

TRENDS AND DEVELOPMENTS

Fishing Vessel and Gear Developments

EQUIPMENT NOTE NO. 5-- SINK GILL-NET FISHING IN NEW ENGLAND:

What was at one time a thriving gill-net fishery, based principally at Gloucester, Mass., now only shadows its former importance. The Gloucester gill-net fishing fleet has been reduced from over 50 vessels earlier in the century to only 3 at present (1960). Fishing is done during the spring and fall

months. The period extending from mid-June through mid-September is not utilized by the gill netters--partly because of the large numbers of dogfish that are present at that time. Cod (Gadus morhua), pollock (Pol-lachius virens), and haddock (Melanogrammus aeglefinus) are included among the species most commonly caught.

The following pictorial presentation of the sink gill-net fishery is a brief attempt to document the fishery as it exists today.



Fig. 1 - The *Phyllis A.*, a 55-foot Gloucester vessel engaged in the sink gill-net fishery. The vessels in this fishery vary in length from 55 to approximately 75 feet. Practically all of the fishing takes place within a 30-mile radius of Gloucester.



Fig. 2 - Cod being hauled aboard over the fairlead drum. The crewman is one of five aboard the vessel. Hauling of the gear is usually started at daybreak and takes 2 to 3 hours.



Fig. 3 - Power is supplied to the net-lifter rotor, pictured here, by a small gasoline engine. The fisherman in the foreground is helping to free the gill net from the pawls which grip the net as it comes around the rotor.

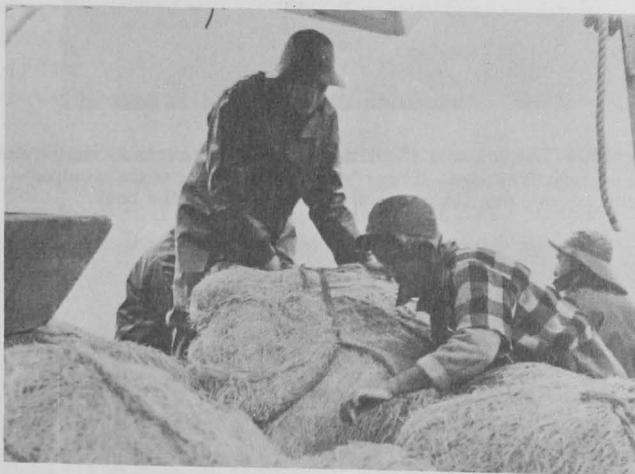


Fig. 5 - Boxes of gill nets being prepared for setting over the stern of the *Phyllis A.* The setting of the string of nets, which in this case consists of 14 boxes, is done with the vessel proceeding at approximately 6 to 8 knots. A string of gear may stretch 3 to 4 miles over the bottom. The site at which the set is made is chosen on the basis of daily catches and previous experience. Sink gill nets are often fished over hard or rock bottom where trawling is not practicable and in depths of 20 to 40 fathoms.

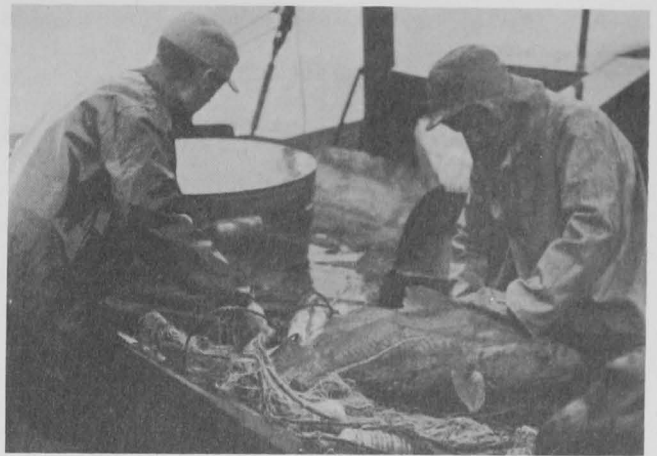


Fig. 4 - Large cod being cleared from enmeshing twine by a crewman. The net-hauling operation is continuous, with the net coming aboard over the port side of the vessel. The fish are cleared from the webbing, and temporarily stowed in the hold, and the gill nets are placed in boxes for further clearing and repairing ashore.



Fig. 6 - After the first string of gear has been taken aboard the vessel, another string is set. The catch of fish from the first string is then forked from the hold of the vessel to the deck for dressing. Daily catches--usually consisting principally of cod, pollock, and haddock--range from about 1,500 to 5,000 pounds.



Fig. 7 - All fish are eviscerated and the larger fish are beheaded prior to landing. The fish are landed in top condition, usually less than six hours after they are brought on deck.



Fig. 8 - A gull gets "his share" as the catch is dressed while the Phyllis A. steams back to Gloucester.



Fig. 9 - After arrival in port, the nets are unloaded from the vessel for inspection and drying ashore.



Fig. 10 - The sections of gill net are placed on racks for drying and mending, if needed. Three "sets" (strings) of gear are required--one ashore, one fishing, and the third aboard the boat.

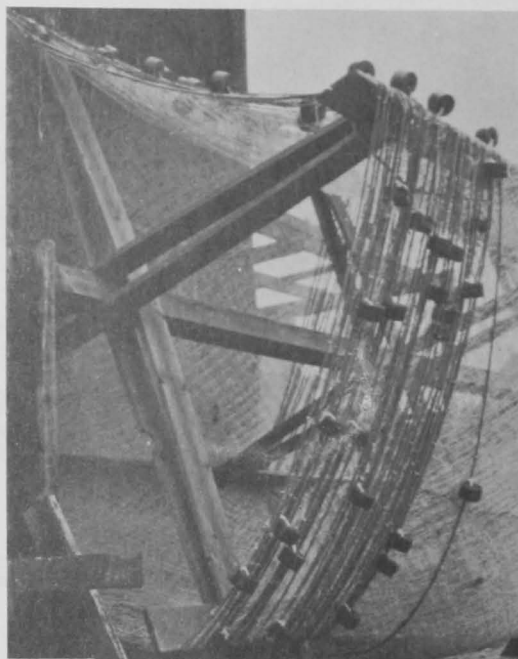


Fig. 11 - One section of the net on a rack. Twine is mostly 6-inch stretched mesh. Plastic floats are used on the float line and hammered leads on the lead line.

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Alaska Exploratory Fishery Program

COMMERCIAL POTENTIAL OF BOTTOM FISH IN SOUTHEASTERN ALASKA STUDIED:

M/V "New Hope" Cruise 60-1: The U. S. Bureau of Commercial Fisheries chartered vessel New Hope was expected to depart from Ketchikan, Sept. 6, 1960, for 6 weeks of exploratory bottom trawling west of Prince of Wales Island in Southeastern Alaska from Cape Muzon to Cape Ommaney. This is the first of a series of cruises under a new program initiated by the Bureau to assist in the development of Alaska's fishery resource.

The purpose of the cruise was to evaluate the commercial potential of bottom fish during a specific late summer period. Earlier cruises in 1956 and 1957 furnished basic topography data and exploratory fishing data for early spring and late fall seasons.

Records were to be maintained on certain meteorological and oceanographic data. Lengths and weights of important commercial species were to be logged and fishing locations charted.

A standard 400-mesh "eastern" otter trawl (commonly used on the West Coast) was to be fished as in a typical commercial fishing operation.



American Fisheries Advisory Committee

FIVE MAJOR PROBLEMS DISCUSSED AT AUGUST MEETING:

Five major problems pertaining to the Nation's commercial fisheries were discussed

at a meeting of the American Fisheries Advisory Committee. The meeting, eleventh of the group, was held in Seattle, Wash., in August 1960, the U. S. Bureau of Commercial Fisheries reported on September 22, 1960.

The major problems were:

(1) The actual and potential effect of foreign fishing activities in the eastern part of the Bering Sea on the United States fishery.

(2) The effects of territorial sea adjustments on the fisheries of the Pacific Northwest area.

(3) The increasing impact of dams and other multiple water-use projects upon the commercial fisheries.

(4) A review of legislation introduced in the 86th Congress to modify the Saltonstall-Kennedy Act, which is an act designed to aid the domestic commercial fishing industry to meet its problems in the biological, technological, and marketing fields.

(5) A discussion of the relative balance achieved by the Bureau of Commercial Fisheries in its allocations of Saltonstall-Kennedy funds to various activities and programs designed to help the fishing industry help itself, but with emphasis on the marketing activities of the Bureau.

The Committee expressed growing and continuing concern over the increased foreign fishing activities in the Eastern Bering Sea and urged the Bureau of Commercial Fisheries to consider the possibilities of overexploitation and the resultant potential depletion of fish stocks.

Inquiries were made relative to the extent of present American fishing operations in the area, the possible short- and long-range effects of foreign fishing activities on the historic fishing rights of United States citizens, and the potential areas of disagreement between the United States and foreign governments in the future.

The Committee also urged the Bureau to secure all possible data relative to the species and the amounts harvested and to particularly guard against any encroachment on the halibut grounds farther to the south which have been historically harvested on a sustained

yield basis by United States and Canadian fishermen under joint conservation policies.

In regard to territorial waters problems, the Committee recommended that since there was no agreement reached at the last International Conference on the Law of the Sea on fishing rights, the United States should stay with its original position of holding to the three-mile limit.

The Committee also suggested that consideration should be given to bilateral or multilateral agreements with foreign nations relative to the utilization of fishery resources off foreign shores.

The Committee placed emphasis on the value of research and recommended continuing research on alternate methods of replacing lost or downgraded salmon spawning areas resulting from multiple water-use projects.

The Committee questioned the desirability of recent Congressional legislation proposing the apportionment of Saltonstall-Kennedy funds to state conservation agencies, educational institutions, and private research organizations, expressing the belief that the present contract program of the Bureau of Commercial Fisheries was more desirable from the standpoint of greatest immediate benefit to the industry and public.

In the discussions concerning allocations of funds to various Bureau activities and work areas, the Committee stated that, within the present framework of financial support from Saltonstall-Kennedy funds, it was their view that a proper balance has been achieved in the allocation of the Saltonstall-Kennedy funds.

Note: Also see Commercial Fisheries Review, May 1960 p. 14.



American Samoa

TUNA LANDINGS, AUGUST 1960:

In August 1960, tuna landings by Japanese and South Korean vessels fishing for the tuna cannery in American Samoa totaled 2.7 million pounds--an increase of 27.8 percent as compared with the 2.1 million pounds landed in August 1959. Landings for January-August 1960 of 18.1 million pounds were 6.6 percent higher than the 17.0 million pounds landed during the first eight months of 1959.

Species	August		Jan.-Aug.	
	1960	1959	1960	1959
	(1,000 Lbs.)			
Albacore	2,439	1,921	15,094	13,207
Yellowfin	260	207	1,861	3,109
Big-eyed	43	13	1,155	685
Skipjack	-	4	10	4
Total	2,742	2,145	18,120	17,005

Note: Majority of the tuna was landed by Japanese long-line vessels; a small amount was landed by a South Korean long-line vessel.



Byproducts

U. S. PRODUCTION AND IMPORTS OF FISH MEAL AND SOLUBLES, JANUARY-JULY 1960:

During the first seven months of 1960, the United States production of fish meal reported to the U. S. Bureau of Commercial Fisheries amounted to 130,443 short tons as compared with 144,770 tons produced by the same firms in January-July last year. Imports of 79,506 tons for the same period were down sharply from the 105,004 tons imported in January-July 1959.

Table 1 - U. S. Supply of Fish Meal and Solubles, 1960 and 1959

Item	January-July		Total 1959
	1960	1959	
	(Tons)		
FISH MEAL			
Domestic production:			
Menhaden	105,246	113,104	223,893
Tuna and mackerel	13,303	12,630	25,380
Herring, Alaska	3,040	5,791	8,094
Other	8,854	13,245	49,184
Total production	130,443	144,770	306,551
Imports:			
Canada	24,421	32,089	39,033
Peru	40,739	37,488	49,923
Chile	9,113	4,995	5,104
Angola	-	20,738	20,738
Union of South Africa	4,930	3,374	9,727
Other Countries	303	6,320	8,400
Total imports	79,506	105,004	132,925
Fish meal supply	209,949	249,774	439,476
FISH SOLUBLES (wet weight)			
Domestic production 2/.	54,647	89,051	165,359
Imports:			
Canada	691	1,243	1,660
Denmark	1,858	10,307	18,723
Other Countries	65	3,213	6,247
Total imports	2,614	14,763	26,630
Fish solubles supply	57,261	103,814	191,989

1/Based on reports from firms which accounted for 92 percent of the 1959 production.
2/Includes production of homogenized-condensed fish.

Similar declines occurred in the domestic production and imports of fish solubles. The January-July production of solubles of 54,647 tons was 34,404 tons less than for the same period the previous year. Imports of solubles during the first seven months of 1960 amounted to 2,614 tons as compared with 14,763 tons in the same period of 1959.



California

AERIAL CENSUS OF SEA LIONS:

Airplane Spotting Flight 60-13-Sea Lion Census: An aerial survey of the coast and offshore islands from the Oregon border to Pt. Conception was conducted by the California Department of Fish and Game Twin Beechcraft on June 8-9 and 13-15, 1960, to

estimate abundance of sea lions in California.

During the five flights made along the Northern California coast, concentrations of sea lions were found on St. George Reef Islands, Sugar Loaf

off Cape Mendocino, Sea Lion Rock off the Mattole River, Fort Ross Reef, Point Reyes, the Farallon Islands, Ano Nuevo, Santa Cruz Point, Point Lobos, Partington Point, and Point Sal. Individuals and small numbers were found intermittently between those places.

Unfavorable weather conditions hampered the census operations, with coastal fog prevailing during June causing delays and interruptions to the flight. Photographs of concentrations of sea lions were taken at areas where significant numbers of animals were encountered. Combined with this were actual counts and estimates made at other areas where it was not worthwhile to make photographs.

Photographic equipment used included a 9" x 9" vertical aerial camera with 12" cone mounted in the plane, a K20 manual-operated aerial camera, and a 35-mm. color camera.

Estimates of the Southern California population have been postponed. Poor flying conditions combined with other aircraft commitments extended the operation beyond the allotted flight schedule.

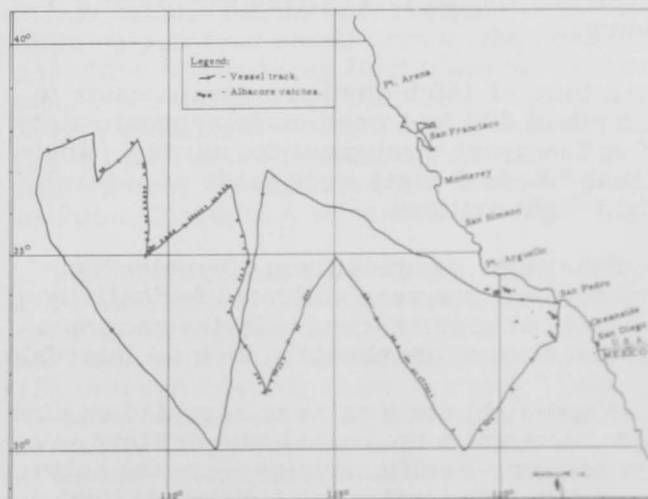
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ALBACORE TUNA MIGRATION OFF PACIFIC COAST STUDIED:

M/V "N. B. Scofield" Cruise 60S3-Albacore: The high seas area off California and Baja California within the latitudes 30° N. and 38° N. and inshore from 134° W. longitude were surveyed by the California Department of Fish and Game research vessel N. B. Scofield from May 23-June 18, 1960. The objectives were: (1) to explore the offshore area prior to the commercial albacore season in an attempt to intercept and determine the migration route or routes of albacore schools approaching the Pacific Coast; (2) to tag and release albacore; and (3) to gather biological and oceanographic data.

Most of the 3,000-mile survey track was scouted during daylight hours using surface trolling gear.

The first albacore were taken on June 4 approximately 500 miles west of San Francisco (latitude 37° 43' N., longitude 132° 45'



M/V N. B. Scofield Cruise 60S3-Albacore (May 23-June 18, 1960).

W.). Subsequent catches of 1 to 26 fish were made each day while running a southeasterly pattern toward the coast. The total catch was 154 albacore.

The majority (90 percent) of the fish averaged about 12 pounds each. Most of the rest were larger fish ranging from about 18 to 30 pounds, and were caught primarily in the southeastern portion of the survey area.

Stomachs of untagged fish showed no evidence of recent heavy feeding. Among the more common organisms observed were: Pacific saury, squid, Pacific jack mackerel, and larval lantern fish.

All of the albacore in suitable condition when hauled aboard were tagged. Experiments designed to test the recovery rate of "spaghetti" tags with that of dart tags were continued. The two types used alternately resulted in a release of 38 "spaghetti" and 36 dart tags. The greatest number of fish tagged at one position was six.

Sea surface temperatures varied from 10.7° to 18.5° C. (51.3° to 65.3° F.). The coolest water extended from the vicinity of Santa Cruz Island to about 200 miles W. by N. of San Miguel Island, while warmest temperatures were found in the southwestern area 400 to 500 miles from Point Arguello.

