

TRENDS AND DEVELOPMENTS

Alaska

HERRING-EGGS-ON-KELP FISHERY AT CRAIG:

The director of the U. S. Bureau of Commercial Fisheries, Ketchikan Technological Laboratory visited Craig, Alaska, this past April to observe the harvest of herring-eggs-on-kelp as a guest of the Alaska Department of Fish and Game. The small commercial fishery for that product is only 8 years old but herring eggs are a historic food item among the local native people. The product is harvested on three herring spawning grounds located near Sitka, Hydaburg, and Craig. The Alaska Department of Fish and Game has set a quota of 225 tons on the harvest. Approximately 100 tons were harvested at Craig where 17 processors, 600 pickers, and 350 boats participated in the 90-minute season. For the most part these were from southeastern Alaska; but one vessel, the Fred D. Parr, and her crew of 28 were chartered from Seattle. The fishery yielded about 350 pounds of herring-eggs-on-kelp per fisherman worth about \$150 for 90 minutes of work. The product consists of $\frac{2}{3}$ to $\frac{4}{5}$ herring eggs by weight and is said to normally sell for about \$2 a pound in Japan but that the price reached \$12 a pound during the year-end holidays.

DENMARK IMPORTS

ALASKAN FISHERY PRODUCTS:

The United States Embassy in Denmark recently published a report on Danish imports of fishery products. The report stated that king crab, shrimp, and salmon accounted for most of the imports from the United States in 1965. All the king crab and much of the shrimp and salmon were of Alaskan origin. The sharp rise in king crab and shrimp imports by Denmark during the past few years was attributed to special marketing efforts.

LOGGING AND SALMON PROBLEMS DISCUSSED:

Mutual problems arising from the effects of the expanding logging industry in Alaska on salmon resources were discussed at a Juneau meeting between regional officials of the U. S. Bureau of Commercial Fisheries and a corresponding staff from the U. S. Forest Service management and research divisions. Summarized information was exchanged on the status of the salmon projects conducted by both services in Alaska. The need for more attention to those problems was brought into focus and it was agreed that a much increased liaison will be organized in Alaska between the Federal and state agencies concerned.

INTEREST IN SEWARD'S FISHERIES POTENTIAL:

A former Seward resident, who is engaged in the general investment and import business in Seattle, discussed with U. S. Bureau of Commercial Fisheries exploratory fishing personnel the possibilities for a bottomfish processing plant in Seward. The Seattle businessman heads a group of local investors anxious to put Seward back into the fishing industry.

NAVY TO RELEASE DUTCH HARBOR BUILDINGS FOR HOUSING NEEDS AT UNALASKA:

Senator Bartlett announced in his April 7, 1966, Washington Report, that certain facilities at the U. S. Navy Department's Dutch Harbor station would be made available for commercial use and that the Navy has agreed to permit area residents to move housing quarters from the base for reconstruction on civilian property.

There are 4 permanent and 3 floating shellfish-processing plants at Unalaska. Each operation employs between 35 and 125 persons.

While the plants primarily process crab, there are plans to expand at least one plant into processing shrimp, ocean perch, and other fish species. Local officials state that inadequate housing and commercial facilities are holding back growth of the industry. The absence of family quarters results in a high turnover of employees.

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NEW FISH-PROCESSING PLANTS AT KOTZEBUE AND GOLOVIN:

The Small Business Administration (SBA) has approved a \$350,000 loan to an Anchorage firm for the construction of fish-processing plants at Kotzebue and Golovin. The funds will also be used for the purchase of 2 tender boats and 2 floating fish-dressing stations. The loan, being made to the Anchorage Development Corporation, will create an estimated 24 new jobs.

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NEW VESSEL FOR KING CRAB FISHERY:

A new crab vessel, the Peggy Jo, stopped in Ketchikan this past April for fuel and a brief visit on her maiden voyage to Kodiak. This is the first new vessel designed and built specifically for the Alaskan king crab industry. She is 100 feet long, 28 feet wide, has a draft of 12 feet, and cost near \$300,000. Several other new crab vessels are now under construction.

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FISHERY SCIENTISTS ORGANIZE:

Alaska now has its own district organization of the American Institute of Fishery Research Biologists. Elected to head up the new organization of professional scientists were: T. R. Merrell, Bureau of Commercial Fisheries, U. S. Department of the Interior, as director; W. H. Noerenberg, Alaska Department of Fish and Game, as vice director; and W. L. Sheridan, U. S. Forest Service, as secretary-treasurer.

The parent organization has over 400 members, mostly in the United States, although some live in Europe, South America, Asia, and Africa. The goals of the Institute are to advance the theory and practice of fishery science by biologists and fishery managers and to maintain high standards among fishery scientists by recognition of achievement and by adherence to a code of professional ethics.

Alaska is a mother lode of natural fishery resources and there are many problems related to those resources. Members of the new District of the American Institute of Fishery Research Biologists hope that they may further the goals of fishery science and conservation. The District has already established its own committees on Conservation Education, Federal and State Fishery Legislation, and Professional Standards among fishery biologists.



Alaska Fisheries Explorations and Gear Development

SHRIMP BEHAVIOR-TRAP STUDIES COMPLETED:

Two months of shrimp behavior trap studies at Little Port Walters were completed this past April by staff members of the U. S. Bureau of Commercial Fisheries. Information gained was being put to immediate use in modifying shrimp pots for spring field operations.

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VESSEL CHARTERED FOR SHRIMP EXPLORATIONS:

The fishing vessel Little Lady of Petersburg, chartered by the U. S. Bureau of Commercial Fisheries, began a 54-day cruise in April 1966 for shrimp exploratory fishing and gear research. Activities will be concentrated in the southern part of Prince of Wales Island, particularly the Cordova Bay area.



Alaska Fisheries Investigations

SALMON EGG SURVIVAL RATES MAY BE IMPROVING:

Pending more complete information which will not be available until the persistence of excessive ice and snow on Olsen Creek is gone, the survival of salmon eggs in the post-earthquake intertidal zone may be showing signs of improving. Based on samples taken in April 1966, the overwinter survival rates of both pink and chum salmon eggs in the upper intertidal zone was considerably higher than for the first year after the earthquake in 1965. Further, the upper intertidal 1966 survival rates were similar to the pre-earth-

quake rates based on samples in the spring of 1964. While the zones are similar with respect to the tide, they occupy different locations because of the earthquake. The present upper intertidal zone is essentially the old middle or lower tidal zone.



American Fisheries Advisory Committee

21ST ANNUAL MEETING HELD IN WASHINGTON, D.C.:

The 21st annual meeting of the American Fisheries Advisory Committee was held May 9-10, 1966, in Washington, D. C. The Committee was addressed by Secretary of the Interior Stewart L. Udall. Text of the address by the Interior Secretary follows:

"It is again my pleasure to welcome the American Fisheries Advisory Committee to Washington. It is also gratifying to see that the excellent attendance continues through the 21 meetings held by this Committee since it was organized in 1955. This fact speaks well for your great interest and your willingness to assist the Department in deliberating the problems of the United States commercial fishing industry. I look forward to receiving your advice and recommendations for their solution.

"In scanning the agenda for this meeting, I note discussions dealing with the quality of the environment in which we live; international competition for fisheries resources; and current developments in respect to Fish Protein Concentrate. These topics are very timely, and are of vital importance to each of us as individuals; to the Nation as a whole; and to the world-wide struggle to which the United States is irrevocably committed.

"I especially share the concern of Dr. Cain (Assistant Secretary of the Interior for Fish and Wildlife and Parks), over the deteriorating quality of the environment in which we live. As you know, one of my main interests in very recent years has been in the conservation and management of water. Of all the natural resources presently known to man, undoubtedly the most abused is water. So long as streams could cope with the load of wastes, we were content to let them struggle along. Suddenly, the load has become too much. Even our salt water estuaries and certain coastal ocean waters are

being fouled. As representatives of the fishing industry, you are aware of the consequences which follow the deterioration of spawning and nursery areas for such important commercial species as shrimp, oysters, salmon, and menhaden. Anyone flying over Lake Erie can look down and see the cloudy mess of pollution which is killing much of the fish and plant life of that once sparkling clear body of water. The scene is like looking at the flyleaf of a book on the end of civilization. If we are unable to turn our great material wealth into saving our great natural wealth, then our prospects are indeed grim. It is not a situation we can dismiss--the piper is waiting to be paid.

"In recognition of our water resource problems, the 88th Congress passed the Water Resources Research Act on July 17, 1964. On that same date, an Office of Water Resources Research was established within the Department of the Interior. The purpose of this Act is to stimulate and sponsor programs of research and to promote the training of scientists capable of dealing with water problems. The program, within one year, stimulated establishment of water resources research institutes in each of the 50 States and the Commonwealth of Puerto Rico. Some of the projects initiated in the first year have dealt with the use and management of water for outdoor recreation, fish and wildlife, and other similar uses to which limited attention had been given.

"In addition, on July 22, 1965, President Johnson signed into law the Water Resources Planning Act--a history making piece of legislation designed to encourage conservation, development, and use of water and related land resources on a comprehensive and coordinated basis by the Federal Government, States, municipalities, and private enterprise. It also established the Water Resources Council, of which I am proud to be the chairman. The first task of the Council has been to study the serious drought condition in the Northeast, and to make recommendations for alleviating it in all possible ways.

"As the chief executive of this Nation's resource agency, I have dedicated myself to the conservation of all of our natural resources, both on land and in the sea. This goal is shared with me by many likewise dedicated members of this Department, some of whom are with us at this moment.

"Today we face a grave and subtle conservation challenge. I invite you--the key representatives of an industry which depends upon our valuable natural resources of the sea for its existence--to join me in meeting this challenge."

Note: See Commercial Fisheries Review, July 1965 p. 18.



California

1966 ANCHOVY REDUCTION FISHERY CLOSES:

Landings in the California anchovy reduction fishery totaled 16,436 tons through April 28, 1966, according to the California Department of Fish and Game. That fishery closed for the season on April 30 when a total of 17,051 tons had been taken--substantially below the authorized quota of 75,000 tons.

The taking of anchovy for straight reduction was approved in October 1965, by the California Department of Fish and Game which established the season as from October 15 to April 30 of each year, with a quota of 75,000 tons for the fishery. The California Department of Fish and Game also created five fishing zones and established quotas for each as: Zone 1 (Point Conception to Port Hueneme) 10,000 tons; Zone 2 (from Port Hueneme on the North to Dana Point on the South and reaches out to sea as far as Catalina Island) 10,000 tons; Zone 3 (Dana Point to the Mexican border) 10,000 tons; Zone 4 (the entire open ocean area west of Catalina and the Santa Barbara Islands) 35,000 tons; and Zone 5 (from Point Conception North) 10,000 tons.

Regulations adopted by that State's Fish and Game Commission stipulated that in areas South of Point Conception, no anchovy reduction fishing was allowed within three miles of the mainland shore or the mainland side of Catalina Island. Regulations also provided that the fishery in any zone shall terminate if the zone were to reach its quota before the overall season ends but provided that five days notice be given to terminate the fishery in any given zone.

During the 1966 season, landings were well below the established quotas for all zones except Zone 2 where the quota of 10,000 tons was reached before the season's end and the zone closed at midnight April 26. The

quota in Zone 2 was exceeded by 2,480 tons due to heavy landings between April 21, when the legally required 5 days notice of closure was given, and the time when the fishery actually closed. That zone proved highly productive and was the focal point of the reduction fishery largely because of its proximity to the majority of the fishing fleet and processing plants.

Note: See Commercial Fisheries Review, June 1966 p. 7.

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PELAGIC FISH POPULATION SURVEY CONTINUED:

M/V "Alaska" Cruise 66A-1-Pelagic Fish (March 14-19, 1966): The coastal waters of southern California from San Clemente Island to Port Hueneme were explored during this cruise by the California Department of Fish and Game research vessel Alaska.

Objectives of the cruise were to: (1) survey the spawning population of Pacific hake (Merluccius productus) to determine density and distribution; (2) gain experience in mid-water trawling for this species; and (3) test proposed new equipment, and monitor mid-water trawl performance by electronic means.



California Department of Fish & Game research vessel Alaska.

This survey was originally planned as a 4-week joint effort with the research vessels John N. Cobb and David Starr Jordan, Bureau of Commercial Fisheries, U. S. Department of the Interior. The Jordan was to survey for hake eggs and larvae and monitor the mid-water trawl performance of the other two vessels. The Alaska and Cobb were to midwater trawl for spawning hake in areas where eggs were most abundant.

However, due to unanticipated repairs, the Jordan could not participate and the egg and

larvae work was limited to a brief survey by the vessel Alexander Agassiz of Scripps Institution of Oceanography. Further, the Alaska was delayed because of her annual overhaul and joined the Cobb only during the final week. The reduced survey located no areas of concentrated spawning, and no spawning hake were taken.

Although no adult hake were found, a school of juveniles was located and sampled by the Cobb in Santa Monica Bay. Those fish were 10-130 fathoms from the surface in a submarine canyon that was 150 to 250 fathoms deep. The school was broken into small groups and extended for at least 2 miles in length but less than $\frac{1}{2}$ mile in width. Midwater trawling on that school by the Alaska was ineffective because the fish were too deep for the vessel's net-depth telemetering equipment.

Considerable experience was gained in operating equipment for fish occurring at deep levels. Through combined operations with the Cobb, it was learned how hake appear on the echo-sounder and what adjustments are required to record them at 80 to 140 fathoms. Observations were made of the Cobb's commercially-oriented operations which use gear considerably larger than on the Alaska.

Echo-sounding for hake detected many schools of anchovies. The Precision Depth Recorder was operated for 337 miles and recorded 373 schools. The schools were distributed over most of the area traversed and included considerable numbers 20 or more miles offshore. Most schools appeared as small "plumes" on the recorder occurring at 10-40 fathoms beneath the surface. Attempts to sample those fish were unsuccessful because of clear water and "flighty" fish. One mixed catch of anchovies and several species of bottom dwelling forms was made in shallow turbid water at Port Hueneme.

A Hach Turbidimeter (model 1720) was tested for measuring sea-water turbidities. Results indicate it is suitable for use at sea although the absolute range of turbidities in Jackson turbidity units is quite small.

Trial plankton tows were made to determine the suitability of the Alaska for egg and larvae surveys; no problems were encountered.

Note: See Commercial Fisheries Review, March 1966 p. 19.

Cans--Shipments for Fishery Products, January-February 1966

A total of 239,907 base boxes of steel and aluminum was consumed to make cans shipped to fish and shellfish canning plants in January-February 1966 as compared with 414,359 base boxes used during the same period in 1965.



Note: Statistics cover all commercial and captive plants known to be producing metal cans. A "base box" is an area of 31,360 square inches, equivalent to 112 sheets 14" x 20" size. Tonnage figures for steel (tinplate) cans are derived by use of the factor 23.7 base boxes per short ton of steel.

Source: U. S. Department of Commerce, Bureau of the Census.

