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U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

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FOR THE

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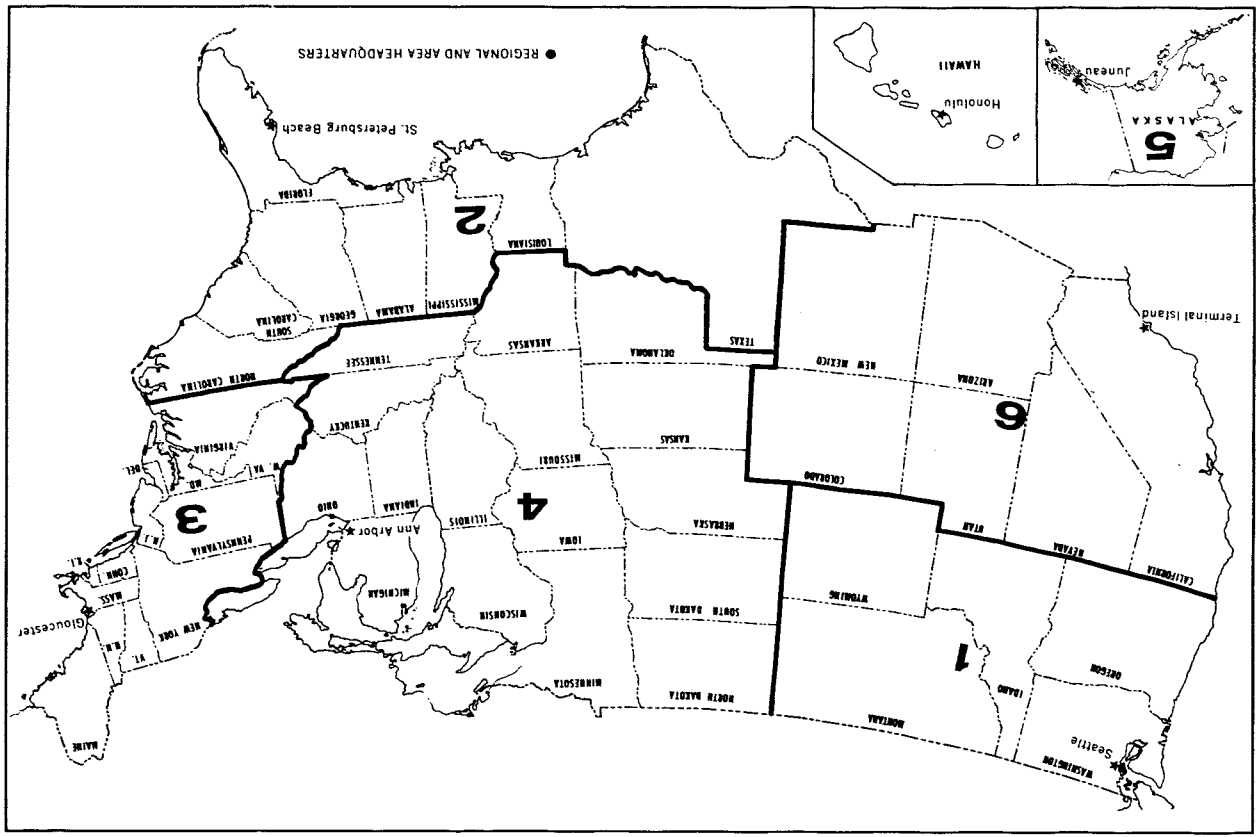

Frontispiece.—Regional and area boundaries, Bureau of Commercial Fisheries, December 31, 1967.

Report of the Bureau of Commercial Fisheries for the Calendar Year 1967

This 11th annual report of the Bureau of Commercial Fisheries is made in compliance with Section 9(a) of the Fish and Wildlife Act of 1956. This Act created the U.S. Fish and Wildlife Service, which comprises the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife.

Information on projects undertaken in 1967 under the Saltonstall–Kennedy Act of July 1, 1954, is combined with other activities in this report. Before 1966 the Saltonstall–Kennedy projects were reported separately.

The United States in 1967 was in sixth place among the fishing countries of the world, being exceeded by Peru, Japan, China (mainland), U.S.S.R., and Norway. Until 1957 the United States ranked second, under Japan, among the major fishing countries. From 1957 to 1967 the world catch (live weight) increased 92 percent and the catch of the five now most important countries increased 146 percent. From 1957 to 1967 the U.S. catch declined 13 percent.

The fisheries of the United States cannot be regarded as isolated from the fisheries of the world. Dynamic developments in international relations in Asia, Africa, Europe, and elsewhere affect the United States. These developments relate not only to fishery matters but also to economic and social problems.

Scientists have estimated the weight of living plant matter, mostly microscopic in size, produced yearly in the oceans at 700 billion tons. Some estimate that the weight of animals in the oceans that are large enough to be harvested by man is 1 to 2 billion tons annually. Converted into equivalent protein foods, this would be more than adequate to feed 10 times the

world's present population of 3 billion people. It is evident that the oceans have a tremendous untapped supply of animal protein that can help satisfy the increasing demand for food.

How does the U.S. fishing industry measure up to this great potential? What is its outlook for the future?

In the decade and a half following World War II, the U.S. fishing industry made little progress. The 1950's saw only limited modernization of processing plants and little improvement in fishing vessels. The average ages of plants, vessels, workers, and fishermen steadily increased because of too little infusion of fresh capital and manpower. With some exceptions, the fishing industry made few technological advances while other food-producing industries were making dramatic gains. Two notable exceptions are in the convenience food line—fish sticks and portions and breaded shrimp.

In contrast to the United States, some nations were quick to recognize the importance of fish and built fleets of large fishing vessels equipped with the latest in modern technology. U.S. landings declined slightly, but the world catch rose from 43 billion pounds in 1948 to 133 billion pounds in 1967.

Although per capita consumption of edible fish and shellfish remained fairly constant during the last 5 years, overall consumption of fishery products (including industrial products) by the United States increased substantially. From 1960 to 1967 total supply of all fishery products rose from 46 to 72 pounds per person, an increase which exceeded the population growth during the same period. U.S. fishermen, however, have not succeeded in supplying the increased demand; foreign producers of fish supplied the increase.

Much of the growth in imports consisted of fish meal, but striking increases also occurred in imports of some of our most desired edible seafood products. Imports of shrimp (round weight) rose from nearly 200 million pounds to over 300 million pounds from 1960 to 1967. Shipments of fish fillets and blocks to the United States from abroad almost doubled in this 7-year period. Chiefly responsible was the tremendous demand for fish blocks necessary for our domestically developed fish stick and portion industry, which in recent years reached an annual wholesale value of nearly $100 million.

The United States is now the world's largest importer of fishery products. Out of its total supply of over 14 billion pounds (round weight) in 1967, imports made up about 71 percent as compared to about 40 percent in 1960. Even so,

the U.S. domestic fishery at the processor level remained a billion-dollar-a-year business.

U.S. domestic catch for human food has remained relatively constant, and the catch for industrial purposes has declined. Despite the decreased landings, however, some encouraging changes signal improvement in the industry. In 1960, 131,000 U.S. fishermen with 12,000 vessels (of more than 5 net tons) and 65,000 craft (of less than 5 net tons) landed 4.9 billion pounds of fish and shellfish worth $354 million to the fishermen. In 1967, a few more fishermen and craft landed about 4.1 billion pounds valued at $440 million. In other words, they landed about 12 percent less fish than in 1960, but received 19 percent more money. Still another promising sign is that the number of vessels newly entering the fishery increased from 449 in 1960 to 869 in 1967. Many of these new vessels replaced wornout and inefficient craft.

Several important U.S. fisheries have had remarkable gains since 1960. For example, landings of king crab increased from 29 million pounds valued at $2.3 million in 1960 to a peak of 159 million pounds worth $16 million in 1966. In 1967, a scarcity existed, and the catch was 128 million pounds valued at $15 million. King crab now has such wide consumer acceptance that orders are often difficult to fill.

Shrimp landed at U.S. ports in 1960 was worth $67 million to the fishermen. In 1967, a record catch of about 308 million pounds was valued at $103 million—up $37 million from 1960. In addition, U.S.-owned vessels operating in the Caribbean continued to land substantial quantities of shrimp which later entered the United States as imports.

The change of the tuna fleet from bait fishing to purse seining with the use of the power block was another important advancement. Begun in 1957, the conversion to purse seines reached its peak in 1963. This outstanding technological improvement in vessels and gear allowed the U.S. industry to attain a greater competitive position with foreign fishermen in harvesting tuna resources.

So, despite the serious problems brought about by postwar inertia and increasing competition by foreign vessels, the U.S. fishing industry has some bright spots.

Several important factors govern trends in the U.S. fisheries. One is the increased demand for fish meal used in poultry and livestock feeding. Vast improvement in poultry raising has caused an explosive increase in the production of broilers;

broilers now consume about 70 percent of all fish meal used in the United States. As a result of industry and Government research programs, the percentage of fish meal in broiler rations has steadily increased from less than 3 percent to as much as 10 percent. U.S. fish meal consumption has increased from over 400 million tons in 1960 to nearly 700 million tons in 1966. The total U.S. supply of fish meal in 1967 was a record 860,000 tons. This increase required greater imports of foreign fish meal largely because of the recent decline in availability of Atlantic menhaden.

Recently, the industry for edible fish began an effective new product development program emphasizing high quality, preparation convenience, and portion control. Results have been spectacular. The increasing variety of nutritious, convenient, and attractive high-quality fish products offered to the consumer will further stimulate demand.

All is not rosy, however. Rapid development of foreign fishing capabilities off U.S. coasts has significantly affected some U.S. fisheries. In the Northwest Atlantic Convention area, total landings by all countries increased from 1.98 million tons in 1935 to 3.63 million tons in 1967. Yet the U.S. catch decreased from 0.55 million ton to 0.33 million ton during the same period—a decline from 27 percent to 9 percent of the total landings.

In the Pacific, U.S.S.R. and Japanese trawlers have frequently hampered operations of United States king crab and halibut fishermen. The activities of about 200 modern U.S.S.R. trawlers in waters off Washington and Oregon recently have interfered with the development of a new and promising United States fishery for hake. The U.S.S.R. fishermen captured 148,500 tons from the same area in 1966. In 1967, their catch of hake was 183,700 tons, including some taken off California.

Admittedly, the U.S. fishing industry is hampered by inadequate modernization, increasing worldwide competition from foreign fishing fleets, and frequent drastic fluctuations in availability of fish. Yet, the industry may be on the threshold of significant improvement.

Congress has been concerned over the lack of ocean research and the state of United States fisheries compared with those of the U.S.S.R., Japan, and other nations. To assist the fisheries, Congress has enacted legislation designed to improve the ability of U.S. fishermen to harvest food from the sea.

One of the most significant laws so far as fishery and ocean

research is concerned was the Marine Resources and Engineering Development Act, which created a Council of Cabinet members headed by the Vice President. The Department of the Interior recently submitted its plan for accelerated development of marine natural resources to the Council. For the future, the Bureau sees increased effort in oceanography, especially studies related to harvesting food from the sea.

Other developments by the fishing industry and the Government give encouragement that U.S. fisheries have a brighter future and will become a more important part of the U.S. economy. Under the Fishing Vessel Construction Subsidy Program new vessels have been built and are operating successfully. Recently, two new large stern ramp trawlers were constructed—one for the East Coast and the other for the West Coast. If these trawlers are successful, they may be the forerunners of a fleet of U.S. high-seas trawlers. Such vessels would compete directly with the successful high-seas fisheries of the U.S.S.R., Japan, and other nations.

New types of fishing gear developed by the Government and the fishing industry promise to revolutionize some fisheries. The new midwater trawl developed by Bureau laboratories in Seattle can capture sizable quantities of hake and other species not fished extensively by U.S. fishermen. Electric shrimp trawls recently developed in the Gulf of Mexico may be able to increase both day and night catches of shrimp.

A new process of manufacturing FPC (fish protein concentrate) has been developed. Food and Drug Administration approval has been obtained for processing FPC from hake and hakelike species. Demand for FPC could lead to increases in the catch and earnings of the present fleet, and this demand in turn would lead to construction of many new fishing vessels capable of taking the fish that FPC will require.

The needs to demonstrate the U.S. right to exclusive use of some resources off its coasts and to enter into conservation agreements with respect to other fisheries emphasize the importance of biological and oceanographic research. Experience has shown that success in negotiations depends heavily on solid scientific evidence.

To sum up, although the U.S. fishing industry has been temporarily dwarfed by the tremendous growth of fisheries of other nations, and the size and capabilities of our fishing fleet do not permit us to challenge foreign fleets off our coasts,

the U.S. fishery remains a viable and profitable industry. Its leaders recognize the need for modernization and expansion.

The Bureau stands ready to assist the U.S. fishing industry to improve its competitive position at home and abroad. This will not only improve the U.S. economy, but also make a major contribution to improving world nutrition.

To comply with the provisions of the Fish and Wildlife Act of 1956, the Bureau participated in many activities. Some of its activities relate to investigations on salmon, shad, striped bass, and other anadromous fishes; on passage of fishes over and around dams and other obstructions; and on whales, seals, and sea lions; and on population dynamics, life histories, and migrations. Other activities relate to investigations of fishery stocks of marine origin, including tunas, sardines, bottomfish, and shellfish. The Bureau also has studies on marine species that inhabit inshore waters. These species include mollusks, principally oysters and clams, and their enemies, including boring snails, starfish, and green crabs; and crustaceans, such as shrimp and blue crabs. Certain fresh waters also receive Bureau attention. The Bureau studies the Great Lakes and other inland waters to acquire knowledge necessary to maintain the fishery resources there at high levels of productivity. Programs are also established on public lands in conjunction with State agencies in interstate and other type waters. Work includes studies of how the environment, fishing, and water-use projects affect the production of fish.

The Bureau also devotes much effort to promoting the economy of the fisheries. It performs research directed toward assessing, developing, and increasing economic use of fishery resources. As required by various statutes, including the Fish and Wildlife Act of 1956 and other laws, the Bureau analyzes various economic aspects of production, distribution, and consumption of fishery products. Under the Fishery Cooperative Marketing Act of 1934, the Bureau carries out the responsibilities of the Department of the Interior for improving transportation facilities and rates for fish and shellfish and their products. In domestic and international economies, the Bureau promotes the legitimate interest of the fishing industry to a degree commensurate with the Bureau's public responsibilities. To other Federal Government agencies, Congress, and the general public, the Bureau furnishes advice, reports, and consultation services and provides detailed information and recommen-

dations on economic problems. In accordance with established policy, the Bureau develops legislation designed to resolve fundamental economic problems of the industry. The Bureau also maintains a market news service that collects, analyzes, and publishes current information and statistics on fishery commodities.

Further, the Bureau helps maintain the welfare of the U.S. commercial fisheries through its research. Investigations are made to help improve and develop methods for catching, handling, processing, preserving, storing, transporting, and marketing fishery products. The Bureau also determines the composition, properties, and nutritive value of fishery products and industrial products; develops and improves fish cookery; and improves the operations of processing plants through advisory and inspection services. Other activities are exploratory fishing to determine the character, extent, and availability of resources and to test, devise, and demonstrate the most effective types of gear and vessels. Additional efforts help develop and increase the markets for domestic fishery products by assisting the industry in its problems of production and distribution. The Bureau also provides an educational service to promote the free flow of domestic fishery products in the economy.

The Bureau also formulates and carries out policy on international fishery matters. It reviews and coordinates international foreign activities and the interests of the Department of the Interior in commercial fisheries. It collects and distributes data on foreign fisheries and collaborates with the Agency for International Development, the United Nations, and the Food and Agriculture Organization in their programs of technical assistance to developing countries.

To promote and aid development of the U.S. commercial fisheries, the Bureau supervises a Federal aid program, a fisheries loan program, a fishing vessel mortgage and loan insurance program, and a fishing vessel construction differential subsidy program. Other activities of the Bureau are the Columbia River Fishery Development Program, which is a cooperative effort with State agencies; coordination and reporting upon water resource development activities that affect commercial fishing; design and inspection of fish protective devices; management of fur seals in the North Pacific; and implementation of laws and regulations that concern the management of commercial fisheries, whales, and seals, pursuant to international agreement.

Condition and Trends of the Fisheries [1]

The year 1967 was highlighted by two extremes—record landings of shrimp and the lowest salmon catch since 1899 except for 1 year. Fishermen for the first time realized over $100 million for their shrimp catch—a record for any species and over twice the exvessel value of salmon, the next most valuable species to domestic fishermen in 1967. In many ways 1967 was a year of readjustment from the record values for the U.S. catch in 1966. In 1967, the overall price of fish and shellfish received by fishermen declined more than 1 percent, and the average monthly wholesale price of fishery commodities dropped 1.6 percent. Compared with 1966, the average annual price was lower for more than one-half of the species making up the commercial catch. The average exvessel price of food fish and shellfish was down only slightly. Compared with comparable periods in 1966, prices were lower in January, March, and May–October but higher in February, April, and November–December. The exvessel price of fish used for reduction declined because of increased imports of fish meal mainly from Peru. The average value of imported fish meal declined from $132 per short ton in 1966 to $112 in 1967.

The U.S. catch of fish and shellfish was 4.1 billion pounds, worth $440 million to fishermen. The decline from 1966 was about 311 million pounds and $33 million. Landings were the lowest in 25 years. The catches of about 60 percent of the species declined with salmon and menhaden suffering the greatest declines. There were also significant declines in the landings of haddock, blue and king crabs, whiting (silver hake), flounders, Atlantic ocean perch, and Pacific herring. Other species with declines were scup (porgy), sea scallop, Pacific and jack mackerel, northern lobster, soft clams, and spiny lobster. Besides increases in shrimp, the catches of tuna, alewives, Pacific hake, thread herring and to a lesser extent anchovies, oysters, cod, spot, squid, and Atlantic mackerel were higher.

Landings in New England declined 59 million pounds. There were decreases in haddock, whiting, flounders, ocean perch, sea scallops, and northern lobster.

Total landings in the Middle Atlantic States declined 6 million pounds. The catch for industrial products was down 8 million and the catch for food increased 2 million pounds.

Landings in the Chesapeake Bay States declined 79 million

[1] Data are preliminary.

pounds. There were smaller catches of menhaden, hard blue crabs, soft clams, croaker, butterfish, scup, shad, striped bass, and fish used for industrial products.

Landings in the South Atlantic States decreased 4 percent in volume and 8 percent in value.

Although landings in Gulf States were down slightly because of smaller menhaden catches, the significant increase in the catch of high-priced shrimp resulted in a gain in total value of 4 percent.

Landings in the continental Pacific States were down 9 percent, and the overall value was down 17 percent. There were increases in the catch of industrial fish as well as albacore, skipjack, and yellowfin tunas. The exvessel tuna prices were much lower than in 1966.

Hawaii had decreased skipjack tuna landings, and the total volume was down over 1 million pounds.

The fisheries of Alaska declined the most. Landings were down 220 million pounds, and the value decreased $33 million. The declines were caused by the very low salmon catch as well as declines in king crab and herring. Greater fishing effort for shrimp, however, produced a record Alaska catch of these shellfish.

Menhaden landings (1.2 billion pounds) comprised 29 percent of the total 1967 catch and were only one-half of the record menhaden catch in 1962. Compared with 1966, the 1967 catch in the Atlantic Ocean and the Gulf of Mexico declined 10 and 12 million pounds, respectively. As menhaden is used almost exclusively for processing into fish meal for use in animal feed, heavy imports of this processed product resulted in a 26-percent drop in the exvessel price of this species.

Some headway was made in using other nonfood fish for reduction. Late in the year a thread herring fishery in the eastern Gulf of Mexico got under way. A greater quantity of Great Lakes alewives as well as Pacific hake and anchovies was used for reduction in 1967. The use of other miscellaneous species for this purpose did not vary greatly from the previous year. Certain food species, particularly whiting (silver hake) and Atlantic sea herring that were caught in greater quantities than could be sold for human food, were processed into fish meal.

Tuna landings in the United States were up 59 million pounds, but the value to fishermen was down $660,000 compared with 1966. Yellowfin and skipjack made up 80 percent

of the tuna catch. Albacore followed by bluefin made up most of the remaining 20 percent. The skipjack tuna catch was nearly double; albacore was up 31 percent; yellowfin was up 7 percent; and bluefin production was less than one-half of the 1966 catch. With the exception of albacore, most of the tuna was landed in California. Compared with 1966, the ex-vessel prices in California were down 2.5, 3.1, and 4.2 cents a pound for bluefin, skipjack, and yellowfin tunas, respectively. The price of albacore was up 0.6 cent per pound. Additional tuna landings by the U.S. fleet in Puerto Rico were 98 million pounds worth $10 million—up 33 million pounds and $555,000 above the previous year. This catch consisted of 80 percent skipjack, 19 percent yellowfin, and 1 percent bluefin.

Shrimp landings of 308 million pounds (heads-on) worth $103 million to fishermen, established a record for this species in both quantity and value. The previous high volume was in 1954 when 268 million pounds were reported. Shrimp has fast become the most valuable marine fish resource and is the first to attain a value of over $100 million to domestic fishermen. Compared with 1966, the catch was up 69 million pounds, and the value was up $7 million. All shrimp-producing areas, except the South Atlantic, registered gains. Landings in Alaska, Maine, and Oregon established a record for each of these States. Landings at Gulf of Mexico ports were up 46 million pounds. This increase was attributed to a record catch of brown shrimp in the northern Gulf of Mexico in waters off Louisiana and Texas. Landings were heavy during the summer, the height of the brown shrimp season. Canning plants operated to capacity, and appreciable quantities of small shrimp were sun dried. Nearly one-half of the total 1967 shrimp catch in the Gulf was landed during June, July, and August. In contrast, only 35 percent was landed in these 3 months during 1957–66. In September, however, hurricane Beulah paralyzed fishing and did extensive damage to many vessels (some were destroyed) and shore establishments. Along the coastal area, major damage was centered in the Port Isabel-Brownsville, Tex., area, an important shrimp production center. A wide area was affected.

The 217-million-pound catch of salmon worth $49 million was down 171 million pounds and $25 million from 1966. The catch was 83 million pounds less than the annual average during 1957–66. In only 1 year in this century have landings been lower—in 1959 when the catch was about 202 million pounds. A big drop in Alaska was offset partially by a signifi-

cant increase in Washington and Oregon. During 1967 landings in Washington, Oregon, and California were 78 million pounds—an increase of 24 million pounds from 1966, and also 27 million above the average annual catch during the previous 10 years.

The Alaska salmon catch was a failure. Landings were 139 million pounds, valued at $25 million—the lowest volume since 1900. The previous low was in 1959—147 million pounds. The 1967 catch was 58 percent less than a year earlier and 44 percent lower than the average for 1957–66. Yearly records of the total catch are available since 1867, but a listing by species was first recorded in 1906. Pink salmon has dominated the salmon catch, followed closely by red (sockeye) salmon. Both species made up 59 percent of the total Alaska salmon catch. For the 61-year period, 1906–66, Alaska salmon landings were pink salmon 42 percent, red (sockeye) salmon 33 percent, chum (keta) salmon 16 percent, silver (coho) salmon 5 percent, and chinook (king) 4 percent.

The 1967 Alaska salmon catch declined for all species except king or chinook. Pink salmon landings were 29 million pounds —a record low volume. It was only 27 percent of the average yearly landings during 1957–66. The previous low catch of pink salmon was close to 31 million pounds in 1906, the first year data by species were collected. Pink salmon landings of less than 50 million pounds occurred in only 6 years during the 1906–66 period—in 1906, 1907, 1909, 1910, 1921, and 1959. Alaska 1967 landings of red (sockeye) salmon of nearly 54 million pounds were 24 percent lower than the 1957–66 average. The previous low was 35 million pounds in 1958. Red salmon landings of less than 50 million pounds occurred in only 4 years, all since 1954. The 1967 catch of chum (keta) salmon was nearly 32 million pounds. It was 35 percent less than the previous 10-year average. Silver (coho) salmon landings were 13 million pounds, 3 and 1 million less than 1966, and the 1957–66 average, respectively. However, landings of king (chinook) salmon in Alaska during 1967 of nearly 12 million pounds were the highest since 1959 and were 2 million above 1966 and the average annual catch in 1957–66.

A 15-million-pound decline in Atlantic flounders resulted in a catch of 111 million pounds worth $13 million. The value was down $3 million. Yellowtail flounders taken in the New England area accounted for most of the decline in volume and

value. A major portion of the catch of this species was small in size.

Because of scarcity of haddock in North Atlantic waters, the catch dropped to 98 million pounds valued at $11 million from 132 million pounds worth $14 million in 1966. The catch in the period 1965–67 has depended almost entirely upon the 1963–year class. There has been poor survival of spawn since then. Accordingly, landings will continue to decline at least in 1968 and 1969.

The Pacific halibut catch, 40 million pounds worth $6.4 million, was only slightly less in quantity, but the value was down significantly from 1966. There was less fishing for halibut as many fishermen turned to other more profitable species. For the first time since 1947, the total catch did not reach the quota set by the International Pacific Halibut Commission. Also for the first time since 1962, the catch by U.S. fishermen (54 percent) was greater than by Canadian fishermen (46 percent). The Canadian fleet remained tied up during May, a month when catches of halibut normally are high.

Atlantic ocean perch landings decreased 10 million pounds to 71 million pounds with an exvessel value of about $3 million—the lowest volume since 1938. The average exvessel price of 3.9 cents per pound was 7 percent less than in 1966. In the peak year, 1951, landings were 258 million pounds with an average price to fishermen of 4.9 cents a pound.

Compared with 1966, sea herring landings decreased 8 million pounds, but the value was up $47,000. The catch in the Atlantic Ocean was down 2 million pounds to 70 million. The Pacific herring catch dropped 6 million to 18 million pounds. The peak U.S. catch of sea herring in the north Atlantic Ocean was 201 million pounds in 1902, and in the North Pacific Ocean 263 million pounds in 1937.

Atlantic sea bass landings were slightly less than the 5-million-pound catch in 1966. Since the peak year in 1952 (22 million pounds), the catch has gradually declined to the present low. Although exvessel prices have fluctuated above the 10 cents per pound since the peak year, the price to fishermen in recent years has been upward—from an average of 11.5 cents a pound in 1965 to 17.1 cents in 1967.

Scup (porgy) is another Atlantic species showing a trend similar to sea bass. Production has dropped from a peak of 49 million pounds in 1960 to 28 million pounds in 1966 and 20 million pounds in 1967. The exvessel price for scup averaged

5.6 cents a pound in 1960, 11.7 cents in 1966, and 16 cents in 1967.

Whiting (silver hake) landings of 70 million pounds worth $2.2 million were 21 million pounds and $1.8 million less than 1966. The supply was good, but the demand was not strong. The average price of 3.1 cents per pound was 30 percent less than the previous year.

The oyster harvest of 60 million pounds of meats worth $32 million to fishermen was up 9 million pounds and $5 million from 1966. The increase was principally in the Chesapeake and Gulf areas. The greater harvest in the Gulf was the result of an 85-percent increase in the production of hermetically sealed processed canned oysters.

The production of Atlantic clam meats, 71 million pounds worth $20 million to fishermen was down 1 million pounds from 1966, but the value was up $2 million. The harvest of hard clams was slightly greater and surf clams slightly less, but soft clams from the Chesapeake area decreased about 2 million pounds. Compared with 1966, the exvessel price of hard, soft, and surf clam meats was up 10, 20, and 13 percent, respectively.

Crab landings were 322 million pounds worth $32 million, down 50 million pounds and $716,000 from 1966. King crab landings declined 31 million pounds and $701,000. Most of the 21-million-pound decline in blue crabs was in the Chesapeake States. Landings of Dungeness crab were up because of increased catches in Alaska.

Northern lobster landings were 3 million pounds less but $120,000 more than the 1966 catch of 30 million pounds valued at $22 million. Since the peak year landings of 31 million pounds in 1960, when fishermen received 45.7 cents per pound, the exvessel price gradually increased to an average of 75.4 cents in 1966 and 83.7 cents in 1967.

Sea scallops were scarce in 1967, but the price reached an all-time high. The harvest was down 5 million pounds (edible meats) from 16 million pounds in 1966, but the average exvessel price increased 11 percent to 83.7 cents per pound. Since the peak year of 1961 when landings were 27 million pounds, the catch declined each year except 1965. In that year, beds off the coast of Virginia yielded a substantial catch of sea scallops.

