REPORT OF THE
United States BUREAU
OF
COMMERCIAL FISHERIES
FOR THE
CALENDAR YEAR 1963

UNITED STATES DEPARTMENT OF THE INTERIOR
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National Oceanic and Atmospheric Administration

Report of the United States Commissioner of Fisheries

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UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

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Report of the Bureau of Commercial Fisheries for the Calendar year 1963

This seventh annual report of the activities and administrative actions of the Bureau of Commercial Fisheries, an agency of the Department of Interior's Fish and Wildlife Service, is made in compliance with section 9(a) of the Fish and Wildlife Act of 1956.

The Bureau is responsible for conserving the Nation's fishery resources to promote the welfare of the fishing industry and to assure that these resources make a material contribution to the well-being of the citizens of the United States. These aims are gained by providing a wholesome nutritious food supply plus industrial and pharmaceutical fish products of high quality and by providing employment, both directly and indirectly. These renewable fishery resources are capable of being maintained and improved to the level of yielding a maximum annual harvest if properly managed, but if unwisely exploited, their depletion is equally possible.

The Bureau's responsibility includes all aspects of resource management and many aspects of production and marketing, which involve the Bureau in relations with other countries and lead it into numerous fields of research, development, and services to the industry. These activities include amelioration of international fishery problems through participation in international meetings and in negotiation of treaties and through membership on commissions established by treaties to carry out the terms; extensive biological research on fish in laboratories, lakes, streams, and on the high seas; operation of a national fish hatchery system; fish passage and survival studies in river basins; exploratory fishing and gear improvement programs to help the competitive position of U.S. fishermen with those of other countries; technological research on fish nutrition and preservation and

on fish oils; research on fish problems, such as disease, effects of pesticides on fish, pest and predator control; and management of the great fur seal resources. In its services to the fishing industry, the Bureau collects information on foreign fishing activities and provides market news reporting of current, domestic and foreign, market information on fishery commodities. It conducts statistical and economic surveys on producing, processing, distributing, and marketing of fishery products and promotes the consumption of fish through a variety of marketing programs. The Bureau also provides services to the industry through a program for quality standards for fishery products and programs for financial assistance.

The greater interest among nations in the sea and the uses of its products has shown a rapid increase in the last few years. More and more the resources of the sea are being used. There has been tremendous expansion of foreign fishing fleets over all the oceans and into waters off our coasts. Many foreign governments have claimed jurisdiction over fisheries off their coasts much farther than the 3 miles historically recognized by the United States and thus pose a threat to longstanding U.S. fisheries in those waters.

The Bureau and other American agencies in their concerted research activities stress oceanography as the means for meeting and solving resource conservation problems. Interagency efforts in oceanography seek untapped fishery resources so that the United States will not lose out to other nations in the harvest of the important resources of the world's oceans. The Bureau's vessel and laboratory construction program is keyed into the National Oceanographic Program, which is coordinated with the development of oceanographic research by all agencies in the Government, from the Navy on the one hand to the Atomic Energy Commission on the other.

From 1950 through 1962 our domestic catch of food fish was gradually declining and our imports growing to over a hundred percent. In 1963 while the imports of food fish decreased, the percentage of our total supply of edible fishery products derived from imports remained about the same. As our population increases the total consumption of fishery products increases, and unless we are to become more and more dependent on foreign nations for our fishery products, our domestic catch must be increased. This can and must be achieved by assisting our domestic fishing industry. Steps in this direction already have been taken through the Fisheries Loan Program, the Fisheries Mortgage Insurance Program, and the Fishing Vessel Construction and Differential Subsidy Program. Additional steps that could be taken are long-term low-cost, or even interest-free, loans to fishermen for the construction of modern vessels that would meet strict standards

on size and equipment along with the removal of present restrictive laws preventing the construction of fishing vessels; Government-financed training of fishermen; and further development of more efficient methods of catching and processing fish.

This report reviews briefly the Bureau's many activities in 1963 to assist the fishing industry so that this country may continue to be one of the leading fishing nations of the world.

Condition and Trends of the Fisheries

The commercial fisheries of the United States in 1963 yielded a catch of 4.85 billion pounds—about 507 million pounds less than in 1962 (app. A). Fishermen received about $377 million for the catch—$19 million less than in the previous year. Most of the decline in the volume of the 1963 catch resulted from a drop of 532 million pounds in menhaden landings. Other items taken in smaller volume were salmon, down 20 million pounds; Atlantic ocean perch, 16 million; blue crabs, 10 million; whiting, 12 million; haddock, 10 million; Pacific mackerel, 8 million; Pacific halibut and Pacific sardines, each 8 million; and Maine herring, 4 million pounds. Items taken in greater volume included shrimp, up 49 million pounds; king crabs, 26 million; and yellowtail flounder, 22 million pounds.

The Atlantic Coast States accounted for 45 percent of the catch, 2.2 billion pounds—18 percent less than in 1962. The Gulf States received 1.4 billion pounds—29 percent of the total—down 3 percent; while the catch off the Pacific Coast States, including Hawaii—1.1 billion pounds—accounted for 23 percent—1 percent less than in 1962. The Great Lakes and Mississippi River States yielded 139 million pounds or 3 percent of the national total.

The States and individual ports with the largest landings do not rank in the same order as the geographic groups of States. While the Atlantic Coast States ranked first in volume of catch, Louisiana led the States in the catch with 761 million pounds, followed by California with 514 million pounds. San Pedro, Calif., with landings of 348 million pounds, valued at $29 million, was again the principal U.S. fishing port in both volume and value. Other leading ports in order of volume of fish landed were Pascagoula, Miss.; Empire, La.; Cameron, La.; Reedville, Va.; and Beaufort—Morehead City, N. C. Of these, all but San Pedro were menhaden ports. New Bedford, Mass., occupied second place in value of landings, followed by Boston, Mass.; Brownsville—Port Isabel, Tex.; and San Diego, Calif.

About 9 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 salmon, bottomfish, and halibut off British Columbia.

Imports of edible fishery products into the United States in 1963 were about 62 million pounds (almost 5 percent) less than the 1.2 billion pounds received in 1962. Items received in considerably smaller volume than in the previous year included fresh or frozen tuna, sea herring, canned salmon, and canned sardines in oil. Items received in greater volume included groundfish and ocean perch fillets, fresh or frozen swordfish and scallops, frozen shrimp, and canned crabmeat. Imports of fish meal during 1963 amounted to a record 376,000 tons—124,000 tons more than in the previous year.

Because of the gain of 1.6 million pounds in imports (live weight basis) in 1963, the U.S. total supply of fishery products (catch plus imports) reached a record of 11.5 billion pounds. The entire increase was due to the greater imports of fish meal, largely from Peru. Imports provided 58 percent of the total U.S. supply of fishery products in 1963 compared with 49 percent the previous year, and only 25 percent in 1950. There was little change in the proportion of the supply of edible fishery products derived from imports. In 1962 receipts of edible products from foreign countries accounted for 45 percent of the total U.S. supply of edible fishery products and in 1963, 47.1 percent. The proportion of industrial products obtained from imports, however, increased sharply and accounted for nearly 66 percent of the total U.S. supply of these items compared with 51 percent in the previous year.

Exports of domestic edible fishery products in 1963 were about 15 percent greater than the 56.5 million pounds shipped to foreign countries in 1962. Most of the gain resulted from increased shipments of frozen shrimp to Japan and fresh and frozen salmon to Canada, France, and other countries. Exports of canned sardines were less than half those in 1962. Although exports of edible fishery products increased in both 1962 and 1963 over the 40 million pounds shipped to foreign countries in 1961, the volume exported during 1963 was only 5.6 percent of the amount imported. Exports of fish oils, the principal nonedible fishery product shipped to foreign countries, totaled a record 262 million pounds in 1963—an increase of 139 million pounds or 113 percent over the previous year.

Average prices for fish and shellfish declined during 1963, according to the U.S. Bureau of Labor Statistics' Wholesale Average Prices and Indexes for Edible Fishery Products for December 1963. The index for all fish and shellfish decreased 11 percent (from 120.9 in December

1962 to 107.5 in December 1963). The index for fresh and frozen fishery products; for processed fresh fish and shellfish; and for processed frozen fish and shellfish, each declined 13 percent while the index for canned fishery products dropped 6 percent.

The per capita consumption of fishery products in the United States was estimated at 10.6 pounds in 1963—the same as in the previous year. The gain of 2.7 million in U.S. population during 1963 would have required an increase in total consumption of about 70 million pounds (round weight basis) to maintain per capita consumption at the same level as in 1962.

Some of the highlights of the fisheries in 1963 were:

1. Menhaden continued to rank first in volume with a catch of 1.8 billion pounds—about 37 percent of the total of all species taken by U.S. fishermen.

2. Shrimp, with a value of $70 million to the fishermen, was the most valuable species taken by U.S. fishermen.

3. For the first time, the U.S. catch of Pacific halibut (45.6 million pounds, live weight basis) was less than the quantity taken by Canadian fishermen (49.4 million pounds).

4. The Washington catch of pink salmon (31.5 million pounds) was the largest since 1955 and was over six times that of 1961, the parent year.

5. The catch of Pacific sardines, once the leading species taken by U.S. fishermen, was only 7 million pounds—less than half of 1 percent of the record 1.5 billion pounds taken in 1936.

6. A record 14.8 million pounds of tuna were landed at Atlantic Coast ports in 1963.

7. Alaska fishermen took a record 79 million pounds of king crabs in 1963—26 million pounds more than in 1962.

8. The catch of shrimp by U.S. fishermen in the Gulf of Mexico (203 million pounds) was 61 million pounds more than in 1962 and the second largest catch since the collection of detailed records on the fishery began in 1956.

9. The catch of shrimp in the South Atlantic States totaled only 16 million pounds—11 million pounds less than in 1962 and the smallest production for many years.

10. The 1963 pack of canned fishery products for human food was 728.9 million pounds—28.4 million pounds less than in the previous year. Reduced packs of salmon, down 24.3 million pounds; Maine sardines, down 12 million pounds; and tuna, down 9 million pounds were responsible for the decline.

11. The domestic production of groundfish fillets (cod, cusk, haddock, hake, Atlantic ocean perch, and pollock) amounted to only 83.4

million pounds—10.2 million pounds less than in 1962 and the smallest production since the mid 1930's.

12. Production of both fish sticks (79 million pounds) and fish portions (95 million pounds) established new records in 1963. Production of fish sticks was 7 million pounds more than in the previous year and portions, 16 million pounds more.

13. Stocks of frozen fishery products increased in 1963.

14. In 1963 for the first time, over half the U.S. supply of fish meal was obtained from imports (domestic production, 255,900 tons; and imports 376,000 tons).

Developments in the Fisheries

Domestic Fisheries

Developments in the fisheries often affect the fishing industry, sometimes favorably and sometimes adversely. For instance, increased landings of a fishery may be due to the discovery of new resources, expansion of fishing grounds, or favorable conditions of the stocks. A decline in the landings of a fishery may be from natural causes, such as depleted stocks from overfishing or failure of a year class, or it may be voluntary on the part of the fishermen due to lack of markets from a change in public food preference or from competition of similar foreign products. New developments in fishing gear and improvements in other gear and their use by the industry usually result in increased landings. Replacement of antiquated vessels by new modern vessels improves the fishermen's ability to make big catches. Likewise, failure to make advancements in fishing gear and to construct new and modern fishing vessels places the industry in an unfavorable competitive position with foreign fishing industries that use such modern equipment. Use of new technological developments in an industry increases productivity at a lower cost of output per worker. The fishing industry that cannot increase productivity at a lower cost of production is at a disadvantage with the rest of the economy in this country and also with the economy of foreign countries that are exporting similar fishery products to our markets.

Some of the developments in the fisheries in 1963 are listed here.

Atlantic Tuna

The U.S. East Coast tuna industry continued to expand at a rapid rate in 1963. Tuna purse seiners completed more than 80 trips off the New England and Middle Atlantic coasts and landed an estimated 12 million pounds in the United States. This was the largest tuna catch

ever taken in the Northwest Atlantic. In 1951 the Bureau began investigating this tuna resource to determine if a tuna fishery could be established in New England. Subsequent exploratory fishing and gear trials showed that tuna were available in commercial quantities. The increased number of tuna fishermen has led to the discovery of more tuna fishing areas.

Menhaden Fish Meal

The rapid expansion of Peru's fish meal production to a new high of 1.3 million tons in 1963 has special significance for the prospects of the future use of the domestic menhaden resources and the prosperity of the U.S. fish meal industry. The domestic fish meal processors mainly base their industry on the U.S. menhaden catch. Until this year, they have been the principal supplier of domestic fish meal requirements; but for the first time, in 1963, U.S. production of fish meal was less than imports in spite of a large increase in the demand for fish meal as an ingredient in chicken broiler rations in the United States. This situation resulted in part from a small decline in domestic production, but it was caused mainly by a 57-percent increase in shipments from Peru.

Canned Tuna and Smoked Lake Fish

Two separate occurrences of fatal *Clostridium* food poisoning, attributed to eating canned tuna and smoked lake fish, severely crippled the sales of these products and affected the general demand for freshwater fishery products. With the cooperation of the Department of Agriculture and at the request of the tuna industry, the Bureau began a crash marketing program for tuna in April 1963. Tuna sales were reported normal after the promotion ended. Almost immediately following the tuna advertising program, the fishing industry was shaken by seven deaths caused by eating smoked lake fish. A new marketing program was immediately set in motion. Reports indicate a gradual recovery of sales throughout the country and restoration of consumer confidence in fishery products. Also the Bureau began a research program on smoked fish in the Great Lakes area in an effort to prevent similar outbreaks of poisoning.

Federal Legislation

Two acts of interest to fisheries were passed by Congress in 1963 (app. B). A brief description of each act follows.

Foreign Assistance Act of 1963

This act passed on December 16, 1963, amends section 106 of the Agricultural Trade Development and Assistance Act of 1954, by including for the purposes of title I and title IV under the term "surplus agricultural commodity" any domestically produced fishery product if the Secretary of the Interior has determined that the product at the time of export is in excess of domestic requirements, adequate carryover, and anticipated exports for dollars. Fish flour (fish protein concentrate) will not be included until approved by the Food and Drug Administration. The amendment with respect to title I will not become effective until January 1, 1965.

Regulations for Preventing Collisions at Sea

This act of September 24, 1963, authorizes the President, on behalf of the United States, to proclaim the international regulations for preventing collisions at sea, on or after a date fixed by the Intergovernmental Maritime Consultative Organization for application of such regulations by governments which have agreed to accept them. Although not of direct fishery interest, certain parts of the regulations do concern some of the larger fishing vessels. These parts are under section 4: Part A—Rule 1 (c) (xiv); Part B—Rule 9 and Rule 13 (a); Part C—Rule 15 (c) (viii); Part D—Rule 26.

International Developments

Developments in the world's fisheries are having a significant impact on the U.S. fishing industry and on U.S. Government programs and policies. These developments are presenting serious problems for the U.S. fishing industry in the form of competition for both high seas fishery resources and for domestic and world markets. The Bureau assists the U.S. fishing industry to solve these problems. One of the Bureau's major aims is to provide adequate information on foreign fishery activities and developments to enable assessment of their impact on the U.S. fishing industry and on Government programs and policies. Such information is essential to determine actions necessary for rational utilization of the high seas fishery resources and to allow our fishing industry to remain competitive on the high seas and in international commerce. The Bureau participates in international meetings to guide rational exploitation of the fishery resources and to protect the rights of the U.S. fishermen. It also enforces the treaties resulting from these meetings. The Bureau takes part in trade and tariff negotiations to assist in developing policies designed to move

U.S.-produced fishery products in domestic and foreign markets. The Bureau participates in international fishery programs as a means to overcome mutual problems and to pave the way for mutual economic expansion.

Developments in Foreign Fisheries

In the span of a few short years, the United States has dropped from second to fifth place among the leading fishing nations of the world. A record world catch of 44,720,000 metric tons was established in 1962, exceeding the 1961 catch by 6.9 percent.

Technologically advanced countries, such as the Soviet Union and Japan, are already exploiting some resources off U.S. coasts that have been traditionally harvested by U.S. fishermen. The extensive Japanese and U.S.S.R. fishing fleets operating on Bering Sea and Gulf of Alaska stocks of bottomfish, king crab, and shrimp have harvested more than 1½ billion pounds annually since 1961. In 1963, massive and highly integrated Soviet fleets, sometimes exceeding 200 vessels, continued to operate in the Northwest Atlantic and Bering Sea. Soviet fishing craft were reported off Kodiak Island and in other areas of the Gulf of Alaska and off the coast of New England on Georges Bank. In 1963 the Soviets assisted Cuba in constructing a modern fishing port in Havana Bay. At least 20 Soviet craft are believed to be operating out of Cuban ports and fishing in the Gulf of Mexico and Caribbean areas. For the first time, a Japanese fishing vessel was reported operating in waters off the east coast of the United States and in the Gulf of Mexico. Japanese fishing vessels were also observed in the Gulf of Mexico. Japanese fleet activitity, as in previous years, continued in the North Pacific and Bering Sea.

The Soviets and Japanese are also exploring almost every sector of the oceans of the world in search of new and distant fishery resources. These countries have developed fleet capabilities far beyond those of the United States and have found and harvested new resources on the high seas. In addition, many other developing and developed countries are placing unprecedented emphasis on the development of modern fishing vessels and gear and on modern processing, distributing, and marketing methods and facilities.

Reporting on Foreign Operations

The Bureau's efforts to improve expert coverage of foreign fishery developments moved forward when the Department of State agreed to add a Regional Fishery Attaché for West Africa to its Fishery Attaché Program. The new attaché will be stationed at Abidjan, Ivory

Coast, and will have regional responsibilities for reporting on fishery developments in the countries along the western coast of Africa. This brings the total number of fishery attachés to four; others are stationed in Tokyo, Mexico City, and Copenhagen.

As in 1962, the Bureau continued to provide current reporting on foreign fishing activities off U.S. coasts.

Treaty Enforcement and Foreign Fishing Surveillance

In 1963 enforcement activities and foreign fishing surveillance were carried out separately and in cooperation with the U.S. Coast Guard off the coasts of Alaska, the Pacific Northwest, and New England in fulfillment of obligations imposed by international fishery conventions. Extensive aerial and sea patrols were made in the North Pacific. Russian fishing operations off the coast of the mid-Atlantic States and in the Gulf of Mexico were also kept under surveillance by air and sea patrols with the cooperation of the U.S. Coast Guard and the U.S. Navy.

U.S. biologists were placed on Japanese ships through the cooperation of the Japanese Fishery Agency and the Japanese fishing industry in response to agreements under the terms of the International North Pacific Fisheries Convention to which the United States and Japan are parties. These biologists on Japanese trawlers and factory ships in the Bering Sea and Gulf of Alaska observed the catch by species, area, and quantity. Primary interest was in the relation of the incidental catch of halibut by size and number to the dominant species in the catch. The reports by these observers have been extremely valuable in pinpointing areas of both high and low abundance of incidentally caught halibut, efficiency of gear used by the Japanese fleet, and general assessement of the groundfish resources of the Gulf of Alaska.

International Meetings

The Bureau at international conference tables continued to provide for conservation and wise use of marine fishery resources now being taken in larger quantities by U.S. and foreign fishermen. Fishery issues involving fishing rights of U.S. fishermen and conservation were resolved at various international fishery bodies, such as the International Pacific Salmon Fisheries Commission, the International Commission for the Northwest Atlantic Fisheries, the Inter-American Tropical Tuna Commission, the Great Lakes Fishery Commission, the International Pacific Halibut Commission, the International North Pacific Fisheries Commission, the North Pacific Fur Seal Commission, and the International Whaling Commission.

Trade and Tariff Negotiations

The U.S. Government made preparations for one of the most extensive trade and tariff negotiations in history, to begin in May 1964 at Geneva under the General Agreement on Tariffs and Trade (GATT). The Bureau participated in preparatory exercises led by Christian Herter, the Special Representative for Trade Negotiations. Views of the U.S. fishing industry were carefully considered, and an assessment was made of the probable impact of possible tariff reductions. Also considered were the European Economic Community (EEC or Common Market) and the new challenges and trade problems that it will create for the U.S. fishing industry. Developments were carefully reviewed, and the industry was informed.

International Programs

United Nations Special Fund projects for fishery development for the Caribbean and Central America areas are now being developed. The Bureau has commented on the feasibility of these projects and may eventually participate by providing manpower and technical assistance.

Bureau technical experts visited Colombia, Brazil, and Panama to advise on commercial fishery development.

Bureau recommendations were taken in the Fisheries Committee of the Organization for Economic Cooperation and Development (OECD) on such matters as an examination of subsidies and other financial supports to fisheries of member countries, a survey of quality standards, and a study of prospects for a market information service to cover European fisheries. With regard to U.S. programs for economic and financial assistance to fisheries in other countries, careful attention was given to loan programs of other agencies.

Accomplishments and Operations

Principal Accomplishments

In recent years the Bureau of Commercial Fisheries' activities have substantially increased mainly because of its participating in the National Oceanographic Program and its confronting the problems that the expansion of fisheries throughout the world present to our fishing industry. Because of them, it has been necessary to start new programs and enlarge others in biological, technological, and exploratory fishing and gear research; in construction of research laboratories and vessels; and in services to the industry. As the

Bureau's activities have increased, so have its accomplishments grown. An account of its principal activities and accomplishments in 1963 follows.

North Pacific

Whale resource management and harvest.—Whale catching and land processing operations of five companies located in California and Oregon were licensed and inspected. A total of 259 whales were captured and processed, the principal market for the whale meat being fur animal ranchers.

Fur seal resource management.—The Bureau continued administering the fur seal industry of the Pribilof Islands and providing care for the Aleut residents. Secretarial services were again supplied to the North Pacific Fur Seal Commission during its Seventh Annual Meeting held in Moscow, U.S.S.R., from February 24 to 27, 1964.

Fur seal harvest.—The year produced a take of 85,254 sealskins of commercial value. On St. Paul Island, 31,777 male seals were taken from July 2 through September 12, while 34,217 females were taken in continuation of the program inaugurated in 1956 to reduce the herds by harvesting female seals as well as males. The take of seals on St. George Island during the same period yielded 10,501 male sealskins and 8,759 female sealskins, making a total harvest on both Islands of 42,278 males and 42,976 females. Under the terms of the Interim Convention on Conservation of North Pacific Fur Seals, Canada and Japan each received 15 percent of the sealskins taken, plus 375 additional skins.

A total of 61,965 sealskins were sold in 1963 for the account of the U.S. Government. Gross sales of these skins totaled $6,066,268.

Considerable time again was devoted to efforts to reach agreement on a new contract for the processing and sale of sealskins as a replacement for the processing contract formerly held by the Fouke Fur Co. That company's contract with the United States was terminated effective December 31, 1962.

Shrimp explorations.—Commercial level stocks of "cocktail-size" pink shrimp and the larger side-stripe shrimp were located in the Gulf of Alaska during explorations of the Bureau's chartered fishing vessel *Yaquina*. These explorations were made between Seward and western Kodiak Island to assist the industry, now unable to improve its economic condition without new stocks of shrimp being available for development. In waters east and south of Kodiak Island catches were made up to 3,000 pounds of "cocktail-size" pink shrimp per 30-minute drag. The best haul of the larger side-stripe shrimp were taken in Alitak Bay on the western end of Kodiak Island in amounts

up to 630 pounds per 30-minute drag. From west of Seward through the Shelikof Straits, catches of shrimp averaged 220 pounds per 30-minute drag with individual hauls producing as high as 2,000 pounds of the pink shrimp and 420 pounds of the side-stripe shrimp. Particularly notable were the consistently high catch rates of side-stripe shrimp made in northern Shelikof Straits. Catches between Prince William Sound and Nuka Passage, near Seward, were significantly lower than those made off Kodiak Island and west of Seward.

Exploratory fishing and gear tests.—Several Bureau exploratory fishing operations not only discovered new fish resources but also tested the usefulness of fishing gear.

Explorations in the Pacific Northwest located concentrations of scallops in two areas off the Oregon coast. The regions surveyed extended from Arago to Newport, Oreg., and from the Columbia River Lightship to Cape Falcon, Oreg., in water depths ranging from 30 to 70 fathoms. Some of the catches were as high as 4 bushels per 30-minute drag. One scallop dredge was used to compare catches of drags made in daylight and after dark, and no difference was observed during the tests. Catches made with an eastern otter trawl were not as large as those made with scallop dredges during comparative gear tests.

Other gear tests, in the Gulf of Alaska and the Puget Sound in Washington, continued the development of a one-boat midwater trawl. In the Gulf of Alaska, midwater trawl tows were made to sample high seas salmon in areas where gill net sets indicated salmon to be present. Surface hauls captured 115 immature salmon (mostly sockeye), and the distribution of gilled fish within the net suggested that the salmon were swimming within a few feet of the surface.

Salmon survey cruises.—The Bureau vessel *George B. Kelez* and the chartered vessel *Bertha Ann* returned to Seattle in late September from high seas fishing cruises made to determine the distribution and abundance of salmon. These vessels caught 14,960 salmon, including steelhead. Both vessels made repetitive sets along constant longitudes; the *Kelez* completed 43 sets south of Adak Island; the *Bertha Ann* completed 48 sets along longitude 162° W. A predominance of one-winter-at-sea sockeye salmon existed in the catches south of Adak Island. Comparative fishing south of Adak Island between purse seines of the University of Washington, Fisheries Research Institute chartered vessel *Commando* and gill nets of the *Kelez* indicated both forms of gear were equally effective for catching salmon on the high seas.

Experimental trawling for salmon was conducted by the Bureau vessel *John N. Cobb* in a joint fishing effort with the *Kelez*. A giant

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pelagic trawl operated from the *Cobb* took 117 salmon in 38 effective tows, an average of about 3 salmon per tow.

Sockeye salmon dominated the winter catches of the *George B. Kelez* and the *Bertha Ann.* The *Kelez* fished along longitude 165° W. as far south as latitude 44°30′ N. in the Gulf of Alaska. The *Bertha Ann* gill netted for salmon in the western Aleutian area and in the Bering Sea north to latitude 57°30′ N. Salmon were caught at every station except the southernmost station fished by the *Kelez.* Prior to this survey it was the general belief that few salmon were present in Bering Sea during the winter.

Tetracycline marking technique.—Bureau scientists have been investigating a method of marking fish by incorporating tetracycline antibiotics in the diet. This method was based on the discovery by scientists at the National Institutes of Health that a small fraction of tetracycline antibiotics administered to man or other mammals is fixed in the growing surface of their bones. This fixed material can be detected by the ultrasensitive method of fluorescence microscopy. In this method of fish marking, a bone specimen from the roof of the mouth is illuminated with ultraviolet light and the deposited material observed through a microscope as a thin yellow-gold fluorescent band.

The success of this method of mass marking fingerling salmon in hatcheries was confirmed in the fall of 1963 by the return of marked adult silver salmon to the Klaskanine hatchery on the lower Columbia River. The ratio of marked fish in the returns to the hatchery was nearly the same as the ratio of marked fish in the hatchery releases.

This method of marking has several advantages: Direct application through diet, not requiring handling or mutilating fish, not adversely affecting survival of fish, and being less expensive than fin clipping.

Columbia River Fishery Development Program.—Calendar year 1963 marked the 15th year of operations of the federally financed Columbia River Fishery Development Program. This program, administered by the Bureau of Commercial Fisheries, is a cooperative endeavor among the five fish and game agencies of the States of Idaho, Oregon, and Washington and the two Bureaus of the U.S. Fish and Wildlife Service. Construction and operation and maintenance of hatcheries, fishways, and screens; stream-improvement projects; and operational studies were continued. In the 21 hatcheries operated under the program, over 57 million fall chinook, 2.5 million spring chinook, 30 million coho, 1.8 million chum salmon, and 3 million steelhead trout, both fry and fingerlingers, were released. In addition over 93 million fall chinook, 4.3 million spring chinook, 37.5 million coho, 0.5 million chum salmon, and 2.5 million steelhead trout eggs were taken at program hatcheries in 1963. The detailed evalua-

tion of fall chinook salmon hatchery production was continued, and about 7.5 million fish were fin clipped and released at program hatcheries. Total marked fish released through 1963 was about 15 million. During the year, 436 marked, 2-year-old chinook salmon of the first brood released under the study were recovered at the hatcheries and in sport fisheries in the Columbia River in Washington and Oregon. Aerial and ground surveys to sample the Columbia River sport fisheries from Tongue Point, near the mouth of the river, upstream to The Dalles Dam were begun as part of the fall chinook salmon hatchery evaluation study. Coupled with these studies was a determination of catches in the Indian fishery near hatcheries in the Bonneville pool area. Surveys in 1963 indicated that Indians caught about 23,000 fall chinook salmon.

Construction was completed on two fishways, the Wiley Creek fishway on a stream tributary to the Willamette River in Oregon and the south bank Lewiston Dam ladder on the Clearwater River in Idaho. Work on the Wiley Creek fishway was done by contract with the Fish Commission of Oregon. This fishway surmounts a barrier to fish that occurred during low water stages, and the facility consists of a vertical slot ladder with a rise of 9 feet. The ladder on the south bank of Lewiston Dam replaces an old wooden ladder and has a counting facility with a submerged viewing window. It was constructed under contract with the Idaho Department of Fish and Game with the Washington Water Power Company contributing a portion of the costs.

During 1963, 26 fish screens were constructed by the Idaho Department of Fish and Game, 15 on the Pahsimeroi River and 11 on the East Fork of the Salmon River. Screening has now been completed at all diversions on the Pahsimeroi drainage.

The Oregon State Game Commission built 22 screens in the Walla Walla River system and 8 on the Wallowa River.

Several stream-improvement projects were completed by the States of Oregon and Washington. On the Little Wenatchee River the Washington Department of Fisheries cleared a logjam, nearly one-half mile in length, which had existed for almost a half century. The Fish Commission of Oregon completed some unique log-sill improvements on Plympton Creek. The section of stream worked upon had a steep gradient, and the streambed contained large rubble. Fish had difficulty passing this area, and, with the log sills installed, passage is now made with ease.