All albacore were caught within a temperature range of 15.3° to 17.9° C. (59.5°-64.2° F.). The majority (83 percent) was taken in 15.9° to 17.1° C. (60.6° - 62.8° F.) water.

A total of 150 bathythermograph casts to a depth of 400 feet were made approximately 20 miles apart throughout the survey. Additional 900-foot casts were made at several night-light stations.

Sea-water samples from 10-meter Nansen bottle casts were collected for salinity analysis at every second bathythermograph station or at approximately 40-mile intervals.

Night-light stations were occupied on nine occasions while the vessel was drifting on a sea anchor. Pacific sauries were the only organism noted under the 1,500-watt light at all stations. The number attracted varied from 2 to about 100. Organisms occurring at fewer stations were Pacific jack mackerel,

lanternfish, squid and several species of salps.

Daytime observations were considered typical for the area. Albatross and storm petrels were present in small numbers most of the time. Their actions did not appear different in areas where albacore were caught. Large concentrations of *Velella lata* were observed in two localities. Mammals were rarely observed. Of interest was the occurrence of glass Japanese net floats. A few large and numerous small ones were observed.

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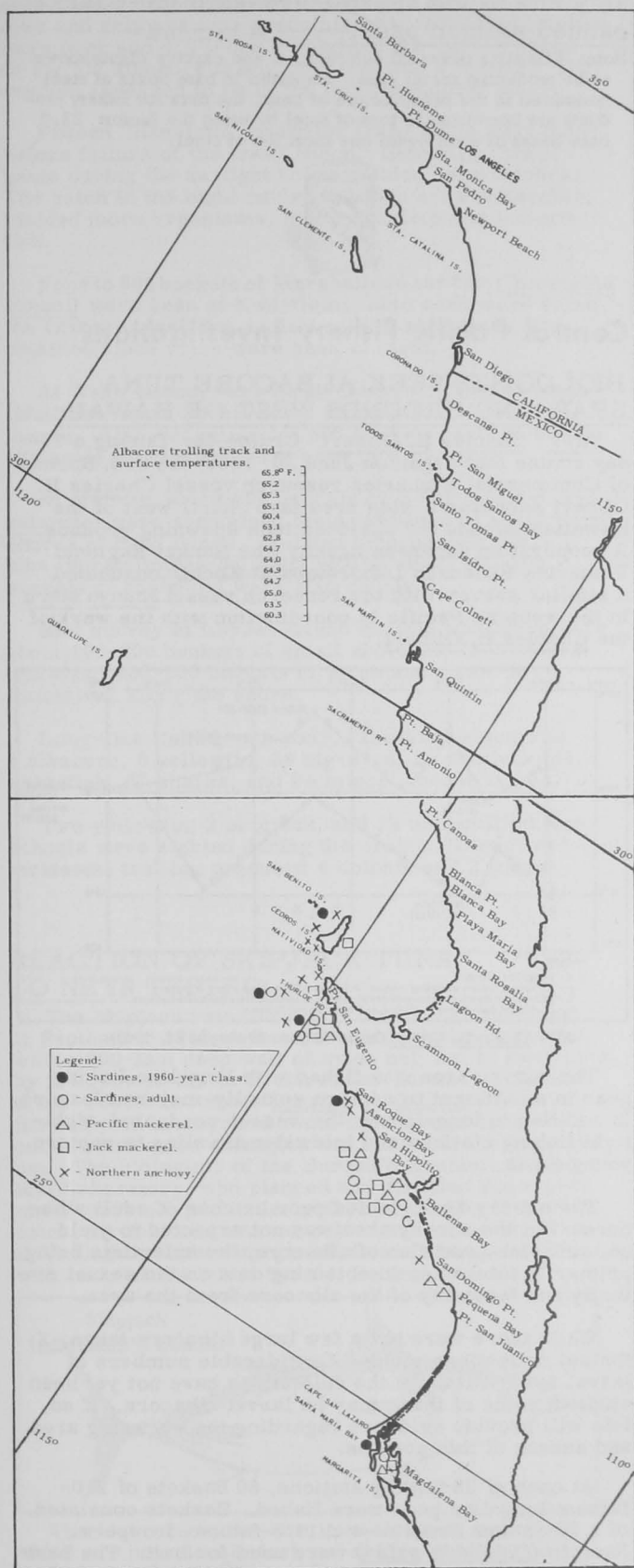
PELAGIC FISH POPULATION SURVEY CONTINUED:

M/V "Alaska" Cruise 60A6-Pelagic Fish: The coastal waters off Baja California from Magdalena Bay to Cedros Island were surveyed (July 12-August 1, 1960) by the California Department of Fish and Game research vessel *Alaska*. The objectives were: (1) to survey the sardine population to determine the amount of recruitment from the 1960 spawning and to measure the density of older fish; (2) to sample sardines for age analysis; (3) to sample Pacific mackerel, jack mackerel, and anchovies for age and distribution studies; (4) to collect live sardines for genetic studies by the U. S. Bureau of Commercial Fisheries Laboratory at La Jolla; and (5) to troll for albacore on the southern extremity of the albacore fishing grounds.

Of the 66 night-light stations occupied, sardines were taken on 12, anchovies on 12, jack mackerel on 9, and Pacific mackerel on 8. In the 411 miles of scouting, 881 anchovy, 3 yellowtail, and 8 unidentified fish schools were sighted.

Sardines of the 1960 year-class were taken on 5 stations. Three samples were taken from fish schools that were predominantly anchovy. Very few young sardines were present at the other 2 stations and none were observed during scouting. Adult sardines were taken on 9 stations mostly in Ballenas Bay. During daylight anchorage in this area more than 100 schools of adult fish were observed.

Anchovies were present in unusually large numbers over the entire area covered. In addition to the schools observed during night

M/V Alaska Cruise 60A6-Pelagic Fish (July 12-Aug. 1, 1960).

scouting, hundreds were seen during daylight hours. They were from 2 to 7 miles offshore in dense to thinly-scattered schools. Fish from some of the dense schools could be brailed during daytime anchorage. The number of samples taken on night-light stations was not representative because the majority of the schools was negatively phototropic. The dominant size group was between 80 and 105 mm.

Larger fish were present only around Cedros Island.

Several thousand adult sardines from Magdalena Bay were delivered alive to the U. S. Bureau of Commercial Fisheries, La Jolla.

A special trolling track was made through previously productive albacore fishing grounds off northern Baja California. No fish were caught or seen.

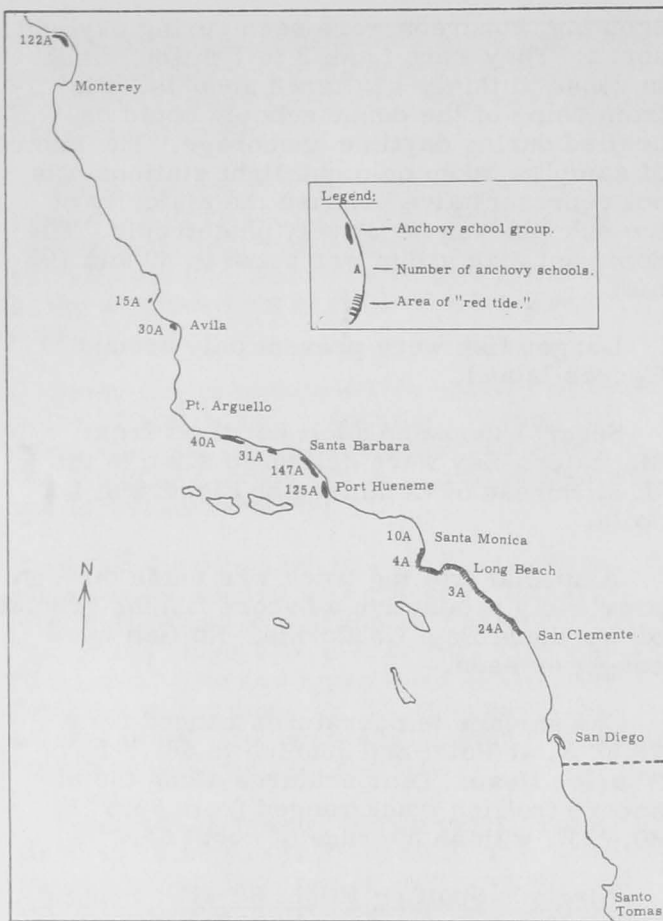
Sea surface temperatures ranged from 78.6° F. at Point San Juanico to 56.1° F. at Thurloe Head. Temperatures along the albacore trolling track ranged from 65.8° to 60.4° F. with an average of about 64.0° F.

Airplane Spotting Flight 60-16 - Pelagic Fish: The inshore area from Punta Santo Tomas, Baja California, to Santa Cruz, Calif., was surveyed from the air (July 22, 25, and 26, 1960) by the Department's Cessna "180" 3632C, to determine the distribution and abundance of pelagic fish schools.

Fog obscured most of the central California coast. Aerial observations were possible only in four small areas--the northern one-third of Monterey Bay, a narrow inshore band from Carmel to Point Sur, a small section of coast near Point Buchon, and San Luis Obispo Bay in the immediate vicinity of the Avila piers. Conditions from Santo Tomas to Point Conception were only fair.

Anchovy schools were most numerous from Port Hueneme to Gaviota where 343 were counted during two days of flying. The observable section of Monterey Bay contained 122 thin schools, all close to shore. Only 41 were seen south of Point Dume and none below San Clemente. Schools containing species other than the northern anchovy were not seen.

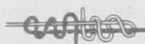
Moderate to severe red-water conditions prevailed from Point Dume to San Clemente,



Airplane Spotting Flight 60-16 (July 22, 25, and 26, 1960).

with the heaviest blooms in the Los Angeles-Long Beach Harbor area and from Newport Beach to Dana Point.

Note: Also see Commercial Fisheries Review, Sept. 1960 p. 15.



Cans--Shipments for Fishery Products, January- July 1960

Total shipments of metal cans during January-July 1960 amounted to 74,727 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 66,673 tons in the same period a year ago. The increase of about 12.1 percent in the total shipments of metal cans January-July this year as compared with the same period of 1959 was prob-



ably due to the sharp increase in the Alaska canned salmon pack.

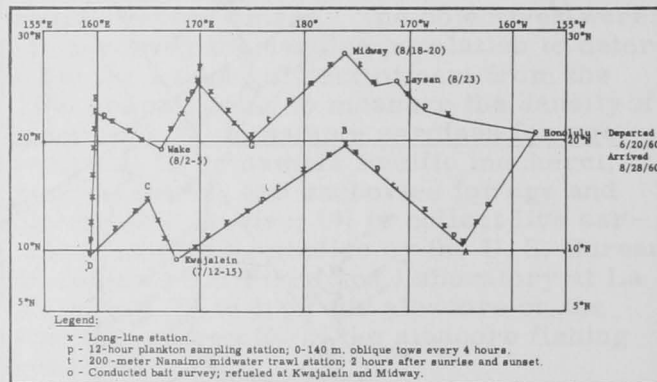
Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.



Central Pacific Fishery Investigations

BIOLOGISTS SEEK ALBACORE TUNA SPAWNING GROUNDS WEST OF HAWAII:

M/V "Charles H. Gilbert" Cruise 48: During a 70-day cruise that began on June 20, 1960, the U. S. Bureau of Commercial Fisheries research vessel Charles H. Gilbert surveyed a wide area (see chart) west of the Hawaiian Islands for albacore tuna spawning grounds. A cooperating Japanese agency (the Nankai Regional Fisheries Research Laboratory at Kochi) conducted a similar survey with the research vessel Shunyo Maru in the western Pacific in coordination with the work of the Charles H. Gilbert.



M/V Charles H. Gilbert Cruise 48 (June 20-August 28, 1960).

The survey area was fished with long-line fishing gear in an attempt to capture sexually-mature albacore. In addition to long-lining, the vessel conducted night-light fishing stations and midwater trawling to capture young tunas.

The survey area yielded poor catches of adult albacore. But the survey area was not expected to yield commercial quantities of albacore, the scientists being primarily interested in obtaining data on the sexual maturity and fecundity of the albacore from the area.

While there were but a few large albacore taken, the net collections yielded considerable numbers of larval tuna. Although the collections have not yet been studied, some of these may be larval albacore. If so, this will provide evidence regarding the spawning area and season of this species.

At each of 38 fishing stations, 60 baskets of 210-fathom long-line gear were fished. Baskets consisted of a 20-fathom floatline and 11 3-fathom droppers. Sauries (Cololabis saira) were used for bait. The best fishing occurred between 10° and 20° N. latitude in the

area between the Hawaiian Islands and Kwajalein--big-eyed and skipjack tuna predominated. Albacore catches were poor and scattered throughout the survey area. Of the six albacore taken, only one was a female. The ovaries appeared to be in the late developing stage.

Fifteen "Nanaimo" midwater trawl hauls were made before failure of the trawl winch. Generally, trawl hauls during the daylight hours yielded poor catches. The catch in the night hauls, although not spectacular, yielded more organisms, mainly shrimp and lanternfish.

Four to 500 buckets of Marshallese sardine (*Harengula kunzei*) were seen at Kwajalein. Also seen were some iao (*Atherinidae*), but no estimate of abundance was obtained since these were seen at night.

At Wake Island, very large concentrations of oama (*Mullidae*) were observed all along the shores of the lagoon. Also, an estimated 100 buckets of 4- to 5-inch wholehole (*Kuhliidae*) were seen in the lagoon.

At Midway, about 120 buckets of iao (*Pranesus in-sularum*) were seen along the northeast and eastern shores of Sand Island. Isolated smaller schools of piha (*Spratelloides delicatulus*) and about 400-500 buckets of wholehole were also counted.

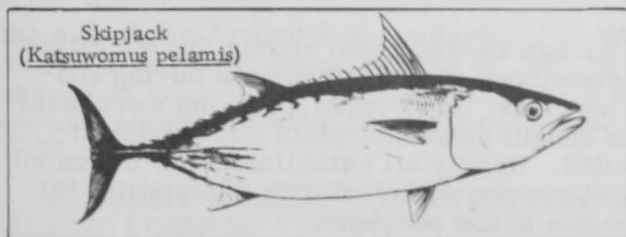
Bait survey at Laysan Island showed that there were about 100-200 buckets of small wholehole (2-3 inches) and about 400-500 buckets of large wholehole (5-10 inches) all along the shore.

Long-line fishing was poor. The total catch was 6 albacore, 6 yellowfin, 28 big-eyed, 15 skipjack, 44 spearfish, 87 sharks, and 34 miscellaneous fishes.

Two yellowfin, 2 skipjack, and 12 unidentified tuna schools were sighted during the cruise. Direct and incidental trolling produced 4 dolphin and 2 wahoo.

REACTION OF SKIPJACK TUNA TO NETS TESTED:

The skipjack tuna found off Oahu's Waianae coast in September 1960 were confronted for the first time with a 300-foot deep wall of nylon net, set in their path by the crew of the U. S. Bureau of Commercial Fisheries' research vessel Charles H. Gilbert. Most of the skipjack managed to avoid the strange barrier--only 10 fish were entangled and landed in the huge gill net. The biologists of the Bureau's Honolulu Biological Laboratory, who planned and directed the experiment, were not particularly discouraged by this small catch, for the trial was conceived as only a first step in linking the Laboratory's studies of tuna behavior with tests of the latest in tuna-fishing methods.



The idea was to see how Hawaiian tuna schools, which are notoriously fast and shifty, would react to a net under the conditions of water clarity and water

temperature which obtain in Hawaiian waters. The Charles H. Gilbert is uniquely equipped for such studies as it is the only tuna-fishing vessel in the world with observation windows in the hull below the waterline. The biologists were not content, however, with confining their observations to those windows, but put on their diving masks and went into the sea with the net to spy on the tuna in their own element.

The experiment has significance in a larger picture of increasingly worldwide competition among tuna fishermen to supply the United States market. This competition stimulates a constant search for more efficient methods of harvesting tuna that has in the past few years brought almost revolutionary changes to the Southern California tuna fishing industry. New tools, such as larger and stronger nets made of nylon and power equipment for hauling the nets, and the new techniques that these tools have brought forth, are enabling the California fishermen to produce tuna more efficiently and more cheaply than has ever been possible when live-bait and pole fishing were employed. Thus their competitive position has been increased over that of Hawaiian fishermen, who still rely on pole-and-line fishing methods.

It is generally thought that the success of net fishing methods for tuna off the West Coast is due to the fact that the deep seines reach down through the thin layer of warm surface water in which the tuna live. The fast-swimming fish, which otherwise would find it easy to escape under the curtain of netting, are stopped by the cold water that they run into as soon as they dive.

Around Hawaii the warm surface water extends down much deeper than it does off the West Coast. The Laboratory's first problem was, therefore, to find out whether a net could be set deep enough in Hawaiian waters to reach water temperatures that would turn back an escaping tuna school. The results of the experiment, which consisted of only four sets on small, fast-moving schools with a make-shift net, are not expected to be conclusive, but the Laboratory's scientists plan to make further trials along similar lines in search of knowledge that will enable Hawaii's tuna fishermen to bring their productive efficiency up to the most advanced level.