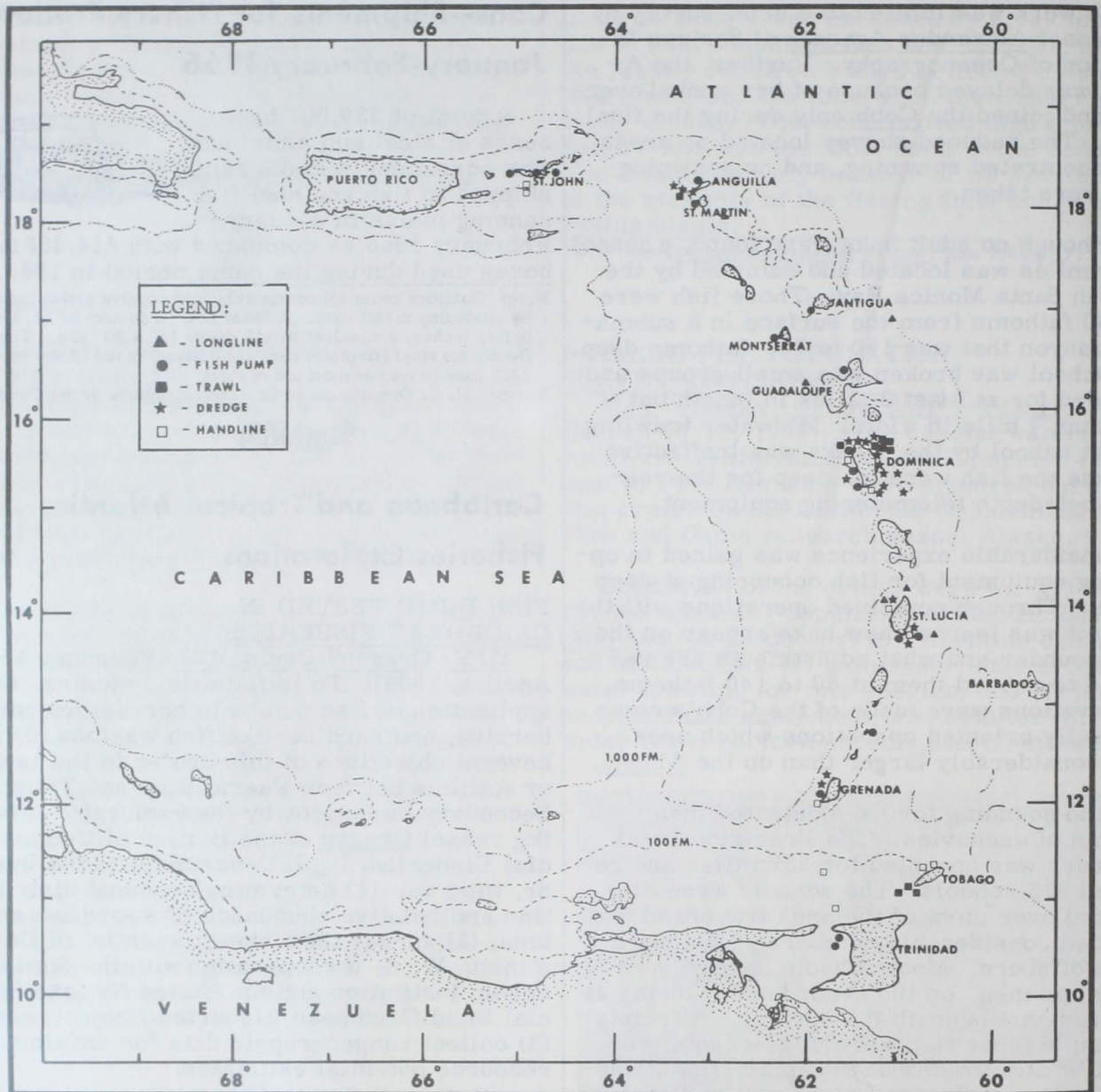


Caribbean and Tropical Atlantic Fisheries Explorations

FISH PUMP TESTED IN CARIBBEAN FISHERIES:

M/V "Oregon" Cruise 107 (February 15-April 1, 1966): To initiate field studies on the application of fish pumps to harvest anchovies, herring, and sardine-like fish was one of the several objectives of this cruise in the Lesser Antilles between Puerto Rico and Trinidad. Secondary objectives by the exploratory fishing vessel Oregon of the Bureau of Commercial Fisheries, U. S. Department of the Interior, were to: (1) determine seasonal distribution and relative abundance of swordfish and tuna; (2) survey the fishery potential of Dominica, W. I., in cooperation with the Smithsonian Institution and the United Nations Special Fund Caribbean Fisheries Project; and (3) collect zoogeographic data for developing resource potential estimates.

Extensive observations were made on the attraction of small schooling fishes to night lights and their susceptibility to capture with an experimental 6-inch (1,500 g.p.m.) fish pump. A total of 17 nights was devoted to the studies at the locations covered. Submerged 1,000-watt lights were used in combinations of from 1 to 4 units with precise intensity control. Species showing direct positive response to various light intensities included Anchoa lyolepis, Anchoviella eurystole, Jenkinsia sp., Membras sp., Harengula clupeiola, H. humeralis, and Chirocentrodon bleekermanus, all of which appeared in dense concentrations at various times during the observations. Species showing indirect positive response in-



Areas investigated during cruise 107 of the M/V Oregon (February 15-April 1, 1966).

cluded *Opisthonema oglinum*, *Decapterus punctatus*, *Trachurus* sp., and several other carangids. All of the latter species exhibited some degree of susceptibility to fish-pump capture. In addition, incidental captures of larger fish included miscellaneous flying fishes (avg. $\frac{1}{4}$ pound each) and large cutlassfish (2 to 3 pounds each). Highest sustained catch rates were made at Grenada where in 1 hour 234 pounds of anchovies and sardines were pumped. Samples of the most abundant species were sun-dried and sent to the Bureau's Technological Laboratory for composition analysis. Results of the first series of analyses follow:

Species	Area	Protein	Oil	Water	Ash
. (Percent)					
<i>Jenkinsia</i> sp. (1")	British Virgin Islands	61.9	7.9	12.5	17.7
<i>Jenkinsia</i> sp. (3")	St. Lucia	34.1	7.8	15.7	42.4
<i>Membras</i> sp.	British Virgin Islands	68.1	9.5	13.6	8.8
<i>Membras</i> sp.	Dominica	66.6	4.8	15.7	12.9
<i>Anchoa lyolepis</i>	Anguilla Island	40.3	7.4	14.5	37.8
<i>Harengula clupeiola</i>	Dominica	36.3	6.2	29.2	28.3

Long-line sets of 500 to 600 hooks were relatively unproductive. A nighttime set off Antigua yielded a single 78-pound swordfish. A daylight set east of St. Lucia yielded 5 blackfin (*Thunnus atlanticus*). The combined bill-

fish catch for all sets was one spearfish (Tetrapterus sp.) and one marlin (Makaira sp.). Additional species caught included 11 white-spotted sharks (average 160 pounds), barracuda (Sphyraena barracuda), snake mackerel (Gempylus sp.), and lancetfish (Alepisaurus sp.). Three sharks were tagged and released in cooperation with American Institute of Biological Sciences (AIBS) tagging studies and samples of flesh and liver were frozen from the remaining catch for analysis by Bureau technologists.

Deep-set lines of 41 hooks each were equipped with magnesium anchor releases and fished in 200 fathoms off Dominica and in 400 fathoms off St. Lucia. The Dominica set surfaced on schedule with a catch of 2 small sharks. The St. Lucia set failed to surface.

Species caught while trolling between stations were: 25 dolphin (Coryphaena hippurus and Coryphaena equisetis) average 12 pounds each, 4 skipjack tuna (Katsuwonus pelamis) average 4 to 19 pounds, 3 little tuna (Euthynnus alletteratus), 4 blackfin tuna (Thunnus atlanticus) average 8 pounds each, 1 wahoo (Acanthocybium solanderi) 37 pounds, 13 great barracuda (Sphyraena barracuda), 1 king mackerel (Scomberomorus cavalla) 23 pounds, 2 Spanish mackerel (Scomberomorus maculatus), and 1 cero (Scomberomorus regalis). Stomach contents and gonads of tuna and mackerel were preserved for the Bureau's Tropical Atlantic Biological Laboratory. Of unusual interest was a juvenile mola (Ranzania sp.) which was found in a dolphin's stomach.

Eight surface-tuna schools were seen between Puerto Rico and Tobago and identified as blackfin and skipjack tuna. Attempts to sample those schools by trolling from both the skiff and the Oregon were unsuccessful.

Fourteen trawl and 28 dredge stations were made on limited grounds in the vicinity of Anguilla, Antigua, Dominica, St. Lucia, and Tobago. Catch rates of brown shrimp (Penaeus brasiliensis) in 30 to 40 fathoms off Tobago ranged from 5 to 16 pounds (heads on) per hour with a 40-foot trawl. Shrimp varied from 11-15 to 26-30 count. Catches in this depth range were dominated by grunt (Haemulon melanurum) 4 per pound. Grunt and small vermilion snapper (Rhomboplites aurorubens) were filleted and frozen for taste

tests by the Bureau's Branch of Marketing Test Kitchen at Pascagoula. Deep-water shellfish of potential commercial value caught in 250 to 450 fathoms off Dominica included scarlet prawns (Plesiopenaeus edwardsianus)--17 pounds per hour (heads on), striped shrimp (Plesionika longipes), Penaeopsis megalops--12 pounds per hour, and lobsterettes (Eunephrops bairdii) and Nephropsis rosea). Dredging operations throughout the survey area were unproductive due to heavy accumulations of limestone rubble and rock.

Hand-line catches off Dominica, St. Lucia, Grenada, and Tobago were low and included 1 silk snapper (Lutjanus vivanus) 2 pounds, 4 croaker (Ophioscion sp.) $\frac{1}{2}$ pound each, 1 southern tilefish (Caulolatilus sp.) 2 pounds, 2 yellow-edge grouper (Epinephelus flavolimbatus) 10 pounds each, 1 warsaw (Epinephelus nigritus) 12 pounds, and several wenchman (Pristipomoides sp.) 1 to 2 pounds each.

Note: See Commercial Fisheries Review, January 1966, p. 23.

Central Pacific Fisheries Investigations

FORECAST FOR SUMMER 1966 HAWAIIAN SKIPJACK TUNA FISHERY:

The skipjack tuna (aku) fishermen of Hawaii, who had their best year in history in 1965, are probably not going to fare as well in 1966, according to scientists of the U. S. Department of Interior's Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii, who predict whether the summer 1966 skipjack tuna catch will be average or above average.

The Bureau's Honolulu Laboratory oceanographer, who has been preparing the skipjack forecasts for 10 years, says that 1966 promises to bring "below average landings, as did 1960." The annual average skipjack catch from 1948 through 1965 has been 10 million pounds. The catch in 1960 was 7.4 million pounds, 2.6 million pounds below the long-term average and less than half the record high catch of 16 million pounds in 1965.

The forecast is based on the time of the year when the surface water at Koko Head begins to warm up. When the water warms up in February and when "favorable" water of low salinity bathes the islands during the summer, the skipjack catch increases.

The laboratory scientist says, "We have found that two environmental indicators can be related to better than average fishing. The first is when the change of winter cooling of the surface water to spring warming occurs in February rather than in March. The second is when waters bathing the islands during the fishing season have a salinity of less than 34.8 parts per thousand. The first index, since it occurs in February or March, is of predictive value with respect to the main skipjack season during the summer months. This year the initial warming of the water took place in March and therefore indicates a fishing season with below average availability of skipjack tuna." The fact that the water warmed late, he points out, does not necessarily preclude favorable low salinity water from entering the islands region during the spring. However, he says, "As of March 31, Koko Head salinities have not yet begun their seasonal decline. In the 10 years since 1956, this has occurred only twice. That was in 1957 and 1960, when salinities began their decline in early April. The 1957 and 1960 skipjack seasons were both below average. Both 1957 and 1960 followed years with well above average catches. The forecast for 1966 therefore is for below average landings, as in 1960."

The scientist points out that the physical mechanisms which bring "favorable" water to the islands are unknown and until they are determined, the skipjack forecasts can be of only general value.

According to John C. Marr, the Bureau's director of the Hawaii Area, whenever the fishery differs substantially from the prediction, more is learned about skipjack. In 1965, for example, the fishery was much better than was expected on the basis of the Koko Head data. It turned out that during 1965 the catch of skipjack per unit of bait used was much greater than had been the case for any previous year.

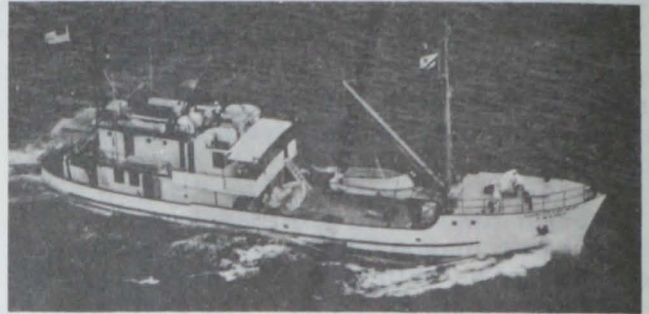
Note: See Commercial Fisheries Review, July 1965 p. 19.

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TUNA BIOLOGICAL STUDIES CONTINUED:

M/V "Charles H. Gilbert" Cruise 90
(March 31-April 6, 1966): The return of live yellowfin, skipjack, wavyback skipjack, and frigate mackerel to Kewalo Basin for density and red muscle size determination for locomotion and hydrodynamic studies was one of the main objectives of this cruise by the re-

search vessel Charles H. Gilbert, of the U.S. Bureau of Commercial Fisheries Biological Laboratory at Honolulu, Hawaii. The area of operations was within 100 miles of Oahu and Kauai.



Research vessel Charles H. Gilbert of the U. S. Bureau of Commercial Fisheries.

Other objectives of the cruise were to:
(1) collect and return live scombrids to behavior tank facilities for sensory threshold and behavior experiments; (2) return yellowfin that have been chilled in ice for a packing company to determine if blood streaks in cooked fish can be avoided; (3) collect blood samples for subpopulation analysis (Subpopulations Program) of skipjack in the Hawaiian Islands; (4) collect fresh samples of fish eye lenses and brains for enzyme studies; and (5) acquaint sea scouts with data collection at sea and seamanship.

Densities from 2 yellowfin and 1 skipjack that were returned live to Kewalo Basin were determined but scombrids of desired species and size were not caught for red muscle size determination. A total of 8 wavyback skipjack was returned live to behavior tank facilities, 10 yellowfin were returned to the packing company, 5 of which were chilled in ice and 5 were bled and chilled, 75 skipjack blood samples were collected and chilled, and eye lenses and brains of 2 dolphin and 5 wavyback skipjack were collected.

Thermograph and barograph were operated continuously during the cruise and the usual standard watch for fish, birds, and aquatic mammals was maintained.

Trolling lines were out continuously between Kewalo Basin and each fishing station; total trolling time was 40 hours 50 minutes. Two skipjack (Katsuwonus pelamis), 11 wavyback skipjack (Euthynnus affinis), 18 yellowfin (Thunnus albacares), 3 dolphin (Coryphaena hippurus) and 1 wahoo (Acanthocybium solan-

ri) were caught. Ten weather stations and bathythermograph stations were made.

ote: See Commercial Fisheries Review, June 1966 p. 11.

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NEW SONAR GEAR INSTALLED ON RESEARCH VESSEL "TOWNSEND CROMWELL":

A research vessel of the U. S. Bureau of Commercial Fisheries Biological Laboratory in Honolulu, Hawaii, is undergoing acceptance trials of special electronic equipment designed to reveal facets of fish behavior never known before.

Biologists agree that the central Pacific Ocean holds uncaught stores of tuna, one of the most valuable of the food fishes. A recent estimate says that at least 150,000 tons of a single species, the skipjack tuna, could be taken without harming the stock. That would about equal the entire U. S. catch of all species of tuna, and the tuna landings in dollar value are the third most important in the country.

But these tuna inhabit an area of some 30 million square miles, about 10 times the size of the continental United States. They are only rarely seen. Where and how they can be located depends on aspects of tuna behavior scientists have been unable to study until now.

The Bureau has installed on the research vessel Townsend Cromwell, operated by its laboratory in Honolulu, a new device that is expected to provide scientists with fresh clues for the finding and catching of the subsurface tunas. The device is a continuous-transmission, frequency-modulated (CTFM) sonar.

Sonar (from SOund NAavigation and RANGing) is a method of locating underwater objects by the sound they reflect. It is the underwater equivalent of the more familiar radar, but whereas radar uses radio waves, sonar uses sound waves, for sound waves travel great distances under water and radio waves do not.

