motion pictures (list of). U.S. Fish and Wildlife Service, Fishery Leaflet 452 (revised), 22 p.

From the sea, fish and shellfish . . . from the land, ripe olives. Special Fisheries Marketing Bulletin for food editors, 1 p.

Holiday issue. Special Fisheries Marketing Bulletin for food editors, 8 p.

How about the new marine oils? U.S. Fish and Wildlife Service, Fishery Leaflet 528, 8 p.

It's fish 'n seafood time! Special Fisheries Marketing Bulletin for food trades, 1 p.

List of fishermen's and fish shore workers' unions in the United States. U.S. Fish and Wildlife Service, Fishery Leaflet 293, 8 p.

List of fishery associations in the United States. U.S. Fish and Wildlife Service, Fishery Leaflet 254, 13 p.

Bureau of Commercial Fisheries—Continued

- Maine seafood festival. Special Fisheries Marketing Bulletin for food editors, 1 p.
- New Bedford, Mass. seafood festival. Special Fisheries Marketing Bulletin for food editors, 1 p.
- Operations of the Bureau of Commercial Fisheries under the Saltonstall-Kennedy Act, fiscal year 1959, ii + 107 p.
- Organizations and officials concerned with the commercial fisheries, 1961. U.S. Fish and Wildlife Service, Fishery Leaflet 449, 16 p.
- Outdoor fish cookery. Special Fisheries Marketing Bulletin for food editors, 24 p.
- Prescription for health . . . eat fish! Special Fisheries Marketing Bulletin for food editors, 32 p.
- Restaurant and institutional recipe cards (5" x 8"). Four recipe cards for restaurants and institutions.
- Ripe olives from the land, scallops from the waters. Special Fisheries Marketing Bulletin for food editors, 1 p.
- Scallops and shrimp from the sea . . . cranberries from the land. Special Fisheries Marketing Bulletin for food editors, 1 p.
- School lunch recipe cards (5" x 8"). Three school lunch recipe cards. Separates from the *Commercial Fisheries Review*. U.S. Fish and Wildlife Service, Fishery Leaflet 522, 7 p.
- Shrimp now gives you bigger sales. Special Fisheries Marketing Bulletin for food trades and food service, 1 p.
- Shrimp and ripe olives combine for good eating. Special Fisheries Marketing Bulletin for food editors, 1 p.
- BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, GALVESTON, TEX.
Fishery research, Galveston Biological Laboratory, fiscal year 1961. U.S. Fish and Wildlife Service, Circular 129, iii + 82 p.
- The Florida red tide. U.S. Fish and Wildlife Service, Fishery Leaflet 506, 8 p.
- BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, HONOLULU, HAWAII.
Progress in 1960. U.S. Fish and Wildlife Service, Circular 127, i + 31 p.
- BUREAU OF COMMERCIAL FISHERIES, BOSTON MARKET NEWS SERVICE.
New England fisheries monthly summary (1961). Twelve issues, January to December, total 288 p.
- New England importer and brokers of imported fishery products, 1961, 8 p.
- BUREAU OF COMMERCIAL FISHERIES, BRANCH OF ECONOMICS.
United States customs receipts from imports of aquatic products for calendar years 1959 and 1960, and list of duty-free aquatic products, 19 p.
- BUREAU OF COMMERCIAL FISHERIES, BRANCH OF EXPLORATORY FISHING, SPECIAL SERVICES UNIT.
There's a new frontier. The discovery of calico scallops is bringing hope to fishermen from North Carolina to mid-Florida for a new and profitable fishery. *Fishing Gazette*, vol. 78, no. 4, p. 34-35, 56.
- BUREAU OF COMMERCIAL FISHERIES, CHICAGO MARKET NEWS SERVICE.
Monthly summary of Chicago's wholesale market fresh and frozen fishery products receipts and prices (1961). Twelve issues, January to December, total 163 p.

- BUREAU OF COMMERCIAL FISHERIES, HAMPTON MARKET NEWS SERVICE.
 Monthly summary of fishery products for Baltimore, Md. Twelve issues, January to December, total 96 p.
 Monthly summary of fishery products production in selected areas of Virginia, North Carolina, and Maryland (1961). Twelve issues, January to December, total 49 p.
- BUREAU OF COMMERCIAL FISHERIES, NEW ORLEANS MARKET NEWS SERVICE.
 Gulf of Mexico monthly landings, production, and shipments of fishery products (1961). Twelve issues, January to December, total 144 p.
- BUREAU OF COMMERCIAL FISHERIES, NEW YORK MARKET NEWS SERVICE.
 Imports of fishery products at New York, N.Y., 1960, 9 p.
 List of primary receivers of imported fishery products and byproducts at New York, N.Y., 1961, 20 p.
 New York City's wholesale fishery trade monthly summaries (1961). Twelve issues, January to December, total 318 p.
- BUREAU OF COMMERCIAL FISHERIES, SAN PEDRO MARKET NEWS SERVICE.
 California fishery products and byproducts brokers and importers, 1961, 6 p.
 California fishery products monthly summary (1961). Twelve issues, January to December, total 170 p.
- BUREAU OF COMMERCIAL FISHERIES, SEATTLE MARKET NEWS SERVICE.
 Washington, Oregon, and Alaska receipts and landings of fishery products for selected areas and fisheries (1961). Twelve issues, January to December, total 100 p.
- BURNER, C. J.
 Fisheries of the eastern Bering Sea. Proceedings of the Eleventh Alaskan Science Conference, August 29 to September 2, 1960, p. 140-141.
- BUTLER, JOHNNY A.
 Development of a thread-herring fishery in the Gulf of Mexico. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 9, p. 12-17. [Also as Separate No. 628.]
- BUTLER, PHILIP A.
 Effects of pesticides on commercial fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 168-172.
- CALDWELL, DAVID K.
 Populations of the butterfish, *Poronotus triacanthus* (Peck), with systematic comments. Bulletin of the Southern California Academy of Sciences, vol. 60, part 1, p. 19-31.
- CALDWELL, DAVID K., and MELBA C. CALDWELL.
 Gray squirrels larcenously feeding at cracker-vending machines. Journal of the Florida Academy of Sciences, vol. 23, no. 4, for the year 1960, p. 285-288.
- CARRIKER, MELBOURNE ROMAINE.
 Comparative functional morphology of boring mechanisms in gastropods. American Zoologist, vol. 1, no. 2, p. 263-266.
 Interrelation of functional morphology, behavior, and autecology in early stages of the bivalve *Mercenaria mercenaria*. Journal of the Elisha Mitchell Scientific Society, vol. 77, no. 2, p. 168-241.
- CASTAGNA, MICHAEL.
 Shipworms and other marine borers. U.S. Fish and Wildlife Service, Fishery Leaflet 505, i+12 p.

CHANLEY, PAUL E.

Inheritance of shell markings and growth in the hard clam, *Venus mercenaria*. Proceedings of the National Shellfisheries Association, vol. 50, for the year 1959, p. 163-169.

CHAPOTON, ROBERT B., and JAMES E. SYKES.

Atlantic coast migration of large striped bass as evidenced by fisheries and tagging. Transactions of the American Fisheries Society, vol. 90, no. 1, p. 13-20.

CLARK, JOHN R., and FRANK A. DREYER.

New England haddock fishery biostatistics—1956. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 375, v+89 p.

COHEN, DANIEL M.

A new genus and species of deepwater ophidroid fish from the Gulf of Mexico. Copeia, 1961, no. 3, p. 288-292.

On the identity of the species of the fish genus *Argentina* in the Indian Ocean. Galathea Report, vol. 5, p. 19-22. Scientific Results of the Danish Deep-Sea Expedition Round the World 1950-52. Danish Science Press, Ltd., Copenhagen, Denmark.

Research program of the Ichthyological Laboratory. U.S. Fish and Wildlife Service, Circular 124, 8 p.