TAGGING RETURNS INDICATE THAT THE SKIPJACK TUNA IS NOT A WIDE-RANGING SPECIES:

Over 13,000 skipjack tuna have been tagged in Hawaiian waters with the D-2 dart tag, since the initiation of the tuna research program by the Honolulu Laboratory of the U. S. Bureau of Commercial Fisheries. Although the recoveries--nearly 1,300--have indicated considerable movement among the islands, there are no records of recapture of the tagged fish in any other fishery. The Hawaiian skipjack fishery is seasonal; the bulk of the annual catch is made between May and September. Although it is hypothesized that these fish enter the Hawaiian area in the spring and leave in the fall, there has been a lack of returns from other areas of skipjack tagged in the Hawaiian waters, a lack of positive evidence that fish recovered one or more seasons after tagging have actually been away during the interim, and a lack of recoveries in Hawaiian waters of skipjack tagged elsewhere in the Pacific. As a result, biologists have increased their efforts to find out where they come from and where they go.

In April 1960, 46 skipjack were caught, tagged, and released from the Bureau's research vessel, Charles

H. Gilbert, near Roca Partida of the Revillagigedo Islands group, which lie off the west coast of Mexico. Although the results of this limited tagging effort has failed to provide any answers, it is interesting to note that 11 of the tagged tuna were recaptured within two months after release and all but one from within the area of release. One fish was recovered about 180 miles north of the release area.

The comparatively high percentage of recovery of tagged skipjack may reflect the existence of a resident population associated with a group of islands, or their movement may have been temporarily restricted by certain environmental factors. In May 1958, 2,000 skipjack were tagged and released in an area off Hilo, Hawaii. A total of 431 of the tagged fish, or 21.5 percent were recaptured within 3 months, with all but 2 from the same general area of release. These fish may have been "trapped" in a patch of low salinity water surrounded by water of higher salinity and, presumably, also differing in other characteristics. Later returns showed that at least some of the skipjack tagged off Hilo regrouped with other schools and moved northwesterly along the Hawaiian archipelago.

Tag returns from individual schools suggest that, normally, the skipjack in Hawaiian waters remain within a school for one month or less, then at least some of the school break off, move into new areas, and regroup with other fish or schools. From the releases off Hilo and Mexico, however, it is evident that there are situations, possibly environmentally conditioned, where the schools remain intact and within a restricted area for at least 2 or 3 months and thus are readily available to capture by fishermen.



Chicago

CONSUMPTION OF FROZEN FISH AND SHELLFISH IN RESTAURANTS AND INSTITUTIONS:

Chicago was one of ten selected cities in which a survey was undertaken to obtain information on the consumption of frozen processed fish and shellfish in institutions and public eating places. A total of 842 establishments were surveyed in that city. About four-fifths of all the establishments in Chicago bought some kind of frozen fishery products in the 12 months proceeding November 1958, the month the survey was made. Of this



group, about 74 percent said they had bought frozen processed fishery products during the period.

Further breakdown of frozen fishery products purchases in November 1958 shows that 46 percent of the establishments surveyed bought frozen processed fish, 35 percent bought frozen processed shellfish, and 13 percent bought frozen portions. The incidence of use of frozen processed fishery products, by institutions (such as schools and hospitals) was greater than restaurants. Of the ten cities in the survey, Chicago ranked fourth in terms of the percentage of all establishments buying frozen processed fishery products during the month of the survey. Chicago establishments most typically bought frozen processed fish in 5-pound packages, and frying was the most popular method of cooking.

Among the establishments using frozen processed shellfish, two-thirds bought breaded shrimp in November 1958, and one-fourth bought raw shrimp. Large quantities of both items were purchased. But breaded shrimp and raw shrimp also were bought widely, and in large quantities, in all the other cities included in the survey.

As with frozen processed fish, the leading shellfish items were also most often bought in 5-pound packages in Chicago. Frying was the most popular method of cooking shellfish.



Only about one-eighth of the establishments surveyed in Chicago bought portions during the month of the survey. This included 73 restaurants and 35 institutions. About 14,000 pounds of portions were purchased by these establishments in November 1958.

Chicago ranked ninth among the ten cities in percentage of establishments buying frozen portions. In Chicago, portions were most often bought uncooked-plain and uncooked-breaded. Nearly all establishments indicated that they were satisfied with the quality and condition of the portions.

About 10 percent of the users of portions in Chicago indicated that the quality was better than that of other frozen processed fish.



Federal Purchases of Fishery Products

DEPARTMENT OF DEFENSE PURCHASES:

JANUARY-JULY 1960: Fresh and Frozen Fishery Products: For the use of the Armed Forces under the Department of Defense, 1.9 million pounds (value \$1.1 million) of fresh

Table 1 - Fresh and Frozen Fishery Products Purchased by Military Subsistence Supply Agency, July 1960 with Comparisons

QUANTITY				VALUE			
July		Jan. - July		July		Jan. - July	
1960	1959	1960	1959	1960	1959	1960	1959
.. (1,000 Lbs.) (\$1,000) ..			
1,909	2,272	13,649	13,618	1,084	1,203	7,070	7,190

and frozen fishery products were purchased in July 1960 by the Military Subsistence Supply Agency. This was lower than the quantity purchased in June by 29.8 percent and 16.0 percent under the amount purchased in July 1959. The value of the purchases in July 1960 was lower by 8.3 percent as compared with June and 9.9 percent less than for July 1959.

During the first seven months of 1960 purchases totaled 13.6 million pounds (valued at \$7.1 million)--a decrease of 0.2 percent in quantity and 1.7 percent in value as compared with the similar period in 1959.

Prices paid for fresh and frozen fishery products by the Department of Defense in July 1960 averaged 56.8 cents a pound, about 12.8 cents more than the 44.0 cents paid in June and 3.4 cents more than the 52.9 cents paid during July 1959.

Canned Fishery Products: Tuna was the only canned fishery product purchased for

Table 2 - Canned Fishery Products Purchased by Military Subsistence Supply Agency, July 1960 with Comparisons

Product	QUANTITY				VALUE			
	July		Jan. - July		July		Jan. - July	
	1960	1959	1960	1959	1960	1959	1960	1959
.. (1,000 Lbs.) ..								
Tuna	481	150	1,930	1,982	204	70	860	938
Salmon	-	1	3	13	-	1	2	10
Sardine	-	107	84	776	-	16	35	116

the use of the Armed Forces during July this year. In the first seven months of 1960 purchases of canned fish were lower by 27.2 percent as compared with the same period in 1959.

JANUARY-AUGUST 1960: Fresh and Frozen Fishery Products: For the use of the Armed Forces under the Department of Defense, 2.4 million pounds (value \$1.2 million) of fresh and frozen fishery products were purchased in August 1960 by the Military Subsistence

Supply Agency. This exceeded the quantity purchased in July by 24.5 percent and was 12.5 percent higher than the

Table 1 - Fresh and Frozen Fishery Products Purchased by Military Subsistence Supply Agency, August 1960 with Comparisons

QUANTITY				VALUE			
Aug.		Jan. - Aug.		Aug.		Jan. - Aug.	
1960	1959	1960	1959	1960	1959	1960	1959
.. (1,000 Lbs.) (\$1,000) ..			
2,337	2,112	16,036	15,730	1,190	859	8,260	8,049

amount purchased in August 1959. The value of the purchases in August 1960 was higher by 9.8 percent as compared with July and 38.5 percent above August 1959.

During the first eight months of 1960 purchases totaled 16.0 million pounds (valued at \$8.3 million)--an increase of 1.9 percent in quantity and 2.6 percent in value as compared with the similar period in 1959.

Prices paid for fresh and frozen fishery products by the Department of Defense in August 1960 averaged 50.1 cents a pound, about 1.7 cents less than the 51.8 cents paid in July but 9.4 cents higher than the 40.7 cents paid during August 1959.

Canned Fishery Products: Tuna was the principal canned fishery product purchased for the use of the Armed Forces during August this year. In the first eight months of 1960 purchases of canned tuna were up 5.7 percent but purchases of both canned salmon and sardines were sharply lower as compared with the same period of 1959.

Table 2 - Canned Fishery Products Purchased by Military Subsistence Supply Agency, August 1960 with Comparisons

Product	QUANTITY				VALUE			
	Aug.		Jan. - Aug.		Aug.		Jan. - Aug.	
	1960	1959	1960	1959	1960	1959	1960	1959
.. (1,000 Lbs.) ..								
Tuna	324	150	2,254	2,132	133	59	993	997
Salmon	1	2	4	15	1	2	3	11
Sardine	15	194	99	970	6	27	41	143

Note: Armed Forces installations generally make some local purchases not included in the data given; actual total purchases are higher than indicated because local purchases are not obtainable.



Films

SALMON FILM WINS HONORS AT EDINBURGH INTERNATIONAL FILM FESTIVAL:

Salmon - Catch to Can, a 14-minute, sound color film sponsored by the Canned Salmon Institute and produced and distributed by the

U. S. Bureau of Commercial Fisheries was accorded honors at the Edinburgh, Scotland, 14th Annual International Film Festival, the Department of the Interior announced on September 29, 1960.

This is the third Bureau of Commercial Fisheries' film to receive honors at Edinburgh Festivals in recent years. An appropriate certificate will be presented during the winter to the Secretary of the Interior. Such presentation is usually made by the British Ambassador.

The award consists of being selected for showing at the Edinburgh Festival where films from about 30 nations compete for a place on the coveted program.

Salmon - Catch to Can was filmed primarily in Alaska. Among other scenes portrayed are the fish ladders at Bonneville Dam on the picturesque Columbia River. The picture shows the life history of the salmon; the three most prominent methods of harvest--purse-seining, gill-netting, and trolling; fishery management programs to assure a continuing resource; a glimpse of the canning process; and a "lead-in" to a second 14-minute film entitled Take a Can of Salmon.

The second film is a cookery presentation and may be used with the first one or separately. Both films are supplemented by a full-color recipe booklet also entitled Take a Can of Salmon^{1/}. Motion picture facilities of MPO Productions, New York City, a commercial motion picture producer, were used in making the honor-winning film.

^{1/}For sale at 15 cents a copy by the U. S. Government Printing Office, Washington 25, D. C.



Fish Kills

NATIONWIDE STATISTICAL REPORTING SYSTEM SET UP:

The U. S. Public Health Service early this year started a nationwide system for reporting the frequency and locations of fish killed by pollution. The project, a cooperative effort between the Public Health Service, the U. S. Fish and Wildlife Service, and State conservation agencies, is the first national tabulation of pollution fish kills that has been undertaken.

In announcing the project, the Surgeon General said it will be an effective means of obtaining additional basic information needed to determine the effects of pollution on the Nation's water resources, as required by the Federal Water Pollution Control Act. All State fish and game conservation agencies are being asked to provide continuing reports of fish killed by pollution as they occur in the Nation's rivers, lakes, and coastal waters. Reports will be made directly to the Public Health Service in Washington, D. C.

The Public Health Service will furnish the U. S. Fish and Wildlife Service with a copy of each report received, as it is received. The two agencies will cooperate in planning fish-kill statistics so they can be used in fish and game management as well as water pollution control.

Quarterly and annual reports of fish kills, listing numbers, locations and causes, when known, will be published. These reports will be distributed to the cooperating agencies, organizations, and individuals who request them.



Fish Meal

FREIGHT RATES FOR MEAL AND SCRAP REDUCED:

Effective October 4, 1960, freight rates were reduced on fish meal and fish scrap originating from South Atlantic and Gulf points ranging from Beaufort (N. C.)-West Port Arthur (Tex.) to destinations in Illinois, Kentucky, and Missouri. The new rates for domestic meal are 6 cents per hundred pounds over the previously-published rates for imports shipped from Southern ports, such as New Orleans, La., Jacksonville, Fla. Because imports are subject to port charges, the net effect is equalization of the inland transportation cost for both domestic and imported meal traffic. For intermediate destination points, the rates will be no higher than the rate for the next more distant point as published in the tariffs.

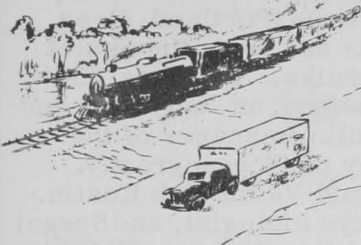
In November 1959 rates on imported fish meal were reduced from Gulf ports to Mid-western points. As a result, the cost for shipping imported fish meal was about \$5 to \$19 a ton less than for shipping domestic fish

meal. This freight rate advantage for imported fish meal with an increased foreign supply worked to the disadvantage of domestic fish meal manufacturers.

During the past several months members of the Industrial Products Traffic Committee of the National Fisheries Institute, with the assistance of a representative of the U. S.

Bureau of Commercial Fisheries, met with representatives of western, southern, and eastern railroads to explain the depressed conditions of the fish meal industry. After several public

hearings as well as informal meetings, the carrier rate-making groups approved the new reduced freight rates.



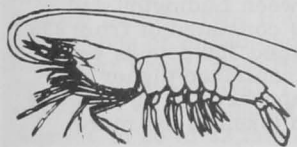
Florida

FISHERIES RESEARCH:

The Marine Laboratory of the University of Miami is conducting research on fisheries. Research of interest to commercial fisheries contained in the Laboratory's June 1960 Salt Water Fisheries Newsletter follows:

Shrimp Larvae: The larval life history of the pink shrimp has been studied at The Marine Laboratory with the support of the U. S. Fish and Wildlife Service. During the first quarter of 1960 a report was completed which described the shrimp larval stages.

The completion of this fundamental work leads to the next phase, involving the distribution of each stage of the larvae (11 in number) geographically and seasonally. This will give information on how the larvae get from the offshore spawning grounds to the estuarine nursery areas at the south end of the Florida peninsula. This question needs study since work on the current system in Florida Bay indicates that no onshore currents exist to carry non-swimming larvae inshore.



Spotted Sea Trout Tagging: Research on spotted sea trout and the ecology of the Ever-

glades National Park, the same estuary which serves as nursery ground for the Tortugas shrimp, is being supported by the Florida State Board of Conservation. The study has chiefly involved research on migration and growth of the sea trout populations from Ft. Myers to Appalachicola. By March 31, 5,348 tagged trout had been released. Two types of tags were used, internal tags of green plastic and the same tag to which a small piece of yellow plastic tubing is attached, the latter protruding through the hole in the fish's belly and drawing attention to the presence of the tag within. A total of 445 tagged fish had been reported by the end of March 1960, this being 8.3 percent of the total released. As before, few sea trout had moved very far because some 96 percent were caught within 30 miles of the place of tagging.

Frozen Shrimp Keeping Qualities: Tests have been made of the usefulness of dried extracts of okra (the green vegetable) in improving color, texture, and keeping qualities of frozen shrimp. Tests are also being made of the effects of freezing, thawing, and re-freezing of shrimp on the bacterial count. Note: See Commercial Fisheries Review, March 1959 p. 34.



Foreign Fishery Developments

COMMERCIAL FISHERIES BUREAU EMPLOYEE REVIEWS FISHERY MATTERS IN WESTERN EUROPE:

A review of fishery reporting by United States embassies and consulates was made by Dr. Sidney Shapiro, Chief, Branch of Foreign Fisheries and Trade, U. S. Bureau of Commercial Fisheries. He left for Europe on September 15, 1960. He planned to talk to government and industry officials about "Common Market" and "Outer Seven" fishery trade problems and brief the Interior representative on the United States Delegation to the GATT trade agreement negotiations in Geneva, Switzerland.

The U. S. Bureau of Commercial Fisheries has been working with the Department of State to improve reporting on foreign fishery developments. The Bureau is now undertaking a complete revision of the fishery reporting requirements in an effort to expand and develop useful and urgently-needed information on foreign developments as they affect the United States fishing industry. Timely and accurate reporting of information useful to United States firms was among the rec-

ommendations made by representatives of the fishing industry at a special conference on fishery export trade, held in Washington on June 20, 1960.

Another objective of the trip was to determine the proposed trade policies expected to affect the United States fisheries in connection with the establishment of the European Common Market. As yet, no information is available on the procedures that may be adopted for unifying markets, prices, and support policies for fishery products. As well as affecting United States trade directly, Common Market policies on tariffs may affect imports into the United States from countries outside the Common Market.



Fur Seals

TWO RUSSIAN SCIENTISTS STUDY HERDS AND FACILITIES ON PRIBILOF ISLANDS:

Two Russian fishery scientists and an interpreter arrived in September 1960 on St. Paul Island in the Pribilofs for a two-week study of the fur seal rookeries and the United States harvesting installations and management practices on the islands.

Two United States fishery scientists, both of the U. S. Bureau of Commercial Fisheries, at the same time went to Russia's Robben Island off the coast of Siberia for a similar study of the Russian fur-seal resource.