The Operational Studies Program continued with several projects providing valuable operational methods directed towards improved management techniques. Of particular interest is the development of

the tetracycline technique for marking fish, which will result in major savings for future migrant-marking programs. Field tests will be continued to perfect recovery methods. The necessary clearance through the Food and Drug Administration is being sought. Another major development is the refinement of the magnetically coded wire tag for use in marking programs. Field tests are continuing on the use of this unique method. Study programs associated with controlled natural rearing of salmonids are continuing at the several natural and artificial impoundment areas.

Problems associated with the many water-development projects now in various stages of construction and planning continue to require the Bureau's detailed analyses of the probable effects of the projects on the fishery resources of the Columbia River. The major projects are being planned or are in various stages of construction by the Corps of Engineers, the Bureau of Reclamation, and several public or private utility agencies. A most significant approach has been the participation by the Bureau of Commercial Fisheries in water-development-project planning with the Bureau of Reclamation. Preliminary fishery resource information has been provided to the Bureau of Reclamation along with suggested project features or operational procedures that would enhance the fishery resources. Such features include a plan of reservoir operation, suggested minimum pool in reservoirs, suggested fish facilities for both upstream and downstream passage of anadromous fish, and suggested release of water to improve downstream habitat. Bureau of Reclamation projects in which the Bureau of Commercial Fisheries participated in planning are: Palouse River, Wash.; Willow Creek, Oreg.; Challis, Idaho; and Bumping Creek Enlargement, Wash.

Considerable emphasis has been placed on assisting the construction agencies to design fish-passage facilities and supplemental-production facilities required for their projects. Along with the technical assistance has been included an inspection program to determine if completed facilities are being operated as designed.

California

Oceanographic data collection.—Large-scale fluctuations in the physical properties of the ocean may affect significantly the abundance and availability of commercial fishes. To make meaningful interpretation of such fluctuations, they must be described as accurately as possible. Recognizing this need, the BCF Biological Laboratory, Stanford, has endeavored to develop time series of certain oceanic properties for which adequate data are available. Current efforts are directed

toward compiling a historical series of charts depicting the sea surface temperature over the North Pacific Ocean for each month of the period 1949–62, inclusive. Owing to the large quantity of observational data, automatic data processing techniques are being used to the fullest possible extent. Knowledge of the surface temperature will be of value for investigating changes in the sea. A practical understanding of these changes must be founded, however, also on a more comprehensive description of subsurface structure than is now available. Bureau scientists have participated actively in numerous phases of long-range planning for oceanographic data collection, particularly with respect to the design of observational networks.

Tuna behavior studies.—Scientists at the Bureau's Biological Laboratory at San Diego have been studying factors affecting the rate of success of purse seining for tuna. On the average, only 50 percent of the purse seine sets on schools of tuna succeed in catching the fish. An understanding of the factors responsible may make it possible for fishermen to improve their catch rate. Examination of logbook records kept by the fishermen themselves and made available through the courtesy of the Inter-American Tropical Tuna Commission has shown that sets made at night are successful more often than those made in daylight. This suggests that visibility of the net is a factor in the fish's ability to avoid capture. A study has, therefore, been started on underwater visibility, particularly as it relates to the ability of tuna to see the purse seine. Visibility of the seine has been found to be affected by a number of factors: Contrast of the seine with the background, the direction and altitude of the sun, moving light rays that are focused by ripples at the water surface and projected onto the net and, of course, water clarity.

Another factor found to affect the rate of success of fishing is the nature of the thermocline. Bureau scientists have shown that, in some areas of the eastern tropical Pacific, purse seine sets are more likely to be successful the greater the extent of temperature change per unit of depth in the thermocline. In other areas, results have suggested that the depth of the mixed layer, which extends from the surface to the thermocline, affects the rate of success—purse seining on the average being more successful when the mixed layer is shallow. Tuna fishermen cooperated in this study by allowing the Bureau of Commercial Fisheries to install bathythermograph (BT) winches on their vessels and by taking periodic BT's at the time sets were made. Other oceanographic conditions, such as water clarity, may be related to or associated with particular thermocline characteristics. Further studies are required to separate the effects of these factors.

Competition between sardine and anchovy.—At the Bureau's Biological Laboratory, La Jolla, hypothesis of a complex interaction or competition between the sardine and anchovy is emerging from the data on eggs and larvae obtained during the past decade from the ocean area between Point Conception on the Pacific Coast in Santa Barbara County, Calif., and Point Juanico on the Gulf of California in Baja California, Mexico. It is evident that the abundance of sardine eggs and larvae has drastically declined while the young stages of anchovy have increased. In 1951 and 1952, anchovy larvae outnumbered sardine larvae by about 3 to 1. By 1954 the disparity had increased to 6 to 1, by 1957 to 15 to 1, and by 1962 to 80 to 1. The anchovy population, based on larval abundance, appears to have tripled in size between 1952 and 1958 and to have further increased in abundance by 1962. Anchovy larvae as they increased spread over a larger area and are now abundant in offshore waters off southern California; sardine larvae now are few in number and mostly distributed along the shore.

Sardines and anchovies occupy the same trophic level, eat the same kind of planktonic food, and spawn in the same areas. As the anchovies have become more widespread, they have tended to occur more frequently with sardines. Wherever sardine larvae now occur they have to compete with a much larger group of anchovy larvae. Thus, the once numerous sardine has been supplanted in its ecological niche by the anchovy.

The implications of this problem may have great significances for the commercial net fisheries of California and Baja California. The hypothesis remains to be tested; more precise information on competition between species in an ecosystem is needed. Some of these studies will require that experiments be carried out at sea, others may be made under controlled conditions in the laboratory. For carrying out the latter, it is essential that the larval stages of sardines and anchovies be reared in the laboratory.

Hawaii

Townsend Cromwell completed.—The most significant accomplishment of the Hawaii Area in 1963 was the addition of a large, modern oceanographic research ship, the 565-ton *Townsend Cromwell*, to the Nation's scientific sea power. The new vessel is 158 feet long, has a top speed of 13.5 knots and a cruising range of 10,000 miles, and is capable of performing a wide variety of scientific missions anywhere in the world's oceans and under the most severe weather and sea conditions. An advanced feature of the *Townsend Cromwell*'s design is

her bulbous bow, an underwater, cigar-shaped projection that reduces water resistance and increases the ship's speed and efficiency. The bulb is used as an underwater observation chamber, with windows for studying fish and other animals. The vessel has well-equipped biological, chemical, and hydrographic laboratories and can accomodate 10 scientists, offering possibilities for carrying specialists from cooperating institutions and thus making the most efficient use of cruise time.

Gulf of Mexico

Gear Research.—Shrimp trawl gear research and development in the Gulf of Mexico, off the northwest coast of Florida, demonstrated that an electrified trawl net could significantly improve the efficiency of commercial shrimp trawling methods. In preliminary experiments during periods of the day when the shrimp are less available to the conventional trawls, the electrified trawl showed a uniform catch rate whereas the standard trawl catch falls off 70 to 90 percent during the daylight. This program, begun in autumn 1962, was continued on the gear research vessel *George M. Bowers* in waters less than 15 fathoms deep. The gear used was a small shrimp trawl equipped with a low-voltage electrical field arranged to proceed the trawl footrope. Studies indicate that the electrified gear causes shrimp that are normally burrowed in the bottom during daylight to leap upward in front of the oncoming trawl. Successful commercial development of this experimental technique would aid the shrimp industry because trawling during daylight and bright moonlight would be equally as efficient and productive as the present dark night trawling periods. Additional experiments will be required to improve this gear and extend its depth of operation at least to the areas now being fished for shrimp on a commercial basis.

Gulf of Mexico menhaden research.—Because abundance of Atlantic menhaden has declined, the commercial fishery for menhaden in the Gulf of Mexico has increased. Since little biological knowledge of this resource is available, research was begun during 1963 to obtain basic information on the life history, migrations, growth, and mortality of the three species of menhaden in this area.

Red-tide research.—A severe outbreak of the red tide occurred on the southwest coast of Florida during the winter of 1962–63. This micro-organism causes massive fish kills and produces poisons which become airborne and cause irritation to humans. Previous studies have found the causative agent and developed some knowledge of the environment that may cause the red-tide outbreaks. New research was

begun during 1963 to review and evaluate all existing knowledge and to find some way of controlling this species of micro-organism.

Atlantic Coast

Sea temperature study completed.—An analysis of surface temperature records from Atlantic Coast shore stations was completed for publication. The results of the analyses show a warming trend which started near the turn of the century and reached a peak in the early 1950's.

Cape Kennedy area fisheries.—The Cape Kennedy area, including 60 miles of coastline and extending seaward from the Indian River to the edge of the Continental Shelf, is one of the most productive fishing areas of its size along the South Atlantic Coast. A great deal of this productivity relates to the unique river-lagoon complex. Average annual production of the commercial fishery for the 4–year period 1959–62 was about 6 million pounds, valued at about a million dollars. Shrimp, black mullet, spotted seatrout, red snapper, blue crab, spot, pompano, and king-whiting were the major species taken.

The recretational fishery of the area annually catches about 3 million fish weighing a total of about 3.2 million pounds. The nine dominant species in numbers of fish caught in decreasing order are: spotted seatrout, pinfish, puffers, other seatrout, catfish, king-whiting, sheepshead, bluefish, and croaker. Estimates of annual total effort of recreational fishermen in the entire area are about 754,000 fishermen fishing about 2.75 million hours.

The Biological Laboratory, Brunswick, Ga., completed a report for the Atomic Energy Commission entitled, "Biological-Statistical Census of the Species Entering Fisheries in the Cape Canaveral (Cape Kennedy) Area." This entailed, in addition to a summery of published data and assembly and analysis of much unpublished data, extensive field work on the recreational fishery.

Trawling for bottomfish.—During exploratory operations off the east coast of Florida and Georgia and the Carolinas, catches of bottomfish were made by the chartered vessel *Silver Bay*. Operations were carried out with standard otter trawls in depths less than 40 fathoms. Catches in individual drags included 2,200 pounds of vermillion snapper, 2,700 pounds of scup, and 1,300 pounds of other species. The most productive tow was 4,500 pounds of large Virginia croakers taken off central Georgia at a depth of 24 fathoms. The success of this work has resulted in several local shrimp operators showing considerable interest in beginning fish trawling on a commercial basis in the area during the off season for inshore varieties of shrimp.

Atlantic menhaden studies.—The ability to predict the abundance of fish in advance of the fishing season is valuable to the fishing industry both economically and logistically. From studies of life history, age, growth, survival, and migrations, Bureau scientists at the Biological Laboratory at Beaufort, N.C., are developing forecasts of Atlantic menhaden abundance. These studies showed poor survival of the young spawned during the 1959–61 period and enabled the scientists to predict a reduced catch for the 1963 season. This prediction was borne out by landings. Other studies at Beaufort indicate that the Atlantic menhaden resource is made up of two distinct self-sustaining groups of fish, one which spawns in the spring and one in the fall. A small internal tag was developed during 1963 for marking young menhaden. This should provide a better method for studies of migrations and mortality rates.

Fish passage studies.—Cooperative studies between Bureau biologists from the Laboratory at Beaufort and personnel of the U.S. Army Corps of Engineers and the North Carolina Resources Commission have led to the successful use of navigation locks in the Cape Fear River for passage of anadromous species upstream. Using these locks, about 2,200 shad, 5,400 river herring, and 24 striped bass were moved around one impassable dam in about 20 days. This method will be studied further and may be important to anadromous species in river with low flow.

Fish classification studies.—The Ichthyological Laboratory, Washington, D.C., continued to carry on a balanced program of studies on the basic classification of both commercial and noncommercial fishes. Particularly well received was a review of the mackerel and tunalike fishes of the Indian Ocean that was prepared for use by the International Indian Ocean Expedition, at the request of the Smithsonian Institution. Studies also progressed on the taxonomy of the codfish family of the western Atlantic, the deep-sea fishes of the brotulid family, and the fresh-water fishes of the perch family. The Laboratory was allotted space in the Mollusk Division of the U.S. National Museum and now has on its staff an expert taxonomist studying bivalve mollusks of the Continental Shelves.

Albatross IV commissioned.—The *Albatross IV*, the Bureau's first new fishery-oceanographic research vessel in many years, was commissioned on May 9, 1963, at the Biological Laboratory at Woods Hole with Secretary Udall as the main speaker. This 187-foot vessel has a designed speed of 12 knots and a cruising range of 9,000 miles. The first trip was a scientific cruise on Georges Bank, May 13–17, to sample sea scallop populations.

The *Albatross IV* is a stern trawler, a somewhat revolutionary design in this country. Biologists have been enthusiatsic about its stability and its large amount of protected working space. Fishing and processing of catches have been possible without interruption even in steady winds over 40 knots with gusts to 50.

One of the purposes of adopting the stern trawl design was to encourage the industry to use stern trawls as a means of increasing fishing efficiency. The fact that the industry has built one such vessel and contemplates several more demonstrates that U.S. fishermen have accepted this vessel design for work in the North Atlantic.

With an adequate vessel, the BCF Laboratory at Woods Hole has now been able to better accomplish its assigned programs, especially its commitments to the International Commission for the Northwest Atlantic Fisheries (ICNAF).

Haddock assessment.—One of the results of increased activity at Woods Hole has been to permit a more detailed assessment of important North Atlantic fisheries. For example, present data suggest that the 1963 year class of haddock is probably substantially larger than the 1958 and 1959 year classes, which have supported the fishery in recent years. If early spring cruises continue to reveal the presence of this abundant year class, local fishermen can make adequate preparations for harvesting this important fish.

Exploratory fishing.—In 1963 additional information concerning the commercial potential of the tunalike species was obtained as part of the Bureau's continuing effort to assist the New England fishing industry. During an exploratory longline cruise by the Bureau's exploratory fishing vessel *Delaware* in November, the northern seasonal range of four tuna species, albacore, bigeye, skipjack, and yellowfin was extended to 180 miles south of Sable Island, Nova Scotia. This is the first time these species have been recorded so far north in the Northwest Atlantic during the late fall. Five albacore, two yellowfin, one bigeye, and one skipjack tuna were caught, and one albacore was lost during longline operations. Several tuna species were also caught in fair quantity over a wide area east of Cape Cod and extending from south of Cape Sable, Nova Scotia, to the area south of Sable Island. The largest catch made during the cruise was 12 albacore on one longline set of 420 hooks, 275 miles east of Cape Cod.

A spring longline cruise located commercial concentrations of swordfish off the U.S. Continental Shelf and provided information on the presence of stocks of tunalike species off the East Coast and in parts of the Central Atlantic Ocean. The most significant tuna catches were made in areas adjacent to the Azores Islands and off the American Continental Shelf. Bigeye tuna predominated in the catch in the

eastern North Atlantic areas, yellowfin tuna in the warmer waters of the mid-North Atlantic, and bluefin tuna were taken in the greatest numbers at the edge of the U.S. Continental Shelf south of Cape Cod. Swordfish were taken exclusively on night sets in the vicinity of the Azores and the American Continental Shelf. A catch of 18 swordfish taken on 420 hooks in early June indicated an abundance of these fish south of Cape Cod and farther east than the new commercial longline fleet was fishing at that time. The swordfish catch results were relayed by radio to the growing fleet of U.S. commercial longline vessels that were operating in adjacent areas. In addition, many of the tuna caught by longline were tagged and released to assist in tuna migration studies carried on in cooperation with other agencies.

During May and early June the Bureau's oceanographic research vessel *Geronimo* assisted the *Delaware* in an oceanographic study of a portion of the Gulf Stream.

Electrotrawling trials for bottomfish.—The experimental trials of electrotrawling gear and equipment for catching bottomfish off the New England coast, which began in 1962, are part of an industry-Government cooperative effort to improve commercial trawl fishing by application of the principles of electrical fishing. The trials were continued in 1963 on the *Delaware*. The electrical equipment required for these trials was developed and supplied by the Smith Research & Development Co. of Lewes, Del. In addition the general fish catching superiority of electric over nonelectric trawls was verified, and new and modified types of gear and cables were tested. A new type of single conductor towing warp was used successfully in conducting the electrical power to the net, thus reducing to one the required number of electrical conductors. Future tests are scheduled to determine the exact electrical characteristics required for successful commercial electrotrawling.

Great Lakes

Sea lamprey-control and lake trout-rehabilitation programs.—Through the efforts of the Great Lakes Fishery Commission and its two research agents, the Bureau of Commercial Fisheries and the Fisheries Research Board of Canada, excellent progress is being made to control the sea lamprey of the Great Lakes. By the use of a chemical toxicant that selectively kills lamprey larvae, the population of lampreys in Lake Superior has been reduced over 80 percent. This population reduction has brought about a sharp decline in the incidence of lamprey scars on lake trout. In addition, Bureau scientists find a substantial increase in the average size, survival, and spawning population of lake trout.

To hasten the recovery of the lake trout population, 8 million hatchery-reared fingerlings have been stocked in Lake Superior since 1958. The largest annual stocking effort was in 1963 when 2.3 million lake trout were planted. This cooperative program by the United States and Canada is succeeding; these fish now comprise the bulk of the trout population in many areas throughout the lake.

Lake whitefish reproduction studies.—At the Bureau's Northville, Mich., research hatchery, studies on the reproduction of lake whitefish have progressed. In a replication of a technique first used successfully in 1961, spawn was taken from hatchery whitefish. This is the first time that whitefish have been reared to maturity in captivity. Also for the first time, either in nature or captivity, whitefish were observed in the spawning act.

Exploratory trawling in Lake Michigan and Green Bay.—Generous amounts of lake bottom suitable for fishing with otter trawls and good catches of alewife and bloater chubs were located in northern Lake Michigan and Green Bay during fishing explorations by the Bureau's exploratory vessel *Kaho.* Yellow perch, whitefish, and walleye were completely absent from many of the trawl catches made in Green Bay; the absence may prove important in developing new methods for the harvesting of alewife in this area. The underutilized alewife has become extremely abundant in Lake Michigan and connecting waters in recent years. Fair to good fishing was experienced in all areas except the Beaver Island-Charleviox, Mich., area in the northern part of the lake in the early summer. Alewife catches in Green Bay were as much as 900 pounds per 30-minute drag. In the deeper waters of Lake Michigan, catches were dominated by bloater chubs taken over an extensive area in quantities up to 340 pounds per 30-minute drag.

General

Foreign fishing explorations.—During an extensive cruise along the northeast coast of South America by the Bureau's exploratory fishing vessel *Oregon*, two new areas with commercial quantities of pink and brown shrimp were located off French Guiana, along with several good areas for bottom trawling for food fish in shallow waters north of the Amazon River. Neither of the shrimp areas had previously been fished by the growing fleet of U.S. shrimp vessels operating out of Guiana ports. News of the shrimp catches, which ranged from 30 to 70 pounds of large shrimp tails per drag, was relayed to the fleet by radio. Good trawling bottom for fish was located generally inside the 60-fathom curve, and the broken bottom found outside 60 fathoms was not so rough as to prohibit future trawling with special types of

trawl gear. Several types of snappers, large seatrout, croakers, grunts, and several species of catfishes were taken, with the largest catches ranging from 800 to 1,500 pounds of fish per 1-hour drag. In addition to the shrimp and bottomfish explorations, the *Oregon* made observations of surface schooling fish and collected biological and hydrographic data as part of the International Cooperative Investigations of the Tropical Atlantic (ICITA) program.

International oceanographic expeditions.—In 1963 the Bureau participated in two international oceanographic expeditions: The International Indian Ocean Expedition (IIOE) and the International Cooperative Investigations of the Tropical Atlantic (ICITA).

Bureau scientists from the laboratories in Honolulu and Seattle planned many of the biological and fishery studies for the IIOE and participated in Cruise I of the *Anton Bruun* in March and April. The studies, conducted from the *Anton Bruun*, a National Science Foundation vessel, are a part of the overall effort of several nations to study the biological and physical oceanography of the Indian Ocean.

The ICITA work consisted of two parts: A cruise in the spring (Equalant I) and another cruise in midsummer (Equalant II). The Bureau participated in each one. Both operations were off the West Coast of Africa, and the studies were coordinated with those carried out abroad 10 other vessels from seven nations. The *Geronimo*, a 147-foot surplus Navy tug converted by the Bureau in 1962 to a fishery-oceanographic research vessel, took part in the midsummer cruise. The Bureau primarily was responsible for the coordination and planning of the survey, and the Director of the BCF Biological Laboratory, Washington, D.C., was appointed International Coordinator of ICITA. In the spring a building in the Navy Yard Annex (formerly the Naval Weapons Plant and the present location of the Bureau's Biological Laboratory in Washington, D.C.) was converted to a research laboratory to house the Bureau's staff of ICITA. These investigations are the outgrowth of the Tropical Atlantic Oceanography Fishery Program, proposed by the Director of the Bureau in 1961. The formal recommendation for the survey was made by the Bureau in April 1962.

The information gained from both the India Ocean and Tropical Atlantic expeditions will contribute towards achieving an aim of the National Oceanographic Program—the maximum development and use of living resources of the sea—by informing U.S. fishermen and fishermen of the underdeveloped countries bordering those oceans about the kind and abundance of the fishery resources in the little known areas of the surveys.

Instrumentation unit.—The staff of the Bureau's newly established Instrumentation Unit at its Biological Laboratory in Washington,

D.C., is (1) assembling and organizing information on the development, procurement, use, and maintenance of oceanographic instruments of particular interest to the Bureau's research programs; (2) cooperating with other Government agencies (through membership in the Interagency Committee on Oceanography) in organizing information on oceanographic instruments and making it available to scientists, engineers, and administrators in Government, industry, and private organizations; and (3) operating a service unit at the Laboratory for testing, calibrating, and evaluating oceanographic instruments.

Fish protein concentrate.—Significant advances were made in the fish protein concentrate (FPC) research program in 1963. Research contracts were awarded to four groups to investigate the following: (1) Design and construction of a model unit for processing fish protein concentrate by a solvent extraction method; (2) design and construction of a model unit for processing fish protein concentrate by the biological digestion procedure; (3) research studies dealing with an enzymatic process to remove the viscera of fish and changes to the usable portions of the fish that may occur through the use of this enzyme cleaning process; (4) flavor reversion factors of fish protein concentrate. This includes the flavor and odor components of FPC and how to control them.

The model units that will be capable of producing 100 pounds of finished product per day are nearly completed and will soon be producing FPC for use in nutritional and dietary research for animal and human feeding and in metabolic studies.

The Bureau's Technological Laboratory at College Park, Md., has been equipped with a process and control unit specifically designed for FPC studies. One section of this unit is being used to produce FPC by methods known to provide products of the highest possible quality. Samples are compared with FPC samples manufactured by more practical, proposed industrial methods for nutritive, organoleptic, and physical characteristics. These comparisons will reveal the effect of different processing methods on the nutritive qualities of differently produced FPC samples.

The eventual manufacture and distribution of FPC to underdeveloped areas for use as a protein supplement in the normal, starchy diets of millions of undernourished people will mark a great stride forward in reducing nutritional deficiency and starvation in the world. In addition, the production of an acceptable FPC product should stimulate the fishing economy.

The value of fish as a protein supplement has been recognized since the beginning of time. The problem has been one of distribution.

Fish protein concentrates would overcome the disadvantages of weight, spoilage, and high transportation costs. Fishery technologists have estimated that at a cost per person of about 2 cents a day, fish protein concentrate could supply the minimum daily requirements of protein, 70 grams. By using the unharvested fish of U.S. waters alone, industry could provide a supplemental animal protein for one billion people for 300 days at the cost of less than one-half cent per person per day.

New products from fish oils.—Knowledge about chemical makeup and physical properties that was gained from past research at the Bureau's Technological Laboratory, Seattle, Wash., made it possible to increase efforts to apply chemical derivatives from fish oils to potential industrial products. Most of the chemical reactions for which derivatives are prepared are chosen to make use of the characteristic unsaturation of fish oils. The exception to this was the development of a simple and rapid method to transform the natural triglycerides to single fatty acid esters by an alcoholysis reaction. By proper choice of the alcohol, esters of different and unique properties can be formed.

Nitrogen derivatives.—Methods were developed to introduce nitrogen and nitrogen-containing functional groups at the carbon-to-carbon double bonds. These included nitrate, nitro, nitro-nitrate, and acetoxy-nitro derivatives that were used as intermediates in the synthesis of amines, amino acids, and amino alcohols. Such derivatives may be useful as surfactants, oils and grease additives, or bactericides. Nitrate esters of the fatty alcohols resulted in new and unique products that are stable, even at distillation temperatures. Since purification of such compounds is often a problem in an industrial process, a technique was developed to separate and purify the polyalcohols of their nitrate. This technique was applicable to large-scale industrial purification of these compounds.

Epoxy derivatives.—Epoxy esters from oils such as soybean oils are used as plasticizers and stabilizers in the production of plastics. The plastic industry is continually searching for better and less expensive materials to use. Since fish oils with their fractions of highly unsaturated fatty acids are of potential value in the preparation of commercial epoxy esters, attempts were made to determine optimum conditions for preparation of epoxy esters. Epoxy esters were found, but more work is needed to obtain better yields for conversion of double bonds to epoxy groups.

Polyurethanes.—As a class of polymers, polyurethanes have rapidly expanding markets in protection coatings and in flexible, semirigid, and rigid foams. Both monoglycerides and partially hydroxylated triglycerides from menhaden oil were used to prepare polyurethane foams. Foams prepared from the monoglyceride derivative darkened

and acquired rancid odors within 4 weeks. Foams prepared from the partially hydroxylated oil were better. This latter approach will be used to improve the product.

Synthetic triglycerides.—Fatty acids occur at random in the natural triglycerides from fish oils. This means that fractionation of these triglycerides into higher degrees of unsaturation is impossible. Yet there have been many requests from other research laboratories for triglycerides with higher iodine value than is available naturally. A method was developed, therefore, to synthesize completely unsaturated triglycerides from unsaturated esters that had been prepared from menhaden oil and fractionated by molecular distillation.

Isolation of fatty acids.—Results from the Bureau's research on fish oils has made other laboratories aware of the potential of fish oils and their fatty acids. From laboratories starting to work with highly unsaturated fatty acids, the Bureau has received requests for fatty acids that can be used as standards in their analytical work. These standards were prepared from fractional distillation and urea-complex fractionation of menhaden oil methyl esters.

At the invitation of the American Oil Chemists' Society, Bureau laboratory chemists participated in a collaborative study on the application of gas-liquid chromatography to the analysis of menhaden oil with the aim of establishing an official method that would include fish oils along with other oils such as peanut and tall oils. Development of an official method will be particularly valuable for laboratories that do routine analyses of fish oils.

Irradiation of fishery products.—The Bureau's irradiation preservation of fishery products program has progressed. Some of the more significant research findings to date indicate that (1) the shelf life of edible haddock, ocean perch, clams, shrimp, king crab, and flounder can be tripled when irradiated at levels from 100,000 to 450,000 rads (radiation absorbed dose) and stored at 33° F.; (2) the high nutritional value of seafood is not adversely affected by irradiation; (3) some strains of bacteria are more resistant to irradiation than others; and (4) it may be possible to use analytical techniques as an objective test in measuring the development of undesirable odors or flavors in long-stored irradiated seafoods.

During summer 1963, construction of the Marine Products Development Irradiator (MPDI) was started at the site of the Bureau's Technological Laboratory in Gloucester, Mass. The Atomic Energy Commission (AEC) is providing the funds for the construction. When completed, it will be operated by Bureau fishery technologists and AEC personnel. This will be the first large-scale gamma irradiator developed exclusively for treating marine products. It will process

1,000 pounds of fish per hour at a dose level of 500,000 rads. The facility will handle the seafood in a manner somewhat similar to that suggested for ultimate commercial application.

The MPDI will be used for developmental research designed to introduce radiation preservation into the complex channels now established for the processing, distribution, and marketing of fresh seafoods. It will be used to provide irradiated seafood for extensive shipping and packaging tests and large-scale product acceptability investigations, samples for evaluation or further development by members of the fishing industry, and information on the cost of radiation processing. The research carried out in this facility will ensure that when radiation preserved fishery products are introduced to the American economy, they will provide the American housewife with products of consistently high quality.

Completion of the MPDI, in the late summer of 1964, will be marked by an International Conference on Radiation Preservation of Foods. This conference will encompass such areas as (1) the technological aspects of the radiation preservation and sterilization of foods, (2) radio active facilities and technology, (3) wholesomeness and food legislation, and (4) the microbiological aspects of irradiation preservation of foods.

In cooperation with the Atomic Energy Commission, the Bureau is studying the orderly marketing of irradiated fishery products. The aims of the first phase were to develop information regarding the marketing feasibility of radiation-processed fishery products and to attempt to determine the potential impact of radiation pasteurization on market supplies and structures. Bureau marketing personnel interviewed various marketing levels of the fishing industry—producers, processors, wholesalers, distributors, brokers, and retailers. The information obtained is being analyzed and evaluated. Although it is too early to cite trends, the interviews generally indicate a favorable response and acceptance of the radiation pasteurization process for fishery products. A second phase, a consumer reaction study, is contemplated for the future.

Pesticides research.—Public awareness of the possible dangers from pesticides to commercial fish and shellfish and their associated organisms was sharply increased by the book "Silent Spring" and the report "Use of Pesticides" of the President's Science Advisory Committee. Bureau research at Gulf Breeze, Fla., continues to show that many species, particularly mollusks, crustaceans, and plankton, are sensitive to minute quantities of these chemical compounds. In addition to these laboratory studies, field programs in Alaska and Washington have been undertaken to determine pesticide effects on acquatic species

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under natural conditions. Studies in Alaska of the spruce budworm-control spraying with DDT indicate that aquatic insects, which serve as food for young salmon, are completely destroyed in streams within the spray area. Surveys several months after the spraying showed that these insects were only slowly re-establishing themselves. Bureau efforts through the Federal Pest Control Review Board resulted in the spraying plans for hemlock looper control being changed to avoid possible damage to oyster beds in Washington State.