The sonar consists of two principal elements. The first of these is a set of retractable transducers located in the bottom of the vessel. When in use, they are extended 5 feet beneath the keel. The sonar emits a continuous beam of high-frequency sound. When this sound strikes an object with a density different from water, a fish, for example, an echo

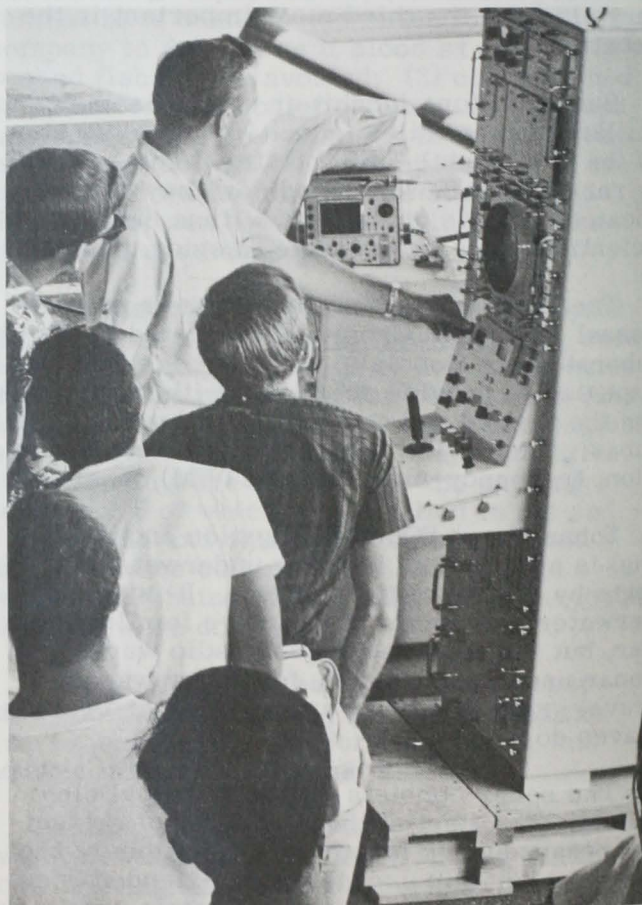
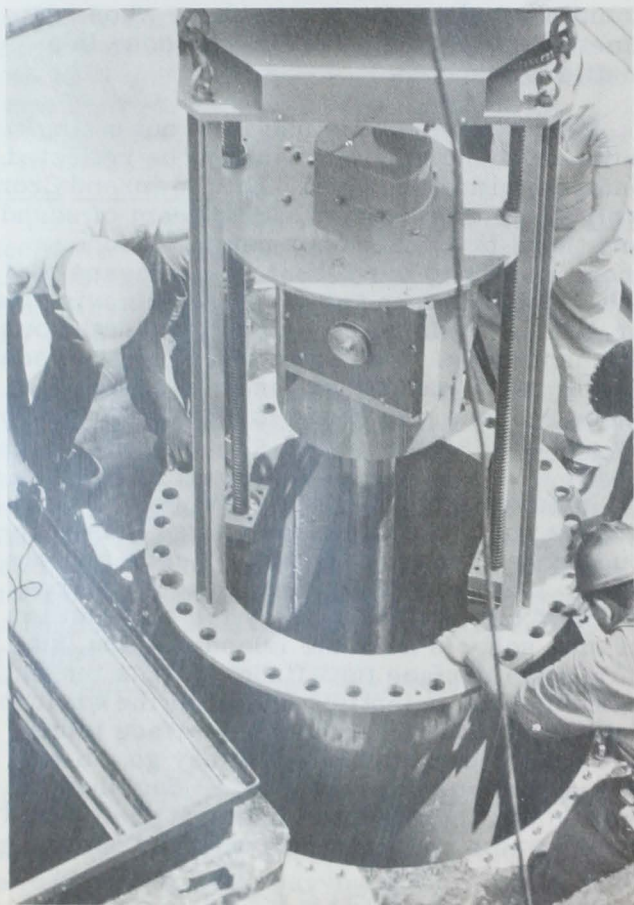
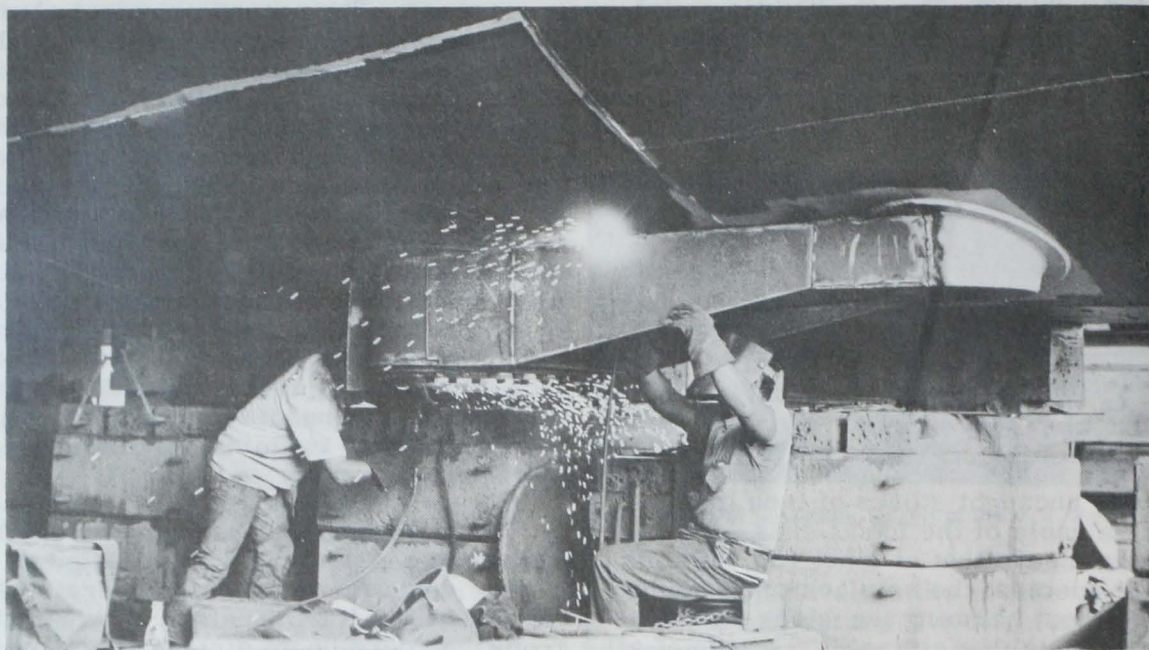
is returned. The second principal element of the sonar is the console, which is a large metal cabinet installed in the "sonar room" of the Townsend Cromwell. When an echo is returned to the transducer, it appears as a point of light on a cathode ray tube (like the screen of a television set); simultaneously it also produces a sound which can be heard through earphones. The operator can determine how far the object is from the ship, in what direction, and approximately how deep it is. Normally, searching is done automatically. In the search mode, he can detect skipjack tuna schools as far as 2,000 feet from the ship; a high resolution mode provides for a more detailed examination of objects within 400 feet of the ship.

The transducer can sweep a complete circle or it can play on a small segment of a circle, depending on how the operator sets the controls. It can operate in any position from the sound beam directed horizontally to it directed vertically. Thus it can search a complete underwater hemisphere whose diameter is 0.8 mile. This can be done in a matter of seconds.

Most sonars now in use send out a single pulse of sound and wait for it to be reflected before emitting another. The Townsend Cromwell sonar emits a continuous beam of sound and there is a continuous return of echoes from targets to the vessel. This means that the sonar can keep track of a fast-moving fish or school. This feature is called Continuous Transmission. The Townsend Cromwell sonar is frequency modulated, like FM radio. For these reasons, the sonar is often referred to as a CTFM sonar.

Installed early in April 1966 (see photographs on page 22), the sonar was being "debugged" and undergoing tests before acceptance. If it operates according to standards, its first use will be to study the composition of tuna schools near the island of Oahu, site of a large surface tuna fishery. It is the intention of the scientists operating the sonar to determine how tightly the subsurface tunas are schooled, to what depths they go, their speed, and how far they range. Such information can then form the basis of studies and experiments and gear with which to catch the fish.





A new sonar to track tuna schools in the central Pacific Ocean has been installed aboard the research vessel Townsend Cromwell of the Bureau of Commercial Fisheries Biological Laboratory, Honolulu. Top, workmen cut hole in bottom of ship to allow installation of a retractable shaft which carries the transducers. Bottom left, transducer shaft is lowered into place. Bottom right, engineer stands at console explaining working of sonar to technicians who will use it.

Federal Purchases of Fishery Products

DEPARTMENT OF DEFENSE PURCHASES, MARCH 1966:

Fresh and Frozen: The Armed Forces are a major buyer of fresh and frozen fishery products. Purchases of fresh and frozen fishery products for the Armed Forces in March 1966 totaled about 2.8 million pounds with a value of \$1.9 million. This represents an important market for the U.S. fishing industry.

Table 1 - Principal Fresh and Frozen Fishery Products Purchased by Defense Personnel Support Center, March 1966 with Comparisons

Product	March				Jan.-Mar.	
	1966		1965		1966	1965
	Qty. Lbs.	Avg. Cost c/Lb.	Qty. Lbs.	Avg. Cost c/Lb.	Qty. Lbs.	Qty. Lbs.
Shrimp:						
Raw headless	30,150	116	92,400	98	174,380	276,800
Peeled and deveined	87,164	152	165,500	141	214,264	319,660
Headed	440,500	105	326,500	88	956,367	929,920
Molded and breaded	75,780	68	60,650	66	104,680	155,900
Total shrimp	633,594	107	645,050	101	1,449,691	1,682,280
Scallops	337,750	49	217,304	85	864,250	538,884
Oysters:						
Eastern	65,852	128	68,718	97	161,756	207,490
Pacific	82,880	90	35,426	80	121,430	97,652
Total oysters	148,732	107	104,144	91	283,186	305,142
Fillet:						
Cod	18,850	42	41,520	36	73,150	156,270
Flounder	343,100	48	178,050	38	970,300	802,500
Ocean perch	321,500	42	313,500	34	1,309,100	1,008,290
Haddock	199,600	47	183,550	37	584,100	455,550
Haddock portions	357,538	51	188,504	47	824,926	498,054
Steaks:						
Halibut	103,200	59	113,770	51	300,300	322,420
Salmon	9,610	70	18,250	64	41,547	32,740
Swordfish	-	-	400	62	500	1,260

In March 1966 purchases of fresh and frozen fishery products for the Armed Forces were up 9.8 percent in quantity and 16.7 percent in value from the previous month. The increase was due mainly to larger purchases of shrimp, scallops, oysters, flounder fillets, and haddock fillets and portions.

Table 2 - Fresh and Frozen Fishery Products Purchased by Defense Personnel Support Center, March 1966 with Comparisons

Product	QUANTITY				VALUE			
	March		Jan.-Mar.		March		Jan.-Mar.	
	1966	1965	1966	1965	1966	1965	1966	1965
 (1,000 Lbs.) (\$1,000)			
	2,780	2,272	7,534	6,678	1,917	1,550	4,824	4,326

Compared with the same month in the previous year, purchases in March 1966 were up 22.4 percent in quantity and 23.7 percent in value. Average prices were generally higher in March 1966 as compared with the same month in 1965.

Canned: Purchases of canned tuna, and sardines in March 1966 were down considerably as compared with a year earlier.

Table 3 - Canned Fishery Products Purchased by Defense Personnel Support Center, March 1966 with Comparisons

Product	QUANTITY				VALUE			
	March		Jan.-Mar.		March		Jan.-Mar.	
	1966	1965	1966	1965	1966	1965	1966	1965
 (1,000 Lbs.) (\$1,000)			
Tuna	-	1,548	821	2,189	-	650	466	941
Salmon	8	2	2,069	8	5	2	1,382	7
Sardine	21	35	232	146	11	20	129	89

Notes: (1) Armed Forces installations generally make some local purchases not included in the data given; actual total purchases are higher than shown because data on local purchases are not obtainable.

(2) See *Commercial Fisheries Review*, June 1966 p. 14. Source: U. S. Department of Defense, Defense Personnel Support Center, Philadelphia, Pa.



Fisheries Laboratory

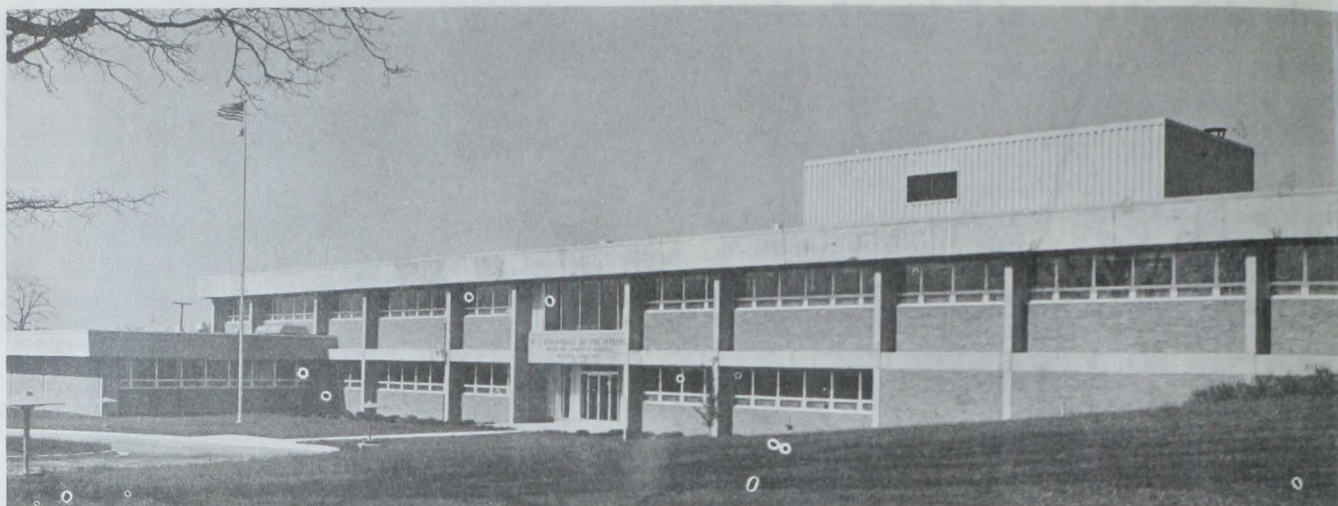
NEW RESEARCH LABORATORY FOR BUREAU OF COMMERCIAL FISHERIES DEDICATED IN MICHIGAN:

Dedication ceremonies were held May 12, 1966, at the new Fisheries Research Laboratory in Ann Arbor, Mich., to be operated by the Bureau of Commercial Fisheries of the U. S. Department of the Interior.

Dr. Stanley A. Cain, Assistant Secretary for Fish and Wildlife and Parks was the principal speaker. Other speakers included United States Representative Weston E. Vivian of Michigan; Harold E. Crowther, Deputy Director, Bureau of Commercial Fisheries; Mayor Wendell E. Hulcher of Ann Arbor; and Dr. Harlan Hatcher, President of the University of Michigan.

The new \$1.4 million center on the North Campus of the University of Michigan houses about 60 researchers and supporting staff. The scientists are engaged in biological, technological, and statistical studies primarily related to lake, river, and reservoir fisheries of the United States. Research is conducted in cooperation with the various States of the Bureau's Great Lakes and Central Region. Among the major studies are sea lamprey research and control, lake trout rehabilitation, pollution, and pesticide control, irradiation of fishery products, and industrial product development.

The new laboratory also houses the technical editorial staff serving all Bureau biological laboratories, and is headquarters for the secretariat of the Great Lakes Fishery Commission, which includes members from Canada and the United States.



A view of the new Fisheries Research Laboratory building in Ann Arbor, Michigan, to be operated by the Bureau of Commercial Fisheries of the U. S. Department of the Interior.