The exchange of scientific information and personnel is provided for in the fur seal convention signed in 1957 by the Soviet Union, Canada, Japan, and the United States. The convention provides for a six-year study of the northern fur seals as a means of obtaining information necessary for improved management of both the American and Asian herds



Although both Russian and American sealing operations had been completed for the

year, during the scientists' visit the seal herds were starting their exodus for the high seas where they will intermingle to some extent during the winter months. In the spring the seals will return to their respective rookeries to breed and bear their young.

The United States scientists are Dr. Victor B. Scheffer, biologist from the Bureau's laboratory in Seattle and Eugene M. Maltzell, biologist-interpreter from Portland, Oreg. The Russian scientists are from the Soviet installations on Kamchatka. They are Timofei Mikhailovich Kantatnov, an engineer, and Petr Georgievich Nikulin, manager of the Kamchatka Laboratory on Oceanography. The translator is Leonid Vasilevich Kostin. Fukuzo Nagasaki, Tokyo biologist, and Sergei V. Dorofeev, Moscow biologist, have joined the Americans on Robben Island.



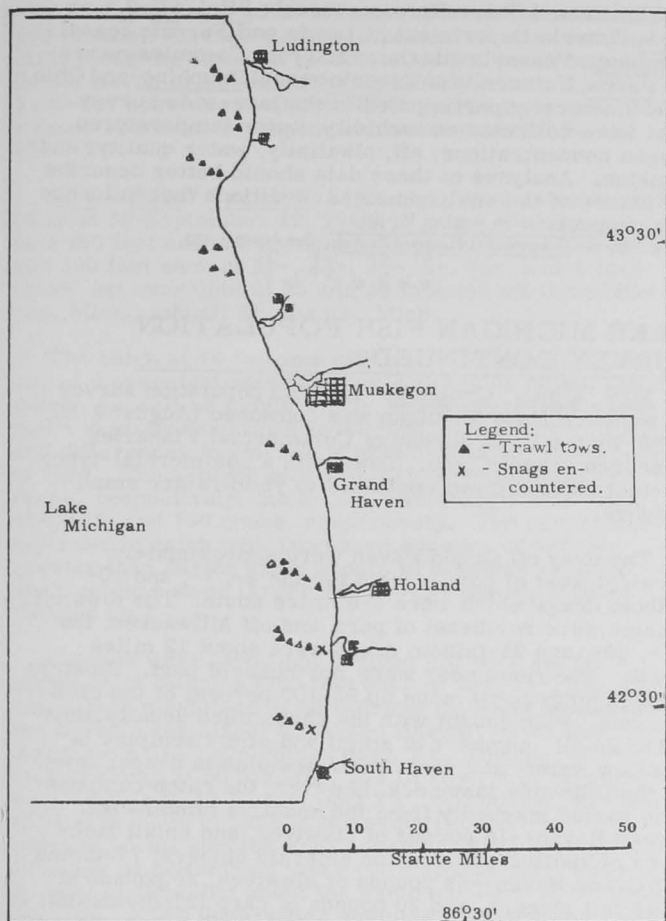
Great Lakes Fisheries Exploration and Gear Research

COMMERCIAL POTENTIAL OF UNDERUTILIZED FISH STOCKS IN LAKE MICHIGAN SURVEYED:

M/V "Art Swaer II" Exploratory Cruise 1: The first in the 1960 series of Lake Michigan exploratory cruises was completed August 17 when the U. S. Bureau of Commercial Fisheries chartered vessel Art Swaer II returned to Ludington, Mich. The primary objectives of the survey were to assess the commercial potential of underutilized fish stocks in the waters of Lake Michigan from Ludington to South Haven, Mich., and to determine the trawling characteristics of the lake bottom in that area.

During the seven-day cruise, 34 otter-trawl drags were completed in various depths between 10 and 38 fathoms using a standard, 50-foot Gulf of Mexico balloon-type fish trawl. Fishing efforts revealed considerable amounts of chubs (*Coregonus* sp.) to be available in the 15 - to 30-fathom depth range. The ten most productive drags were made between Ludington and Grand Haven. These ten catches consisted of from 233 to 577 pounds of chubs and averaged 360 pounds per 30-minute drag. These catches contained higher percentages of larger chubs which appeared to be in better physical condition than were fish taken in the more southerly areas.

Bottom conditions were found to be generally favorable for trawling at all but the shallowest depths examined. Depth recordings made at 10 fathoms consistently showed rough bottom conditions, and two of three attempts to drag at this depth resulted in severe damage to the net.

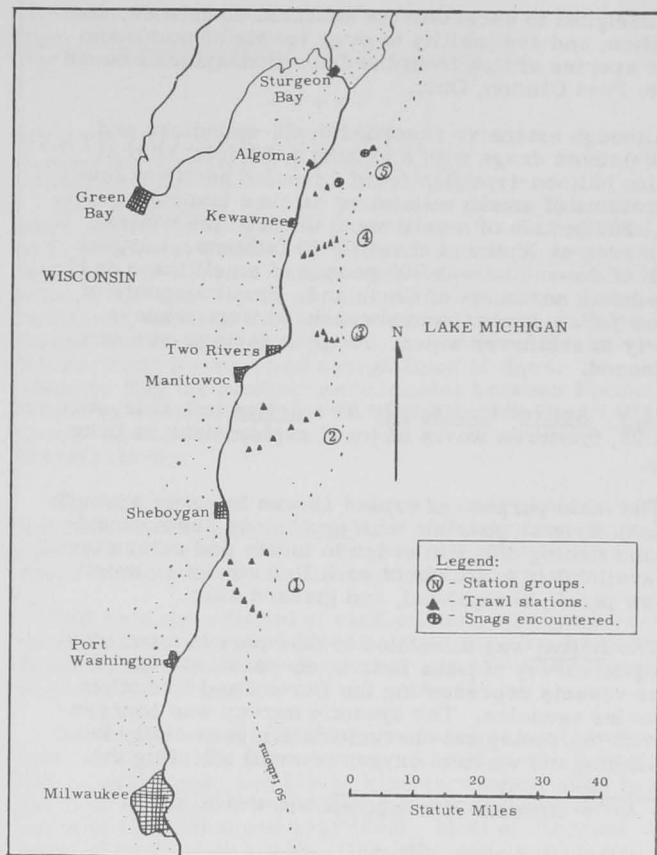


M/V Art Swaer Cruise 1 (August 10-17, 1960).

M/V "Kevinbren" Exploratory Cruise 2: The second Lake Michigan exploratory cruise was completed September 13, when the Bureau chartered vessel Kevinbren returned to Milwaukee, Wis. The Kevinbren is a Great Lakes gill-net tug that has been adapted to the trawl-method of fishing. The objectives of the 7-day cruise were to determine the commercial abundance and seasonal distribution of the various species of fish in the area between Sheboygan and Sturgeon Bay, Wis., and to learn the location of areas suitable for trawling.

Some 32 drags were completed in depths of 14 to 41 fathoms using a 50-foot (headrope), two-seam, Gulf of Mexico balloon-type trawl. Catches ranged from 55 to 705 pounds of mixed chubs, smelt, and alewives per half-hour drag. Best fishing results were obtained in 30-minute drags near Two Rivers in 20 to 36 fathoms, where 4 drags produced from 245 to 705 pounds; near Algoma in 25 to 32 fathoms, where 2 drags caught 304 and 428 pounds; and near Sheboygan in 30 to 32 fathoms, where 1 drag took 465 pounds. Alewives were present in about half of the catches, with the two largest amounts being 100 pounds in a 60-minute drag at 26-27 fathoms near Sheboygan and 30 pounds in a 30-minute drag at 20-21 fathoms near Kewanee. Smelt were found throughout the operational area, but in amounts of not more than 25 pounds per 30-minute drag.

Extensive echo-sounding operations revealed that the bottom topography varies greatly throughout the area covered. In the southern portion, the slope is



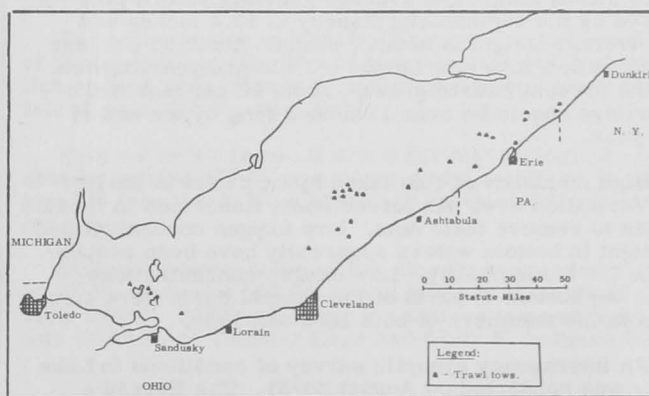
M/V Kevinbren Cruise 2.

rather gentle with only a few areas in the 15-25 fathom range too irregular for fishing operations. North of Two Rivers, the slope becomes steep, irregular, and terraced. Two drags in the northernmost station group resulted in minor gear damage.

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SEASONAL DISTRIBUTION STUDIES OF COMMERCIAL FISH STOCKS IN LAKE ERIE CONTINUED:

M/V "Active" Cruise 11: A 17-day trawling survey of the United States waters of Lake Erie, was completed on August 19, 1960, by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel Active. The cruise



M/V Active Cruise 11 (August 3-19, 1960).

was designed to ascertain the seasonal abundance, distribution, and availability to other trawls of smelt and other species of fish from the Ohio-Pennsylvania boundary to Port Clinton, Ohio.

Although extensive recorded depth-soundings and 28 30-minute drags with a standard, 50-foot, Gulf of Mexico balloon-type fish trawl revealed no large concentrations of smelt, consistent catches (averaging about 200 pounds of smelt) were taken in the central basin area at depths of about 10-13 fathoms. Largest catch of the cruise was 400 pounds of smelt taken in 12-13 fathoms northeast of Cleveland. Small amounts of yellow perch, burbot, and sheepshead were taken--mostly in shallower water. No gear damage was experienced.

M/V "Active" Cruise 12: The Active left Erie, August 29, for three weeks of trawl explorations in Lake Erie.

The main purpose of cruise 12 was to cover as much of Lake Erie as possible with continuous depth-sounding and fishing effort in order to locate and determine the availability to trawls of such fish stocks as smelt, yellow perch, sheepshead, and gizzard shad.

The Active was scheduled to take part in a two-day synoptic survey of Lake Erie in cooperation with 12 other vessels representing the Bureau and five other fisheries agencies. The synoptic survey was concerned with the ecological characteristics (especially the horizontal and vertical oxygen content) affecting the fish of Lake Erie.

Note: Also see Commercial Fisheries Review, Sept. 1960 p. 20.



Great Lakes Fishery Investigations

LAKE ERIE FISH POPULATION SURVEY:

M/V "George L." August 1960: Intensive trawling operations (108, 10-minute tows) by the U. S. Bureau of Commercial Fisheries research vessel George L. in the East Harbor and Bono areas in early August revealed more clearly that young-of-the-year fish generally were scarcer than in 1959. Most notable were the reduced catches of yellow perch and yellow pike. Only 5 young-of-the-year yellow pike were captured.

Yellow pike, hatched in 1959, now average 13 inches long (the legal length in Ohio) and range from about 10 to 15 inches long. The average yearling yellow pike landed by the commercial fishery is 13.4 inches and the average weight is about $\frac{3}{4}$ pound. About 95 percent of the yellow pike now landed in Ohio are yearling fish. At the present rate of growth, about 90 percent of the yearlings should be over 13 inches long by the end of the year.

High mortality of fish taken by trap nets in the Huron-Vermilion area has forced some fishermen in those areas to remove their nets. Low oxygen concentrations at night in bottom waters apparently have been responsible for the mortality. Low oxygen concentrations near the bottom in parts of the central basin were common in the summers of both 1959 and 1960.

An interagency synoptic survey of conditions in Lake Erie was conducted on August 30-31. The Bureau's research vessels Active and George L., Ohio Divisions

of Wildlife and Shore Erosion vessels SP-1, SP-3, SE-1, Ontario Department of Lands and Forests vessel Keenosay, Pennsylvania Game and Fish Commission vessel Perca, University of Toronto vessel Dauphine, and Ohio State University participated in the lake-wide survey. Data were collected on turbidity, water temperatures, oxygen concentrations, pH, alkalinity, water quality, and plankton. Analyses of these data should better describe the nature of the environmental conditions that influence fish production in Lake Erie.

Note: Also see Commercial Fisheries Review, Oct. 1960 p. 30.

LAKE MICHIGAN FISH POPULATION SURVEY CONTINUED:

M/V "Cisco" Cruise 6: The fish population survey in southern Lake Michigan was continued (August 9-23, 1960) by the U. S. Bureau of Commercial Fisheries research vessel Cisco. Tows with a commercial-type, 52-foot balloon trawl continued to yield rather small catches.

The tows off Grand Haven were approximately straight west of port, except for the 4-, 7-, and 10-fathom drags which were 4-6 miles south. The tows off Racine were northeast of port, and off Milwaukee, the 15-, 20-, and 25-fathom drags were about 12 miles north. The remainder were northeast of port. Bloaters (Leucichthys hoyi) made up 98-100 percent of the chub catches. Fish caught with the chubs were usually limited to small numbers of smelt and slimy sculpins in shallow water, and deep-water sculpins in deeper tows. In the following instances, however, the catch composition varied markedly from the usual: 4 fathoms off Grand Haven--16 pounds of alewives, and small numbers of spottail shiners and emerald shiners; 7 fathoms off Grand Haven--69 pounds of alewives, 30 pounds of spot-tail shiners, and 20 pounds of carp (2 individuals); 10 fathoms off Grand Haven (average of 3 tows)--54 pounds of alewives, 19 pounds of yellow perch, and 21 pounds of whitefish (9 of 39 whitefish in the 3 tows were of legal size); 50 fathoms off Grand Haven--130 pounds of deep-water sculpins.

Gangs of nylon gill nets (50 feet each of $1\frac{1}{4}$ - and $1\frac{1}{2}$ -inch, 200 feet of 2-inch, and 300 feet each of $2\frac{3}{8}$ -, $2\frac{1}{2}$ -, $2\frac{1}{4}$ -, 3-, $3\frac{1}{2}$ -, and 4-inch mesh) were set overnight at 25 and 50 fathoms off Grand Haven and off Racine. Catches were light.

A gang of nylon gill nets (minus the 100 feet of 2-inch mesh) set for 5 nights at 80 fathoms off Racine took 1,670 chubs. It appeared that the smaller meshes "loaded up" and practically quit fishing early in the set. Nearly all the fish in the smaller meshes were very soft. They must have been in the net for several days. Most of the chubs in this set were difficult to identify, since they were intermediate in appearance between typical L. hoyi and L. kiyi. There were, however, several quite typical L. kiyi, but not nearly so many as were taken in similar sets in the same area in 1954.

Linen gill nets set off Grand Haven, compared with identical gangs set at the same time of year in 1954, took considerably fewer of all chub species at 25 fathoms, and about the same number of bloaters but fewer of other chub species at 50 fathoms. L. kiyi continued to be especially scarce in sets made this cruise. Nothing of significance other than chubs was taken in the gill nets.

Hydrographic collections and observations were made at 25-fathom stations off Grand Haven and Racine and

at a 70-fathom station in midlake between Grand Haven and Racine. Surface water temperatures were very uniform along the transect made across the lake from Grand Haven to Racine, ranging mostly from about 69° F. on the east side to about 67° F. on the west side. Extremes recorded during the cruise were 64.2° F. and 73.4° F.

M/V "Cisco" Cruise 7: Light chub catches were made (August 30-September 12, 1960) in gangs of nylon gill nets (50 feet each of 1 $\frac{1}{4}$ - and 1 $\frac{1}{2}$ -inch, 200 feet of 2-inch, and 300 feet each of 2 $\frac{3}{8}$ -, 2 $\frac{1}{2}$ -, 2 $\frac{3}{4}$ -, 3-, 3 $\frac{1}{2}$ -, and 4-inch mesh) set overnight at 25 and 50 fathoms off Grand Haven, Mich., and off St. Joseph, Mich.

The catch at 50 fathoms off Grand Haven is an average of 4 overnight sets lifted on successive days. These 4 sets, as well as single 2-, 3-, and 4-night sets were made to study variations in catches on successive nights, and differences in catches in nets set for varying lengths of time. The 1-night sets took 277, 217, 151, and 169 chubs, respectively; the 2-, 3-, and 4-night sets took 438, 615, and 760 chubs, respectively. The percentage increase in catch with increased duration of set was greater than during experiments in previous cruises when catches were larger and heavily fishing meshes "loaded up."

Catches were also light in linen gill nets set for 5 nights at 25 fathoms (255 feet each of 2 $\frac{3}{8}$ -, 2 $\frac{1}{2}$ -, 2 $\frac{5}{8}$ -, 2 $\frac{3}{4}$ -, and 3-inch mesh) and at 50 fathoms (510 feet of each of the above mesh sizes) off Grand Haven. At 25 fathoms there were 215 Leucichthys hoyi, 1 L. alpenae, and 4 lake herring; at 50 fathoms, 193 L. hoyi, 5 L. alpenae, 4 L. reighardi, 12 L. kiyi, and 2 L. zenithicus. In identical sets made in 1954 at the same time of year, catches of all species were considerably larger at 25 fathoms; at 50 fathoms there were appreciably fewer L. hoyi in 1954, but about the same numbers of the other species. A few deep-water sculpins were all that were taken with the chubs and herring in the gill nets.