Review of *Guide to marine fishes*, by Alfred Perlmutter. Transactions of the American Fisheries Society, vol. 90, no. 4, p. 503.

COLLINS, JEFF.

Processing and quality studies of shrimp held in refrigerated sea water and ice. Part 5—Interchange of components in a shrimp-ice system. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 7, p. 1-3. [Also as Separate No. 622.]

COLTON, JOHN B., Jr.

The distribution of eyed flounder and lanternfish larvae in the Georges Bank area. Copeia, 1961, no. 3, p. 274-279.

COLTON, JOHN B., JR., KENNETH A. HONEY, and ROBERT F. TEMPLE.

The effectiveness of sampling methods used to study the distribution of larval herring in the Gulf of Maine. Journal du Conseil Permanent International pour l'Exploration de la Mer, vol. 26, no. 2, p. 180-190.

COLTON, JOHN B., JR., and ROBERT F. TEMPLE.

The enigma of Georges Bank spawning. Limnology and Oceanography, vol. 6, no. 3, p. 280-291.

CONOVER, JOHN T., RAYMOND L. FRITZ, and MANUEL VIEIRA.

A morphometric study of silver hake. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 368, ii+13 p.

COUNTS, ROBERT C.

A device for measuring larval and juvenile fishes. Copeia, 1961, no. 2, p. 224-226.

COYNE, JAMES A.

Receipts of fresh and frozen fishery products at Baltimore's wholesale fish market, 1960. U.S. Fish and Wildlife Service, Baltimore Market News Service, 60 p.

CRADDOCK, DONOVAN R.

An improved trap for the capture and safe retention of salmon smolts. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 23, no. 4, p. 190-192.

CRAIG, WILLIAM L., and JOSEPH J. GRAHAM.

Report on a co-operative, pre-season survey of the fishing grounds for albacore (*Thunnus germon*) in the eastern North Pacific, 1959. California Fish and Game, vol. 47, no. 1, p. 73-85.

DAVIS, HARRY, C.

Effects of some pesticides on eggs and larvae of oysters (*Crassostrea virginica*) and clams (*Venus mercenaria*). U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 12, p. 8-23. [Also as Separate No. 634.]

DAVIS, HARRY C., and RAVENNA UKELES.

Mass culture of phytoplankton as foods for metazoans. Science, vol. 134, no. 3478, p. 562-564.

DE SYLVA, DONALD P., and WARREN F. RATHJEN.

Life history notes on the little tuna, *Euthynnus alletteratus*, from the south-eastern United States. Bulletin of Marine Science of the Gulf and Caribbean, vol. 11, no. 2, p. 161-190.

DEES, LOLA T.

A list of the circulars of the United States Fish and Wildlife Service. U.S. Fish and Wildlife Service, Fishery Leaflet 518, 8 p.

A list of the fishery bulletins of the United States Fish and Wildlife Service. U.S. Fish and Wildlife Service, Fishery Leaflet 509, 14 p.

Ambergris. U.S. Fish and Wildlife Service, Fishery Leaflet 517, 7 p.

Brine shrimp. U.S. Fish and Wildlife Service, Fishery Leaflet 527, 1 + 5 p.

Cephalopods: cuttlefish, octopuses, squids. U.S. Fish and Wildlife Service, Fishery Leaflet 524, 10 p.

List of research reports of the United States Fish and Wildlife Service. U.S. Fish and Wildlife Service, Fishery Leaflet 519, 4 p.

List of Special Scientific Report (Nos. 1-67) and Special Scientific Report—Fisheries (Nos. 1-). U.S. Fish and Wildlife Service, Fishery Leaflet 514, 35 p.

Rains of fishes. U.S. Fish and Wildlife Service, Fishery Leaflet 513, 5 p.

Spiny lobsters. U.S. Fish and Wildlife Service, Fishery Leaflet 523, 1 + 7 p.

Sturgeons. U.S. Fish and Wildlife Service, Fishery Leaflet 526, 1 + 8 p.

The mosquitofish, *Gambusia affinis*. U.S. Fish and Wildlife Service, Fishery Leaflet 525, 6 p.

United States Fish and Wildlife Service papers on physical and chemical oceanography. U.S. Fish and Wildlife Service, Fishery Leaflet 515, 14 p.

United States Fish and Wildlife Service publication on limnology, 1940-60. U.S. Fish and Wildlife Service, Fishery Leaflet 512, 7 p.

DI COSTANZO, CHARLES J., and MURRAY L. HAYES.

A method of separating river stocks of red salmon in the Bristol Bay fishery. Proceedings of the Eleventh Alaskan Science Conference, August 29 to September 2, 1960, p. 102-103.

DI MARCO, PETER.

Production of fishery products in selected areas of Alabama, Florida, Louisiana, Mississippi, and Texas, 1960. U.S. Fish and Wildlife Service, New Orleans Market News Service, 44 p.

DOBKIN, SHELDON.

Early developmental stages of pink shrimp, *Penaeus duorarum*, from Florida waters. U.S. Fish and Wildlife Service, Fishery Bulletin 190, vol. 61, iv + p. 321-349.

- DOLLAR, A. M., A. M. GOLDNER, W. DUANE BROWN, and H. S. OLCOTT.
Observations on "green" tuna. *Food Technology*, vol. 15, no. 5, p. 253-255.
- DOW, ROBERT L., and DANA E. WALLACE.
The soft-shell clam industry of Maine. U.S. Fish and Wildlife Service, Circular 110, v + 36 p.
- DRAGOVICH, ALEXANDER.
Relative abundance of plankton off Naples, Florida, and associated hydrographic data, 1956-57. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 372, ii + 41 p.
- DRAGOVICH, ALEXANDER, JOHN H. FINUCANE, and BILLIE Z. MAY.
Counts of red tide organisms, *Gymnodinium breve*, and associated oceanographic data from Florida west coast, 1937-59. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 369, ii + 175 p.
- DUMONT, WM. H., and G. T. SUNDSTROM.
Commercial fishing gear of the United States. U.S. Fish and Wildlife Service, Circular 109, iv + 61 p.
- DUNCAN, THOMAS O.
The Pacific region of the Bureau of Commercial Fisheries. U.S. Fish and Wildlife Service, Circular 108, ii + 17 p.
- EBER, L. E.
Effects of wind-induced advection on sea surface temperature. *Journal of Geophysical Research*, vol. 66, no. 3, p. 839-844.
- EDWARDS, ROBERT L.
Studies of the *Phlebotomidae* (Mallophaga) from birds of the order Procellariiformes. 1. The genus *Halipeurus* Thompson. *Journal of Parasitology*, vol. 47, no. 1, p. 125-157.
The fishes of Richmond Gulf, Ungava, Canada. *Proceedings of the American Philosophical Society*, vol. 105, no. 2, p. 196-205.
- EDWARDS, ROBERT L., and J. L. CHAMBERLIN.
Grant No. 1547 (1953), \$1,500. Ecological investigation of Richmond Gulf, Hudson Bay. *Year Book of the American Philosophical Society*, 1961, p. 285-287.
- FARRIS, DAVID A.
Abundance and distribution of eggs and larvae and survival of larvae of jack mackerel (*Trachurus symmetricus*). U.S. Fish and Wildlife Service, Fishery Bulletin 187, vol. 61, iv + p. 247-279.
- FAVORITE, FELIX.
Pacific subarctic circulation. [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961, Abstracts of Symposium Papers, p. 343-344.
Surface temperature and salinity off the Washington and British Columbia coasts, August, 1958 and 1959. *Journal of the Fisheries Research Board of Canada*, vol. 18, no. 3, p. 311-319.
- FAVORITE, FELIX, RICHARD J. CALLAWAY, and JAMES F. HERARD.
North Pacific and Bering Sea oceanography, 1959. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 377, iii + 212 p.
- FAVORITE, FELIX, JOHN W. SCHANTZ, and CHARLES R. HERARD.
Oceanographic observations in Bristol Bay and the Bering Sea, 1939-41, USCGT *Redwing*. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 381, ii + 323 p.
- FINUCANE, JOHN H., and BILLIE Z. MAY.
Modified Van Dorn water sampler. *Limnology and Oceanography*, vol. 6, no. 1, p. 85-87.