In his remarks, the Assistant Secretary said he knew of no better location for a fishery research station than Ann Arbor. He cited it as the State of Michigan's fishery research center and the headquarters of the Great Lakes International Commission. He also pointed out the aggregation of fishery scientists working in Ann Arbor--technologists, economists, marketing specialists, administrators, and others, and that real cooperation existed among the persons of those various disciplines.

The Assistant Secretary concluded with, "...we wish a bright future to this laboratory that is being dedicated today. It joins a group of distinguished laboratories on the Atlantic, Gulf, and Pacific coasts. But we have more than a hopeful wish before us. In my opinion, this laboratory will become distinguished for its fundamental researches, for the cleverness of its technological applications to fish management and the industry, for its good judgment and balance, and for its vision."

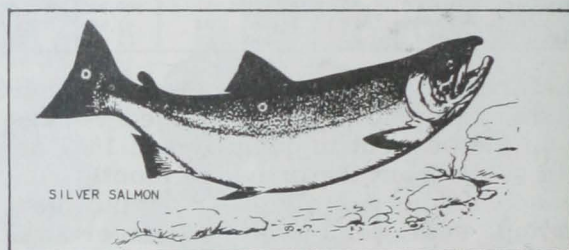
Concurrent with the dedication ceremonies was acceptance of the John Van Oosten Great Lakes Fishery Research Library, also located in the new laboratory building. The late Dr. Van Oosten participated in some of the earliest continuing fishery research on the Great Lakes and was Director of the Bureau's first laboratory in the Great Lakes area.



Great Lakes

MICHIGAN STREAMS STOCKED WITH YOUNG SILVER (COHO) SALMON:

Approximately 225,000 young silver (coho) salmon were released in mid-May 1966 in the Big Huron River, Baraga County, Mich., to conclude the Michigan Conservation Department's first-year plantings of the fish in 3 northern Michigan streams.



The 5- to 6-inch fish were planted above Big Erick's Bridge east of Skanee. Earlier in the spring, some 600,000 other silver salmon were stocked in the Platte River, Benzie County, and Bear Creek, Manistee County. Many of the fish planted in the latter 2 streams have made their way into the Great Lakes. These silver salmon, along with those now swimming down the Big Huron River, carry the Michigan Conservation Department's hopes for revitalizing fishing in the Great Lakes and connecting streams.

If the program progresses as planned, the young salmon will grow for about two years in the Great Lakes and then return to the rivers for spawning in fall 1967.

As part of the planting program in the Big Huron River, also liberated were 50,000 year-old rainbow trout under an accelerated program to boost steelhead runs in Great Lakes streams. (News Bulletin, Michigan Department of Conservation, Lansing, May 19, 1966.)
 Note: See Commercial Fisheries Review, February 1966 p. 18.

* * * * *

FISH BLOCK PRODUCTION OF UNDERUTILIZED FRESH-WATER SPECIES STUDIED:

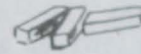
Fish blocks for the production of fish sticks and portions generally are in short supply and are principally from foreign sources. Blocks likely will remain scarce until underutilized species now available to the domestic fishery can be used. The potential market for fish blocks made from abundant underutilized fresh-water fish appears good. Why not then, simply start catching those fish and making them into fish blocks? This question has to be answered on the basis that there are many problems--technological and economic--that up to now have prohibited the use of underutilized fish for fish-block production.

Investigations are now underway by the U. S. Department of the Interior's Bureau of Commercial Fisheries that are aimed at producing suitable fish blocks from sheepshead and burbot filets. These studies are being conducted by the Bureau's technological laboratory at Ann Arbor, Mich., in cooperation with processors from the Lake Superior and Lake Erie fisheries.

Sheepshead poses the more difficult task for several reasons--rancid off-flavors develop in the product during frozen storage; sections of dark brownish-red flesh degrades the appearance of the portions; and in some instances, the texture of sheepshead portions is hard and tough. Studies to control those detrimental factors are proceeding quite well. Sheepshead blocks processed under several different conditions, aimed at controlling these factors, are being prepared. The blocks from the studies that appear acceptable for commercial use will be taken to experienced industry members for further evaluation.

Very little is known about the frozen storage characteristics of burbot. Therefore, in addition to investigating the physical and initial quality characteristics of blocks made from burbot, the expected shelf life of frozen

portions cut from burbot blocks is being determined.



Great Lakes Fisheries Explorations and Gear Development

LAKE MICHIGAN TRAWLING STUDIES CONTINUED:

M/V "Kaho" Cruise 31 (March 29-April 28): A 31-day exploratory fishing cruise in Lake Michigan was completed April 28, 1966, by the research vessel Kaho of the Bureau of Commercial Fisheries, U. S. Department of the Interior. The cruise was conducted in two phases to study and document the inshore spawning migration of alewives. The first phase was from March 29 to April 7 and the second phase from April 19-28. The survey covered the portions of Lake Michigan from Ludington, Mich., to Two Rivers, Wis., southward. The characteristics and timing of the runs are of extreme importance to the newly developing Lake Michigan industrial fisheries which now supply both pet-food manufacturers and fish-meal reduction plants. The information will also help lakeside municipal and industrial water users cope with alewife spawning migrations which create problems at Lake Michigan water intakes.

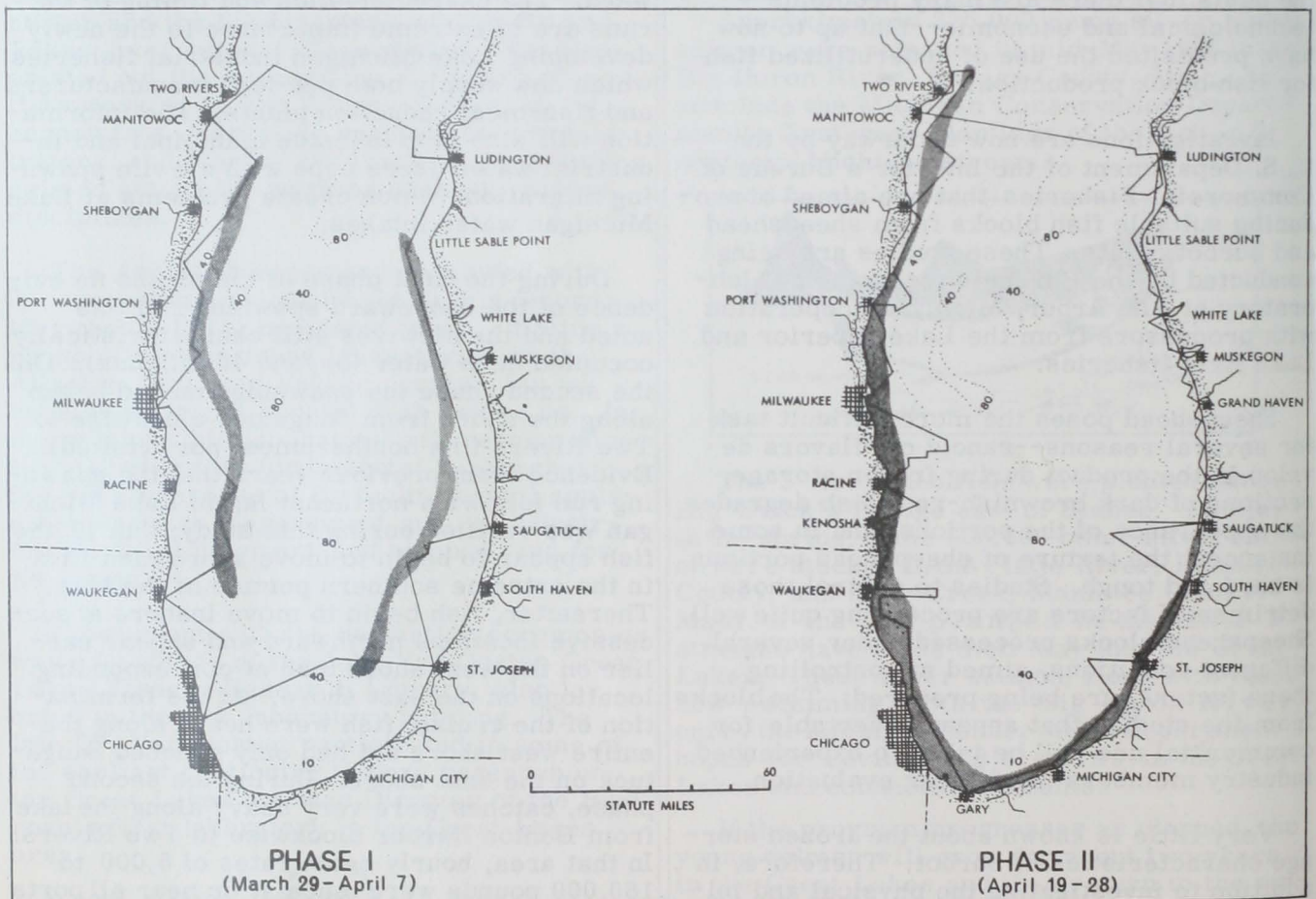
During the first phase of the cruise no evidence of the shoreward spawning run was noted and the alewives still characteristically occupied deep water (beyond 45 fathoms). On the second phase the spawning run had begun along the shore from Saugatuck clockwise to Two Rivers (the northernmost port visited). Evidence from previous years that the spawning run follows a northeast lag in Lake Michigan was verified during this study; that is, the fish appear to begin to move shoreward first in the extreme southern portion of the lake. Thereafter, fish begin to move inshore at successive locations northward and appear earlier on the west shore than at corresponding locations on the east shore. At the termination of the cruise, fish were heavy along the entire west shore but had only reached Saugatuck on the east shore. During the second phase, catches were very heavy along the lake from Benton Harbor clockwise to Two Rivers. In that area, hourly catch rates of 6,000 to 180,000 pounds were made at or near all ports visited.

FISHING OPERATIONS: Exploratory drags were made at various locations around the lake where heavy alewife concentrations were observed on the echo-sounder or to verify the absence of alewives at certain depths or particular locations. Two drags (off Saugatuck) were made to capture chub for technological studies. A total of 32 drags was completed, 10 during Phase I and 22 during Phase II. Drags were of various lengths with on-bottom time periods ranging from 1 minute to 30 minutes. Drags made in areas holding large concentrations of alewives were shortened to less than the standard 30-minute period to avoid making large catches. Major gear damage resulted from sets in some areas--in the piers at Manitowoc, at 8 fathoms off Two Rivers and at 6 fathoms off Port Washington.

FISHING RESULTS PHASE I (March 29-April 7): During Phase I there was no evidence of the beginning of the spawning run anywhere in the southern half of the lake.

Alewives were completely lacking in all harbors visited and in shallow waters. The best landings and echo-sounder recordings of alewives were made in 45-50 fathoms from Saugatuck south along the east shore and along the west shore south of Port Washington. Alewives were not positively located off Manitowoc. Severe weather prevented a thorough survey along the east shore between Little Sable Point and Saugatuck. The best landing was 1,500 pounds in a 30-minute drag at 44 fathoms off Benton Harbor.

FISHING RESULTS PHASE II (April 19-28): From just north of Benton Harbor around the southern portion of the lake to Waukegan, dense scattered schools were located along the beaches in 6-9 fathoms and heavy concentrations were found in all harbors. Commercial trawlers fishing just in front of the Benton Harbor piers were landing up to 9,500 pounds in 10-minute drags. The Kaho made large catches at all stations and particularly in the harbor of Gary, Ind., where an



Track lines of echo-sounding survey by the R/V Kaho during Exploratory Cruise No. 31. Shaded areas indicate bottom concentrations of alewives.

estimated 6,000 pounds were caught during a 3-minute drag and off Chicago where 1,200 pounds were taken in 2 minutes. Soundings also showed dense fish concentrations in the harbors of Benton Harbor and Michigan City.

From Kenosha to Port Washington heavy concentrations were also recorded in all harbors. Drags in the harbors of Kenosha and Port Washington yielded large catches of alewives. In the open lake off those ports the bulk of the alewife had not yet reached the beaches and heaviest concentrations were found at 15-19 fathoms. Commercial trawlers fishing off Kenosha in 18-19 fathoms were catching 11,000 to 12,000 pounds per hour drag. A large catch estimated at 5,000 pounds was made at 15 fathoms off Port Washington. Alewife apparently had not yet reached the harbors or beaches from Sheboygan to Two Rivers where they were found to be highly concentrated from 27-29 fathoms. The Kaho landed 1,600 pounds in a 15-minute drag at the same depth off Two Rivers. Commercial trawlers in that area were making comparable landings.

Along the east shore from Ludington to Holland, alewives were virtually absent in the harbors and along the beaches. Weather prohibited excursions into deep water to search for alewife concentrations between Little Sable Point and Saugatuck. The absence of alewife off Ludington has been noted before during the same time of the year. Scattered fish (possibly alewives) were sounded at mid-lake in mid-water at about 50 fathoms.

Phase II started and ended at Saugatuck, Mich. Alewives were not found at any depth off Saugatuck on April 19; however, by the end of the cruise on April 28, heavy schools were concentrated in front of the piers in $3\frac{1}{2}$ to 4 fathoms where commercial trawlers were making good catches. At all locations where alewives were heavy, virtually no other fish were taken and only 2 yellow perch were taken during the entire cruise.

The Kaho, departed from the Saugatuck vessel base May 3, 1966, on a 24-day exploratory fishing cruise in Lake Michigan, including Green Bay. This cruise, the first of two 24-day surveys, covering the entire lake was primarily concerned with completing knowledge concerning the seasonal availability of alewife and chub stocks to bottom trawl

fishing gear at specific monitoring locations in Lake Michigan and Green Bay. This information, particularly that on alewife, will be important to the newly developed Lake Michigan industrial fisheries supplying pet food manufacturers, and fish-meal reduction plants. The commercial production of Lake Michigan alewife increased from a mere 400 pounds in 1956 to nearly 15 million pounds in 1965. The future potential size of this fishery appears to be at least ten times this amount.

Note: See Commercial Fisheries Review, April 1966 p. 26.



Great Lakes Fishery Investigations

BIOLOGICAL RESEARCH AND SEA LAMPREY CONTROL, APRIL 1966:

Some of the highlights of Great Lakes biological research during April 1966 by the Biological Laboratory at Ann Arbor, Mich., operated by the Bureau of Commercial Fisheries, U. S. Department of Interior.

Sea Lamprey Control: Electric barriers in 13 of the 16 Lake Superior tributaries were in operation by April 8. The Misery River and Firesteel River barriers were activated by April 13. Miners River weir is generally placed in operation in early May. The total catch of sea lampreys at the end of the month was 125 compared to 23 a year earlier. Sea lampreys were taken in 8 streams with the Two Hearted River contributing 91 of the total catch. The 3 index barriers on tributaries of northern Green Bay were operating by April 4. A total of 25 sea lampreys were taken by April 29. The Ocqueoc River barrier located in northern Lake Huron near Hammond Bay was placed in operation March 21, and 23 sea lampreys were captured by the end of the month.

Chemical treatment of lamprey-producing streams was confined to southern Lake Michigan and northern Lake Huron. Blue Creek, a tributary stream in the St. Joseph River system, was treated successfully with TFM during the last week in April. Pretreatment surveys of northern Lake Huron streams scheduled for initial treatment were well underway by the end of the month and the treatment crew had preliminary preparations in progress. A comprehensive survey of Lake Michigan streams scheduled for treatment along the west shore failed to disclose sea lamprey ammocetes in the State of Wisconsin. A num-

ber of small streams in Green Bay treated four years ago also showed a lack of re-established populations.

Lake Michigan Research: The Bureau's research vessel Cisco completed its first cruise of the season on April 16. Collections of alewives and chubs were obtained to provide material for the alewife experiments and pesticide studies. Following the cruise, the vessel was taken to drydock at Sturgeon Bay, Wis., where the hull was sandblasted and repainted.