U.S. standards for fishery products and certification service.—Since 1956, at the request of members of the fishing industry, the Bureau has developed grade standards for 14 fishery products. On these standards the Bureau bases its inspection and certification service. Two of the standards were developed during the past year—fried fish portions and breaded fish sticks. In addition, revisions of these two latest standards have been completed and promulgated. The revisions are designed to further upgrade the quality of the two products and to keep pace with technological advancements and production capabilities of the fishing industry.

During the past year over 215 million pounds of fishery products were inspected and certified by USDI inspectors located in 17 States throughout the country. Lot inspection services were also provided at the request of the Chicago Mercantile Exchange, which included a new commodity, raw headless shrimp for futures trading during 1963. One of the major requirements for raw headless shrimp delivered in fulfillment of a futures contract is that it be U.S. grade A quality.

Transportation.—The Bureau gave its support to the President's suggestions to the Congress regarding a national transportation policy. The present exemption for motor carriers is important in providing adequate transportation services for fishery industry firms such as door-to-door service, many stopoff deliveries of small shipments, and variations in routes over which shipments can be handled. These services must be suited to the vagaries of fish production from resources that often have changed availability.

Improvements in transportation services available to the fishing industry, particularly in Alaska, were noted. In 1963 for the first time, it became possible to load a refrigerator car of frozen fish in Alaska and have it transported unopened to its destination in one of the other 49 continental States. This was made possible by the opening of a railroad-car ferry between Saxman, Alaska, and Prince Rupert, British Columbia. Many shipments of frozen fish were made by Alaska firms at significant savings in transportation and handling charges.

Rough-fish market development.—Progress was made in developing new markets for unutilized or underutilized fish in such promising fields as mink farming, pet foods, and screwworm-eradication projects. Bureau efforts have been instrumental particularly in the pet-food industries for developing greater use of fishery products from the Great Lakes and Gulf areas.

Frozen shrimp traded on Chicago Mercantile Exchange.—Futures in frozen shrimp were traded for the first time on November 11, 1963, on the Chicago Mercantile Exchange, Chicago, Ill. It is the first fishery product that has ever been traded in a futures market and may pave the way for others. Daily information on shrimp futures, which has a stabilizing influence on markets and prices, is published in daily Fishery Products Reports of several Market News Service field offices because of interest in the shrimp market. Discussions on futures trading in shrimp were begun with the Chicago Mercantile Exchange in 1957.

Canned shrimp promotion.—In response to their request for marketing assistance, the Bureau cooperated with the Gulf Shrimp Canners Association by planning an educational and promotional program for Lent 1964. This cooperative industry-Government program was designed to move the large inventories of domestic canned shrimp into the normal trade channels. As part of this promotional effort, the Bureau prepared a Special Fisheries Marketing Bulletin, financed by the shrimp canning industry. The Bureau also supplied other promotional materials such as food photographs, both in color and black and white, and informational releases for use by those in the mass-publicity media.

Canned tuna promotion program.—The Bureau cooperated with the California tuna industry in a "crash promotion program" to improve the marketing structure of canned tuna by increasing consumer demand. The program included the preparation of special informational releases, television slides, television and radio spot announcements, and color and black and white food photographs for use by the mass-publicity media on a public-service basis. The professional staff of fishery marketing specialists and home economists scheduled personal appearances and fish-cookery demonstrations before consumer and institutional groups. Telegrams also were sent to about 45 major food trade associations, requesting assistance by giving prominence to canned tuna in their merchandising programs. Followup contacts were made with the appropriate representatives of the educational media of radio, television, newspapers, home economists, dieticians, school-lunch supervisors, inplant feeders, and others connected with food service.

At Bureau request, the U.S. Department of Agriculture featured canned tuna in its plentiful food list for August. This was the first time that a fishery product was featured by the Plentiful Foods Committee. In addition, Food Guide Bulletin listed canned tuna for promotion in the Food Stamp Plan areas. The Department of Agriculture also enlisted its Agricultural Marketing Service, Office of Information, and Federal Extension Service staffs in stimulating sales at the retail and consumer levels. Additional cooperative efforts were made by home demonstration representatives of the public utility companies.

As a result of the combined efforts of industry and Government, the retail sales of canned tuna were reported as "back to normal" in late October.

Natural sponge marketing-promotional program.—The natural sponge industry which is centered at Tarpon Springs, Fla., asked the Bureau for marketing assistance. The sponge resource, which was stricken by a biological blight in the late thirties that drastically reduced the production of natural sponges, has now generally recovered. The advent of synthetic sponges, however, has largely displaced the natural sponge on the retail market. The Bureau conducted a joint consumer pilot marketing and promotional program in the Harrisburg, Pa., area during October 1963. The purpose of the program was to stimulate retail sales of natural sponges. The results are being evaluated.

Marketing assistance for fishery products.—U.S. domestic fishing industries asked the Bureau to assist them in restoring consumer confidence in all fishery products. This confidence had been badly weakened, and in some instances destroyed, because of unfavorable publicity on smoked fish from the Great Lakes area. Once again the Bureau prepared promotional materials of all kinds for mass-publicity media outlets on a public-service basis. Staff members also made the usual personal appearances and fish-cookery demonstrations before consumer and institutional groups.

"Seafoods Across the Land" presented at convention.—At the request of the Executive Committee on the National Restaurant Association, the Bureau made the major food presentation entitled "Seafoods Across the Land" at their annual convention. This association schedules one featured food item at its convention each year. The Bureau was able to present the nutritional, economic, and merchandising advantages of fishery products to over 25,000 restaurateurs and others who supervise food-preparation personnel.

Fish-cookery demonstrations.—As a part of the continuing program to promote the use of seafoods, Bureau home economists con-

ducted 243 fish-cookery demonstrations for school-lunch supervisors and others responsible for mass feeding. These home economists also appeared on more than 125 television and radio shows throughout the country and developed kitchen-tested recipes for institutional and homemaker use. These recipes are distributed as booklets and folders and made available to food publicists in radio, television, newspapers, and magazines.

Fishery educational motion pictures.—Twenty-one Bureau-produced, and for the most part industry-financed, fishery educational motion pictures are now in national distribution through more than 200 cooperating film libraries and Government distribution channels. They are viewed annually by an audience of over 2 million persons, exclusive of audiences exposed to public-service television showings. The latest Bureau-produced motion picture, *Watermen of Chesapeake*, was released for showings in December 1963. Since 1946, 22 international and national film festival awards have been received by the Department for Bureau-produced films.

Market News Service reporting.—The fishing industry was provided with current information on landings, receipts, prices, demand, markets, stocks, imports and exports, and new developments in domestic and foreign fisheries. Reports are 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, Seattle, and Chicago. Every effort is made to collect and distribute market information while it is timely and current, since speed is essential if the information is to be of greatest benefit to the users.

The reputation of the Fishery Market News Service for its excellent coverage in the United States has become known to the European fishery industries. In 1963, at the request of the Organization for Economic Cooperation and Development (OECD), the Bureau made a 3-month study to determine whether it would be possible to start a fishery market reporting system in Europe.

Fishery statistics.—For each of the 42 States supporting commercial fisheries, annual 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 19 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; and, each quarter, on the monthly production of fish sticks and portions. Publication of detailed information

on the Gulf shrimp catch by depth, area of capture, species, sizes, number of trips, and days fished was started in the Current Fishery Statistics series.

Fisheries Financial Assistance Programs

In fiscal year 1963 the Bureau continued with its loan programs to aid the fishing industry. A report of the activities under each program follows.

Fisheries Loan Program

The Fisheries Loan Program continued operations which began in the latter part of 1956. The total since the program began is 1,268 applications for $34,599,601, and of these, 673 for $15,472.951 have been approved (app. C). During the 1963 fiscal year 99 applications totaling $1,591,178 were received, and 55 for $826,640 were approved. About 30 percent of the funds loaned to date were loaned to California fishermen for the conversion of tuna vessels for purse seining. The program assisted in the conversion of 30 vessels while private funds assisted the conversions of about 70 other vessels. As these are among the largest vessels used in the U.S. fisheries and the conversion required considerable structural changes as well as expensive nets, the loans were correspondingly large. The conversion of these vessels revived this segment of the industry to a point where it became one of the most profitable instead of one of the least profitable fisheries in the United States.

Fisheries Mortgage Insurance Program

The Fishing Vessel Loan and Mortgage Insurance Program which provides for insurance of mortgages given for the construction, reconstruction, or reconditioning of fishing vessels was continued during fiscal year 1963. During the year 14 applications for insurance on $1,593,180 were received, bringing the total to 31 for $3,897,720. Twelve were approved for $817,130, and 5 for $1,250,165 were pending. Total approvals under the program had reached 23 for $2,187,455. Considerable interest by banks and insurance companies continued throughout the year.

Fishing Vessel Construction Differential Subsidy Program

June 12, 1963, was the last date to accept applications for the Fishing Vessel Construction Differential Subsidy Program which began in 1960. Six applications for $560,616 were received during the fiscal

year, raising total applications to 13 for $1,156,481. Seven applications for $607,283 were pending at the end of the year.

American Fisheries Advisory Committee

Executive Order No. 11007 requires the publication of information relating to industry advisory committees.

The American Fisheries Advisory Committee (AFAC) consists mostly of industry members, which are appointed by the Secretary of the Interior for the purpose of submitting to him advice and recommendations on fishery matters in regard to formulation of policy, rules, and regulations pertaining to requests by industry for assistance and other matters deemed appropriate by the Committee Chairman. The Committee met on May 27–29, 1963, in the Department of the Interior, Washington, D.C.

A list of the Committee members in 1963 is given in appendix D.

New Programs

In 1963 new programs were started in economics, technological research, and biological research. Several are more closely concerned with the fishing industry than the others and should directly affect it. This is particularly true of the Bureau's new overall economics program.

Economics Program

In 1963 the Branch of Economics was elevated to division status. Existing economic programs were intensified, and new programs started. Preceding this reorganization, the Bureau selected a committee of five economists from colleges, universities, and educational foundations and asked it to define the role of economic analysis in the Bureau's overall commitment to promote the Nation's fishery resources. The committee reviewed the Bureau's economic programs and made certain recommendations with respect to the need for (1) greater emphasis on the solution to problems related to the longrun welfare of the fishing industry, (2) high-level professional competence of the staff, and (3) closer integration of work on related economic, biological, and technological problems now largely dealt with in the various Regional installations of the Bureau. The committee also recommended the reorganization of the administration of the economic functions of the Bureau with the purpose of giving these functions a greater role in the overall program.

The new Division of Economics was established to provide economic information to the fishing industry and basic economic research on the special problems of the fisheries having regional, national, or international significance. This organizational change has created the need for recruitment and for intraining programs and refresher courses to focus skills of the staff upon the preparation of economic situation reports for various fishery commodities. Some of the staff of the Division are now located in the Economics Laboratory. In addition to the training and recruitment phases, the Laboratory has been critically examining the current sources of statistical data and the needs for additional specialized and critical statistics for research projects.

Foreign Trade Promotion

Part of the new overall economics program is the foreign trade promotion for U.S.-produced fishery products. During 1963 the Bureau made considerable progress in exploring possibilities for European markets for U.S-produced fishery products. Basically, the United States has been an importing nation rather than an exporting nation with respect to fishery products.

Plans for the first foreign fishery trade mission were developed during the year. This will be a do-it-yourself mission in which not more than eight industry representatives with diversified interests will participate. The mission will be coordinated and guided by one representative from the Bureau and one foreign trade specialist from the Department of Commerce. The purpose of the mission is to develop new markets, introduce additional packs and varieties of fishery products, and expand present sales in the countries visited. The mission is expected to spend about one month visiting four or five Western European countries.

Past experience has demonstrated that U.S. participation in trade missions, by both private industry and Government, can have immediate and practical results as a means of stimulating U.S. exports. Greater emphasis, however, will now be placed on the promotion of U.S. exports than has been done in the past. With additional attention to followup efforts to assure exploitation of information generated by trade missions, the results in terms of new business should be improved. An expanded trade mission program will be a significant factor in a successful export drive.

The Bureau has taken other active roles in foreign trade promotion through such means as (1) maintaining close liaison with the fishery attachés in Copenhagen, Mexico City, and Tokyo, who make surveys of existing markets and assess new market potentials; (2) participating

in the United States-Japan Tuna Conference, October 1962; (3) having Bureau representatives keep alert to new trade opportunities while traveling on other major assignments; (4) publishing items pertaining to foreign trade opportunities in the Bureau's daily Market News Service reports and its monthly publication, *Commercial Fisheries Review*.

Smoked Fish Research Program

In October 1963 when food poisoning resulted from Great Lakes smoked fish, the Bureau started an emergency research program designed to reduce or eliminate similar occurrences and to provide relief to the smoked fish industry of that area. Several of the leading scientists from the Bureau's technological laboratories converged on the Great Lakes area and developed an approach to the problem. The first phase consisted of making a survey to determine States' policies relative to production of smoked fish, arrange for samples, and encourage the cooperation of industry members. Following completion of this, the group began tests to determine the effects that the adoption of the Food and Drug Administration (FDA) processing recommendations would have on the quality of the product and economics of production, to develop new and better processing methods, and to evaluate the use of salt, nitrate, antibiotics, and other chemicals for controlling *Clostridium botulinum* in smoked fishery products. A research contract has been awarded to E. M. Foster of the University of Wisconsin to prepare thermal death time curves at various temperatures for destruction of *Cl. botulinum* type E spores and toxin in smoked fish. Additional contracts are contemplated in an effort to resolve some of the problems of the smoked fish industry.

Salmonella Research Program

A new microbiological program has been initiated to determine the incidence of salmonella in marine products. This program will include a detailed survey of fish-processing plants to obtain microbiological data that will enable the Bureau to draw up a realistic plant sanitation code and thereby eliminate or prevent the occurrence of this troublesome organism in fishery products.

The aims of this program will be accomplished by collecting bacteriological samples from production line and plant area. The samples will be analyzed to determine the extent of the contamination by *Salmonella* in each plant surveyed. Sources of contamination will be pinpointed by collecting and analyzing samples of water, animals, insects, soil, various fishery products, and other pertinent materials. Suggested operational and sanitation measures will be developed for

plant use, and after the plant has applied these measures, more samples will be collected and analyzed to determine the efficiency of such measures.

The Bureau's Technological Laboratory, Pascagoula, Miss., now has this program well underway. An exhaustive library search on previous studies and analytical methods has been made. Two Bureau microbiologists working on the project have received a 2-week training course in serological identification of the groups and species of the *Salmonella* bacteria. Equipment and supplies have been purchased to analyze multiple samples by the selected method.

Development of Disease-Resistant Oysters

The Congress appropriated funds in 1963 for cooperative studies by the States of New Jersey, Delaware, Maryland, and Virginia to develop a brood stock of disease-resistant oysters. This stock is to be based on the oysters that resisted the 1957–60 blight in Delaware and lower Chesapeake Bays. Most of the oysters in that area were killed by this blight, which was caused by a hitherto unknown organism. The few oysters that survived appear to be resistant to it, and this resistance is passed to the offspring. No efficient control for the disease has been found; therefore industry must depend on a disease-resistant brood stock to supply young oysters to rehabilitate depleted beds.

Shellfish Advisory Service

Both scientists and shellfish growers recognize that the results of research only infrequently find practical application in the shellfish industry. A major cause is a lack of understanding by industry members. The Bureau began a Shellfish Advisory Service in 1963 to assist the industry and State conservation departments in applying research results. Knowledge is already available which, if properly applied, could improve shellfish culture and increase production.

Development of Commercial Fisheries in Reservoirs

In 1963, a fishery research program began in South Dakota to determine the potential of commercial fisheries in northern reservoirs and to acquire knowledge of the commercial fish resource.

Considerable information on fish populations was obtained by fishing four Lake Erie-type commercial trap nets and by setting gill nets under the ice. The more abundant of the 26 species taken were buffalofish, crappie, carp, freshwater drum, carpsuckers, and goldeye. Trap nets fished in a single locality captured about 100,000 pounds of fish in 2 months of which about 70 percent were nonsport fish. In-

dividual net lifts were examined for species composition of the catch and catch per unit of effort. In an effort to evaluate the distribution, movement, and population size, over 40,000 fish were marked and released.

Shad Planting in Susquehanna River

In 1963, a 2½-year cooperative research program was started with the States of Pennsylvania, Maryland, and New York to determine if the Susquehanna River is suitable for shad. The research is financed by four power companies owning dams on the river. At the end of the study, the Department of the Interior will advise the Federal Power Commission whether fish facilities are needed at damsites on the river.

Results of the studies at the end of the first year of the program were encouraging: 11 million shad eggs from the Columbia River, transplanted in several locations in the Susquehanna River, produced a good hatch of shad. Juvenile shad from this hatch were seen moving downstream as late as November.

Meetings

For the benefit of the Nation and the fishing industry, the Bureau participates in many meetings, both international and national as well as with private fishery organizations. These meetings deal with conservation of the resources, trade in fishery products, and fishery research.

Bureau representatives attend meetings aimed at conserving the resources harvested by both our fishermen and those of other countries. The aims of the Bureau are to provide for the wise use of the resources and to safeguard the traditional rights of U.S. fishermen. The contest among nations for the fishery resources has intensified the issue of fishery jurisdiction of nations in territorial seas. The Bureau takes part in meetings held for the purpose of settling such problems. Bureau representatives also help negotiate equitable bilateral and multilateral international fishery agreements.

The contest among nations for the markets for fishery products and the market places has caused trade problems. The Bureau is represented at meetings concerned with international trade problems so that it can partake in forming policy and influencing negotiations that will be in the best interests of the U.S. fishing industry.

Bureau scientists attend meetings with other scientists for the purpose of exchanging knowledge in the field of interest and to plan future research.

Some of the more important meetings attended by Bureau officials in 1963 are given here.

California Cooperative Oceanic Fisheries Investigations

The highlight of the annual meeting of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) was a Larval Fish Symposium attended by scientists from most of the Bureau's biological laboratories. Among the participants were five European scientists, who also visited various Bureau of Commercial Fisheries laboratories after the meeting.

The papers at this symposium focussed attention on a phase of fishery biology that needs more emphasis. A detailed knowledge of the physiology and taxonomy of all larval fishes that occur in our waters is quite important. Data on their distribution, behavior, ecological requirements, and limiting factors affecting their abundance will permit more accurate forecasts to be made on the occurrence of future harvestable stocks. Such forecasts will enable the commercial fishing industry to make long-range plans and operate more efficiently.

FAO Conference

The Bureau participated in the 12th session of the Food and Agriculture Organization of the United Nations (FAO) Conference in Rome, October 31 to December 5, 1963. At this Conference, the Bureau recommended that FAO give serious consideration to elevating the status of its Fisheries Division. Other countries supported the recommendation. A resolution was adopted by the Conference requesting the Director General to prepare proposals outlining measures to take which will assure that FAO, through its Fisheries Division, has in future years the status of being the leading intergovernmental body in encouraging rational harvesting of food from the oceans and inland waters.

International Commission for the Northwest Atlantic Fisheries

The 13th annual meeting of the International Commission for the Northwest Atlantic Fisheries (ICNAF) was held at Halifax, Nova Scotia, on June 3–7, 1963. All 13 member countries were represented. Serving as U.S. Commissioners were Frank P. Briggs, Thomas A. Fulham, and Ronald W. Green.

Information was presented indicating increased fishing effort throughout the ICNAF area. The catch per unit of effort has been generally declining, however, which is evidence that further and more

stringent conservation measures are needed. Russian fishing effort on Georges Bank increased greatly in 1962 over 1961. The Russians reported a catch for 1962 of 41,900 metric tons of silver hake, which is about the same as that taken in the western Atlantic by the United States (44,202 metric tons). They also caught 151,144 metric tons of adult herring on Georges Bank in 1962, as compared with the U.S. catch of 80,000 metric tons. The latter are all immature fish and taken inshore.

Attention was given to several problems in the ICNAF area. Revision of the regulations on using chafing gear on trawls was considered. Means of adopting an international inspection system for enforcement of regulations were also discussed. The problems of following the Rule of the Road and of increasing competition among vessels on the fishing grounds were also considered.

Attempts are being made to reach agreement among International Council for Exploration of the Sea (ICES), FAO, and ICNAF on a joint reporting form for fishery statistics in the North Atlantic.

International Fishing Gear Congress

The second World Fishing Gear Congress was held in London, England, in late May 1963. Two Bureau representatives were among about 650 participants from some 50 countries attending the conference, which was arranged by FAO. During the Congress, 87 technical papers were presented of which 6 were prepared by Bureau personnel. The prepared papers and discussions from the floor provided information on the latest world developments in fishing gear, techniques, materials, fish detection, and gear research. Particular attention was given to fish behavior and its relation to fishing operations, as well as its influence on the design of future fishing gear.

North Pacific Fisheries Treaty Renegotiation Meetings

A meeting of the parties to the International Convention for the High Seas Fisheries of the North Pacific Ocean took place in Washington, D.C., June 6–21, 1963. Delegations from Canada, Japan, and the United States met to determine the course of the convention after expiration of the effective 10-year period in June 1963.

During the course of the meeting, the delegations from the three countries reviewed the existing North Pacific Fisheries Convention

and discussed a new draft convention proposed by the Japanese delegation. It was necessary to determine whether the Japanese proposal, in modified form, or continuation of the existing convention with appropriate clarification and understandings would provide the better basis for resolving North Pacific fisheries problems.

As agreement was not achieved at the first meeting, a second meeting of the three parties took place in Tokyo, Japan, from September 16 to October 7, 1963. The U.S. delegation submitted a new draft convention incorporating various modifications to the Japanese draft convention presented at the Washington, D.C., meeting. Modifications to the U.S. draft were submitted by the Japanese and Canadian delegations. After a thorough examination and discussion of the proposals, the three delegations concluded that complete agreement could not be reached and that further study would be necessary to resolve the remaining differences. The delegations were encouraged with the results of the second meeting and with the prospects for the future and agreed to recommend a third meeting to be convened sometime during spring 1964.

Regional Fisheries Commission for West Africa and Regional Fisheries Advisory Commission for the Southwest Atlantic

Industry and Bureau representatives attended the inaugural session of the Regional Fisheries Commission for West Africa at Tunis, Tunisia, in November and also the inaugural session of the Regional Fisheries Advisory Commission for the Southwest Atlantic at Rio de Janeiro, Brazil, in December. Both of these commissions were recently established under FAO sponsorship. The United States is keenly interested in the work of FAO regional fishery commissions, both from the viewpoint of regional economic development and in the interest of the U.S. fishery industries.

World Food Congress

The Bureau, through the U.S. FAO Interagency Committee, actively participated in the U.S. hostship of the FAO-sponsored World Food Congress, held in Washington, D.C., in June. The role of fish in nutrition, particularly for poorly fed peoples, was considered at the meeting.

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

To ensure the best use of available manpower and facilities and to promote the exchange of ideas and research results, the Bureau cooperates with various foreign governments, other Federal agencies, States, universities, and private organizations. It also coordinates its programs with those groups. The cooperation and coordination are effected through international agreements and treaties, formal and informal arrangements with Federal and State agencies, universities, and private organizations.

Fishery jurisdiction in territorial seas is one of the international problems facing our country today. The jurisdiction has no uniformity among the coastal nations throughout the world. Although the problem has generated two international meetings, the Law of the Sea Conference in 1958 and another in 1960, it is still not resolved. Some nations are advocating an international acceptance of a uniform 3 miles among coastal nations, some 12, some 20, and still others 200 miles. Since 1960, more and more countries have been adopting 12 miles, most of them for fishery jurisdiction only and not for an extension of territorial limits. U.S. Government policy is to retain now our 3-mile territorial limit and 3-mile fishery jurisdiction. A bill before the Congress, however, would extend the limit to 12 miles.

Cooperation With International Groups

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 FAO, ICNAF, the International North Pacific Fisheries Commission (INPFC), and the Great Lakes Fishery Commission.

Cooperation With Federal Agencies

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; Depart-

ment of Labor; Department of the Treasury; Department of Commerce; Weather Bureau; and various defense agencies.

Cooperative survey of Panama fishery resources.—The cooperative spiny lobster survey in Panama, begun in 1962 under the auspices of the U.S. Agency for International Development (AID), ended in December 1963. The survey located commercial quantities of spiny lobsters and scallops during exploratory cruises by the chartered Gulf shrimp vessel *Pelican* in the Pacific and Caribbean coastal waters. Several types of gear, including three types of pots, trawls, and free diving, were tested to determine the most efficient method of harvesting the lobsters. In addition, experimental and simulated commercial fishing and training cruises were made to introduce the local fishermen to new fishing methods. In several areas in the Gulf of Panama good catches of spiny lobsters were produced with pots and shrimp trawls. The best catch of 2,847 spiny and rock lobsters weighing 2,750 pounds was taken during 7 days of fishing with pots and trawls in the northwestern section of the Gulf of Panama.

During trawling operations to capture bait for the lobster pots, the *Pelican* found commercial quantities of scallops in the Bay of Panama. Learning of this discovery from a Bureau cruise report, a Panamanian business firm obtained additional details and began scallop fishing with one of their shrimp vessels on a temporary basis. Fifteen or more vessels are known to have entered this new fishery, and over 300 people have been employed in a Panamanian scallop-processing plant. In November commercial vessels were reported to have caught up to 2,000 pounds of scallop meats per day.

Cooperative Columbia River mouth survey.—The exploratory fishing vessel *John N. Cobb* completed the 13th cruise of a cooperative undertaking with the Atomic Energy Commission (AEC) to study the fluctuations of the demersal fauna in an area southwest of the mouth of the Columbia River. Commercial trawl gear and other devices are used to sample periodically a series of standard stations along a cruise track line from depths of 50 fathoms out to depths of 1,000 fathoms, when possible. During the latest winter cruise, stations out to depths of 200 fathoms were sampled with a regular 400-mesh eastern commercial otter trawl with a small-mesh liner in the cod end. English sole, rex sole, skates, and the greenstriped rockfish were the most abundant species encountered at the stations in less than 100 fathoms. At 200 fathoms a 1-hour drag caught 400 pounds of sablefish and turbot. The largest catch of ocean perch was also taken at this depth. Similar to past winter cruises, Dover sole and hake were almost absent from the catches in all the tows. Oceanographic observations were collected, and personnel of the Fish Commission of Oregon tagged Dover sole

and sablefish as part of a study of these species. Of the 13 cruises along this track over the past several years, 4 have been made by the *John N. Cobb* and 6 by the research vessel *Commando*, which was chartered from the University of Washington.

Liaison With Defense Agencies.—Considerable liaison was carried on by the Bureau with the U.S. Army Corps of Engineers and the U.S. Air Force regarding plans for removing two radar towers located on the edge of commercial fishing grounds off the New England coast. Meetings between fishery groups, the Corps of Engineers, and the Bureau were held in Boston and in New Bedford, Mass., in early spring to determine a practical location for disposing of the tower legs without causing undue hardship on fishing operations. These meetings were arranged by the Bureau's Gloucester Regional Office. The fishing industry agreed that the Army Engineers dismantle the tower legs and leave them on the bottom at their present locations provided they were properly marked on navigational charts and temporarily marked at sea by buoys. By leaving the legs lying on the ocean floor at their original locations, the Corps of Engineers saved considerably in the total cost of tower removal.

Advice to Area Redevelopment Administration.—The Bureau continued to carry out its responsibilities of advising the Area Redevelopment Administration (ARA) on project proposals submitted to that agency. Several commercial loans for fishery industry projects were approved. In addition, several public facility grants were made to communities where fishery activities are important parts of the local economy. All of these projects that were activated during the year led to increased employment opportunities and a strengthening of the local economies in the redevelopment areas where they were effected.

Manpower Development and Training Act.—Bureau personnel cooperated with the Department of Labor in apprising the fishing industry of the Manpower Development and Training Act. As a result, training programs have developed for fishermen and onshore workers on both coasts. Workers are being trained as fish filleters in Oregon and as fishermen in Boston. Training apprentice wages and expenses are being paid by the Department of Labor.

Cooperation With States

The Bureau functions in its formal agreements with States through commissions, such as the Atlantic States Marine Fisheries Commission and the Gulf States Marine Fisheries Commission. Interstate commissions coordinate the research efforts and conservation actions of the

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several States involved in such compacts. This coordinated action is largely based on scientific data provided by Bureau researchers.

Cooperation With National, Regional, and Local Groups

The Bureau cooperates closely with a number of national, regional, and local fishery and allied trade associations, which embrace almost all research, development, and service functions of the Bureau. It makes use of the professional talent and research facilities of universities, State agencies, trade associations, and private organizations by contracting with such groups to supplement Government research and service activities. Appendix E lists the organizations with which the Bureau had research and development contracts and grants in 1963.

Cooperation With Woods Hole Oceanographic Institution.—The Woods Hole Oceanographic Institution (WHOI) has a research contract from the Bureau. With WHOI and other agencies, the Bureau has been engaged for several years in a continuing cooperative program of exploratory fishing for tunas and swordfish in the Northwest Atlantic. As part of this program, the Bureau's exploratory fishing vessel *Delaware* made two separate longline fishing cruises for swordfish and tuna in the spring and the fall of 1963. The spring cruise extended from the east coast of the United States almost to the European Continent with 30 longline stations being occupied. The fall cruise extended over a wide area east of Cape Cod from south of Sable Island, Nova Scotia, to south of Cape Sable, Nova Scotia. No tuna were taken in longline sets made farther north and east of this area. This cooperative program to assess the distribution and abundance of large pelagic fishes in the Northwest Atlantic has been instrumental in the recent development of the Atlantic Coast tuna purse seine and swordfish longline industries. It is scheduled to continue in 1964.