The 1967 pack of canned fishery products (for human consumption) in the United States, American Samoa, and Puerto Rico was 30.8 million standard cases (699 million pounds) with a primary wholesale value of $446 million. This was about 2.3

million cases (124 million pounds) and over $62 million less than 1966. Nearly all of the decline was caused by the low production of canned salmon. Canned tuna, which makes up the bulk of the pack, 19.7 million standard cases worth $261.5 million, declined only slightly. The salmon pack of 2.1 million cases valued at $76.1 million was 2.3 million cases and $60.0 million less than 1966. The pack of canned shrimp increased 392,500 cases to 2.5 million with a value of $24.3 million. Canned clam products, 2.5 million cases valued at $21.7 million, were 84,000 cases less than the previous year, but the value was up $600,600. The pack of canned crab meat, 497,800 cases valued at $16.1 at the wholesale level, compared with a 1966 pack of 564,000 cases worth $16.4 million. Canned Maine sardines, 1.3 million cases with a value of $13.9 million, was 82,000 cases less than 1966, but the wholesale value was up $1.6 million. The quantity of canned oyster meat totaled 330,000 cases valued at $6.2 million, while the production of oyster specialties (mostly stews) was 243,000 cases worth $4 million. Compared with 1966, the pack of oyster meats was up 130,000 cases and oyster specialties declined 40,000 cases. The production of canned animal food of 10.4 million cases worth $78.3 million increased 37 percent in volume and 43 percent in value over 1966.

Production of processed fresh and frozen fishery products was generally less than in 1966. Fish fillets and steaks were down 12.9 million pounds and $5.2 million from 1966. Four species, flounder, haddock, ocean perch, and cod, made up 77 percent of the total fillets and steaks produced both years; however, cod was the only one registering an increase in 1967. Fish sticks and portions established a record of 235.2 million pounds—up 6.2 million pounds, but the value, $91.1 million, was $2.7 million less than in 1966. Processed frozen raw, peeled, and cooked shrimp commodities increased over the previous year; however, production of breaded shrimp declined 10.7 million pounds and $8.8 million from the record of 104.9 million pounds worth $94.2 million in 1966.

Production of fish meal of 211,200 tons was 13,000 tons less than 1966, and the lowest since 1948. The wholesale price averaged $123 a ton, $21 less than the previous year.

Imports of edible fishery products were down 8 percent or 123 million pounds, and the value declined 6 percent or $30 million from 1966 when total receipts from foreign countries were 1.6 billion pounds with a declared value of $568 million—a record year. Major declines were noted for frozen tuna, blocks or slabs

of fish meat used for processing sticks and portions, fish fillets, canned sardines (not in oil), canned herring (in oil), and frozen northern lobster and spiny lobster. Increased imports of such important seafoods as frozen shrimp, oysters, and canned tuna—up 7.1, 4.7, and 3.8 million pounds, respectively—partially offset the overall decline in edible products. Imports of fish meal, an important ingredient in animal foods, reached an all-time high in 1967—651,486 short tons, 45 percent greater than the previous year. The declared value of fish meal was 23 percent greater than in 1966. Peru furnished 68 percent of the total fish meal imports and Norway 17 percent.

Total exports of edible domestic fishery products were 1.7 million pounds below 1966, but the value was up $4.6 million. Shipment of shellfish increased 19 percent and fish commodities declined 11 percent. Fresh and frozen products increased and canned products decreased. Salmon, shrimp, and squid made up 61 percent of the domestic exports in 1967 and 55 percent in 1966. Shipments of shrimp and squid were up significantly but salmon was down slightly from the previous year. Exports of fish oil (77 million pounds) and shells (42 million pounds) made the bulk of the industrial fishery products. The quantity of fish oil exported declined less than 1 percent from 1966, but the value dropped 37 percent. Exports of unmanufactured shells (mostly freshwater mussel shells) decreased 35 percent in volume and 56 percent in value from the previous year.

The combined domestic landings and the catch by foreign nationals furnished a record supply of edible and industrial products for use in the United States in 1967. The total supply on a round weight basis (exclusive of marine univalve and bivalve mollusk shells) was 14 percent greater than in 1966—the quantity for human consumption was down 6 percent, but the volume for industrial products (principally fish meal) was up 44 percent. Of the total supply, foreign countries contributed 71 percent and the United States 29 percent. U.S. fishermen harvested 48 percent of the supply used for food—about the same as in 1966, but only about 17 percent of the fish for the record supply of fish meal. The total value of imported fishery products was down slightly, less than 2 percent from the 1966 value of $720 million.

Developments in the Fisheries

In 1967, there were important developments in the domestic fisheries, Federal legislation affecting fisheries, and international fishery matters.

Domestic Fisheries

In the domestic fisheries, 1967 saw the expansion of the calico scallop fishery of the east coast of Florida, continuing improvement of Lake Michigan alewife fishery, fisheries for Pacific hake in Puget Sound and off the Washington Coast, effect on the fishing industry of the Roman Catholic church's decision to rescind its regulation of Friday as a day of abstinence from meat, and start of a thread herring fishery off the west coast of Florida.

Florida Calico Scallop Fishery

Availability of scallops, invention of mechanical shucking and cleaning devices, and a reduced North Carolina calico scallop fishery in 1967 have made possible a sustained commercial harvest from vast underutilized scallop beds off the east coast of Florida.

Bureau exploratory vessels in 1959–60 found large commercial concentrations off St. Augustine, New Smyrna Beach, and Cape Kennedy. From September through December 1967 four vessels intermittently landed 5,035 bushels of scallops at St. Augustine and Port Canaveral.

Calico scallops previously had been harvested only occasionally in Florida. An obstacle to a large fishery for scallops was lack of an efficient method of handling the scallops aboard the vessels. Within the past 2 years, however, industry solved this problem by developing a device to separate mechanically the live from dead scallops, a shucker, and an eviscerator. Some of these devices are being tested on board scallop vessels.

Lake Michigan Alewife Fishery

The alewife fishery in Lake Michigan continues to increase each year. Catches of alewives increased from 400 pounds in 1956 to an estimated 40 million pounds in 1967. About two-thirds of the 1967 catch were landed in Wisconsin and the other third was landed in Michigan. The alewives landed at ports on Lake Michigan were used mainly for fish meal, oil, and pet food.

Commercial fishing vessels had good winter fishing during the 1967–68 season in Lake Michigan. Catches of 15,000 to 20,000 pounds per day per vessel were taken between storms. Ice forma-

tion on the lake was minimal and did not interfere much with the fishing.

Investigations in the fall of 1967 indicated that, despite the large mortality of alewives earlier in the year, stocks of adults were large in Lake Michigan and young-of-the year recruitment was as good as or better than in any year on record.

The increased commercial harvest of alewives and introduction of salmon that are predators may change the present population balance among species in the Great Lakes.

Pacific Coast Hake Fishery

The Pacific Coast had two hake fisheries in 1967. The Puget Sound fishery, which began in the fall of 1965, has successfully completed two seasons. Catches in the 1965–66 and 1966–67 winter seasons were 6¼ and 9¾ million pounds, respectively, although few boats participated in the fishery. If markets had not been limited, catches in both seasons would have been much larger. Landings and catch per unit of effort in the 1967–68 winter season have been below those of previous seasons. The hake were processed into fish meal, oil, and pet food.

United States vessels began the other Pacific hake fishery in July 1966 off Aberdeen, Wash., 2 months after a large U.S.S.R. fleet began catching hake. In 1966, the U.S.S.R. caught 300 million pounds of hake and the United States 3¾ million pounds. The United States used 4 vessels in 1966 and 10 in 1967. Because the U.S. fleet was larger than in 1966, could scout more effectively, and had improved midwater trawls, depth telemetry equipment, and the protection afforded by the 12-mile fishing limit, the U.S. catch in 1967 increased to almost 20 million pounds. U.S.S.R. catches in 1967 off Washington and Oregon reportedly were about 20 percent lower than those in 1966.

Pacific hake taken in the ocean in 1966 and 1967 were landed at Aberdeen and processed there into fish meal and oil.

An Economic Development Administration grant supplemented earnings of U.S. fishermen who participated in the 1966 and 1967 ocean hake fishery. They stopped fishing in both years when the grant ended.

Removal of Friday Abstinence from Meat

The Roman Catholic church's edict of late 1966, discontinuing Friday abstinence, significantly affected the fishing industry.

The effect of the edict on fish consumption is long run and not yet entirely known. Preliminary indications are that it will remove the stigma of fish being considered primarily a Friday food.

Marketing efforts in 1967 were adjusted to changing the attitudes and behavior of many consumers who previously had considered fish a penitential item.

The edict appeared to affect sales in 1967. Institutional sales of fishery products—particularly those of parochial institutions—tended to decline. Seafood, however, appeared on restaurant menus more often after the edict than before, and, according to Gallup Surveys, consumers favored this trend. The effect on retail sales in 1967 was not determined. Nevertheless, the preliminary per capita consumption figures of 10.6 pounds of fish indicate that domestic use of fishery products in 1967 was the same as in 1966.

Thread Herring Fishery

A fall-winter fishery for thread herring and sardinelike species for industrial use developed in 1967 off the west coast of Florida. The Bureau's new exploratory vessel *Oregon II* and commercial fishing vessels operating out of Florida and Louisiana cooperatively sought and detected the schools of fish, and industry vessels obtained information on size of schools. From September through December 1967 commercial fishermen landed 10,400,000 pounds.

This new fall-winter fishery promises to extend the industrial fishery season in the northeastern Gulf of Mexico.

Federal Legislation

During 1967, the 1st Session of the 90th Congress, a considerable number of fishery bills were introduced. Little final action on this legislation was accomplished. When the Session ended, only three bills that had provisions affecting commercial fisheries were enacted. See appendix B for detailed information and citations concerning these bills.

Foreign Assistance

During consideration of amendments to the Foreign Assistance Act of 1961, the Congress adopted an amendment to emphasize work with fish protein concentrate. As finally enacted, Public Law 90–137 contains an authorization to the President to conduct a program to demonstrate the potential and to encourage the use of fish and other protein concentrates to reduce nutritional deficiencies in less developed areas. Included would be studies relating to food technology, development of marketing techniques, development of consumer acceptance programs, and

feeding programs designed to demonstrate the nutritional value of these concentrates as a diet supplement.

Under the terms of the Act, the President is to consult with the National Council on Marine Resources and Engineering Development, Government agencies, and other groups, and to encourage participation by private industry. The President is authorized to use funds made available under Part I of the Foreign Assistance Act of 1961, as amended, and is urged to use at least $2,500,000 of such funds for the purposes of this new section.

Loan of Naval Vessels

Existing law permits the loan of certain naval vessels to foreign countries. In Public Law 90–224 the Congress extended the terms of certain loans of vessels and permits the making of new loans. This extension authority provides that for a new loan or the extension of an existing loan there be a condition that the loan agreement be immediately terminated upon a finding made by the President that the country with which such agreement was made has seized any United States fishing vessel because it was fishing in international waters.

Marine Resources and Engineering

The Marine Resources and Engineering Development Act of 1966 (Public Law 89–454) provided inter alia for the creation of the National Council on Marine Resources and Engineering Development and for its termination 120 days after submission of the final report and recommendations of the Commission on Marine Science, Engineering, and Resources, another organization created by this same Act. The 1966 Act also provided that the final report and recommendations of the Commission should be made not later than 18 months after the establishment of the Commission. In 1967, the Congress enacted Public Law 90–242, which amended the 1966 Act by setting June 30, 1969, as a specific date for the termination of the Council and extended the time for the final report and recommendations of the Commission from 18 months after its establishment to 24 months after such event.

International Developments

Developments in foreign fisheries greatly affect the fishing industry and fishery policy of the United States. The continued expansion in 1967 of foreign fishing activities off the coasts of the United States in areas traditionally fished by U.S. fishermen created a need for new arrangements to conserve the fisheries.

To assist and protect the fisheries, the United States concluded a number of new agreements and extended others with the U.S.S.R., Japan, and Mexico, governing the conduct of fishing in areas of mutual concern.

The Bureau continued its efforts to obtain information on fishery developments in foreign countries in order to assess their impact on the United States, which is an important market for foreign fishery products. It also analyzed data on foreign fishery trade to measure its effect on the U.S. fishing industry. The Bureau continued to take an active and leading role in activities of international fishery commissions and at meetings sponsored by the Food and Agriculture Organization of the United Nations and affiliated organizations.

Developments in Foreign Fisheries

The upward trend in the world catch which began in the early 1950's continues. Although complete figures are not available for 1967, fishery statisticians estimate that the catch exceeded the previous record of 62.6 million short tons (live weight) in 1966. The average annual increase in the total catch during the 5 years, 1962–66, was 3 million tons. The six major fishing countries (Peru, Japan, China (mainland), U.S.S.R., Norway, and United States), which account for 57 percent of the 1966 world catch, had an average year–to–year increase of 1.5 million tons during the 5–year period. Peru and U.S.S.R. registered the greatest increase, followed by Norway and Japan. During the 1962–66 period the U.S. catch declined at an average annual rate of 92,000 tons.

In 1967, delegations of the United States discussed fishery problems with delegations of the Governments of the U.S.S.R., Japan, and Mexico.

The agreement known as the Kodiak Gear Agreement, signed by the United States and the U.S.S.R. in 1964, was reviewed in December 1967 and extended for 1 year.

In 1963 and 1964, U.S.S.R. trawling activities increased rapidly in the Gulf of Alaska and began to cause considerable damage to the fixed pot fishing gear of United States king crab fishermen. United States and U.S.S.R. negotiators met to consider the problem and agreed that fishermen should operate with due consideration for the interests of others. This principle is the basis for the Kodiak Gear Agreement, which provides that U.S.S.R. fishermen will not trawl or fish with other mobile gear in six areas around Kodiak Island during July to October

when United States king crab fishermen fish extensively with fixed crab pots.

Duration of the original agreement was 3 years. The agreement was extended for 1 year at the discussions in December 1967 because it benefited U.S. fishermen by greatly reducing gear conflicts.

The United States takes the position that king crabs constitute a fishery resource of the Continental Shelf and that, as a coastal country, it has sovereign rights over them. This principle is contained in the Convention on the Continental Shelf which entered into force June 10, 1964, after being ratified by 22 countries, including the United States and the U.S.S.R. The United States, however, has allowed certain traditional U.S.S.R. fisheries for king crab to continue subject to specific limitations. Limitations on the U.S.S.R. king crab fishery were first established in the United States–U.S.S.R. agreement of February 5, 1965. The 2–year agreement provided that the U.S.S.R. king crab fishery in the eastern Bering Sea would be limited to a production of 118,600 cases of 48 half–pound cans of crab meat each year. In February 1967 the agreement was renewed for 2 years and the quota cut to 100,000 cases a year.

In early 1967, after the United States established a zone of exclusive fishery jurisdiction that extends 9 miles beyond the 3–mile United States territorial sea, the U.S.S.R. and the United States again met to resolve certain fishing conflicts. U.S.S.R. fishing off the United States West Coast had increased and was hindering United States fishermen in the Pacific Northwest and in Alaska. In many instances the large fleets of the U.S.S.R. preempted fishing grounds on the high seas. The U.S.S.R., however, was concerned about how the extension of United States fishery jurisdiction would affect its fisheries.

In the agreement signed February 13, 1967, the U.S.S.R. agreed not to fish in several large areas of the high seas off the Pacific Northwest Coast of the United States where United States fishermen usually operate. In return for these important U.S.S.R. concessions on high–seas fishing, the United States agreed that during some periods of the year the U.S.S.R. might transfer catches and continue its fisheries within certain small areas of the United States 3– to 12–mile fishery zone that were not used by United States fishermen. Recognition of such traditional fishing rights is authorized by Public Law 89–658, signed October 14, 1966, establishing the 9–mile fishery zone.

On December 18, 1967, both sides acknowledged that the agree-

ment had benefited them and, therefore, extended it without change for another year.

Large-scale U.S.S.R. fishing off the United States mid-Atlantic Coast also created problems. Information available early in 1967 indicated that U.S.S.R. fleets were catching species, such as hake, on the high seas before these fish could move inshore where United States fishermen usually operate. To resolve this conflict in the Atlantic, the United States and the U.S.S.R. signed a 1-year agreement November 25, 1967. The Atlantic agreement follows the pattern of the United States–U.S.S.R. agreement on similar North Pacific problems signed February 13, 1967. Under terms of the Atlantic agreement, the U.S.S.R. agreed to refrain from fishing during the first 3 months of the year in a 4,700-square-mile area of the high seas south of Long Island, New York. This agreement should provide substantial protection to fluke, hake, and scup because they concentrate in the area during the times indicated.

The U.S.S.R. also agreed not to increase its 1968 catch in the Middle Atlantic Bight above the level of 1967 catches. In addition, the U.S.S.R. agreed to refrain from fishing, especially for fluke and scup.

In return for the U.S.S.R. concessions, the United States agreed that U.S.S.R. fishing vessels may load at specified times in two small areas of the United States 3- to 12- mile contiguous fishery zone established by Public Law 89-658 and may fish in one small area in the contiguous fishery zone. This agreement will be reviewed in late 1968.

The United States and Japan also had fishery problems. In early 1967, the United States began discussions with Japan on its claims to fishing rights within the United States fishery zone. An agreement to remain in effect until December 1968 was reached May 9, 1967.

The agreement allows certain traditional Japanese fisheries to continue inside the United States exclusive fishery zone during specific periods. It also places certain restrictions on Japanese fishing on the high seas outside the fishery zone. The agreement will minimize gear conflicts in areas usually fished by U.S. fishermen. Off Alaska within the 3- to 12-mile-zone, for example, Japan is permitted to continue crab fishing off the Pribilof Islands and to trawl in prescribed areas in the Aleutian Islands. Japan, on the other hand, agreed to refrain from fishing in the six areas off Kodiak established under the United States–U.S.S.R. gear agreement, extensive portions of which lie beyond 12 miles,

during the period specified in that agreement, as well as in certain other areas. Future arrangements concerning Japanese fishing off the United States under this agreement are scheduled for discussion in November 1968.

In addition, the United States and Mexico had fishery problems. In October 1967, they exchanged notes giving effect to an agreement that provides for reciprocal fishing rights for United States and Mexican fishermen off each other's coasts for 5 years commencing January 1968. This agreement is based on laws that both countries have passed to extend their fishery jurisdiction to 12 miles. One major difference exists in the two claims of fishery jurisdiction, however. Mexico claims a 9–mile territorial sea, whereas the United States claims a 3–mile territorial sea. The agreement, therefore, applies only to waters between 9 and 12 miles.

The agreement lists the species which each country claims its fishermen have traditionally fished off the other country. The fisheries most concerned are shrimp in the Gulf of Mexico, tuna off the Pacific Coast, and finfish on both coasts. The agreement provides for exchange of data on the areas in which traditional fishing has been carried on, annual review of the operation of the agreement, and cooperation in a program of research and conservation of stocks of mutual concern. Each country will be responsible for enforcing the agreement within its fishery zone.

The agreement is of considerable economic importance to several segments of the U.S. fishing industry, particularly the shrimp industry of the Gulf States and the tuna industry of the Pacific Coast.

Foreign Trade

Bureau staff members analyzed data on foreign trade in fishery products to determine how changes in import and export trade affect the U.S. fishing industry. They participated also in the work of interagency committees that consider various problems involved in fishery product tariffs and trade in connection with Kennedy Round negotiations.

During 1967, the value of U.S. imports of fishery products was $687 million, down 5 percent from the record year, 1966. The value of fishery exports was $102 million, up nearly 3 percent. The value of exports in 1967 increased 43 percent over the previous 5–year average.

During 1967, the Bureau's Office of International Trade Promotion continued its efforts to develop and expand markets for

U.S. fishery products in Western European countries. The Bureau participated in food trade fairs in Milan, Italy; Leeds and London, England; Frankfurt, Germany; Dublin, Ireland; Cologne, Germany; and Dijon, France. The average immediate sale from each fair was about $100,000 per fair. Projected sales for the next 12 months were estimated to be $3 million.

The most popular U.S. fishery products were expensive, high-quality species including frozen Alaska king crab meat, lobsters, shrimp, and salmon. The popular canned items were smoked salmon, shad, shrimp, and sturgeon. At the London Trade Center fair $330,000 worth of frozen Marine shrimp were sold.

During 1967, the Bureau was responsible for introducing and selling fishery products not previously promoted or marketed in Western Europe. At Dublin, Leeds, and Dijon, fishery products new in the area were sold at retail to the public. These were frozen fish frankfurters, IQF (individually quick frozen) oysters, IQF shrimp with cocktail sauce, IQF Maine shrimp, frozen lobsters, and canned smoked salmon, shad, and sturgeon. New products that were displayed and then sampled by tradesmen at other fairs included frozen Dungeness crab meat, West Coast shrimp meat, fish sausage, canned fish spread, and chowder.

Twenty–two U.S. firms participated in one or more international food fairs for the first time during 1967. Since it began in July 1965, the Bureau's export program has had 58 firms that have participated in 19 foreign fairs in 7 different countries (Ireland, U.K., France, Belgium, Italy, Germany, and Austria).

During October 30 to November 1, 1967 the Bureau participated in the 54th National Foreign Trade Convention at New York, N.Y. "Strengthening the World Economy—A Reassessment of Responsibilities and Policies" was a timely theme of the Convention. The consensus of the speakers was that the present upsurge of protectionist reaction in the United States presented a very real and serious economic and political threat to the United States and to the world in general and that organized effort was essential to combat this reaction.

Foreign Trade Analysis

Increasing realization that international trade in fishery products had serious problems caused the Bureau to activate the Foreign Trade Analysis Section in the Branch of Foreign Trade and Economic Services. The program of this Section has been organized and staff members have been recruited.

In 1967, the Section established a system for continuing in-

ternational competitiveness studies (United States versus its principal competitors) on important edible fishery products. The Section also established a system for a continuing survey to measure how tariff changes affect U.S. foreign trade in fishery items. Other accomplishments of the Section were determining (in summary form) the probable impact of Kennedy Round tariff cuts on U.S. production of selected fishery items and preparing a briefing book, "Kennedy Round Concluded."

International Meetings

The more important international meetings in 1967 involving the Bureau and its personnel were those of Food and Agriculture Organization of the United Nations, Great Lakes Fishery Commission, Gulf and Caribbean Fisheries Institute, Inter-American Tropical Tuna Commission, Intergovernmental Oceanographic Commission, International Commission for the Northwest Atlantic Fisheries, International Council for the Exploration of the Sea, International North Pacific Fisheries Commission, International Pacific Halibut Commission, International Pacific Salmon Fisheries Commission, International Symposium on Protein Foods and Concentrates, International Whaling Commission, North Pacific Fur Seal Commission, Organization for Economic Cooperation and Development, and UNDP/FAO Caribbean Fisheries Development Project.

International Programs

Important international programs in which the Bureau participated in 1967 were the United Nations' Codex Alimentarius Commission and the Foreign Currency Research Program.

Reporting on Foreign Operations

Fishing activities of foreign countries are changing continually. The Bureau obtains the information it needs to have to know how foreign fishery activities and developments affect the U.S. fishing industry and U.S. Government programs and policies. Fishery attachés in United States embassies in Denmark, Ivory Coast, Japan, and Mexico supplied the U.S. Government and the commercial fishing industry with news on fishery developments in their regions. Current information on the world's ever-changing fisheries provided a basis for many U.S. Government and industry decisions. Such reports are also used in international negotiations and in resolutions of international fishery problems.

The Bureau continued to provide current reporting on the increasing foreign fishing off United States coasts, particularly

by Japanese and U.S.S.R. vessels. In 1967, East German and Polish vessels intensified their fishing in the Northwest Atlantic.

Treaty Enforcement and Foreign Fisheries Surveillance

The Bureau helped the U.S. Coast Guard make aerial and surface patrols in most U.S. waters to enforce the 13 fishery treaties and agreements to which the United States is a party, to provide intelligence information on foreign fishing fleets and their catches off the United States, and to protect the contiguous fisheries zone and territorial waters from foreign fishing. Bureau personnel traveled over 300,000 miles on aerial patrol and 100,000 miles on surface patrol in the Northwest Atlantic Ocean, Bering Sea, Gulf of Alaska, and off the Pacific Coast. In addition, the Bureau made more than 5,200 dockside inspections in California, Puerto Rico, and New England to enforce regulations promulgated under authority of the Tuna Convention Act and the Northwest Atlantic Fisheries Act.

Many violations by foreign vessels were reported and investigated. Three U.S.S.R. and two Japanese vessels were seized. Four of these seizures were for violating the contiguous fisheries zone or territorial waters, and convictions were obtained in a U.S. court. The fifth seizure was a Japanese longliner that was apprehended in the Gulf of Alaska for having halibut in violation of the International North Pacific Fisheries Convention. The vessel was released to custody of the Japanese Government for appropriate action.

Accomplishments and Operations

Principal Accomplishments

A summary of some of the Bureau's more important accomplishments in 1967 follows:

North Pacific

Accomplishments in the North Pacific region concerned midwater availability of pink shrimp around southeastern Kodiak Island; Columbia River Fishery Development Program; Columbia River Fish–Passage Research Program; development of inland fresh fish markets; estimates of growth and mortality rates of groundfish; recommendations for king crab quotas; Pacific hake studies; Pacific saury explorations; Pribilof Islands fur seal industry; research on distribution of salmon; and water resource developments.

Alaska pink shrimp studies.—In cooperation with industry, the Bureau's Exploratory Fishing and Gear Research Base at Juneau investigated midwater availability of pink shrimp, *Pandalus borealis,* around southeastern Kodiak Island. By making echo-sounding transects coupled with test drags with a Cobb pelagic trawl from the Bureau vessel *John R. Manning,* the researchers found schools of pink shrimp at night considerable distances above the bottom in inshore waters. Although no commercial-size catches were taken—the largest catch was 710 pounds of shrimp in a 1-hour haul—considerable information was obtained on diurnal movements of shrimp. Results suggest that pink shrimp would be most available to midwater trawls either as they begin rising from the ocean bottom with onset of darkness or just before they finish descending to the bottom in early morning.

The Research Base experimented also with a Dutch twin-bag trawl to reduce the number of unwanted fish in catches of small ocean pink shrimp. The Dutch trawl has an upper bag and a lower one and is made so that bottomfish enter the lower bag while shrimp enter the upper one. Test fishing with a modified version of the trawl in Kalsin Bay, Kodiak Island, was encouraging. No shrimp were taken in the lower bag, and no bottomfish, crabs, or debris in the upper one.

Columbia River Fishery Development Program.—By means of fishways over barriers, hatcheries, and screens on water diversions, this Program endeavors to increase and preserve salmon stocks of the Columbia River Basin.

In 1967, the Program continued active participation in managing salmon and steelhead runs of the Columbia River Basin by funding operation of 21 hatcheries, 720 fish screens, and 84 major fishways. This is a cooperative effort—most of the work being done under contracts to conservation agencies in Washington, Oregon, and Idaho.

The results of artificial propagation have been encouraging. Over 252,000 adult coho salmon returned to 13 hatcheries. Studies by the State of Washington Department of Fisheries indicate that for each fish that returned to the hatchery four were caught by the fisheries.

Results from the Bureau's hatchery evaluation study show that Columbia River fall chinook salmon are caught in the ocean from Alaska to California. Using information on the recoveries of marked fish, Bureau scientists have calculated that from the 1961 brood of fall chinook salmon released from

Spring Creek National Hatchery more than 1,385,000 pounds of salmon were caught by commercial and sport fishermen.

Rearing salmonids in artificial or controlled impoundments has produced significant results. About 700,000 migrant-sized salmon were raised in a 20-acre pond. They fed on natural food in the pond and were also given supplemental feeding with hatchery food. Cost of rearing these fish was substantially less than the cost of fish raised by standard hatchery methods.

Two hatchery streams had special fishing seasons to crop excess numbers of coho salmon. Forty thousand adults and 25,000 jacks (early maturing, small salmon) were caught.

The catch of salmon by sportsmen in the Columbia River set new records. Sportsmen caught over 300,000 coho salmon and 77,000 chinook salmon.

Gill net landings of 3.8 million pounds of coho salmon were the second highest in 30 years.

The chinook salmon runs varied markedly. Small runs of spring and summer chinook salmon characterized the returns of adult chinook to Columbia River. Because of the poor runs, commercial fisheries were curtailed and catches in the river were low. The fall run of chinook salmon, many of which had been produced by hatcheries, was excellent. A total of 39,000 fish returned to the hatcheries, and about 196,000 fish were caught in the river. The river catch was more than 1 million pounds greater than the 1966 catch.