Experiments on the interrelationship of alewives with yellow perch and smelt were initiated. Mature yellow perch held at the laboratory for an egg supply spawned successfully. Although the yearling alewives held in the laboratory did not eat the perch eggs, they readily ate the newly hatched larvae. Adult smelt and smelt eggs also were acquired. Alewives fed on both the eggs and the young smelt fry. In addition, rainbow trout eggs are being held for hatching. This species initially will serve as a substitute for lake trout to permit preliminary investigations to get underway.

Lake Superior Research: All contract fishermen hired by the Bureau of Commercial Fisheries in the biological sampling of lake trout in Lake Superior began fishing their grounds in April except one fisherman on Isle Royale. The inshore waters along the east shore of Keweenaw Peninsula produced good fishing. The fishing offshore of the Huron Islands was less than a year ago. Scarring by sea lampreys was lower except in Keweenaw Bay where fresh wounds were twice as numerous as a year earlier. In the Marquette area, scarring was down by 30 percent.

The Bureau's research vessel Siscowet began operating on Lake Superior during the final week of the month. A 4-day cruise in Minnesota waters of Lake Superior in cooperation with the University of Minnesota covered the herring grounds north of Duluth. Tow nets were used to sample larval fish populations. Larval fish were readily captured and many were still in the yolk-sac stage. Bottom trawling also was carried out on the herring grounds with coregonid species occurring predominantly in the catches.

Lake Erie Research: The spring sampling of the commercial landings of yellow

pike (walleyes) and yellow perch was completed during the month. Over 1,000 of each species were examined at the south shore ports. Data also were collected for comparative fecundity studies of both species in each of the three basins of Lake Erie. Samples of fish for studies of pesticide residues in fish flesh were collected and shipped to the Bureau's laboratory in Ann Arbor.

The research vessel Musky II carried out routine operations in the western basin of Lake Erie in April--servicing thermographs and experimental sediment collectors located in strategic areas. Preliminary trawling was carried on to determine winter mortality rates in fish populations.

Note: See Commercial Fisheries Review, January 1966 p. 35, and February 1966 p. 19.

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CHEMICAL TREATMENT OF SEA LAMPREY-PRODUCING STREAMS CONTINUED:

With the State of Michigan Conservation Department's approval, the U. S. Department of the Interior's Bureau of Commercial Fisheries resumed in late April 1966, its chemical war on sea lampreys in Michigan streams still harboring the eel-like killers. About 60 tributaries of Lakes Superior, Michigan, and Huron are on the Bureau's list for treatment through the end of June 1967.

Final applications of chemicals in 2 streams in Michigan and several Indiana streams will complete the first round of treatments in lamprey-producing tributaries of Lake Michigan.

Starting in late April, the Bureau hoped to mount its first all-out offensive against lampreys in Lake Huron streams where 48 rivers and creeks are scheduled for treatment within the next 3 or 4 years.

A total of 16 streams are scheduled for first treatment this summer and 2 are on tap for their second application of chemicals.

On Lake Michigan, where streams were still too high for chemical work to begin in late April, the Bureau planned to re-treat 27 streams which had re-established sea lamprey populations.

Starting in the summer of 1966, chemical treatment will again be applied to 19 Lake Superior streams, 15 in Michigan and 4 in Wisconsin.

"Planned re-treatment of the Great Lakes tributaries does not mean that earlier work was a failure," said the scientist in charge of the Bureau's sea lamprey control program. "Actually, we've scored heavily on the sea lamprey in our first round of chemical releases and now we're going back to some of these waters with hopes of knocking out lamprey populations which have become re-established," he explained.

Latest studies indicate that lamprey numbers in previously treated Lake Superior streams have been reduced by 80 percent over the last 4 years.

The most encouragement of the lamprey control program comes from evidence of natural reproduction among lake trout in Lake Superior. Noteworthy, too, are signs of high survival among hatchery-reared lake trout planted in Lake Superior.

In Lake Michigan, where treatment work started later than in Lake Superior's streams, it appears that fishery workers also have been successful in reducing the sea lamprey. The Bureau has high hopes that its follow-up treatments in Lake Michigan streams will have the same results now showing up in Lake Superior.

Note: See Commercial Fisheries Review, June 1965 p. 21.

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GREAT LAKES SEA LAMPREY TAGGING PROGRAM:

In a notice to members of the Great Lakes commercial fishing industry, the regional office of the U. S. Bureau of Commercial Fisheries at Ann Arbor, requested all fishermen to be on the alert for tagged sea lampreys. The recovery of tags from sea lampreys will provide valuable information to aid in further reducing the numbers of that parasite in the Great Lakes. Anyone catching a sea lamprey with a tag attached is requested to send the tag, information as to date, size of the lamprey, exact location, and method of capture to the Bureau of Commercial Fisheries, U. S. Department of the Interior, P. O. Box 640, Ann Arbor, Mich., or to the Fisheries Research Board of Canada, Biological Station, Ships Canal Post Office, Sault Ste. Marie, Ontario, Canada.

The sea lampreys are being marked with 2 conspicuous tags. The first type consists of 2 colored disks fastened by a nickel pin to the

back of the animal. The second tag is a plastic tube which is passed through the back of the lamprey and joined to form a circle. Markings on the tag provide biologists with the date and location where the sea lamprey was tagged. Persons returning tags will receive an acknowledgment with information on movement and growth of the sea lamprey from which the tag was taken.

Biological data obtained from the tag returns will provide valuable information on the life history and movements of sea lampreys in the Great Lakes. This information is needed to evaluate the success of the chemical program to control the sea lamprey.



Gulf Fisheries Explorations and Gear Development

SHRIMP GEAR STUDIES CONTINUED:

M/V "George M. Bowers" Cruise 64-Phases II, IV, VI, and VII (February 21-May 6, 1966): A 42-day exploratory cruise off the southwestern coast of Florida, Tampa to Key West, was completed May 6, 1966, by the U. S. Department Interior, Bureau of Commercial Fisheries' exploratory fishing vessel George M. Bowers.



The Bureau's exploratory fishing vessel George M. Bowers.

The cruise objectives were: (1) initial field testing of a prototype electroshrimp

trawling system to determine the functioning capabilities, reliability and ruggedness of its components; (2) underwater photography of the electroshrimp trawling system; and (3) photographic recording of the escape reaction of electrically-stimulated shrimp from the Tortugas shrimp grounds.

PHASE II AND PHASE VI--Gear Studies (February 28-March 16, and April 11-26, 1966): A prototype electroshrimp trawling system designed and built by the staff of the Bureau's Gear Research Unit was completed earlier this year. The system is composed of 4 primary components. They are the power control panel aboard the vessel; a cable, supplying power from the vessel to the trawl; an electric pulsing unit mounted on one of the trawl doors and an electrode array. Voltage is controlled from a variable transformer and is monitored on a meter in the panel. The power supply cable being used for the initial trials is a neoprene coated, 4-conductor American Wire Gauge (AWG) No. 12 cable. Two of the conductors are used for the primary power source, and the other 2 conductors are used to monitor voltage readings. The electrical pulser is encased in a water-tight-underwater housing and is attached to one of the trawl doors. The housing is fabricated from polyvinyl-chloride tubing and is designed specifically for the electrical pulser. The electrode array is made up of 5 electrodes, equally spaced ahead of the footrope. Each electrode is a heavy-tinned copper braid which has been slipped over a rope core and then connected to a conductor from the electrical pulser.

During field trials, several faulty components were found and were either replaced immediately or were to be exchanged for parts which were on order. The first material tested for use as electrode wire was not adequate and was replaced. Another difficulty encountered was that the designed voltage peaks were not obtained on a continual basis, indicating either malfunctioning components or possibly underrated internal components in the electrical pulser. Facilities available in the field did not permit the correction of this latter condition and repairs were to be effected in the laboratory.

PHASE IV--Underwater Trawl Studies (March 22-April 5, 1966): Turbid water conditions which spread uniformly over the Tortugas shrimp grounds did not permit the scheduled trawl photography to be carried out. Transmissometer readings indicated

underwater visibility was limited to only 6 feet. This would not have permitted the effective detailed photography necessary.

Operational testing was carried out on coral reefs adjacent to the Gulf Stream with the new 400-foot film capacity motion picture camera. The electrically-driven unit with reflex focusing gives the SCUBA-equipped photographer more flexibility and control than other systems available. Although additional counter-balance weight had to be added to the housing, the unit handled well underwater and 800 feet of motion picture footage were taken.

PHASE VII--Shrimp Behavior Studies (April 26-May 6, 1966): Results from previous cruises have indicated the escape reaction of electrically-stimulated shrimp have varied according to the type of substrate in which they are burrowed. Therefore, as a continuation of the shrimp behavior studies, SCUBA divers recorded photographically the escape reaction of shrimp from a hard clay bottom. The sequences were recorded with 900 feet of colored motion picture film. The film will provide information on the electrical stimulation of shrimp on one of the important shrimp grounds in the Gulf of Mexico. Bottom samples were taken from the area for laboratory analysis.

In cooperation with Woods Hole Oceanographic Institute, 240 drift bottles were released in 40 locations off the west coast of Florida.

Note: See Commercial Fisheries Review, January 1966 p. 35 and December 1965 p. 33.



Industrial Fishery Products

U. S. FISH MEAL, OIL, AND SOLUBLES:
Production by Areas, April 1966: Preliminary data as collected by the Bureau of Com-

U. S. Production ^{1/} of Fish Meal, Oil, and Solubles, April 1966 (Preliminary) with Comparisons			
Area	Meal	Oil	Solubles
	Short Tons	1,000 Pounds	Short Tons
April 1966:			
East & Gulf Coasts . .	6,017	4,625	1,980
West Coast ^{2/}	3,578	481	1,944
Total	9,595	5,106	3,924
Jan. -Apr. 1966 Total .	20,036	6,623	9,195
Jan. -Apr. 1965 Total .	18,962	11,861	5,606

^{1/}Does not include crab meal, shrimp meal, and liver oils.
^{2/}Includes American Samoa and Puerto Rico.

Commercial Fisheries, U. S. Department of the Interior.

Production, March 1966: During March 1966, a total of 911,000 pounds of marine animal oils and 4,806 tons of fish meal was produced in the United States. Compared with March 1965 this was an increase of 183,000 pounds of marine animal oils and

Product	Mar.		Jan.-Mar.		Total 1965
	1/1966	1965	1/1966	1965	
(Short Tons)					
Fish Meal and Scrap:					
Herring	216	497	309	1,039	12,859
Menhaden 3/	-	-	-	2/	175,838
Tuna and mackerel	3,220	1,925	6,178	5,474	25,410
Unclassified	1,370	732	2,719	1,668	27,984
Total 4/	4,806	3,154	9,206	8,181	242,091
(1,000 Pounds)					
Fish Solubles:					
Menhaden	2/	-	2/	-	74,405
Other	2,752	957	5,271	2,667	23,612
Total	2,752	957	5,271	2,667	98,017
(1,000 Pounds)					
Oil, body:					
Herring	2/	184	2/	471	8,603
Menhaden 3/	-	-	-	2/	175,368
Tuna and mackerel	458	354	826	844	4,799
Other (inc. whale)	453	120	691	394	6,864
Total oil	911	658	1,517	1,709	195,634

1/ Preliminary data.
2/ Included in "unclassified" or "other."
3/ Includes a small quantity of thread herring.
4/ Does not include a small quantity of shellfish and marine animal meal and scrap because production data are not available monthly.
Source: U. S. Department of the Interior, Bureau of Commercial Fisheries.

2,752 tons of fish meal and scrap. Fish solubles production amounted to 2,752 tons--an increase of 1,795 tons as compared with March 1965.

U. S. FISH MEAL AND SOLUBLES:

Production and Imports, January-March 1966: Based on domestic production and imports, the United States available supply of fish meal for the first 3 months in 1966 amounted to 84,557 short tons--18,812 tons (or 18.2 percent) less than during the same period in 1965. Domestic production was 2,260 tons (or 27.6 percent) higher and imports were 1,022 tons (or 22.1 percent) lower than in January-March 1965. Peru continued to lead other countries with shipments of 43,592 tons.

The United States supply of fish solubles during January-March 1966 amounted to 5,714 tons--an increase of 10.1 percent as

U. S. Supply of Fish Meal and Solubles, January-March 1966

Item	Jan.-Mar.		Total 1965
	1966	1965	
(Short Tons)			
Fish Meal and Scrap:			
Domestic production:			
Menhaden	-	1/	175,838
Tuna and mackerel	7,413	5,474	25,410
Herring	309	1,039	12,859
Other	2,719	1,668	39,264
Total production	10,441	8,181	253,371
Imports:			
Canada	10,432	10,076	43,830
Peru	43,592	80,220	209,801
Chile	14,037	2,080	5,651
Norway	22	-	78
So. Africa Rep.	955	500	5,100
Other countries	5,078	2,312	6,206
Total imports	74,116	95,188	270,666
Available fish meal supply	84,557	103,369	524,037
Fish Solubles 2/:			
Domestic production	5,271	2,667	98,017
Imports:			
Canada	378	458	1,488
Iceland	33	-	-
Other countries	32	2,066	3,650
Total imports	443	2,524	5,138
Available fish solubles supply	5,714	5,191	103,155

1/ Included with "other."
2/ Wet weight basis except for imports from South Africa Republic (included in "other countries").
Source: U. S. Department of the Interior, Bureau of Commercial Fisheries, and U. S. Department of Commerce, Bureau of the Census.

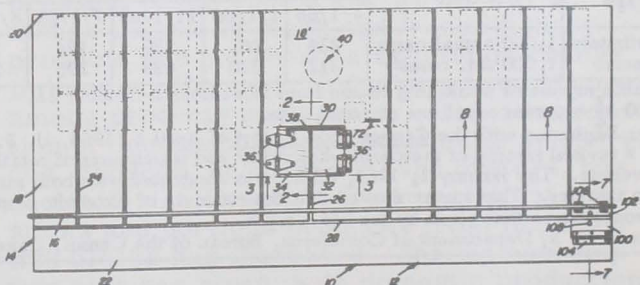
compared with the same period in 1965. Domestic production of fish solubles increased 97.6 percent and imports of fish solubles decreased 82.4 percent.



Inventions Patented

LIVE BAIT VENDING MACHINE:

A recently patented live bait vending machine consists of a housing of many storage slots which communicate with a discharge opening. The storage slots hold the containers in which live bait or other items are stored. The vendor is placed on a reservoir of water with an agitator to aerate the water which will keep the bait alive for weeks. A

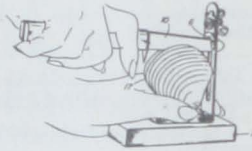


coin-operated dispenser releases one container at a time. Being manually-operated, there is no need for electricity.

The vendor is also adapted for vending other items such as dough bait, worms, fishing tackle, and even frozen bait, food, or cold drinks when placed on a refrigerator unit. The main purpose of the vendor is to have a variety of bait and tackle available for the fishermen at all times of day or night--24 hours a day. (U. S. Patent No. 3,209,884 issued Richard A. Stehling, Sr., Mason Route, Fredericksburg, Texas.)

COMBINED CLAM AND OYSTER OPENER:

A patent was recently granted on an inexpensive combination clam and oyster opener that is simple and rugged. It eliminates cutting of the hands of the operator. All size clams and oysters can be opened simply by raising or lowering the adjustable guide. A working model is available. (U. S. Patent No. 3,231,930 issued Theodore R. Berry, 16 Harriet St., West Orange, N. J. 07052.)



Maine Sardines

CANNED STOCKS, APRIL 1966:

Canners stocks of Maine sardines on April 1, 1966, were down 2,000 cases from those of the same date in 1965, and down 387,000 cases from stocks on hand 3 years earlier.

Preliminary data show the 1965 pack as 1,266,903 standard cases (100 cans 3 3/4-oz.)

canned in 23 plants in Maine. That was 46.3 percent more than the 865,751 cases packed during 1964, when fishing was extremely poor. The 1965 pack was 21.8 percent less than the 1,619,235 cases in 1963.