FISCUS, CLIFFORD H.

Growth in the Stellar sea lion. *Journal of Mammalogy*, vol. 42, no. 2, p. 218-223.

FITZGIBBON, DON.

Indexes of the cost of transportation for fishery products. U.S. Fish and Wildlife Service, *Commercial Fisheries Review*, vol. 23, no. 6, p. 12-13. [Also as Separate No. 621.]

FRASCATORE, ANTHONY J., JOSEPH H. CARVER, JOHN J. RYAN, and RICHARD D. TENNEY.

Standards development program at the Bureau of Commercial Fisheries Technological Laboratory in Gloucester, Massachusetts. *Food Technology*, vol. 15, no. 12, p. 16-18.

FRITZ, RAYMOND L.

Size distribution by depth of the longfin hake, *Phycis chesteri*. *Copeia*, 1961, no. 2, p. 229-230.

GALTSOFF, PAUL S.

Physiology of reproduction in molluscs. *American Zoologist*, vol. 1, no. 2, p. 273-289.

The three hearts of the oyster. *Proceedings of the National Shellfisheries Association*, vol. 51, for the year 1960, p. 7-11.

GANGMARK, HAROLD A.

An improvised dispenser of thyodene in field titrations. U.S. Fish and Wildlife Service, *Progressive Fish-Culturist*, vol. 23, no. 2, p. 96.

GINSBURG, ISAAC.

Food fishes with fins and scales. U.S. Fish and Wildlife Service, *Fishery Leaflet 531*, 7 p.

GLUDE, JOHN B.

The future of the United States oyster industry from a biologist's viewpoint. *Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960*, p. 131-135.

GORDON, WILLIAM G.

Food of the American smelt in Saginaw Bay, Lake Huron. *Transactions of the American Fisheries Society*, vol. 90, no. 4, p. 430-443.

GORDON, WILLIAM G., and KEITH D. BROUILLARD.

Great Lakes trawler conversion. U.S. Fish and Wildlife Service, *Fishery Leaflet 510*, 1+15 p.

GRAHAM, JOSEPH J., and WILLIAM L. CRAIG.

Oceanographic observations made during a cooperative survey of albacore (*Thunnus germa*) off the North American West Coast in 1959. U.S. Fish and Wildlife Service, *Special Scientific Report—Fisheries No. 386*, iv+31 p.

GRAHAM, JOSEPH J., and JAMES W. MCGARY.

Investigation of the potential albacore resource of the central North Pacific. U.S. Fish and Wildlife Service, *Commercial Fisheries Review*, vol. 23, no. 11, p. 1-7. [Also as Separate No. 631.]

GREENWOOD, M. R.

Vessel construction: Improvements . . . efficiency . . . keynote 1960 vessel construction. *Fishing Gazette, 1961 Annual Review Number*, vol. 78, no. 13, p. 94, 96-100.

GRICE, GEORGE D.

Calanoid copepods from equatorial waters of the Pacific Ocean. U.S. Fish and Wildlife Service, *Fishery Bulletin 186*, vol. 61, iv+p. 171-246.

- GRONINGER, HERMAN S.
Formation of acetoin in cod and other bottom-fish filets during refrigerated storage. *Food Technology*, vol. 15, no. 1, p. 10-12.
- GRUGER, EDWARD H., JR.
Fractionation and purification of triglycerides, fatty acids and methyl esters from fish oils. *Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960*, p. 53-59.
- GUNTER, GORDON, and WILLIAM J. DEMORAN.
Lateral lines and an undescribed sensory area on the head of the Gulf menhaden, *Brevoortia patronus*. *Copeia*, 1961, no. 1, p. 39-42.
- HARGIS, WILLIAM J., JR., and CLYDE L. MACKENZIE, JR.
Sexual behavior of the oyster drills: *Euplura caudata* and *Urosalpinx cinerea*. *Nautilus*, vol. 75, no. 1, p. 7-16.
- HARTMAN, WILBUR L.
Reproductive behavior of North American sticklebacks. *In High School Biology, Biological Investigations for Secondary School Students*, p. 145-146. American Institute of Biological Sciences, New York, N.Y.
- HASKELL, WINTHROP A.
Gulf of Mexico trawl fishery for industrial species. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 2, p. 1-6. [Also as Separate No. 612.]
- HATCH, RICHARD W.
Regular occurrence of false annuli in four brook trout populations. *Transactions of the American Fisheries Society*, vol. 90, no. 1, p. 6-12.
- HATCH, RICHARD W., and DWIGHT A. WEBSTER.
Trout production in four central Adirondaek Mountain Lakes. Cornell University Agricultural Experiment Station, Memoir 373, 81 p.
- HAYES, M. L.
Biological research and the economics of commercial fisheries in Alaska. *Proceedings of the Eleventh Alaskan Science Conference, August 29 to September 2, 1960*, p. 141-142.
- HEBARD, JAMES F.
Currents in southeastern Bering Sea. *International North Pacific Fisheries Commission, Document No. 281, Bulletin 5*, p. 9-16.
- HESTER, FRANK J.
A method of predicting tuna catch by using coastal sea-surface temperatures. *California Fish and Game*, vol. 47, no. 4, p. 313-326.
Tuna seines: How deep? *Pacific Fisherman*, vol. 59, no. 12, p. 19-20.
- HITZ, C. R.
Occurrence of two species of juvenile rockfish in Queen Charlotte Sound. *Journal of the Fisheries Research Board of Canada*, vol. 18, no. 2, p. 279-281.
- HITZ, CHARLES R., and ALLAN C. DELACY.
Variation in the occurrence of coronal spines in *Sebastes auriculatus* (Girard). *Copeia*, 1961, no. 3, p. 279-282.
- HITZ, C. R., H. C. JOHNSON, and A. T. PRUTER.
Bottom trawling explorations off the Washington and British Columbia coasts, May-August 1960. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 6, p. 1-11. [Also as Separate No. 620.]
- HOESE, H. D., C. E. RICHARDS, and M. CASTAGNA.
Appearance of the gag, *Mycteroperca microlepis*, in coastal waters of Virginia. *Chesapeake Science*, vol. 2, nos. 1-2, p. 104-105.

HOFFMAN, CARL P., JR.

Fishery transportation briefs. *Fishing Gazette*, vol. 78, no. 6, p. 11, 15; no. 7, p. 8, 11; no. 8, p. 8.

The changing scene in fishery transportation. *Fishing Gazette*, 1961 Annual Review Number, vol. 78, no. 13, p. 136-140.

HOLMES, ROBERT W., and ROBERT J. LINN.

A modified Beckman model du spectrophotometer for seagoing use. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 382, iv+4 p.

HOLMES, ROBERT W., and JAMES M. SNODGRASS.

A multiple-detector irradiance meter and electronic depth-sensing unit for use in biological oceanography. *Journal of Marine Research*, vol. 19, no. 1, p. 40-56.

HOLT, JOHN K.

Equipment Note No. 10—A sea sled to towing vessel communication method. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 9, p. 18-19. [Also as Separate No. 629.]

HOWARD, GERALD V.

The Pacific coast tuna fisheries. *Western Fisheries*, vol. 62, no. 2, p. 55-58, 60, 86-91.

INGLIS, ANTHONY.

Review of *Ecology of inland waters and estuaries*, by George K. Reid. *Transactions of the American Fisheries Society*, vol. 90, no. 2, p. 232-233.

JACOBY, CARL.