In the Columbia River Basin some emphasis has been on developing the fish passage systems at major dams. Emergencies occurred at John Day Dam on main stem Columbia River and at Lower Monumental Dam on the Snake River during the annual spring freshet. Both are under construction and required almost constant attention to assure adequate conditions for fish passage. A fish collection facility on a barge at Hells Canyon Dam did not operate properly, was severely damaged, and is being modified as suggested by Bureau fish facility specialists. Fish collection facilities and water supplies for large hatcheries planned on the Columbia (expansion of Ox Bow and Spring Creek hatcheries) and in California (Mad River) were reviewed. Plans were offered for modifying obsolete fishways at River Mill Dam on Clackamas River and Leaburg Dam on McKenzie River, Oreg.

There has been an unaccountable loss of chinook salmon and steelhead upstream from McNary Dam on the Columbia River.

The Bureau is investigating why the escapements of fish into the Snake River system have declined. The Bureau is also studying the fish passage system at Ice Harbor Dam near the mouth of the Snake River. Spillway flows definitely seem to influence the passage of fish, and the Corps of Engineers have adopted recommendations to modify the patterns of spillway flows.

Major construction during 1967 was confined to work on the first and second phases (the cul-de-sac fishway and exit structure) of the fishway at Willamette Falls. These portions of the fishway will be operational by March 1968. Work on the last phase, the fishways at the main falls, has not been started.

The Bureau's economic study of the Columbia River Fishery Development Program confirmed results of its preliminary study presented in 1966 to the Bureau of the Budget. The analysis showed that annual net benefits accruing from sport and commercial fishing attributable to the Columbia River are slightly under $14 million. The study indicates that in the future both costs and benefits will rise but annual benefits will rise at a more rapid rate than annual costs.

Columbia River Fish-Passage Research Program.—Bureau scientists have had an extensive research program on the fresh-water aspects of the Columbia River salmon and steelhead, with particular emphasis on the problems of fish passage. Much of the work has been done at the Bureau's Fisheries-Engineering Research Laboratory at North Bonneville, Wash.

Research on fish migration over dams centered primarily on the effects of water-use projects on salmon and steelhead trout and on developing methods for reducing losses and increasing production wherever possible. This research is coordinated closely with the Bureau of Sport Fisheries and Wildlife, the five fishery agencies of the adjacent States, Corps of Engineers, private and public power companies, Battelle-Northwest, and local universities. Complete reviews of progress are made at least annually to fishery technicians and administrators of the Columbia Basin Fishery Technical Committee.

Efforts to provide safe passage for young salmonids at dams have resulted in a trial installation of an entrained air system at Ice Harbor Dam where compressed air was injected into a turbine and effects on fish were measured. Results suggest some benefits (lower mortality) from use of air when turbines were

operated on overload. Other tests in a laboratory have shown that shear planes, hitherto nearly ignored, may account for a major portion of injuries and deaths of fish in turbines. Additional studies at Ice Harbor Dam indicate that loss of debilitated fish in the river below the dam may in some cases be substantial. Predation is suspected. Efforts to provide for safe passage of juvenile salmonids around turbines have indicated that light may attract more fish into gatewells which can be used for collection or bypass areas. Development of techniques for bypassing migrants around turbines is receiving additional attention.

Studies of the rates and timing of migration of juvenile salmonids provided extensive information on the 1966–67 outmigrations. These investigations revealed the comparative timing of outmigrations from major tributaries as these fish moved past various dams and into the estuary. Estimates of populations were made, and a measure of survival through various sections of the river was obtained. Specifically, these studies have shown a relation between rate of travel of the fish, the volume of discharge, and size of impoundments.

In the study of the losses of adult salmonids in the Columbia River, Bureau biologists successfully used the newly developed sonic tag in the stomach of chinook salmon. A backpack type of tag had to be used for steelhead trout because these fish would not retain the internal tag. This program is producing much useful information on where high mortality of salmon occurs in the Columbia River System and possible causes of the mortality.

The laboratory at Bonneville Dam continues to be a highly productive, application-oriented research unit. Studies with adult salmonids revealed the response of fish presented with a choice of flows of different temperature. Salmon and steelhead rejected heated flows (10–15° F. increase) when river temperatures exceeded 65° F. Tests with adult fish in an "endless" pipe showed that all sockeye salmon could negotiate passages of more than 5,400 feet in elevation, summer chinook up to 5,200 feet, and steelhead trout up to 1,872 feet. Response of fish to high-velocity jets and to varying orifice flows was examined in relation to attraction provided. These tests are expected to provide for improved conditions at the entrance of fish collection systems.

The impact of the environment—especially of temperatures and dissolved gases on the well-being of salmonids—has been

studied and documented extensively by Bureau biologists. A special report on temperatures preferred by salmonids was prepared for use in establishing water quality standards. A panel of Bureau experts has given a series of illustrated talks highlighting the effects of high temperature on fish and reviewing the consequences of anticipated increases in the river temperature. Talks have been given to the technicians and administrators of the State and Federal fishery and water quality control agencies, Bonneville Power Administration thermal task force, utility administrators, and local fishery interests.

Fresh fish by air.—The North Pacific groundfish industry has been unable to compete with imports of groundfish in markets for frozen blocks or frozen packaged fillets. The production of groundfish in the area, therefore, has been controlled by the size of the fresh fish market. This market has been limited to a relatively narrow coastal region because of the short time the fish is fresh enough to be marketable.

Bureau marketing specialists in Seattle, Wash., worked with the local industry, container manufacturers, airlines, and food tradesmen in the Midwest to determine if markets could be developed in inland areas that had not previously received fresh marine species.

With direct Bureau encouragement, the fishing industry in Seattle airshipped to Midwestern markets 350,000 pounds of West Coast rockfish, 75,000 pounds of Pacific oysters, 30,000 pounds of Dungeness crabs, and 30,000 pounds of fresh salmon. In addition, several firms airshipped fresh fishery products from the Northwest to Midwestern, Southern, and East Coast markets as an indirect result of Bureau efforts. During 1967, 2.5 million pounds of fresh West Coast fishery products were airshipped inland. Very few such shipments had been made during the previous year of 1966.

Groundfish.—With its data on growth and mortality and other information, the Bureau's Biological Laboratory in Auke Bay, Alaska, was able to make preliminary estimates of the maximum sustainable yield of stocks of Pacific hake and Pacific ocean perch. These estimates served as the basis for the United States position in discussions with the U.S.S.R. on fishery problems off the coasts of North America. Scientists of the United States and the U.S.S.R. agreed on coordinated research on the stocks of hake and Pacific ocean perch off the west coast of North America.

King crab.—Research by the Bureau's Biological Laboratory,

Auke Bay, Alaska, indicates that the average size of commercial king crab in the Bering Sea has declined significantly in recent years. This decline may be due to intensive fishing by Japan and U.S.S.R. This information was instrumental in developing Bering Sea king crab catch quotas for Japan and U.S.S.R. during the 1967 negotiations with those nations.

Pacific hake.—The Bureau's Technological Laboratory in Seattle, Wash., and the fish reduction industry of the Pacific Northwest are cooperatively investigating the reduction of Pacific hake into fish meal, oil, and solubles. Results indicate that Pacific hake can be successfully reduced to fish meal with currently available equipment. One plant in Washington is now producing fish meal from hake.

The Bureau's Exploratory Fishing and Gear Research staff at Seattle, Wash., gathered information that will benefit commercial fishing. The researchers found that as sunset approaches the dense schools of hake that live near the sea bottom during the day begin to rise and the fish disperse. As sunrise approaches, the hake begin to descend toward the bottom and re-form schools. Exploratory catch rates of hake with Bureau-developed pelagic trawls were 10,000 to 60,000 pounds per half hour for daylight fishing compared to 50 to 6,000 pounds per half hour during late evening and night fishing. With existing fishing techniques, this diurnal behavior means that hake fishing is limited to daylight hours.

Intensive Bureau explorations also provided information on the distribution and size of the hake schools and helped fishermen make good catches.

The researchers also found that the vertical movement of euphausiids (shrimplike organisms), the hake's primary food, coincides with the evening and early morning movement of the hake.

Pacific saury.—Using colored lights, researchers on the Bureau vessel *John N. Cobb* have attracted saury alongside the ship. They then used a modified lift net to collect this close relative of the flying fish. Their best catches were made about 60 miles off the Oregon Coast.

The U.S.S.R. also is interested in the saury stocks off Oregon and Washington.

Fishermen of Japan and U.S.S.R. intensively fish saury off their coasts. Their yearly production is about 1 billion pounds.

Pribilof Islands fur seal industry.—The Fur Seal Act of 1966 (Public Law 89-702) provides new authority for extensive

changes in administering native Aleut affairs on the Pribilof Islands.

As an important step toward creating an independent, self-governing community on St. Paul Island, a townsite has been described and surveyed into lots, blocks, and streets. Title to property will either be sold to individual natives or conveyed to the community, provided it incorporates as a municipality and the Secretary of the Interior determines that it is a viable community. To aid incorporation, the community will receive grants totaling $150,000 from the special Pribilof Islands fund, which will be spread over 5 succeeding fiscal years.

Another major benefit of the Act gives residents of the islands Federal retirement credit for service performed before 1950. This credit will draw about $100,000 during each of the next several years from the Pribilof Islands fund. Nineteen workmen became newly qualified for retirement during 1967, and 25 others received substantially increased annuities.

Medical and dental care on the Pribilof Islands has become the direct responsibility of the Secretary of Health, Education and Welfare.

The State of Alaska administers the elementary education program under reimbursable contract with the Bureau.

Further evidence of increasing local autonomy at St. Paul Island are community takeover of the previously owned Government grocery store, construction of a postoffice, experimental operation of a hotel and boardinghouse, and development of attractions that will encourage tourists.

Operations in the fur seal industry during 1967 were normal, and the harvest of 55,638 male and 10,034 female seals was close to predictions. No sealskins were withheld in 1967 for experimental processing. From the skins that had been reserved for such processing, 6,750 were sent with the 1967 harvest to the Fouke Fur Company for processing under contract. The Bureau has 8,913 skins stored in Seattle.

Net receipts deposited to the Pribilof Islands fund during fiscal 1967 were $2,591,267. Administrative costs were $2,163,741, and Alaska received a payment of $322,256 as its statutory 70 percent share of net proceeds.

Salmon.—Significant new findings on movements of sockeye salmon will be used in refining the techniques of forecasting the runs. In 1967, analysis of systematic fishing by three vessels in the North Pacific Ocean during the summer of 1966 indicated that assumptions underlying present forecasting systems

do not hold and must be reevaluated in preparing future forecasts. Immature sockeye salmon that move west across the North Pacific during the summer do not originate in the Gulf of Alaska as formerly hypothesized; they may come from the south or from the depths. Bristol Bay immature sockeye are found concentrated in the Adak area and in the Western Gulf of Alaska throughout the summer. This finding has important implications for the index sampling that is used for forecasting purposes.

A forecast of the Bristol Bay sockeye salmon run for 1967, based on catches of the Japanese mothership fishing fleet made shortly before the fishing season, was accurate. The forecast was made available to the Alaska salmon industry so it could plan cannery operations. It was made available also to the Alaska Department of Fish and Game which used it for management planning.

Studies of the oceanic current known as the Alaskan Stream showed that it fluctuates considerably in volume and velocity during the spring and summer. Such fluctuations may affect greatly the migration routes of Bristol Bay sockeye. Scientists now believe that reduced flow of the Alaskan Stream in the spring of 1966 affected the migration routes of maturing Bristol Bay sockeye and reduced the expected catch of these salmon by Japan that year.

Experimental telemetry buoys were tested and performed up to expectations. In tests off the coast of Oregon, these buoys measured salinity, temperature, and pressure from the surface to 100 m. (109 fm.). The measurements were telemetered on command to ship and shore stations. The buoys were successfully interrogated over a distance of 300 to 400 miles. Bureau scientists at the Biological Laboratory, Seattle, Wash., hope that these buoys are forerunners of a series of buoys that will be deployed off the coast of Japan, allowed to drift across the ocean, and interrogated by satellite to provide a synoptic picture of oceanic conditions.

Water resource developments.—Two projects in Alaska water resource development are outstanding because of their benefits. In Southeastern Alaska, the Lake Grace project, proposed by the Alaska Power Administration, may provide opportunity to improve salmon runs in Grace Creek. The project would provide higher minimum winter flows and increase the productive spawning area. A selective level intake structure would overcome the water temperature problems the project would create.

Construction of the Corps of Engineers' Fairbanks Flood Control project could result in an outstanding public recreation area for interior Alaska. Through its cooperative efforts with the Bureau and Borough, the State classified for public recreation large blocks of land in the project area. In addition, the Corps of Engineers has agreed that fish facilities are necessary to mitigate anticipated losses of salmon and that the Corps will provide hatchery facilities, if necessary, to stock the reservoir and adjacent streams.

In Alaska, considerable attention has been given to the rapidly developing petroleum industry with its associated explorations, leasing, drilling, and production. Careful monitoring of these operations is necessary to prevent damage to the abundant marine fishery resources.

In the Pacific Northwest, significant accomplishments were made in 1967. At the request of the Bureau of Reclamation, a report was prepared on the feasibility of improving the fisheries in the anticipated wetlands and lakes in the Columbia Basin. This study also included a report on feasibility of pumpback storage at Banks Lake.

The study of the Bumping Lake enlargement was completed. This joint project of the Bureau of Reclamation, Bureau of Sport Fisheries and Wildlife, and Bureau of Commercial Fisheries provides substantial enhancement of salmon and steelhead runs by improving stream flows.

Significant progress has been made on comprehensive studies of the Columbia–North Pacific and Willamette Basin. A special study on the middle Snake River in Idaho and Oregon was completed. Many reports on projects outside Columbia Basin in California, Oregon, and Washington were reviewed in cooperation with the Bureau of Sport Fisheries and Wildlife to coordinate Bureau of Commercial Fisheries interests in those areas. Reports on Blue Creek and the Milton–Freewater, Walla Walla project, were submitted for final review.

California

The chief accomplishments in California involved apprentice meatcutter training, EASTROPAC (a large-scale oceanographic expedition), immersion freezing of fish, rearing pelagic fishes, tuna fishery forecasting; Tunaboat Refrigeration Conference; and the expendable bathythermograph program (recording oceanographic changes).

Apprentice meatcutter training.—The Los Angeles City Department of Education, with advice from the Union and Chain

Store Employees' Council, administers a program in southern California to train apprentice meatcutters for journeymen positions. The Bureau marketing personnel also participate in this program to provide information on fishery products.

Because the meatman in most markets is responsible also for sales of fresh and frozen fish, knowledge of fish and fish merchandising is an integral part of the training program. Three sessions per school year for each class of about 30 students are devoted to fish. The General Manager of the California Fisheries Association and Bureau marketing representatives cooperate in these sessions. The first session is a lecture covering care and handling, sanitation, quality recognition and maintenance, nutrition, gross profit potential, display, and merchandising. The second session is a trip to a wholesale fish establishment. Students see varieties of available fish and learn about techniques of filleting and cleaning. The third session is a cooking demonstration by a Bureau home economist, who stresses the differences between cooking meat and fish. The economist provides information on menu planning with fish as an entree, garnishing, preparation of complementary side dishes, number of servings per pound from each type of market form, cooking methods, and testing for doneness. For some students, sampling the cooked fish is the first time they have tasted fish.

Bureau marketing specialists believe this training is quite important. The more the meatcutters know about fish the better they will be able to sell fish to the housewife.

EASTROPAC.—EASTROPAC is a large-scale oceanographic expedition, designed to yield specific information on the distribution and abundance of skipjack tuna resources and to increase our understanding of how the distribution of fish is related to the oceanography of the eastern tropical Pacific Ocean. When completed, the expedition will have involved about 15 vessels from 15 agencies from 4 countries. The Bureau's Fishery-Oceanography Center at La Jolla, Calif., has been involved heavily with EASTROPAC. Results of the cruises to date have shown unexpected high nutrient values in the upper ocean layers far south of the Equator and a scarcity of skipjack tuna larvae north of the Equator, but an abundance between latitudes 7° and 15° S. On the cruises a number of new seamounts have been discovered that are important to the tuna fisheries. Tuna appear to school near seamounts because of local enrichment processes.

Immersion freezing.—The Bureau's Technological Laboratory

at Terminal Island has performed research on the immersion freezing technique. The Bureau technologists found that immersion of tuna in Freon 12 effectively preserves and maintains the quality of fish. The residuals of Freon 12 were low and should pose no problem. Commercialization of this process will depend upon economics of the technique, which is in the conceptual engineering stage. The use of propolene glycol is also being studied as an immersion freezing agent. It also has proved to be an effective freezing agent. Still to be determined are how much the propolene glycol penetrates the fish flesh under varying conditions and how much of this chemical is left in the flesh.

Rearing pelagic fishes.—For more than 100 years marine biologists have had little success in rearing pelagic fishes. A significant step toward this goal was made at the Bureau's Fishery-Oceanography Center at La Jolla, Calif., where sardine, anchovy, Pacific mackerel, and more than 20 other species were reared from egg to advanced juvenile or to adult stages.

Temperate tuna fishery forecasting.—In recent years industry acceptance of the Bureau of Commercial Fisheries tuna forecasting activity has grown rapidly. Bureau experience in this area is helping to improve the catch and put more money in the fishermen's pockets. For example, as the result of last year's albacore advisory broadcasts, the California albacore tuna fleet moved into Oregon waters and arrived on the fishing grounds more than 2 weeks earlier than usual. The extra 2 weeks of fishing added substantially to the catch for the season.

Tunaboat Refrigeration Conference.—The second Tunaboat Refrigeration Conference in San Diego, Calif., December 18, 1967, reviewed advantages and disadvantages of the 35-year-old brine refrigeration system used on tunaboats. The Conference discussed also alternative equipment, methods of operation, and systems that might be used. The 45 persons at the Conference represented canners, union representatives, research workers, State and Federal officials, and owners, skippers, and engineers of tunaboats.

XBT program.—At the Bureau's Ocean Research Laboratory, Stanford, Calif., extensive experience has been gained with XBT (expendable bathythermograph) systems aboard Matson Line vessels operating between San Francisco and Honolulu. Experience with the *Californian*, a Matson freighter, has demonstrated that a program measuring oceanographic changes in key regions of the ocean would be technologically feasible and eco-

nomically reasonable. The program has to be well planned and must use "ships-of-opportunity." Data from such a program together with additional environmental data from other programs already in operation or in planning stages should afford essential information for fishery predictions of broader scope and greater reliability than the present capability can provide. This program is at a breakthrough point, and immediate future efforts will be focused on analysis and interpretation of the data on hand to determine how seasonal and long-term changes in the eastern Pacific and particularly in the California Current system affect the commercial fisheries.

Hawaii

In the Hawaii area the chief accomplishments were collection of numerical data on operations of the Hawaiian skipjack tuna fishing fleet and hypotheses for origin and movement of harvested skipjack in the Pacific Ocean.

Data on fishing fleet.—An unmatched body of numerical data on the operations of the Hawaiian skipjack tuna fishing fleet was collected during the summer of 1967 by the Bureau of Commercial Fisheries Biological Laboratory, Honolulu. The object of the investigation was to obtain information by which fishing strategy can be improved. The data collected by the observers are now being prepared for analysis by computer. These data form the basis of one of the most detailed studies of a fishing fleet ever to be made.

Skipjack tuna hypotheses.—Data have been put together to formulate a model or set of hypotheses that could account for the origin and movement of the harvested skipjack tuna in the Pacific Ocean. It appears that few skipjack tuna spawn in the eastern Pacific and that skipjack tuna harvested in that part of the ocean must come from elsewhere; the model postulates that these fish come from the central equatorial Pacific. Studies of skipjack biology (primarily larval distributions and subpopulations) in the central Pacific have shown that it is unlikely that skipjack in the central Pacific constitute a single homogeneous population unit. The model suggests that of the various population units or subpopulations of the central Pacific skipjack tuna from spawnings in the central equatorial Pacific contribute most of the fish harvested in both the eastern Pacific and Hawaiian area fisheries.

South Central States

The chief accomplishment in nine South Central States in 1967 concerns the catfish farmpond industry.

Catfish.—Growing catfish in ponds is diversifying the farming activities in nine South Central States and providing an estimated 2,000 jobs for unemployed farmworkers. Production of catfish from farmponds has increased from a few thousand pounds in 1963 to an estimated 15 million pounds in 1965.

The catfish farmpond industry received new impetus in 1967 under a cooperative technical assistance project of the Bureau of Commercial Fisheries and the Economic Development Administration of the Department of Commerce. Both agencies helped finance a program of technical assistance for the fish farming industry in Alabama, Arkansas, Georgia, Illinois, Kansas, Mississippi, Missouri, Oklahoma, and Texas. The Bureau provided the industry with research and information on harvesting, processing, and marketing catfish and studied methods for improving the harvesting procedures.

Gulf of Mexico

In the Gulf of Mexico the chief accomplishments were an analysis to determine optimum shrimp fishing effort; culture of shrimp; estuarine studies; marketing underutilized species; shrimp marketing; tilefish explorations; and water resource developments.

Analysis to determine optimum shrimp fishing effort.—The first phase of this study was completed in 1967. It showed that in the Tortugas area in 1964 and 1965 a reallocation of the fishing effort would have saved the fleet $550,000. This possible cost savings when distributed equally among the estimated 1,300 shrimp fishermen would have resulted in an increase of $425 per individual.

Culture of shrimp.—Biological studies have begun on the farming of shrimp. Four species of Gulf of Mexico shrimp appear suitable for pond culture. All four species have now been hatched and reared to postlarvae in the Bureau's Biological Laboratory at Galveston, Tex. Both brown and white postlarval shrimp were hatched in the laboratory and reared to late juveniles in ponds. When they were 17 weeks old, about 85 percent of the postlarval white shrimp had survived in the ponds. Growth was equal to that of natural areas, but it is apparent that food is a limiting factor. With adequate quantity and proper kinds of food we can expect shrimp to grow better in ponds than in natural areas.

Estuarine studies.—Biological data acquired by scientists at the Bureau's Biological Laboratory at St. Petersburg, Fla., aided in obtaining the first denial of a dredge–fill permit by the Corps

of Engineers because of the effect upon living resources. Similar data were also used to enact legislation in Florida to prevent further sale of State–owned submerged bottoms except after prescribed biological studies.

Under the auspices of the Gulf States Marine Fisheries Commission, the Bureau and three Gulf of Mexico States have undertaken an inventory of estuarine resources. The Bureau's laboratory at St. Petersburg is providing coordination and data assembly services for this inventory.

Hydraulic model studies of Galveston Bay were undertaken in cooperation with the Corps of Engineers to develop realistic plans for hurricane protection that will not impair the value of the estuary to fishery resources.

Development of new sampling techniques at the Bureau's laboratory in St. Petersburg, Fla., has resulted in a better understanding of the estuarine areas as nursery grounds for shrimp. This information has been directly useful to the States in managing these resources. Vegetation along the shorelines and submerged plants in shallow water are preferred nursery habitats for young shrimp. Bulkheading and hydraulic spoil destroy this vegetation and the usefulness of these as shrimp nursery areas.

Marketing underutilized species.—Cooperative industry–State-Federal marketing programs in the Gulf were effective in expanding markets for mullet, Spanish mackerel, oysters, and red snapper and in helping establish a new calico scallop fishery in the Southeast.

Shrimp marketing.—Cooperative efforts of marketing personnel of the Bureau, Texas, Florida, and the U.S. Department of Agriculture helped move 191.4 million pounds of shrimp into trade channels and also stabilized shrimp prices. Early in the summer of 1967 it became evident that shrimp production in the United States would be exceptionally heavy and that this production, coupled with expected record imports, could seriously depress shrimp prices. The Bureau served as the coordinating marketing agency during the last half of 1967. Shrimp was included in three national marketing programs, "Outdoor Fish Cookery" during summer, "National Fish and Seafood Parade" during October, and "Shrimp Christmas Tree Promotion" during November and December. Texas and Florida cooperated through marketing programs under Public Law 88–309—commonly referred to as "Federal Aid to States." Their representatives developed color mats and television film strips and appeared on radio and television programs during the three na-

tional marketing programs, "Outdoor Fish Cookery," "National Fish n' Seafood Parade," and "Shrimp–Poultry Holiday Promotion." The U.S. Department of Agriculture listed shrimp in its October "List of Foods in Plentiful Supply" and cooperated further in the shrimp–poultry promotion in November and December.

Tilefish explorations.—The Bureau research vessel *Oregon II*, operating from the Exploratory Fishing Base at Pascagoula, Miss., discovered new stocks of northern tilefish in the Gulf of Mexico. The fish weighed 1 to 26 pounds and averaged 6 to 8 pounds. The *Oregon II* first located concentrations of tilefish in the fall of 1967 at distances of 40 to 50 miles off Texas and Louisiana at depths of 150 to 250 fm. Commercially significant exploratory fishing catch rates averaged 44 tilefish per 300 hooks of longline gear. Tilefish were again found in the same general depth range on the northern edge of Campeche Banks off Yucatan, Mexico.

Although the Bureau previously had caught an occasional immature tilefish, this is the first evidence that commercial concentrations of mature tilefish are in western Gulf waters. This species is more commonly associated with commercial fisheries in the Northwest Atlantic, although fishermen from the west coast of Florida have taken small quantities in recent years.

Water resource developments.—In the Gulf of Mexico, the Bureau's Regional Office and its Biological Laboratory, both at St. Petersburg, Fla., have concentrated on preventing the exploitation of estuarine areas. For more than 10 years the continuing loss of the estuarine areas has alarmed scientists and conservation–minded citizens including those whose livelihood depends on the role of estuaries in marine resource productivity. Because comprehensive knowledge of these areas would help in combating further exploitation, a detailed inventory of Gulf estuaries was begun in mid–1966. Bureau and State representatives of the Estuarine Technical Coordinating Committee of Gulf States Marine Fisheries Commission planned this study. Scientists from the Marine Fishery Departments of Louisiana, Mississippi, and Alabama and the Bureau's Galveston and St. Petersburg Beach Laboratories are conducting the study which will continue to at least mid–1970.

In March 1967, the Jacksonville District Engineer, Corps of Engineers, denied a permit application to dredge and fill in Boca Ciega Bay, Fla. The decision, based on recommendations in a U.S. Fish and Wildlife Service report, was made solely on

expected adverse effects of the project on fish and wildlife resources. This was the first denial by the Corps of Engineers that has been based on provisions of the Fish and Wildlife Coordination Act. The applicant for the permit has filed suit against the Corps, contending that the Corps is limited by law to consider only navigational aspects of such projects in rendering a decision. After the decision on the Boca Ciega permit, the Jacksonville District Engineer denied a permit to dredge and fill in Sarasota Bay. This decision also was based on provisions of the Fish and Wildlife Coordination Act and U.S. Fish and Wildlife Service recommendations.

Conservation in Florida is making good progress. In July 1967 the State legislature passed the Randell–Thomas bill. This law forbids sale of State-owned submerged lands, setting of bulkhead lines, or issuance of dredge and fill permits if Cabinet trustees of the Internal Improvement Fund decide that resulting harm to natural resources would be contrary to the public interest. Estuarine studies and surveys made by the Bureau and the Bureau of Sport Fisheries and Wildlife provided data that aided the bill's sponsors.

Waste material dumped into navigable waters must not adversely affect the public interest. A chemical corporation applied to the Mobile District Engineer of the Corps of Engineers for permission to dump 2 million tons of waste products into the Gulf of Mexico and 2,000 tons daily thereafter. The Bureau's strong opposition was a major factor in withdrawal of this application and issuance of a statement by the District Engineer that he "will grant no permits for dumping any waste material in navigable waters . . . unless thorough studies and complete coordination with appropriate Federal and State agencies indicate that there would be no adverse effects on navigation, marine life, or other aspects affecting the public interest."

Atlantic

The chief accomplishments of the Atlantic Coast were sampling of Atlantic herring; Atlantic tuna investigations; cooperative fishery surveys of the U.S.S.R. and the United States; distribution of fish and fish products from the Boston Fish Pier; economic analysis of efficiency of Boston large trawlers; method for processing fish protein concentrate; research on lobsters; methods of handling irradiated products; menhaden studies; portable shipboard net instrumentation package; rearing shellfish; research on submersibles; study of improving the unloading

of fish at Boston Fish Pier; trials of lobster traps in New England offshore waters; and water resource developments.

Atlantic herring.—The herring of Georges Bank were sampled by vessels under the direction of the Bureau's Biological Laboratory in West Boothbay Harbor, Maine, during four cruises in 1967. All life history stages from larvae to spawning adults were found. Adult populations from Nova Scotia and other Gulf of Maine areas were also sampled. Differences in body characteristics were found between the Georges Bank–Cape Cod area and Nova Scotia–Eastern Gulf of Maine area; so, the herring in these two areas may be different groups with little intermixing.