The 1966 pack of Maine sardines through March 19 totaled 30,651 standard cases, according to the Maine Sardine council. The pack during the same period a year earlier totaled 19,883 cases. Fishing had been limited along the entire Maine coast due to adverse weather conditions.

The new law legalizing year-round canning of Maine sardines removed the traditional December 1 closing date for the packing season. The new legislation opened winter canning to all Maine sardine packers and allows winter canning with domestic as well as imported herring.

Note: See Commercial Fisheries Review, April 1966 p. 28.



Maine

FISHERY LANDINGS, 1965:

Landings of fish and shellfish at Maine ports in 1965 totaled 204.8 million pounds valued at \$21.9 million. Compared with 1964, the quantity increased 6 percent, but the value was about the same. Sea herring landings of 70.2 million pounds were 9.3 million pounds above the 1964 total and accounted for the greater part of the overall increase of 12.3 million pounds.

Ocean perch landings amounted to 60.3 million pounds compared with 58.9 million pounds in 1964. Knox County accounted for 61 percent of the total, while nearly all of the remainder was landed in Cumberland County. Landings of ocean perch taken from the Gulf of Maine declined slightly in 1965.

Canned Maine Sardines--Wholesale Distributors' and Canners' Stocks, April 1, 1966, with Comparisons^{1/}

Type	Unit	1965/66 Season			1964/65 Season					1963/64			
		4/1/66	1/1/66	11/1/65	7/1/65	6/1/65	4/1/65	1/1/65	11/1/64	7/1/64	6/1/64	4/1/64	1/1/64
Distributors	1,000 actual cases	234	267	289	194	198	236	238	291	234	254	291	261
Canners	1,000 std. cases ^{2/}	312	520	689	295	203	314	538	629	514	499	658	1,063

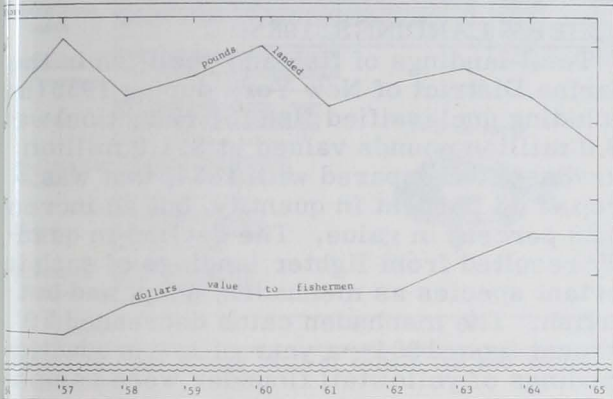
^{1/} Table represents marketing season from November 1-October 31.

^{2/} 100 3 3/4-oz. cans equal one standard case.

Note: Beginning with the Canned Food Report of April 1, 1963, U. S. Bureau of the Census estimates of distributors' stocks were based on a revised sample of merchant wholesalers and warehouses of retail multiunit organizations. The revised sample resulted in better coverage. The January 1, 1963, survey was conducted with both samples to provide an approximate measure of the difference in the two samples. That survey showed that the estimate of distributors' stocks of canned Maine sardines from the revised sample was 13 percent above that given by the old sample.

Source: U. S. Department of Commerce, Bureau of the Census, Canned Food Report, April 1, 1966.

Landings of whiting, 27.7 million pounds (live weight), were 10 percent above 1964 and set a new record for the second consecutive year. After getting off to a rather slow start, an increased fleet of otter trawlers and a slightly longer season resulted in the record catch. Cumberland County led in whiting landings with 19.7 million pounds, followed by Sagadahoc County with 4.1 million pounds and Lincoln County with 3.7 million pounds.



Maine lobster catch and value, 1956-65.

Lobster totals declined 12 percent from the previous year to 18.9 million pounds. This was the smallest catch since 1950 and was the cause for considerable concern throughout the industry. A cooperative program on the study of lobsters was undertaken by the Maine Department of Sea and Shore Fisheries and the U. S. Department of the Interior's Bureau of Commercial Fisheries in 1965. Lobster bait shortages, which are occurring more frequently each year, were alleviated somewhat in 1965 by a two-fold increase in the catch of alewives to 3.1 million pounds.

Shrimp landings (2.1 million pounds) set a record in 1965 and doubled the 1964 catch. Demand for those shellfish continued to grow at a rapid pace. There were two peeling machines in operation in 1965. Most of the shrimp were marketed as fresh and frozen raw peeled meats. (U. S. Department of the Interior, Bureau of Commercial Fisheries, Branch of Fishery Statistics.)



Marketing

EDIBLE FISHERY PRODUCTS, FIRST QUARTER 1966 AND REVIEW OF 1965:

The demand in the United States for edible fishery products is expected to continue strong throughout 1966, reflecting rising consumer income, relatively high meat prices anticipated through the summer months, and population gains. Moderate advances in retail prices for both canned and frozen products appear likely.



With the exception of red salmon, current supplies of most canned fishery products are about adequate. Supplies of frozen fishery products at the end of the first quarter in 1966 were up from the previous year, mainly because of larger stocks of imported fish blocks. Stocks of fish sticks and portions, spiny lobster tails, scallops, and crab meat were substantially larger than in the previous year. On the other hand, cold-storage holdings of raw, headless shrimp were down sharply.

Final data for 1965 indicate that per capita consumption of commercially-caught fish and shellfish amounted to 11.0 pounds, edible weight, up from 10.5 pounds in 1964 and 10.7 pounds in 1963. The increase resulted largely from increased consumption of canned fishery products, 4.4 pounds per person in 1965 compared with 4.1 pounds in 1964. Consumption of fresh and frozen fishery products in 1965 amounted to 6.1 pounds per person, up 0.2 pound from a year earlier. In addition, per capita consumption of fish and shellfish taken by sportsmen and for home use by commercial fishermen was estimated at 3 pounds per person.

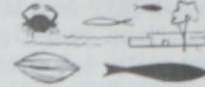
Annual per capita consumption of commercially-caught fish and shellfish in the United States has, for many years, averaged 10 to 11 pounds except for a few years during the depression of the 1930's and World War II. Although the use of fresh and frozen fishery products has not shown a significant change in the past 30 years, there have been changes among products and species. The consumption of domestically-caught Atlantic mackerel, cod, haddock, ocean perch, and oysters, has declined significantly. Consumption of fish sticks and portions produced from imported fish blocks has increased. Shrimp consumption also has risen; both domestic production and imports of shrimp have grown.

Per capita consumption of canned fishery products reached a peak in the 1930's, averaging 4.7 pounds during the years from 1934 to 1939. Consumption of canned salmon declined from an average of 2.4 pounds per capita in the 1930's to less than 1 pound for each year since 1958. Consumption of canned Pacific sardines also has dropped sharply. Conversely, the use of canned tuna has grown rapidly, from a half pound per person in 1935 to more than 2 pounds since 1959. The consumption of cured fishery products fell steadily from 3 to 4 pounds per person early in the century to about a half pound in recent years.

Over half of the fishery products consumed in the United States came from abroad in 1965 (including raw materials used in domestic processing) and the strong domestic demand will continue to encourage imports. Prices of fresh or frozen tuna and shrimp, two of the largest import items, are much above spring 1965 levels. If domestic landings of those two species are not substantially higher than in 1965, imports must increase at a time

when world-wide demand also is increasing. The United States already ranks as the world's largest importer of fishery products.

Note: This analysis was prepared by the Bureau of Commercial Fisheries, U. S. Department of the Interior, and published in the U. S. Department of Agriculture's May 1966 issue of the National Food Situation (NFS-116).



New York

FISHERY LANDINGS, 1965:

Total landings of fish and shellfish in the Marine District of New York during 1965 (not including unclassified fish for reduction) were 69.0 million pounds valued at \$11.9 million ex-vessel. Compared with 1964, that was a drop of 13 percent in quantity, but an increase of 20 percent in value. The decline in quantity resulted from lighter landings of such important species as menhaden, scup, and butterfish. The menhaden catch decreased 29 percent from 1964--a year of low production. Landings of yellowtail flounder were compar-

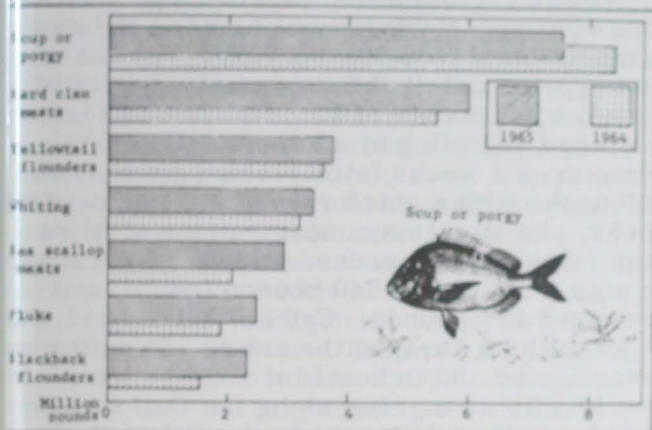
New York Marine Landings, 1965 and 1964

Species	1965		1/1964	
	Pounds	Value	Pounds	Value
Fish				
Bluefish	1,036,366	156,817	675,115	109,426
Butterfish	765,655	89,407	1,066,655	126,161
Cod	365,931	53,239	516,500	72,220
Flounders:				
Gray sole	21,800	2,362	14,620	2,072
Blackback	2,244,783	118,528	1,440,640	74,031
Yellowtail	3,671,223	262,335	3,561,810	233,403
Fluke	2,451,552	557,042	1,853,780	445,448
Unclassified	-	-	900	45
Menhaden	30,139,635	417,407	42,424,700	516,226
Scup or porgy	7,536,888	746,701	8,343,820	783,648
Sea bass	381,611	84,467	500,740	95,821
Striped bass	702,935	135,831	965,500	138,439
Whiting	3,337,645	160,522	3,123,200	159,323
Unclassified	2,765,409	226,472	3,198,340	260,785
Total Fish	55,421,433	3,011,130	67,686,320	3,017,048
Shellfish				
Lobsters, Northern	648,571	446,277	546,715	305,747
Clams:				
Hard	5,947,632	5,149,573	5,402,292	4,135,545
Razor	5,344	1,526	5,856	1,464
Soft	205,553	66,540	180,832	55,677
Surf	1,505,240	126,783	1,217,676	108,852
Conchs	42,900	9,669	40,950	7,989
Mussels, sea	295,310	44,813	124,950	16,512
Oysters	199,336	322,471	213,468	315,037
Scallops:				
Bay	886,043	721,497	687,096	731,474
Sea	2,917,153	1,898,374	2,044,332	1,114,682
Squid	974,063	66,009	1,007,130	74,008
Total Shellfish	13,627,145	8,853,532	11,471,297	6,866,987
Grand Total	69,048,578	11,864,662	79,157,617	9,884,035

1/In addition to the catch in the Marine District there was a catch in the Hudson River area totaling 172,100 pounds valued at \$24,185 consisting of shad 78,200 pounds, striped bass 29,500 pounds, alewives 37,000 pounds, and other species 27,400 pounds. Note: Does not include the catch of unclassified fish for reduction. Univalve and bivalve mollusks are reported in pounds of meats. All other species are shown in round weight.

able to 1964, and there were increases in fluke and blackback flounder landings.

The pound net catch showed no appreciable gains during the year. Scup and bluefish were the leading items with 7.5 and 1.0 million pounds, respectively. Catches of shad, menhaden, and herring by pound nets were light.



New York State marine catch of certain fish and shellfish, 1965 and 1964.

The commercial catch of striped bass failed to come up to that of 1964--the largest on record for New York. The total catch of 102,000 pounds was about the third largest in recent years, with 82 percent of the catch being landed by ocean-haul seiners. The otter trawl catch of striped bass was down sharply, particularly for the fall season.

Lobster production increased in both the offshore otter trawl and inshore pot fisheries. Ex-vessel values were high in both fisheries, ranging from 70 cents to \$1.25 a pound.

Landings at New York City's Fulton Street Market in 1965 were 5.7 million pounds--a decrease of 11 percent compared with 1964. The decline was due to a drop in landings of scup and butterfish--two of the major species. Sea scallop landings increased over 1964, with the majority of the vessels fishing in waters off New York after the decline in production from areas off the Virginia Capes.

Hard clam production increased in quantity and value. The increase in production came in the summer season with many casual fishermen taking advantage of a good supply and high prices.



North Atlantic Fisheries Explorations and Gear Development

TUNA AND SWORDFISH DISTRIBUTION STUDIES IN NORTHWEST ATLANTIC CONTINUED:

M/V "Delaware" Cruise 86-2 (March 8-April 6, 1966): Concentrations of large bluefin tuna were located in the Gulf Stream area of the Northwestern Atlantic during a recent exploratory long line fishing cruise of the research vessel *Delaware* operated by the Bureau of Commercial Fisheries, U. S. Department of the Interior. The vessel utilized radio-facsimile equipment to receive daily sea surface temperature charts in determining optimum fishing areas. The one-month investigation covered a 750-mile section of the Gulf Stream from south of Cape Cod to south of Newfoundland and obtained new seasonal distribution information on bluefin, yellowfin, big-eyed, and albacore tuna, as well as swordfish.



Fig. 1 - A deck sample of bluefin, yellowfin, and albacore tuna, and swordfish were part of a day's 9-ton long-line catch in the Gulf Stream by the *M/V Delaware*.

OBJECTIVES: Principal objectives of the cruise were to : (1) evaluate methods of lo-

cating tuna and swordfish concentrations based on analysis of the thermal environment structure, and (2) survey the distribution and abundance of tuna and swordfish in the North-western Atlantic during late winter.

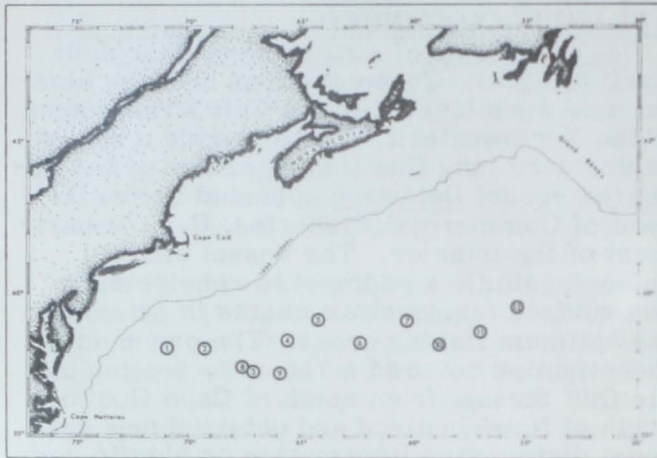


Fig. 2 - Station pattern of M/V Delaware Cruise 66-2 (March 8-April 6, 1966.)

GEAR USED: Fishing gear consisted of 165-fathom units of long line with ten branch-lines attached at 15-fathom intervals. Each 10-hook unit was buoyed from the surface with a 5- or 20-fathom line. Squid and her-ring baits were alternately used on every other unit. Adjunct equipment included a marine radiofacsimile recorder, bathythermographs (BT's), bathykymographs (BKG's), and a recording thermograph.

METHODS OF OPERATION: The approximate geographic position of each fishing station was selected using data from general sea surface temperature isotherm charts and sonic layer depth charts received daily from the U. S. Naval Oceanographic Office by the radiofacsimile recorder on the vessel. The validity of the data was checked and the exact position of each station was determined from analysis of actual observations on sea surface temperature variation by recording thermograph, and BT's along the vessel track into the area. With the exception of two day sets of long-line gear, 60 units of long-line gear (600 hooks) were set after midnight at each station and hauled after sunrise to permit the gear to fish during the dark and light hours of the day. The effect of current on the gear was measured by plots of Loran bearings on the ends of the long-line set at time of setout and haulback. BT recordings of the subsurface-temperature profile were taken at the time and position of each Loran bearing. The depth of the gear, and the time

and depth of fish hooked, were recorded by BKG instruments placed at the centers (between hooks 5 and 6) of several units on each set. An exact time record was kept on each unit of gear retrieved to relate the fish catch to surface temperature variations on the thermograph.