Relative growth of fins in the fourhorn sculpin, *Myoxocephalus quadricornis*, from the upper Great Lakes. *Copeia*, 1961, no. 4, p. 473-475.

JENSEN, ALBERT C.

Recaptures of tagged spiny dogfish, *Squalus acanthias*. *Copeia*, 1961, no. 2, p. 228-229.

Scientists forecast improved catch of haddock on Georges during '61. *National Fisherman and Maine Coast Fisherman*, vol. 41, no. 12, p. 10.

JENSEN, ALBERT C., and JOHN P. WISE.

Movement of tagged halibut off New England—II. *Transactions of the American Fisheries Society*, vol. 90, no. 4, p. 489-490.

JENSEN, ALVIN L.

Methods for lipid analysis. An annotated bibliography. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 376, i+76 p.

JOHNSON, HAROLD C.

Equipment Note No. 8.—New hydraulically-driven block speeds hauling crab-pot warps. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 1, p. 15-16. [Also as Separate No. 611.]

Vessel construction: Pacific coast. *Fishing Gazette*, 1961 Annual Review Number, vol. 78, no. 13, p. 100-101, 104.

JOHNSON, JAMES H.

Sea surface temperature monthly average and anomaly charts, northeastern Pacific Ocean, 1947-58. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 385, ii+56 p.

JONES, WALTER G., and GEORGE Y. HARRY.

The Oregon trawl fishery for mink food—1948-1957. *Fish Commission of Oregon, Research Briefs*, vol. 8, no. 1, p. 14-30.

JUDY, MAYO H.

Validity of age determination from scales of marked American shad. U.S. Fish and Wildlife Service, Fishery Bulletin 185, vol. 61, iv+ p. 161-170.

JUHL, ROLF.

A study of vessel and gear usage in the shrimp fishery of the southeastern United States. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 8, p. 1-8. [Also as Separate No. 624.]

JUNE, FRED C.

Age and size composition of the menhaden catch along the Atlantic coast of the United States, 1957, with a brief review of the commercial fishery. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 373, iii+39 p.

The menhaden fishery of the United States. U.S. Fish and Wildlife Service, Fishery Leaflet 521, 13 p.

KELLY, GEORGE F., and ALLAN M. BARKER.

Observations on the behaviour, growth, and migration of redfish at Eastport, Maine. Conseil Permanent International pour l'Exploration de la Mer, Rapports et Procès-Verbaux des Réunions, vol. 150, p. 263-275.

Vertical distribution of young redfish in the Gulf of Maine. Conseil Permanent International pour l'Exploration de la Mer, Rapports et Procès-Verbaux des Réunions, vol. 150, p. 220-223.

KELLY, GEORGE F., ALLAN M. BARKER, and GEORGE M. CLARKE.

Racial comparisons of redfish from the western North Atlantic and the Barents Sea. Conseil Permanent International pour l'Exploration de la Mer, Rapports et Procès-Verbaux des Réunions, vol. 150, p. 28-41.

KELLY, GEORGE F., and ROBERT S. WOLF.

Age and growth of the redfish (*Sebastes marinus*) in the Gulf of Maine. [Abstract.] Conseil Permanent International pour l'Exploration de la Mer, Rapports et Procès-Verbaux des Réunions, vol. 150, p. 262.

KELLY, WILLIAM N.

Production of fishery products in selected areas of Virginia, Maryland, and North Carolina, 1960. U.S. Fish and Wildlife Service, Hampton Market News Service, 49 p.

KENYON, KARL W., and DALE W. RICE.

Abundance and distribution of the Stellar sea lion. *Journal of Mammalogy*, vol. 42, no. 2, p. 223-234.

KERNS, ORRA E., JR.

Abundance and age of Kvichak River red salmon smolts. U.S. Fish and Wildlife Service, Fishery Bulletin 189, vol. 61, iv+p. 301-320.

LEE, CHARLES F.

Industrial products, trends and developments. *Fishing Gazette*, 1961 Annual Review Number, vol. 78, no. 13, p. 130-132.

LEROH, D. W., and DAYTON L. ALVERSON.

Considerations influencing the design and operations of a fisheries gear research vessel. In Jan-Olof Traung and Norio Fujinami (editors), *Research Vessel Design*, FAO Research Vessel Forum in Tokyo, September 18-30, 1961, p. LER 1-17.

LEWIS, DONALD E.

Sockeye salmon, *Oncorhynchus nerka*, without a dorsal fin. *Copeia*, 1961, no. 1, p. 116-117.

LEWIS, ROBERT M.

Comparison of three tags on striped bass in the Chesapeake Bay area. Chesapeake Science, vol. 2, nos. 1-2, p. 3-8.

LISTON, J., JULIA G. CHAPEL, and J. A. STERN.

The spoilage of Pacific coast rockfish. 1. Spoilage in ice storage. Food Technology, vol. 15, no. 1, p. 19-22.

LISTON, JOHN, and CHARLES R. HITZ.

Second survey of the occurrence of parasites and blemishes in Pacific ocean perch, *Sebastes alutus*, May-June 1959. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 383, iii+6 p.

LOOSANOFF, VICTOR L.

Biology and methods of controlling the starfish, *Asterias forbesi* (Desor). U.S. Fish and Wildlife Service, Fishery Leaflet 520, 11 p.

Partial metamorphosis in *Anomia simplex*. Science, vol. 133, no. 3470, p. 2070-2071.

Recent advances in the control of shellfish predators and competitors. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 113-127.

LOVE, TRAVIS D.

Report of "jellied" flounder from Gulf of Mexico. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 8, p. 9-10. [Also as Separate No. 625.]

LUX, FRED E.

Bureau studies yellowtails to balance market here. Sunday Standard-Times, New Bedford, Mass., February 26, p. 17.

LYNCH, EDWARD J., RICHARD M. DOHERTY, and GEORGE P. DRAHEIM.

The groundfish industries of New England and Canada. A comparative economic analysis. U.S. Fish and Wildlife Service, Circular 121, v+187 p.

MACKENZIE, CLYDE L., Jr.

A practical chemical method for killing mussels and other oyster competitors. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 3, p. 15-19. [Also as Separate No. 615.]

Growth and reproduction of the oyster drill *Eupleura caudata* in the York River, Virginia. Ecology, vol. 42, no. 2, p. 317-338.

MACKENZIE, CLYDE L., Jr., and L. W. SHEARER.

Chemical control of *Polydora websteri* and other annelids inhabiting oyster shells. Proceedings of the National Shellfisheries Association, vol. 50, for the year 1959, p. 105-111.

MALINS, DONALD C., and CLIFFORD R. HOULE.

Monoenoic fatty acids in dogfish livers: Isomers of the C₁₆, C₁₈, C₂₀, and C₂₂ series. Proceedings of the Society for Experimental Biology and Medicine, vol. 108, no. 1, p. 126-129.

MANGOLD, HELMUT K.

Thin-layer chromatography of lipids. Journal of the American Oil Chemists' Society, vol. 38, no. 12, p. 708-727.

MANN, HERBERT J.

Underwater observation chambers on the research vessel *Charles H. Gilbert*. In Jan-Olof Traung and Norio Fujinami (editors), Research Vessel Design, FAO Research Vessel Forum in Tokyo, September 18-30, 1961, p. MAN 1-9.