Cooperative surf clam survey.—In 1963, the Bureau began a surf clam survey under a cooperative agreement with the Eastern Sea Clam Packers Committee of the Oyster Institute of North America. A preliminary survey along the Middle Atlantic coast was completed. Surveys were made off northern New Jersey and the Delaware-Maryland coast, with sample tows at about 1-mile intervals in areas outside present commercial clam grounds. Catch results off Delaware and Maryland were considered of commercial importance, and catches as great as 3 bushels of surf clams per 5-minute tows were made with sampling gear. The discovery of this potential new ground was reported to the commercial clamming fleet operating in the Middle Atlantic area. In the northern New Jersey area, surf clams were taken in most of the sampling tows but were too few to be of commercial significance. Black

quahog clams were taken in the deeper waters over the entire area surveyed in quantities as great as 5 bushels per tow. This cooperative survey will be continued in 1964.

Organization, Employment, Budget, and Physical Property

Organization

During 1963 the Office of the Secretary approved major changes in the organization of the Bureau.

The Headquarters Office in Washington, D.C., now consists of the Office of the Director and five staff divisions, each with an Assistant Director at the head. The position of former Assistant Director was elevated to that of Deputy Director of the Bureau.

A Division of Economics was established to serve as an instrument to develop Bureau policy and as a source of information of maximum use to the domestic fisheries industry. This Division has the following four Branches: Economic Research, Foreign Trade and Economic Services, Current Economic Analysis, and Fishery Statistics. Certain economic functions previously assigned to other divisions now reside in the Division of Economics. The changes have resulted in added emphasis being given to economic studies.

Other changes included the transfer of the internal audit function from the Office of the Director to the Division of Administration. The present Branch of Audit is responsible for auditing all activities of the Bureau that are related to, or involved with, Bureau finances and the financial investigative phases of the Bureau's financial assistance programs, including the fishery loan program, the vessel mortgage insurance program, and the fishing vessel construction differential subsidy program.

In September 1963, the approval given to change the Bureau's California Area to Region 6 (Southwest Region) meant realinement of States included and redefining of duties. The actual changeover did not take place until February 1964. A chart of the Bureau's organization as of December 31, 1963, is shown in figure 1, and a map of the five regional and two area offices as of December 31, 1963, is shown in figure 2.

Employment

The total employment for the Bureau of Commercial Fisheries averaged 2,099 throughout calendar year 1963. Of this total average, 1,749 were permanent and 350 were seasonal employees. The peak employment for the year was reported at the end of July, at which time the staff consisted of 1,752 permanent and 638 seasonal employees,

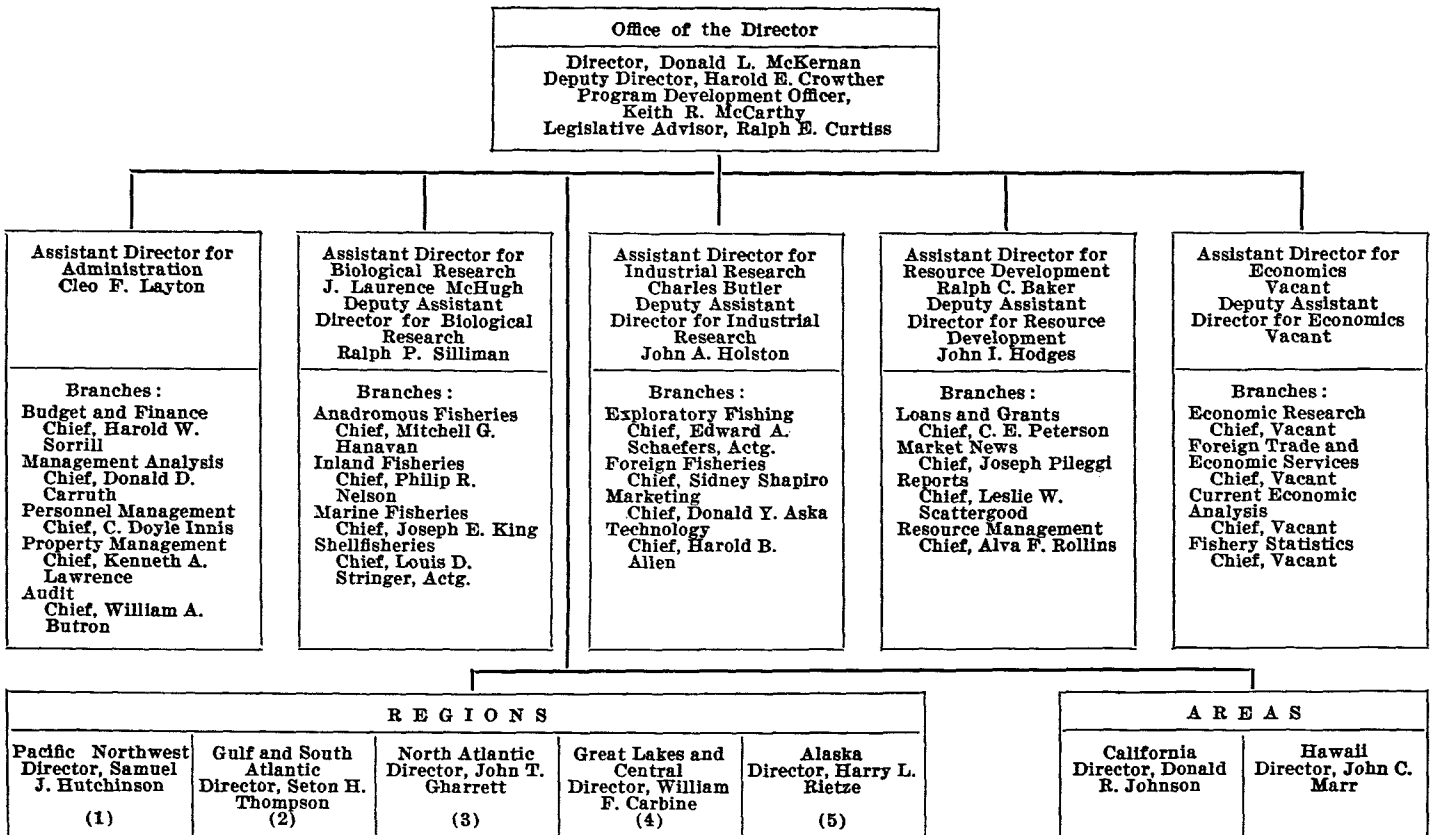

FIGURE 1.—Organization Chart, Bureau of Commercial Fisheries, December 31, 1963.

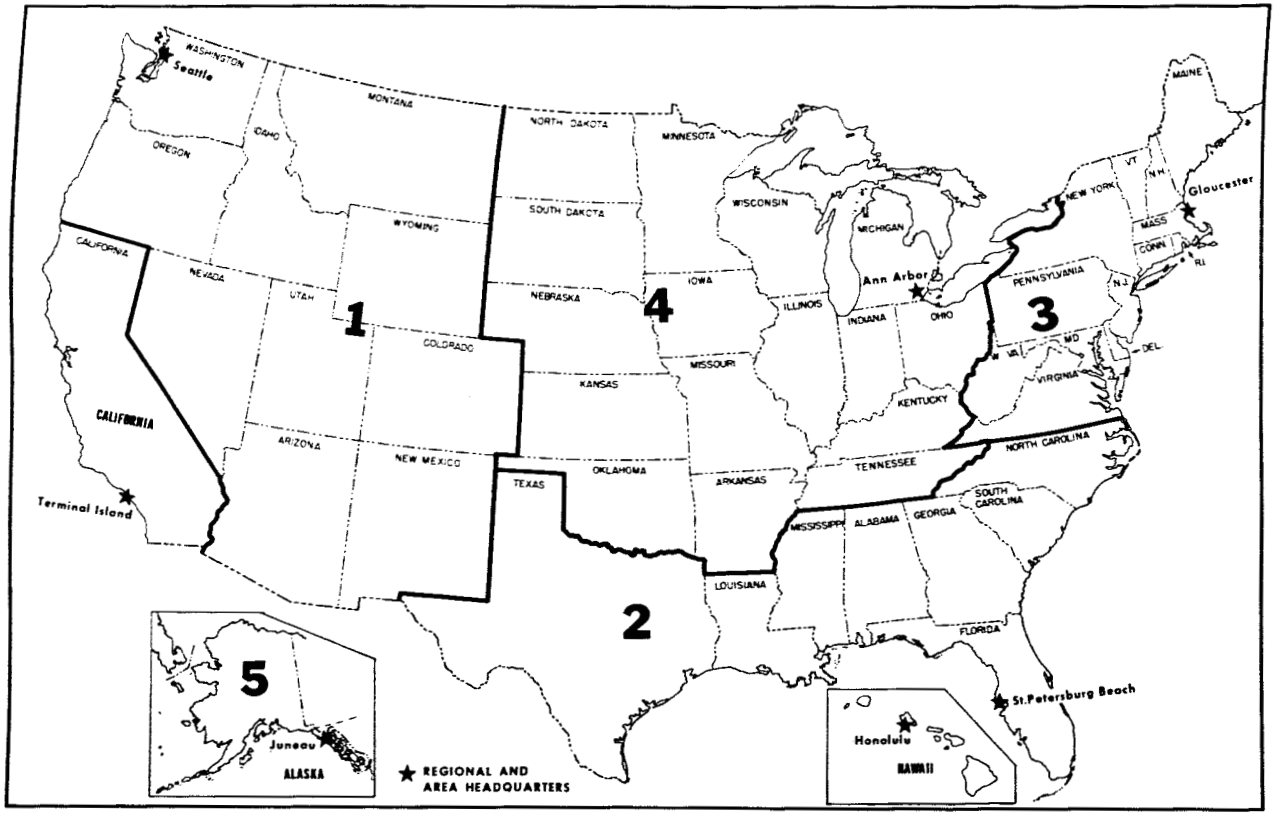

FIGURE 2.—Regions and areas, Bureau of Commercial Fisheries, December 31, 1963.

making a total of 2,390. The variations in the number of employees throughout the year and the relation between the total number and the number of permanent employees and seasonal, or temporary, employees are shown in figure 3.

Bureau employees fall generally into four broad categories. Of the total of 1,989 full-time employees reported as of October 31, 1963, 832 were classified in about 45 professional and technical series; 251 in 16 subprofessional series; 463 in 41 clerical and administrative series; and 443 were in positions, the pay of which is determined outside of the Classification Act (wage board employees). Figure 4 shows the grade structures for the professional and technical series, subprofessional series, and the clerical and administrative series and the number of employees in each grade for these three classifications as of October 31, 1963.

Budget

For the fiscal year 1963, $36.4 million were available to carry out the Bureau's program (app. F). Of this amount, $28 million were from annual appropriations; $5 million from Public Law 466 (known as the Saltonstall-Kennedy Act) funds; $0.7 million made available to the Bureau by the Great Lakes Fishery Commission; and $0.5 million from members of the fishing industry for inspection and grading of fishery products.

Figure 5 shows the available funds to carry out the Bureau's program for each year from 1957 to 1963.

Physical Property

Field laboratories and stations, vessels, and installations on the Pribilof Islands are the principal properties of the Bureau (app. G). In the calendar year 1963 there were 27 large laboratories and installations, 76 smaller stations and offices, and 30 vessels of 40 feet and longer. Figures 6, 7, and 8 show the Bureau's principal fishery biological research laboratories, and figure 9 the principal exploratory fishing and gear research and technological laboratories.

Construction of the *Townsend Cromwell* was completed at a cost of $1,049,935, exclusive of scientific equipment to be installed. This vessel will be used in the Central Pacific and is based at Honolulu, Hawaii. Its operation will be in connection with the Bureau's Biological Laboratory at Honolulu for the purpose of making general oceanographic surveys and studies on the movement and abundance of tunas and related species. The Bureau's principal fishery research vessels are shown in figures 10 and 11.

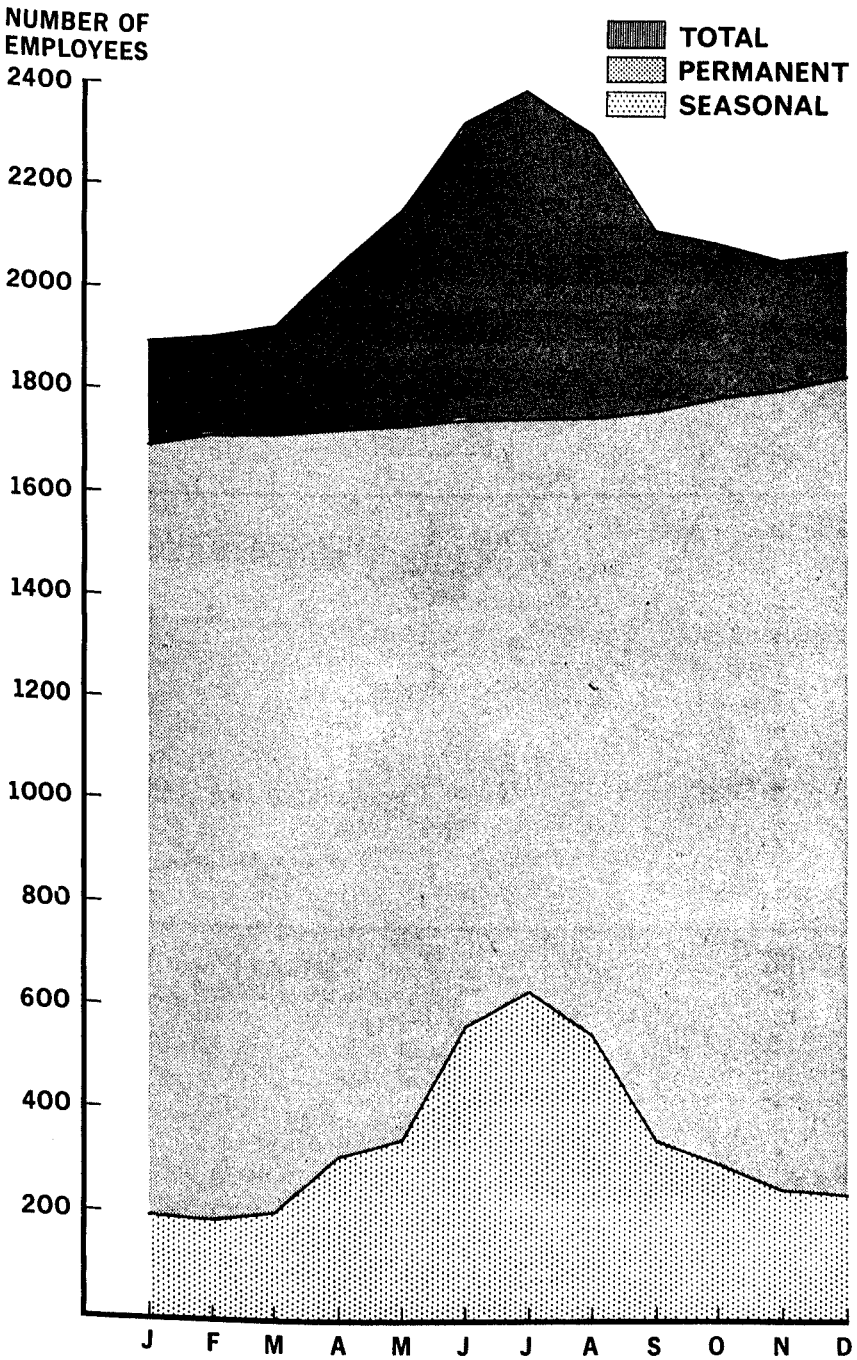

FIGURE 3.—Bureau of Commercial Fisheries employment totals by month, calendar year 1963.

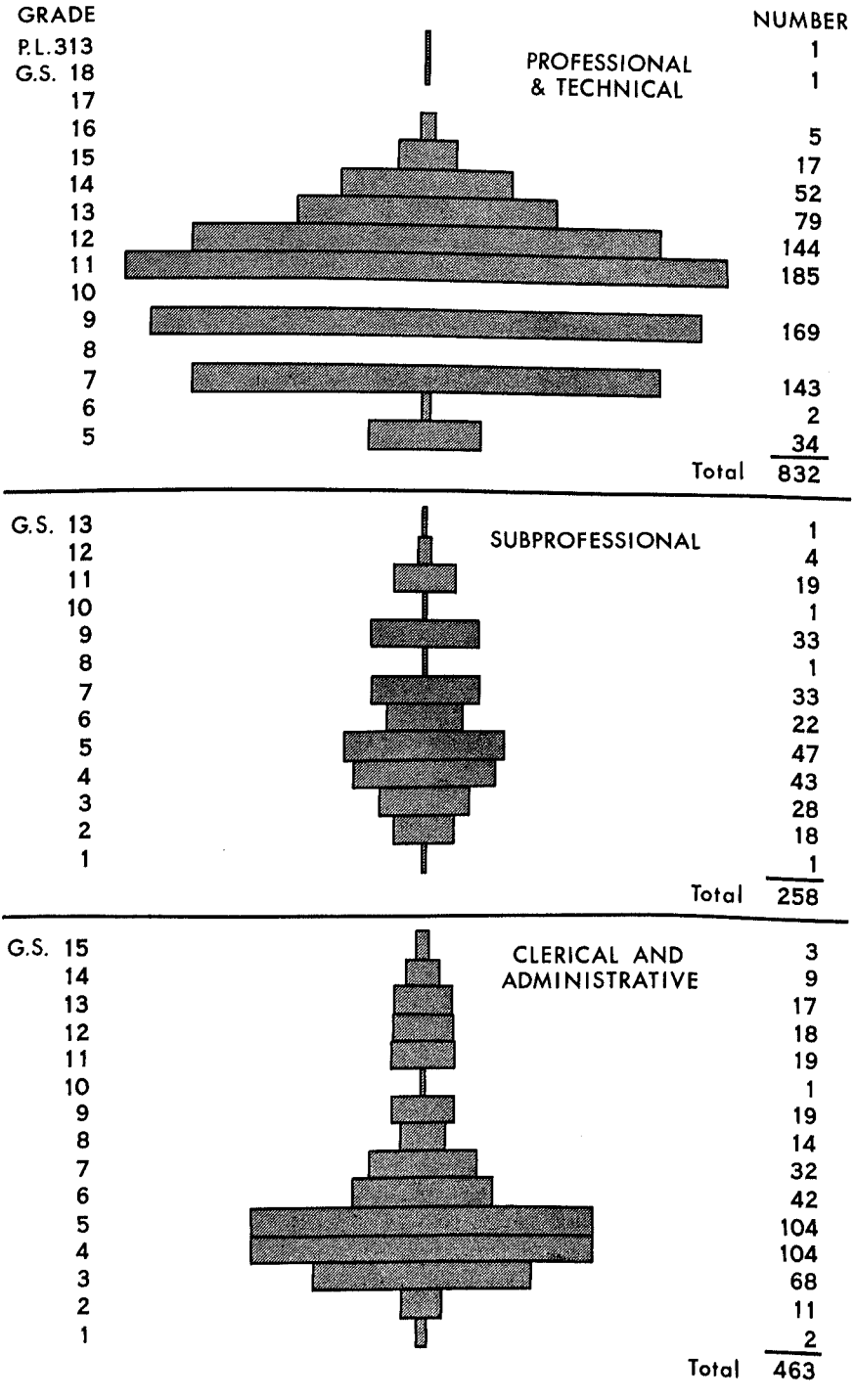

FIGURE 4.—Distribution by grade of professional and technical, subprofessional, and clerical and administrative employees, Bureau of Commercial Fisheries, October 31, 1963.

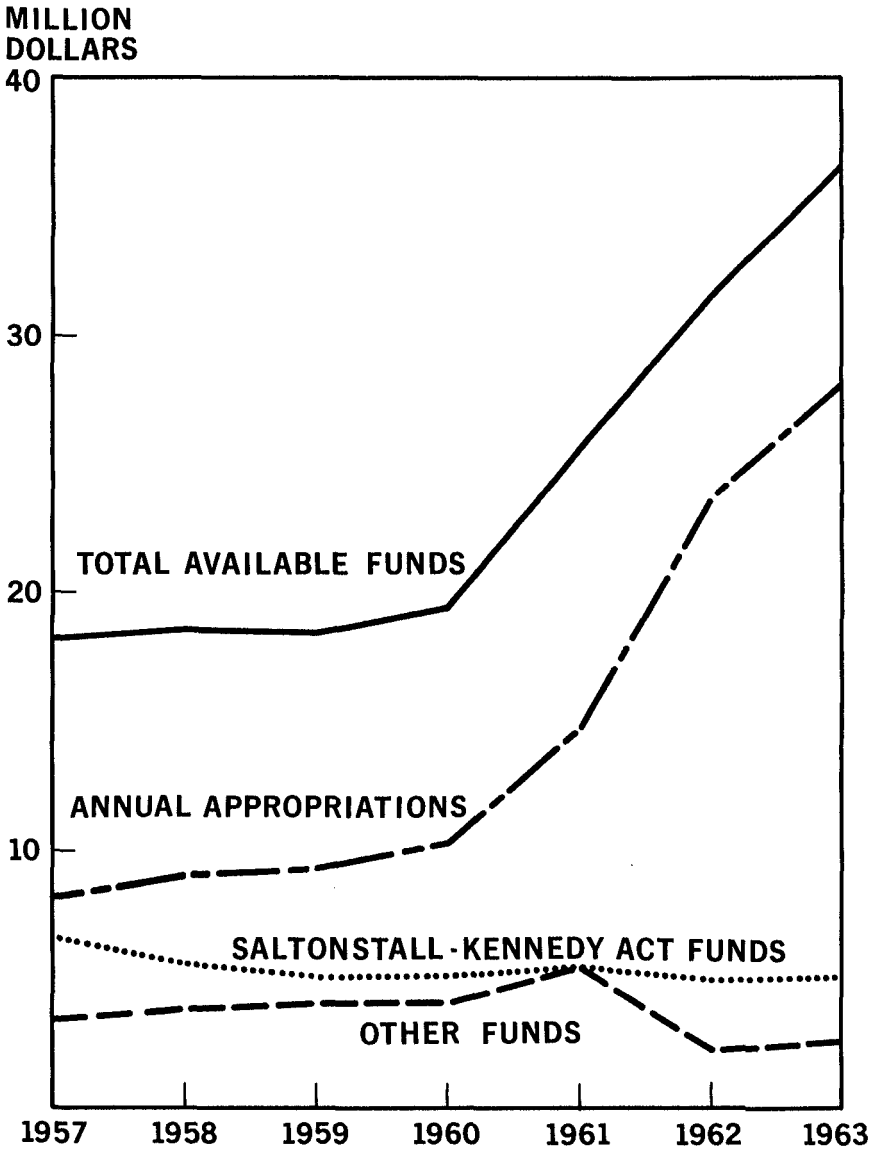

FIGURE 5.—Funds available to the Bureau of Commercial Fisheries, fiscal years 1957–63.

In the calendar year 1963 replacements and improvements of Bureau facilities were continued; construction and design contracts were awarded.

Two construction contracts were awarded for new research laboratories at La Jolla, Calif., and Seattle, Wash., at a cost of $2,200,000 and $1,851,000, respectively. The laboratory at La Jolla will be located on the campus of Scripps Institution of Oceanography. Both laboratories will constitute major fishery-oceanographic research centers under the National Oceanographic Program, the laboratory at La Jolla for the eastern Pacific Ocean and the laboratory at Seattle for the North Pacific Ocean.

The vessel *David Starr Jordan* was contracted for at a cost of $1,747,876 in June 1963. This vessel is to replace the *Black Douglas* and will be used for oceanographic research in the eastern Pacific in conjunction with the laboratory at La Jolla.

Plans were under way for the award of contracts for the construction of laboratories at Ann Arbor, Mich., and Beaufort, N.C., and for the replacement of the vessel *Delaware*.

Several contracts for the design of vessels were given. One was awarded in February 1963 for a vessel to operate in the North Pacific and Bering Sea area. This vessel will provide all-season high seas fishery and oceanographic research in conjunction with the Seattle laboratory. A design contract for a vessel to be based at the Bureau's Biological Laboratory at Galveston, Tex., was awarded in June 1963. This vessel is planned for inshore oceanographic research on the occurrence of red tide and the movements and survival of young fishes, shrimp, and other marine species.

Improvements or additions to existing installations were both made and planned. The shop and garage building were completed at Boothbay Harbor, Maine. At Oxford, Md., salt-water ponds, sea-water systems, a boat basin, and service building were contracted for in June 1963 at a cost of about $136,000. The Oxford facilities are for research on diseases of marine animals including oysters. The design for rehabilitation of the lighthouse and dock at St. Simons Island, Ga., was completed in January 1963, however, construction was delayed pending the clearing of title to the property. Construction on the Auke Bay, Alaska, dock facilities and salt-water system for the Biological Laboratory was begun in December 1962. The site for the Shellfish Research Center at Milford, Conn., was authorized for purchase for $160,000.

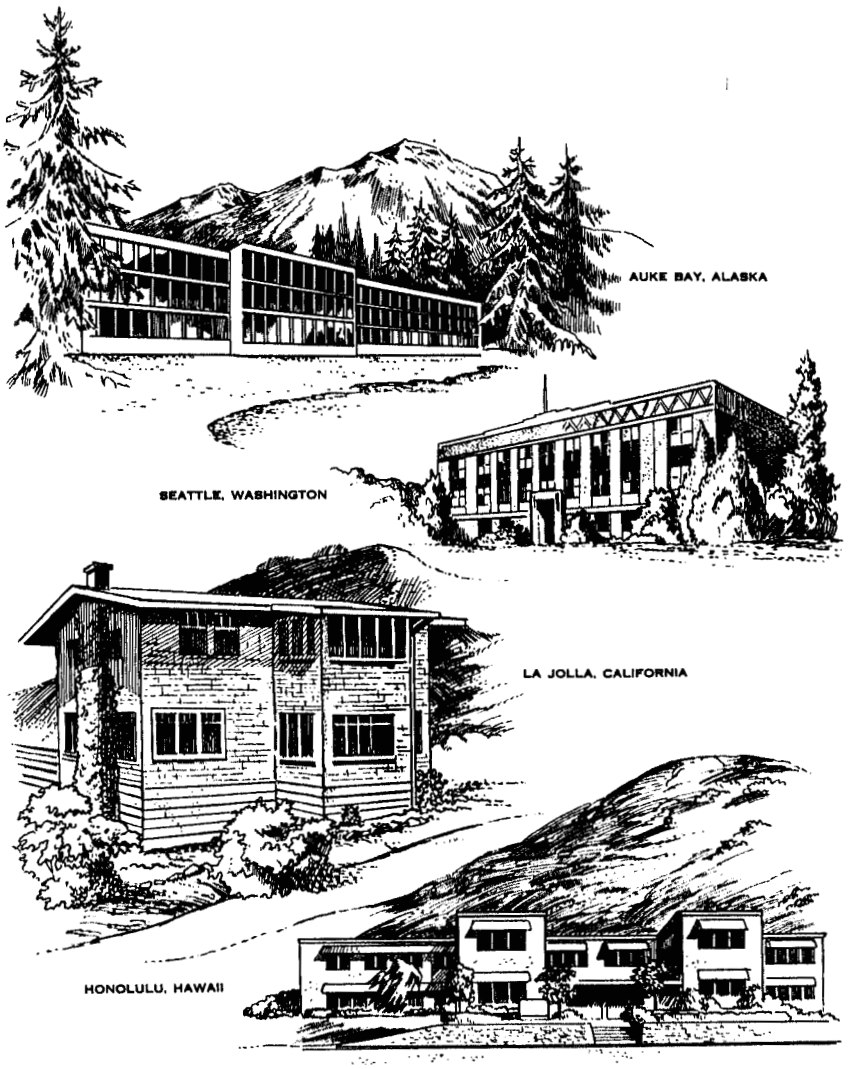

FIGURE 6.—Bureau of Commercial Fisheries biological laboratories, Pacific, 1963.

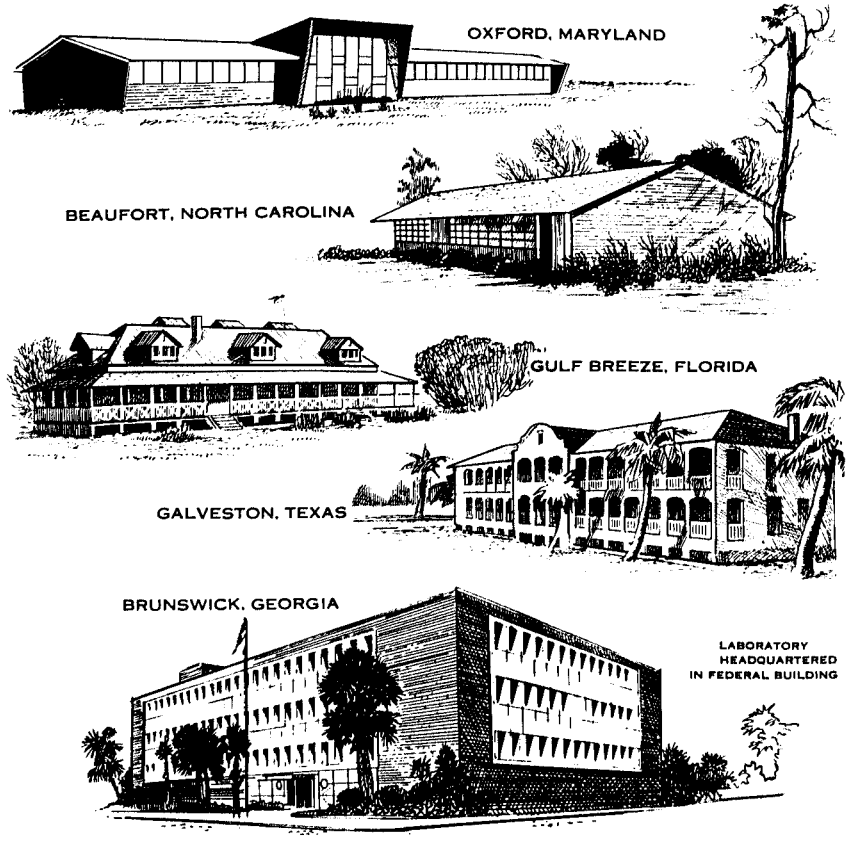

FIGURE 7.—Bureau of Commercial Fisheries biological laboratories, Middle and South Atlantic and Gulf Coast, 1963.