RESULTS: An abundance of large bluefin tuna (Thunnus thynnus) was found in the western portion of the area surveyed. At one station approximately 9 tons were taken on 600 hooks, a catch rate of 12.3 fish per 100 hooks. A second sampling at another station in the same area 2 weeks later yielded 3.5 tons on 600 hooks with a catch rate of 4.2 fish per 100 hooks, and suggests concentrations of more than random occurrence. Bluefin tuna ranged in size from 215 to 340 pounds (round) and averaged 277 pounds. Catches totaling 17 tons at 8 stations covered the entire 750-mile area investigated and indicated a distribution of that bluefin size group along the Gulf Stream area from Cape Hatteras to the Grand Banks.

Catches of swordfish (Xiphias gladius) at six stations covering the entire area of investigation indicated a thin distribution of the species along the Gulf Stream area at that time of year. Although the catches were small (17 total) it is noteworthy that the size of fish in the western portion of the area (18-110 pounds, 13 fish) was much smaller than fish in the eastern portion (155-350 pounds, 4 fish). Average size of swordfish on the cruise was 107 pounds.

Yellowfin tuna (Thunnus albacares) were found at 4 of the 5 stations having surface temperature of 69° F. or greater. Average weight of 18 fish caught was 35 pounds. Albacore (Thunnus alalunga) were taken in small numbers at all but the 3 westernmost stations, providing new distributional information on the species at that time of year. Size of albacore averaged 34 pounds, with a range of 10 to 59 pounds. Big-eyed tuna (Thunnus obesus) were taken at 4 stations, with a good catch rate (2.5 fish per 100 hooks) at one of the stations. Size of big-eyed tuna averaged 102 pounds, with a range of 31 to 138 pounds.

Large catches of blue shark (Prionace glauca) were made throughout the area. A total catch of 359 blue shark from the 12 stations fished weighed an estimated 16 tons. Shark damage to fish was not significant, although considerable time was lost due to frequent snarls and parting of the gear.

Other catches of interest were 5 specimens of the pelagic stingray (*Dasyatis violacea*) and 1 Atlantic loggerhead turtle (*Caretta caretta*).

In cooperation with the Woods Hole Oceanographic Institution a total of 92 tuna, 2 swordfish, and 1 turtle were marked and released using dart tags. Sharks tagged and released in conjunction with U. S. Department of Interior shark studies at the Bureau of Sport Fisheries and Wildlife Sandy Hook Marine Laboratory and the Shark Research Panel of the American Institute of Biological Sciences totaled 315. Shark, tuna, and swordfish eyes and shark vertebral columns were frozen for research studies at the Retina Foundation of the Massachusetts General Hospital and Harvard Medical School. Bluefin tuna stomachs and gonads were frozen for analysis at the Bureau's Tropical Atlantic Biological Laboratory in Miami, Fla., and specimens of bluefin, big-eyed, and albacore tuna were preserved frozen for anatomical studies at the U. S. National Museum and the Bureau's Ichthyological Laboratory, Washington, D. C. During the cruise, 45 BT messages were transmitted to the Naval Oceanographic Office through Coast Guard radio stations.

Note: See Commercial Fisheries Review, March 1966 p. 31.



North Atlantic Fisheries Investigations

LARVAL HERRING DISTRIBUTION GULF OF MAINE STUDIED:

M/V "Rorqual" Cruise 2-66 (February 14-March 6, 1966): To determine the distribution of larval herring along the coast of the Gulf of Maine was the objective of this cruise by the research vessel Rorqual, operated by the Bureau of Commercial Fisheries, U. S. Department of the Interior, Biological Laboratory, Boothbay Harbor, Me. The area of operations was between Cape Ann and Grand Manan Channel.

BIOLOGICAL OBSERVATIONS: A total of 21 stations was occupied. Three-mile oblique tows were made at each station using the Boothbay No. 4 trawl. One Gulf III oblique tow was made in the Grand Manan Channel.

HYDROGRAPHIC OBSERVATIONS: Surface temperatures and salinities were taken at each station. Five drift bottles and 5 sea-

bed drifters were released at 21 standard stations. A Nansen bottle cast, a bathythermograph (BT) cast, and a Secchi disc reading were taken at the Grand Manan station.

PRELIMINARY FINDINGS: Nearly 2,000 (1,912) larval herring were caught ranging in standard length from 17 to 46 millimeters (0.7 to 1.8 inches). The heaviest concentrations were found in Ipswich Bay and off Bluehill, Frenchmans and Pleasant Bays. Mean lengths were generally larger in the west and east and smallest near Penobscot Bay. The largest mean length was from a catch off Machias Bay.

M/V "Rorqual" Cruise 3-66 (March 16-23, 1966): The Bureau's research vessel Rorqual continued its operations between Cape Ann and Grand Manan Channel during the cruise to determine the distribution of larval herring along the coastal Gulf of Maine.

BIOLOGICAL OBSERVATIONS: Oblique tows with the Boothbay No. 4 trawl were made for larval herring at 50 stations. A watch was kept for schools of sardine-sized herring. Meter net tows were made along the coast for barnacle larvae.

HYDROGRAPHIC OBSERVATIONS: Surface temperatures and salinities were taken at each station. A total of 5 drift bottles and 5 sea-bed drifters were released at 21 stations.

PRELIMINARY FINDINGS: Larval herring were abundant during this cruise. The total catch was 1,954. The larvae ranged from 20-40 millimeters (0.8 to 1.6 inches) standard length. One school of sardine-sized herring was sighted on the surface 3 miles southeast of Pemaquid Point. Barnacle larvae were not present along the coast in large numbers.

Note: See Commercial Fisheries Review, January 1966 p. 42.

LOBSTER AND SEA HERRING POPULATION STUDIES CONTINUED:

R/V "Albatross IV" Cruise 66-5 (April 19-29, 1966): To sample populations of sea herring and lobsters and obtain related environmental data was the main objective of this cruise by the research vessel Albatross IV of the U. S. Bureau of Commercial Fisheries. Other objectives were to: (1) obtain blood samples from sea herring and lobsters, (2) make plankton tows for herring larvae, and

(3) observe lobster habitat using a deep-sea still picture camera. The areas of operation were Cape Cod Bay, Stellwagen Banks, Jeffreys Ledge, general area of George Bank, Corsair, Lydonia, Veatch and Hudson Canyons, and South Long Island Slope.



The Albatross IV, research vessel of the U. S. Bureau of Commercial Fisheries.

FISHING OPERATIONS: Herring: Three herring trawl sets lasting 1 hour each were made at some stations in waters of 24 to 50 fathoms yielding a total of 4 bushels. The herring obtained were from 19.5 to 32.5 centimeters (about 8 to 13 inches) long. At another lobster station a half bushel of herring was obtained and those fish were from 24.4 to 30.1 centimeters (about 10 to 12 inches) long. The majority of herring in the samples were from the 1960 and 1961 year-classes. Shipboard examination of gonadal condition showed that the majority of the fish were in late stage VIII of maturity. A total of 70 herring blood samples was taken for analysis.

Lobster: A total of 29 trawl sets was made at the 5 major lobster stations covered. The sets made in waters of 60 to 160 fathoms yielded about 950 lobsters, 55 percent females and 45 percent males--63 of the females were berried. The average weight of the entire catch was 4 pounds, and the average weight of legal size lobsters was 5 pounds. The range in weight of the entire catch was 0.1 to 22 pounds. The largest catch occurred on Hudson Canyon where 10½ baskets of lobsters were obtained from a 1-hour tow. Large lobsters were prevalent on Lydonia and Oceanographer Canyons, while short lobsters were prevalent in the catches from Veatch's and Hudson Canyons. A total of 42 lobsters was collected from the 16 lobster stations fished on the South Long Island Slope and the 3 lobster stations fished in the Gulf of Maine. The largest catch in that transect made at one station yielded 13 lobsters. One lobster (5

pounds) was collected from the Stellwagen Bank station. Species of fish, other than herring, collected during the cruise were haddock (30 bushels), American dab (2 bushels), yellowtail (7 bushels), winter flounder (1½ bushels), sand dab (1 bushel), alewives (¼ bushel), cod (7 bushels), eel pout (5 bushels), pollock (5 bushels), cusk (1 bushel), hake (1 bushel), sculpin (½ bushel), dogfish (7,500 lbs.), goose fish (3,700 lbs.), halibut (4 pounds), and grenadiers (¼ bushel).

CAMERA OPERATIONS: In all, 7 camera "drops" were made during the cruise. During each drop 20 to 30 pictures of the ocean bottom were taken, mostly in known lobster grounds. The drops were made on the slopes of Georges Bank and on the troughs, slopes and runs of Lydonia, Veatch and Hudson Canyons.

PLANKTON OPERATIONS: During the cruise, 18 one-meter net plankton tows lasting 15 minutes each (5 minutes at 20 meters, 5 minutes at 10 meters, and 5 minutes at the surface) were made. A total of 6,305 herring larvae with an average length of 39 millimeters or about 1.5 inches (range 30 to 50 millimeters or 1.2 to 2.0 inches) were obtained. Approximately 80 percent of the larvae were from 3 stations. No larvae were obtained at the other stations.

HYDROGRAPHIC OBSERVATIONS: Sea bed drifters and drift bottles were released at selected stations along the Continental Shelf. At each trawl station bathythermograph (BT) casts were made, salinities collected, and weather observations recorded.

Note: See Commercial Fisheries Review, January 1966 p. 41.



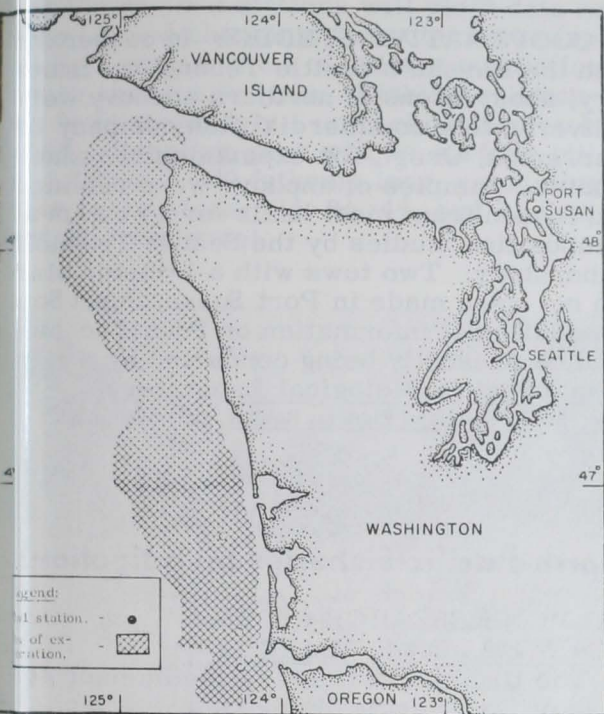
North Pacific Fisheries Explorations and Gear Development

HAKE AND ANCHOVY

POPULATION SURVEY CONTINUED:

M/V "John N. Cobb," Cruise 77 (April 13-May 4, 1966): A 3-week pelagic survey for northern anchovy (Engraulis mordax) in waters off the Washington coast between Cape Flattery and the Columbia River mouth was recently completed by the exploratory fishing vessel John N. Cobb, operated by the Bureau of Commercial Fisheries, U. S. Department of the Interior. Two days of the allotted time

the cruise were used in pelagic fishing and gear evaluation in Puget Sound prior to the scheduled departure date.



Map of operations during M/V John N. Cobb Cruise 77 (April 15-1966).

OBJECTIVES: The primary objectives of the cruise were to: (1) obtain data on the geographic and bathymetric distribution of northern anchovy during the time interval April-early May; (2) obtain data on the fishing efficiency of the modified $\frac{2}{3}$ -scale, 3-inch mesh version of the Mark II "Cobb" pelagic trawl for northern anchovy; and (3) obtain biological information on northern anchovy. A secondary objective was to obtain samples of northern anchovy for composition analysis by the Bureau's Seattle Technology Laboratory. Objectives of the 2-day pelagic fishing and gear evaluation effort in Puget Sound were to: (1) have SCUBA equipped divers assess the degree of structural modification necessary to achieve proper trawl pattern of the $\frac{2}{3}$ -scale net; (2) fish the modified trawl on concentrations of Pacific hake (*Merluccius productus*) in Port Susan; and (3) return samples of Pacific hake and plankton to the Bureau's Seattle Biological Laboratory for biological analysis.

GEAR: Midwater trawls fished during the survey were: (1) the Standard Mark II "Cobb" pelagic trawl, constructed of 3-inch mesh filament webbing, equipped with a full

$\frac{1}{2}$ -inch mesh liner in the cod-end, and (2) the modified $\frac{2}{3}$ -scale, $\frac{3}{4}$ -inch-mesh version of the Mark II "Cobb" pelagic trawl. Both trawls were fished with a pair of 5-by 8-foot aluminum hydrofoil-type otter boards attached to 30-fathom bridles. Fishing depth of the trawl was monitored by using a dual electrical depth telemetering system, with the depth sensing units positioned on the trawl at the lower end of the wings. A high-resolution, low-frequency echo sounder was used to locate fish schools.

METHODS OF OPERATIONS: Onshore-offshore echo-sounding transects were made at oblique angles to the coast between the 10- and 140-fathom isobaths. Upon location, fish populations were sampled with a pelagic trawl to obtain data on species composition and availability to the trawl. Post-sampling procedures included the outlining of significant schooling areas by closely spaced echo-sounding transects. A bathythermograph cast, with its associated sea-surface reference temperature, was made after each haul.

TWO-DAY PUGET SOUND EFFORT: One drag, 2 plankton tows, and 5 bathythermograph casts were made in Puget Sound. A 2-minute drag at latitude 48°06.6' N. and longitude 122°22.8' W., was made on strong echo traces ranging between 45 and 63 fathoms over an average bottom depth of 65 fathoms. About 9,000 pounds of Pacific hake were collected. A random sample (289 fish) showed a 3.1:1 male to female sex ratio, respectively. Length measurements ranged from 31 to 46 centimeters (12.2 to 18.1 inches), with males averaging 35.0 centimeters (13.8 inches), and females 37.9 centimeters (about 14.9 inches). Gonads were observed in various stages of development. A brief examination by personnel from the Seattle Biological Laboratory showed that both plankton samples contained hake-like eggs. Vertical temperature profiles taken in Port Susan showed surface water temperatures ranging from 49.8° to 51.2° F., while corrected temperatures at 65 fathoms ranged from 48.5° to 49.9° F.

SCUBA-equipped divers observed that the unmodified $\frac{2}{3}$ -scale, $\frac{3}{4}$ -inch mesh version of the Mark II "Cobb" pelagic trawl showed an excessive amount of ball oning web while under tow at a balanced depth of 10 fathoms. This feature was successfully corrected by lengthening the criss-cross riblines. This modified version was then used during the remainder of the cruise.

WASHINGTON COAST EXPLORATIONS:

A total of 6 hauls, 5 with the modified $\frac{2}{3}$ -scale, $\frac{3}{4}$ -inch mesh trawl and one with the Standard Mark II "Cobb" trawl was made off the Washington coast between Grayland and the Columbia River Lightship over average bottom depths ranging from 23 to 74 fathoms. Anchovy was the dominant species collected, followed by silvergray rockfish (*Sebastes brevispinis*), yellowtail rockfish (*Sebastes flavidus*), starry flounder (*Platichthys stellatus*), and dogfish (*Squalus acanthias*).

No echo traces indicating anchovy were observed between the 10- and 140-fathom isobaths from Cape Flattery to Grays Harbor during the survey. The area between Grays Harbor and Pacific Park showed an occasional weak to fair echo trace over bottom ranging from 19 to 41 fathoms. A total of 75 pounds of anchovy was collected from a 10-minute tow off Grayland, on light scattered traces ranging from 8 to 15 fathoms in depth over an average bottom depth of 33 fathoms. These fish ranged from 6 to 13 centimeters (2.4 to 5.1 inches) and averaged 8.96 centimeters (3.5 inches) in length.