- MARAK, ROBERT R., and JOHN B. COLTON, JR.
Distribution of fish eggs and larvae, temperature, and salinity in the Georges Bank-Gulf of Maine area, 1953. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 398, iii+61 p.
- MARR, JOHN C.
A hypothesis of the population biology of the sardine, *Sardinops caerulea*. [Abstract.] Proceedings of the Ninth Pacific Science Congress, vol. 10, p. 63.
- MARVIN, KENNETH T., LARENCE M. LANSFORD, and RAY S. WHEELER.
Effects of copper ore on the ecology of a lagoon. U.S. Fish and Wildlife Service, Fishery Bulletin 184, vol. 61, iv+p. 153-160.
- MASSMANN, WILLIAM H., and ANTHONY L. PACHECO.
Movements of striped bass tagged in Virginia waters of Chesapeake Bay. Chesapeake Science, vol. 2, nos. 1-2, p. 37-44.
- MATSUMOTO, WALTER M.
Collection and descriptions of juvenile tunas from the central Pacific. Deep-Sea Research, vol. 8, nos. 3-4, p. 279-285.
- MCGARY, JAMES W., JOSEPH J. GRAHAM, and TAMIO OTSU.
Oceonography and North Pacific albacore. California Cooperative Oceanic Fisheries Investigations, Reports, vol. 8, p. 45-53.
- McHUGH, J. L.
Power from the tides. Sea Frontiers, vol. 7, no. 1, p. 30-40. International Oceanographic Foundation, Miami, Fla.
- McKERNAN, DONALD L.
Fisheries . . . 1960 . . . highlights of the work of the Bureau of Commercial Fisheries covering industrial and biological developments. Fishing Gazette, 1961 Annual Review Number, vol. 78, no. 13, p. 18-23.
Nutrition's place in today's seafood marketing. Quick Frozen Foods, vol. 23, no. 9, p. 127-128.
The role of international commissions in world fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 1-21.
- McLAUGHLIN, PATSY A., and JAMES F. HEBARD.
Stomach contents of the Bering Sea king crab. International North Pacific Fisheries Commission, Document No. 280, Bulletin 5, p. 5-8.
- McMULLIN, LESLIE D.
List of fishery cooperatives in the United States, 1960-61. U.S. Fish and Wildlife Service, Fishery Leaflet 292, iii +15 p.
- McNEELY, RICHARD L.
Experiments utilizing electrical trawl cables—a progress report. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 4, p. 1-7. [Also as Separate No. 616.]
Purse seine revolution in tuna fishing. Pacific Fisherman, vol. 59, no. 7, p. 27-58.
- McNEELY, RICHARD L., and WALTER T. PEREYRA.
A simple screening device for the separation of benthic samples at sea. Journal du Conseil Permanent International pour l'Exploration de la Mer, vol. 26, no. 3, p. 259-262.
- McRAE, ERNEST D., JR.
Red crab explorations off the northeastern coast of the United States. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 5, p. 5-10. [Also as Separate No. 619.]

MEAD, GILES W., and CARL J. SINDERMANN.

Systematics and natural marks. Conseil Permanent International pour l'Exploration de la Mer, Rapport et Procès-Verbaux des Réunions, vol. 150, p. 9-11.

MERRILL, ARTHUR S.

Remarks concerning the benefits of systematic and repetitive collecting from navigation buoys. [Abstract.] American Malacological Union, Bulletin No. 27, p. 26.

Shell morphology in the larval and postlarval stages of the sea scallop, *Placopecten magellanicus* (Gmelin). Bulletin of the Museum of Comparative Zoology, vol. 125, no. 1, p. 3-20.

Some observations on the growth and survival of organisms on the shell of *Placopecten magellanicus*. [Abstract.] American Malacological Union, Bulletin No. 28, p. 4-5.

The sea scallop fishery. [Abstract.] American Malacological Union, Bulletin No. 28, p. 14.

MERRELL, T. R.

Survival of pink salmon at Little Port Walter Research Station. Proceedings of the Eleventh Alaskan Science Conference, August 29 to September 2, 1960, p. 99-102.

Unusual white sturgeon diet. Fish Commission of Oregon, Research Briefs, vol. 8, no. 1, p. 77.

MILLER, DAVID.

A modification of the Small Hardy Plankton sampler for simultaneous high-speed plankton hauls. Marine Ecology, vol. 5, no. 45, p. 165-172.

MURRAY, ALTON T., and DEVORA R. ALEXANDER.

Questions and answers regarding the federal wage-hour law amendments of 1961 affecting the fishing industry, 7 p.

NAKAMURA, EUGENE L., and HEENY S. H. YUEN.

Incidence of the giant trematode, *Hirudinella marina* Garcia, in skipjack tuna, *Euthynnus plectamis* (Linnaeus), from Marquesan and Hawaiian waters. Transactions of the American Fisheries Society, vol. 90, no. 4, p. 419-423.

NOBLEN, CARROLL R.

The identification of larval yellow perch, *Perca flavescens*, and walleye, *Stizostedion vitreum*. Copeia, 1961, no. 3, p. 282-288.

O'BRIEN, JOHN J.

New England fisheries—annual summary, 1960. U.S. Fish and Wildlife Service, Boston Market News Service, 50 p.

New England food-fish landings up but industrial-fish landings down in 1960. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 2, p. 23-25.

New England sea scallop fishery, and marketing of sea scallop meats, 1939-60, 52 p.

OSTERHAUG, KATHRYN L.

A literature review on possible uses for dogfish. U.S. Fish and Wildlife Service, Technical Leaflet 16, 43 p.

PACHECO, ANTHONY L., and GEORGE C. GRANT.

A frame used as a towing aid for small boats. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 23, no. 4, p. 161.

PEIFER, JAMES J., and W. O. LUNDBERG.

Effect of dietary fats and marine oil fractions on cardiovascular tissues. [Abstract.] Federation Proceedings, vol. 20, no. 1, part 1, p. 93. Federation of American Societies for Experimental Biology, Washington, D.C.

PETERSON, C. E.

Financial assistance to fishing industries in various countries. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 11, p. 8-13. [Also as Separate No. 632.]

PETERSON, C. E., and LUTHER L. LONG.

A report on Federal programs of financial aid to commercial fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 30-35.

PETERS, JOHN A.

Handling and packaging chilled fishery products. Fishing Gazette, 1961 Annual Review Number, vol. 78, no. 13, p. 108, 110, 113.

PIAVIS, GEORGE W.

Embryological stages in the sea lamprey and effects of temperature on development. U.S. Fish and Wildlife Service, Fishery Bulletin 182, vol. 61, iv + p. 111-143.

POSGAY, J. A., and DWIGHT S. SIMPSON.

Design of a fishery-oceanographic research vessel for the North Atlantic. Part I—Deck arrangement, by J. A. Posgay; Part II—Technical appendix, by Dwight S. Simpson. In Jan-Olof Traung and Norio Fujinami (editors), Research Vessel Design, FAO Research Vessel Forum in Tokyo, September 18-30, 1961, p. POS 1-16.

POWER, E. A.

Fisheries. In 1961 Britannica Book of the Year, p. 207-208. Encyclopaedia Britannica, Inc., Chicago, Ill.

Fisheries. In Collier's Encyclopedia Year Book, 1961 Edition, p. 233-234. P. F. Collier & Son Corporation, New York, N.Y.

Fisheries of the United States, 1960—a preliminary review. U.S. Fish and Wildlife Service, Fishery Leaflet 393 (Revised), xi+59 p.

Fishery statistics of the United States, 1959. U.S. Fish and Wildlife Service, Statistical Digest 51, ii+457 p.

Year's catch 4,850,000,000 pounds. Fishing Gazette, 1961 Annual Review Number, vol. 78, no. 13, p. 142-143.

PROVENZANO, ANTHONY J., JR.

Effects of the flatworm *Stylochus ellipticus* (Girard) on oyster spat in two salt water ponds in Massachusetts. Proceedings of the National Shellfisheries Association, vol. 50, for the year 1959, p. 83-88.

PYCHA, RICHARD L.

Recent changes in the walleye fishery of northern Green Bay and history of the 1943 year class. Transactions of the American Fisheries Society, vol. 90, no. 4, p. 475-488.

RATHJEN, WARREN F., and PETER C. WILSON.

Russian gill-netter docks in Boston, Massachusetts. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 9, p. 41-43.

REARDON, CHARLES M.

Halibut and troll salmon landings and ex-vessel prices for Seattle, Alaska ports and British Columbia, 1960-59, 34 p.