FIGURE 8.—Bureau of Commercial Fisheries biological laboratories, North Atlantic and Great Lakes, 1963.

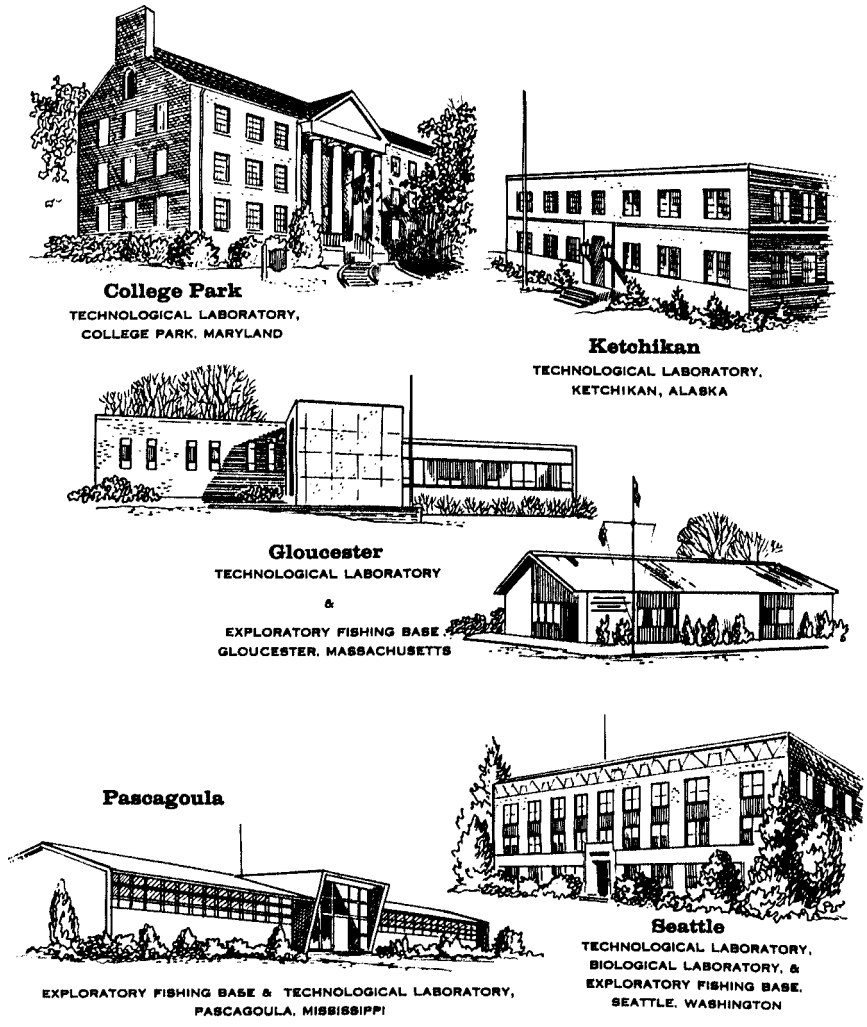

FIGURE 9.—Bureau of Commercial Fisheries exploratory fishing and gear research and technological laboratories, 1963.

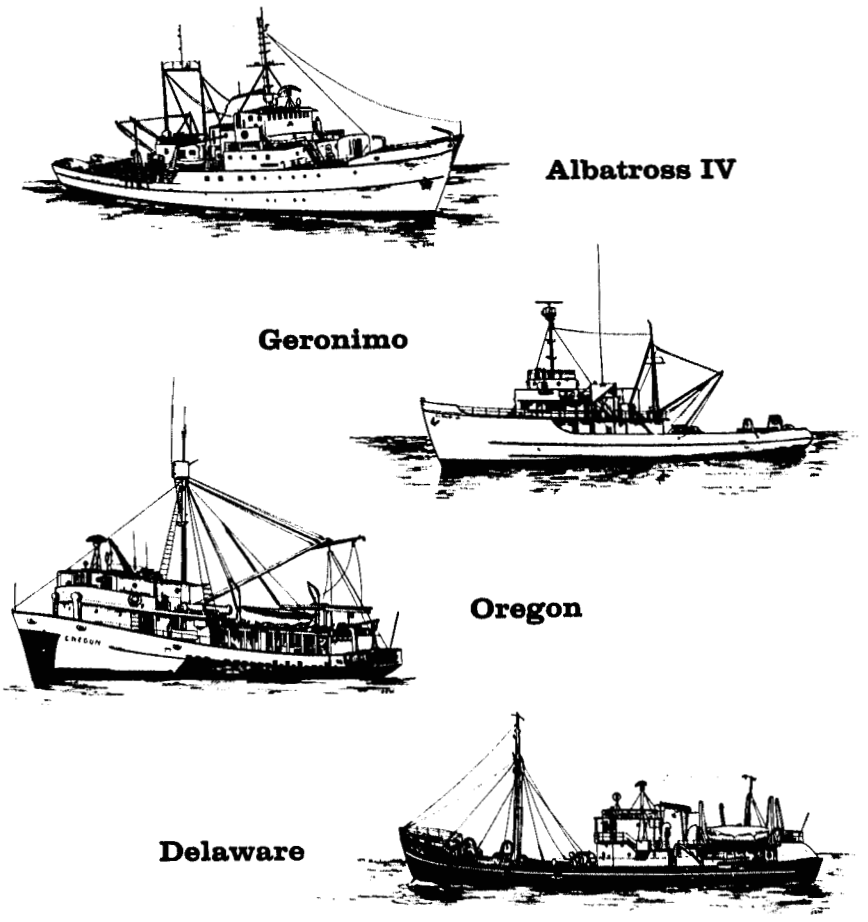

FIGURE 10.—Bureau of Commercial Fisheries principal research vessels operating in the Atlantic in 1963.

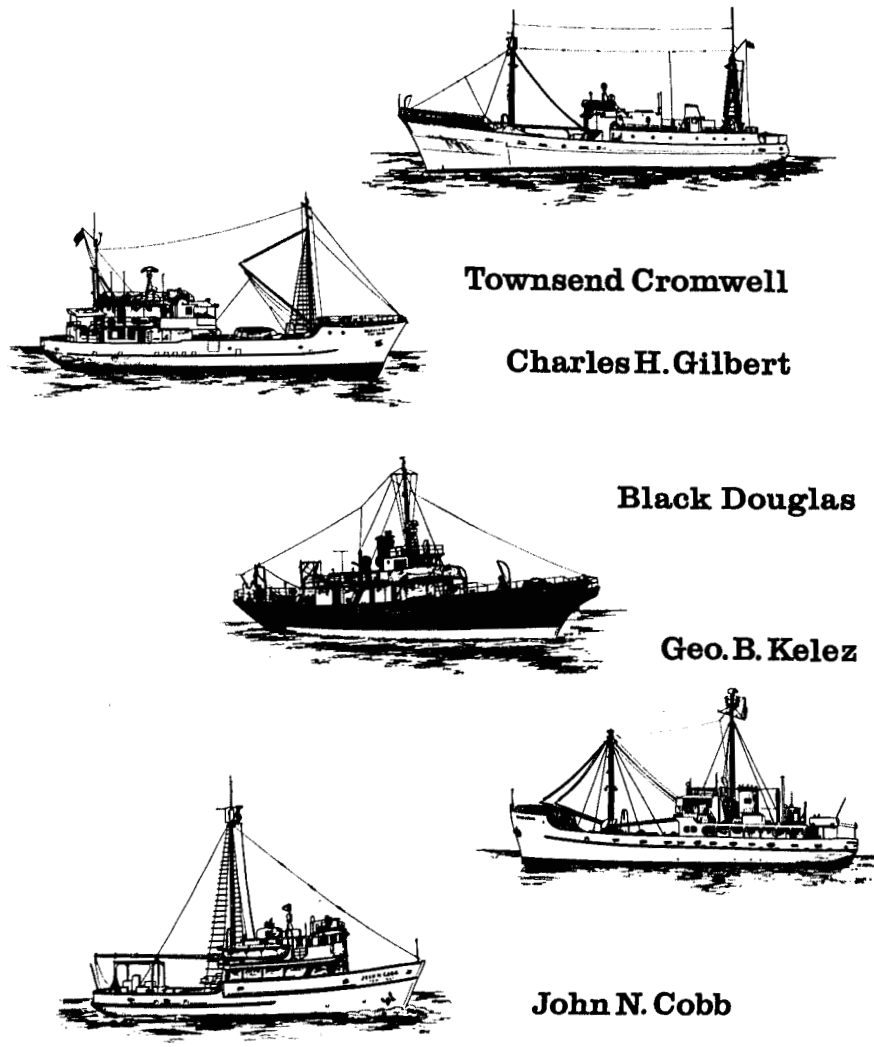

FIGURE 11.—Bureau of Commercial Fisheries principal research vessels operating in the Pacific in 1963.

Publications

Publications are the principal means by which the Bureau informs the fishing industry and general public of continuing progress in its biological, chemical, economic, engineering, marketing, and statistical activities.

Since the activities of the Bureau are many and varied, its publications appeal to several groups of readers. Fifty-one percent of the papers deal with statistics and, therefore, are of special interest to the fishing industry and fishery research workers; 12 percent are for commercial and industrial audiences; 32 percent are contributions to scientific knowledge, particularly relating to fisheries; and the remaining 5 percent present popular information for the general public, especially school children.

Exclusive of the Fishery Products Reports (6,009 pp.), which the 7 Market News Service field offices issued 5 times a week, the Bureau sponsored 867 publications (12,611 pp.) in 1963. In the Fish and Wildlife Service series, 573 reports (9,007 pp.) were published. The remaining 294 papers (3,604 pp.) appear in non-Service technical and trade journals. Bureau employees wrote most of the papers; employees of research institutions under contract to the Bureau and unpaid collaborators wrote the others.

One 16 mm. sound, color, motion picture was produced in 1963.

Appendix H of this report describes the Bureau's series of publications and partially lists the publications issued in 1963.

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Appendix A—Fisheries of the United States

A-1.—*Employment, fishing craft, and establishments, calendar years 1963 and 1962*

	1963	1962
Persons employed:		
Direct:		
Fishermen	*Number* 128,470	*Number* 126,333
Shoreworkers	87,252	90,903
Indirect:		
Allied industries (gear manufacture, boat building, processing equipment, etc.)	315,000	310,000
Total	530,722	527,326
Craft utilized:		
Fishing:		
Vessels (5-net tons and over)	11,928	11,511
Motor boats	62,090	59,406
Other boats	3,955	4,816
Total	77,973	75,733
Fishing vessels, documentations issued and canceled:		
First documentation	569	352
Redocumentation	21	16
Documents canceled	−396	−365
Net gain	194	3
Fishery shore establishments:		
Pacific Coast States	593	583
Atlantic Coast and Gulf States	2,918	2,897
Great Lakes and Mississippi River States	667	636
Hawaii	16	19
Total	4,194	4,135

A-2.—*U.S. catch of certain species, calendar years 1963, 1962, and record year*

Species	1963		1962		Record catch	
	Million pounds	*Million dollars*	*Million pounds*	*Million dollars*	*Year*	*Million pounds*
Menhaden	1,816	22	2,348	26	1962	2,348
Tuna [1]	322	40	312	45	1950	391
Salmon	294	49	315	56	1936	791
Crabs	252	21	234	19	1963	247
Shrimp	240	70	191	73	1954	268
Herring, sea	194	2	191	3	1937	317
Flounders, Atlantic	125	12	104	11	1963	125
Haddock	124	12	134	11	1929	294
Ocean perch, Atlantic	108	5	124	5	1951	258
Jack mackerel	96	2	90	2	1952	147
Whiting	93	2	105	2	1957	133
Clams	63	14	54	12	1963	61
Oysters	58	27	56	29	1908 [2]	152
Mullet	43	2	43	3	1902	43
Cod, Atlantic	42	3	47	3	1880	294
Scup	42	3	46	3	1960	49
Halibut, Pacific	46	7	54	12	1915	67
Mackerel, Pacific	40	1	49	1	1935	147
Lobsters, northern	30	17	29	15	1960	31
Scallops, sea	20	9	25	10	1961	27
Pollock	15	1	16	1	1938	41
Snapper, red	13	4	13	3	1902	23
Striped bass	9	1	9	1	1961	9
Sardine, Pacific	7	[3]	15	[3]	1936	1,502
Other	755	51	750	50	----------	----------
Total	4,847	377	5,354	396	1962	5,354

[1] Does not include landings of tuna by U.S. vessels in Puerto Rico.
[2] First year in which an oyster survey was made in all areas.
[3] Less than $500,000.

A–3.—*Summary of manufactured fishery products, by quantity and value, calendar years, 1963 and 1962*

Item	1963		1962	
	Quantity	Value	Quantity	Value
Packaged products, fresh and frozen:				
Fish:				
Not breaded:				
Fillets and steaks, raw:	*Thousand pounds*	*Thousand dollars*	*Thousand pounds*	*Thousand dollars*
Flounders	45,894	16,426	38,198	14,097
Groundfish, including ocean perch	83,419	26,408	93,625	28,302
Halibut	9,192	4,647	10,386	6,087
Other (including whale meat for animal feeding)	34,123	12,055	36,739	12,386
Total	172,628	59,536	178,948	60,872
Breaded, raw and cooked:				
Sticks	79,300	31,589	72,217	30,076
Fillets, portions and steaks	95,448	34,483	77,488	27,641
Shellfish:				
Not breaded:				
Shrimp	96,020	81,299	77,959	79,229
Other	98,358	79,814	105,357	79,209
Total	194,378	161,116	183,316	158,438
Breaded:				
Shrimp	74,900	52,493	76,803	62,230
Other	16,423	13,358	19,820	14,258
Total	91,323	65,851	96,623	76,488
Specialties, fish and shellfish	35,992	22,423	38,729	26,019
Total fresh and frozen	669,069	374,998	647,321	379,534
Canned:				
Fish and shellfish for human consumption:				
Tuna	326,712	201,588	335,506	209,821
Salmon	158,153	87,963	182,435	106,712
Sardines:				
Maine (sea herring)	37,890	13,244	50,248	20,077
Pacific	2,568	685	6,168	1,300
Mackerel	57,395	7,603	54,917	7,560
Clam products and specialties	62,660	19,000	56,412	17,944
Shrimp and specialties	16,328	19,733	13,513	19,145
Oysters and specialties	14,483	8,108	12,282	6,975
Squid	7,167	621	7,094	632
Other	45,581	22,784	38,727	20,017
Total for human consumption	728,937	381,329	757,302	410,183
Bait and animal food:				
Animal food	306,189	39,042	375,685	45,866
Salmon eggs for bait	783	1,236	723	817
Total bait and animal food	306,972	40,278	376,408	46,683
Total canned	1,035,909	421,607	1,133,710	456,866
Cured fish and shellfish:				
Salted	41,020	21,075	30,763	12,334
Smoked	26,182	25,139	33,111	33,505
Dried fish and shellfish, and lute fisk	[1] 1,612	2,039	1,106	908
Total cured	68,814	48,253	64,980	46,747
Industrial products:				
Meal and scrap	511,814	30,235	624,518	35,573
Oil, body and liver	185,827	10,853	250,002	11,002
Fish solubles and homogenized condensed fish	214,804	6,753	249,298	6,035
Oyster shell lime and poultry grit	797,166	5,480	871,312	5,889
Marine pearl shell and mussel shell buttons	[2] 781	1,521	[2] 1,741	2,668
Other	----------	13,759	----------	13,911
Total industrial products	----------	68,601	----------	75,678
Grand total	----------	913,459	----------	958,825

[1] Includes freeze-dried products.
[2] Number of gross.

A–4.—*Foreign trade in fishery products, by quantity and value, calendar years 1963 and 1962*

Item	1963		1962	
	Quantity	Value	Quantity	Value
Imports:				
Edible:	*Thousand pounds*	*Thousand dollars*	*Thousand pounds*	*Thousand dollars*
Fresh or frozen:				
Fresh-water (not fillets)	37,329	12,986	41,000	13,938
Salt-water (not fillets)	354,184	55,422	413,050	68,707
Groundfish and ocean perch fillets	231,768	50,328	221,420	46,937
Other fillets	68,869	23,772	76,443	26,127
Shrimp	150,138	101,911	141,183	91,898
Lobsters:				
Common	21,847	16,259	22,101	15,000
Spiny	34,048	38,214	35,947	42,182
Scallops	13,342	6,306	11,563	4,993
Other shellfish	14,241	4,664	6,891	3,675
Canned:				
Anchovies	4,171	2,529	4,940	2,573
Bonito and yellowtail	5,865	1,617	8,727	2,325
Salmon	1,250	607	6,843	3,436
Sardines	41,548	12,994	52,945	16,291
Tuna	57,494	23,864	56,719	22,884
Crabmeat	5,296	6,370	3,505	4,701
Lobsters	2,643	4,818	3,309	5,811
Oysters and oyster juice	8,463	3,101	7,830	2,810
Other	25,776	12,195	28,481	11,169
Cured:				
Dried, pickled, or salted:				
Cod, haddock, hake, pollock, and cusk	43,920	9,457	44,822	9,222
Herring	25,501	3,589	25,860	3,625
Other	2,878	922	3,315	895
Smoked or kippered	4,172	1,022	4,132	1,032
Other	5,655	1,599	1,810	651
Total edible	1,160,398	394,546	1,222,836	400,882
Nonedible:				
Fish and marine animal oils	[1] 10,791	8,160	[1] 11,257	8,730
Fish meal and scrap	[2] 376	37,039	[2] 252	24,298
Fish solubles	[2] 7	494	[2] 6	425
Other		50,469		50,522
Total nonedible		96,162		83,975
Grand total imports		490,708		484,857
Exports of domestic products:				
Edible:				
Fresh or frozen	30,261	13,636	20,822	6,373
Canned:				
Mackerel	4,940	681	4,272	671
Salmon	10,228	8,239	8,978	7,292
Sardines	3,639	716	7,766	1,503
Shrimp	3,199	3,054	2,212	2,572
Squid	8,048	742	7,785	729
Other	2,609	2,010	3,023	2,200
Total canned	32,663	15,442	34,036	14,967
Cured	963	711	1,022	718
Other	858	587	650	412
Total edible	64,745	30,376	56,530	22,470
Nonedible:				
Fish and marine animal oils	262,342	15,636	123,050	6,047
Other		10,593		7,211
Total nonedible		26,229		13,258
Grand total exports		56,605		35,728

[1] In thousand gallons.
[2] In thousand tons.

Appendix B—New Legislation

Act of September 24, 1963

33 U.S.C., 1958 Ed., Supp. V, 1051–1094

Authorizes the President to proclaim regulations for preventing collisions at sea. Certain parts of the regulations pertain to fishing vessels.

77 Stat. 194; Public Law 88–131; Act of September 24, 1963.

Foreign Assistance Act of 1963

7 U.S.C., 1958 Ed., Supp. V, 1706

Amends section 106 of the Agricultural Trade Development and Assistance Act of 1954 by including under certain conditions "any domestically produced fishery product" under the term "surplus agricultural commodity" for the purposes of title I and title IV.

68 Stat. 457; Public Law 480, 83d Cong.; sec. 106; Act of July 10, 1954.
77 Stat. 390; Public Law 88–205; sec. 403(c) (1) (2); Act of December 16, 1963.

Appendix C—Fisheries Loan Fund

C–1.—*Status of fisheries loan fund, June 30, 1963*

Funds appropriated		$13,000,000
Principal collected	$6,750,000	
Interest collected and accrued	1,458,000	
Total collected		8,208,000
Total		21,208,000
All expenses to end of fiscal year 1963	1,379,881	
Loans approved	13,403,502	
Total		14,783,383
Balance		6,424,617

C–2.—*Cumulative totals, fiscal years 1962 and 1963, and totals, fiscal year 1963*

	Cumulative total				Total fiscal year 1963	
	As of June 30, 1962		As of June 30, 1963			
	Number	*Amount*	*Number*	*Amount*	*Number*	*Amount*
Applications received	1169	$33,008,423	1268	$34,599,601	99	$1,591,178
Applications approved	618	14,646,311	673	15,472,951	55	826,640
Applications declined	309	7,960,558	337	8,476,814	28	516,256
Applications ineligible	96	2,638,804	103	2,741,166	7	102,362
Being processed	23	407,011	8	303,544		

C–3.—*Cumulative totals, fiscal years 1962 and 1963, and totals, fiscal year 1963*

	Cumulative total				Total fiscal year 1963	
	As of June 30, 1962		As of June 30, 1963			
Northeast:	*Number*	*Amount*	*Number*	*Amount*	*Number*	*Amount*
Applications received	292	$9,603,141	315	$10,135,031	23	$531,890
Applications approved	153	4,320,824	165	4,499,337	12	178,513
California:						
Applications received	175	10,320,850	184	10,440,750	9	119,900
Applications approved	104	4,684,481	111	4,790,511	7	106,030
Gulf & South Atlantic:						
Applications received	299	7,547,516	314	7,949,568	15	402,052
Applications approved	114	2,604,804	122	2,823,874	8	219,070
Pacific Northwest:						
Applications received	204	3,626,821	223	3,854,802	19	227,981
Applications approved	126	2,058,080	138	2,216,702	12	158,622
Alaska:						
Applications received	146	1,183,000	174	1,441,591	28	258,591
Applications approved	97	718,834	110	845,739	13	126,905
Great Lakes:						
Applications received	32	369,525	34	384,789	2	15,264
Applications approved	9	60,420	11	89,920	2	29,500
Hawaii:						
Applications received	20	355,570	23	391,070	3	35,500
Applications approved	14	197,068	15	205,068	1	8,000
Puerto Rico:						
Applications received	1	2,000	1	2,000	0	0
Applications approved	1	1,800	1	1,800	0	0

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

(From beginning of program through fiscal year 1963)

	Debt payment	Improvements	Other
New England and Middle Atlantic	51	47	2
South Atlantic and Gulf	65	34	1
California	32	64	4
Pacific Northwest	38	61	1
Great Lakes	33	67	0
Alaska	24	75	1
Hawaii and Puerto Rico	46	50	4
Total	44	54	2

C–5.—*Number of loan applications received monthly, fiscal years 1957–63*

	1957	1958	1959	1960	1961	1962	1963
July	----------	17	9	15	8	19	6
August	----------	17	12	13	10	16	7
September	----------	14	10	9	7	16	11
October	----------	12	7	16	6	14	13
November	----------	18	13	9	19	26	7
December	88	11	13	15	21	14	8
January	16	14	10	16	18	29	5
February	41	18	12	27	26	19	12
March	40	22	15	28	13	19	11
April	22	22	14	13	18	16	12
May	28	11	10	19	31	9	2
June	30	9	12	10	7	11	5
Total	265	185	137	190	184	208	99

C–6.—*Amounts applied for monthly, fiscal years 1957–63*

	1957	1958	1959	1960	1961	1962	1963
July	----------	$274,524	$251,571	$830,182	$134,196	$532,305	$141,780
August	----------	931,110	363,000	234,465	275,972	297,614	223,021
September	----------	607,851	385,517	465,610	176,781	438,785	117,243
October	----------	204,635	62,532	305,150	195,095	145,443	132,107
November	----------	375,583	153,559	124,905	428,011	296,877	144,267
December	$2,533,020	160,670	331,502	198,161	425,076	182,876	275,415
January	377,485	520,323	153,501	344,197	203,752	907,519	68,100
February	1,458,748	305,318	115,000	554,425	665,798	195,612	111,670
March	2,563,703	862,325	185,069	698,063	692,766	390,959	119,470
April	629,131	336,888	189,871	226,542	426,453	321,438	102,661
May	2,276,774	642,025	185,869	1,003,874	877,990	86,911	23,000
June	948,437	224,652	291,980	343,372	216,160	262,927	132,444
Total	10,787,298	5,445,904	2,668,971	5,328,946	4,718,050	4,059,266	1,591,178

Appendix D—Year 1963 Membership, American Fisheries Advisory Committee

[Authorized by Act of July 1, 1954 (68 Stat. 376, as amended)]

Chairman: Frank P. Briggs, Assistant Secretary of the Interior

Ralph E. Carr, President
Mid-Central Fish Co.,
1656 Washington Street,
Kansas City, Mo.

Harold F. Cary, Asst. to President
Van Camp Sea Food Co.,
840 Van Camp Street,
Long Beach, Calif.

Chris Dahl
Kayler-Dahl Fish Co.,
Box 1092,
Petersburg, Alaska

George J. Davidson
Boat Service Corp.,
Room No. 1, Administration Building,
Fish Pier,
Boston 10, Mass.

J. Roy Duggan, Executive Vice President
King Shrimp Co., Inc.,
Brunswick, Ga.

Ammon G. Dunton
Dunton, McLeod & Simmons,
White Stone, Va.

Louis Fischer
Fischer Sea Foods,
Cocoa, Fla.

Ray H. Full, President
Kishman Fish Co.,
Vermilion, Ohio

H.R. Humphreys, Jr., President
Standard Products Co., Inc.,
White Stone, Va.

Leon S. Kenney, President
Pinellas Seafood Co.,
1533 Third Street, South,
Saint Petersburg 5, Fla.

E. Robert Kinney, President
Gorton's of Gloucester,
Gloucester, Mass.

Thomas D. McGinnes, President
Virginia Seafoods, Inc.,
Irvington, Va.

John S. McGowan, President
Bumble Bee Seafoods, Inc.,
Astoria, Oreg.

James McPhillips, Vice Chairman
Southern Industries Corp.,
Post Office Box 1685,
Mobile, Ala.

John Mehos
Liberty Fish & Oyster Co.,
Post Office Box 267,
Galveston, Tex.

Arthur H. Mendonca, President
F. E. Booth Co., Inc.,
3150 Third Street,
San Francisco 24, Calif.

Anthony Nizetich, Manager
Fishermen's Cooperative Association,
Fishermen's Wharf, Berth 73,
San Pedro, Calif.

Einar Pedersen
8801 Golden Gardens Drive NW.,
Seattle, Wash.

Roy Prewitt
Lonoke, Ark.

Daniel H. Smith
Smith Brothers of Port Washington,
100 North Franklin Street,
Port Washington, Wis.

Robert D. Balkovic, Executive Secretary
Bureau of Commercial Fisheries

Appendix E—Organizations With Which the Bureau Had Research and Development Contracts and Grants in 1963

Organization	*Location*
Alaska Department of Fish and Game	Juneau, Alaska
Alaska, University of	College, Alaska
Artisan Industries	Waltham, Mass.
American Scientific Corp	Alexandria, Va.
Battelle Memorial Institute	Columbus, Ohio
Boston University	Boston, Mass.
Bowdoin College	Brunswick, Maine
California Department of Fish and Game	Sacramento, Calif.
California Marine Research Committee	Sacramento, Calif.
Colorado State University	Fort Collins, Colo.
Delaware, University of	Newark, Del.
Duke University	Durham, N.C.
Fish Commission of Oregon	Portand, Oreg.
Florida, University of	Gainesville, Fla.
Gulf Coast Research Laboratory	Ocean Springs, Miss.
Harvard University	Cambridge, Mass.
Hawaii, University of	Honolulu, Hawaii
Iowa State University	Ames, Iowa
Johns Hopkins University	Baltimore, Md.
Louisiana, University of Southwestern	Lafayette, La.
Maryland, University of	College Park, Md.
Massachusetts Institute of Technology	Cambridge, Mass.
Massachusetts, University of	Amherst, Mass.
Miami, University of	Miami, Fla.
Michigan State University	East Lansing, Mich.
Michigan, University of	Ann Arbor, Mich.
Minnesota, University of	Minneapolis, Minn.
National Academy of Sciences	Washington, D.C.
National Fisheries Institute	Washington, D.C.
New York University	Bronx, N.Y.
North Carolina State University	Raleigh, N.C.
Oregon State University	Corvallis, Oreg.
Oyster Institute of North America	Port Norris, N.J.
Pennsylvania Fish Commission	Harrisburg, Pa.
Pennsylvania State University	University Park, Pa.
Pennsylvania, University of	Philadelphia, Pa.
Philadelphia General Hospital	Philadelphia, Pa.
Puerto Rico, University of	Mayaguez, P.R.
Rhode Island, University of	Kingston, R.I.
Rutgers University	New Brunswick, N.J.
San Jose State College	San Jose, Calif.
Scripps Institution of Oceanography	La Jolla, Calif.
Smithsonian Institute	Washington, D.C.
Stanford University	Stanford, Calif.

Texas A. & M. Research Foundation	College Station, Tex.
Texas, University of	Austin, Tex.
Virginia Polytechnic Institute	Blacksburg, Va.
Washington State Department of Fisheries	Olympia, Wash.
Washington, University of	Seattle, Wash.
Washington, University of (Fisheries Research Institute).	Seattle, Wash.
Wisconsin, University of	Madison, Wis.
Woods Hole Oceanographic Institution	Woods Hole, Mass.

Appendix F—Budget for Fiscal Year 1963

Function	Appropriations								Contributed funds	Reimbursements	Total
	Management and investigations of resources	Special foreign currency	Construction	Construction of fishing vessels	General administrative expenses	Administration of Pribilof Islands	Payment to Alaska from Pribilof Islands receipts	Promote and develop fisheries [1]			
Management	$384,000								$1,000	$8,000	$393,000
Marketing and technology	3,685,000	$125,000						$1,989,000	494,000	409,000	6,702,000
Research	8,170,000	175,000						2,470,000	741,000	664,000	12,220,000
Research on fish migration over dams	1,489,000							249,000		143,000	1,881,000
Fishing vessel mortgage insurance	51,000										51,000
Columbia River fishery facilities	2,104,000		$1,626,000						2,000	2,000	3,734,000
Construction of fishery facilities			6,847,000								6,847,000
Construction of fishing vessels				$750,000							750,000
General administrative services					$622,000			377,000	36,000	24,000	1,059,000
Administration of Pribilof Islands						$1,765,000				30,000	1,795,000
Fur seal research						252,000					252,000
Payment to Alaska from Pribilof Islands receipts							$703,000				703,000
Fisheries Advisory Committee								35,000			35,000
Total	15,883,000	300,000	8,473,000	750,000	622,000	2,017,000	703,000	5,120,000	[3] 1,274,000	[3] 1,280,000	36,422,000

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

[2] Includes $675,000 from Great Lakes Fishery Commission and $456,000 for inspection and grading fishery products.