Atlantic tuna investigations.—Investigations of the ecology of the tunas in the tropical Atlantic in recent years have shown that these fish are in commercial quantities in the eastern tropical Atlantic (Gulf of Guinea). These studies have been made at the Bureau's Tropical Atlantic Biological Laboratory at Miami, Fla. A good deal of evidence indicates that for several months of the year these tunas are associated with an oceanographic frontal system that moves north and south along the coast of west Africa. The fishery associated with this front, and in the Gulf of Guinea in general, is now the only tropical Atlantic fishery successfully harvesting surface schools of tunas. The Bureau expects that U.S. tuna vessels will be increasingly active in the eastern tropical Atlantic. It is, therefore, expedient that as much as possible be learned about the general distribution and abundance of these fishes and also how they are associated with special oceanographic features. Beginning with the 1963 meeting of the International Cooperative Investigations of the Tropical Atlantic, researchers have compiled a significant background of data. The data collected are being analyzed and the picture of the oceanographic dynamics of the area is developing rapidly. By building on this base and by adding adequate fishery data that are just becoming available, the Bureau hopes to have available the information that is required to develop a migration model for the Gulf of Guinea surface tuna fishery and to manage the Atlantic tuna resource.

Cooperative fishery surveys, U.S.S.R./United States.—During the summer of 1967 a series of cooperative cruises by scientists of the U.S.S.R. and United States were carried out in the Middle Atlantic Bight off the United States east coast. Two research vessels were involved, both named *Albatross* (*Albatross IV* of the Bureau's Biological Laboratory at Woods Hole, Mass., and the *Albatros* of the U.S.S.R.). The two principal purposes

were to carry out experiments to establish the comparability of sampling techniques and to provide a common base for the estimation of the abundance of stocks and for the management of those stocks that are harvested by the international fishery for groundfishes in the Middle Atlantic Bight. These observations and experiments are pertinent to rational use of the fish stocks of the area. The cooperative investigations were arranged through ICNAF (International Commission for the Northwest Atlantic Fisheries) in which the U.S.S.R. and United States are members. ICNAF has requested additional cooperative cruises.

Distribution of fish and fish products from the Boston Fish Pier.—A Bureau study in 1967 identified the geographic areas in which Boston–landed fish are consumed and the distribution channels from the fish pier to final consumption or retail sale. The study also determined the forms (i.e., fresh or frozen, whole, dressed, fillets, or steaks) in which the fish are sold. This study is important because it provides information that can be used to determine whether it is feasible to have a commercial irradiation unit at or near the Boston Fish Pier.

Economic analysis of efficiency of Boston large trawlers.—A Bureau study in 1967 shows that large Boston trawlers fishing on Georges Bank use only a small part of their hold capacity. The study has provided a major source of data for a systems analysis of the cost and earnings data of the fishery. The systems analysis is being done for the National Council on Marine Resources and Development.

FPC (Fish Protein Concentrate).—Since beginning research in 1963 on FPC, the Bureau has made significant progress in developing a feasible processing method. This work has been done largely at the Bureau's Technological Laboratory at College Park, Md. After numerous studies on the purity and nutritional value of FPC, the U.S. Food and Drug Administration approved the Bureau's process. The February 2, 1967, issue of the "Federal Register" details the conditions under which approval of FPC made from lean meat was granted. To encourage U.S. food industries to use FPC, the Bureau prepared foods containing FPC as a food supplement and provided pertinent information to the food industry.

To fulfill provisions of the Fish Protein Concentrate Act (Public Law 89–701), the Bureau awarded a contract for designing, building, and operating a demonstration plant to pro-

duce FPC experimentally. The plant is to be built in the Pacific Northwest.

Lobsters.—Lobster research continued on the inshore and offshore lobsters of the New England areas. Scientists at the Bureau's Biological Laboratory at West Boothbay Harbor, Maine, have found that the parasites, blood proteins, and body characteristics differ between these two groups of lobsters. A tag has been developed that will be retained through molting, and a tagging study completed to study growth and migration in one area.

A team of SCUBA divers is studying the behavior of lobsters in their natural habitat and has obtained many new facts on their feeding, molting, and territorial protection. An artificial reef was constructed to determine whether it was feasible to increase the amount of suitable habitat, and lobsters began to populate the reef almost immediately.

MPDI (Marine Products Development Irradiator).—The Marine Products Development Irradiator at the Bureau's Technological Laboratory, Gloucester, Mass., is being used to study how commercial handling methods affect the quality of irradiated products, what consumers think of these products, and what are the economics of the irradiation process. During 1967, MPDI irradiated over 220 lots of products (over 55,000 pounds). Most of the lots irradiated were fish, but fruits, meats, chickens, and nonfood products were also treated. The Bureau accomplished some of this work through active cooperation with the Department of the Army and the Department of Agriculture.

Studies of the distribution of 33 shipments of irradiated and nonirradiated haddock fillets, chiefly to Florida, Texas, and Washington, were made to determine the temperature patterns under actual commercial conditions. The information gathered included product temperatures, truck air temperature, number of stops, deliveries, transfers, and re-icing. Similar studies were begun on shrimp.

A comprehensive commercial benefit study was completed also for fillets of cod, flounder, haddock, and sole. This is a highly documented study on effects of irradiated fishery products when shipped by commercial land transportation, including studies on shelf life and microbial contamination. The data indicate that these irradiated fillets can be commercially transported, without deterioration, to far greater distances than nonirradiated fillets.

After successful completion of irradiation research, approval of FDA (U.S. Food and Drug Administration) for use of radiation must be obtained. The Bureau has petitioned FDA to permit commercial use of radiation–pasteurized cod and haddock.

Menhaden.—Biologists at the Bureau's Biological Laboratory in Beaufort, N.C., have updated the analysis of biological data and fishery statistics of Atlantic menhaden. The analysis shows that the major factors in the decline of annual catch are a succession of poor year classes and increased heavy fishing on young fish in the Chesapeake Bay area. Surveys of the abundance of juvenile menhaden on both the Atlantic and Gulf of Mexico Coasts do not indicate that the 1966 or 1967 year classes are large enough to improve production.

About 363,000 Atlantic menhaden were tagged in four coastal areas. Tag returns provided new leads on seasonal movements in and out of major estuaries along the Coast. A large concentration of eggs was discovered off North Carolina in the winter of 1966–67—the first direct evidence of where Atlantic menhaden spawn.

Portable shipboard net instrumentation package.—The Bureau's Exploratory Fishing and Gear Research Base at Gloucester, Mass., demonstrated on commercial draggers a portable instrumentation package that shows how a trawl net is performing during fishing. The package consists of transducers that transmit to the dragger information on the width of the mouth of the trawl net. Also included in the package are a self–contained electrical power source, a reel with cable for connecting the power source with the instruments on the net, and a recorder for registering measurements transmitted from transducers on the net. The package can be quickly and easily installed aboard any commercial dragger.

Rearing shellfish.—Studies of aquaculture as a method for increasing the production of oysters and clams continued. New facilities for such studies were completed at the Bureau's Biological Laboratory, Milford, Conn.

Genetics studies have determined the normal chromosome complement of oysters. Bureau geneticists have studied techniques for inducing mutations and, to determine inheritance patterns, have established several lines of progeny from parents with induced mutations. These studies lead the Bureau to believe that oysters can be selectively bred for desirable characteristics—an essential technique for more effective oyster farming.

Experimental culture of oysters off the bottom of a natural pond is now in its final phase at the Bureau's Biological Laboratory, Oxford, Md. About 1,400 strings were originally suspended in the pond. During 1967, all strings were removed and the oysters planted on the bottom for final hardening of shell before marketing. These oysters, because they were initially grown in suspension, should be of marketable size in 2½ years instead of the 3 to 4 years necessary when they are grown entirely on the bottom.

Initial studies in the rafting of shells to catch seed oysters have been completed. Excellent sets have been obtained in natural areas by this method. Attempts to catch seed oysters on longlines is also being investigated.

The availability of suitable kinds and quantities of food to feed hatchery-reared larvae is another essential factor to successful oyster farming. Several commercial oyster hatcheries recently have had difficulties in maintaining larvae on natural foods from the sea. Bureau scientists studied means of growing more planktonic algae. They have found temperature tolerance of some of these algal foods has improved the culture media and have tested methods for providing the quantities of culture media that commercial hatcheries must have.

Research submersibles.—During the year Bureau scientists made dives on chartered research submarines to determine the value of these vehicles as tools in the Bureau's biological research and resource assessment. Perhaps the most noteworthy of these was a two-dive series made in the *Aluminaut* on the calico scallop and royal red shrimp grounds off Florida. On these dives Bureau scientists discovered that the stocks of these shellfish are much denser than conventional fishing indicates.

Study of improvement of unloading process of fish at Boston Fish Pier.—The Bureau's study in 1967 analyzed the present unloading system at the Boston Fish Pier to determine its cost. Considering the present fleet, the Bureau proposed changes that were feasible in terms of benefit and cost to the industry. A basic recommendation is that the unloading system be changed to a method in which fishermen pack, ice, and store the fish in boxes in the vessel's hold rather than store the fish in bulk in the hold.

Trials of lobster traps in New England offshore waters.—The Bureau's Exploratory Fishing and Gear Research Base at Gloucester, Mass., made good progress toward developing a commercial pot fishery for lobsters in deep offshore waters in

the Northwest Atlantic. Base personnel designed and tested 11 steel-framed offshore lobster traps. On an initial 40-hour set, eight traps with parlors (a second holding compartment) caught an average of 22.25 pounds of lobsters per pot, compared with a catch of only one lobster among the three traps without parlors. Later trials had about the same results. Yields of over 1 pound per haul per conventional pot in the inshore lobster fishery during the same period in late fall are considered very good.

Water resource developments.—In the Bureau's North Atlantic Region, 196 separate water resource development projects affecting commercial fishery resources were reviewed. Most of the projects were associated with alterations of the estuarine and coastal environment as a result of numerous navigation, beach erosion control, and hurricane protection projects through Federal planning or under Federal permits.

Bureau personnel attended more than 40 coordinating meetings on various projects. Most of the problems concerned conservation and development of commercial fishery resources associated with construction of conventional, nuclear, and pumped-storage power projects and Corps of Engineers' studies. The Bureau's Regional Office at Gloucester, Mass., had representation on Technical and Policy Committees relative to fishery studies on these projects: Cornwall Pumped Storage Project, Storm King Mountain, Hudson River, N.Y.; Canal Electric Power Plant, Cape Cod Canal, Sandwich, Mass., Chesapeake and Delaware Canal, Spoil Disposal in Upper Chesapeake Bay, Md.

Policy and Technical Committees for Fisheries Management of the Connecticut River Basin were established in 1967. Connecticut, Massachusetts, New Hampshire, and Vermont, the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife signed a Statement of Intent for conserving and restoring anadromous fishery resources. A maximum degree of coordination prevails among State and Federal agencies for managing and developing fishery resources on the Connecticut River.

As a result of the April 1967 meeting of FAWTAC (Fish and Wildlife Technical Assistance Committee) of Delaware River Basin Commission a recommendation that the Bureau assist States on fish passage problems on the Delaware River provided impetus for a workshop in May on fish facilities. Interest in exchanging ideas on fish passage problems among

Federal and State agencies expanded the workshop beyond the limits of the Delaware River Basin to include participation of most of the northeast States. The New York Conservation Department held the workshop at DeBruce Conservation Camp, Livingston Manor, N.Y. Forty-four biologists and engineers participated in the workshop.

Great Lakes

The chief accomplishments in the Great Lakes region are increasing production of alewives from Lake Michigan; study of Lake Michigan fish populations; control of sea lampreys; and water resource development.

Alewives for industrial use.—The Bureau has been helping industry develop fisheries in the Great Lakes by increasing the use of some of the more abundant species of fish.

For the past 4 years the Bureau marketing staff has encouraged establishment of pet food and fish meal operations to use Great Lakes species that are now underutilized. The marketing staff provided industry with details on the economic feasibility of fish meal operations. The staff also provided marketing advisory services and liaison between purchasing agents and producers of fish meal and oil and pet foods. Support for technical assistance came from other Bureau groups.

Partly as a result of Bureau assistance, Menominee, Mich., has a new fish meal plant, and Saugatuck, Mich., has a 5–million–pound cold storage facility. The latter was built to hold alewives and other species for pet food manufacturers. These facilities helped stimulate Great Lakes fishermen to increase their catches of alewives for pet food and fish meal. Their catches rose from 29 million pounds in 1966 to about 45 million pounds in 1967.

Lake Michigan fish populations.—The massive die-off of alewives in southern Lake Michigan in 1967 is the most serious incident of this kind in the Great Lakes since the establishment of the alewife in Lake Ontario during the late 1800's. The spring die-off caused great losses to municipalities and industries along the southern shore of Lake Michigan.

Recognizing the seriousness of the situation, Secretary of the Interior Stewart L. Udall appointed a task force of Interior experts to study the problem caused by the alewives and to develop a plan of action. The task force recommended a three-part program on alewives: First, study the abundance, distribution, growth, and migration of alewife stocks to determine

areas and probable intensities of die-offs; second, study methods to handle this die-off; and third, provide information that is needed to establish a balance of fish stocks that will reduce the population of alewives and alleviate the problems caused by their extreme abundance.

During the die-off biologists from the Bureau's Biological Laboratory at Ann Arbor, Mich., collected and analyzed samples of dead alewives from Michigan beaches. This study showed that about 70 percent of the dead fish were 3 and 4 years old. To determine the cause of die-offs, Bureau biologists began laboratory work to determine the tolerance of alewives to water temperature changes and various water quality characteristics. To help predict the abundance of alewives, the Bureau made a survey in southern Lake Michigan in the autumn and found the abundance of adult alewives had declined significantly and the population of young-of-the-year fish was high.

Sea lamprey control.—Under a program administered by the Great Lakes Fishery Commission, scientists of the Bureau of Commercial Fisheries Biological Laboratory at Ann Arbor, Mich., and the Government of Canada continue their efforts to control the sea lamprey population in Lakes Superior and Michigan. During 1967 a further decline in abundance of sea lampreys in Lake Superior was evident from the low incidence of lamprey wounds (2 percent) found on lake trout and a smaller spawning migration of lampreys into tributary streams. Because of reduced lamprey predation, lake trout populations in Lake Superior increased in 1967 by almost 35 percent over 1960. In some areas of the lake, lake trout populations are now as abundant as they were during the prelamprey period. In Lake Michigan, Bureau and State biologists report that introduced lake trout are thriving well and that lamprey-scarred fish are less common.

Water resource developments.—In the Bureau's Great Lakes Region, the coordinated FWS (Fish and Wildlife Service) report on "Fish and Wildlife as Related to Water Quality of the Lake Erie Basin" was completed and released. It further advances the Great Lakes water quality series that began with release in 1966 of a similar report for the Lake Michigan Basin. Similar FWS reports for Lakes Ontario and Huron are well advanced. Bureau inputs for what will eventually be comprehensive FWS reports on Upper Mississippi, Wabash, Grand (Mich.) and White (Arkansas and Missouri) River Basins were

completed. Through its continuing work on these comprehensive basin studies the Bureau is gradually approaching its goal of detailed assessment of Midwestern commercial fishery potentials and incorporation of these potentials into the total water resources development framework.

General

Many Bureau activities in 1967 had general rather than regional effects. These activities include the Commercial Fisheries Research and Development Act of 1964; cooperatives; demand for fish and fishery products; design of fish protective devices; economic analysis of cost and efficiency of containers for handling, transporting, and processing fresh fish products; fishery product publicity; fishery statistics; Market News Service reporting; National Anadromous Fish Program; preservation with controlled atmospheres; transportation of fishery products; USDI inspection and certification program; and water resource developments.

Commercial Fisheries Research and Development Act of 1964.—In 1967 the States again responded well to the Commercial Fisheries Research and Development Act of 1964 (Public Law 88–309). As of December 31, 1967, funds were made available to 208 projects from 47 States, Puerto Rico, the Virgin Islands, Guam, and American Samoa. The total State and Federal costs of these projects is $13,462,404. The State share is $3,654,680 and the Federal share $9,807,724.

An appropriation of $4.1 million was received in each of the fiscal years 1966, 1967, and 1968 under Section 4(a) of the Act. On projects funded under this section the Federal Government pays either 50 percent or 75 percent of the costs.

The projects involve collection and dissemination of statistics, construction of laboratories and vessels, economics research, extension services, improvement of fishing gear and methods, marketing, processing and product development, propagation of commercial species, and resource ecology.

This Act provides opportunities for the Bureau and States to cooperate and coordinate their fishery research and development. The cooperation and coordination are being accomplished by maintaining close relations among the Bureau and the individual States and organizations, such as the Atlantic States Marine Fisheries Commission, the Gulf States Marine Fisheries Commission, and the Pacific Marine Fisheries Commission.

Some results of Federal–State–interstate cooperation in designing and carrying out projects are significant. These are

State cooperation with the Great Lakes Fishery Commission in performing research on stocks of fish harvested by United States and Canadian fishermen in Lakes Superior, Michigan, Erie, and Ontario. Another example is the cooperation between Oregon, California, and the Pacific Marine Fisheries Commission in maintaining a Pacific Coast port sampling pool to measure changes in characteristics of the catch of several commercial fish species. Also significant are the results of a short-term Oregon study, which provided information useful to the Bureau and the Department of State in their negotiations with the U.S.S.R. on effects of intensive fishing on Pacific Northwest hake and rockfish. Still other achievements are joint Bureau–State sponsorship of a Governor's Conference on Central Pacific Fishery Resources; Bureau–State cooperation in carrying out a massive seed oyster rehabilitation project in Long Island Sound; a cooperative Gulf of Mexico estuarine inventory and motion picture with five States; and State compilation of fishery statistics to meet national and international needs.

Cooperatives.—The Bureau in 1967 helped more than one hundred U.S. fishery cooperatives. Cooperatives in Alaska, California, Florida, Louisiana, Maine, Massachusetts, New Jersey, and New York received help with organizing and operating methods. In about one-third of the cooperatives, Bureau personnel reviewed procedures for compliance with the Fishery Cooperative Marketing Act of 1934.

With about 10,000 members operating about 7,500 fishing craft, the cooperatives in 1967 had landings that represented 20 to 25 percent of the total dollar volume of the U.S. catch.

Bureau personnel also forwarded publications and other written material to cooperatives in Ecuador, Honduras, and Panama.

The Bureau also reviewed proposed legislation for a bank to provide credit for fishermen's cooperatives.

Demand for fish and fishery products.—Economists in the Bureau made basic analyses of the demand for cod, flounder, haddock, menhaden, ocean perch, salmon, sole, and tuna. These demand analyses involved econometric investigations to determine price, income, and cross elasticities. Results have been used in a systems analysis study for the Bureau's projection of long-range consumption. They have also been used in the Bureau's "Current Economic Analyses, Situation and Outlook Reports."

Design of fish protective devices.—The Bureau has a small staff of fish-facility specialists who help develop designs for fishways, locks, barriers, screens, spawning channels, and other devices. These experts, who are stationed in Portland, Oreg., advise on fish facility designs throughout the Nation including Columbia River Basin and often contact many State fish and game agencies and private engineering firms.

Projects outside Columbia River Basin, especially in California, required attention of the Bureau's staff of fish-facility experts at Portland, Oreg. Planning the details for the huge Tehama–Colusa spawning channel on the Sacramento River was a major activity. Many other facilities, such as screens, fishways, and channel modifications, were reviewed also. Anadromous Fish Act developments included large screening proposals and plans for a major hatchery on Mad River. Advice was given to Fish and Wildlife Service and State fishery technicians at a New York meeting to discuss several planned projects in the Northeast, including Tocks Island on Delaware River.

Staff members represented the Bureau on several steering committees that supervise programs to evaluate fish facilities. These included Tehama–Colusa spawning channel, River Mill Dam on Clackamas River, Fall Creek project on South Fork of the McKenzie River, and Mossyrock development on the Cowlitz River.

Economic analysis of cost and efficiency of containers for handling, transporting, and processing fresh fish products.—Oregon State College, Corvallis, and the Bureau's Technological Laboratory, Gloucester, Mass., tested various containers in the laboratory and in commercial channels to determine the types of containers that are the least costly but most effective. The study showed that the main reason why containers cost so much is that they have to hold melting ice. Thus, the study indicated that it is quite important to study storage chemistry with the aim of eliminating the need for melt.

Fishery product publicity.—To promote sales of fishery products, Bureau marketing personnel used newspapers, radio, and television; demonstrated fish cookery; developed and distributed free recipes, developed and published recipe booklets for sale; and circulated films.

Through contact with food editors of newspapers, the Bureau obtained over 131,000 column inches of editorial space in over 2,900 newspapers with a total combined circulation of 250 million issue readers. Bureau press materials were distrib-

uted to coincide with the promotions for Lenten, Outdoor Fish Cookery, and Fish n' Seafood Parade. Certain holiday promotions by industry also were helped by the Bureau.

Bureau marketing representatives during 1967 arranged 477 public service radio and television shows. These shows informed the public of the variety and availability of fishery products, discussed methods of preparing fish, gave facts about the industry, and presented other topics of an educational nature.

The Bureau's marketing staff provided 236 fish cookery demonstrations for retail, restaurant, school lunch, military, institutional, and college audiences. About 10,000 persons were instructed on preparation, quality maintenance, nutrition, availability, and merchandising.

Bureau research home economists tested 798 recipes and made 1,122 yield tests for school lunch, institutional, and consumer application. Resulting information was disseminated nationally through publications, demonstrations, and mass media.

The Bureau also developed four publications that the U.S. Government Printing Office printed and sold. These are "Fish & Shellfish Buying Guide and Quality Recipes for Type A School Lunches," "Let's Cook Fish," "Fish for Compliments on a Budget," and "Nautical Notions for Nibbling."

Two hundred cooperating film libraries make national distribution of Bureau-produced fishery educational films. During 1967, over 5 million persons, exclusive of television and other mass showings, viewed Bureau films on 22 different subjects.

Fishery statistics.—The Bureau's fishery statisticians assembled data on the fisheries for the 45 States that had commercial fishing. These data include the numbers of commercial fishermen, fishing craft, and gear, as well as the quantity and value of the catch by species and gear, production of processed fishery commodities, and foreign trade in fishery products. With the cooperation of State fishery agencies, the data on landings were published monthly for 19 States. Also printed monthly was information on the production of fish meal, oil, and solubles; freezing; and cold storage holdings of fish and shellfish. Released quarterly were data on the monthly production of fish sticks, fish portions, and breaded shrimp.

Market News Service reporting.—In 1967, the Bureau's Fishery Market News Service completed its 30th year of providing the U.S. fishing industry with timely and current market information on prices, landings, market receipts, stocks, packs,

markets, imports and exports, rail and truck movements, and new developments in foreign fisheries. While Congress was in session the Market News offices informed the industry about legislative actions affecting fisheries and related industries. These field offices also provided historical records on price series and fishery products receipts at key wholesale market centers as a basis for research and analytical studies of industry problems.

Market News disseminated this information through its mimeographed daily "Fishery Products Reports" and other periodic reports published by its seven field offices at principal fish landing ports and leading wholesale market centers. Other dispensers of this information were newspapers, periodicals, and radios.

National Anadromous Fish Program.—The States have responded well to the National Anadromous Fish Program, established by the Anadromous Fish Act (Public Law 89–304) of October 30, 1965. In fiscal year 1967 (which ended June 30, 1967), about $1 million was made available by the Bureau to the 31 States bordering the oceans and Great Lakes. Twenty-three States were awarded 45 contracts totaling $2,076,970, of which the Federal share is 50 percent. These anadromous fish projects include studies of biology, use of fishery stocks, indexes of population size and abundance, migratory behavior, restoration and rehabilitation of runs, construction of salmon hatcheries, and development of hatchery techniques.

In fiscal year 1968 (which began July 1, 1967), $2 ¼ million was made available to the Bureau for matching funds under this Act.

The Act, administered jointly by the Bureau and the Bureau of Sport Fisheries and Wildlife, authorizes Federal appropriations up to $25 million through June 30, 1970, to States and other non-Federal interests for conserving, developing, and improving the Nation's anadromous fish resources. The Act also includes Great Lakes fishes that spawn in streams tributary to the Lakes. Under the Act, Federal funds may be used to finance up to 50 percent of project costs.

Perhaps the most important contribution of the Act is that the Pacific Coast States have been given the means to increase their research efforts and capabilities. They can better develop and perfect methods for preventing and controlling infectious diseases in salmon and steelhead trout and improving hatchery diets and extended rearing. Financial assistance to Washington

made it possible for that State to operate at full capacity 11 salmon hatcheries in fiscal year 1967. The State estimated that, because of this financing, 264,000 additional coho salmon and 145,000 chinook salmon would be made available to the fisheries in 1968–71.

Excellent progress also was made elsewhere. Washington State estimates that improvement of the water supply and construction of a rearing pond at its Samish hatchery will result in increased yearly catches of coho salmon. The State of Oregon awarded a contract for building a salmon hatchery on Elk River in Curry County, Oreg.; it will rear salmon for release in southern coastal streams of the State. Six earthquake–damaged pink and chum salmon spawning streams were rehabilitated in Prince William Sound, Alaska, during fiscal year 1967. A contract was let for investigating the biology and use of alewives and blueback herring in Virginia waters; the investigation will provide information necessary for developing these resources. The present inventory of fish passage needs in New England streams will provide guidelines for improving the anadromous fishery resources in that area. A study of striped bass and American shad in South Atlantic and Gulf coastal areas, now under way, will provide new and updated information on the status of these resources. Funds were provided for buying research equipment for a newly constructed survey vessel to be used by the State of Michigan for fishery investigations in Lake Michigan.

Preservation with controlled atmospheres.—Experiments at Bureau Technological Laboratories at Ann Arbor, Mich., and Seattle, Wash., have shown that the shelf life of perishable food stuffs can be increased by placing them in gaseous environments that inhibit growth of spoilage organisms. Researchers have used different ratios of CO_2, O_2, and N_2 gases. A combination of irradiation and controlled atmospheres has also been tested. Preliminary data indicate that use of certain controlled atmospheres can increase the shelf life of the test fish up to 1½ times the usual expected shelf life.

Transportation of fishery products.—The Bureau continued its efforts to maintain adequate transport service and facilities for fishery products.

Its staff worked with the halibut and salmon industries to maintain continuing service from Alaska. The staff participated in two Federal Maritime Commission proceedings and presented three volumes of testimony. These proceedings are Docket 66–22

and 23, "Alaska Steamship Company–General Increase in Rates, Peninsula and Bering Sea Areas of Alaska (1966)" and "Alaska Steamship Company–General Increase in Rates, Southeastern Area of Alaska (1966)." The staff also reviewed several recent trade studies on Alaska.

USDI (U.S. Department of Interior) inspection and certification program.—The Bureau in 1967 provided continuous inspection and certification services to 39 processing plants on a cost–reimbursable basis. Fifty–three inspectors examined 244 million pounds of fishery products. In addition, nine lot inspection offices serviced 22 States and various State and Federal agencies that use USDI inspection in procuring fishery products.

To provide industry with more economical inspection services, the Bureau cross-licensed 55 inspectors from other Federal agencies to officially sample and inspect fishery products for quality and condition.

Water resource developments.—Water development projects continue to increase throughout the Nation, and the Bureau has spent considerable effort in examination and analysis of the projects and their probable effects upon fish and shellfish resources and their environments. Investigations of water resources by Bureau personnel include dam and reservoir projects for irrigation, flood control, navigation, and hydroelectric power plants; irrigation and diversion canals and channels; review of water quality standards; oil and gas exploration, leasing, and production; and environmental effects associated with overall river basin use and development.

Bureau personnel reviewed and evaluated about 150 water projects and subsequently participated in project planning and operation in about one–third of them. Two areas receiving attention are clearing seining and trawling areas in reservoirs and avoiding or mitigating adverse effects on fishery resources because of thermal effects from nuclear and fossil–fueled power generating plants.

Bureau Regional personnel participated in the Federal Water Pollution Control Administration's review of proposed water quality standards submitted by States under provision of the Water Quality Act of 1965. Detailed comments were supplied on standards proposed for all or part of 20 States.

Fisheries Financial Assistance Programs

The Bureau's three financial assistance programs continued to aid the U.S. fishing industry. A report of the activities under each program follows.