REARDON, CHARLES M.—Continued

Seattle and Astoria landings, receipts, and value of fishery products, 1960. U.S. Fish and Wildlife Service, Seattle Market News Service, 43 p.

REID, GERALD M.

Stomach content analysis of troll-caught king and coho salmon, southeastern Alaska, 1957-58. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 379, ii+8 p.

REINTJES, JOHN W.

Menhaden eggs and larvae from M/V *Theodore N. Gill* cruises, South Atlantic coast of the United States, 1953-54. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 393, iii+7 p.

REINTJES, JOHN W., and FRED C. JUNE.

A challenge to the fish meal and oil industry in the Gulf of Mexico. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 62-66.

RICE, DALE W.

Census of the California gray whale, 1959/60. Norsk Hvalfangsttidende, vol. 50, no. 6, p. 219-225.

Sei whales with rudimentary baleen. Norsk Hvalfangsttidende, vol. 50, no. 5, p. 189-193.

RICE, DALE W., and DAVID K. CALDWELL.

Observations on the habits of the whalesucker (*Remilegia australis*). Norsk Hvalfangsttidende, vol. 50, no. 5, p. 181-189.

RICHARDSON, T., A. L. TAPPEL, and E. H. GRUGER, JR.

Essential fatty acids in mitochondria. Archives of Biochemistry and Biophysics, vol. 94, no. 1, p. 1-6.

RIDGWAY, GEORGE J.

Special immunological techniques for the study of marine populations. [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961, Abstracts of Symposium Papers, p. 184-185.

RIDGWAY, G. J., J. E. CUSHING, and G. L. DURALL.

Serological differentiation of populations of sockeye salmon, *Oncorhynchus nerka*. International North Pacific Fisheries Commission, Bulletin No. 3, p. 5-10.

RIDGWAY, GEORGE J., and GEORGE W. KLONTZ.

Blood types in Pacific salmon. International North Pacific Fisheries Commission, Bulletin No. 5, p. 49-55.

RILEY, FRANCIS.

Fur seal industry of the Pribilof Islands, 1786-1960. U.S. Fish and Wildlife Service, Fishery Leaflet 516, v+14 p.

RISOLI, T. J.

New York City's wholesale fishery trade, 1960. U.S. Fish and Wildlife Service, New York Market News Service, 58 p.

RODEN, G. I.

On the wind-driven circulation in the Gulf of Tehuantepec and its effects upon surface temperatures. Geofisica Internacional, Mexico, vol. 1, no. 3, p. 55-76. [English and Spanish.]

RONHOLT, LAEL L., and AUSTIN R. MAGILL.

Biological observations and results of the 1960 *John N. Cobb* exploratory shrimp cruise off the central Oregon coast. Fish Commission of Oregon, Research Briefs, vol. 8, no. 1, p. 31-52.

- ROPES, JOHN W.
Longevity of the horseshoe crab, *Limulus polyphemus* L. Transactions of the American Fisheries Society, vol. 90, no. 1, p. 79-80.
- ROUNSEFELL, GEORGE A.
How can research production be measured? Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 139-150.
Review of *Fishery management*, by R. S. Fort and J. D. Brayshaw. Transactions of the American Fisheries Society, vol. 90, no. 3, p. 341-342.
Review of *Living fishes of the world*, by Earl S. Herald. Transactions of the American Fisheries Society, vol. 90, no. 3, p. 341.
- RUGGIERO, MICHAEL.
Equipment Note No. 9—The surf-clam fishery of New Jersey. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 8, p. 11-13. [Also as Separate No. 626.]
- RUNNELS, T. D., HUGO W. NILSON, MAURICE BENDER, DONALD G. SNYDER, and L. E. OUSTERHOUT.
The relationships of processing variables and chemical composition to the nutritive value of fish meals as determined by broiler feeding tests. U.S. Fish and Wildlife Service, Technical Leaflet 21, 38 p.
- RUNNELS, T. D., and D. G. SNYDER.
Unidentified growth factors in broiler diets. Proceedings of the II International Animal Nutrition Conference, Madrid, Spain, October 1960, p. 204-214.
- SABOCK, DAVID K.
What's happened to fish meal and solubles prices? Fishing Gazette, vol. 78, no. 8, p. 18, 49.
- SAKUDA, HENRY M.
Observations of molting female king crabs, *Paralithodes camtschatica* (Tilesius). International North Pacific Fisheries Commission Document No. 271, Bulletin No. 5, p. 1-4.
- SAMSON, V. J.
California fisheries, 1960. U.S. Fish and Wildlife Service, San Pedro Market News Service, 42 p.
- SANFORD, F. BRUCE, and CHARLES F. LEE.
Menhaden industry. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Technical Leaflet 31, 31 p.
- SAUR, J. F. T.
On the differences between sea water temperatures from ship's weather observations and sea surface temperatures. [Abstract.] Journal of Geophysical Research, vol. 66, no. 5, p. 1558-1559.
- SCATTERGOOD, LESLIE W.
Maine sharks. In Roger F. Duncan and Fessenden S. Blanchard, A cruising guide to the New England coast, p. 463-467. 5th ed. Dodd, Mead & Co., Inc., New York, N.Y.
The sea urchin fishery. U.S. Fish and Wildlife Service, Fishery Leaflet 511, 5 p.
- SCHULTZ, LEONARD P., PERRY W. GILBERT, and STEWART SPRINGER.
Shark attacks. Science, vol. 134, no. 3472, p. 87-88.
- SETTE, OSCAR E.
Problems in fish population fluctuations. California Cooperative Oceanic Fisheries Investigations, Reports, vol. 8, p. 21-24.

SETTE, OSCAR E.—Continued

Report of the chairman of the standing committee on Pacific fisheries. Proceedings of the Ninth Pacific Science Congress, vol. 10, p. 1-4.

SHEARER, L. W., and C. L. MACKENZIE, JR.

The effects of salt solutions of different strengths on oyster enemies. Proceedings of the National Shellfisheries Association, vol. 50, for the year 1959, p. 97-103.

SHERMAN, KENNETH.

A high school oceanographic laboratory. American Biology Teacher, vol. 23, no. 1, p. 29-35.

Occurrence of early developmental stages of the oblong ocean sunfish *Ranzania laevis* (Pennant) in the central North Pacific. Copeia, 1961, no. 4, p. 467-470.

SHERMAN, KENNETH, and ROBERT P. BROWN.

Oceanographic and biological data, Hawaiian waters, January-October 1959. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 396, iv+71 p.

SHERMAN, KENNETH, and JOHN P. WISE.

Incidence of the cod parasite *Lernaeocera branchialis* L. in the New England area, and its possible use as an indicator of cod populations. Limnology and Oceanography, vol. 6, no. 1, p. 61-67.

SHIPPEN, HEBERT H.

Distribution and abundance of skipjack in the Hawaii fishery, 1952-53. U.S. Fish and Wildlife Service, Fishery Bulletin 188, vol. 61, iv+p. 281-300.

SINDERMANN, CARL J.

Isoagglutination in elasmobranch fishes. [Abstract No. 260.] American Zoologist, vol. 1, no. 3, p. 390.

Parasite tags for marine fish. Journal of Wildlife Management, vol. 25, no. 1, p. 41-47.

Parasitological tags for redfish of the western North Atlantic. Conseil Permanent International pour l'Exploration de la Mer, Rapport et Procès-Verbaux des Réunions, vol. 150, p. 111-117.

Serological studies of redfish. [Abstract.] Conseil Permanent International pour l'Exploration de la Mer, Rapport et Procès-Verbaux des Réunions, vol. 150, p. 118.

Serological studies of Atlantic redfish. U.S. Fish and Wildlife Service, Fishery Bulletin 191, vol. 61, iv+p. 351-354.