[3] Reimbursements include funds from the following: $40,000 PHS; $68,000 CIA; $94,000 AID; $143,000 Corps of Engineers; $380,000 Bureau of Sport Fisheries and Wildlife; $430,000 AEC.

Appendix G—Physical Properties

G–1.—*Principal laboratories and installations, calendar year 1963*

Location	Type	Principal use	Gross valuation [1]
Alaska:			
Auke Bay	Biological Laboratory	Biological research	$436,000
Juneau	Exploratory Fishing and Gear Research Base, warehouse and shops.	Exploratory fishing and gear research, vessel maintenance, loans and grants.	[2] 145,000
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:			
La Jolla	Biological Laboratory	Biological research	([3])
San Diego	do	do	([3])
Stanford	do	do	([3])
Connecticut, Milford	do	do	92,000
District of Columbia:			
Navy Yard Annex	do	do	([3])
U.S. National Museum	Ichthyological Laboratory	do	([3])
Florida:			
Gulf Breeze	Biological Laboratory	do	62,000
St. Petersburg Beach	Office of Loans and Grants	Loans and grants	([3])
Georgia, Brunswick	Biological Laboratory	Biological research	([3])
Hawaii, Honolulu	do	Biological research, loans and grants, statistics.	315,000
Maine, Boothbay Harbor	do	Biological research	[2] 211,000
Maryland:			
College Park	Technological Laboratory	Technological research, home economics.	84,000
Oxford	Biological Laboratory	Biological research, statistics.	207,000
Massachusetts:			
Boston	Office of Loans and Grants	Loans and grants	([3])
Gloucester	Technological Laboratory	Technological research, fishery products inspection.	334,000
Do	Exploratory Fishing and Gear Research Base.	Exploratory fishing and gear research.	65,000
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, marketing development, statistics.	([3])
Mississippi, Pascagoula	Exploratory Fishing and Gear Research Base, Technological Laboratory.	Exploratory fishing and gear research, market development, biological and technological research.	370,000
North Carolina, Beaufort	Biological Laboratory	Biological research, statistics	201,000
Texas, Galveston	do	Biological research	351,000
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.	[2] 142,000
Puerto Rico, Mayaguez	Technological Laboratory	On loan to University of Puerto Rico.	

[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 1963*

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	$44,000
Juneau	Statistical Field Office	Statistics	(3)
Karluk Lake	Field Research Station	Biological research	27,000
Kasitsna Bay	do	do	12,000
Little Port Walter	do	do	158,000
Olsen Bay	do	do	7,000
St. Paul Island	do	do	
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)
Tiburon	Field Research Station	Biological research	(2)
Florida:			
Apalachicola	Statistical and Market News Field Office.	Statistics and market news reporting.	(2)
Fort Myers	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.	Biological research, fishery products inspection, marketing.	
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)
Idaho:			
Boise	Field Research Station	Biological research	(2)
Weiser	do	do	(2)
Illinois:			
Chicago	Market News Office, Fishery Products Inspection Office.	Market news reporting, fishery products inspection.	(2)
Do	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.	do	(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)
Salisbury	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.	
New Bedford	Field Office	Statistics, biological research, market news reporting.	(2)
Provincetown	Statistical Field Office	Statistics, market news reporting.	(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 1963*—Continued

Location	Type	Principal use	Gross valuation [1]
Michigan:			
Hammond Bay	Field Research Station	Biological research	[2]
Ludington	do	do	[2]
Marquette	do	do	[2]
Northville	do	do	
Mississippi:			
Ocean Springs	Statistical Field Office	Statistics and market news reporting.	[2]
Pascagoula	Field Research Station	Biological research, marketing.	[2]
Missouri, St. Louis	Marketing Office	Marketing	[2]
New Jersey, Toms River	Statistical Field Office	Statistics	[2]
New York:			
Bayport	do	do	[2]
New York City	Marketing News Office, Marketing, Fishery Products Inspection Office.	Market news reporting, marketing, fishery products inspection.	[2]
Ohio:			
Cleveland	Marketing Office	Marketing	[2]
Sandusky	Field Research Station	Biological research	[2]
Oregon:			
Eugene	do	do	[2]
Portland	do	do	[2]
Rhode Island:			
Point Judith	Field Station	Statistics, biological research	[2]
Warren	Statistical Field Office	Statistics	[2]
South Carolina, Charleston	do	do	[2]
Texas:			
Aransas Pass	Market News and Statistical Field Office.	Statistics and market news	[2]
Brownsville	Market News and Statistical Field Office, Fishery Products Inspection Office.	Statistics and market news, fishery products inspection.	[2]
Dallas	Marketing Office	Marketing	[2]
Freeport	Statistical Field Office	Statistics	[2]
Galveston	Market News and Statistical Field Office.	Statistics and market news	[2]
Port Arthur	do	do	[2]
Port Isabel	do	do	[2]
Virginia:			
Franklin City	Field Research Station	Biological research	[2]
Hampton	Market News Office	Market news reporting	[2]
Portsmouth	Statistical Field Office	Statistics	[2]
Weems	do	do	[2]
Washington:			
North Bonneville	Field Research Station	Biological research	[2]
Seattle	Market News and Statistical Office.	Market news reporting, statistics, loans and grants.	[2]
Do	Marketing Office	Marketing	[2]
Wisconsin:			
Ashland	Field Research Station	Biological research	[2]
La Crosse	Statistical Field Office	Statistics	[2]

[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 Commercial Fisheries vessel fleet, calendar year 1963*

Name of vessel	Home port	Length (feet)	Year built	Cost	Horsepower	Mission
FSR-791 [1]	Seattle, Wash.	222	1954	$2,200,000	1,500	On loan from Army to transport supplies and personnel to the Pribilof Islands fur seal stations.
Albatross IV	Woods Hole, Mass.	187	1962	2,000,000	1,100	Fishery and biological research studies; oceanographic studies in Atlantic waters.
Geo. B. Kelez	Seattle, Wash.	176	1944	805,000	1,000	High-seas salmon investigation and oceanography.
Townsend Cromwell.	Honolulu, Hawaii.	158	1963	1,049,935	800	Pacific oceanography; tuna biology, behavior and distribution.
Black Douglas	San Diego, Calif.	152	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.
Geronimo	Washington, D.C.	147	1944	----------	2,000	Fishery oceanographic 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	(2)	300,000	600	On loan to the California Department of Fish and Game.
John N. Cobb	Seattle, Wash.	93	1950	235,392	500	Exploratory fishing for pelagic and bottom fish, shrimp and crabs; gear research.
Murre II	Juneau, Alaska	86	1943	64,000	115	Oceanographic studies in coastal waters of southeastern Alaska with limited use for servicing shore facilities.
John R. Manning	do.	86	1950	181,600	320	Bottom surveys for halibut; patrol work; observations on foreign fishing activities in Bering Sea.
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 sheepshead, gizzard shad and smelt.
Rorqual	Gloucester, Mass.	64	1941	187,000	230	Gear research and inshore exploration on herring and shellfish.
T–19	South Carolina	64	1942	187,000	--------	On loan to State of South Carolina.
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.

See footnotes at end of table.

G-3.—*Bureau of Commercial Fisheries vessel fleet, calendar year 1963*—Con.

Name of vessel	Home port	Length (feet)	Year built	Cost	Horsepower	Mission
Siscowet	Ashland, Wisc.	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.
Phalarope II	Boothbay Harbor, Maine.	40	1932	8,000	225	Clam and herring studies.
Sockeye	King Salmon, Alaska.	40	1946	11,250	175	Salmon research work.
J-1110	Beaufort, N.C.	40	1934	15,000	200	Research on shellfish, striped bass, and other coastal species; collection of samples for radiobiological studies.

[1] For replacement of Penguin II.
[2] Year vessel was built is unknown.

Appendix H—Fish and Wildlife Service Series and a 1963 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 on 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. Separates were issued as documents through volume 46; the last document was No. 1103. Beginning with volume 47 in 1931 and continuing through volume 62 in 1963, each separate appeared as a numbered bulletin. A new system began with volume 63 in which papers are bound together in a single issue of the bulletin instead of being issued individually. Fishery Bulletin 215 and volume 63, no. 1 (18 papers—315 p.) were issued in 1963. Some bulletins are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402; they are distributed free to libraries and to a limited number of scientific cooperators.

Fishery Industrial Research.—Technical reports dealing with scientific investigations of fishery technology, economics, exploratory fishing, and gear research. Volume 1, no. 1 and volume 2, no. 2 (7 papers—261 p.) were published in 1963. They are distributed free to libraries and to a limited number of scientific 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. Thirty-four of these reports (1,578 p.) were published in 1963. They are distributed free to libraries and cooperators on a limited mailing list.

Fishery Leaflet.—Popular information on fishery subjects intended primarily for use in correspondence. Seventeen leaflets (134 p.) were published during the year. They are distributed free on request.

Circular.—Popular and semitechnical publications of general and regional interest intended to aid conservation and management. Sixteen circulars (748 p.) were published in 1963. They are usually distributed to depository libraries.

Commercial Fisheries Abstracts.—A monthly abstract of world literature (chiefly English language) on fishery technology. Volume 16 in 1963 had 12 issues (359 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 25 in 1963 had 12 issues (1,539 p.) They are 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.

Statistical Digest.—Annual statistics with detailed tabulations relating to fishery production, manufacture, and commerce. These succeeded the Administrative Report series. One digest (462 p.) was published in 1963. Digests are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402; some are distributed free to 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 1963 there were 253 monthly landings reports (941 p.) for 19 States; 30 monthly reports of manufactured products (138 p.); and 40 annual reports of sectional and State operating units, catch statistics, manufactured products, and foreign trade (434 p.).

Fishery Products Report.—Daily (5 times a week), monthly, and annual data on landings, receipts, supplies, prices, imports, and movements of fish and fish products in local areas; market conditions; and fishery developments in the United States and foreign countries. Special Market News data reports also are issued sporadically. Seven Market News Service field offices prepare and mail these free reports. During 1963 the daily reports totaled 6,009 pages; the monthly and annual, 1,620 pages; and supplementary reporting, 99 pages.

Miscellaneous papers.—Nineteen miscellaneous papers, totaling 379 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 is *Watermen of Chesapeake.*

A detailed list of publications of the Bureau of Commercial Fisheries and its personnel or contractors or collaborators during 1963 follows. The articles are listed by authors.

Publications [1]

ABEGGLEN, CARL, ALTON Y. ROPPEL, AND DALE W. RICE.

Marine mammals. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 15, p. 209–216. Reinhold Publishing Corporation, New York.

ABEGGLEN, CARL E.

Review of *Whales*, by E. J. Slijper. Atlantic Naturalist, vol. 18, no. 2, p. 136.

AHLSTROM, ELBERT H., AND JAMES R. THRAILKILL.

Plankton volume loss with time of preservation. California Cooperative Oceanic Fisheries Investigations, Reports, vol. 9, July 1, 1960 to June 30, 1962, p. 57–73.

ALEXANDER, DEVORA R.

Estimated Federal income tax procedure for commercial fishermen: Questions and answers. U.S. Fish and Wildlife Service, Fishery Leaflet 552, 2 p.

ALLEN, DONALD M.

Shrimp farming. U.S. Fish and Wildlife Service, Fishery Leaflet 551, 8 p.

ALLEN, KEVIN J., AND EDWARD H. COHEN.

New whiting products tested at University of Massachusetts annual school-lunch conference. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 9, p. 1–4. [Also as Separate No. 685.]

ALVERSON, DAYTON L.

Characteristics of fishes. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 1, p. 3–12. Reinhold Publishing Corporation, New York.

Fishing gear and methods. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 4, p. 41–60. Reinhold Publishing Corporation, New York.

[1] This 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., AND MAURICE E. STANSBY.
The spiny dogfish (*Squalus acanthias*) in the northeastern Pacific. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 447, iii+25 p.

ALVERSON, DAYTON L., AND NORMAN J. WILIMOVSKY.
Fisheries of the future. New Scientist, vol. 18, no. 342, p. 536–538.

AMBROSE, MARY E., AND CHARLES F. LEE.
Accuracy of the official method for determining breading percentages of frozen raw breaded shrimp. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 6, p. 8–13. [Also as Separate No. 678.]

AMOS, MURRAY H., RAYMOND E. ANAS, AND ROGER E. PEARSON.
Use of a discriminant function in the morphological separation of Asian and North American races of pink salmon, *Oncorhynchus gorbuscha* (Walbaum). International North Pacific Fisheries Commission, Document 412–Rev. 1, Bulletin No. 11, p. 73–100.

ANDERSON, MARGARET L., FREDERICK J. KING, AND MAYNARD A. STEINBERG.
Effect of linolenic, linoleic, and oleic acids on measuring protein extractability from cod skeletal muscle with the solubility test. Journal of Food Science, vol. 28, no. 3, p. 286–288.

AUSTIN, THOMAS S.
International cooperation. AIBS Bulletin, vol. 13, no. 5, p. 46–48.

AYERS, ROBERT J., AND JAMES M. MEEHAN.
Catch locality, fishing effort, and length-frequency data for albacore tuna landed in Oregon, 1951–60. Fish Commission of Oregon, Investigational Report No. 2, vii+180 p.

BAILEY, MERRYLL M.
Age, growth, and maturity of round whitefish of the Apostle Islands and Isle Royale regions, Lake Superior. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 63–75.

BAKER, RALPH C., FORD WILKE, AND C. HOWARD BALTZO.
The northern fur seal. U.S. Fish and Wildlife Service, Circular 169, iii+19 p.

BALTZO, C. HOWARD.
Living and working conditions on the Pribilof Islands, Alaska. U.S. Fish and Wildlife Service, Fishery Leaflet 548, 5 p.

BARRY, E. J.
Gulf fisheries (selected areas)–1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, New Orleans Market News Service, 42 p.

BAXTER, KENNETH N.
Abundance of postlarval shrimp–one index of future shrimping success. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 79–87.

BEETON, ALFRED M.
Limnological survey of Lake Erie, 1959 and 1960. Great Lakes Fishery Commission, Technical Report No. 6, 32 p.

BEETON, ALFRED M., AND DAVID C. CHANDLER.
The St. Lawrence Great Lakes. *In* David G. Frey (editor). Limnology in North America, p. 535–558. University of Wisconsin Press, Madison.

BERRY, FREDERICK H.

Caranx fasciatus Cuvier, an unidentifiable name for a carangid, fish. Copeia, 1963, no. 3, p. 583–584.

BERRY, FREDERICK H., AND IZADORE BARRETT.

Gillraker analysis and speciation in the thread herring genus *Opisthonema*, Inter-American Tropical Tuna Commission, Bulletin, vol. 7, no. 2, p. 113–190.

BLACKBURN, MAURICE.

Distribution and abundance of tuna related to wind and ocean conditions in the Gulf of Tehuantepec, Mexico. Proceedings, of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1557–1582.

BLAHM, THEODORE H.

A detector of fish activity. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 1, p. 54–55.

Passage of salmon fingerlings through small tunnels. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 302–303.

BONNER, RUPERT R., JR.

A method of transporting striped bass. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 4, p. 217.

BOYAR, H. C.

Scales and earstones reveal age of Atlantic herring. Maine Field Naturalist, vol. 19, no. 3, p. 40–41.

BROCK, VERNON E.

Appendix A. The International Cooperative Investigation of the Tropical Atlantic. *In* National oceanographic program, fiscal year 1964, p. 33–37. Interagency Committee on Oceanography of the Federal Council for Science and Technology, ICO Pamphlet No. 11.

Developing tropical Atlantic fisheries through international research. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 152–155.

Will tuna research change direction? Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 50–52.

BROOKER, J. R.

Five years of voluntary fishery products inspection. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 11, p. 11–17. [Also as Separate No. 693.]

BROUILLARD, KEITH D.

Economic factors related to lake trout quotas on Lake Superior. U.S. Fish and Wildlife Service, Fishery Industrial Research, vol. 2, no. 2, p. 1–4.

Economic review of the Great Lakes commercial fisheries, 1940–59. U.S. Fish and Wildlife Service, Circular 141, iv+20 p.

BULLIS, HARVEY R., JR., AND ROBERT CUMMINS, JR.

Another look at the royal red shrimp resource. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 9–13.

BUREAU OF COMMERCIAL FISHERIES.

Chesapeake seafood specialties. Special Fisheries Marketing Bulletin (for food editors), 24 p.

Commercial fisheries outlook, January–March 1963. U.S. Fish and Wildlife Service, Fishery Leaflet 336, 4 p.

Commercial fisheries outlook, April–June 1963. U.S. Fish and Wildlife Service, Fishery Leaflet 336, 4 p.

Commercial fisheries outlook, July–September 1963. U.S. Fish and Wildlife Service, Fishery Leaflet 336, 4 p.

Commercial fisheries outlook, October–December 1963. U.S. Fish and Wildlife Service, Fishery Leaflet 336, 4 p.

Fish and Wildlife Act of 1956, as amended (an excerpt from Title 16 of the United States Code). U.S. Fish and Wildlife Service, Fishery Leaflet 557, 9 p.

For the twelve days of Christmas seafoods bring to you. Special Fisheries Marketing Bulletin (for food editors), 4 p.

Give a twist to the holiday bird with seafood stuffing. Special Fisheries Marketing Bulletin (for food editors), 2 p.

Instructions for typing manuscripts to be printed at the Government Printing Office (with exceptions for manuscripts to be processed). U.S. Fish and Wildlife Service, Fishery Leaflet 559, 8 p.

Let the sparkle of Mardi Gras linger on your table throughout the Lenten season. Special Fisheries Marketing Bulletin (for food editors), No. 63–1A, 20 p.

Let's get hot with cool tuna. Special Fisheries Marketing Bulletin (for food trades), 1 p.

New fish and seafood recipes. Special Fisheries Marketing Bulletin (for food editors), 4 p.

Operations of the Bureau of Commercial Fisheries under the Saltonstall–Kennedy Act, fiscal year 1962, iii+81 p.

Protein treasure from the seven seas. Special Fisheries Marketing Bulletin (for food editors), No. 63–3A, 18 p.

Quick, cool, tuna for the long, hot, summer. Special Fisheries Marketing Bulletin (for restaurants and institutions), 1 p.

Report of the Bureau of Commercial Fisheries for the calendar year 1961, iii+82 p.

Saltonstall—Kennedy Act, as amended (an excerpt from Title 15 of the United States Code). U.S. Fish and Wildlife Service, Fishery Leaflet 556, 2 p.

Sardines from Maine. Special Fisheries Marketing Bulletin (for food editors), No. 63–2A, 12 p.

17 seafood salads. Special Fisheries Marketing Bulletin (for food editors), No. 63–4A, 4 p.

Trident: a long range report of the Bureau of Commercial Fisheries. U.S. Fish and Wildlife Service, Circular 149, vii+113 p.

Tuna's R's. 1–right, 2–ready, 3–reasonable. Special Fisheries Marketing Bulletin (for school lunch), 1 p.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, BEAUFORT, N.C.

Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1961. U.S. Fish and Wildlife Service, Circular 148, ii + 40 p.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, GALVESTON, TEX.

Biological Laboratory, Galveston, Tex., fishery research for the year ending June 30, 1962. U.S. Fish and Wildlife Service, Circular 161, iii + 101 p.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, HONOLULU, HAWAII.

Progress in 1961–62. U.S. Fish and Wildlife Service, Circular, 163, 35 p.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORIES AT HONOLULU, SAN DIEGO, AND STANFORD.

Skipjack—a world resource. U.S. Fish and Wildlife Service, Circular 165, i + 28 p.

BUREAU OF COMMERCIAL FISHERIES, BOSTON MARKET NEWS SERVICE.

New England fisheries monthly summary (1963). Twelve issues, January to December, total 276 p.

New England importers and brokers of imported fishery products, November 1963, 9 p.

BUREAU OF COMMERCIAL FISHERIES, BRANCH OF EXPLORATORY FISHING.

Exploratory fishing and gear reesarch bases. American Zoologist, vol. 3, no. 3, p. 381–392.

BUREAU OF COMMERCIAL FISHERIES, CHICAGO MARKET NEWS SERVICE.

Information guide for the daily "Fishery products reports," 1963, 7 p.

List of brokers and importers of fishery products and byproducts, Chicago, Ill., 7 p.

Monthly summary of Chicago's wholesale market fresh and frozen fishery products receipts, prices, and trends (1963). Twelve issues, January to December, total 158 p.

BUREAU OF COMMERCIAL FISHERIES, DIVISION OF INDUSTRIAL RESEARCH.

United States standards for grades of frozen fried fish portions. September 1963, first issue, 4 p.

United States standards for grades of frozen fried fish sticks. September 1963, second issue, 4 p.

United States standards for grades of frozen raw breaded fish sticks. September 1963, first issue, 4 p.

United States standards for grades of frozen raw breaded fish portions. November 1963, second issue, 4 p.

BUREAU OF COMMERCIAL FISHERIES, HAMPTON MARKET NEWS SERVICE.

Monthly summary of fishery products for Baltimore, Md. (1963). Twelve issues, January to December, total 96 p.

Monthly summary of fishery products production in selected areas of Virginia, North Carolina, and Maryland (1963). Twelve issues, January to December, total 48 p.

BUREAU OF COMMERCIAL FISHERIES, NEW ORLEANS MARKET NEWS SERVICE.

Gulf of Mexico monthly landings, production, and shipments of fishery products (1963). Twelve issues, January to December, total 145 p.

List of primary receivers of imported fishery products and byproducts at New Orleans, La., 1963, 3 p.

BUREAU OF COMMERCIAL FISHERIES, NEW YORK MARKET NEWS SERVICE.

New York City's wholesale fishery trade monthly summaries (1963). Twelve issues, January to December, total 230 p.

BUREAU OF COMMERCIAL FISHERIES, REGION 3, GLOUCESTER, MASS.

A program of fishery research and services, North Atlantic region. U.S. Fish and Wildlife Service, Circular 164, ii+20 p.

BUREAU OF COMMERCIAL FISHERIES, REGION 4, ANN ARBOR, MICH.

Commercial fisheries: Research and development in the Great Lakes and central region. A long-range program of the Bureau of Commercial Fisheries. U.S. Fish and Wildlife Service, Circular 147, iii+38 p.

BUREAU OF COMMERCIAL FISHERIES, REGION 5, JUNEAU, ALASKA.

Program of research and services for Alaska's commercial fisheries. U.S. Fish and Wildlife Service, Circular 171, iii+20 p.

BUREAU OF COMMERCIAL FISHERIES, SAN PEDRO MARKET NEWS SERVICE.

California fishery products and byproducts brokers and importers, 1963, 7 p.

California fishery products monthly summary (1963). Twelve issues, January to December, total 198 p.

BUREAU OF COMMERCIAL FISHERIES, SEATTLE MARKET NEWS SERVICE.

Seattle, Wash., brokers and importers of fishery products, 1963, 6 p.

Washington, Oregon, and Alaska receipts and landings of fishery products for selected areas and fisheries (1963). Twelve issues, January to December, total 93 p.

BUREAU OF COMMERCIAL FISHERIES, TECHNOLOGICAL LABORATORY, GLOUCESTER, MASS.

Specification for fish portions: frozen raw, frozen raw breaded and frozen fried breaded. NASPO Fish Specification No. 4, 14 p. Prepared for the National Association of State Purchasing Officials, an affiliate organization of the Council of State Governments [branch office], 1755 Massachusetts Avenue, N.W., Washington, D.C., 20036.

Specification for shrimp; raw or cooked; chilled or frozen. NASPO Fish Specification No. 5, March 1963, 13 p. Reproduced for the National Association of State Purchasing Officials by the Council of State Governments [main office], 1313 East Sixtieth Street, Chicago, Ill., 60637

Specification for shrimp; frozen raw breaded. NASPO Fish Specification No. 6, March 1963, 12 p. Reproduced for the National Association of State Purchasing Officials by the Council of State Governments [main office], 1313 East Sixtieth Street, Chicago, Ill., 60637.

BUTLER, CHARLES.

Fish are coming to the surface as major help in controlling coronaries. Modern Hospital, vol. 100, no. 2, p. 126–127.

Impact of the Common Market and the Trade Expansion Act on U.S. fisheries. Fishery Products Conference. National Canners Association, Convention Issue Information Letter, No. 1909, January 31, 1963, p. 103–104.

BUTLER, PHILIP A., AND PAUL F. SPRINGER.

Pesticides—a new factor in coastal environments. Transactions of the Twenty-eighth North American Wildlife and Natural Resources Conference, p. 380–390.

CHAMBERLIN, J. LOCKWOOD, AND FRANKLIN STEARNS.

A geographic study of the clam, *Spisula polynyma* (Stimpson). *In* Wilfrid Webster (editor), Serial Atlas of the Marine Environment, folio 3, 12 p. American Geographical Society, New York.

CHILDS, G. R.

Maryland nutrition studies with laying hens. Proceedings of the 1963 Maryland Nutrition Conference for Feed Manufacturers, March 14–15, 1963, p. 83–92.

CLARK, JOHN R.

Size selection of fish by otter trawls, results of recent experiments in the Northwest Atlantic. International Commission for the Northwest Atlantic Fisheries, Special Publication No. 5, The selectivity of fishing gear, p. 24–96.

CLAUSING, DOUGLAS S.

Improved gummed paper for plastic scale impressions. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 2, p. 100.

CLEAVER, FRED C.

Bering Sea king crab (*Paralithodes camtschatica*) tagging experiments. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 59–63.

COHEN, DANIEL M.

A new genus and species of bathypelagic ophidioid fish from the western North Atlantic. Museum of Comparative Zoology, Breviora, No. 196, 8 p.

The publication dates of Goode and Bean's *Oceanic ichthyology*. Journal of the Society for the Bibliography of Natural History, vol. 4, pt. 3, p. 162–166.

COHEN, DANIEL M., AND MENICO TORCHIO.

Comments on the identity of the Mediterranean fish *Strinsia tinca*. Annals and Magazine of Natural History, ser. 13, vol. 6, p. 389.

COHEN, EDWARD H., AND JOHN A. PETERS.

Effect of storage in refrigerated sea water on amino acids and other components of whiting (*Merluccius bilincaris*). U.S. Fish and Wildlife Service, Fishery Industrial Research, vol. 2, no. 2, p. 5–11.

Storage of fish in refrigerated sea water. 2.—Quality changes in whiting as determined by organoleptic and chemical analyses. U.S. Fish and Wildlife Service, Fishery Industrial Research, vol. 2, no. 2, p. 21–27.

COLLETTE, BRUCE B.

Review of *Collected works, vol. IV, Ichthyology*, by L. S. Berg, 1961. Copeia, 1963, no. 1, p. 215–216.

The first record of the short bigeye, *Pseudopriacanthus altus* from the Caribbean Sea. Copeia, 1963, no. 3, p. 591.

The subfamilies, tribes, and genera of the Percidae (Teleostei). Copeia, 1963, no. 4, p. 615–623.

The systematic status of the Gulf of Mexico butterfish, *Poronotus burti* (Fowler). Copeia, 1963, no. 3, p. 582–583.

COLLETTE, BRUCE B., AND ROBERT H. GIBBS, JR.

A preliminary review of the fishes of the family Scombridae. [Abstract.] Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962. FAO Fisheries Reports No. 6, vol. 3, p. 977.

Preliminary field guide to the mackerel and tuna-like fishes of the Indian Ocean (Scombridae). U.S. National Museum, Smithsonian Institution, Washington, D.C., 48 p.

COLLETTE, BRUCE B., FRANK H. TALBOT, AND RICHARD H. ROSENBLATT.

The first California record of sierra, *Scomberomorus sierra*, Jordan and Starks. California Fish and Game, vol. 49, no. 1, p. 53–54.

COLLINS, GERALD B.

Fish passage research in the Columbia River Basin. Transactions of the Twenty-eighth North American Wildlife and Natural Resources Conference, March 4, 5, and 6, 1963, p. 356–360.

COLLINS, GERALD B., CARL H. ELLING, JOSEPH R. GAULEY, AND CLARK S. THOMPSON.

Effect of fishway slope on performance and biochemistry of salmonids. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 221–253.

COLTON, JOHN B., JR., AND KENNETH A. HONEY.

The eggs and larval stages of the butterfish, *Poronotus triacanthus*. Copeia, 1963, no. 2, p. 447–450.

COOPER, EDWIN L., HERBERT HIDU, AND JOHN K. ANDERSEN.

Growth and production of largemouth bass in a small pond. Transactions of the American Fisheries Society, vol. 92, no. 4, p. 391–400.

COPE, C. E.

Receipts and prices of fresh and frozen fishery products at Chicago, 1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Chicago Market News Service, 57 p.

COSTELLO, T. J.

The use of stains in shrimp mark-recapture experiments. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 142–143.

COYNE, JAMES A.

Receipt of fresh and frozen fishery products at Baltimore's wholesale fish market, 1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Baltimore Market News Service, 55 p.

CROWE, WALTER R., ERNEST KARVELIS, AND LEONARD S. JOERIS.

The movement, heterogeneity, and rate of exploitation of walleyes in northern Green Bay, Lake Michigan, as determined by tagging. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 38–41.

CRUTCHFIELD, JAMES (CHAIRMAN), GIULIO PONTECORVO, WALTER WILLIAMS, JOHN H. CUMBERLAND, AND FRANCIS T. CHRISTY, JR.

Report to the Bureau of Commercial Fisheries on the Branch of Economics. U.S. Fish and Wildlife Service, Circular 173, iii+12 p.

CRUTCHFIELD, JAMES, AND ARNOLD ZELLNER.

Economic aspects of the Pacific halibut fishery. U.S. Fish and Wildlife Service, Fishery Industrial Research, vol. 1, no. 1, iv+173 p.

DANIELS, S. L., L. L. KEMPE, E. S. GRAHAM, AND A. M. BEETON.