A 52-foot commercial-type balloon trawl was fished off Grand Haven and St. Joseph. All tows off St. Joseph were approximately due west of port as were all tows off Grand Haven except those at 7, 10, and 12 fathoms, which were 4 to 6 miles south of port. The trawl catches were generally smaller than during previous cruises. The catches at intermediate depths (15° to 40° F.) were exclusively chubs except for a few deep-water sculpins and slimy sculpins and an occasional yellow perch or smelt. At 45 and 50 fathoms off Grand Haven, however, 136 and 202 pounds, respectively, of deep-water sculpins were taken; and in the 7-, 10-, and 12-fathom drags off Grand Haven, yellow perch, alewives, and smelt were common (237 pounds of perch at 7 fathoms, 52 pounds of alewives at 10 fathoms, 18 pounds of smelt at 12 fathoms). At 7 fathoms there were also 25 pounds of spot-tail shiners and a few longnose suckers. Usually the chubs in the catches were 95 to 100 percent bloaters, but in the 20-fathom tow off St. Joseph, L. zenithicus and L. alpenae made up about 20 percent of the take.

Hydrographic collections and observations were made at regular 25-fathom stations off Grand Haven and St. Joseph. Surface-water temperatures, mostly about 75° F., were the highest observed this year. The maximum recorded in the open lake was 77.4° F. Near the end of the cruise, however, strong northerly winds set up a stiff current, and a resultant upwelling dropped surface-water temperatures to as low as 54.6° F. near the shore

off Grand Haven. The area of upwelling extended out from shore about 3 miles.

Note: Also see Commercial Fisheries Review, Oct. 1960 p. 30.

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WESTERN LAKE SUPERIOR FISHERY SURVEY CONTINUED:

M/V "Siscowet" Cruise 5: Studies during this cruise were conducted (August 8-17, 1960) by the U. S. Bureau of Commercial Fisheries research vessel Siscowet at Isle Royale, Mich., Thunder Bay, Ont., and Grand Marais, Minn. The Isle Royale stations were located in Rainbow Cove, north of Thompson's Island, south of Mott Island, northeast of Gull Island, southeast of Canoe Rocks, Todd Harbor, and east of Rock of Ages. In Thunder Bay the stations were located between Pie and Welcome Islands, and just south of Thunder Cape. At Grand Marais the station was just south of Grand Marais Harbor.

The objectives of cruise 5 were to collect various forms of chubs (Leucichthys sp.) and lake trout morphological studies, and to compare the relative abundance of the lake trout with previous years' catches.

Gill nets were fished at each station. The gangs were mostly small-mesh nets (1-, 2-, 2 $\frac{1}{4}$ -, 2 $\frac{1}{2}$ -, 3-, 3 $\frac{1}{2}$ -inch mesh). One 6-inch-mesh net was attached to the gang in search of large trout.

Good collections of chubs were made at nearly all stations in the Isle Royale area. A total of 451 L. hoyi, 216 L. zenithicus, and 116 L. kiyi were taken. The catch of small lake trout (409) was greater than the catch of 1959 (362) and 1958 (208). Most of the trout were 12 to 16 inches long. Only two large trout (siscowets) were captured and only one fish was scarred by lamprey.

The state of gonads from the Isle Royale chubs suggested that L. kiyi is the first to spawn in the fall; L. zenithicus spawns possibly in late fall or early winter; and L. hoyi spawns in late winter or early spring. The appearance of L. zenithicus at Isle Royale was similar to that of L. reighardi in the eastern part of Lake Superior. The L. reighardi have been observed, however, to spawn in the spring. Morphological studies must be made of these two species to seek means of separation.

The catches in the Thunder Bay region are believed to have included L. reighardi dymondi, a subspecies reported to exist along the north shore of Lake Superior. Positive identification was not made in the field, but preliminary examination of the fish strongly suggested its identity as L. dymondi.

The catch at Grand Marais, Minn., consisted mainly of bloaters (L. hoyi). The sexual development of these fish agreed very closely with that of bloaters taken at Isle Royale and Thunder Bay.

Fish collected from all areas for morphological studies totaled 204 L. zenithicus, 212 L. hoyi, 95 L. kiyi, 79 lake trout, 57 unidentified chubs, and 21 lake herring.

Surface temperatures at Isle Royale ranged from 55.7° F. northeast of Gull Island to 62.0° F. south of Mott Island. At Thunder Bay the surface temperature was 54.5° F. at Thunder Cape and 61.0° F. between Pie

and Welcome Islands. The surface temperature at Grand Marais, Minn., was 56.4° F.

Note: Also see Commercial Fisheries Review, Oct. 1960 p. 32.



Gulf Exploratory Fishery Program

EXPLORATORY FISHING FOR INDUSTRIAL FISH:

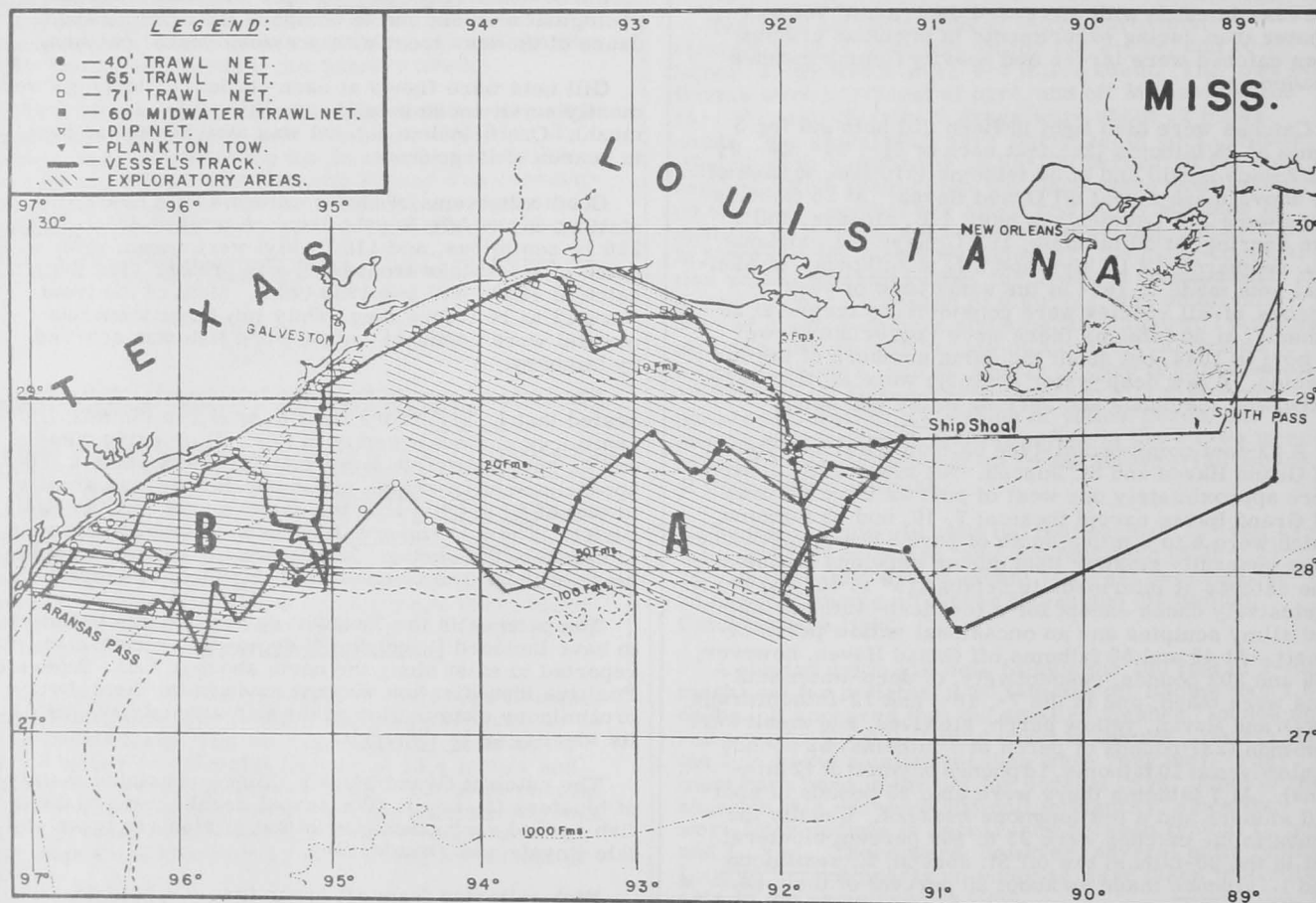
M/V "Oregon" Cruise 69: A 25-day exploratory survey (August 1-25, 1960) of industrial fish concentrations was made by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel Oregon between Ship Shoal, La., and Aransas Pass, Tex. A total of 81 bottom trawling stations, 3 midwater trawling stations, 8 dip-net stations, and 1 plankton station was made. A total of 20 surface-salinity readings was taken over the trawling areas.

beyond 30 fathoms were uniformly poor and transects out to 100 fathoms showed untrawlable bottom for the available gear. Midwater schools of fish were not encountered during any phase of the trip.

The best results were obtained between Ship Shoal and Galveston in 3 to 10 fathoms. The largest catch in this area was 4,200 pounds in a 2-hour drag. One drag made in 17 fathoms produced 1,500 pounds of round herring (Etrumeus sp.) and another produced 1,000 pounds of butterfish (Poronotus sp.).

One item of interest was the proportion of menhaden taken by bottom trawls. There were two species; Brevoortia patronus averaging 10-11 inches and B. gunteri averaging 6-7 inches. Surface salinity in the area ranged from 27.7 p.p.t. to 36.0 p.p.t.

Between Galveston and Aransas Pass, Tex., the most productive depths were also 3 to 10 fathoms. The best drags were made off Pass Cavallo where 1,500 pounds



M/V Oregon Cruise 69 (August 1-25, 1960).

Bottom trawls of three sizes were used during the trip. The most productive was a 71-foot, 2-seam balloon trawl using 10 by 3 foot chain-hung doors. A 65-foot, 4-seam flat trawl was used in some of the shallow-water drops, and a 40-foot, 2-seam balloon trawl was used where doubt existed about bottom conditions.

Catches between 10 and 30 fathoms were generally light and consisted primarily of scad (Decapterus sp.) and porgy (Stenotomus sp.). Bottom trawling conditions

of fish were taken in 1½-hour drags. Surface salinity in the area ranged from 37.1 p.p.t. to 38.4 p.p.t.

Approximately 600 pounds of various species were frozen or preserved for technological and biological studies.



Gulf Fishery Investigations

Following are some of the highlights of the studies conducted by the Galveston, Tex., Biological Laboratory of the U. S. Bureau of Commercial Fisheries during July-September 1960:

SHRIMP FISHERY INVESTIGATIONS: Pink Shrimp Growth: Investigation of the growth of pink shrimp during early juvenile stages was initiated in early August. Approximately 11,000 specimens taken from an arm of Biscayne Bay were graded to sizes ranging from 9 to 14 mm. (carapace length), marked by "feeding" them trypan red stain, and released. Bait shrimp fishermen and dealers were alerted to recover the marked shrimp, but none have been recaptured to date. A sample of 100 shrimp so marked is being held alive to check the stain's retentivity. Indications are that despite no recoveries, the marking phase of the experiment was a success.

Mortality of Marked Shrimp: The third phase of an experiment designed to evaluate the effects of marking as measured by the comparative survival of shrimp marked by various methods was completed this quarter. As in the two previous phases, stained and unmarked (control) shrimp experienced approximately equivalent survival. Specimens tagged with Petersen discs suffered appreciably greater mortality.

Larvae Studies: Efforts to rear penaeid larvae from eggs spawned by laboratory-held females were continued. To date no gravid white shrimp, *Penaeus setiferus*, with spermatophores attached have been taken alive. We are, therefore, investigating the feasibility of artificial fertilization, mixing eggs taken from gravid females with sperm dissected from intact spermatophores. Attempts to obtain fertile eggs by this means have thus far been unsuccessful.

Seabobs, *Xiphopenus kroyeri*, spawned (or, in some cases, aborted) in our aquaria several times during the quarter. Many of the eggs underwent considerable development before succumbing to predation by unidentified microzoans.

Several experiments aimed at improving techniques for rearing larvae were initiated. These involved varying the ratio of medium volume to organism; varying the rate with which the holding medium is agitated; controlling micro-organism populations with antibiotic and other chemical solutions; and rearing *Palaemonetes* (Caridea) larvae to draw inferences as to food requirements needed for optimum survival and growth of late larval stages in *Penaeidea*.

Commercial shrimp post-larvae are being reared to sizes at which species determination using adult characteristics can be made. This will validate the use of existing keys to identify post-larval *Penaeidae* occurring in the Galveston area.

Routine collection and tabulation of commercial production and effort statistics for Galveston Bay's bait shrimp fishery continued as they have since mid-1959. These statistics will be used in conjunction with comparable data obtained from the adjacent offshore fishery in attempts to relate (quantitatively) progeny occupying inshore "nursery" areas and their progenitors inhabiting offshore areas.

Indicative of the seasonal trend, bait production for the quarter showed a marked increase over that of the

previous quarter. Production for July was slightly lower than that for the same period a year ago while August's production exhibited almost a threefold increase. Greater utilization of shrimp for bait during the current year reflects a slight upward trend in local sport fishing activity and the reproduction of larger-than-normal broods of both brown and white shrimp. Comparable statistics are given in the following table:

Month	1960				1959			
	Catch (pounds)	Composition (%)		Lbs. Per Hrs. Effort	Catch (pounds)	Composition (%)		Lbs. Per Hrs. Effort
		Brown	White			Brown	White	
June	204,200	99	1	106.6	61,200	Data unavailable		5.5
July	149,600	63	37	42.9	166,000	40	60	54.4
Aug.	218,600	19	81	95.2	82,000	9	91	38.1
Sept.	Data not yet available				67,700	20	80	31.5

INDUSTRIAL FISHERY STUDIES: Considerable progress has been made in compiling and evaluating data collected during the past year on the spawning of groundfishes, particularly on the dominant species. Length-weight data were compiled and some sample curves worked out.

Croaker, spot, and white trout constituted 62 percent of the total catches by weight in July and 69 percent in August. In July and August 1959 these three species were 69 percent and 64 percent, respectively. Data for September showed the three dominant species constituted about 69 percent of the total catch by weight. Eight additional species made up the bulk of the catch and miscellaneous species constituted 7 percent of the catch by weight for July, 6 percent in August, and 9 percent in September, all of which was slightly less than the same period in 1959. The average number of species for July was 13, 10 for August, and 16 for September. New species identified were as follows: *Euthynnus alliteratus*, *Sphyræna barracuda*, *Monocanthus ciliatus*, *Ophidion holbrooki*, *Epinephelus niveatus*, *E. flavilimbatus*, *Lopholatilus chamaeleontion*, *Spheroides spengerli*, and an, as yet, unidentified flat fish. Our check list of species observed in industrial landings in the Pascagoula area now totals 181 vertebrates of 77 families and 32 species of invertebrates of 26 families. An unusual catch was made by the petfood trawler *Deacon's Daughter* when she took a 12-foot female tiger shark, *Galeocerdo cuvier*, estimated at over 600 pounds, off Horn Island in 4 fathoms of water.

Forty landings were sampled in July from a total of 1,724,943 pounds, 35 in August from 1,048,210 pounds and 30 in September. Fishing was disrupted in the middle of September by hurricane "Ethel." The average depth fished in July was 5 fathoms, in August it was 4.8 fathoms, and September 5 fathoms. Many of the large refrigerated vessels continued fishing west of the Mississippi River Delta well into August. During the same period of 1959, no vessels from the Pascagoula fleet were fishing in the area west of the river. By early September the entire fleet was fishing generally from just east of the Mobile ship channel to the Horn Island area. Catches have been generally good, and the fleet has been limited mainly by the amount of fish the plants could utilize. The vessels were averaging about one trip a week throughout the quarter. Two local plants ceased handling finfish during the shrimp season, but one had resumed canning petfood by the middle of September.

EFFECT OF PESTICIDES ON MARINE ORGANISMS: Determination of median tolerance limits for various insecticides was continued this quarter with most of the emphasis on brown shrimp (*Penaeus aztecus*) which were abundant locally from May through August. Since August, studies have been shifted to white shrimp (*P. setiferus*), blue crabs (*Callinectes sapidus*), pinfish

(*Lagodon rhomboides*), golden croaker (*Micropogon undulatus*), and spot (*Leiostomus xanthurus*). New chemicals tested this quarter include TDE (DDD), Methoxychlor (DMDT), Sabane, Rotenone, and Nemagon, all of which were less toxic to shrimp than most of the chlorinated hydrocarbons tested, such as Dieldrin, Heptachlor, DDT, Endrin, BHC, and Aldrin. Thus far, studies have been confined mainly to the chlorinated hydrocarbon group of pesticides. Work with the organic phosphates is pending the installation of a fume hood and acquisition of other safety equipment.