Serological techniques in fishery research. Transactions of the Twenty-sixth North American Wildlife and Natural Resources Conference, p. 298-309.

Serology of Atlantic clupeoid fishes. [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961, Abstracts of Symposium Papers, p. 185-186.

Sporozoan parasites of sea herring. [Abstract.] Journal of Parasitology, vol. 47, no. 4, sec. 2, p. 34.

The effect of larval trematode parasites on snail migrations. [Abstract No. 259.] American Zoologist, vol. 1, no. 3, p. 389.

SINDERMANN, CARL J., and DONALD F. MAIRS.

A blood group system for spiny dogfish, *Squalus acanthias* L. Biological Bulletin, vol. 120, no. 3, p. 401-410.

SINDERMANN, CARL J., and DONALD F. MAIRS—Continued

Blood properties of prespawning and postspawning anadromous alewives (*Alosa pseudoharengus*). U.S. Fish and Wildlife Service, Fishery Bulletin 183, vol. 61, iv + p. 145-151.

SKERRY, JOHN B.

An eastward extension of the winter movement of the mackerel, *Scomber scombus*. Copeia, 1961, no. 1, p. 115.

SKUD, BERNARD EINAR.

Review of *Education and recruitment of oceanographers in the United States*. A report by the Committee on Education and Recruitment, American Society of Limnology and Oceanography, Inc., August 30, 1960. Transactions of the American Fisheries Society, vol. 90, no. 2, p. 232.

SLAVIN, JOSEPH W.

Packaging refrigerated seafood. Seafood Merchandising, vol. 21, no. 2, p. 13-15, 48-49.

Seafood quality depends on modern refrigeration. Fishing Gazette, 1961 Annual Review Number, vol. 78, no. 13, p. 120, 122, 124-127.

Technological research in the North Atlantic area of the United States. Actualités Marines, vol. 5, no. 1, p. 28-31. Département des Pêcheries, Province de Québec, Québec, Canada.

SMITH, KEITH A.

Air-bubble and electrical-field barriers as aids to fishing. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 73-86.

Air-curtain fishing for Maine sardines. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 3, p. 1-14. [Also as Separate No. 614.]

SMITH, LLOYD L., JR., and RICHARD L. PYCHA.

Factors related to commercial production of the walleye in Red Lakes, Minnesota. Transactions of the American Fisheries Society, vol. 90, no. 2, p. 190-217.

SMITH, MANNING A., VERNON C. APPLGATE, and B. G. H. JOHNSON.

Physical properties of some halo-nitrophenols. Journal of Chemical & Engineering Data, vol. 6, no. 4, p. 607-608.

SMITH, STANFORD H., HOWARD J. BUETTNER, and RALPH HILE.

Fishery statistical districts of the Great Lakes. Great Lakes Fishery Commission, Technical Report No. 2, 24 p.

SMYTH, J. ADGER.

World production and trade in fish meal and oil. U.S. Fish and Wildlife Service, Fishery Leaflet 507, viii+86 p.

SNOW, GEORGE.

U.S. Fish and Wildlife Service. Southeastern Fisheries Association, 9th Annual Convention, Jacksonville, Fla., May 20-22, 1961. The Southeastern, p. 30, 32, 37.

SOHN, BERNARD I., JOSEPH H. CARVER, and GEORGE F. MANGAN, JR.

Composition of commercially-important fish from New England waters. Part I—Proximate analyses of cod, haddock, Atlantic ocean perch, butterfish, and mackerel. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 2, p. 7-10. [Also as Separate No. 613.]

SPRAGUE, LUCIAN M.

Erythrocyte antigens of the oceanographic skipjack (*Katsuwonus pelamis*) recognized by phytoagglutinins. [Abstract.] Records of the Genetics Society of America, no. 30, p. 111; Genetics, vol. 46, no. 8, p. 901.

SPRAGUE, LUCIAN M., and LESLIE I. NAKASHIMA.

Studies on the erythrocyte antigens of the skipjack tuna (*Katsuwonus pelamis*). [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961, Abstracts of Symposium Papers, p. 186.

SPRINGER, STEWART.

Dynamics of the feeding mechanism of large galeoid sharks. American Zoologist, vol. 1, no. 2, p. 183-185.

Elasmobranchii. In Peter Gray (editor), Encyclopedia of the Biological Sciences, p. 329-331. Reinhold Publishing Corporation, New York, N.Y.

Some environmental factors affecting the feeding behavior of sharks. [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961, Abstracts of Symposium Papers, p. 180-181.

SQUIRE, JAMES L., JR.

Aerial fish spotting in the United States commercial fisheries. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 12, p. 1-7. [Also as Separate No. 633.]

STANSBY, MAURICE E.

Role of fish in diets for control of blood cholesterol levels. U.S. Fish and Wildlife Service, Technical Leaflet 32, 6 p.

Thin-layer chromatography—a new analytical technique with potential applications to foods. Food Technology, vol. 15, no. 8, p. 378.

STANSBY, M. E., and ROSEMARY SCHAIRER.

Index of fishery technological publications, 1918-55. U.S. Fish and Wildlife Service, Circular 96, ii+237 p.

STERN, JOSEPH A., DIPTIMAN CHAKRAVARTI, JOSEPH R. UZMANN, and MARY N. HESSELHOLT.

Rapid counting of nematoda in salmon by peptic digestion. In International North Pacific Fisheries Commission, Bulletin No. 3, p. 1-4.

STEVENS, ROY C.

Potential for fish solubles—liquid fish in the fertilizer industry. Proceedings of the Gulf and Caribbean Fisheries Institute, Thirteenth Annual Session, November 1960, p. 36-38.

STOLTING, WALTER H.

Effects of fishery regulation on the processing and marketing of fishery products, 4 p.

STRASBURG, DONALD W.

Diving behaviour of Hawaiian skipjack tuna. Journal du Conseil Permanent International pour l'Exploration de la Mer, vol. 26, no. 2, p. 223-229.

Larval carapid fishes from Hawaii, with remarks on the ecology of adults. Copela, 1961, no. 4, p. 478-480.

STRASBURG, DONALD W., and JOHN C. MARR.

Banded color phases of two pelagic fishes, *Coryphaena hippurus* and *Katsuwonus pelamis*. Copela, 1961, no. 2, p. 226-228.

SYKES, JAMES E.

The Chesapeake Bay cooperative striped bass program. Chesapeake Science, vol. 2, nos. 1-2, p. 1-2.

TAGATZ, MARLIN, E.

Reduced oxygen tolerance and toxicity of petroleum products to juvenile American shad. *Chesapeake Science*, vol. 2, nos. 1-2, p. 65-71.

Tolerance of striped bass and American shad to changes of temperature and salinity. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 388, ii + 8 p.

TAGATZ, MARLIN E., and DONNIE L. DUDLEY.

Seasonal occurrence of marine fishes in four shore habitats near Beaufort, N.C., 1957-60. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 390, ii + 19 p.

TALBOT, GERALD B.

At Hatteras' back door. *Sea Frontiers*, vol. 7, no. 2, p. 103-112.

The American shad. U.S. Fish and Wildlife Service, Fishery Leaflet 504, 8 p.

TAPPEL, A. L., W. DUANE BROWN, H. ZALKIN, and V. P. MAIER.

Unsaturated lipid peroxidation catalyzed by hematin compounds and its inhibition by vitamin E. *Journal of American Oil Chemists' Society*, vol. 38, no. 1, p. 5-9.

TAPPEL, A. L., and T. RICHARDSON.

Function of essential fatty acids in mitochondria. [Abstract.] *Federation Proceedings*, vol. 20, no. 1, p. 146. Federation of American Societies for Experimental Biology, Washington, D.C.

THOMPSON, J. R., and STEWART SPRINGER.

Sharks, skates, rays, and chimaeras. U.S. Fish and Wildlife Service, Circular 119, iii+19 p.

THOMPSON, MARY H.