Fisheries Loan Program

The Fisheries Loan Program continued operations that began in the latter part of 1956. Public Law 89–85, enacted July 1, 1965, authorized continuation of this Program. Loans may be made for financing or refinancing the cost of purchasing, constructing, equipping, maintaining, repairing, or operating new or used commercial fishing vessels or gear under certain restrictions. The applicant must be a U.S. citizen, possess ability, experience, resources and other qualifications necessary to enable him to operate successfully and show that reasonable financing is not otherwise available. During fiscal year 1967, 145 applications totaling $5,191,285 were received and 84 for $3,033,075 were approved. The total since the Program began is 1,975 applications for $51,650,004, and of these, 1,041 for $24,152,641 have been approved (app. C).

Fishing Vessel Construction Differential Subsidy Program

Public Law 86–516 authorized the Fishing Vessel Construction Differential Subsidy Program that began in 1960, and Public Law 88–498, approved August 30, 1964, amended P. L. 86–516. During fiscal year 1967, $3 million was appropriated to carry out the purposes of the Act. To qualify for a subsidy, a vessel must meet certain requirements. It must be of advanced design that will enable it to operate in expanded areas, be equipped with newly developed gear, and must not operate in a fishery if such operation would cause economic hardship to efficient vessels already in that fishery. A public hearing is required on each application before a finding of eligibility can be made. Under the expanded Program as of June 30, 1967, the Bureau received 80 applications for subsidies estimated at about $19,058,500. Of these, 42 were from New England, 14 from the Gulf Coast area, 17 from California, 5 from Seattle, Wash., and 2 from Alaska. Fifty–five of these applications were approved after hearings and by June 30, 1967, construction contracts were effected for 19 vessels involving subsidies of $9,936,888.

Fishing Vessel Mortgage and Loan Insurance Program

The Fishing Vessel Mortgage and Loan Insurance Program was continued during fiscal year 1967. This Program provides Government insurance of mortgages given for construction, reconstruction, or reconditioning of fishing vessels. During 1967, 45 applications for insurance totaling $9,923,773 were received and brought the total applications to 167 for $20,302,018. Forty applications involving $8,330,415 were approved during 1967,

and 12 for $3,158,501 were pending June 30, 1967. Since this Program began in 1960, the Department of the Interior has approved 133 applications for a total of $15,052,071.

American Fisheries Advisory Committee

The American Fisheries Advisory Committee consists of key members of the U.S. commercial fishing industry. The Secretary of the Interior appoints these members under provisions of the Saltonstall–Kennedy Act of July 1, 1954. The function of the Committee is to submit to the Secretary advice and recommendations on matters relating to the commercial fisheries program in the Department of the Interior. In 1967, the Committee met in Washington, D.C., May 25 and 26, and in Key West, Fla., December 4 to 6.

Appendix D lists the Committee members of 1967.

New Programs

The Bureau had five new research programs in 1967. These are a study to improve fish farming; economic analysis of methods to manage and regulate international fisheries; evaluation of an experimental small–scale reduction process; development of Hawaiian fisheries; and the market potential and economic feasibility for irradiated fish and seafood products.

A Study to Improve Fish Farming

The Bureau will study the best way to raise fish. Economists will use "models" to accomplish this. They will determine the best way to stock fish, what and how often to feed them, how much water to supply, and when to harvest them under different market prices.

Economic Analysis of Methods to Manage and Regulate International Fisheries

Bureau economists will try to determine the most efficient use of capital (vessels) and labor (crew), taking into account biological relations between catch and fishing effort. The study will show how various methods of managing and regulating the fisheries will affect the earnings of the vessels and crewmembers. It will also show any social benefits to be gained.

Evaluation of an Experimental Small–Scale Reduction Process

EDA (Economic Development Administration) awarded the Bureau's Region 4 a new technical assistance project contract to study a fish reduction process that could be used by small fisheries. The Branches of Economics, Marketing, and Tech-

nology are involved. The funds finance an 18–month study on construction, engineering, and economic evaluation of a small model unit designed to process underutilized whole fish and fishery byproducts into high–protein supplements (a type of press cake and other related products) particularly suited for mink food. To help the industry, the Bureau is making animal feeding tests and evaluating methods of handling, storage, marketing, and distribution.

Development of Hawaiian Fisheries

The Bureau's Biological Laboratory at Honolulu has reorganized its research programs. It now has a new program designed to increase the yield and efficiency of the pole– and–line fishery for skipjack tuna in Hawaii and the efficiency of the Hawaiian longline fishery. The Bureau is trying also to develop a fisheries for high–seas skipjack tuna and for fish and shellfish other than tuna. Achievements of these goals would reverse declining trends of the pole– and–line fishery for skipjack and the longline fishery for larger tunas.

The Market Potential and Economic Feasibility for Irradiated Fish and Seafood Products

Bureau economists will begin this study by estimating costs of processing, irradiating, storing, and distributing irradiated fish products. Economists will also estimate and compare rates of loss from spoilage and quality deterioration for both irradiated and nonirradiated products in commercial trade channels. A determination will then be made of how irradiated fish products compete in the market and their demand is among consumers and institutions.

Meetings

Chiefly to urge policies that would benefit the U.S. fishing industry, Bureau officials participated in certain international conferences and meetings. They presented scientific reports and prepared background papers, position papers, and similar papers for U.S. representatives. Subjects discussed at these meetings included the need for an Indian Ocean Fishery Commission and an interim Fishery Committee for the Eastern Central Atlantic; the new Department of Fisheries of the Food and Agriculture Organization and Article VII amendment to FAO Constitution; life and habits of shrimp; fish behavior in relation to fishery techniques and tactics; freezing and irradiation of fish; coordinated studies on alewives, management of yellow pike (walleyes)

fishery in Lake Erie; salmon planting in Lake Michigan; sea lamprey control; Bureau participation in Gulf and Caribbean Fisheries Institute meeting; determination of a tuna catch quota in the eastern tropical Pacific Ocean; resources of the high seas; regulation of gear used in the Convention area of the International Commission for the Northwest Atlantic Fisheries, fishing effort, an international inspection scheme, and a new statistical area for extension of data collection south to Cape Hatteras; marine resources of the eastern North Atlantic Ocean; halibut fishery regulations in the eastern Bering Sea; Pacific halibut stocks; Pacific sockeye salmon; protein sources; whaling conservation measures; North Pacific fur seals; fishery policies of members of the Organization for Economic Cooperation and Development; and review of the work plan of the Caribbean Fisheries Development Project. A summary of the work done at these meetings follows.

FAO (Food and Agriculture Organization of the United Nations)

In 1967, FAO advanced its work through its Committee on Fisheries, Council, Conference, and biological or technological meetings.

FAO Committee on Fisheries and FAO Council.—The Committee on Fisheries met April 24 to 29, 1967. It stressed the need for an Indian Ocean Fishery Commission and an interim Fishery Committee for the Eastern Central Atlantic. The FAO Council at its 48th session, June 12 to 23, 1967, approved the establishment of these bodies.

FAO Conference.—At its 14th biannual meeting October 23 to November 23, 1967, in Rome the Conference discussed two subjects of major interest to fisheries. One subject was the organization of the new Department of Fisheries, which completed its first year's growth in 1967. The Department was created in January 1966 by upgrading the FAO Fisheries Division. The reorganization is being phased over a 6-year period to permit its work to expand in an orderly fashion.

The other subject was the Article VII amendment to the Constitution. The amendment provides for organization of regional fisheries bodies according to sea areas rather than land areas. Sea areas would cover all countries fishing in a given area or ocean instead of only those countries having land area adjacent to the body of water. This amendment is important because countries, such as Japan and the U.S.S.R., are beginning to fish throughout the world.

FAO World Scientific Conference on the Biology and Culture

of Shrimp and Prawns.—This Conference was held in Mexico City June 24 to 27, 1967. About 180 biologists, researchers, and participants from 30 nations and six international organizations attended the Conference. It assembled considerable information on the biology of shrimp and the economy of the shrimp industry. More knowledge is needed about the shrimp resources and the trade in shrimp products.

FAO Conference on Fish Behaviour in Relation to Fishing Techniques and Practices.—At the Conference in Bergen, Norway, October 19 to 27, 1967, many papers were presented on the behavior of fish. They provided information on how fish react when they are about to be caught by different types of gear and with different techniques of fishing. The papers also fully developed the fisheries and their future. FAO received several suggestions for study groups on various subjects dealing with fish behavior. The 141 participants represented 31 countries and 70 international organizations. Many other visitors also attended the Conference.

FAO Technical Conference on the Freezing and Irradiation of Fish.—The Conference was held in Madrid September 3 to 9, 1967. The 78 papers presented and the discussions of them dealt extensively with the quality of fishery products. The 361 participants (leading fish processing technologists and scientists) from 42 countries and four international organizations agreed that the techniques of freezing and irradiating fishery products are being improved as time passes. Irradiation is the newer of the techniques for maintaining quality. This process is not being used extensively but has promise. One of the key bits of information needed is the economic feasibility of this process. The Conference discussed this need and how to obtain the information.

Great Lakes Fishery Commission

This Commission considered coordination of alewife studies, management of Lake Erie yellow pike (walleye) fishery, planting salmon in Lake Michigan, and sea lamprey control.

Coordinated studies on alewives.—At the interim meeting the Commission noted that it had promised the U.S. Department of the Interior that it would help coordinate studies on the alewife problem. The Commission Chairman pointed out that the excellent progress made toward solving the sea lamprey problem allowed the Commission to devote more time to coordinating other research.

Management of yellow pike fishery in Lake Erie.—The prob-

lem of management continues because the States concerned and the Province of Ontario do not have uniform regulations. Representatives of the various regulatory agencies concerned will further discuss this problem in an effort to reach an agreement on proper regulations for the walleye fishery.

Planting salmon in Lake Michigan.—Introduction of exotic species continues to interest the Commission. At the Commission's interim meeting November 28 to 29, 1967, at Ann Arbor, Mich., it was reported that salmon planted in Lake Michigan in 1966 and 1967 have shown very good survival. This has stimulated enthusiasm in some areas for an expansion of the salmon planting program. The Commission, however, believes large-scale plantings should wait until more research has been done to determine the effect of these introductions.

Sea lamprey control.—At its 12th annual meeting June 20 to 22, 1967, at Madison, Wis., the Commission reported that the sea lamprey control program continues to be successful. The run of spawning lampreys in Lake Superior has been reduced overall, and the number of lamprey scars on whitefish in Lake Michigan has declined significantly. On Lake Huron the chemical treatment of lamprey-producing streams began, but lack of funds forced postponement of a major treatment program in that lake.

Gulf and Caribbean Fisheries Institute

Bureau personnel contributed significantly to the 20th annual session of the Gulf and Caribbean Fisheries Institute at San Juan, Puerto Rico, November 12 to 16, 1967. Some 60 of the 200 participants in the meeting were from the Caribbean area or Central and South America—a record high from this region.

Inter-American Tropical Tuna Commission

At its annual meeting in San Jose, Costa Rica, April 4 and 6, 1967, the Commission adopted a resolution for managing and conserving yellowfin tuna resources of the eastern Pacific Ocean. The Commission recommended that its members (Costa Rica, Ecuador, Mexico, Panama, and the United States) establish a prescribed tonnage limit of 84,500 short tons of yellowfin tuna by fishermen of all nations during each calendar year from an area of the eastern Pacific Ocean earlier defined by the Commission; establish open and closed seasons for yellowfin tuna under prescribed conditions; and permit landing of not more than 15 percent of weight of yellowfin tuna among tuna fishes taken on a fishing trip after close of the yellowfin tuna fishing season.

These recommendations were put into effect so far as they con-

cerned the vessels and persons subject to jurisdiction of the United States by regulations that the Department of the Interior made effective June 23, 1967. The 1967 yellowfin season was closed on that date, and U.S. fishing vessels departing on fishing trips thereafter were not permitted to keep or land quantities of yellowfin in excess of 15 percent of other tuna (principally skipjack) taken on such fishing trips. These restrictions were to remain in effect until the yellowfin season reopened January 1, 1968. Because of the June 1967 closure of yellowfin tuna fishing, the 1967 catch of yellowfin was slightly more than 90,000 tons.

IOC (Intergovernmental Oceanographic Commission)

Representatives of 47 of the 58 member nations attended the fifth session of IOC October 19 to 28, 1967, in Paris.

Two agenda items received particular attention. These were U.N. Resolution 2172 on Resources of the Sea and further development of IOC activities and legal aspects of scientific research and its application on the high seas.

IOC established a working group to consider legal aspects specifically related to scientific investigations of resources of the ocean. Official programs adopted were cooperative investigations in the Mediterranean, CICAR (Cooperative Investigations of the Caribbean and Adjacent Regions), and establishment of a working committee to plan and coordinate with the World Meteorological Organization on IGOSS (Integrated Global Ocean Station System).

ICNAF (International Commission for the Northwest Atlantic Fisheries)

Through its working group, preliminary scientific meetings before the annual meeting, and its annual meeting ICNAF was able to make excellent progress in 1967.

ICNAF Working Group for Biological and Economic Assessments of Conservation Actions.—The Working Group met in London April 1 to 13, 1967. This Group was charged initially with examination of the economic and biological evaluation of alternative conservation measures that might be applied in North Atlantic fisheries. Because stocks of some species in this area are heavily fished, the time may not be too far distant when means will have to be found to fish these stocks rationally to assure maximum benefits on a sustained basis. Not only must stocks be maintained at the best biological levels, but nations must not fish in a manner that wastes these economic resources. Some thought must be given to avoidance of excessive use of more vessels and men, whose earnings will continue to decrease

as the limited resources are harvested. Because these resources are a common property, discussion among the nations using them is vital.

ICNAF's Seventeenth Annual Meeting.—Almost 2 weeks of preliminary scientific meetings preceded ICNAF's 17th annual meeting June 5 to 9, 1967, in Boston. Many items of substantive interest to ICNAF were discussed, and reports were prepared for the Commissioners.

Items considered at the annual meeting of special concern to the United States were the topside chafing gear problem, questions concerning regulation of fishing effort, proposals for an international inspection scheme, and a new statistical area for extension of data collection south to Cape Hatteras.

For several years ICNAF has been unable to put into effect the needed mesh regulations, which had been earlier agreed to by most ICNAF Contracting Governments but had been accepted only with reservations by the United Kingdom, U.S.S.R., and Poland, which held that the regulations should not apply to chafing gear used by stern trawlers. After intensive study of this problem, ICNAF at its 1966 meeting approved a new type of chafing gear developed by Poland. This approval coincided with action by the United Kingdom which had the effect of removing its objection to the mesh regulations. At its 1967 annual meeting, ICNAF amended the approved specifications of the Polish-type gear to permit it to extend over all or any part of the length of the upper side of the cod end. After this modification, the U.S.S.R. withdrew its reservations, and Poland agreed to withdraw its reservation.

In recent years, concern has grown over the need to control fishing intensity in the ICNAF area. It has become apparent that mesh regulations may not be sufficient to conserve the fishery resources. The Commission, therefore, devoted much time at the 1967 annual meeting to a preliminary consideration of factors that would be involved in introducing catch quotas in the ICNAF area. It was evident that all aspects of such a regulatory system would need a thorough review. A Standing Committee on Regulatory Measures, therefore, was set up to consider administrative and economic problems associated with introducing new types of regulatory measures. The new Committee was also asked to work with the Standing Committee on Research and Statistics to define scientific questions that would need to be answered if new regulatory measures were proposed.

Proposals for an international inspection scheme to facilitate

enforcement of regulatory measures have been under consideration by both ICNAF and NEAFC (North East Atlantic Fisheries Commission). At its 1967 annual meeting, NEAFC reached tentative approval for such a scheme. ICNAF could adopt a similar scheme upon entry into force of the Protocol Relating to Measures of Control. It was agreed at the ICNAF meeting, therefore, that views of ICNAF member countries on an international inspection scheme based on the NEAFC scheme would be assembled for consideration by the ICNAF Ad Hoc Committee on Trawl Regulations before the 1968 ICNAF annual meeting.

In other action, ICNAF recognized the importance of collecting data on fisheries south of the Convention area. ICNAF established a new Statistical Area 6 extending from the Convention area south to Cape Hatteras for which member countries would be asked to report catch effort statistics, as provided in Article VI of the Convention. Regulatory measures would not be proposed for this area because it is outside the ICNAF Convention area.

ICES (International Council for the Exploration of the Sea)

All 17 member nations were represented at ICES' 55th statutory meeting October 9 to 18, 1967, at Hamburg, Germany. The United States, which is not a member, sent a delegation of observers.

As the oldest international organization dealing with marine sciences, ICES has been principally concerned with marine resources of the eastern North Atlantic Ocean.

Under a Convention prepared in 1964, ICES plans to broaden its scope of endeavor to include the entire Atlantic Ocean and its adjacent seas, with primary emphasis on the North Atlantic. The Convention will go into force when all member nations have signed. Then the purposes of ICES will be to promote and encourage investigations of the seas, particularly those related to the living resources thereof, to draw up the required programs, to organize the research that appears necessary, and to publish or otherwise disseminate results of studies carried out under auspices of ICES.

INPFC (International North Pacific Fisheries Commission)

At its 14th annual meeting, November 6 to 10, 1967, at Tokyo, INPFC recommended that fishing regulations for the halibut fishery in 1968 in the eastern Bering Sea be the same as those in effect in 1967. INPFC further recommended that an extensive area in the southeastern Bering Sea, which is a nursery ground

for young halibut, be closed to halibut fishing. Canadian and United States representatives stated that their Governments intended to require their fishermen to release all halibut taken by trawl nets in any part of the Bering Sea. The Japanese representative stated that within a part of this area, Japan would undertake to prohibit all trawl fishing by Japanese fishing vessels and expressed the intention of his Government to apply a minimum size limit of 66 cm. (26 inches) for halibut. This limit would apply to Japanese fishing throughout the Bering Sea.

In the Gulf of Alaska, INPFC studies focused on how the halibut stocks are affected by the expanding trawl fisheries for other species. Scientists of Canada, Japan, and the United States exchanged and studied the groundfish catch statistics. INPFC approved a number of recommendations that its Gulf of Alaska Groundfish Committee had made for further research in this field. INPFC also agreed to perform joint research on groundfishes other than halibut in the northeast Pacific to determine what joint conservation measures are necessary.

INPFC further recommended that research on king crab in the eastern Bering Sea be continued and strengthened.

International Pacific Halibut Commission

At its 43d annual meeting January 31 to February 3, 1967, at Seattle, Wash., the Commission (composed of Canada and the United States) approved a research program for 1967. It continues the 1966 program of tagging and assessing possible effects of foreign fishing upon halibut stocks.

The Commission recommended that the regulatory areas be changed. Area 2 would include all Convention waters south of Cape Spencer, Alaska; Area 3A would be between Cape Spencer and the Shumagin Islands; Area 3B would be the Shumagin Islands to Atka Island (not including the Bering Sea); area 3C to be west of Atka Island (not including the Bering Sea); Area 4A the Bering Sea edge—Unimak Pass to the Pribilof Islands; Area 4B the Fox Islands grounds, Bering Sea; Area 4C the edge grounds and the Bering Sea side of the Aleutian chain between long. 170° W. and 175° W.; Area 4D the Bering Sea east of long. 175° W. and north of a line between Cape Newenham and St. Paul Island and waters west of long. 175° W. Areas 2, 3A, and 3B were to open May 9 with catch limits of 23 million pounds, 33 million pounds, and 3½ million pounds, respectively. In Area 3C the season was from March 29 to November 15; in Area 4A from April 3 to April 17; Area 4B from September 1 to Septem-

ber 10; Area 4C from March 29 to April 22; and Area 4D from March 29 to November 15, 1967.

International Pacific Salmon Fisheries Commission

At its annual meeting at Bellingham, Wash., December 18, 1967, the International Pacific Salmon Fisheries Commission reviewed the 1967 fishing in the Convention Area. Believing the 1968 run of sockeye would not be as large as that of 1967, the Commission predicted a catch of about 500,000 fish for each member country (Canada and the United States). The Commission expressed concern over effects of logging operations on salmon stocks of interest to the Commission. The Commission discussed also problems associated with waste disposal by pulp mills.

The Commission forwarded its report to the Governments of Canada and the United States for consideration.

International Symposium on Protein Foods and Concentrates

At the International Symposium on Protein Foods and Concentrates in Mysore, India, June 27 to July 4, 1967, Indian scientists were very much interested in fish protein concentrate as a means of alleviating the increasing food crisis in India. Other protein sources given considerable emphasis at the Symposium were single cell protein from petroleum and lysine supplementation of vegetable proteins. A Bureau technologist attended the Symposium.

IWC (International Whaling Commission)

The IWC at its 19th annual meeting in London June 26 to 30, 1967, recommended that the pelagic catch limit for the 1967/68 Antarctic season should be reduced from 3,500 bluewhale units to 3,200 units. This reduction met the Commission's obligation agreed upon in 1965 to reduce the catch in the 1967/68 season below the estimated level of sustainable yields of fin and sei whale stocks of the Antarctic. The current estimated sustainable yield of those stocks is 3,300 bluewhale units.

The IWC further agreed that blue whales should not be taken in the Southern Hemisphere; that the ban on killing humpback whales in the North Pacific should extend for 3 years beginning in 1968; and that the provision for taking undersized whales in the northeastern Pacific for local consumption should extend 3 years. The United States received permission to take 100 gray whales off the west coast of the United States for experimental purposes.

North Pacific Fur Seal Commission

At its 10th annual meeting in Washington, D.C., February 13 to 17, 1967, the North Pacific Fur Seal Commission reviewed the fur seal research and management activities carried on by the Party Governments (Canada, Japan, United States, and U.S.S.R.) in 1966. The Commission also reviewed and approved plans of the Party Governments for 1967 fur seal investigations on land and sea. The Commission's research is directed toward achieving the maximum sustainable yield from the fur seal resource with due regard to the effect on other living marine resources, studying means of improving sealskin quality, and determining the effectiveness of various methods of killing seals.

The Commission examined 400 experimental sealskins contributed by the Party Governments as part of a study of sealskin quality. Conclusions reached from this investigation and others will serve as the basis for recommendations to the Party Governments when the future of the Convention is considered after October 14, 1968.

Research and harvesting continued on the Commander and Pribilof breeding grounds. In 1966, the U.S.S.R. harvested 18,514 sealskins and the United States 52,802. In accordance with the terms of the Convention, the Governments of Japan and Canada each received 1,500 sealskins from the U.S.S.R. and 15 percent of the United States harvest.

The Commission agreed that Commission members and its Standing Scientific Committee should be prepared to discuss at the 11th annual meeting whether pelagic sealing in conjunction with land sealing could be permitted in certain circumstances. The Convention requires that shortly after October 14, 1968, recommendations on this matter must be submitted to the contracting Governments.

OECD (Organization for Economic Cooperation and Development)

The Fisheries Committee of OECD held its 17th session in Paris April 17 and 18, 1967. The Committee continued to reappraise the fishery policies of member countries with emphasis on fishing fleet development over the last 8 years. Reports on fishing fleet development of the United States, Japan, Norway, and Denmark were presented.

In other actions, the Committee reviewed reports on progress of the North Atlantic Fisheries Bio-Economic Assessment Working Group and compilation of fishing fleet statistics in the North Atlantic (which OECD is doing with other international organizations). The Committee decided that OECD

should try to collect more complete economic data on fishing fleets. The Committee also decided to make available for general distribution the reports on electronic equipment in fishing and on changes in minimum and fixed prices in fishing industries.

UNDP/FAO (United Nations Development Program/Food and Agriculture Organization) Caribbean Fisheries Development Project Liaison Officers Meeting

The Liaison Officers of its UNDP/FAO Caribbean Fisheries Development Project held their second annual meeting September 19 to 22, 1967, in Bridgetown, Barbados. Representatives of FAO, UNDP, and Bureau of Commercial Fisheries and various Caribbean countries attended the meeting. Delegates from Barbados, Dominica, Dominican Republic, French Guiana, Grenada, Guadeloupe, Guyana, Jamaica, Martinique, Netherlands Antilles, Puerto Rico, St. Lucia, St. Vincent, Surinam, and Trinidad and Tobago reviewed the progress of the Project and discussed the work plan for 1968. Discussions centered on activities of the exploratory fishing-training vessels *Alcyon* and *Calamar*. Suggestions of the delegates were incorporated into the work plan for exploratory fishing, marketing, and training, and the delegates then approved the work plan.

During the meeting the *Calamar* unloaded 36,000 pounds of trawl fish, and attendees observed all steps in handling the fish from unloading through retail selling.

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

Through cooperation with various foreign governments, other Federal agencies, States, universities, and private organizations, the Bureau benefits from the facilities and skills of these cooperators and the exchange of ideas and results. The Bureau also coordinates many of its programs with these groups.

Cooperation with International Groups

Cooperation enables international groups to solve mutual problems by developing and exchanging needed information. International organizations, such as Food and Agriculture Organization of the United Nations, Great Lakes Fishery Commission, International Commission for the Northwest Atlantic Fisheries, International North Pacific Fisheries Commission, and North Pacific Fur Seal Commission coordinate the research efforts of several countries.

In 1967, the Bureau participated in the work of Codex Ali-

mentarius Commission and in the Foreign Currency Research Program.

Cooperation with Codex Alimentarius Commission.—The Bureau assists in the work of Codex Alimentarius Commission, an international body operating under auspices of the United Nations. The Commission is trying to develop and establish international standards for foods.

The Bureau is developing standards for fish and fishery products, for fish plant sanitation, and for proper labeling of fishery products.

Foreign Currency Research Program (P.L. 480).—As provided in Section 104B(3) of Public Law 480, the Bureau is financing 10 biological research projects in India, Israel, and Poland. Most of these contracts are held by universities. The work progressed well during 1967.

Scientists at the University of Delhi, India, studied how fish ovaries change when fish are exposed to various wave lengths of light. Their findings on the effects of light will help fish culturists improve their methods of controlling spawning.

Researchers at the University of Calcutta, India, are studying the availability of fish fry in the rivers. Their aim is to find a ready source of fry that can be supplied to fish cultural stations. These stations can rear the fish to marketable size and, therefore, increase production of much needed protein.

Biologists at Annamalia, India, have determined the breeding seasons of some of the important commercial species of herringlike fishes.

At the University of Kerala, India, progress was made on basic research dealing with the role the shell molt gland plays in the reproductive process of Crustacea.

Scientists at the Hebrew University in Israel report progress on several projects. They have established two gene pools of carp to start an inbreeding–crossbreeding program that should lead to superior crossbreeds. In another project contract, they have developed methods for spawning mullet in captivity and are rearing mullet larvae to a size suitable for stocking ponds.

Two technological research projects were completed in Israel in 1967. The first project, "Enzymes of Lipolysis and Assimilation of Fatty Acids in Fish Muscle," was carried out at the Hebrew University. The aim of this project was to identify the enzymes responsible for degradation of fat in fish muscle. The effect of enzyme inhibitors and various storage conditions on enzyme action was investigated also. The second project, "Pro-

teolytic Enzymes of Fish," was carried out at the Tel Aviv University. This project involved purification of previously isolated enzymes and determination of their properties and function. Information gained from these two projects will be used to determine how various enzymes relate to deterioration of quality in fish flesh during both the frozen and fresh states. Then procedures can be developed to reduce the rate of breakdown of fish muscle and help the consumer obtain high-quality fishery products.

One research project, "Effect of Low Levels of Fish Products on the Utilization of Plant Protein in the Nutrition of Growing Chickens and Pigs," is under way in Poland. This project consists of pilot feeding experiments with broilers and pigs. The aim is to determine the least amounts of selected fish meals and fish solubles that can be added to different types of plant feeds and still enable the animals to grow at one optimum rate. Results of the experiments will be used as a guide for developing rations for broilers and bacon pigs.

Cooperation with Federal Agencies

The Bureau has formal and informal agreements with other Government agencies—Atomic Energy Commission; Department of Agriculture; Department of Commerce (including the Bureau of Census and the Weather Bureau); Department of Health, Education and Welfare; Department of Labor; Department of State; Department of the Treasury; Economic Development Administration; Federal Trade Commission; and Department of Defense.

Bureau cooperation with Federal agencies in 1967 included the sending of Bureau specialists as part of survey teams of the Agency for International Development. The Bureau participated also in the Economic Development Administration's program on projects related to commercial fishing industries in some of the economically depressed areas designated for redevelopment under the Public Works and Economic Development Act of 1965. The Bureau also worked closely with the Department of Agriculture in scheduling and promoting U.S. foods at international food fairs.

Cooperation with AID (Agency for International Development).—Bureau specialists have been part of survey teams sent by AID to study the feasibility of producing FPC (fish protein concentrate, a protein food supplement) in Africa, the Far East, and Latin America. The developing countries visited were Ghana, Kenya, Morocco, Uganda, Ceylon, India, Korea,

Thailand, Brazil, Chile, Honduras, and Peru. The Bureau also provided AID cooperative liaison on general problems of FPC use overseas.