Note: See *Commercial Fisheries Review*, February 1960 p. 36.



Hawaii

COMMERCIAL FISHERY LANDINGS, JULY 1959-JUNE 1960:

Commercial fisheries landings of sea and pond fish in the State of Hawaii during the fiscal

Species		Quantity	Value
English Name	Hawaiian Name		
		1,000 Lbs.	US\$ 1,000
Ocean Catch:			
Amberjack	Kahala	75	22
Big-eyed scad	Akule	245	174
Dolphin	Mahimahi	102	52
Goatfish	Weke-ula Weke Moano Kumu	126	74
Crevalles	Ulua Omilu	86	39
Mackerel	Opelu	208	82
Snappers:			
Gray	Uku	44	21
Pink	Opakapaka Kalekale	108	57
Red	Ulaula koeae, ehu	60	53
Swordfishes, sailfishes spearfishes, & marlins	A'u & A'u lepe	693	186
Tuna & tunalike fish:			
Albacore	Ahipalaha	11	2
Big-eyed & bluefin		1,403	598
Yellowfin	Ahi	454	165
Skipjack	Aku	10,196	1,259
Bonito	Kawakawa	5	1
Shellfish:			
Crabs	Kona, Papai, Samoan	11	6
Limpet	Opihi	18	8
Lobster, spiny	Ula	13	8
Octopus	Hee	5	3
Squid	Muhee	5	2
Other fish & shellfish	-	316	125
Total Ocean Catch		14,184	2,937
Pond Catch:			
Clams	Olepe	2	1
Crabs	Kuakonu, Papai	6	3
Milkfish	Awa	16	6
Mullet	Amaama	47	40
Other species	-	13	7
Total Pond Catch		84	57
Grand Total		14,268	2,994

year July 1959-June 1960 amounted to 14.3 million pounds, valued at \$3.0 million ex-vessel, according to the Hawaiian Division of Fish and Game. Landings of tuna made up 84.6 percent of the quantity and 67.6 percent of the value of all fishery landings. Skipjack tuna was the most important species landed.

The Island of Oahu accounted for close to 10.9 million pounds (valued at about \$2.3 million), or about 76.7 percent of the quantity and 76.4 percent of the total value of all landings of sea and pond fish and shellfish in the fiscal year ending June 30, 1960. The Island of Hawaii was the second most important center of Hawaii's fishing industry and accounted for 15.3 percent of both the total landings and their value. Landings of commercial fish and shellfish in the Islands of Maui, Lanai, Molokai, and Kauai were quite light.

Island	Sea Catch		Pond Catch		Total Catch	
	Quantity	Value	Quantity	Value	Quantity	Value
	1,000 Lbs.	\$1,000	1,000 Lbs.	\$1,000	1,000 Lbs.	\$1,000
Hawaii	2,184	458	2	1	2,186	459
Maui	891	139	-	-	891	139
Lahai	13	5	-	-	13	5
Molokai	13	7	8	5	21	12
Oahu	10,863	2,235	74	51	10,937	2,286
Kauai	220	93	-	-	220	93
Total	14,184	2,937	84	57	14,286	2,994

Landings of commercial fish and shellfish in the Hawaiian Islands during July 1959-June 1960 by months were heaviest during the summer and early fall months. The July-October 1959 period accounted for 56.2 percent of the total landings. July 1959 alone accounted for close to 19.2 percent of the total landings. Landings of commercial fish and shellfish in the Hawaiian Islands are dominated by the seasonal availability of skipjack tuna. The fishery for tuna is the most important fishery in the Islands.

Period	Sea Catch		Pond Catch		Total Catch	
	Quantity	Value	Quantity	Value	Quantity	Value
	1,000 Lbs.	\$1,000	1,000 Lbs.	\$1,000	1,000 Lbs.	\$1,000
1959	2,739	391	6	3	2,745	394
July	2,101	323	6	4	2,107	327
Aug.	1,668	287	9	6	1,677	293
Sept.	1,480	278	6	3	1,486	281
Oct.	953	203	7	5	960	208
Nov.	558	241	17	13	575	254
Dec.						
1960						
Jan.	441	141	12	10	453	151
Feb.	448	167	6	5	454	172
March	690	219	3	1	693	220
Apr.	816	220	4	3	820	223
May	1,180	229	5	3	1,185	232
June	1,110	238	3	1	1,113	239
Total	14,184	2,937	84	57	14,268	2,994

Note: See *Commercial Fisheries Review*, May 1960, p. 25.

Industrial Fish as Food for Ranch Mink

The United States ranch-mink industry in 1958 was composed of approximately 6.5 million animals, including breeders and pelters. It is estimated that the 1960 herd size will increase by 10-15 percent to over 7.0 million mink. Three-fourths of the mink production is concentrated in the Great Lakes states and adjacent Midwest states, with Wisconsin producing almost four times as many animals as any other state. Western and Pacific Northwest states account for 15 percent of the production, with most of the remaining 10 percent accounted for by the New England and Middle Atlantic States.

Fish, including the nonmarketable species for human consumption and scrap fish from fish-processing plants, provide an economical and highly nutritious source of feed for ranch mink. Mink ranchers can be expected to use an estimated 256 million pounds of fresh and frozen fish and fish scrap in 1960.

Table 1 - Estimated Potential Use of Fish by Mink Ranchers

Area	Average Level of Fish in Ration	Estimated Consumption of Fish
	%	Million Lbs.
Great Lakes & Midwest States	25	164
West & Pacific Northwest	50	66
Atlantic Coast	30	26
Total		256

This is based on an average total feed consumption of 125 pounds per animal annually. In addition, a limited amount of fish meal is used--some in the cereal portion of the rations and a lesser amount as a replacement for fresh fish. An estimated 2.5 million pounds of fish meal will be utilized in mink rations during 1960.

In the Midwest between 40 million and 50 million pounds of the fish used will be of fresh-water origin, composed of sheepshead, carp, smelt, bloater chubs, tullibeas, lake herring, alewives, yellow perch and pickerel fillet scrap, and miscellaneous species. Salt-water fish used by Midwest ranchers will include whole whiting and hake, cod and flounder scrap, miscellaneous species from the Atlantic Coast; croakers and a conglomerate of species from the Gulf of Mexico; and sole and rockfish scrap from the Pacific Northwest states. Western ranchers utilize whole fish composed of various species of sole and rockfish not used for human consumption, either because of their small size or limited markets, and a few miscellaneous species. Waste from West Coast fillet-processing industries is exten-

sively used for mink feed. Some croakers are used by Colorado and Utah ranchers. Atlantic Coast ranchers make use of whiting and hake; cod, flounder, and other fish-processing scrap; and whatever species of whole fish are available to them locally.

Most of the fish is distributed to ranchers through feed dealers and mink ranchers' co-ops. This is generally true throughout the United States. Ranchers who have the freezer capacity, do take advantage of local sources of fish. The trend in the Midwest is toward a ready-mixed complete ration, either frozen and delivered to ranchers by feed dealers, or delivered ready to feed from co-ops.

The price the rancher pays for fish frozen and delivered to the ranch averages about \$4.50 a hundred pounds. Some ranchers may pay as much as \$6.00 for preferred species, or as little as \$2.00 for thiaminase fish and fish scrap. Costs of freezing, packaging, handling, transportation, and brokerage fees average about \$2.25 a hundred pounds. There is, of course, considerable variation in this cost, depending on the circumstances and efficiency of operations. Fish from the Atlantic Coast and the Gulf can be delivered frozen into Chicago at \$3.50-\$4.00 a hundred pounds.

Fish produced for mink feed must be of a quality almost equivalent to fish used for human consumption. This point cannot be overemphasized. Fish should be iced aboard the vessels and in the plants until frozen. The fish should be packaged in 50-pound containers, either boxes or bags, of no greater than six-inch thickness and quick-frozen, preferably at -20° F. Cold storage should be at -5° F. Fish which contain the thiaminase factor should not be included with other fish unless all the fish are to be cooked or treated to destroy the enzyme.

The mink-food market for fish can be expected to increase, particularly if efforts are maintained to keep the quality of fish high. This increase can be accelerated through research into methods of making greater use of present abundant sources of thiaminase fish, through research into ways to reduce feed costs and increase profits, and through increased use of fish in mink rations.

--Walter G. Jones,
Fishery Marketing Specialist,
Branch of Marketing,
Division of Industrial Research,
U. S. Bureau of Commercial Fisheries,
Ann Arbor, Mich.



North Atlantic Fisheries Investigations

DISTRIBUTION AND ABUNDANCE OF GROUND FISH IN THE INSHORE NURSERY AREAS SURVEYED:

M/V "Capt. Bill III": A 5-day cruise (the second of a series), by the chartered fishing vessel Capt. Bill III was made late in August by fishery biologists of the U. S. Bureau of Commercial Fisheries to determine the distribution and abundance of bottom fish inhabiting inshore waters, especially small haddock which might be taken by unregulated boats using small mesh trawl nets. The survey was made in the vicinity of Cape Cod and the Massachusetts Bay area between Cape Ann and the Isles of Shoals.

Thirty-two different kinds of fish were taken in the 30 tows. Haddock and cod were the most abundant of the food fish, and dogfish far outnumbered the noncommercial fish taken. Several schools of tuna were sighted in various parts of Cape Cod Bay during the 5-day period. The haddock data will be used in a study of the extent of nursery grounds at this season of the year.

A special collection of dogfish was made for the University of Cambridge, England.

Note: Also see Commercial Fisheries Review, Sept. 1960 p. 25.



North Pacific

Exploratory Fishery Program

GOOD TRAWLING BOTTOM FOUND OFF BRITISH COLUMBIA:

M/V "John N. Cobb" Cruise 47: A relatively large clear area of about 60 square miles of trawlable ocean-bottom was found northwest of Triangle Island by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel John N. Cobb. Catches of 3,000 pounds of rockfish and from 200 to 700 pounds of Dover sole per hour tow were commonly made in the area at depths from 75-115 fathoms. Good catches of rock sole and true cod were obtained at depths from 50-75 fathoms. The vessel returned to Seattle September 9, 1960, completing an 8-week exploratory bottom-trawling cruise off British Columbia.

Several small patches of clear dragging bottom were found south of the Scott Islands

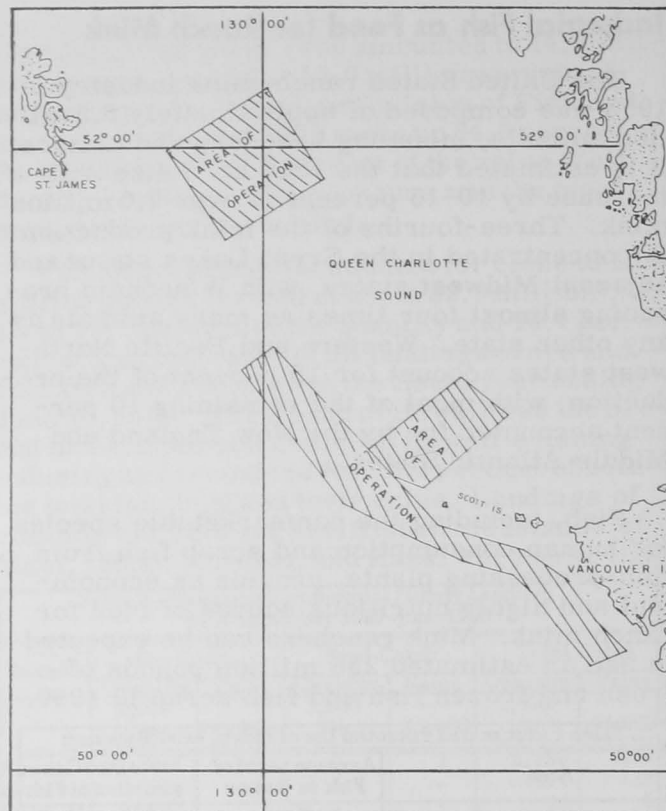


Fig 1 - M/V John N. Cobb Cruise 47 (July 18-September 9, 1960).

where the commercial trawl fleet had previously been unable to fish. Good catches of rockfish and Dover sole were taken in that area.

Only a small patch of clear bottom was found in the limited time available for surveying the Queen Charlotte Sound region. As precise radio bearings are difficult to obtain in that area and it is too far from shore to obtain radar fixes from coastal promontories, commercial trawlers would probably not be able to position themselves accurately enough to utilize this restricted ground. Future work to extend the survey thus seems advisable for that region.

Soundings shown on charts for the areas investigated northwest of Triangle Island and in Queen Charlotte Sound were scanty and often in error. Special efforts were therefore made during the cruise to compile extensive and accurate soundings. The soundings will be summarized and distributed to the trawl fleet to facilitate their fishing operations.

Locations of the delineated clear areas and catches obtained were communicated to

the trawling fleet directly, and through their association representatives as soon as the survey work was complete in each area.

The procedure used to survey the area was as follows: (1) Sounding transects, using a high resolution research model echo-sounder, were made approximately two miles apart and at right angles to each other. The character of the bottom with respect to hardness was plotted during the sounding transects as were the definitely untrawlable stretches. (2) The promising sections within the soft bottom areas were then surveyed using a snag cable 280 feet long between standard 8-foot by 4-foot otter doors. (3) On snag cable tows coming clear a standard 400-mesh eastern otter trawl was towed to evaluate the species and magnitude of fish populations present.

A total of 129 stations including sounding transects, snag cable tows, and otter trawl tows were made during the cruise.

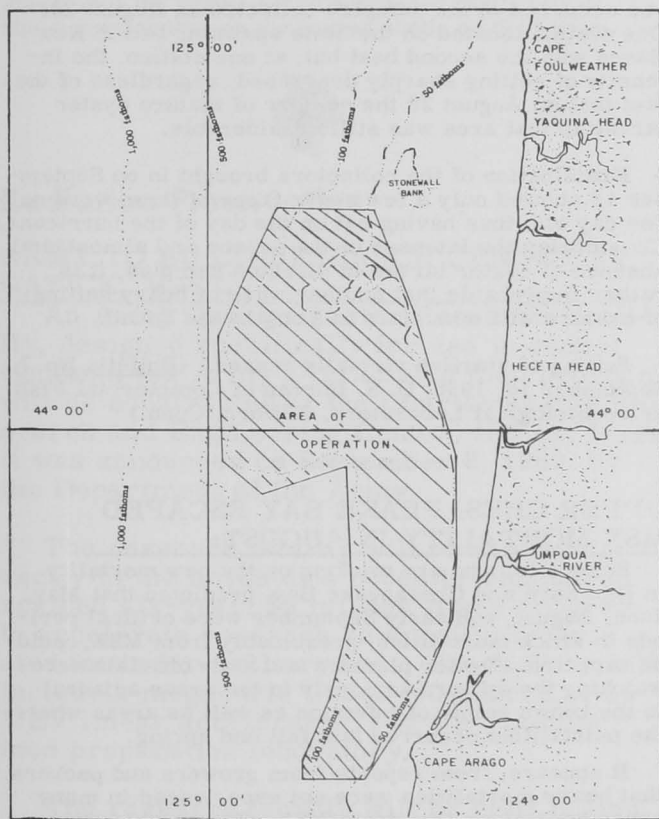


Fig. 2 - M/V John N. Cobb Cruise 48 (September 26-November 5, 1960).

M/V "John N. Cobb" Cruise 48: The John N. Cobb departed Seattle on September 26, 1960, for 6 weeks of exploratory shrimp fishing between Coos Bay and Newport, Oreg., in cooperation with the Oregon Fish Commission.

Biologists from the Fish Commission were aboard during the entire cruise and participated in all phases of the operation. The primary purpose of the cruise was to delineate commercial shrimp grounds.



Oregon

HATCHERY-PRODUCED SALMON SUPPLEMENT NATURAL SPAWNING:

Salmon and steelhead releases from 16 Oregon Fish Commission hatcheries for the first six months of 1960 totaled more than 42 million fingerlings. The releases were made, according to the Director of Fish Culture, as a supplement to natural fish stocks. The hatcheries are located on key rivers throughout the state.

Coastal rivers received 1,755,000 fingerlings of which 105,000 were steelhead, 309,000 fall chinook, 226,000 chums, and 1,114,000 silver salmon.

The main Columbia River and small tributaries received 26,000 spring chinook, 31,696,000 fall chinook, 103,000 steelhead, 1,230,000 chums, and 2,656,000 silver for a total of 35,711,000 fish.

Willamette River was stocked with 4,663,000 fingerlings. Contributions to that area were 3,935,000 spring chinook, 201,000 fall chinook, 528,000 steelhead, and 3,770,000 silvers.