Quantitation of microorganic compounds in waters of the Great Lakes by adsorption on activated carbon. Proceedings of the Sixth Conference, Great Lakes Research, p. 118–123.

DASSOW, JOHN A.

Handling fresh fish. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 22, p. 275–287. Reinhold Publishing Corporation, New York.

The crab and lobster fisheries. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 14, p. 193–208. Reinhold Publishing Corporation, New York.

The halibut fisheries. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 9, p. 120–130. Reinhold Publishing Corporation, New York.

DASSOW, JOHN A., AND RICHARD L. MCNEELY.

Commercial fishery methods. *In* M. A. Joslyn and J. L. Heid (editors), Food processing operations, vol. 1, ch. 20, p. 548–568. The AVI Publishing Company, Inc., Westport, Conn.

DAVIS, HARRY C.

The effect of salinity on the temperature tolerance of eggs and larvae of some lamellibranch mollusks. *In* John A. Moore (editor), Proceedings, vol. 1, Contributed papers, p. 226. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

DAY, C. GODFREY.

Oceanographic observations, 1960, east coast of the United States. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 406, iii+59 p.

DEES, LOLA T.

Index of fishery biological papers by U.S. Fish and Wildlife Service authors appearing in non-Government publications, 1940–56. U.S. Fish and Wildlife Service, Circular 151, i+138 p.

DODIMEAD, A. J., F. FAVORITE, AND T. HIRANO.

Salmon of the North Pacific Ocean. Part II. Review of oceanography of the subarctic Pacific region. International North Pacific Fisheries Commission, Document No. 546, Bulletin No. 13, 195 p.

DOHERTY, RICHARD M., GEORGE P. DRAHEIM, DONALD J. WHITE, AND CHARLES L. VAUGHN.

Sea scallop industry of Canada. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 7, p. 11–16. [Also as Separate No. 681.]

DRAGOVICH, ALEXANDER.

Hydrology and plankton of coastal waters at Naples, Florida. Quarterly Journal of the Florida Academy of Sciences, vol. 26, no. 1, p. 22–47.

DRAGOVICH, ALEXANDER, JOHN H. FINUCANE, JOHN A. KELLY, JR., AND BILLIE Z. MAY.

Counts of red-tide organisms, *Gymnodinium brevc*, and associated oceanographic data from Florida west coast, 1960–61. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 455, ii+40 p.

DRAGOVICH, ALEXANDER, AND JOHN A. KELLY, JR.

A biological study and some economic aspects of squid in Tampa Bay, Florida. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 87–102.

DRYER, WILLIAM R.

Age and growth of the whitefish in Lake Superior. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 77–95.

DYER, JOHN A.

Industrial fisheries products. Market variations . trends . developments. Fishing Gazette, 1963 Annual Review Number, vol. 80, no. 13, p. 120–123.

Present and future market for fish oil. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 5, p. 12–15. [Also as Separate No. 676.]

EDWARDS, ROBERT L.

Observations on the small mammals of the southeastern shore of Hudson Bay. Canadian Field-Naturalist, vol. 77, no. 1, p. 1–12.

Report on the new *Albatross IV*. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 55–59.

ENGEL, DAVID W., AND EDNA M. DAVIS.

The relationship of cellular blood components to activity in certain marine teleosts. American Zoologist, vol. 3, no. 4, p. 521.

ENGLE, JAMES B., AND AARON ROSENFIELD.

Progress in oyster mortality studies. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 116–124.

ESCHMEYER, WILLIAM N.

A deepwater-trawl capture of two swordfish (*Xiphias gladius*), in the Gulf of Mexico. Copeia, 1963, no. 3, p. 590.

FARRIS, DAVID.

Reproductive periodicity in the sardine (*Sardinops caerulea*), and the jack mackerel (*Trachurus symmetricus*) on the Pacific coast of North America. Copeia, 1963, no. 1, p. 182–184.

Shrinkage of sardine (*Sardinops caerulea*) larvae upon preservation in buffered formalin. Copeia, 1963, no. 1, p. 185–186.

FAVORITE, FELIX, AND MITCHELL G. HANAVAN.

Oceanographic conditions and salmon distribution south of the Alaska Peninsula and Aleutian Islands, 1956. International North Pacific Fisheries Commission, Document No. 415, Bulletin No. 11, p. 57–72.

FINLEY, BOB E.

Catch 'em out—cook 'em out. Ohio Conservation Bulletin, vol. 27, no. 3, p. 7–9.

FLITTNER, GLENN A.

Review of the 1962 seasonal movement of albacore tuna off the Pacific coast of the United States. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 4, p. 7–13. [Also as Separate No. 674.]

FRENCH, ROBERT R.

Activation of U.S. Bureau of Commercial Fisheries research vessel *George B. Kelez*. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 8, p. 6–13. [Also as Separate No. 684.]

FRITZ, RAYMOND L.

An analysis of silver hake tag returns. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 214–215.

FUSS, CHARLES M., JR.

Gulf of Mexico shrimp trawls. Part one. The flat trawl. Fishing Gazette, vol. 80, no. 3, p. 12–13, 52. Part two. Semi balloon trawl and accessories. *Ibid.*, no. 4, p. 38–39; also appears, without charts and illustrations, in Fishing Gazette, 1963 Annual Review Number, vol. 80, no. 13, p. 87–90.

GANGMARK, HAROLD A.

A view of the present status of spawning channels. *In* Richard S. Croker and Don Reed (editors), Report of Second Governor's Conference on Pacific Salmon, Hyatt House, Seattle, January 7–10, 1963, p. 105.

GANGMARK, HAROLD A., AND F. BRUCE SANFORD.

Theory on development of mounds near Red Bluff, Calif. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 213–220.

GAUGLITZ, E. J., JR., AND L. W. LEHMAN.

The preparation of alkyl esters from highly unsaturated triglycerides. Journal of the American Oil Chemists' Society, vol. 40, no. 5, p. 197–198.

GAULEY, JOSEPH R., AND CLARK S. THOMPSON.

Further studies on fishway slope and its effect on rate of passage of salmonids. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 45–62.

GILBERT, PERRY W., AND STEWART SPRINGER.

Testing shark repellents. *In* Perry W. Gilbert (editor), Sharks and survival, p. 477–494. D.C. Health and Company, Boston.

GNAEDINGER, R. H.

Problem of thiaminase in mink feeding. National Fur News, vol. 35, no. 7, p. 8, 18.

GOODING, REGINALD M.

The olfactory organ of the skipjack *Katsuwonus pelamis*. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1621–1631.

GORDON, WILLIAM G.

A trawling survey of southern Lake Michigan (August–November 1960). U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 2, p. 1–6. [Also as Separate No. 667.]

GRAHAM, H. W.

United States research report, 1962. International Commission for the Northwest Atlantic Fisheries, Redbook 1963, Part II, Research Reports by Member Countries, p. 104–130.

GREENWOOD, M. R.

How Lake Michigan otter trawling has altered the production picture. Fish Boat, vol. 8, no. 6, p. 24.

Vessel construction. Modern vessels—improved gear—advanced developments. Fishing Gazette, 1963 Annual Review Number, vol. 80, no. 13, p. 78–80, 82–86.

GRIFFITHS, RAYMOND C.

Studies of oceanic fronts in the mouth of the Gulf of California, an area of tuna migrations. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1583–1609.

GROSS, GEORGE B.

What does area redevelopment mean to fisheries? [Abstract.] Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 26 .

GRUGER, EDWARD H., JR.

Uses of industrial fish oils. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 21, p. 260–271. Reinhold Publishing Corporation, New York.

HANKS, JAMES E.

Reproduction and larval development of the New England clam drill, *Polinices duplicatus* (Say) (Naticidae: Gastropoda). *In* John A. Moore (editor), Proceedings, vol. 1, Contributed papers, p. 227. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

HANKS, ROBERT W.

Chemical control of the green crab, *Carcinus maenas* (L.). Proceedings of the National Shellfisheries Association, 1961, vol. 52, p. 75–86.

Occurrence of an unusual mollusk on the coast of Maine. Maine Field Naturalist, vol. 19, no. 2, p. 22–23.

The soft-shell clam. U.S. Fish and Wildlife Service, Circular 162, i+16 p.

HARTT, ALLAN C.

Problems in tagging salmon at sea. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 144–145.

HAYES, MURRAY L.

King crab tagging methods in Alaska. International Commission for the Northwest Atlantic Fisheries. North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 262–265.

HAYES, MURRAY L., AND DONALD T. MONTGOMERY.

Movements of king crabs tagged and released in Shumagin Islands area, 1957–62. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 458, ii + 7 p.

HERMAN, SIDNEY S.

Planktonic fish eggs and larvae of Narragansett Bay. Limnology and Oceanography, vol. 8, no. 1, p. 103–109.

HESTER, FRANK J., DONALD C. AASTED, AND ROBERT W. GILKEY.

The bathykymograph, a depth–time recorder. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 441, ii + 5 p.

HESTER, F. J., J. R. HUNTER, AND R. R. WHITNEY.

Jumping and spinning behavior in the spinner porpoise. Journal of Mammalogy, vol. 44, no. 4, p. 586–588.

HEYAMOTO, H.

Age of young sablefish, *Anaploma fimbria* (Pallas) 1811. Journal of the Fisheries Research Board of Canada, vol. 19, no. 6, p. 1175–1177.

HICKS, STEACY D.

Physical oceanographic studies of Narragansett Bay, 1957 and 1958. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 457, iii + 30 p.

HIDA, THOMAS S., AND ROBERT A. MORRIS.

Preliminary report on the Marquesan sardine, *Harengula vittata*, in Hawaii. Pacific Science, vol. 17, no. 4, p. 431–437.

HILDEBRAND, SAMUEL F.

Family Albulidae. *In* Yngve H. Olsen (editor), Fishes of the Western North Atlantic, p. 132–147. Memoir Sears Foundation for Marine Research, No. 1, pt. 3.

Family Clupeidae. *In* Yngve H. Olsen (editor), Fishes of the Western North Atlantic, p. 257–454. Memoir Sears Foundation for Marine Research, No. 1, pt. 3.

Family Elopidae. *In* Yngve H. Olsen (editor), Fishes of the Western North Atlantic, p. 111–147. Memoir Sears Foundation for Marine Research, No. 1, pt. 3.

HITZ, C. R., AND D. L. ALVERSON.

Bottom fish survey off the Oregon coast, April–June 1961. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 6, p. 1–7. [Also as Separate No. 677.]

HOFFMAN, CARL P., JR.

Transportation. Legislation to implement the President's transportation message. Its significance in the fishing industry. Fishing Gazette, 1963 Annual Review Number, vol. 80, no. 13, p. 112–117, 123.

HOLMES, R. W.

A summary of productivity measurements in the southeastern Pacific Ocean. Proceedings of the Conference on Primary Productivity Measurements, Marine and Freshwater, held at the University of Hawaii, August 21–September 6, 1961. U.S. Atomic Energy Commission, Division Technical Information, TID 7633, p. 18–57.

HOLSTON, JOHN A.

A look at the fisheries potential of Panama. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 145–148.

HOSS, DONALD E.

Accumulation of radioactive gold by estuarine methods. Association of Southeastern Biologists Bulletin, vol. 10, no. 2, p. 30.

HOWARD, GERALD V.

The matter of availability and the harvest of tunas. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1041–1055.

HUNTER, CHARLES, AND HERBERT LARKINS.

North Pacific and Bering Sea winter gillnetting. Pacific Fisherman, vol. 61, no. 6, p. 7, 9.

IVERSEN, ROBERT T. S., PAUL J. PERKINS, AND RICHARD D. DIONNE.

An indication of underwater sound production by squid. Nature, vol. 199, no. 4890, p. 250–251.

JARVIS, NORMAN D.

Delicatessen fish products. U.S. Fish and Wildlife Service, Fishery Leaflet 553, 6 p.

Spiced and pickled seafoods. U.S. Fish and Wildlife Service, Fishery Leaflet 554, 18 p.

JENSEN, ALBERT C.

A standard terminology and notation for otolith age readers. International Commission for the Northwest Atlantic Fisheries, Redbook 1963, Part III, Selected Papers from the 1963 Annual Meeting, p. 131–134.

Further field experiments with tags for haddock. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 194–203.

JENSEN, ALBERT C., AND ROBERT K. BRIGHAM.

The line-trawl fishery for cod and haddock at Chatham, Massachusetts. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 6, p. 14–19. [Also as Separate No. 679.]

JEWETT, STANLEY G., JR.

A stonefly aquatic in the adult stage. Science, vol. 139, no. 3554, p. 484–485.

JOHNSON, JAMES H.

Changes in availability of albacore in the eastern Pacific Ocean, 1952 and 1958. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1227–1235.

JONES, EVERET C.

Tremoctopus violaceus uses *Physalia* tentacles as weapons. Science, vol. 139, no. 3556, p. 764–766.

JUNE, FRED C.

The menhaden industry. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 11, p. 146–159. Reinhold Publishing Corporation, New York.

JUNGE, CHARLES O., JR., AND LLOYD A. PHINNEY.

Factors influencing the return of fall chinook salmon (*Oncorhynchus tshawytscha*) to Spring Creek Hatchery. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 445, iii + 32 p.

KANAYAMA, RICHARD K.

The use of alkalinity and conductivity measurements to estimate concentrations of 3–trifluormethyl–4–nitrophenol required for treating lamprey streams. Great Lakes Fishery Commission, Technical Report No. 7, 10 p.

KARRICK, NEVA L.

Fish meal quality. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 20, p. 253–259. Reinhold Publishing Corporation, New York.

KAUNITZ, HANS, ERICH GAUGLITZ, JR., AND DONALD G. MCKAY.

Studies of the generalized Schwartzman reaction produced by diet. IV. Ethyl ester fractions of cod liver oil and dihydroxystearic acid. Metabolism, vol. 12, no. 4, p. 371–380; abstracted in Federation Proceedings, vol. 22, no. 2, p. 671.

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

Effect of tagging on redfish *growth rate at Eastport, Maine.* International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 210–213.

Estimation of population size and mortality rates from tagged redfish, *Sebastes marinus* L., at Eastport, Maine. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 204–209.

KELLY, WILLIAM N.

Production of fishery products in selected areas of Virginia, Maryland, and North Carolina, 1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Hampton Market News Service, 41 p.

KENYON, KARL W., AND CLIFFORD H. FISCUS.

Age determination in the Hawaiian monk seal. Journal of Mammalogy, vol. 44, no. 2, p. 280–282.

KEYES, MARK C.

Necrotic hemorrhagic enteritis in a seal. Small Animal Clinician, vol. 3, no. 11, p. 628.

KIMSEY, J. BRUCE.

Review of *Between Pacific tides*, by Edward F. Ricketts and Jack Calvin. Third edition revised by Joel W. Hedgpeth. Transactions of the American Fisheries Society, vol. 92, no. 1, p. 69.

Review of *Tropical inland fisheries*, by C. F. Hickling. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 323.

KRAMER, DAVID.

Records and observations from plankton grid studies off Baja California, April 1952. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 422, ii + 42 p.

KRAUEL, KATHRYN K., AND GEORGE J. RIDGWAY.

Immunoelectrophoretic studies of red salmon (*Oncorhynchus nerka*) serum. International Archives of Allergy, vol. 23, p. 246–253.

KUTKUHN, JOSEPH H.

Expanded research on Gulf of Mexico shrimp resources. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 65–78.

Review of *Fisheries hydrography*, by Ilmo Hela and Taivo Laevastu. Transactions of the American Fisheries Society, vol. 92, no. 2, p. 187–188.

LANDER, ROBERT H.

Girth–length relationships in sockeye and chum salmon. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 305–307.

LARKINS, HERBERT A.

Comparison of salmon catches in monofilament and multifilament gill nets. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 5, p. 1–11. [Also as Separate No. 675.]

LASKER, REUBEN.

The effect of temperature on the incubation time, development and growth of Pacific sardine (*Sardinops caerulea* Girard) and northern anchovy (*Engraulis mordax* Girard) embryos and larvae. *In* John A. Moore (editor), Proceedings, vol. 1, Contributed papers, p. 114. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

LEE, CHARLES F.

Processing fish meal and oil. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 16, p. 219–235. Reinhold Publishing Corporation, New York.

LEE, CHARLES F., GEORGE M. KNOBL, JR., ROBERT K. ABERNETHY, AND EMMETT F. DEADY.

Mechanizing the blue crab industry. Part II—Measures for immediate relief through worker specialization. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 8, p. 1–5. [Also as Separate No. 683.]

LEE, CHARLES F., GEORGE M. KNOBL, JR., AND EMMETT F. DEADY.

Mechanizing the blue crab industry. Part I—Survey of processing plants. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 7, p. 1–10 [Also as Separate No. 680.]

LEE, CHARLES F., AND F. BRUCE SANFORD.

Handling and packing of frozen breaded shrimp and individually frozen peeled and deveined shrimp. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 11, p. 1–10. [Also as Separate No. 692.]

Oyster industry of Chesapeake Bay, South Atlantic, and Gulf of Mexico. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 3, p. 8–17. [Also as Separate No. 670.]

LISTON, JOHN, MAURICE E. STANSBY, AND H. S. OLCOTT.

Bacteriological and chemical basis for deteriorative changes. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 27, p. 350–361. Reinhold Publishing Corporation, New York.

LOOSANOFF, VICTOR L.

Propagation of the common starfish, *Asterias forbesi*, in Long Island Sound during a twenty-five year period. *In* John A. Moore (editor), Proceedings, vol. 1, Contributed papers, p. 98. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

LOOSANOFF, VICTOR L., AND HARRY C. DAVIS.

Rearing of bivalve mollusks. *In* F. S. Russell (editor), Advances in marine biology, vol. 1, p. 1–136. Academic Press, London and New York.

Shellfish hatcheries and their future. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 1, p. 1–11. [Also as Separate No. 664.]

LOVE, TRAVIS D.

Putting technological knowledge to work in the Gulf fishing industry. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 52–55.

LUX, FRED E.

Identification of New England yellowtail flounder groups. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 1–10.

MACY, PAUL T., AND IDA K. JOHNSON.
Aquatic biology and oceanography. A selected list of books. U.S. Fish and Wildlife Service, Fishery Leaflet 541, 9 p.

MAGNUSON, JOHN J.
Tuna behavior and physiology, a review. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1057–1066.

MAGNUSON, JOHN J., AND LLOYD L. SMITH.
Some phases of the life history of the trout-perch. Ecology, vol. 44, no. 1, p. 83–95.

MALINS, DONALD C., AND C. R. HOULE.
Nitration of methyl oleate with acetyl nitrate: a synthesis of methyl aminostearate. Journal of American Oil Chemists' Society, vol. 40, no. 2, p. 43–45.

MALINS, DONALD C., AND JOHN C. WEKELL.
TLC–versatile tool. Journal of Chemical Education, vol. 40, no. 10, p. 531–534.

MALTZEFF, EUGENE M., AND PAUL D. ZIMMER.
Fall chinook salmon returns to hatcheries in the Bonneville Dam pool area, 1945–60. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 437, ii + 13 p.

MARR, JOHN C.
A model of the population biology of the Pacific sardine *Sardinops caerulea*. *In* B. B. Parrish (editor), Contributions to herring symposium 1961, p. 270–278. Conseil Permanent International pour l'Exploration de la Mar, Rapports et Procès-Verbaux des Réunions, vol. 154.

Note on the return rate of tagged skipjack, *Katsuwonus pelamis*, and the effects of handling. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 15–16.

Subpopulation identification. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1011–1021.

MARR, JOHN C., AND LUCIAN M. SPRAGUE.
The use of blood group characteristics in studying subpopulations of fishes. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 308–313.

MATHISEN, OLE A., ROBERT L. BURGNER, AND TED S. Y. KOO.
Statistical records and computations on red salmon (*Oncorhynchus nerka*) runs in the Nushagak District, Bristol Bay, Alaska, 1946–59. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 468, ii + 32 p.

MATHISEN, OLE A., AND RON J. LOPP.
Photographic census of the Steller sea lion herds in Alaska, 1956–58. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 424, ii + 20 p.

MATSUMOTO, WALTER M.
Unique shape of the first elongate haemal spine of albacore, *Thunnus alalunga* (Bonnaterre). Copeia, 1963, no. 2, p. 460–462.

McCann, James A., and Frank A. Dreyer.

Length and age frequency samples collected from Georges Bank and Gulf of Maine haddock landings, 1956–60. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 439, ii+113 p.

Length and age frequency samples collected from Georges Bank haddock landings, 1931–55. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 438, iii+127 p.

McDermott, John P., and Robert Livingstone, Jr.

Haddock tag returns in relation to fish condition. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 216–217.

McHugh, J. L.

Conflict of interest and the Federal scientist. Non-official expression in writing, teaching, and lecturing. Proceedings of the First Symposium on Current Problems in the Management of Scientific Personnel, October 17–18, 1963, p. 105–108. Federal Council for Science and Technology, Washington, D.C.

The love life of the fish. Fishery Products Conference. National Canners Association, Convention Issue Information Letter, No. 1909, January 31, 1963, p. 103.

McKee, Lynne G.

Can-draining device to aid sample inspection. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 10, p. 17–18. [Also as Separate No. 691.]

The oyster, clam, scallop, and abalone fisheries. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 13, p. 183–192. Reinhold Publishing Corporation, New York.

McKernan, Donald L.

Cooperation in conservation needed—Canada, U.S. lagging in world fisheries. Western Fisheries, vol. 66, no. 2, p. 84, 108–110, 112.

Fishery highlights of 1962. Fishery Products Conference. National Canners Association, Convention Issue Information Letter, No. 1909, January 31, 1963, p. 102–103.

McKernan describes commercial fisheries oceanographic interest. Data, Oceanography Issue, vol. 8, no. 5, p. 49–51.

. . . 1962 . . . a year for competing . . . 1963 . . . a year for surpassing . . . Fishing Gazette, 1963 Annual Review Number, vol. 80, no. 13, p. 16–24, 133–137, 139.

Science—money—winning battle against hard-to-kill sea lamprey. National Fisherman combined with Maine Coast Fisherman, vol. 44, no. 7, p. 30–31.

United States Department of Interior, the Bureau of Commercial Fisheries. American Zoologist, vol. 3, no. 3, p. 361–386.

What condition is our industry in? What does the future hold for it? Fish Boat, vol. 8, no. 1, p. 24–25.

McKernan, Donald L., and J. L. McHugh.

Bureau of Commercial Fisheries BCF. AIBS Bulletin, vol. 13, no. 5, p. 31–33.

McLAUGHLIN, PATSY A.

Survey of the benthic invertebrate fauna of the eastern Bering Sea. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 401, ii + 75 p.

McMULLIN, LESLIE D.

Organizing and operating fishery cooperatives in the United States. U.S. Fish and Wildlife Service, Circular 155, iv + 57 p.

McNEELY, RICHARD L.

Development of the *John N. Cobb* pelagic trawl—a progress report. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 7, p. 17–27. [Also as Separate No. 682.]

McNEIL, WILLIAM J.

Quality of the spawning bed as it relates to survival and growth of pink salmon embryos and alevins and time of fry emergence. *In* John A. Moore (editor), Proceedings, vol. 1, Contributed papers, p. 242. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

Status of research on the improvement of salmon spawning beds in Alaska. [Abstract.] *In* Richard S. Croker and Don Reed (editors), Report of Second Governor's Conference on Pacific Salmon, Hyatt House, Seattle, January 7–10, 1963, p. 111.

MEAD, GILES W., E. BERTELSON, AND DANIEL M. COHEN.

Reproduction in deep-sea fishes. *In* John A. Moore (editor), Proceedings, vol. 4, Specialized symposia, p. 310. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

MERRELL, THEODORE R., JR.

Sea lions create havoc. Pacific Fisherman, vol. 61, no. 12, p. 13, 15.

MERRILL, ARTHUR S.

Mollusks from a buoy off Georgia. Nautilus, vol. 77, no. 2, p. 68–70.

MERRILL, ARTHUR S., AND RUTH D. TURNER.

Nest building in the bivalve genera *Musculus* and *Lima*. Veliger, vol. 6, no. 2, p. 55–59.

MILLER, DAVID, JOHN B. COLTON, JR., AND ROBERT R. MARAK.

A study of the vertical distribution of larval haddock. Journal du Conseil, vol. 28, no. 1, p. 37–49.

MIYAUCHI, DAVID T.

Drip formation in fish. 1.—A review of factors affecting drip. U.S. Fish and Wildlife Service, Fishery Industrial Research, vol. 2, no. 2, p. 13–20.

MIYAUCHI, D., M. EKLUND, J. DASSOW, J. SPINELLI, AND N. STOLL.

Application of radiation-pasteurization processes to Pacific crab and flounder. Final summary for the period October 1961 to September 1962. Report Number 18036, Isotopes-Industrial Technology TID 4500 (19th ed.), Division of Isotopes Development, U.S. Atomic Energy Commission. Contract No. AT (49–11)–2058 (April), 45 p. [Copies available from the Office of Technical Services, Department of Commerce, Washington, D.C., 20230; price $1.25.]

MONAN, GERALD E.

A device for measuring the length of fish. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 2, p. 107–108.

Development of a mathematical relationship between electric-field parameters and the electrical characteristics of fish. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 123–136.

MOSHER, KENNETH H.

Racial analysis of red salmon by means of scales. International North Pacific Fisheries Commission, Document No. 395–Rev. 1, Bulletin No. 11, p. 31–56.

NELSON, RICHARD [W.]

Processing animal feed. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 17, p. 236–239. Reinhold Publishing Corporation, New York.

Storage life of individually frozen Pacific oyster meats glazed with plain water or with solutions of ascorbic acid or corn syrup solids. Frosted Food Field, vol. 36, no. 6, p. 42–44; also in U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 4, p. 1–4. [Also as Separate No. 672.]

NEWMAN, H. WILLIAM.

Biopsy cannula for tissue samples from live adult fish. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 3, p. 162–163.

NICHOLS, PAUL R., AND PEGGY M. KENEY.

Crab larvae (*Callinectes*), in plankton collections from cruises of M/V *Theodore N. Gill*, South Atlantic coast of the United States, 1953–54. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 448, ii + 14 p.

NICHOLS, PAUL R., AND WILLIAM H. MASSMANN.

Abundance, age, and fecundity of shad, York River, Va., 1953–59. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 179–187.

NORTH PACIFIC FUR SEAL COMMISSION, STANDING SCIENTIFIC COMMITTEE.

Glossary of terms used in fur seal research and management. U.S. Fish and Wildlife Service, Fishery Leaflet 546, 9 p.

O'BRIEN, JOHN J.

Information and explanatory statement for daily New England Market News Service "Fishery products reports" issued at Boston, 1963. (U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Boston Market News Service, 11 p.

New England fisheries—annual summary, 1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Boston Market News Service, 50 p.

New England purse-seine [tuna] fishery takes leap forward in 1962. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 6, p. 43–45.

O'CONNELL, CHARLES P.

The structure of the eye of *Sardinops caerulea*, *Engraulis mordax*, and four other pelagic marine teleosts. Journal of Morphology, vol. 113, no. 2, p. 287–329.

O'CONNELL, CHARLES P., AND RODERICK J. H. LEONG.

A towed pump and shipboard filtering system for sampling small zooplankters. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 452, ii + 19 p.

OLCOTT, H. S., AND J. VAN DER VEEN.

Role of individual phospholipids as antioxidants. Journal of Food Science, vol. 28, no. 3, p. 313–315.

OLDFIELD, J. E., R. O. SINNHUBER, AND A. A. RASHEED.
Nutritive value of marine oils. II. Effects of in vivo, antioxidants in feeding menhaden oil to swine. Journal of the American Oil Chemists' Society, vol. 40, no. 8, p. 357–360.

ORRELL, RUSSELL F., CARL ROSIER, AND LYLE R. SIMPSON (editors).
Stream catalog of Southeastern Alaska, Regulatory Districts Nos. 3 and 4. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 465, ii + 237 p.

OSTERHAUG, KATHRYN L., JOHN DASSOW, AND MAURICE E. STANSBY.
Nutritive value and quality of fish. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 28, p. 362–368. Reinhold Publishing Corporation, New York.

OTSU, TAMIO, AND RICHARD N. UCHIDA.
Model of the migration of albacore in the North Pacific Ocean. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 33–44.

OWEN, R. W., JR.
Northeast Pacific albacore oceanography survey, 1961. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 444, iii + 35 p.
Trailing incubator for studies of C 14 uptake by phytoplankton. Limnology and Oceanography, vol. 8, no. 2, p. 297–298.

PARISER, E. R., AND E. ODLAND.
MIT–UNICEF studies on the production of fish protein concentrate for human consumption. U.S. Fish and Wildlife Service, Commercial Fsheries Review, vol. 25, no. 10, p. 6–13. [Also as Separate No. 690.]

PATASHNIK, MAX.
Net-weight determination for frozen glazed fish. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 10, p. 1–5. [Also as Separate No. 689.]

PEREYRA, WALTER T.
Scope ratio–depth relationships for beam trawl, shrimp trawl, and otter trawl. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 12, p. 7–10. [Also as Separate No. 696.]

PERKINS, FRANK E.
A gravity food dispenser for laboratory fish. U.S. Fish and Wildlife Service, Progressive Fish–Culturist, vol. 25, no. 1, p. 56.

PERKINS HERBERT C.
Redescription and second known record of the bothid fish, *Monolene asaedai* Clark. Copeia, 1963, no. 2, p. 292–295.

PETERS, JOHN A.
The bottom fisheries. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 5, p. 63–78. Reinhold Publishing Corporation, New York.

PETERS, JOHN A., EDWARD H. COHEN, AND FREDERICK J. KING.
Effect of chilled storage on the frozen storage life of whiting. Food Technology, vol. 17, no. 6, p. 109–110.

PETERSON. C. ELDRED.
Vessel construction subsidy and mortgage insurance programs. Fishery Products Conference. National Canners Association, Convention Issue Information Letter, No. 1909, January 31, 1963, p. 104.

PILEGGI, JOSEPH.

Review of *Color of foods*, by Gordon Mackinney and Angela C. Little. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 1, p. 134.