Cooperation with EDA (Economic Development Administration).—The Bureau continued to participate in EDA's program on projects related to commercial fishing industries in some of the economically depressed areas designated for redevelopment under the Public Works and Economic Development Act of 1965 (Public Law 89–136). Bureau personnel have developed or have helped local committees to develop proposals for improving the economic conditions of depressed areas. At EDA's request, Bureau personnel reviewed, evaluated, and commented on project proposals and made recommendations for approving or denying the funding of the projects. Included in the proposals in 1967 were projects for expanding the fishing industry of Florida by processing and marketing underutilized species; investigating the pasteurization process as a means for extending the shelf life of shrimp and crab meat; developing and expanding the catfish raising and marketing industries; and determining the feasibility of developing and expanding ocean-oriented industries in several areas.

EDA approved expenditures of $481,958 in technical assistance funds to finance commercial fishery projects in economically depressed areas in California, the Great Lakes area, Louisiana, New England States, North Carolina, Virginia, Tennessee, and Washington.

Cooperation with U.S. Department of Agriculture.—The Bureau and the U.S. Department of Agriculture, Foreign Agricultural Service, International Trade Fairs Division, work closely in scheduling and promoting U.S. foods at international fairs. The success of the Bureau's international trade promotion program stemmed from the excellent cooperation and coordination with the Department of Agriculture which has had 12 years' experience in organizing and operating such food fairs.

The Bureau and Agriculture cooperate also in Agriculture's Plentiful Foods Program. Bureau representatives attend Agriculture's plentiful foods meetings to report on the current fishery supply situation. When particular fishery products are abundant and prices depressed, Agriculture lists these products in its "List of Foods in Plentiful Supply." Agriculture then distributes the list to food trade personnel and publicists.

In another publication, Agriculture reports the test kitchen research on fishery products of the Bureau's National Home

Economics Research Center. School lunch personnel, dietitians, and food publicists receive this publication.

Training program assistance to AID (Agency for International Development).—During 1967 the Bureau arranged and supervised training programs in fishery-related subjects for 16 participants from 10 different countries (China 1; Guyana 2; Indonesia 1; Kenya 1; Korea 2; Pakistan 3; Sierra Leone 2; Thailand 1; Uganda 1; and Viet Nam 2). The Bureau also supervised administrative functions for training two participants from the Philippines in rat research and control.

Cooperation with States

The Bureau cooperates with two interstate commissions—Atlantic States Marine Fisheries Commission and the Gulf States Marine Fisheries Commission. These Commissions coordinate the conservation actions and research efforts of the States involved in interstate compacts. Formal agreements provide for this coordinated action, and Bureau scientists provide the data that make it possible.

All coastal and inland States with commercial fisheries have cooperative arrangements with the Bureau for collecting and compiling fishery statistics.

Cooperation with Other Groups

The Bureau cooperates closely with numerous national, regional, and local fishery and allied trade associations.

This cooperation draws upon the development, research, and service functions of the Bureau. The Bureau uses also the professional skill 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 1967.

Organization, Employment, Budget, and Physical Properties

A summary of the Bureau's organization, employment, budget, and physical properties in 1967 follows:

Organization

In 1967 several relatively minor changes were made in the organization of the Bureau. The Branch of Market News was transferred from the Division of Resource Development to the

Division of Economics. The Office of Equal Employment Opportunity and the Office of Data Processing were established in the Division of Administration. The Branch of Foreign Trade and Economic Services activated the Foreign Trade Analysis Section.

A chart of the Bureau's organization as of December 31, 1967 is shown in figure 1, and a map of the six regional and one area offices and the territory covered by each as of December 31, 1967, is shown in the frontispiece.

Employment

Employment for the Bureau averaged 2,391 throughout calendar year 1967 (1,945 permanent and 446 seasonal employees). The peak employment in 1967 was reported at the end of July when the staff comprised 1,956 permanent and 756 seasonal employees—a total of 2,712. Figure 2 shows the variations in the number of employees throughout 1967 and the relation between the total number and the number of permanent employees and seasonal, or temporary, employees.

Bureau employees fall generally into four broad categories. Of the total 2,156 full-time employees reported as of October 31, 1967, 980 were classified in about 45 professional and technical series; 257 in 11 subprofessional series; 547 in 38 clerical and administrative series; and 372 were in positions, the pay of which is determined outside the Classification Act (189 vessel positions, 183 other). Figure 3 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, 1967.

Budget

For fiscal year 1968, $56.8 million were available for obligations to carry out the Bureau's programs (app. F). Of this amount, $45.5 million were from annual appropriations; $7.3 million from Public Law 466 (known as the Saltonstall–Kennedy Act) funds; $0.3 million for payment to Alaska from Pribilof Island fur seal receipts; $0.9 million made available to the Bureau by the Great Lakes Fishery Commission; $0.7 million from members of the fishing industry for inspection and grading of fishery products; and $2 million for reimbursable work for other Federal organizations.

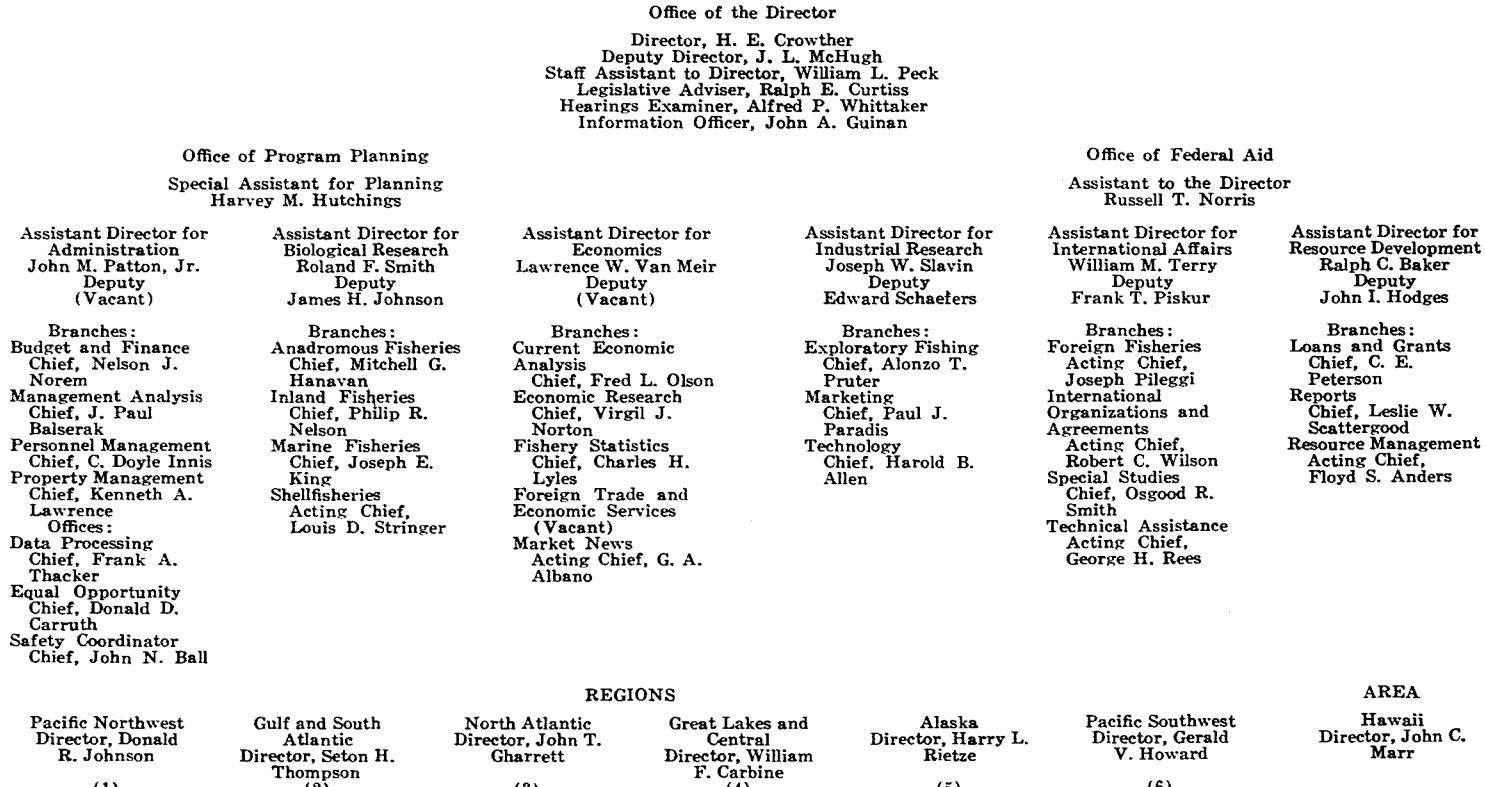

FIGURE 1.—Organization Chart, Bureau of Commercial Fisheries, December 31, 1967.

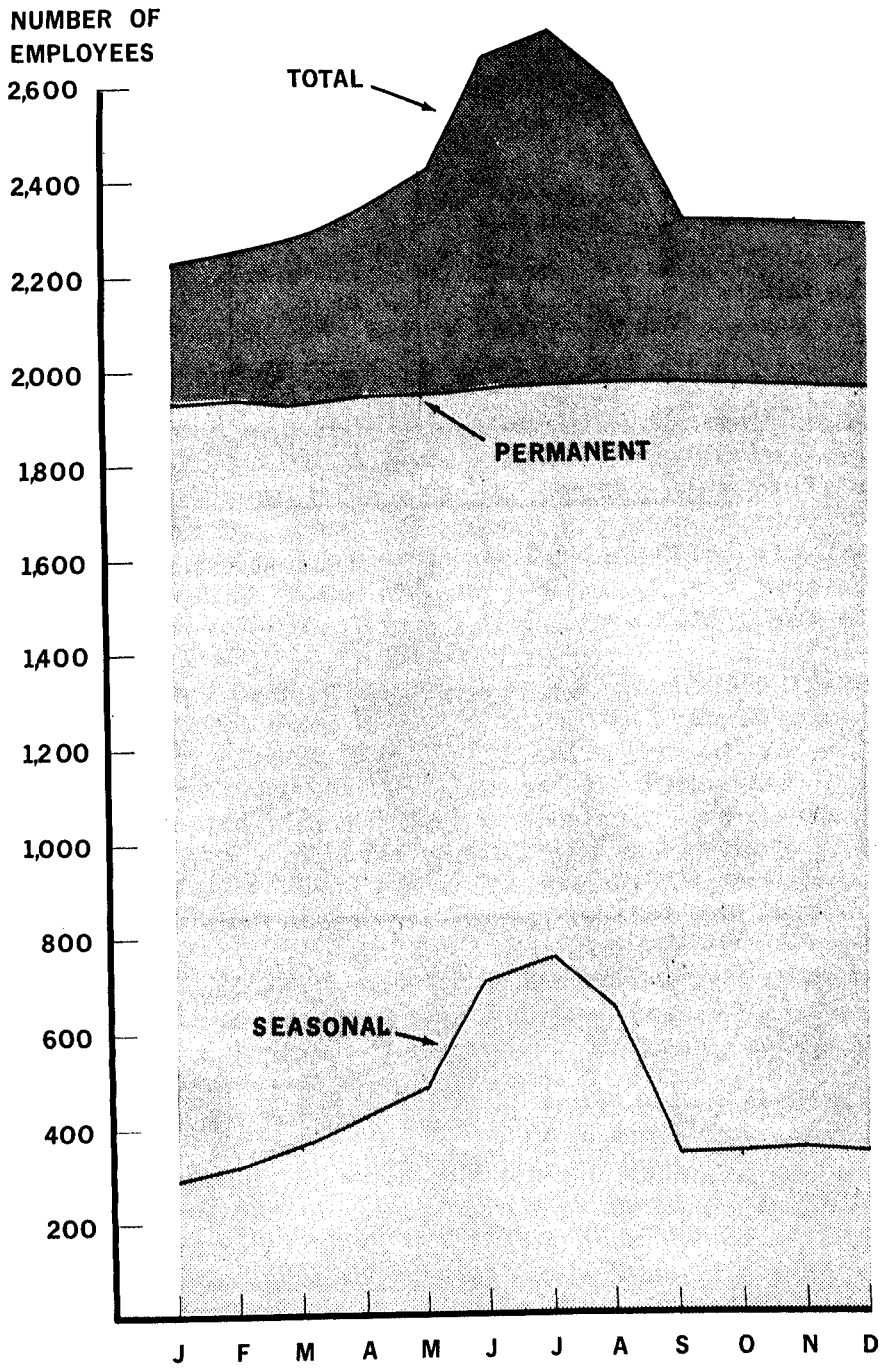

FIGURE 2.—Bureau of Commercial Fisheries employment totals by month, calendar year 1967.

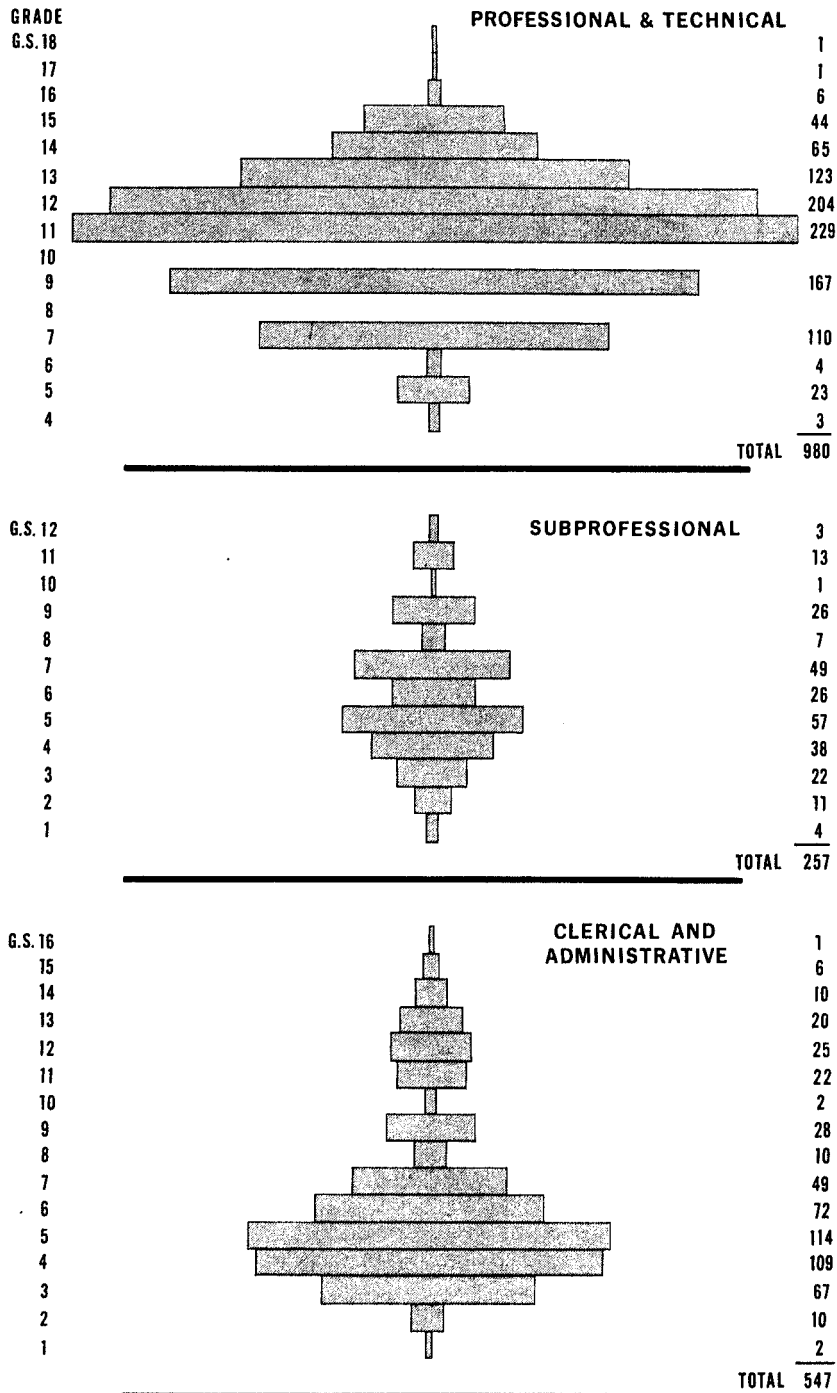

FIGURE 3.—Distribution by grade of professional and technical, subprofessional, and clerical and administrative employees, Bureau of Commercial Fisheries, October 31, 1967.

Figure 4 shows the available funds to carry out the Bureau's program for each year from 1957 to 1967.

Physical Properties

The principal properties of the Bureau are field laboratories and stations, vessels, and installations on the Pribilof Islands (app. G). The Bureau has 29 large laboratories and installations, 69 smaller stations and offices, and 29 vessels of 40 feet and longer. Figures 5, 6, and 7 show the Bureau's principal fishery biological research laboratories, and figure 8 shows the principal exploratory fishing and gear research bases and technological laboratories.

During fiscal year 1967, the construction program, which began in 1962, tapered off because several projects were completed: the additional building for the Bureau's Biological Laboratory at Milford, Conn.; the fishery and oceanographic research vessel *Miller Freeman* for the Bureau's Biological Laboratory at Seattle, Wash., and the fishing and gear research vessel *Oregon II* for the Bureau's Exploratory Fishing Base at Pascagoula, Miss.

The research vessel *Miller Freeman* is a valuable addition to the Bureau's fleet. Based at Seattle, Wash., the *Miller Freeman*, large enough to carry 10 scientists and a crew of 26, will operate in the North Pacific Ocean and the Bering Sea. The vessel is equipped with biological, oceanographic, and electronic laboratories and is rated for unrestricted ocean service with a cruising radius of 13,000 miles. The specially designed stern-ramp configuration of the vessel makes it possible to do deep-sea trawling.

The Bureau's newest exploratory fishing research vessel is the *Oregon II*. It is outfitted with electronics gear, fishing gear, winches, other hydraulic gear handling equipment, refrigeration, and laboratories. It was subjected to a series of shakedown cruises and gear and equipment trials. It is equipped for a variety of fishing techniques including purse seining, gill netting, longlining, trawling, pot fishing, tending traps, and dredging. The *Oregon II* will operate in the Gulf of Mexico and South Atlantic region out of Pascagoula, Miss.

Still to be completed are the exploratory fishing and gear research vessel *Delaware II*, to be based at Gloucester, Mass., and the experimental tank area to be used for studying oyster genetics at the Biological Laboratory at Milford.

Figures 9 and 10 show the Bureau's principal fishery research vessels.

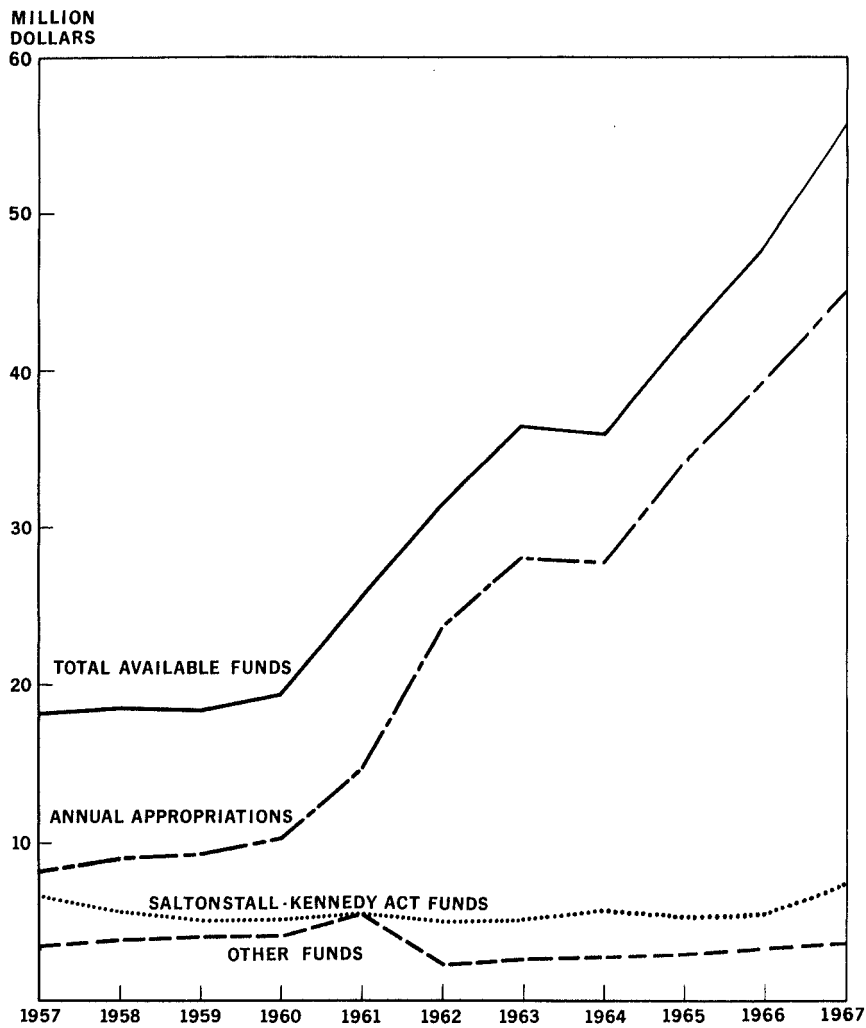

FIGURE 4.—Funds available to the Bureau of Commercial Fisheries, fiscal years 1957–67.

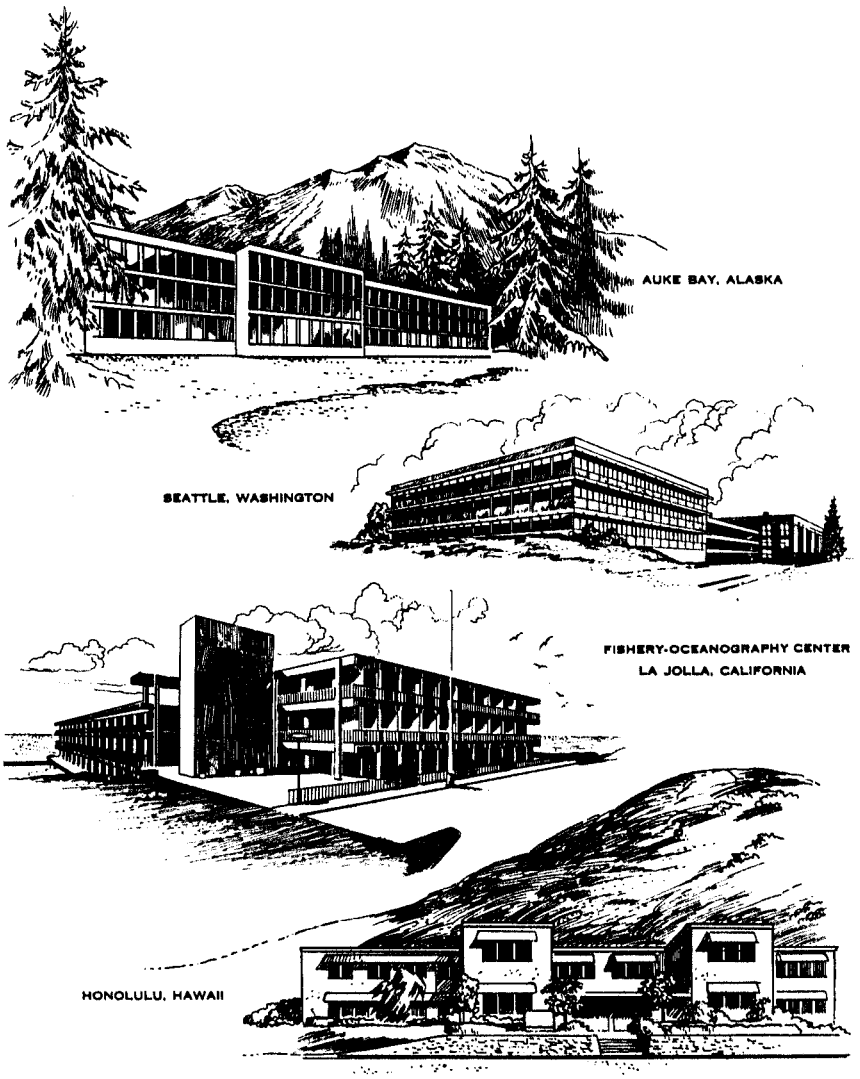

FIGURE 5.—Bureau of Commercial Fisheries biological laboratories, Pacific, 1967.

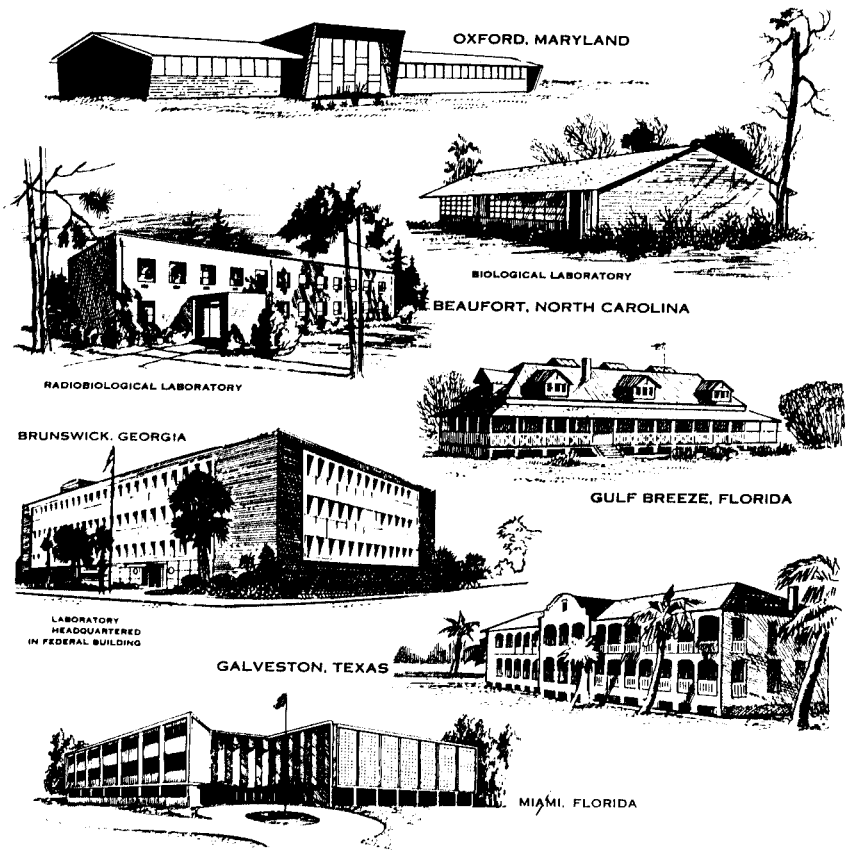

FIGURE 6.—Bureau of Commercial Fisheries biological laboratories, Middle and South Atlantic and Gulf Coast, 1967.

FIGURE 7.—Bureau of Commercial Fisheries biological laboratories, North Atlantic and Great Lakes, 1967.

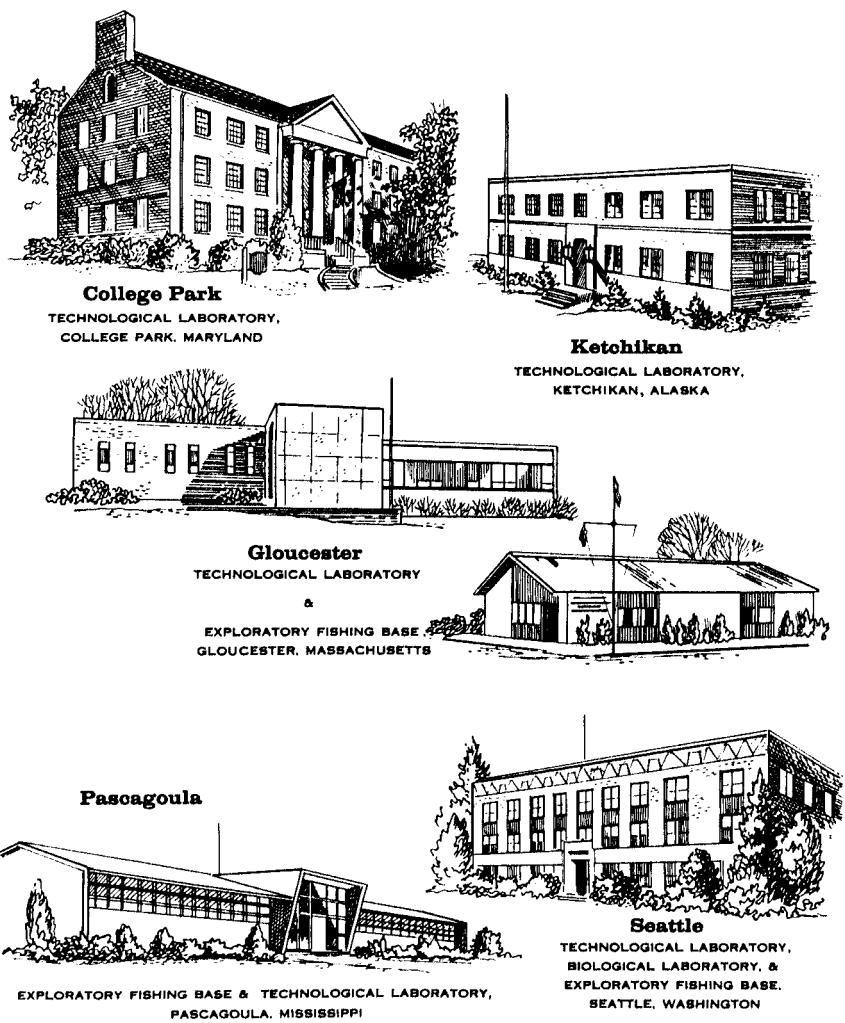

FIGURE 8.—Bureau of Commercial Fisheries exploratory fishing and gear research bases and technological laboratories, 1967.