"All of the silvers, spring chinook, and steelhead were released as yearlings from 4 to 6 inches in length," the Director of Fish Culture stated. "Chums were released as unfed fry and fall chinook were fed up to 90 days to correspond with natural migration habits of these species. The silver salmon yearlings included in the stocking program were from the 1958 brood and will return as adults to the sport and commercial fisheries in the summer and fall of 1961.

"The chinook fingerlings, also the 1958 brood, will return to the rivers in 1962 and 1963. Steelhead normally spend one or two years in fresh water and two or more years in the ocean, and will return during the winters of 1962 and 1963."

A new hatchery diet in pellet form was fed to all 1958 brood silvers and 449,000 of the spring chinook. Healthy, well-fed fish

are the result of feeding the new moist pellet developed by the Oregon Fish Commission and the Astoria Seafoods Laboratory of Oregon State College. The custom-made pellets contain tuna and salmon viscera and other fish products combined with meals and vitamin supplements to form the complete fish diet in one easy-to-handle form. An estimated 500,000-600,000 pounds of pellets will be fed during fiscal 1961 to fish in the hatcheries now.



Oysters

LONG ISLAND SOUND OBSERVATIONS ON SPAWNING AND SETTING:

As of August 31, 1960: During the week preceding August 31, 1960, the bottom water temperature of the oyster-producing section of Long Island Sound ranged between 70.5° F. and 74.5° F. The water was relatively clear, showing no dinoflagellate blooms.

Since August 23, the number of mature oyster larvae per sample remained relatively constant at one station, but showed a pronounced increase at another station. However, at still another station larvae were still uncommon. It may be of significance, nevertheless, that, although at the one station where the number of oyster larvae remained approximately the same, the total number of bivalve larvae increased more than tenfold, perhaps indicating generally favorable conditions for the existence of these organisms.

As was predicted, setting of oysters became heavier August 25 to 29. The heaviest setting occurred at one station located at a 20-foot depth in the Milford area and one station at a 30-foot depth in Bridgeport. Five other stations indicated a setting that may be of commercial importance, but 3 stations registered only a light and scattered setting.

Since a high percentage of oyster spat found on the collectors on August 29 was one-day-old or younger, the setting was expected to continue for several days. This is especially true in the region of one station where the number of mature oyster larvae significantly increased.

As the situation appeared at the end of August, it was rather probable that, during this summer, certain sections of Long Island Sound had already obtained an oyster set of commercial magnitude. Whether this set will survive combined attacks of drills, starfish, and flatworms (*Stylochus*) will depend upon the distribution and occurrence of those enemies and the control measures employed by the industry.

Setting of starfish continued but was still extremely light. Examination of the last set of collectors revealed the presence of one starfish spat per 40 shells at two stations. (Bulletin No. 6, August 31, 1960, U. S. Bureau of Commercial Fisheries Biological Laboratory, Milford, Conn.)

As of September 15, 1960: During the first ten days of September 1960 the bottom water temperature of the oyster-producing sections of Long Island Sound remained relatively steady, averaging between 72.0° F. and 73.0° F. However, hurricane "Donna" on September 12 somewhat reduced the temperature which on the day after the storm, ranged between 66.5° F. and 69.0° F.

Early in the month some mature oyster larvae were encountered in the plankton samples but, in general, their number began to show a decrease toward mid-September. On September 13 no oyster larvae were found in any of the samples. It is of interest, nevertheless, that the number of bivalve larvae other than oysters, mostly of the coot clam (*Mulinia*), was greater in the samples taken at all stations the day after the hurricane than in the collection made on September 9.

Larvae of the flatworm, possibly *Stylochus*, were encountered in the samples early in September and continued to occur in comparatively large numbers. A heavy setting of these oyster-killing worms has been recorded on spat collectors from Milford Harbor and Long Island Sound proper.

Setting of oysters continued during the first two weeks of September. Heaviest set was recorded at the same station where the largest number of mature larvae occurred in the samples collected on August 29. One station located on the State spawning bed in New Haven was the second best but, at one station, the intensity of setting sharply decreased, regardless of the fact that on August 29 the number of mature oyster larvae in that area was still considerable.

Examination of the collectors brought in on September 13 showed only a few spat. Some of them were only one day old, thus having set on the day of the hurricane. Considering the lateness of the season and almost total absence of oyster larvae in plankton samples, it is rather improbable that another wave of heavy setting of oysters will take place in Long Island Sound.

Setting of starfish virtually ceased. (Bulletin No. 7, September 15, 1960, U. S. Bureau of Commercial Fisheries Biological Laboratory, Milford, Conn.)

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UPPER CHESAPEAKE BAY ESCAPED MSX MORTALITY IN AUGUST:

Scientists, who are working on the new mortality in Delaware and Chesapeake Bay, predicted that May, June, August, and early September were critical periods in which mortalities, presumably from MSX, could be expected. Oyster planters and state officials were watching the oysters anxiously in the areas adjacent to the known points of infection as well as areas where the mortalities occurred last fall and spring.

It appears, from reports from growers and packers, that heavy mortalities were not experienced in many areas heretofore free from MSX. The notable exception was losses of 15 to 30 percent of oysters planted off the mouth of the Rappahannock.

Since that area is relatively close to the area of heavy losses in the Bay off Mobjack, it appears that there has been little expansion of the zones of heavy damage. Even in the areas where 50 to 75 percent mortalities were found last year, the rate of losses,

appear to be substantially less than last year, and far less than is taking place in the same oysters placed on experimental test trays. No explanation can be made of this difference at present.

The zones of high mortality in lower Chesapeake still are confined to the western side of the Bay from off the Rappahannock River to the mouth of the Bay, to Mobjack Bay, the lower York River, and the lower James River.

Oysters in the James River seed area still are free from MSX, according to the Head of Shellfish Investigations of the Virginia Fisheries Laboratory. A shellfish biologist reports some mortality in Holland Straits of adult oysters, but explains that they are heavily infested with *Dermocystidium*, which might account for the losses.

* * * * *

SET BEST ON SHELLS SUSPENDED ON RACKS:

An experiment conducted in 1959 in the Cape Cod, Mass., area by biologists of the U. S. Bureau of Commercial Fisheries indicated that oysters set preferably on shells suspended on racks rather than on shells placed in bags on the bottom. The higher density of set on suspended shells was attributed to greater silting of bottom shells. This summer the experiment was repeated and bottom shells were flushed regularly and remained clean; still the oyster set on suspended shells was 3 times greater than on the bagged shells on the bottom.



Radiation Preservation

ARMY TO BUILD RESEARCH CENTER AT NATICK, MASS.:

An Army Quartermaster Research Facility, designed specifically for use in connection with the Army's irradiated food program, will be constructed at the Quartermaster Research and Engineering Center, Natick, Mass., it was announced on September 8, 1960, by the Department of the Army.

The research facility will be geared directly to the needs of a recently-announced revised six-year, \$5 million Army program to accelerate research on specific irradiated foods for military use. The facility will include a megacurie Cobalt-60 source, a 24 MEV linear accelerator, and a supporting food preparation laboratory.

The research facility will be built in lieu of a full-scale production plant, originally planned to be constructed at Stockton, Calif. Construction of the Stockton plant was suspended in October 1959 pending further laboratory studies to determine the feasibility of radiation as a practical means of food preservation. The Natick facility will assist in these studies.

Much of the planning and equipment developed for the original Stockton plant at a cost of \$1.3 million dollars will be adapted for use in the Natick facility. It is estimated that an additional \$1.8 million will be required to establish the Natick facility.

The new facility is expected to be operational in about two years. The facility will be made available for use by other agencies working in this field.

Location of the facility at Natick was determined on the basis of a detailed survey conducted by the Army. The Army received technical assistance from the Atomic Energy Commission. Advice also was invited from the Departments of Agriculture, Commerce, Interior, State, and Health, Education and Welfare, together with the International Cooperation Administration, and the Small Business Administration. All of the above agencies are members of the Interdepartmental Committee on Radiation Preservation of Food, formed in 1956.

The Army study considered such factors as operational efficiency for maximum utilization by all users, site development, construction costs, product availability, and proximity of highways, railways, airways, and related transportation.

The Army program, which is administered by the Quartermaster General, concentrates on total sterilization to preserve food for long periods of time. This aspect of irradiated food is of greatest interest to the military. The Army program is being closely coordinated with a civilian research program being developed by the Atomic Energy Commission (AEC) and with the Interdepartmental Committee on Radiation Preservation of Food. The AEC program will concentrate on low-dose radiation processing of perishable food to extend shelf life.

Note: Also see *Commercial Fisheries Review*, May 1960 p. 29, Mar. 1960 p. 37, Oct. 1959 p. 16.



South Atlantic Exploratory Fishery Program

SCALLOP AND SHRIMP RESOURCES SURVEY OFF FLORIDA EAST COAST PLANNED:

M/V "Silver Bay" Cruise 26: The U. S. Bureau of Commercial Fisheries chartered fishing vessel Silver Bay was scheduled to

leave Brunswick, Ga., on October 18, 1960, to make a 5-week survey of the scallop and shrimp resources off the coast of Florida, between Cape Canaveral and Key West.

Due to the number of requests for another series of scallop-dredging demonstration trips, similar to the series conducted in June this year, daily trips from Ft. Pierce, Fla., were scheduled for October 19-21. Interested persons were invited to accompany the Silver Bay.



Tuna

U. S. BIOLOGIST ACCOMPANIES NORWEGIAN SURVEY CRUISE OFF WEST AFRICA:

A U. S. Bureau of Commercial Fisheries biologist from the San Diego, Calif., Biological Laboratory staff was an observer aboard the Norwegian research vessel Johan Hjort while on a two-months cruise to African waters, which began about October 1, 1960. Ten Norwegian commercial fishing vessels accompanied the research vessel.

Purpose of the expedition was to determine if it is feasible for Norwegian vessels to develop a tuna fishery south of Dakar, West Africa.

The United States biologist studied the use of sonar equipment in locating and tracking tuna. The invitation to join the cruise came to the Bureau from the Director of the Institute of Marine Research, Bergen, Norway.



U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, JULY 1960:

Imports of edible fresh, frozen, and processed fish and shellfish into the United States during July 1960 increased by 6.9 percent in quantity, but were lower by 1.3 percent in value as compared with June 1960. The increase in quantity was due primarily to higher imports of groundfish fillets (up 8.4 million pounds) and frozen tuna other than albacore (up 3.7 million pounds), and to a lesser degree, an increase in the imports of fresh and frozen salmon and fresh

swordfish. The increases were partly offset by a 3.9-million-pound decrease in the imports of lobster and spiny lobster and a drop of 1.6 million pounds in the imports of frozen shrimp.

Compared with July 1959, the imports in July this year were down 1.3 percent in quantity and 6.3 percent in value due to lower imports of most of the major imported fishery products. Compensating, in part, for the decreases was an increase of about 4.3 million pounds in the imports of frozen albacore and other tuna.

Item	QUANTITY			VALUE		
	July		Year	July		Year
	1960	1959	1959	1960	1959	1959
	(Millions of Lbs.)			(Millions of \$)		
Imports:						
Fish & shellfish: Fresh, frozen, & processed 1/	92.2	93.4	1,070.5	25.3	27.0	309.8
Exports:						
Fish & shellfish: Processed only 1/ (excluding fresh & frozen)	2.1	6.2	68.0	1.0	1.4	22.8

1/Includes pastes, sauces, clam chowder and juice, and other specialties.

United States exports of processed fish and shellfish in July 1960 were higher by 38.8 percent in quantity and 25.0 percent in value as compared with June 1960. Compared with the same month in 1959, the exports this July were lower by 66.5 percent in quantity and 28.6 percent in value. The drop in exports in July this year as compared with the same month in 1959 was due to sharply lower exports of canned California sardines and squid.

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA:

The quantity of tuna canned in brine which may be imported into the United States during the calendar year 1960 at the 12½-percent rate of duty is 53,448,330 pounds. Any imports in excess of the quota will be dutiable at 25 percent ad valorem.

Imports from January 1-September 3, 1960 amounted to 32,925,519 pounds, according to data compiled by the Bureau of Customs. From January 1-August 29, 1959, a total of 31,345,084 pounds had been imported.

IMPORTS AND EXPORTS OF SELECTED FISHERY PRODUCTS, JANUARY-JUNE 1960:

During the first half of 1960, the pattern of United States imports showed declines in some of the major commodities. Frozen groundfish and ocean perch fillets, frozen tuna, and fish meal imports decreased; shrimp and fresh or frozen lobster imports increased.

Exports of fish oils exceeded the levels reached during the first half of 1959, a record year. Canned salmon and canned sardine exports were down; shrimp and squid exports were up.

Imports: GROUND FISH AND OCEAN PERCH FILLETS AND BLOCKS: Imports of 32,946,000 pounds of frozen fillets during January-June 1960 were 40 percent less than during the first six months of 1959. Receipts from Canada, Denmark, Norway, and Iceland were lower. Imports of frozen blocks or slabs (33,886,000 pounds) were up 25 percent. Canada supplied 44 percent of the imported fish blocks.

TUNA, FRESH AND FROZEN: Frozen albacore imports of 36,971,000 pounds during January-June 1960 were 52 percent above the like period of 1959. Nearly all was received from Japan. Frozen yellowfin and other tuna imports of 69,807,000 pounds, on the other hand, declined 26 percent. Frozen yellowfin and other tuna imports from Japan were 42 percent less than during the first half of 1959.

TUNA, CANNED IN BRINE: During the first six months of 1960, imports of 6,738,000 pounds of canned white-meat tuna in brine were up 31 percent; imports of 16,156,000 pounds of canned light-meat tuna in brine were down 9 percent. Total receipts of canned tuna in brine were only slightly more than for the like period of 1959. As in the past, Japan was by far the leading supplier.

SHRIMP, MOSTLY FROZEN: Imports of 51,365,000 pounds during January-June 1960 were 3 percent higher than in January-June 1959. Supplying about two-thirds of the total, Mexico continued to account for the major part of the imports. Receipts from El Salvador were 3,241,000 pounds, more than three times those of the like period in 1959. Receipts from Japan, on the other hand, were 1,373,000 pounds or about one-fourth those of the comparable period of 1959. Imports of 1,069,000 pounds from India were down 20 percent.

LOBSTER AND SPINY LOBSTER, FRESH OR FROZEN: During the first six months of 1960, imports of northern lobsters were 14,564,000 pounds and imports of spiny lobsters were 18,475,000 pounds; both totals were higher than those of the similar period of 1959. Canada, Australia, and the Union of South Africa were the major suppliers.

SALMON, CANNED AND FRESH OR FROZEN: Imports of 12,541,000 pounds of canned salmon, nearly all from Japan, were 28 percent below those of January-June 1959. Imports of 2,632,000 pounds of fresh or frozen salmon, nearly all from Canada, were down 53 percent from those of a year earlier.

CANNED SARDINES: Due probably to reduced supplies of the domestic product, January-June 1960 imports of 5,000,000 pounds of canned sardines not-in-oil were nearly five times those imported during all of 1959. The Union of South Africa supplied 90 percent of the total. With Norway and Portugal supplying the major share, imports of 10,358,000 pounds of canned sardines in oil were 8 percent above those of the first half of 1959.

CANNED CRABMEAT AND CANNED OYSTERS: Japan supplied nearly all the canned crab meat and oysters imported into the United States. Imports of 2,978,000 pounds of canned oysters were 6 percent above those of January-June 1959. Imports of 1,246,000 pounds of canned crab meat declined sharply and were 71 percent less than those of the comparable period of 1959.

SEA SCALLOPS, FRESH OR FROZEN: During the first half of 1960, imports of 3,095,000 pounds were 85 percent above those of the similar period of 1959. The 2,744,000 pounds received from Canada were more than double those received during the like period of 1959.

FISH MEAL: During January-June 1960, imports of 66,375 short tons were only two-thirds those of the like period of 1959. Imports from Peru were 10 percent less than in 1959 and accounted for nearly one-half of the six-months' receipts; Canada supplied nearly one-third. No fish meal was received from Angola, which supplied 20,738 tons during the first half of 1959.

FISH SOLUBLES: Imports of 2,518 tons during the first six months of 1960 were only one-fourth those of the like period of 1959.

Exports: CANNED SARDINES, NOT-IN-OIL: During the first half of 1960, exports of 9,878,000 pounds were 73 percent below those of the like period of 1959. The Philippines, although the destination of more than half the exports, took 36 percent less than during the comparable period of 1959. Cuba, the second leading market in 1959, has taken only minor quantities in 1960.

CANNED SALMON: Exports of 2,583,000 pounds for January-June 1960 were 41 percent less than in the same period of 1959.

SHRIMP, FRESH, OR FROZEN AND CANNED: Canada took the major share of United States exports of shrimp products. Exports of fresh or frozen shrimp and of canned shrimp in January-June 1960, were each 1,234,000 pounds. Exports of fresh or frozen shrimp, however, were 63 percent higher than in January-June 1959; exports of canned shrimp were up 10 percent.