Proximate composition of Gulf of Mexico industrial fish. Part 10—Summer studies. Bureau of Commercial Fisheries Technological Laboratory, Pascagoula, Miss., report to the industry, 5 p.

Proximate composition of South Atlantic industrial fish. Part 1—Survey (1959-1960). Bureau of Commercial Fisheries Technological Laboratory, Pascagoula, Miss., report to the industry, 3 p.

THOMPSON, SETON H.

What is happening to our estuaries? *Transactions of the Twenty-sixth North American Wildlife and Natural Resources Conference*, p. 318-322.

THORSTEINSON, FREDRIK V., RICHARD W. NELSON, and DEXTER F. LALL.

Experimental harvest of the Stellar sea lion in Alaskan waters. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 371, iii+15 p.

THRAILKILL, JAMES R.

Zooplankton volumes off the Pacific coast, 1958. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 374, ii+70 p.

THURSTON, CLAUDE E.

Proximate composition and sodium and potassium contents of four species of commercial bottom fish. *Journal of Food Science*, vol. 26, no. 5, p. 495-498.

Proximate composition of nine species of rockfish. *Journal of Food Science*, vol. 26, no. 1, p. 38-42.

Proximate composition of nine species of sole and flounder. *Journal of Agricultural and Food Chemistry*, vol. 9, no. 4, p. 313-316.

UCHIDA, RICHARD N.

Hermaphroditic skipjack. *Pacific Science*, vol. 15, no. 2, p. 294-296.

UKELES, RAVENNA.

The effect of temperature on the growth and survival of several marine algal species. *Biological Bulletin*, vol. 120, no. 2, p. 255-264.

U.S. FISH and WILDLIFE SERVICE.

Inspectors' instructions for grading frozen cod fillets. Bureau of Commercial Fisheries, Division of Industrial Research, July (first issue), 31 p.

Inspectors' instructions for grading frozen ocean perch fillets. Bureau of Commercial Fisheries, Division of Industrial Research, July (first issue), 31 p.

Interim Federal Specification, sardine, canned, PP-S-0051e (INT-FWS), February 24, 1961, 13 p. Interim revision of Federal Specification PP-S-51d, April 11, 1957. [Copies available from General Services Administration, Washington 25, D.C.]

Interim Federal Specification, shrimp, frozen, raw, breaded, PP-S-00315b (Int-F&WS) (Revised), April 6, 1961, 15 p. Interim Federal Specification PP-S-00315a (Int-F&WS), April 21, 1959, and Interim Federal Specification PP-S-00315, July 12, 1956. [Copies available from General Services Administration, Washington 25, D.C.]

Interim Federal Specification, sponge: natural, C-S-00631d (INT-F&WS), May 8, 1961, 10 p. Revision of C-S-00631c (GSA-FSS), October 5, 1959. [Copies available from General Services Administration, Washington 25, D.C.]

Specification for frozen ocean-perch fillets and Pacific ocean-perch fillets. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass., NASPO Fish Specification No. 1, May, 7 p. Reproduced for The National Association of State Purchasing Officials by the Washington Office of the Council of State Governments, 1025 Connecticut Avenue NW., Washington 25, D.C.

Specification for chilled and frozen cod or haddock fillets. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass., NASPO Fish Specification No. 2, July, 7 p. Reproduced for The National Association of State Purchasing Officials by the Washington Office of the Council of State Governments, 1025 Connecticut Avenue NW., Washington 25, D.C.

United States Standards for grades of frozen fried scallops. Bureau of Commercial Fisheries, Division of Industrial Research, January (first issue), 6 p. Also in *Federal Register*, vol. 26, no. 240, p. 11979-11981.

VAN OOSTEN, JOHN.

Formation of an accessory annulus on the scales of starved whitefish. *U.S. Fish and Wildlife Service, Progressive Fish-Culturist*, vol. 23, no. 3, p. 135.

Records, ages, and growth of the mooneye, *Hiodon tergisus*, of the Great Lakes. *Transactions of the American Fisheries Society*, vol. 90, no. 2, p. 170-174.

VROOMAN, ANDREW M.

Serological differentiation of sardine subpopulations off California. [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961, Abstracts of Symposium Papers, p. 188.

WALBURG, CHARLES H.

Natural mortality of American shad. Transactions of the American Fisheries Society, vol. 90, no. 2, p. 228-230.

WATERS, MELVIN E.

Inhibition of mold on smoked mullet. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 4, p. 8-13. [Also as Separate No. 617.]

WATHNE, FRED, and HAROLD C. JOHNSON.

Shrimp exploration in central Alaskan waters by the M/V *John N. Cobb*, October-November 1959. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 1, p. 1-8. [Also as Separate No. 609.]

WATSON, JOHN E.

The branding of sea herring as a short-term mark. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 23, no. 3, p. 105.

Tricaine methanesulfonate as an anesthetic for herring. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 23, no. 4, p. 174.

WEBER, K. G.

The status of fish passage in the Pacific northwest. [Abstract.] Tenth Pacific Science Congress of the Pacific Science Association, Honolulu, Hawaii, 1961. Abstracts of Symposium Papers, p. 151-152.

WEBSTER, JOHN R., and ROYSTON Z. MEDFORD.

Flatworm distribution and associated oyster mortality in Chesapeake Bay. Proceedings of the National Shellfisheries Association, vol. 50, for the year 1959, p. 89-95.

WIGLEY, ROLAND L.

A new isopod, *Chiridotca nigrescens*, from Cape Cod, Massachusetts. Crustaceana, vol. 2, part 4, p. 286-292.

Benthic fauna of Georges Bank. Transactions of the Twenty-sixth North American Wildlife and Natural Resources Conference, p. 310-317.

Bottom sediments of Georges Bank. Journal of Sedimentary Petrology, vol. 31, no. 2, p. 165-188.

Natural history of a selected species of marine invertebrate. In High School Biology—Biological Investigations for Secondary School Students, p. 381-383. American Institute of Biological Sciences, Johnson Publishing Company, Boulder, Colo.

WILIMOVSKY, NORMAN J.

An application of radioactive isotopes in fish tagging. Proceedings of the Eleventh Alaskan Science Conference, August 29 to September 2, 1960, p. 93-99.

WILKE, FORD, and CLIFFORD H. FISCHUS.

Gray whale observations. Journal of Mammalogy, vol. 42, no. 1, p. 108-109.

WOLF, ROBERT S.

Age composition of the Pacific sardine, 1932-1960. U.S. Fish and Wildlife Service, Research Report 53, iii+36 p.

Graphic presentation of Pacific sardine age composition data. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 384, i + 34 p.

WOLF, ROBERT S., and ANITA E. DAUGHERTY.

Age and length composition of the sardine catch off the Pacific coast of the United States and Mexico in 1958-59. California Fish and Game, vol. 47, no. 3, p. 273-285.

WOOSTER, WARREN S.

Further evidence of a Pacific south equatorial countercurrent. *Deep-Sea Research*, vol. 8, nos. 3-4, p. 294-297.

Yearly changes in the Peru current. *Limnology and Oceanography*, vol. 6, no. 2, p. 222-226.

WOOSTER, WARREN S., and MALVERN GILMARTIN.

The Peru-Chile undercurrent. *Journal of Marine Research*, vol. 19, no. 3, p. 97-122.

YUEN, HEENY S. H.

Bow wave riding of dolphins. *Science*, vol. 184, no. 3484, p. 1011-1012.

ZEIN-ELDIN, ZOULA P.

Plankton pigments in East Lagoon, Galveston, Texas. *Transactions of the American Fisheries Society*, vol. 90, no. 1, p. 32-41.

ZIMMER, PAUL D., CLIFTON C. DAVIDSON, and FLOYD S. ANDERS.

Annual fish passage report—Rock Island Dam, Columbia River, Washington, 1959. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 394, ii + 14 p.