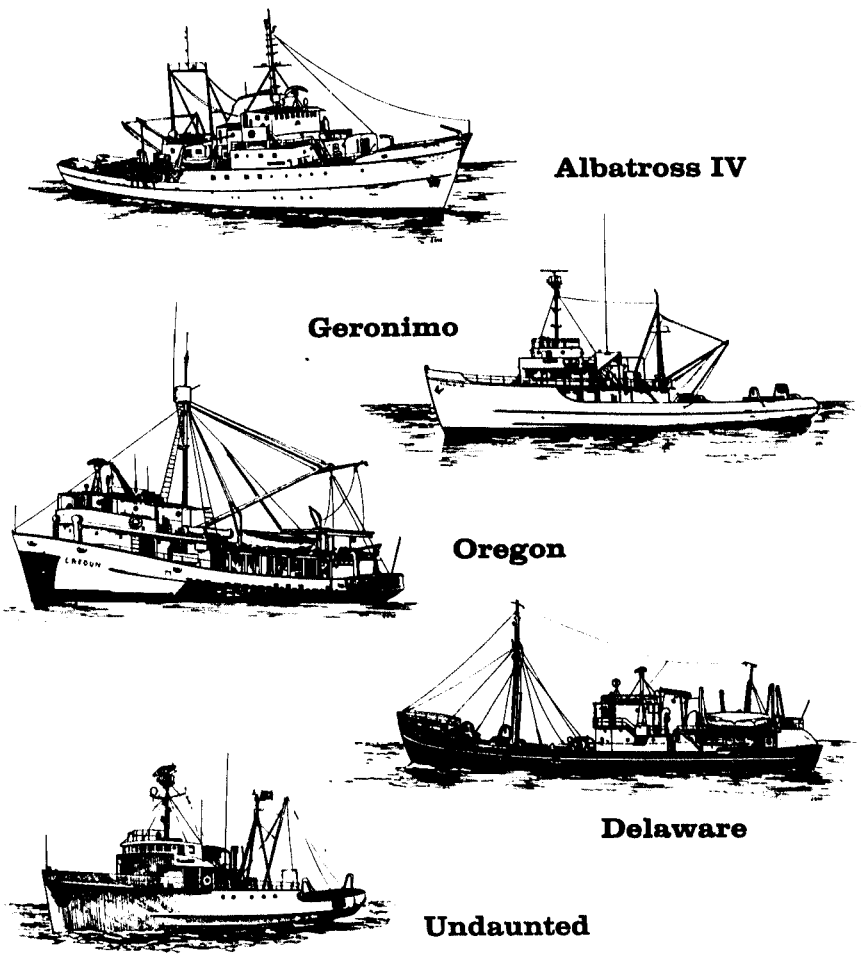

FIGURE 9.—Bureau of Commercial Fisheries principal research vessels operating in the Atlantic in 1967.

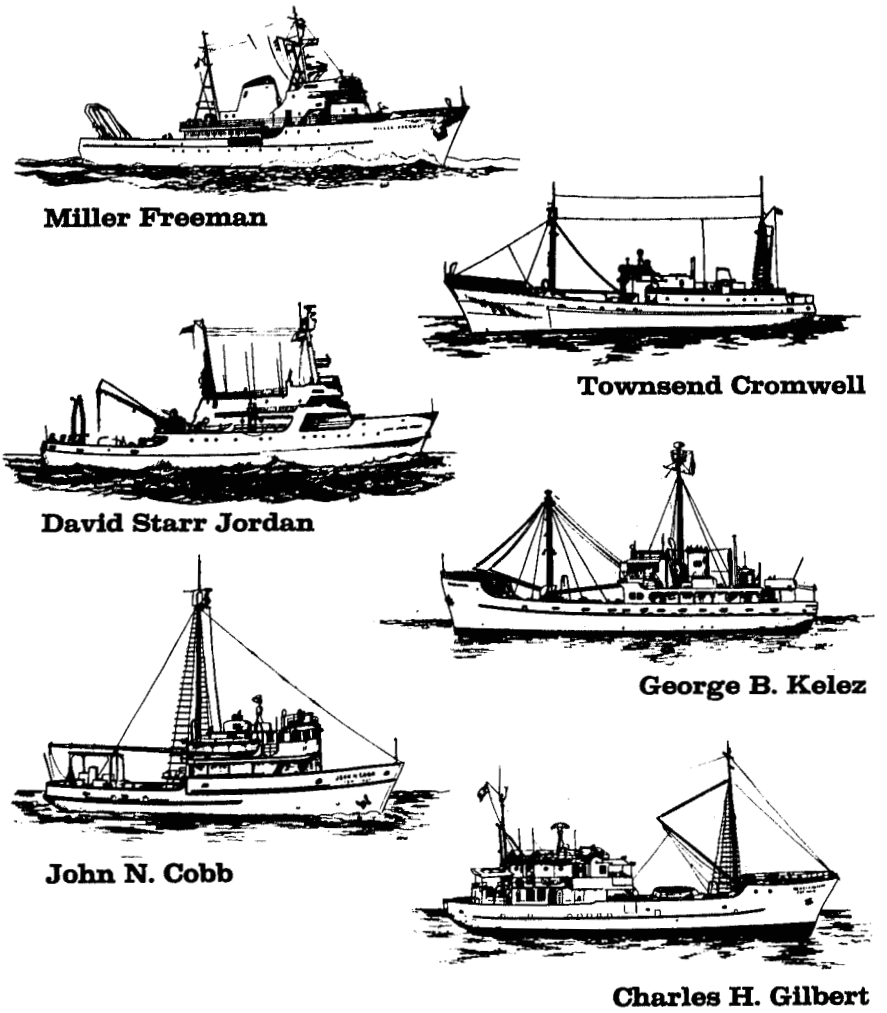

FIGURE 10.—Bureau of Commercial Fisheries principal research vessels operating in the Pacific in 1967.

Publications

Through publications the Bureau tells the U.S. fishing industry, fishery scientists, and the general public of the success in its biological, chemical, economic, engineering, exploratory, marketing, and statistical efforts to expand and improve the U.S. fishing industry.

These publications comprise three general categories. Forty-nine percent of the publications are contributions to scientific knowledge, particularly relating to fishery biology, fishery technology, and oceanography; 45 percent are statistical reports of interest to fishery researchers and the fishing industry; and the remaining 6 percent present popular information for the general public and nontechnical or semitechnical reports for the fishing industry.

Exclusive of the 1,764 Fishery Products Reports (5,774 pp.), which the seven Market News Service field offices issued five times a week, the Bureau sponsored 836 publications (55,669 pp.) in 1967. In the Fish and Wildlife Service series 507 reports (51,761 pp.) were published. The remaining 329 publications (3,908 pp). appear in non-Service technical and trade journals. Bureau employees wrote most of the publications; employees of research institutions under contract to the Bureau and unpaid collaborators wrote the others.

Appendix H of this report describes the Bureau's series of publications and partially lists the publications issued in 1967.

Appendix A—Fisheries of the United States

A-1.—*Employment, fishing craft, and establishments, calendar years 1967 and 1966*

	1967	1966
Persons employed:	*Number*	*Number*
Fishermen	(1)	135,636
In fishery wholesaling and manufacturing establishments	(1)	88,748
Total	(1)	224,384
Craft used:		
Fishing:		
Vessels (5-net tons and over)	(1)	12,677
Motor boats	(1)	66,941
Other boats	(1)	2,504
Total	(1)	82,122
Fishing vessels, documentations issued:		
First documentation	842	785
Redocumentation	27	31
Total	869	816
Fishery shore establishments:		
Pacific Coast States	(1)	588
Atlantic Coast and Gulf States	(1)	2,923
Great Lakes and Mississippi River States	(1)	650
Hawaii	(1)	26
Total	(1)	4,187

[1] Not available.

A-2.—*U.S. landings of certain species, calendar years 1967 and 1966, and record catch*

Species	1967 [1]		1966		Record catch	
	Million pounds	*Million dollars*	*Million pounds*	*Million dollars*	*Year*	*Million pounds*
Menhaden	1,166	15	1,308	22	1962	2,348
Tuna [2]	329	45	269	45	1950	391
Crabs: blue, Dungeness and king	316	27	366	31	1966	362
Shrimp	312	103	239	96	1967	312
Salmon	206	49	388	73	1936	708
Flounders, Atlantic and Gulf	111	14	128	16	1965	134
Haddock	98	11	132	14	1929	294
Alewives, Atlantic	59	1	58	1	1908	90
Ocean perch, Atlantic	72	3	82	3	1951	258
Whiting	70	2	90	4	1957	133
Anchovies, California	70	1	62	1	1953	86
Herring, sea, Atlantic	69	2	72	1	1902	201
Clams, Atlantic: surf, hard and soft (meats)	68	19	73	18	1966	72
Oysters (meats)	58	32	51	27	[3] 1908	152
Cod, Atlantic	43	3	38	3	1880	294
Halibut, Pacific	40	8	40	10	1915	67
Jack mackerel	38	1	41	1	1952	147
Mullet	34	2	38	3	1902	43
Hake, Pacific	28	(4)	12	(4)	1967	28
Lobster, northern	27	22	30	22	1960	31
Bonito	21	1	19	1	1967	21
Scup or porgy	20	3	28	3	1960	49
Herring, sea, Pacific	16	1	24	1	1937	263
Snapper, red	13	4	13	4	1902	23
Scallop, sea, Atlantic (edible meats)	10	8	16	8	1961	27
Striped bass, Atlantic	10	2	9	2	1967	10
Pollock	9	1	9	1	1938	41
Sea bass, black, Atlantic	5	1	5	1	1952	22
Mackerel, Pacific	1	(4)	5	(4)	1935	147
Sardine, Pacific	(4)	(4)	1	(4)	1936	1,502
Other	730	55	720	60		
Total	4,049	436	4,366	472		

[1] Preliminary.

[2] Does not include landings of tuna by U.S. vessels in Puerto Rico.

[3] First year in which an oyster survey was made.

[4] Less than 500,000 pounds or $500,000.

A–3.—*Summary of processed fishery products, by quantity and value, calendar years 1967 and 1966*

Item	1967 [1]		1966	
	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	45,099	20,661	49,542	22,754
Groundfish, including ocean perch	71,032	26,908	75,418	27,494
Halibut	7,899	4,613	7,538	4,741
Other (including whale meat for animal feeding)	83,000	21,500	86,089	22,917
Total	207,030	73,682	218,587	77,906
Breaded, raw and cooked:				
Sticks	73,881	32,549	81,415	35,787
Fillets, portions and steaks	160,000	68,000	152,392	65,150
Shellfish:				
Not breaded:				
Shrimp	132,000	137,200	92,340	102,580
Other	155,000	121,000	152,886	119,799
Total	287,000	258,200	245,226	222,379
Breaded:				
Shrimp	94,000	85,200	104,926	94,169
Other	14,500	12,800	13,653	11,627
Total	108,500	98,000	118,579	105,796
Specialties, fish and shellfish	60,150	38,500	55,630	35,038
Total fresh and frozen	896,561	568,931	871,829	542,056
Canned:				
Fish and shellfish for human consumption:				
Tuna	388,845	261,527	394,268	270,239
Salmon	99,699	73,367	209,161	136,075
Sardines:				
Maine (sea herring)	29,260	13,863	31,118	12,262
Pacific	(2)	(2)	116	25
Mackerel	12,733	2,363	18,575	3,346
Clam products and specialties	69,623	23,027	73,666	22,690
Shrimp and specialties	17,247	24,308	14,999	22,315
Oyster and specialties	16,288	10,123	16,380	7,220
Squid	14,615	1,439	11,363	1,148
Other	50,002	35,716	52,723	32,521
Total for human consumption	698,312	445,733	822,369	507,841
Bait and animal food:				
Animal food	505,860	76,217	364,619	54,614
Salmon eggs for bait	554	1,597	559	1,253
Total bait and animal food	506,414	77,814	365,178	55,867
Total canned	1,204,726	523,547	1,187,547	563,708
Cured fish and shellfish:				
Salted	40,181	22,925	35,934	17,532
Smoked	31,097	34,180	28,968	32,164
Dried fish and shellfish, and lutefisk	[3] 1,216	6,717	[3] 884	2,803
Total cured	72,494	63,822	65,786	52,499
Industrial products:				
Meal and scrap	423,378	26,039	448,306	32,315
Oil, body and liver	122,398	6,111	164,742	12,522
Fish solubles	149,350	4,588	166,882	5,160
Oyster shell lime and poultry grit	622,734	4,144	668,424	4,315
Marine pearl shell and mussel shell buttons	[4] 213	789	[4] 223	816
Other		19,356		17,925
Total industrial products		61,027		73,053
Grand total		1,217,327		1,231,316

[1] Preliminary.

[2] Included with other canned products.

[3] Includes freeze-dried products.

[4] Number of gross.

A–4.—*Foreign trade in fishery products, by quantity and value, calendar years 1967 and 1966*

Item	1967		1966	
	Quantity	Value	Quantity	Value
Imports:				
Edible:	*Thousand pounds*	*Thousand dollars*	*Thousand pounds*	*Thousand dollars*
Fresh or frozen:				
Fresh-water (not fillets)	26,937	10,683	31,346	12,061
Salt-water (not fillets)	550,494	90,199	621,216	107,261
Groundfish and ocean perch fillets	283,567	69,812	315,097	82,593
Other fillets	84,862	32,231	92,708	36,677
Shrimp	183,512	148,451	176,425	141,239
Lobsters:				
Common	15,568	15,070	17,047	15,521
Spiny	35,340	56,449	36,923	61,054
Scallops	13,461	9,314	16,712	8,375
Other shellfish	13,687	5,170	7,677	3,618
Canned:				
Anchovies	4,930	3,693	5,723	3,971
Bonito and yellowtail	1,633	480	2,854	794
Salmon	121	106	589	345
Sardines	52,439	16,510	57,588	17,030
Tuna	65,321	30,198	61,560	27,598
Crab meat	2,177	2,708	2,257	2,819
Lobsters	2,864	7,295	3,018	7,064
Oysters and oyster juice	16,114	5,845	12,015	4,494
Other	46,117	16,517	48,966	16,492
Cured:				
Dried, pickled, or salted:				
Cod, haddock, hake, pollock, and cusk	37,540	10,939	42,411	11,225
Herring	24,077	3,624	31,493	4,690
Other	2,540	995	3,220	1,229
Smoked or kippered	3,951	1,103	4,010	1,112
Other	3,185	909	2,859	829
Total edible	1,470,437	538,301	1,593,714	568,091
Nonedible:				
Fish and marine animal oils	[1] 7,919	4,845	[1] 9,688	6,299
Fish meal and scrap	[2] 651	72,992	[2] 488	59,292
Fish solubles	4	279	5	319
Other	.....	91,466	.....	85,701
Total nonedible	.....	169,582	.....	151,611
Grand total imports	.....	707,883	.....	719,702
Exports of domestic products:				
Edible:				
Fresh or frozen	53,578	30,191	52,265	25,872
Canned:				
Mackerel	538	116	1,139	206
Salmon	20,543	15,593	20,484	14,561
Sardines	1,373	488	3,557	1,168
Shrimp	5,255	5,585	4,479	5,192
Squid	12,787	1,562	10,159	1,067
Other	10,951	10,832	15,374	12,671
Total canned	51,447	34,176	55,192	34,865
Cured	2,915	3,157	2,147	2,145
Total edible	107,940	67,524	109,604	62,882
Nonedible:				
Fish and marine animal oils	76,816	4,674	77,255	7,401
Other	.....	10,011	.....	14,530
Total nonedible	.....	14,685	.....	21,931
Grand total exports	.....	82,209	.....	84,813

[1] In thousand gallons.

[2] In thousand tons.

Appendix B—New Legislation

Foreign Assistance Act of 1967—Fish and Other Protein Concentrates

22 U.S.C. 2178

Authorizes the President to conduct a program designed to demonstrate the potential and encourage the use of fish and other protein concentrates to reduce nutritional deficiences in less developed areas. The program shall include studies relating to food technology, development of suitable marketing techniques, development of consumer acceptance programs, and feeding programs to demonstrate value of the concentrates as a diet supplement. The President is to encourage private enterprise participation and to consult with the National Council on Marine Resources and Engineering Development and others. Funds made available under Part I of the Foreign Assistance Act of 1961, as amended, are authorized for this purpose and the President is urged to use at least $2,500,000 for this purpose.

81 Stat. 450; Public Law 90-137; Act of November 14, 1967.

Naval Vessels—Extend Loan Authorization

50 U.S.C. app. 1878 vv

This Act authorizes the extension of existing loans of certain naval vessels and permits new loans of such vessels. However, section 3 of the Act contains language which subjects extension of existing loans or new loans to a requirement that the loans will be terminated upon a finding made by the President that the country receiving the vessels has seized any United States fishing vessel on account of its fishing activities in international waters, except that such condition shall not be applicable in any case governed by international agreement to which the United States is a party.

81 Stat. 729; Public Law 90-224; Act of December 26, 1967.

Amendments to Marine Resources and Engineering Development Act of 1966

33 U.S.C. 1102, 1104

Amends the Marine Resources and Engineering Development Act of 1966 (33 U.S.C. 1101-1108) by changing the termination date of the National Council on Marine Resources and Engineering Development from "one hundred and twenty days after the submission of the final report of the Commission . . . ." to a date certain which is June 30, 1969, and by changing the due date of the final report and recommendations of the Commission on Marine Science, Engineering, and Resources from eighteen months after establishment of the Commission to twenty-four months after such establishment.

81 Stat. 780; Public Law 90-242; Act of January 2, 1968.

Appendix C—Fisheries Financial Assistance Programs

Fisheries Loan Fund

C-1.—*Status of fisheries loan fund, June 30, 1967*

Funds appropriated		$13,000,000
Principal collected	$13,091,045	
Interest collected and accrued	2,578,937	
Total collected		15,669,982
Total		28,669,982
All expenses to end of fiscal year 1967	2,717,000	
Net loans approved	21,376,262	
Total		24,093,262
Balance		4,576,720

C-2.—*Cumulative totals, fiscal years 1966 and 1967, and totals, fiscal year 1967*

	Cumulative total				Total fiscal year 1967	
	As of June 30, 1966		As of June 30, 1967			
	Number	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*
Applications received	1,830	46,458,719	1,975	51,650,004	145	5,191,285
Applications approved	957	21,119,566	1,041	24,152,641	84	3,033,075
Applications declined	452	10,278,141	488	10,893,005	36	614,864
Applications ineligible	129	3,186,272	134	3,528,972	5	392,700
Being processed	32	697,608	14	1,040,776	.....	.....

C-3.—*Cumulative totals, fiscal years 1966 and 1967, and totals, fiscal year 1967*

Region	Cumulative total				Total fiscal year 1967	
	As of June 30, 1966		As of June 30, 1967			
	Number	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*
Northeast:						
Applications received	392	11,453,230	419	12,839,121	27	1,385,891
Applications approved	205	5,197,599	218	5,587,357	13	389,798
California:						
Applications received	245	13,573,011	267	14,191,242	22	618,231
Applications approved	146	6,222,287	164	6,802,946	18	580,659
Gulf & South Atlantic:						
Applications received	371	8,973,204	389	9,844,489	18	871,285
Applications approved	135	3,050,516	147	3,902,191	12	851,675
Pacific Northwest:						
Applications received	361	6,918,683	396	8,384,167	35	1,465,484
Applications approved	215	3,872,213	237	4,725,466	22	853,253
Alaska:						
Applications received	390	4,635,189	431	5,467,583	41	832,394
Applications approved	227	2,461,203	244	2,784,893	17	323,690
Great Lakes:						
Applications received	47	512,332	49	530,332	2	18,000
Applications approved	13	108,920	15	142,920	2	34,000
Hawaii:						
Applications received	23	391,070	23	391,070	0	0
Applications approved	15	205,068	15	205,068	0	0
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 1967]

	Debt payment	Improvements	Other
	Percent		
New England and Middle Atlantic	44	55	01
South Atlantic and Gulf	49	50	01
California	41	56	03
Pacific Northwest	35	64	01
Great Lakes	38	62	0
Alaska	18	82	0
Hawaii and Puerto Rico	46	50	04
Total	39	59	02

C–5.—*Loan applications received monthly, fiscal years 1957–67*

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
	Number										
July	17	9	15	8	19	6	5	13	4	10	
August	17	12	18	10	16	7	2	10	10	12	
September	14	10	9	7	16	11	21	22	14	12	
October	12	7	16	6	14	13	14	21	16	28	
November	18	13	9	19	26	7	16	14	22	22	
December	88	11	13	15	21	14	8	15	15	18	19
January	16	14	10	16	18	29	5	12	12	31	18
February	41	18	12	27	26	19	12	13	8	19	4
March	40	22	15	28	13	19	11	18	12	14	7
April	22	22	14	13	18	16	12	48	13	11	6
May	28	11	10	19	31	9	2	36	10	16	3
June	30	9	12	10	7	11	5	19	7	11	4
Total	265	185	137	190	184	208	99	219	157	186	145

C-6.—*Amounts applied for monthly, fiscal years 1957–67*

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
July		$274,524	$251,571	$830,182	$134,196	$532,305	$141,780	$136,794	$346,404	$34,900	$462,852
August		931,110	363,000	234,465	275,972	297,614	223,021	11,718	213,015	223,249	566,800
September		607,851	385,517	465,610	176,781	438,773	117,243	233,864	544,554	150,752	809,886
October		204,635	62,532	305,150	195,095	145,443	132,107	243,298	199,273	177,585	640,425
November		375,583	153,559	124,905	428,011	296,877	144,267	296,669	256,687	341,360	518,516
December	$2,533,020	160,670	331,502	198,161	425,076	182,876	275,415	350,103	265,783	408,475	573,990
January	377,485	520,323	153,501	344,197	203,752	907,519	68,100	1,087,030	272,845	707,009	559,771
February	1,458,748	305,318	115,000	554,425	665,798	195,612	111,670	1,001,800	48,970	529,390	51,037
March	2,563,703	862,325	185,069	698,063	692,766	390,959	119,470	194,515	138,085	388,197	229,128
April	629,131	336,888	189,871	226,542	426,453	321,438	102,661	830,592	124,500	163,115	338,913
May	2,276,774	642,025	185,869	1,003,874	877,990	86,911	23,000	569,175	247,657	374,893	119,899
June	948,437	224,652	291,980	343,372	216,160	262,927	132,444	285,097	236,165	225,600	320,068
Total	10,787,298	5,445,904	2,668,971	5,328,946	4,718,050	4,059,254	1,591,178	5,240,655	2,893,938	3,724,525	5,191,285

Fishing Vessel Construction Differential Subsidy Program

C–7.—Contracts executed each fiscal year

	Fiscal year 1965		Fiscal year 1966		Fiscal year 1967		Cumulative totals	
	Number	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*
New England	1	155,613	7	1,091,154	8	6,766,937	16	8,013,703
California					2	1,705,600	2	1,705,600
Gulf								
Pacific Northwest					1	217,585	1	217,585
Alaska								
Total	1	155,613	7	1,091,154	11	8,690,122	19	9,936,888

Fishing Vessel Mortgage and Loan Insurance Program

C–8.—*Cumulative totals, fiscal years 1961 through 1967–totals, fiscal year 1967*

Region	Cumulative totals														Total fiscal year 1967	
	As of June 30, 1961		As of June 30, 1962		As of June 30, 1963		As of June 30, 1964		As of June 30, 1965		As of June 30, 1966		As of June 30, 1967			
	Number	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*	*Number*	*Dollars*
Northeast:																
Applications received	3	160,000	9	804,500	11	1,054,500	11	1,054,500	13	1,464,500	15	1,796,750	22	2,932,330	7	1,135,580
Applications approved	2	120,000	4	231,250	8	775,365	8	775,365	9	1,034,928	11	1,367,178	15	1,916,678	4	549,500
California:																
Applications received			1	557,000	1	557,000	1	557,000	2	1,262,000	2	1,262,000	12	8,239,375	10	6,977,375
Applications approved			1	557,000	1	557,000	1	557,000	2	1,262,000	2	1,262,000	10	7,550,825	8	6,288,825
Gulf and South Atlantic:																
Applications received	2	56,500	3	95,060	13	458,740	33	1,384,090	49	2,806,646	85	4,816,524	111	6,196,092	26	1,379,568
Applications approved	1	34,500	3	95,060	10	253,504	31	965,119	43	1,962,969	66	3,092,169	94	4,584,259	28	1,492,090
Pacific Northwest:																
Applications received	2	425,000	4	848,000	6	1,827,500	7	1,846,250	8	1,861,250	13	2,127,375	15	2,558,625	2	431,250
Applications approved	1	75,000	3	488,046	4	507,546	5	526,296	5	526,296	8	635,535	8	635,535		
Alaska:																
Applications received							3	54,744	5	75,596	7	375,596	7	375,596		
Applications approved							3	54,774	4	64,774	6	364,774	6	364,774		

Appendix D—American Fisheries Advisory Committee Membership, 1967

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

Chairman: STANLEY A. CAIN, *Assistant Secretary of the Interior for Fish and Wildlife and Parks*

Harry Heber Bell
Harry H. Bell and Sons, Inc.,
2001 Pass-a-Grille Way,
St. Petersburg Beach, Fla. 33706

Lawrence I. Clarke
Atlantic Processing Company,
Drawer 248,
Amagansett, Long Island, N.Y.
11930

Clifton D. Day, Manager
Sea Food Division,
Del Monte Corporation,
215 Fremont Street,
San Francisco, Calif. 94119

J. Roy Duggan, President
King Shrimp Co., Inc.,
P. O. Box 899,
Brunswick, Ga. 31521

Ammon G. Dunton
Dunton, McLeod and Simmons,
White Stone, Va. 22578

Jacob Dykstra, President
Point Judith Fishermen's
Cooperative Association,
Point Judith, R. I. 02882

Arthur H. Frohman
L. H. Frohman and Sons, Inc.,
510 North Dearborn Street,
Chicago, Ill. 60610

Jack Gorby
Food Division,
Westgate-California Corp.,
1995 Bay Front Street,
San Diego, Calif. 92101

E. Robert Kinney, President
The Gorton Corporation,
327 Main Street,
Gloucester, Mass. 01931

Thomas D. McGinnes, President
Virginia Seafoods, Inc.,
Irvington, Va. 22480

John Mehos
Liberty Corporations,
P. O. Box 267,
7th & Wharf,
Galveston, Tex. 77551

Anthony Nizetich
Director of Government and
Industry Relations,
Star Kist Foods, Inc.,
Terminal Island, Calif. 90731

Einar Pedersen
8801 Golden Gardens Drive, N.W.,
Seattle, Wash. 98107

Roy Prewitt
American Fish Farmers Federation,
P. O. Box 191,
Lonoke, Ark. 72086

W. A. Ritter, President
Pan-Alaska Fisheries, Inc.,
1818 Westlake North,
Seattle, Wash. 98109

Arthur O. Salasnek
Salasnek Fisheries, Inc.,
2140–80 Wilkins Street,
Detroit, Mich. 48207

John Salvador
S. Salvador and Sons Co.,
P. O. Box 462,
158 King Street,
St. Augustine, Fla. 32084

Theodore H. Shepard
Schulman–Shepard, Inc.,
944 International Trade Mart,
New Orleans, La. 70130

Daniel H. Smith
Smith Brothers of Port
Washington,
100 North Franklin Street,
P. O. Box 246,
Port Washington, Wis. 53074

W. O. Smith
3104 Tongass Avenue,
Ketchikan, Alaska 99901

Rupert R. Bonner, Executive Secretary
Bureau of Commercial Fisheries

Appendix E—Organizations with Which the Bureau Had Research and Development Contracts and Grants in 1967

Organization	*Location*
Alabama Department of Conservation	Montgomery, Ala.
Alabama, University of	University, Ala.
Alaska Department of Fish and Game	Juneau, Alaska
Arizona Game and Fish Department	Phoenix, Ariz.
Arkansas Game and Fish Commission	Little Rock, Ark.
Artisan Industries	Waltham, Mass.
Auburn University	Auburn, Ala.
Barkley and Dexter Laboratories, Inc.	Fitchburg, Mass.
Bears Bluff Laboratories	Wadmalaw Island, S. C.
Brooklyn College of the City University of New York.	Brooklyn, N. Y.
California Academy of Sciences	San Francisco, Calif.
California Department of Fish and Game	Sacramento, Calif.
California, San Diego University of	La Jolla, Calif.
California, University of	Berkeley, Calif.
Colorado Game, Fish and Parks Department	Denver, Colo.
Columbia University	Palisades, N. Y.
Connecticut Board of Fisheries and Game	Hartford, Conn.
Delaware Board of Game and Fish Commissioners.	Dover, Del.
Delaware Commission of Shell Fisheries	Dover, Del.
Delaware, University of	Newark, Del.
Essex Marine Laboratory, Inc.	Essex, Conn.
Esso Research and Engineering Co.	Linden, N. J.
Florida Board of Conservation	Tallahassee, Fla.
Florida State University	Tallahassee, Fla.
FMC Corporation	Santa Clara, Calif.
Georgetown University	Washington, D. C.
Georgia State Game and Fish Commission	Atlanta, Ga.
Georgia, University of	Athens, Ga.
Guam Division of Fish and Wildlife	Agana, Guam
Hawaii Department of Land and Natural Resources.	Honolulu, Hawaii
Hawaii, University of	Honolulu, Hawaii
Idaho Department of Fish and Game	Boise, Idaho
Illinois Department of Conservation	Springfield, Ill.
Indiana Division of Fish and Game	Indianapolis, Ind.
Inter-American Tropical Tuna Commission	La Jolla, Calif.
Iowa State Conservation Commission	Des Moines, Iowa
Iowa State University	Ames, Iowa
Kansas Forestry, Fish and Game Commission	Pratt, Kans.
Kentucky Department of Fish and Wildlife Resources.	Frankfort, Ky.
Long Beach State College	Long Beach, Calif.
Louisiana Wildlife and Fisheries Commission	New Orleans, La.
Maine Department of Sea and Shore Fisheries	Augusta, Maine
Maryland Department of Chesapeake Bay Affairs.	Annapolis, Md.