CANNED SQUID: During the first half of 1960, exports of 5,860,000 pounds were 15 percent above those of the 1959 period. The import controls initiated by the Philippines in April 1960, resulted in a drop in the exports to that country from 3,924,000 pounds in January-March to 434,000 pounds in April-June. Exports to Greece of 1,403,000 pounds were 25 percent less than in the comparable period of 1959.

FISH OILS: During the first half of 1960, exports of 52,820,000 pounds were 7 percent above those of the comparable period of 1959. The Netherlands and West Germany took 40,893,000 pounds. Sweden and Norway were other important outlets.

* * * * *

IMPORTS OF FISHERY PRODUCTS AT NEW HIGH DURING 1959:

For the tenth straight year, the annual value of United States imports of fishery products (edible and inedible, including all types of byproducts) has set a new record high. The 1959 value of fishery products imported into the United States was \$366.5 million, a gain of 12 percent over 1958 and 85 percent above 1950. Of the total, the value of fishery products for food uses was \$311.0 million and that for industrial purposes, \$55.5 million.

The United States continued as the world's leading importer of fishery products. Imports contributed the following share to the

United States supply of selected fishery products: groundfish and ocean perch fillets and blocks--67 percent; frozen tuna--50 percent; shrimp--42 percent; fresh or frozen northern lobster--42 percent; spiny lobster--89 percent; canned crabmeat--71 percent; and fish meal--28 percent. In most of those categories, imports made a substantial gain.

In 1959, 108 countries shared in the United States market for fishery products. For countries like Japan, fishery products were an important segment of their trade with the United States. Mexico earns a large part of its dollar exchange from the sale of shrimp. Likewise, frozen fish provides considerable dollar exchange for Canada and Iceland.

Trends by Countries: Canada, Japan, and Mexico continued to be the leading suppliers of fishery products imported into the United States (table 1). Products from those coun-

Table 1 - Value of United States Imports of Fishery Products, by Selected Countries of Origin, 1956-59

Country	1956	1957	1958	1959
	(\$1,000)			
Canada	95,483	97,404	107,005	101,967
Japan	70,800	77,202	84,872	96,226
Mexico	27,815	25,248	28,005	32,869
Norway	13,620	11,144	12,087	16,405
Peru	7,320	9,167	10,907	16,374
Union of South Africa	8,039	8,554	9,332	12,090
Iceland	6,200	6,022	8,775	10,000
Denmark	2,887	3,463	5,728	8,239
Australia	6,609	7,766	7,665	8,180
Panama	4,269	6,291	5,852	6,458
Portugal	4,907	5,507	5,177	5,452
Cuba	8,158	6,282	5,542	4,810
Ecuador	2,308	3,075	3,510	4,159
Angola	742	1,046	2,065	3,023
Brazil	2,976	2,337	2,359	3,002
Netherlands	928	2,496	1,509	2,628
United Kingdom	2,033	1,540	1,787	2,388
India	1,328	1,407	1,547	2,239
France	2,273	1,139	1,169	2,230
Chile	1,673	1,130	2,007	1,282
Other	10,829	19,223	20,271	26,479
Total	281,197	297,443	327,171	366,500

Note: Value at the foreign port of shipment.

tries accounted for 63 percent of the total value of all fishery imports. Norway, Peru, Union of South Africa, Iceland, Denmark, and Australia were other leading suppliers.

During 1956-59, significant increases occurred in annual imports from many countries including Japan, Peru, and Denmark.

CANADA: During 1959, Canada was again the leading supplier of fishery products to the United States market. As usual, a wide variety of Canadian fishery products were imported. Fresh or frozen fish and shellfish accounted for the largest part.

Table 2 - Value of United States Fishery Products Imports from Canada, 1959

Product	Value
Fresh or frozen:	\$1,000
Lobster	13,802
Groundfish fillets	13,191
Fresh-water fish	11,220
Salmon	7,212
Fresh-water fish fillets	6,052
Halibut	5,714
Flounder fillets	4,176
Fish blocks	3,850
Canned lobster	4,099
Fish meal and scrap	4,776
Other fishery products	21,736
Total	\$101,967

JAPAN: The value of fishery imports from Japan reached a record \$96.2 million in 1959 (table 3).

Table 3 - Value of United States Imports of Fishery Products from Japan, 1959

Product	Value
Fresh or frozen:	\$1,000
Albacore tuna	7,787
Other tuna	12,642
Shrimp	5,051
Swordfish fillets	4,323
Canned:	
Light-meat tuna in brine	13,254
White-meat tuna in brine	4,567
Salmon	10,778
Crab meat	7,908
Pearls, cultivated	12,875
Other	17,041
Total	\$96,226

As shown in table 1, imports from Japan have steadily increased, and that country may soon surpass Canada as the leading foreign supplier of fishery products to the United States market. Various tuna products account for a major part of the trade.

MEXICO: During 1959, Mexico supplied 64 percent of the total quantity of shrimp imported into the United States. Owing to these shrimp imports, Mexico was again the third leading supplier. The value of shrimp imports was more than 5 times that of all other fishery products received from Mexico--shrimp imports were valued at \$27.8 million and imports of all other types of fishery products from Mexico were valued at \$5.1 million; total imports, \$32.9 million.

Table 4 - Important United States Fishery Products Imports from Countries other than Canada, Japan, and Mexico, 1959

Country	Product	Value
Norway	Canned sardines	\$5,052
Peru	Fish meal	4,675
Union of South Africa	Frozen spiny lobster	7,897
Iceland	Groundfish fillets and blocks	6,052
Denmark	Frozen fillets and blocks	3,254
Australia	Frozen spiny lobster	7,392
Panama	Shrimp (mostly frozen)	6,259
Portugal	Canned sardines	6,623

OTHER COUNTRIES: In 1959, the most important fishery products imported from other leading suppliers included canned sardines, spiny lobsters, fillets, and fish meal (table 4).

Area of Origin: In 1959, the United States imported more fishery products from other North American countries than from any other area (table 5). The value of those im-

Area	Edible	Inedible	Total
	(\$1,000)		
North America	143,282	8,559	151,841
Asia	80,463	21,863	102,326
Europe	46,617	8,215	54,832
South America	18,253	10,807	29,060
Africa	11,801	5,521	17,322
Oceania	10,617	502	11,119
Total	311,033	55,467	366,500

Note: Value at the foreign port of shipment.

ports was \$151.8 million or 41 percent of the total. Asia, owing primarily to products originating in Japan, was the next leading source. Europe, South America, Africa, and Oceania followed in that order.

Trends by Commodities: In 1959, value-wise, fresh or frozen shrimp was again the leading commodity in the import trade (table 6). The other leading products in descending

Commodity	1956	1957	1958	1959
	(\$1,000)			
Edible Products:				
Fresh or frozen:				
Shrimp	32,986	35,415	43,162	52,306
Tuna	15,337	16,765	25,377	29,728
Groundfish fillets and blocks	25,987	27,417	30,431	38,759
Lobster	34,285	36,827	35,661	38,635
Other	50,663	55,575	63,243	60,940
Total fresh or frozen	159,258	171,999	197,874	220,368
Canned:				
Tuna	14,998	17,002	16,882	21,688
Salmon	11,650	9,470	11,271	11,130
Sardines	7,110	8,957	8,564	8,370
Crab meat	5,318	6,254	6,116	7,947
Lobster	5,031	5,017	3,952	6,441
Other	13,486	14,645	15,561	17,083
Total canned	57,593	61,345	62,346	72,659
Other edible products	16,315	17,612	19,992	18,006
Inedible Products:				
Fish meal	11,518	9,717	11,335	15,884
Pearls	8,651	9,989	10,944	13,678
Other	27,862	26,781	24,680	25,905
Total inedible	48,031	46,487	46,959	55,467
Total fishery imports	281,197	297,443	327,171	366,500

Note: Value at the foreign port of shipment.

importance were fresh or frozen groundfish and ocean perch fillets and blocks, fresh or frozen lobster, frozen tuna, canned tuna, fish meal, pearls, and canned salmon.

SHRIMP: Imports of shrimp rose to record high levels during 1959. The value of imports reached \$52.3 million. The principal supplier was Mexico, but increased quantities were received in 1959 from a number of countries, including Japan, Ecuador, Panama, India, and El Salvador.

TUNA: During 1959, the value of frozen tuna imports was \$29.7 million; the value of canned tuna, \$21.7 million. Japan is by far the leading supplier of frozen and canned tuna. A significant increase occurred in imports of canned tuna from Spain and Portugal.

GROUND FISH AND OCEAN PERCH FILLETS AND BLOCKS: In 1959, imports of fresh and frozen groundfish and ocean perch fillets and blocks reached a record high of \$38.8 million. The value of the frozen fish blocks alone was \$17.0 million or more than double imports during 1956. The principal sources of imported fillets and blocks were Canada and Iceland. Other important suppliers were Norway and Denmark.

LOBSTER: Imports were of two main types of lobster, northern lobster and spiny lobster. Canada supplies nearly all the northern lobster imported. The Union of South Africa, Cuba, and Australia have been the leading suppliers of spiny lobster. Imports of fresh or frozen lobster were valued at \$38.6 million canned lobster, \$6.4 million.

FISH MEAL: The quantity imported during 1959 was valued at \$15.9 million. Peru, Canada, Angola, Union of South Africa, and Chile were leading suppliers to the United States.

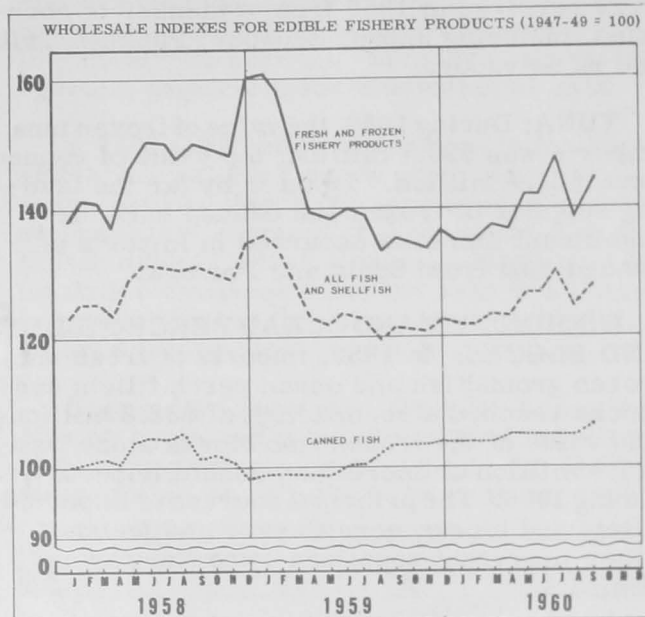
Duties Collected: Duties collected on imports of fishery products into the United States during 1959 totaled a record \$17.7 million (table 7).

Year	Duties Collected	Average Ad Valorem Equivalent
	\$1,000	Percent
1959	17,737	4.8
1958	16,645	5.1
1957	15,955	5.4
1956	15,504	5.5



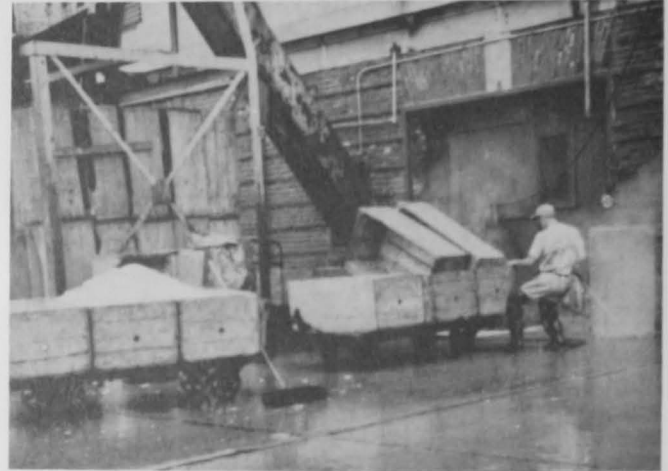
Wholesale Prices, September 1960

The mid-September 1960 wholesale price index for edible fishery products (fresh, frozen, and canned) at 128.1 percent



of the 1947-49 average was up 3.0 percent from the preceding month, and up 5.3 percent from the same month of 1959. The increase from August to September 1960 was due mainly to higher prices for haddock (drawn and filleted) and the fresh-water varieties. Prices in September this year were also up from September last year due to higher prices for canned and fresh salmon and for both fresh and frozen shrimp.

The wholesale price index for the drawn, dressed, and whole finfish subgroup in September this year increased



Washing fish boxes on the Boston Fish Pier.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, September 1960 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ (\$)		Indexes (1947-49=100)			
			Sept. 1960	Aug. 1960	Sept. 1960	Aug. 1960	July 1960	Sept. 1959
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					128.1	124.4	129.9	121.6
Fresh & Frozen Fishery Products:					143.7	138.5	147.7	134.8
Drawn, Dressed, or Whole Finfish:					169.8	158.1	165.1	159.9
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.12	.09	120.4	88.9	136.8	153.1
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.31	.36	95.4	109.9	106.2	101.1
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.94	.90	210.6	202.2	198.0	179.7
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.74	.64	183.5	158.7	156.2	179.7
Whitefish, L. Erie pound or gill net, rnd., fresh.	New York	lb.	1.00	.74	202.3	149.7	136.6	146.7
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.77	.73	179.4	170.0	158.3	170.0
Processed, Fresh (Fish & Shellfish):					137.0	131.6	146.0	124.3
Fillets, haddock, sml, skins on, 20-lb. tins	Boston	lb.	.32	.27	108.9	90.2	154.8	117.4
Shrimp, lge. (26-30 count), headless, fresh.	New York	lb.	.72	.68	114.1	106.6	124.8	105.1
Oysters, shucked, standards	Norfolk	gal	7.00	7.00	173.2	173.2	173.2	151.6
Processed, Frozen (Fish & Shellfish):					110.1	112.6	117.8	107.2
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.39	.39	100.8	102.1	100.8	98.8
Haddock, sml, skins on, 1-lb. pkg.	Boston	lb.	.28	.27	87.9	84.8	84.8	102.0
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.27	.27	108.7	108.7	106.7	108.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.69	.72	106.5	111.5	121.5	98.0
Canned Fishery Products:					106.5	104.8	104.8	103.4
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	25.50	24.50	133.0	127.8	127.8	127.8
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.10	11.10	80.0	80.0	80.0	77.9
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	7.65	8.00	89.8	93.9	93.9	88.1
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	8.75	8.75	93.1	93.1	93.1	93.1

1/Represent average prices for one day (Monday or Tuesday) during the week in which the 15th of the month occurs. These prices are published as indicators of movement and not necessarily absolute level. Daily Market News Service "Fishery Products Reports" should be referred to for actual prices.

7.4 percent as compared with August. An increase of about 35.4 percent (3 cents a pound) in ex-vessel prices for large haddock at Boston, plus a further increase of 4.2 percent in the fresh king salmon price at New York, and some increases in the prices for the fresh-water species were responsible for the increase from mid-August to mid-September 1960. Lower wholesale prices (down 13.2 percent) for frozen dressed Pacific halibut failed to offset the increases. From September a year ago to this September the wholesale price index increased 6.2 percent, due to a sharply higher price (up 17.2 percent) for fresh king salmon and higher prices for the fresh-water varieties during the Jewish holidays. These increases were partially offset by lower prices for fresh large drawn haddock (down 21.4 percent) and frozen dressed Pacific halibut (down 5.6 percent).

The fresh processed fish and shellfish subgroup wholesale index this September rose 4.1 percent from the preceding month. Lighter landings of small fresh haddock at Boston resulted in an increase of 20.7 percent in the price of small haddock fillets. In addition, the wholesale price for fresh shrimp at New York City advanced 7.0 percent. From September 1959 to September this year, the subgroup price index increased 10.2 percent due to a higher (14.2 percent) shucked oyster price and a higher (8.6 percent) fresh shrimp price. These increases were partly balanced out by a drop of 7.2 percent in the price for fresh small haddock fillets at Boston.

The mid-month September wholesale price index for the frozen processed fish and shellfish subgroup declined by 2.2 percent from August to September this year. A drop of 4.5 percent in the frozen shrimp (26-30 count) price at Chicago and a slightly lower frozen flounder fillet price were responsible for the change. An increase of about 1 cent a pound in the price for frozen small haddock fillets partially offset the increases. However, from September last year to this September the subgroup price index rose by 2.7 percent. Increases of about 2.0 percent for frozen flounder fillets and 8.7 percent for frozen shrimp more than offset a 13.8-percent drop in the frozen small haddock fillet price in September this year as compared with the same month of 1959. Prices for frozen ocean perch fillets were about unchanged from August to September this year and also about unchanged from September a year ago.

The canned fish primary price index this September was up 1.6 percent from the preceding month due to a 4.1-percent higher canned pink salmon price. Supplies of canned pink salmon from the 1960 pack are short. This increase more than offset a drop of 4.4 percent in the canners' opening price for the 1960 pack of California sardines. The lower price for California sardines is purely tentative as the new packing season was off to a slow start. Wholesale prices for canned fish this September were up 3.0 percent from September last year with the exception of the Maine sardine price which was unchanged.