Review of *Fish as food. Vol. II—Nutrition, sanitation, and utilization*, edited by Georg Borgstrom. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 3, p. 106.

Review of *Food processing operations—their management, machines, materials, and methods*, vol. 1, edited by Maynard A. Joslyn and J. L. Heid. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 8, p. 135.

Review of *Food texture*, by Samuel A. Matz. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 1, p. 134–135.

Review of *Industrial fishery technology (a survey of methods for domestic harvesting, preservation, and processing of fish used for food and for industrial products)*, edited by Maurice E. Stansby. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 11, p. 100–101.

Review of *Maintaining fishes for experimental and instructional purposes*, by William M. Lewis. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 3, p. 104–105.

Review of *Shadows in the sea (the sharks, skates and rays)*, by Harold W. McCormick and Tom Allen with Captain William E. Young. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 10, p. 93.

Review of *The frozen food cookbook and guide to home freezing*, by Jean I. Simpson. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 7, p. 123.

Review of *The technology of food preservation*, by Norman W. Desrosier. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 8, p. 135.

Review of *Whaler's eye*, by Christopher Ash. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 11, p. 112.

Review of *Whales (the biology of the cetaceans)*, by E. J. Slijper, translated by A. J. Pomerans. U. S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 10, p. 95–96.

PONTECORVO, GIULIO, AND LESLIE W. SCATTERGOOD.

Economic survey of the U.S. fisheries in the Passamaquoddy region, 1956–57. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 473, ii + 14 p.

POSGAY, J. A.

Tagging as a technique in population studies of the sea scallop. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 268–271.

POWER, E. A.

Advance report on the fisheries of the United States, 1962. U.S. Fish and Wildlife Service, C.F.S. No. 3150, 25 p.

Fisheries. *In* 1963 Britannica Book of the Year, p. 371. Encyclopedia Britannica, Inc., Chicago.

Fisheries. *In* Collier's Year Book, 1963 edition, p. 246–247. The Crowell-Collier Publishing Company, New York.

Fisheries. *In* Encyclopedia International, p. 153–155. The Grolier Society, Inc., New York.

Fisheries industry. *In* the Americana Annual, 1963, p. 244–245. Americana Corporation, New York.

Fisheries of the United States, 1962 (a preliminary review). U.S. Fish and Wildlife Service, C.F.S. No. 3200, xvi + 62 p.

Fishery statistics of the United States, 1961, U.S. Fish and Wildlife Service, Statistical Digest 54, ii + 460 p.

Statistical review of the fisheries. The catch—1962 count: 5,200,000,000 pounds. Fishing Gazette, 1963 Annual Review Number, vol. 80, no. 13, p. 126–127, 132–137, 139.

POWERS, CHARLES F.

Some aspects of the oceanography of Little Port Walter estuary, Baranof Island, Alaska. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 143–164.

PRIVETT, O. S., AND E. CHRISTENSE NICKELL.

Preparation of highly purified fatty acids via liquid–liquid partition chromatography. Journal of the American Oil Chemists' Society, vol. 40, no. 5, p. 189–193.

PRUTER, A. T.

Conservation of marine resources. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 2, p. 13–21. Reinhold Publishing Corporation, New York.

PYCHA, RICHARD L.

Great Lakes trout program showed progress last year. Fish Boat, vol. 8, no. 9, p. 32–35.

RALEIGH, ROBERT F.

The composition. abundance, and depth distribution of the 1957 summer net zooplankton of Bare Lake, Alaska, after fertilization. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 423, ii + 14 p.

RASHEED, A. A., J. E. OLDFIELD, J. KAUFMES, AND R. O. SINNHUBER.

Nutritive value of marine oils: 1. Menhaden oil at varying oxidation levels, with and without antioxidants in rat diets. Journal of Nutrition, vol. 79, no. 3, p. 323–332.

REARDON, CHARLES M.

Halibut and troll salmon landings and ex-vessel prices for Seattle, Alaska ports and British Columbia, 1963–62. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Seattle Market News Service, 35 p.

Seattle landings, receipts, and value of fishery products, 1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Seattle Market News Service, 35 p.

REES, GEORGE H.

Edible crabs of the United States. U.S. Fish and Wildlife Service, Fishery Leaflet 550, i + 18 p.

Progress on blue crab research in the South Atlantic. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 110–115.

REINTJES, JOHN W.

An initial inquiry into a photoelectric device to detect menhaden marked with fluorescent pigments. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 362–368.

RENFRO, WILLIAM C.

Gas-bubble mortality of fishes in Galveston Bay, Texas. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 320–322.

RENFRO, WILLIAM C., AND HARRY L. COOK.

Early larval stages of the seabob, *Xiphopenaeus kroyeri* (Heller). U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 165–177.

RENNER, JAMES A.

Sea surface temperature monthly average and anomaly charts, eastern tropical Pacific Ocean, 1947–58. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 442, ii+57 p.

RICE, DALE W.

Birds associating with elephants and hippopotamuses. Auk, vol. 80, no. 2, p. 196–197.

Pacific coast whaling and whale research. Transactions of the Twenty-eighth North American Wildlife and Natural Resources Conference, March 4, 5, and 6, p. 327–335.

Progress report on biological studies of the larger cetacea in the waters off California. Norsk Hvalfangst-Tidende (Norwegian Whaling Gazette), No. 7, p. 181–187.

The whale marking cruise of the *Sioux City* off California and Baja California. Norsk Hvalfangst-Tidende (Norwegian Whaling Gazette), No. 6, p. 153–160.

RICE, THEODORE R.

Accumulation of radionuclides by aquatic organisms. *In* Studies of the fate of certain radionuclides in estuarine and other aquatic environments, p. 35–50. [U.S.] Public Health Service Publication No. 999-R-3.

Review of zinc in ecology. *In* Vincent Schultz and Alfred W. Element, Jr., Proceedings of the first national symposium on radioecology, p. 619–631. Reinhold Publishing Corporation, New York, and American Institute of Biological Sciences, Washington, D.C.

The role of phytoplankton in the cycling of radionuclides in the marine environment. *In* Vincent Schultz and Alfred W. Element, Jr., Proceedings of the first national symposium on radioecology, p. 179–185. Reinhold Publishing Corporation, New York, and American Institute of Biological Sciences, Washington, D.C.

RIDGWAY, GEORGE J.

Distinguishing tuna species by immunochemical methods. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 205–211.

RISOLI, T. J.

New York City's wholesale fishery trade, 1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, New York Market News Service, 43 p.

ROBERTSON, ROBERT, AND ARTHUR S. MERRILL.

Abnormal dextral hyperstrophy of post-larval *Heliacus* (Gastropoda; Architectonicidae). Veliger, vol. 6, no. 2, p. 76–79.

ROCKWELL, JULIUS, JR.

An electromechanical fishing and counting fence used in Ireland. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 12, p. 1–6. [Also as Separate No. 695.]

Overview of Government–Industry Oceanographic Instrumentation Symposium. Proceedings of the Mountain States Navy Research and Development Clinic, Raton, N.M., September 28–29, 1961, p. C-1–C-6.

RODEN, GUNNAR I.

On sea level, temperature, and salinity variations in the central tropical Pacific and on Pacific Ocean islands. Journal of Geophysical Research, vol. 68, no. 2, p. 455–472.

RODMAN, DUANE T.

Anesthetizing and air-transporting young white sturgeons. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 2, p. 71–78.

ROITHMAYR, CHARLES M.

Distribution of fishing by purse seine vessels for Atlantic menhaden, 1955–59. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 434, iii+22 p.

ROITHMAYR, CHARLES M., AND RICHARD A. WALLER.

Seasonal occurrence of *Brevoortia patronus* in the northern Gulf of Mexico. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 301–302.

RONHOLT, LAEL L.

Distribution and relative abundance of commercially important pandalid shrimps in the northeastern Pacific Ocean. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 449, ii+28 p.

Equipment Note No. 14—A light box for photographing fish and invertebrates at sea. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 9, p. 8–11. [Also as Separate No. 687.]

ROPES, JOHN W.

The incidence of *Malacobdella grossa* in hard clams from Nantucket Sound, Massachusetts. Limnology and Oceanography, vol. 8, no. 3, p. 353–355.

ROPPEL, ALTON Y., ANCEL M. JOHNSON, RICHARD D. BAUER, DOUGLAS G. CHAPMAN, AND FORD WILKE.

Fur seal investigations, Pribilof Islands, Alaska, 1962. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 454, v+101 p.

ROSE, JOSEPH H.

Supposed larva of *Protanyderus vipio* (Osten Sacken) discovered in California (Diptera: Tanyderidae). Pan-Pacific Entomologist, vol. 39, no. 4, p. 272–275.

ROTHSCHILD, BRIAN J.

A critique of the scale method for determining the age of the alewife, *Alosa pseudoharengus* (Wilson). Transactions of the American Fisheries Society, vol. 92, no. 4, p. 409–413.

A utility raft for fishery work. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 4, p. 218–219.

Graphic comparisons of meristic data. Copeia, 1963, no. 4, p. 601–603.

ROUBAL, WILLIAM T.

Tuna fatty acids: I. Initial studies on the composition of the light and dark meats of bluefin tuna (*Thunnus thynnus*)–structural isomers of the monoenoic fatty acids. Journal of the American Oil Chemists' Society, vol. 40, no. 6, p. 213–215.

Tuna fatty acids: II. Investigations of the composition of raw and processed domestic tuna. Journal of the American Oil Chemists' Society, vol. 40, no. 6, p. 215–218.

ROUNSEFELL, GEORGE A.

Bureau of Commercial Fisheries Biological Laboratory, Galveston, Tex. U.S. Fish and Wildlife Service, Circular 154, 1 + 29 p.

Marking fish and invertebrates. U.S. Fish and Wildlife Service, Fishery Leaflet 549, iii + 12 p.

Review of *Pink salmon* (*Oncorhynchus gorbuscha*) *in northern Norway in the year 1960*, by Magnus Berg. Transactions of the American Fisheries Society, vol. 92, no. 2, p. 187.

SABO, JULIUS J., JOHN P. BAPTIST, AND FRED G. RUETER.

Savannah estuary environmental radiological survey (SEERS) project. *In* Studies of the fate of certain radionuclides in estuarine and other aquatic environments, p. 11–33. [U.S.] Public Health Service Publication No. 999-R-3.

SALOMAN, CARL H., AND GORDON R. RINCKEY.

Large lookdowns from Tampa Bay, Florida. Quarterly Journal of the Florida Academy of Sciences, vol. 26, no. 2, p. 192–193.

SAMSON, V. J.

California fisheries, 1962. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, San Pedro Market News Service, 53 p.

Information and explanatory statement for daily San Pedro Market News Service "Fishery products reports," 1963. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, San Pedro Market News Service, 7 p.

West Coast shrimp crossings, by ports of entry, 1951–1963, November 1963. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, San Pedro Market News Service, 7 p.

SANFORD, F. BRUCE.

Letters, The use of "I." Science, vol. 142, no. 3599, p. 1526.

Processing marine plant products. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 18, p. 240–246. Reinhold Publishing Corporation, New York.

SANFORD, F. BRUCE, CHARLES F. LEE, AND TRAVIS D. LOVE.

Gulf States shrimp canning industry. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 2, p. 7–14. [Also as Separate No. 668.]

SANFORD, F. BRUCE, AND HELEN E. PLASTINO.
Bibliography of publications of the Branch of Technology, author index–1961. U.S. Fish and Wildlife Service, Fishery Leaflet 547, 4 p.

SAUR, J. F. T.
A study of the quality of sea water temperatures reported in logs of ships' weather observations. Journal of Applied Meteorology, vol. 2, no. 3, p. 417–425.

SCHEFFER, VICTOR B., AND ANCEL M. JOHNSON.
Molt in the northern fur seal. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 450, ii + 34 p.

SCHEFFER, VICTOR B., AND KARL W. KENYON.
Baculum size in pinnipeds. Zeitschrift für Saugetierkunde, vol. 28, no. 1, p. 38–41.
Elephant seal in Puget Sound, Washington. Murrelet, vol. 44, no. 2, p. 23–24.

SCHEFFER, VICTOR B., AND DALE W. RICE.
A list of the marine mammals of the world. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 431, i + 12 p.

SCHWARTZ N., H. E. GAFFNEY, M. S. SCHMUTZER, AND F. D. STEFANO.
A method for the analysis of chlorinated benzenes in clams (*Mercenaria mercenaria*) and oysters (*Crassostrea virginica*). Journal of the Association of Official Agricultural Chemists, vol. 46, no. 5, p. 893–898.

SEAGRAN, HARRY L.
Lake and river fisheries. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 6, p. 79–86. Reinhold Publishing Corporation, New York.

SECKEL, GUNTER R.
Climatic parameters and the Hawaiian skipjack fishery. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1201–1208.

SHAW, WILLIAM N.
A method of tagging channeled whelks. Nautilus, vol. 77, no. 1, p. 28–30.
Index of condition and per-cent solids of raft-grown oysters in Massachusetts. Proceedings of the National Shellfisheries Association, 1961, vol. 52, p. 47–52.

SHAW, WILLIAM N., AND JAMES A. MCCANN.
Comparison of growth of four strains of oysters raised in Taylors Pond, Chatham, Mass. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 11–17.

SHERMAN, KENNETH.
Pontellid copepod distribution in relation to surface water types in the central North Pacific. Limnology and Oceanography, vol. 8, no. 2, p. 214–227.

SHOMURA, RICHARD S.
Monofilament gill net fishing for skipjack tuna in Hawaiian waters (a progress report). Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1177–1199.
Monofilament gill net fishing for skipjack tuna in Hawaiian waters, 1961–62. U.S. Fish and Wildlife Service, Circular 170, iii + 21 p.

SHOMURA, RICHARD S., AND BETTY ANN KEALA.
Growth and sexual dimorphism in growth of bigeye tuna (*Thunnus obesus*), a preliminary report. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1409–1417.

SHUMAY, GEORGE, AND THOMAS E. CHASE.
Bathymetry in the Galapagos Region. Presented at the Tenth Pacific Science Congress of the Pacific Science Association held at the University of Hawaii, Honolulu, Hawaii, August 21–September 6, 1961, p. 11–19.

SHUSTER, CARL N., JR., AND ROBERT E. HILLMAN.
Comments on *Microecological factors in oyster epizootics*, by Marshall Laird. Chesapeake Science, vol. 4, no. 2, p. 101–103.

SIDWELL, VIRGINIA D., GEORGE M. KNOBL, AND DONALD G. SNYDER.
Improvement of the protein quality of various vegetable protein supplements with fish protein concentrate (fish flour). [Abstract 2338.] Federation of American Society for Experimental Biology, 47th Annual Meeting, Atlantic City, N.J., April 16–20, 1963, Abstracts, vol. 22, no. 2, pt. 1, p. 552.

SINDERMANN, CARL J.
Disease in marine populations. Transactions of the Twenty-eighth North American Wildlife and Natural Resources Conference, March 4, 5, and 6, 1963, p. 336–356.

Immunogenetic studies of elasmobranch fishes. *In* John A. Moore (editor), Proceedings, vol. 2, Contributed papers, p. 210. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

Use of plant hemagglutinins in serological studies of clupeoid fishes. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 137–141.

SINDERMANN, CARL J., AND KENNETH A. HONEY.
Electrophoretic analysis of the hemoglobins of Atlantic clupeoid fishes. Copeia, 1963, no. 3, p. 534–537.

SKERRY, JOHN B.
Soviets' northwest Atlantic fishing continues on large scale in 1963. Fish Boat, vol. 8, no. 12, p. 20–21, 38.

SKUD, BERNARD EINAR.
Herring tagging experiments in southeastern Alaska. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 19–32.

Initial sardine biology research results termed very informative. Portland [Maine] Press Herald, vol. 102, no. 6, p. 2.

SLAVIN, JOSEPH W.
Freezing and cold storage. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 23, p. 288–308. Reinhold Publishing Corporation, New York.

Low-level radiation preservation of fishery products. Research and development in progress. U.S. Atomic Energy Commission, Division of Biology and Medicine and Office of Technical Information, Issue No. 1, p. 167.

SLAVIN, JOSEPH W., AND CLARENCE J. CARLSON.
Recent developments in refrigeration applicable to freezing and thawing tuna at sea. Pacific Fisherman, vol. 61, no. 7, p. 27–28.

SLAVIN, JOSEPH W., AND KEITH A. SMITH.
Refrigeration. Catching and preserving New England tuna. Fishing Gazette, 1963 Annual Review Number, vol. 80, no. 13, p. 100–102, 104–109.

SLAVIN, JOSEPH W., MAYNARD A. STEINBERG, AND THOMAS J. CONNORS.

Low-level radiation preservation of fishery products, October 1960–October 1962 (TID–18285), 36 p. Prepared for the Division of Isotopes Development, U.S. Atomic Energy Commission, under contract No. AT(49–11)–1889. [Copies available from the Office of Technical Services, Department of Commerce, Washington, D.C., 20230; price $2.00.]

SMITH, KEITH A.

Exploratory fishing for Maine herring. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 463, ii+9 p.

SMOKER, WILLIAM A.

Influence of freshwater environment on survival of coho salmon. *In* John A. Moore (editor), Proceedings, vol. 1, Contributed papers, p. 245. XVI International Congress of Zoology, August 20–27, 1963, Washington, D.C.

SPARKS, ALBERT K.

Infection of *Crassostrea virginica* (Gmelin) from Hawaii with a larval tapeworm, *Tylocephalum*. Journal of Insect Pathology, vol. 5, no. 3, p. 284–288.

SPRAGUE, LUCIAN M., JAMES R. HOLLOWAY, AND LESLIE I. NAKASHIMA.

Studies of the erythrocyte antigens of albacore, bigeye, skipjack, and yellowfin tunas and their use in subpopulation, identification. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1381–1393.

SPRINGER, STEWART.

Field observations on large sharks of the Florida–Caribbean region. *In* Perry W. Gilbert (editor), sharks and survival, p. 95–113. D.C. Heath and Company, Boston.

SPRINGER, STEWART, AND PERRY W. GILBERT.

Anti-shark measures. *In* Perry W. Gilbert (editor), Sharks and survival, p. 465–476. D.C. Heath and Company, Boston.

SPRINGER, STEWART, AND ROSEMARY H. LOWE.

A new smooth dogshark, *Mustelus highmani*, from the equatorial Atlantic coast of South America. Copeia, 1963, no. 2, p. 245–251.

SPRINGER, VICTOR G., AND JOHN H. FINUCANE.

The African cichlid, *Tilapia heudeloti* Dumeril, in the commercial fish catch of Florida. Transactions of the American, Fisheries Society, vol. 92, no. 3, p. 317–318.

SQUIRE, JAMES L., JR., AND FRANK J. MATHER III.

Observations on the commercial potential of tuna in the oceanic northwest Atlantic. Gulf and Caribbean Fisheries Institute, Proceedings of the 15th Annual Session, November 1962, p. 124–133.

STANSBY, MAURICE E.

Analytical methods. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 29, p. 369–374. Reinhold Publishing Corporation, New York.

Cured fishery products. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 25, p. 323–335. Reinhold Publishing Corporation, New York.

General bibliography. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 30, p. 375–382. Reinhold Publishing Corporation, New York.

Miscellaneous industrial products. *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 19, p. 247–252. Reinhold Publishing Corporation, New York.

Processing of seafoods. *In* Maynard A. Joslyn and J. L. Heid (editors), Food processing operations, vol. 1, ch. 20 p. 569–599. The AVI Publishing Company, Inc., Westport, Conn.

STANSBY, MAURICE E. (EDITOR).

Industrial fishery technology. Reinhold Publishing Corporation, New York, 393 p.

STANSBY, MAURICE E., AND H. S. OLCOTT.

Composition of fish (except section on proteins). *In* Maurice E. Stansby (editor), Industrial fishery technology, ch. 26, p. 339–349. Reinhold Publishing Corporation, New York.

STICKNEY, ALDEN P.

Histology of the reproductive system of the soft-shell clam (*Mya arenaria*). Biological Bulletin, vol. 125, no. 2, p. 344–351.

STOUT, VIRGINIA F.

A simple procedure for obtaining docosahexaenoic acid. Journal of the American Oil Chemists' Society, vol. 40, no. 1, p. 40.

Effects of ionizing radiation on lipids of fish. Final summary for the period October 1961 through September 1962. Report Number 18657, Isotopes–Industrial Technology, (TID 4500) (19th ed.), Division of Isotopes Development, U.S. Atomic Energy Commission. Contract No. AT(49–11)–2058 (April), 18 p. [Copies available from the Office of Technical Services, Department of Commerce, Washington, D.C., 20230; price $0.50.]

STRASBURG, DONALD W.

Employment of submarines for scientific research. Proceedings of the Hawaiian Academy of Science, 38th Annual Meeting, 1962–63, published by the University of Hawaii, p. 13.

The diet and dentition of *Isistius brasiliensis*, with remarks on tooth replacement in other sharks. Copeia, 1963, no. 1, p. 33–40.

SULLIVAN, LEO J., AND HARRY L. SEAGRAN.

Technological investigations of pond-reared fish. Part 1.—Product development from buffalofish. U.S. Fish and Wildlife Service, Fishery Industrial Research, vol. 2, no. 2, p. 29–42.

SUTHERLAND, DOYLE F.

Variation in vertebral numbers of juvenile Atlantic menhaden. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 435, ii + 21 p.

THOMAS, WILLIAM H.

Physiological factors affecting the interpretation of phytoplankton production measurements. *In* Maxwell Doty (editor), Algal productivity in the Pacific, p. 147–162. Proceedings of the Conference on Primary Productivity Measurements, Marine and Freshwater, Atomic Energy Commission, TID 7633, p. 147–162.

THOMAS, WILLIAM H., HAROLD L. SCOTTEN, AND JOHN S. BRADSHAW.

Thermal gradient incubators for small aquatic organisms. Limnology and Oceanography, vol. 8, no. 3, p. 357–360.

THOMPSON, MARY H.

The mechanism of iron sulfide discoloration in cans of shrimp. Food Technology, vol. 17, no. 5, p. 157–163.

THOMPSON, RICHARD B.

Chironomids and trout. Washington State Game Department, Game Bulletin, vol. 15, no. 2, p. 4–5.

THORSTEINSON, FREDRIK V., WALLACE H. NOERENBERG, AND HOWARD D. SMITH.

The length, age, and sex ratio of chum salmon in the Alaska Peninsula, Kodiak Island, and Prince William Sound areas of Alaska. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 430, iii+ 84 p.

THRAILKILL, JAMES R.

Zooplankton volumes off the Pacific coast, 1959. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 414, ii+77 p.

TREFETHEN, PARKER S.

Sonic fish tracking. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 81–83.

TREFETHEN, P. S., AND A. J. NOVOTNY.

Marking fingerling salmon with trace-elements and non-radioactive isotopes. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 64–65.

TRETSVEN, WAYNE I.

Bacteriological survey of filleting processes in the Pacific Northwest. I. Comparison of methods of sampling fish for bacterial counts. Journal of Milk and Food Technology, vol. 26, no .9, p. 302–306.

Bacteriological survey of filleting processes in the Pacific Northwest. II. Swab technique for bacteriological sampling. Journal of Milk and Food Technology, vol. 26, No. 12, p. 383–388.

TUBIASH, HASKELL S.

Bacterial necrosis of bivalve larvae. [Abstract.] Bacteriological Proceedings, vol. 63, p. 164.

UCHIDA, RICHARD N.

Synopsis of biological data on frigate mackerel *Auxis thazard* (Lacepédè) 1802 (Pacific Ocean). Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 2, p. 241–273.

UKELES, RAVENNA.

The effect of surface active agents on the growth of marine phytoplankton. Journal of Protozoology, Program, and Abstracts Supplement, vol. 10, p. 10.

U.S. FISH AND WILDLIFE SERVICE.

Interim Federal Specification, clams, raw, shucked; fresh (chilled) and frozen. PP-C-00401b (INT-FWS), March 14, 1963, 12 p. Interim Revision of Federal Specification PP-C-401a, April 25, 1952. [Copies available from General Services Administration, Washington, D.C., 20405.]

Interim Federal Specification, oysters, raw, shucked (fresh or frozen). PP-O-00956d (INT-FWS), March 26, 1963, 9 p. Interim Revision of Federal Specification PP-O-956c, June 16, 1952. [Copies available from General Services Administration, Washington, D.C., 20405.]

Interim Federal Specification, shrimp; canned. PP-S-00311b (INT-FWS), August 9, 1963, 8 p. Interim Revision of Federal Specification PP-S-311a, September 8, 1955. [Copies available from General Services Administration, Washington, D.C., 20405.]

VAN LANDINGHAM, JOHN W.

Inorganic nutrients in the sea. Journal of Chemical Education, vol. 40, p. 272–276.

VAN OOSTEN, JOHN.

Surface currents of Lake Michigan, 1931 and 1932. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 413, ii+51 p.

WAGNER, CHARLES H.

Fish farming engineering research. *In* Richard S. Croker and Don Reed (editors), Report of Second Governor's Conference on Pacific Salmon, Hyatt House, Seattle, January 7–10, 1963, p. 120–122.

WALDRON, KENNETH D.

Synopsis of biological data on skipjack *Katsuwonus pelamis* (Linnaeus) 1758 (Pacific Ocean). Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 2, p. 695–748.

WALDRON, KENNETH D., AND JOSEPH E. KING.

Food of skipjack in the central Pacific. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1431–1457.

WATHNE, FREDERICK.

Progress seen in shrimp research. Fish Boat, vol. 8, no. 3, p. 24, 37.

Promising leads in fishing gear development. Gulf and Caribbean Fisheries Institute. Proceedings of the 15th Annual Session, November 1962, p. 5–9.

WATSON, JOHN E.

A method for tagging immature herring. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 451, ii+7 p.

WEAVER, CHARLES R.

Influence of water velocity upon orientation and performance of adult migrating salmonids. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 97–121.

WELLS, LARUE, AND ALFRED M. BEETON.

Food of the bloater, *Coregonus hoyi*, in Lake Michigan. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 245–255.

WETMORE, ALEXANDER, AND HARVEY R. BULLIS, JR.

The birds of Serrana Bank in the western Caribbean Sea. Condor, vol. 65, no. 4, p. 329.

WHEELER, CHESTER O.

Solenoid release for remote operations. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 25, no. 4, p. 215–216.

WHORLEY, VIRGINIA.

List of publications—Division of Industrial Research. By branch, year, and author, 1955–61 inclusive. U.S. Fish and Wildlife Service, Fishery Industrial Research, vol. 2, no. 2, p. 43–84.

WIGLEY, ROLAND L.

Occurrence of *Praunus flexuosus* (O. F. Muller) (Mysidacea) in New England waters. Crustaceana, vol. 6, pt. 2, p. 158.

Pogonophora on the New England continental slope. Science, vol. 141, no. 3578, p. 358–359.

WILIMOVSKY, NORMAN J.

A radioactive internal tag for herring. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 359–361.

WILLIAMS, RICHARD B.

Use of netting to collect motile benthic algae. Limnology and Oceanography, vol. 8, no. 3, p. 360–361.

WINCHESTER, CLARENCE F.

Choice sea food for farm animals. Feedstuffs, vol. 35, no. 28, p. 18.

Present and future factors that may influence fish meal demand. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 25, no. 3, p. 1–7. [Also as Separate No. 669.]

WISE, JOHN P.

Bibliography on the biology of the cod, *Gadus morhua* and related species. U.S. Fish and Wildlife Service, Fishery Bulletin 215, vol. 62, iv + p. 483–538.

Cod groups in the New England area. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 1, p. 189–203.

Factors affecting number and quality of returns from tagging cod with different tags and using different methods of capture in ICNAF Divisions 4X and 5Y in 1957. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Woods Hole, Mass., May 1961, Special Publication No. 4, p. 101–105.

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 1960–61. California Fish and Game, vol. 49, no. 4, p. 290–301.

WOLFERT, DAVID R.

The movements of walleyes tagged as yearlings in Lake Erie. Transactions of the American Fisheries Society, vol. 92, no. 4, p. 414–420.

WOOSTER, W. S., AND J. L. REID, JR.
Eastern boundary currents. *In* M. N. Hill (general editor), The sea: ideas and observations on progress in the study of the seas. Vol. 2, The composition of sea-water—comparative and descriptive oceanography, p. 253–280. Interscience Publishers, a division of John Wiley & Sons, New York and London.

WYRTI, KLAUS.
The horizontal and vertical field of motion in the Peru Current. Scripps Institution of Oceanography, Bulletin, vol. 8, no. 4, p. 313–346.

WYRTI, KLAUS, AND EDWARD B. BENNETT.
Vertical eddy viscosity in the Pacific equatorial undercurrent. Deep-Sea Research, vol. 10, no. 4, p. 449–455.

YANCEY, ROBERT M., AND FREDRIK V. THORSTEINSON.
The king salmon of Cook Inlet, Alaska. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 440, ii + 18 p.

YOSHIDA, HOWARD O., AND TAMIO OTSU.
Synopsis of biological data on albacore *Thunnus germo* (Lacépède) 1800 (Pacific and Indian Oceans). Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 2, p. 274–318.

YOUNG, E. P., AND R. R. KIFER.
Menhaden fish meal as a protein supplement to practical swine diets. Proceedings of the 1963 Maryland Nutrition Conference for Feed Manufacturers, March 14–15, 1963, p. 34–37.

YUEN, HEENY S. H.
Schooling behavior within aggregations composed of yellowfin and skipjack tuna. Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species, La Jolla, Calif., July 2–14, 1962, FAO Fisheries Reports No. 6, vol. 3, p. 1419–1429.

ZEIN-ELDIN, ZOULA P.
Effect of salinity on growth of postlarval penaeid shrimp. Biological Bulletin, vol. 125, no. 1, p. 188–196.

ZIMMER, PAUL D., ROY J. WAHLE, AND EUGENE M. MALTZEFF.
Progress report. Spring chinook salmon transplantation study, 1955–61. U.S. Fish and Wildlife Service, Special Scientific Report—Fisheries No. 443, ii+24 p.

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