Appendix E—Organizations with Which the Bureau Had Research and Development Contracts and Grants in 1967—Continued

Organization	*Location*
Massachusetts Department of Natural Resources.	Boston, Mass.
Massachusetts Institute of Technology	Cambridge, Mass.
Massachusetts, University of	Amherst, Mass.
Mercer County Community College	Trenton, N. J.
Miami, University of	Miami, Fla.
Michigan Department of Conservation	Lansing, Mich.
Michigan State University	East Lansing, Mich.
Michigan, University of	Ann Arbor, Mich.
Minnesota Department of Conservation	St. Paul, Minn.
Mississippi Marine Conservation Commission	Biloxi, Miss.
Mississippi State University	State College, Miss.
Missouri Department of Conservation	Jefferson City, Mo.
Montana Fish and Game Department	Helena, Mont.
Nebraska Game, Forestation and Park Commission.	Lincoln, Nebr.
New Hampshire Fish and Game Commission	Concord, N. H.
New Jersey Department of Conservation	Trenton, N. J.
New York Department of Conservation	Albany, N. Y.
New York Division of Fish and Game	Long Island, N. Y.
*North Carolina Department of Conservation and Development.	Raleigh, N. C.
North Carolina State University	Raleigh, N. C.
North Carolina, University of	Chapel Hill, N. C.
North Dakota Game and Fish Department	Bismarck, N. Dak.
Northeastern University	Boston, Mass.
Ocean Research Corporation	Kennebunk, Maine
Ohio Division of Wildlife	Columbus, Ohio
Ohio State University	Columbus, Ohio
Oklahoma Department of Wildlife Conservation.	Oklahoma City, Okla.
Oregon State Department of Forestry	Portland, Oreg.
Oregon State Fish Commission	Portland, Oreg.
Oregon State University	Corvallis, Oreg.
Pacific Salmon Inter-Agency Council	Portland, Oreg.
Pennsalt Chemical Corporation	Warminster, Pa.
Pennsylvania Fish Commission	Harrisburg, Pa.
Puerto Rico Department of Agriculture	San Juan, P. R.
Rhode Island Department of Natural Resources	Providence, R. I.
Rhode Island, University of	Kingston, R. I.
Rutgers University	New Brunswick, N. J.
South Carolina Department of Wildlife Resources.	Wadmalaw Island, S. C.
South Dakota Department of Fish, Game and Parks.	Pierre, S. Dak.
Tennessee Game and Fish Commission	Nashville, Tenn.
Texas Department of Parks and Wildlife	Austin, Tex.

*North Carolina Division of Commercial and Sport Fisheries, Raleigh, N.C.

Appendix E—Organizations with Which the Bureau Had Research and Development Contracts and Grants in 1967—Continued

Organization	*Location*
Texas, University of	Austin, Tex.
Utah State Department of Fish and Game	Salt Lake City, Utah
Vermont Fish and Game Department	Montpelier, Vt.
Virgin Islands, Office of the Governor	St. Thomas, V. I.
Virginia Commission of Fisheries	Newport News, Va.
Virginia Institute of Marine Science	Gloucester Point, Va.
Virginia Polytechnic Institute	Blacksburg, Va.
Washington Department of Fisheries	Olympia, Wash.
Washington, University of	Seattle, Wash.
West Virginia Department of Natural Resources.	Charleston, W. Va.
Wisconsin Department of Conservation	Madison, Wis.
Woods Hole Oceanographic Institution	Woods Hole, Mass.

Appendix F—Budget for Fiscal Year 1968

[In thousands of dollars]

Function	Appropriations											Other funds		
	Management and investigations of resources	Special foreign currency program	Construction	Construction of fishing vessels	Federal aid research and development	Anadromous and Grent Lakes	Payment to Alaska	Administration of Pribilof Islands	Fishery promotion and development	General administrative expenses	Fishery Loan Fund	Trust funds	Reimbursements	Total
Management	560													560
Marketing and technology	7,216	122							2,288			745	830	11,201
Research	11,892	78							4,456			869	884	18,179
Research on fish migration over dams	1,419								53				101	1,573
Fishing vessel mortgage insurance	45													45
Columbia River fishery facilities	2,593		79										173	2,845
Construction of fishery facilities			1,436											1,436
Construction of fishing vessels				6,002										6,002
General administrative services									478	720				1,198
Aid to States and other cooperators					4,720	2,333								7,053
Administration of Pribilof Islands								2,203					44	2,247
Fur seal research								293						293
Payment to Alaska from Pribilof Islands receipts							332							332
Loans to fisheries											3,801			3,801
Total Program	23,725	200	1,515	6,002	4,720	2,333	332	2,496	7,275	720	3,801	1,614	2,032	56,765

Appendix G—Physical Properties

G-1.—*Principal laboratories and installations, calendar year 1967*

Location	Type	Principal use	Gross valuation [1]
Alaska:			
Auke Bay	Biological Laboratory	Biological research	$436,000
Gibson Cove	Laboratory, office, and warehouse.	Biological research and enforcement of commercial fishing laws and regulations.	398,175
Juneau	Exploratory Fishing and Gear Research Base, warehouse, and shops.	Exploratory fishing and gear research, vessel maintenance.	[2] 145,000
Ketchikan	Technological Laboratory	Technological research	195,000
Pribilof Islands	Fur seal processing facilities and native villages.	Management of Alaska fur seals.	4,425,600
California:			
La Jolla	Fishery-Oceanography Center.	Biological research	2,600,000
Connecticut, Milford	Biological Laboratory	do	1,316,400
District of Columbia:			
U.S. National Museum.	Ichthyological Laboratory	do	([3])
Florida:			
Gulf Breeze	Biological Laboratory	do	124,529
Miami	do	Biological research, statistics, and market news reporting.	1,545,900
St. Petersburg Beach.	do	Biological research	25,969
Georgia, Brunswick	do	do	([3])
Hawaii, Honolulu	do	Biological research, loans and grants, statistics.	315,000
Maine, Boothbay Harbor	do	Biological research	289,015
Maryland:			
Beltsville	Processing Plant	Processing of fish protein concentrate.	([3])
College Park	Technological Laboratory	Technological research, home economics.	[4] 134,110
Oxford	Biological Laboratory	Biological research	207,000
Massachusetts:			
Gloucester	Technological Laboratory	Technological research, fishery products inspection.	367,680
Do	Marine Products Irradiator	Research on irradiation of fishery products.	([5])
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 Laboratory, Exploratory Fishing and Gear Research Base, Marketing Office.	Biological research, technological research, statistics, exploratory fishing and gear research, market development.	[2] 1,441,173
Mississippi, Pascagoula	Exploratory Fishing and Gear Research Base, Technological Laboratory, Marketing Office.	Exploratory fishing and gear research, market development, biological and technological research, market development.	415,453
North Carolina:			
Beaufort	Biological Laboratory, Statistics Office.	Biological research and statistics.	270,237
Do	Radiobiological Laboratory	Research in radiobiology	344,457
Oregon, Portland	Columbia River Fisheries Program Office.	Columbia River fisheries development.	([3])

See footnotes at end of table.

G–1.—*Principal laboratories and installations, calendar year 1967*—Continued

Location	Type	Principal use	Gross valuation [1]
Texas, Galveston	Biological Laboratory and Statistics Office.	Biological research, statistics.	370,403
Washington, Seattle	Biological Laboratory, Technological Laboratory, Exploratory Fishing and Gear Research Base, Pioneer Laboratory, Marketing, dock and warehouse.	Biological, technological, and food science research, exploratory fishing and gear research, Pribilof Islands supply, fishery products inspection, market development.	[2] 2,245,721
Puerto Rico, Mayaguez	Technological Laboratory	On loan to University of Puerto Rico.	25,000

[1] Figures shown are original acquisition or construction costs.

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

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

[4] Retained by Bureau of Commercial Fisheries under agreement pending conveyance to University of Maryland pursuant to Public Law 89–227.

[5] Owned by Atomic Energy Commission and operated by Bureau of Commercial Fisheries.

G–2.—*Minor field research stations, market news offices, exploratory fishing stations, market development offices, and statistical offices, calendar year 1967*

Location	Type	Principal use	Gross valuation [1]
Alabama, Bayou LaBatre	Market News and Statistical Field Office.	Market news and statistics 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	(4)
Traitors Cove	do	do	8,000
Arkansas, Kelso	Exploratory Fishing and Gear Research Station.	Exploratory fishing and gear research.	(2)
California:			
Los Angeles	Inspection Office	Inspection	(2)
San Francisco	Marketing and Inspection Office.	Marketing, inspection	(2)
Terminal Island	Marketing Office, Technological Laboratory, Market News and Statistics Office.	Technological research, fishery products inspection, market news and statistics reporting.	(2)
Florida:			
Apalachicola	Market News and Statistical Field Office.	Market news and statistics reporting.	(2)
Fort Myers	do	do	(2)
Key West	do	do	(2)
St. Petersburg	Fishery Inspection, Federal Aid, Loans and Grants, River Basin Studies, and Marketing.	Fishery products inspection, Federal aid, Loans and Grants, River Basin Studies, and Market development.	(2)
Tampa	Market News and Statistical Field Office.	Market news reporting, statistics.	(2)
Georgia:			
Atlanta	Marketing Office	Marketing	(2)
Brunswick	Statistical Field Office	Statistics	(2)
St. Simons Island	Exploratory Fishing and Gear Research Station.	Exploratory fishing and gear research.	42,967
Idaho, Boise	Field Research Station	River Basin Studies	(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 1967*—Continued

Location	Type	Principal use	Gross valuation [1]
Illinois:			
Chicago	Market News Office, Fishery Products Inspection Office.	Market news reporting, fishery products inspection.	(2)
Do	Marketing Office	Marketing	(2)
Louisiana:			
Galiano	Statistical Field Office	Statistics	(2)
Houma	do	Statistics reporting	(2)
Morgan City	do	do	(2)
New Orleans	Market News Office, Statistical Field Office.	do	(2)
Maine:			
Portland	Field Office	Statistics, market news, enforcement.	(2)
Rockland	do	do	(2)
West Boothbay Harbor.	Statistical Field Office	Statistics	(2)
Maryland, Baltimore	Market News Office, Marketing.	Market news reporting, marketing.	(2)
Massachusetts:			
Boston	Market News Office, Marketing, Loans and Grants.	Market news reporting, statistics, biological and technological research, marketing, fishery loans.	(2)
Gloucester	Field Offices	Statistics, biological research, fishery products inspection, enforcement.	(2)
New Bedford	Field Office	Statistics, biological research, market news reporting, enforcement.	(2)
Provincetown	Statistical Field Office	Statistics, market news reporting, enforcement.	(2)
Michigan:			
Hammond Bay	Field Research Station	Biological research	(2)
Ludington	do	do	(2)
Marquette	do	do	(2)
Minnesota, St. Paul	Marketing Office	Marketing	(2)
Mississippi:			
Ocean Springs	Statistical Field Office	Statistics, market news reporting.	(2)
Missouri, St. Louis	Marketing and Inspection Offices.	Market development, fishery products inspection.	(2)
New Jersey, Toms River	Statistical Field Office	Statistics	(2)
New York:			
Bayport	do	do	(2)
New York City	Market News Office, Marketing, Fishery Products Inspection Office.	Market news reporting, marketing, fishery products inspection.	(2)
Ohio:			
Cleveland	Marketing and Inspection Office.	Market development, fishery products inspection.	(2)
Sandusky	Field Research Station	Biological research	(2)
Oregon:			
Astoria	Enforcement and field research stations	Enforcement of commercial fisheries laws and regulations and biological research.	(2)
Eugene	Field research station	River Basin studies	(2)
Portland	do	Biological research	(2)
Rhode Island:			
Point Judith	Field Station	Statistics, biological research.	(2)
Warren	Statistical Field Office	Statistics	(2)
South Carolina, Charleston.	do	do	(2)
Tennessee, Camden	Statistical Office	do	(2)
Texas:			
Aransas Pass	Market News and Statistical Field Office.	do	(2)

See footnotes at end of table.

G–2.—*Minor field research stations, market news offices, exploratory fishing stations, market development offices, and statistical offices, calendar year 1967*—Continued

Location	Type	Principal use	Gross valuation [1]
Brownsville	Statistical Field Office, Fishery Products Inspection Office.	Statistics, fishery products inspection.	([2])
Dallas	Marketing Office	Marketing	([2])
Freeport	Statistical Field Office	Statistics	([2])
Galveston	Market News and Statistics Field Offices.	Market news reporting, statistics.	([2])
Port Arthur	Statistical Field Office	Statistics	([2])
Virginia:			
Franklin City	Field Research Station	Biological research	([2])
Hampton	Market News Office	Market news reporting	([2])
Virginia Beach	Statistical Field Office	Statistics	([2])
Weems	do	do	([2])
Washington:			
Bellingham	Enforcement Office	Enforcement of commercial fisheries laws and regulations.	([2])
North Bonneville	Field Research Station	Biological research	14,000
Pasco	do	do	([2])
Seattle	Market News Statistics, Enforcement, Loans and Grants, Federal Aid and Reports.	Market news and statistical reporting, fishery loans, Federal aid to States, and report publication.	([2])
Wisconsin, Ashland	Field Research Station	Biological research	([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.

[4] Included in Pribilof Islands.

G–3.—*Bureau of Commercial Fisheries vessel fleet, calendar year 1967*

Name of vessel	Home port	Length	Year built	Cost or estimated value	Main engine	Mission
		Feet		*Dollars*	*Horsepower*	
Pribilof	Seattle, Wash	222	1953	2,200,115	1,400	Transportation of supplies and personnel to the Pribilof Islands fur seal stations.
Miller Freeman.	do	214	1967	3,381,804	2,150	High-seas salmon investigations and oceanography.
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	876,105	1,000	High-seas salmon investigations and oceanography.
David Starr Jordan.	San Diego, Calif	171	1965	2,000,000	900	Oceanography; sardine ecology, studies on biology of other commercial species.
Oregon II	Pascagoula, Miss	170	1967	2,000,000	1,600	Exploratory fishing.
Townsend Cromwell.	Honolulu, Hawaii	158	1963	1,800,000	800	Pacific oceanography; tuna biology, behavior, and distribution.

G-3.—*Bureau of Commercial Fisheries vessel fleet, calendar year 1967* —Continued

Name of vessel	Home port	Length	Year built	Cost or estimated value	Main engine	Mission
		Feet		*Dollars*	*Horsepower*	
Delaware	Gloucester, Mass	147	1937	302,473	735	Exploratory fishing and biological studies on the groundfishes and sea scallops, gear research.
Geronimo	Galveston, Tex	143	1944	1,000,000	1,850	Fishery oceanographic research.
Undaunted	Miami, Fla	143	1944	1,000,000	1,850	Investigations of tropical Atlantic.
Charles H. Gilbert.	Honolulu, Hawaii	123	1952	409,890	500	Pacific oceanography; tuna biology, behavior, and distribution.
Oregon	St. Simons Island, Ga.	100	1950	300,000	600	Exploratory fishing and gear research.
John N. Cobb	Seattle, Wash	93	1950	235,392	500	Exploratory fishing for pelagic and bottomfish, 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.
George M. Bowers.	Pascagoula, Miss	73	1956	93,800	210	Gear research.
Kaho	Saugatuck, Mich	65	1961	118,000	300	Exploratory fishing and gear research on industrial fishes, chubs, alewives, sheepshead, gizzard shad, and smelt.
Rorqual	Boothbay Harbor, Maine.	64	1941	187,000	230	Gear research and inshore exploration on herring and shellfish.
Cisco	Saugatuck, Mich	60	1950	79,560	175	Research on deepwater fish species, their distribution, abundance, and ecology; limnology.
Heron	Juneau, Alaska	58	1940	19,000	135	Salmon and herring research.
Siscowet	Ashland, Wis	57	1946	95,034	147	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.
Hiodon	Mobridge, S. Dak	46	1965	24,156	190	Research on reservoir fish species.
Musky II	Sandusky, Ohio	45	1960	29,741	165	Studies on warmwater fishes of Lake Erie; limnology; pollution studies.
Kingfish	St. Petersburg Beach, Fla.	43	1954	24,500	150	Estuarine investigations.
J-1110	Beaufort, N.C.	40	1934	15,000	200	Research on shellfish and other coastal species.
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.

Appendix H—Fish and Wildlife Service Publication Series and a 1967 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 in 1963: in volume 63 the articles are bound together in a single issue of the Bulletin instead of being issued only as individual papers. Volume 66, no. 1 (10 papers, 164 pp.) and 13 papers (385 pp.) of volume 66, no. 2, were issued in 1967. Bulletins are distributed free to libraries, research institutions, scientists, and State agencies. Some Bulletins are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Fishery Industrial Research.—Technical reports dealing with scientific investigations of fishery technology, economics, exploratory fishing, and gear research. No. 4 of volume 3 (6 papers, ii + 58 pp.) and no. 1 of volume 4 (6 papers, ii + 71 pp.) were published in 1967. They are distributed free to the fishing industry, libraries, scientists, and technologists.

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. Eighteen of these reports (956 pp.) were published in 1967. They are distributed free to biologists, cooperators, and libraries. They also are distributed free on individual requests.

Fishery Leaflet.—Popular information on fishery subjects intended primarily for use in correspondence. Nine leaflets (212 pp.) were published in 1967. They are distributed free to biologists, cooperators, and libraries. They also are distributed free on individual requests.

Circular.—Popular and semitechnical publications of general and regional interest intended to aid conservation and management. Twenty-five Circulars (1,043 pp.) were published in 1967. They are distributed free to biologists, cooperators, and libraries. They also are distributed free on individual requests.

Data Report.—Reports that include compilations of unanalyzed or partially analyzed data collected during biological, limnological, or oceanographic investigations. The reports were originally printed as 3- by 5-inch microfiche, each of which has up to 40 pages of material. In June 1965, the Bureau began using the 4- by 6-inch size of microfiche, which holds up to 70 pages. The pages are reduced to one-eighteenth normal size; consequently, they can be read only through a microscope, microfiche "reader," or any similar device for enlarging. The Data Report series is the first Government microfiche series to be used for primary publication of scientific reports. Advantages of microfiche over regular size reports are threefold. They occupy only about

one-hundredth as much space; they can be printed in a matter of weeks rather than months; and for our distribution lists, the cost of printing and mailing is only about one-tenth as much. Data Reports 15, 16, 17, 18, 19, 20, 21, and 22 (966 pp., 18 microfiches) were issued in 1967. They are distributed free to a restricted mailing list of laboratories, libraries, State fishery agencies, research institutions, and research scientists. [Hard (full-size) copy is available for purchase at the U.S. Department of Commerce, Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151.]

Commercial Fisheries Abstracts.—A monthly abstract of world literature (chiefly English language) on fishery technology. Volume 20 in 1967 had 12 issues (364 pp.). They have free but limited distribution.

Commercial Fisheries Review.—A monthly periodical which features articles on Bureau research and operations and trends and developments in the domestic and foreign fisheries. Volume 29 in 1967 had 11 issues (828 pp.). They are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price is $6.50 a year, $2 additional for foreign mailing, single copies 60 cents each. Index for volume 28 (1966) of the Commercial Fisheries Review was issued also (52 pp.).

Statistical Digest.—Annual statistics with detailed tabulations relating to fishery production, manufacture, and commerce. These succeeded the Administrative Report series. One digest (756 pp.) was published in 1967. 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 areas. In 1967, the Branch of Fishery Statistics issued 312 Current Fishery Statistical publications totaling 1,803 pages. In addition, considerable data were supplied to the Bureau's Branch of Market News for release in its Fishery Products Reports. The Current Fishery Statistical publications are sent to private and Government industries in the United States, foreign industries, and United States embassies.

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 reports also are issued intermittently. Seven Market News Service field offices prepare and mail these free reports. During 1967 the 1,764 daily reports totaled 5,774 pages; the 34 monthly and 7 annual reports, 611 pages; and the 20 supplementary reports, 245 pages.

Current Economic Analysis.—Reports on prices, landings, production of processed products, imports, exports, and inventories. These reports deal with probable market conditions and price movements in the future and are designed to help industry personnel make decisions on short-run and intermediate production, distribution, and pricing. They also assist personnel in fishery-related industries and Government to plan and make decisions in their areas of interest or responsibility. In 1967, four issues of the Current

Economic Analysis S4 to 7 (Shellfish Situation and Outlook) (212 pp.) and one issue of the Current Economic Analysis F2 (Food Fish Situation & Outlook) (71 pp.) were published.

An Index of Exvessel Prices was developed for New England groundfish, tuna, salmon, industrial fish, all finfish, shrimp, other shellfish, all shellfish, and all fish. Using 1957–59 equal to 100, the Bureau publishes these indices monthly.

Fishery Market Development Series.—This series, established in 1966 to replace the Test Kitchen Series, contains popular educational publications on care, preparation, purchase, and nutrition of fishery products. These publications are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. During 1967 four publications (one of 202 pages on 102 cards and the other three of 99 pp.) were issued.

Miscellaneous papers.—Five miscellaneous papers, totaling 42,659 pages, were issued. The first two papers are the Bureau's annual reports for 1964 and 1965 (273 pp.). They are distributed free to biologists, cooperators, and libraries and on individual requests. The third paper, "Inspectors' Instructions for Grading Frozen Raw Breaded Shrimp" (25 pp.) was prepared only for the guidance of fishery products inspectors and is not distributed to the public. The fourth and fifth papers (42,361 pp.) by Galen H. Maxfield (which see) are both titled "Pacific Salmon Literature Compilation—1900–59." The fourth paper (subtitled "Instructions and Index" (20 pp.)) is available only at the U.S. Department of Commerce, Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151, in hard copy and on one microfiche. The fifth paper (42,341 pp. on 645 microfiches) is also available at the Clearinghouse but only on microfiche.

A detailed list of publications of the Bureau of Commercial Fisheries and its personnel or contractors or collaborators during 1967 follows. The articles are listed by authors.

Publications [1]

AHLSTROM, ELBERT H.

Co-occurrences of sardine and anchovy larvae in the California Current region off California and Baja California. Calif. Coop. Oceanic Fish. Invest. Rep. 11: 117–135.

ALLEN, HAROLD B.

Technology's role in the seafood industry. Commer. Fish. Rev. 29(2): 59–61.

ALVERSON, DAYTON L.

The past and future in West Coast trawling. Boat Owners' News 2(3): 5, 8–9.

AMES, WARREN E.

Studies on maturity of sockeye salmon. *In* Investigations by the United States for the International North Pacific Fisheries Commission—1966, pp. 98–99. Int. N. Pac. Fish. Comm., Annu. Rep. 1966.

[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.

ANDERSON, WILLIAM D., JR.
Field guide to the snappers (Lutjanidae) of the western Atlantic. U.S. Fish Wildl. Serv., Circ. 252, iii + 14 pp.

ANDERSON, WILLIAM W., and ELMER J. GUTHERZ.
Revision of the flatfish genus *Trichopsetta* (Bothidae) with descriptions of three new species. Bull. Mar. Sci. 17: 892–913.

ANTHONY, VAUGHN.
Use of population dynamics in marine fishery studies. Amer. Biol. Teach. 29: 448–452.

APPLEGATE, VERNON C., MANNING A. SMITH, and BENNETT R. WILLEFORD.
Molecular characteristics versus biological activity. Chemistry 40(9): 28–30.

ARMSTRONG, REED S.
The subtropical underwater of the eastern Gulf of Mexico. Commer. Fish. Rev. 29(3): 46–48.

ARMSTRONG, REED S., and JOHN R. GRADY.
"Geronimo" cruises entire Gulf of Mexico in late winter. Commer. Fish. Rev. 29(10): 35–40.

ARMSTRONG, REED S., JOHN R. GRADY, and ROBERT E. STEVENSON.
Bureau of Commercial Fisheries programs. Cruise "Delta 1" of the "Geronimo." Commer. Fish. Rev. 29(2): 15–18.

ATKINSON, C. E., J. H. ROSE, and T. O. DUNCAN.
Salmon of the north Pacific Ocean—Part IV: Spawning populations of north Pacific salmon. 4. Pacific salmon in the United States. Int. N. Pac. Fish. Comm., Bull. 23: 43–223.

BABB, ALBERT L., WILLIAM P. MILLER, WILLIAM E. WILSON, JR., GENE L. WOODRUFF, and ANTHONY J. NOVOTNY.
Neutron activation analysis of stable dysprosium biologically deposited in the bone of chinook salmon fingerlings. (Summary.) Trans. Amer. Nucl. Soc. 10: 449.

BARKER, ALLAN M., and THOMAS M. GROUTAGE.
Statistics of the New Jersey surf clam fishery—1965. [Abstract.] Proc. Nat. Shellfish. Ass. 57: 1.

BARKER, ALLAN M., and ARTHUR S. MERRILL.
Total solids and length-weight relation of the surf clam, *Spisula solidissima*. Proc. Nat. Shellfish. Ass. 57: 90–94.

BARKLEY, RICHARD A.
Is the boundary between the Kuroshio and Oyashio a compound vortex street? [Abstract.] CSK Newslett. 9: 11.
The impact of computers on science. Proc. Hawaii. Acad. Sci., 42d Annu. Meet., pp. 27–29.

BARNETT, HAROLD J., RICHARD W. NELSON, and JOHN A. DASSOW.
Technological studies of Dungeness crab processing. Part 3—Laboratory experiments in the control of drain time. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(4): 11–17.

BARR, LOUIS, and ROLAND MCBRIDE.
Surface-to-bottom pot fishing for pandalid shrimp. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 560, iii + 7 pp.

BARRY, E. J.

Gulf fisheries (selected areas)—1966. U.S. Fish Wildl. Serv., Bur. Commer. Fish., New Orleans Market News Serv., 39 pp.

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