The area between Pacific Park and the Columbia River Lightship showed several fair to excellent concentrations of anchovy-like traces between the 12- and 74-fathom isobaths. Excellent echo traces showing several concentrations of anchovy-like signs were located throughout a $2\frac{1}{2}$ -by $1\frac{1}{4}$ -mile area lying west of the Columbia River mouth over bottom ranging from 21 to 35 fathoms. A 5,000-pound catch of anchovy was made in a 15-minute tow on those traces, which ranged from 18 to 32 fathoms in depth over an average bottom depth of 35 fathoms. These fish ranged 10 to 18 centimeters (3.9 to 7.1 inches) and averaged 14.15 centimeters (5.6 inches) in length. Extreme gilling was observed throughout the bag of the $\frac{2}{3}$ -scale $\frac{3}{4}$ -inch mesh trawl. Excessive gilling occurred again during a 60-minute tow off Peacock Spit. A total of 3,000 pounds of anchovy was collected from heavy echo traces ranging from 14 to 21 fathoms in depth over an average bottom depth of 23 fathoms. Anchovy ranged from 11 to 18 centimeters (4.3 to 7.1 inches) and averaged 15.03 centimeters (5.9 inches) in length. A single 30-minute tow, with the Standard Mark II "Cobb" pelagic trawl, yielded 18,000 pounds of anchovy off Cape Disappointment. Heavy echo traces ranged from 17 to 22 fathoms in depth over an average bottom depth of 23

fathoms. No gilling was observed during this tow. No signs were observed between the 10- and 50-fathom isobaths south of the Columbia River Lightship.

COOPERATIVE STUDIES: In cooperation with the Bureau's Seattle Technology Laboratory, about 7 tons of northern anchovy were delivered to a commercial fish company in Warrenton, Oreg., for experimental reduction studies. Samples of anchovy were retained and frozen from most hauls for proximate composition studies by the Seattle Technology Laboratory. Two tows with a 1-meter plankton net were made in Port Susan, Puget Sound, for additional information on Pacific hake studies presently being conducted by the Bureau's Seattle Biological Laboratory.

Note: See Commercial Fisheries Review, June 1966 p. 25.



North Pacific Fisheries Investigations

SALMON RESEARCH CRUISES PLANNED FOR SUMMER 1966:

The U. S. Department of the Interior's Bureau of Commercial Fisheries Biological Laboratory in Seattle, Wash., will send its research vessel, the George B. Kelez, and two chartered vessels to the North Pacific during summer 1966 for research on salmon. The Bureau's research vessel will fish a series of stations south of Unalaska Island along long. 167° W. Two chartered vessels, the Paragon and St. Michael, are to fish stations about 330 miles east and west of the George B. Kelez at long. 176° W. south of Adak Island, and at long. 158° W. south of the Shumagin Islands.



Fig. 1 - Bureau of Commercial Fisheries vessel R/V George B. Kelez.

Stations will be fished on each longitudinal to study the north-to-south distribution of immature salmon south of the Aleutian Islands and Alaskan Peninsula. Repeated fishing at the various stations will yield data on movement and changing characteristics (species, age, origin, etc.) of salmon populations in those areas with time. Fishing will continue from about July 1 until about September 1, 1966. Sampling gear will be surface gill nets 1,400 to 1,500 fathoms long, consisting of four mesh sizes-- $2\frac{1}{2}$, $3\frac{1}{4}$, $4\frac{1}{2}$, and $5\frac{1}{4}$ inches stretched measure).



Fig. 2 - Bureau of Commercial Fisheries chartered vessel M/V Dragon.



Fig. 3 - Bureau of Commercial Fisheries chartered vessel M/V Michael.

Primary objectives of the summer cruise are to:

(1) Determine the relative abundance, north-to-south distribution, age composition, and racial origin of immature salmon south of the Alaska Peninsula and Aleutian Islands.

This information may suggest more accurate methods of forecasting runs of sockeye salmon in Bristol Bay.

(2) Determine the percentage of captured fish that drop out of high seas gill nets before they are landed. Direct observation of salmon in the nets while the nets are fishing will be attempted in order to establish the dropout rate.

(3) Compare catches from gill nets and purse seines for information on selectivity of both types of gear for certain species, sizes, and ages of salmon.

(4) Obtain oceanographic data to improve understanding of the distribution and abundance of salmon.

This cruise will be the greatest effort in personnel and vessels that the Bureau's Seattle laboratory has expended in several years. Detailed knowledge of the summer distribution of immature salmon from areas south of the Shumagin Islands as far west as Adak Island, a distance of over 700 miles, is expected to be gained from studies.

--By Richard Bakkala, Fishery Research Biologist, Biological Laboratory, U. S. Bureau of Commercial Fisheries, Seattle, Washington 98102



Oceanography

MANUFACTURERS INVITED TO EXHIBIT PRODUCTS AT FRANKFURT, GERMANY:

An opportunity for United States manufacturers to open outlets in Western Europe for oceanographic instrumentation, equipment, systems, and services was announced by the U. S. Department of Commerce on April 12, 1966. The Department's Bureau of International Commerce (BIC) will give its first overseas exhibition of oceanographic products at the U. S. Trade Center in Frankfurt, West Germany, on November 2-9, 1966. United States manufacturers are invited to show and sell.

A broad market development campaign is underway to attract buyers, agents, and distributors to the exhibition from West Germany and from neighboring countries of Western Europe.

A market survey conducted in Western Europe for the U. S. Bureau of International Commerce pinpointed business opportunities. Among some of the business opportunities were: ocean mineral and food resources development; fisheries research and fish farming; marine and civil underwater engineering, construction, and harbor installation; marine biology and geophysical oceanic research, underwater TV, and movies; and hydrography. The survey revealed that a growing number of European firms was interested in diversifying their capabilities to take advantage of advanced ocean sciences and engineering to develop the vast resources of the ocean.

As in the United States, Western European firms and organizations, both private and government, now are engaged in a wide variety of oceanographic activities--physics, chemistry, meteorology, graphics, geology, metallurgy, biology, medicine, naval architecture, and civil engineering.

U. S. firms interested in taking part in the Frankfurt Trade Center show may obtain additional information and marketing facts from the Bureau of International Commerce, U. S. Department of Commerce, Washington, D. C. 20230, or from any of the Department's 42 field offices.

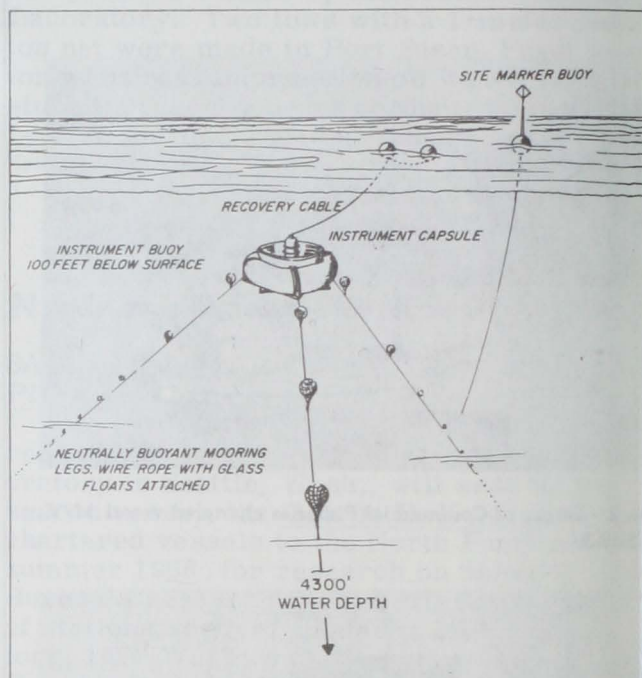
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DEEP-WATER BUOY SYSTEM IMPLANTED OFF CALIFORNIA COAST FOR OCEAN RESEARCH:

The successful implantation of a three-point buoy moor in deep water (4,300 feet) was recently made by a marine engineering firm. This buoy system, installed for the Environmental Scientific Services Administration (ESSA) of the U. S. Coast and Geodetic Survey, is located 80 miles off the California coast. The purpose of the buoy system is to support instruments which are recording continual magnetic measurements for the first time in the deep ocean basin. The project scientist for ESSA termed the retrieval of the first 60 days of recorded data as a "significant step toward the establishment of magnetic observatories throughout the 78 percent of the world covered by the oceans". Previously, the engineering firm successfully implanted and recovered a similar buoy system for ESSA in 12,000 feet of water.

The system consists of a stable toroidal (doughnut-shaped) buoy, 8 feet in diameter,

moored 100 feet below the water's surface. The buoy is anchored in exact position by three 6,150 ft. wire mooring legs. To prevent the wire legs from sagging, glass floats are attached at 120-foot intervals along each of the legs. The foam-filled buoy supports an instrument case containing a magnetometer which measures the earth's magnetic field vector. After 30 days, the magnetometer is removed from the buoy and the batteries are recharged for 24 hours; the instrument is then reinstalled in the buoy.



Stable deep-water buoy for long-term geophysical measurement.

According to the engineering firm, this buoy system is the first to hold position without vertical, horizontal, or rotational movement and to allow the collection of precise deep-ocean geophysical measurements. Although it was designed by ESSA primarily as a deep-sea magnetometer station, the system provides a highly stable platform which readily can be instrumented with a variety of other sensors. For example, it can be used to measure deep-sea tides, seismic sea waves (tsunamis), or to provide a geodetic bench mark. "Hopefully, a series of these buoy systems will be implanted throughout the world enabling man to increase his knowledge and understanding of the deep ocean," said the ESSA scientist.



Salmon

**U. S. PACIFIC COAST
CANNED STOCKS, APRIL 1, 1966:**

On April 1, 1966, canners' stocks (sold and unsold) in the United States of Pacific canned salmon totaled 1,183,396 standard cases (48 1-lb. cans)--302,551 cases less than on March 1, 1966, and 252,349 cases less than on April 1, 1965, when stocks totaled 1,435,745 standard cases.

On the basis of total stocks of 1,621,019 standard cases (consisting of cans of 1/4-lb., 1/2-lb., 1-lb., etc.), red salmon accounted for 68.6 percent of the total canners' stocks (April 1, 1966; pink salmon accounted for 15.8 percent (148,831 cases were 1-lb. talls). Next came coho or silver (102,039 cases), followed by chum (92,726 cases), and king salmon (58,239 cases).

Table 1 - Total Canners' Stocks of Pacific Canned Salmon, April 1, 1966

Species	Apr. 1, 1966	Mar. 1, 1966	Feb. 1, 1966
	(No. of Actual Cases)		
King	58,239	66,421	87,321
Red	1,112,151	1,315,770	1,553,294
Coho	102,039	119,342	155,072
Pink	255,864	365,595	520,292
Chum	92,726	142,969	201,711
Total	1,621,019	2,010,097	2,517,690

Carryover stocks at the canners' level totaled 733,575 standard cases on July 1, 1965, the approximate opening date of the Pacific salmon packing season. Adding the 1965 new

season pack of 3,541,187 standard cases brought the total available supply for the 1965/66 market season to 4,274,762 standard cases.

Shipments at the canners' level of all salmon species from July 1, 1965, to April 1, 1966, totaled 3,091,366 standard cases. The carryover of 733,575 standard cases on July 1, 1965, the beginning of the 1965/66 sales year, was substantially lower (37.6 percent) than the carryover of 1,175,588 cases a year earlier.

Data on canned salmon stocks are based on reports from U. S. Pacific Coast canners who packed over 96 percent of the 1965 salmon pack. (Division of Statistics and Economics, National Canners Association, April 27, 1966.)

Note: See Commercial Fisheries Review, June 1966 p. 30.



Sea Scallops

**SUPPLIES PLENTIFUL DURING
FIRST QUARTER OF 1966:**

The consumption of sea scallops in the United States was up sharply as of March 1966. January-March 1966 consumption was 8.5 million pounds compared with 6.0 million pounds a year earlier--42-percent increase. Much of the increase in consumption can be attributed to lower retail prices, particularly for frozen scallops. In March 1966, retail prices for fresh and frozen scallops at Boston averaged 13 percent below the December 1965 levels. Prices for frozen scallops in Balti-

Table 2 - Total Canners' Stocks on Hand April 1, 1966 (Sold and Unsold), by Species and Can Size

	King	Red	Coho	Pink	Chum	Total
	(Actual Cases)					
4 lb.	3,763	138,101	46,098	2,386	132	190,480
4 lb.	52,165	381,217	36,001	99,802	20,341	589,526
4 lb.	2,019	589,744	16,144	148,831	69,719	826,457
1 lb.	292	3,089	3,796	4,845	2,534	14,556
Total	58,239	1,112,151	102,039	255,864	92,726	1,621,019

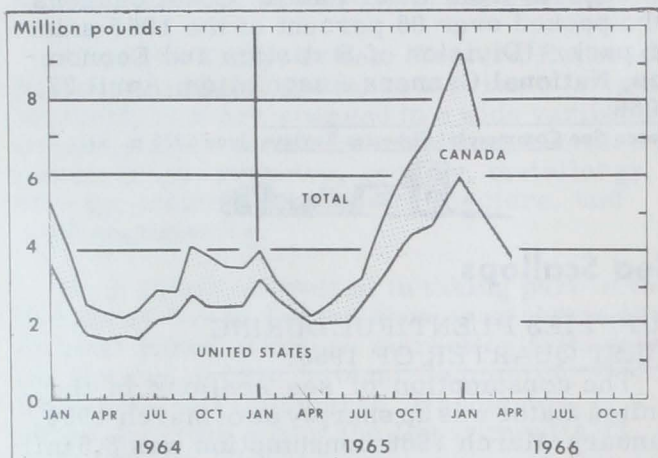
Table 3 - Canners' Shipments from July 1, 1965 to April 1, 1966, by Species and Can Size

	King	Red	Coho	Pink	Chum	Total
	(Actual Cases)					
4 lb.	10,437	286,947	78,740	6,107	-65	382,166
4 lb.	116,687	601,798	96,547	312,538	73,751	1,201,321
4 lb.	18,712	870,879	91,956	900,806	428,824	2,311,177
1 lb.	-37	6,370	10,473	53,094	14,087	83,987
Total	145,799	1,765,994	277,716	1,272,545	516,597	3,978,651

more averaged 23 percent below December.

Prices broke at the ex-vessel and wholesale levels in December because cold-storage holdings in the United States and Canada were at record highs. Wholesale prices leveled off in January and February 1966 but dropped steadily in March, although not as emphatically as at the close of 1965.

Following the large drop in ex-vessel prices in December, part of the loss was recovered in January. Since the middle of February, ex-vessel prices have edged downward.



First of month scallop cold-storage holdings.

Prices at all levels dropped during the first quarter of 1966 because of abundant supplies. In addition to the high U. S. and Canadian inventory carryover of frozen scallops at the end of 1965, scallop fishing has been good. New England landings in the first quarter of 1966 were about 27 percent above a year earlier. When the increased U. S. and Canadian landings are added to frozen inventories on hand January 1, 1966, total U. S.-Canadian supplies in January were 10.4 million pounds, or more than double the supplies of a year earlier.

With lower prices stimulating consumption, the larger supplies have moved quickly into retail channels. U. S. cold-storage holdings were cut sharply in the first quarter 1966 because consumption was greater than U.S. landings and imports. By April 1, U. S. cold-storage holdings were only 3.8 million pounds--down from the 5.9 million pounds on hand January 1. Although April 1, 1966, holdings were much above the 2 million pounds on hand April 1, 1965, price levels prevailing in the first quarter of this year probably will re-

duce frozen stocks to near year-ago levels by mid-1966.

Further price weakness would appear unwarranted because:

1. Stocks were reduced substantially in March when retail prices showed a tendency to level off.
2. The scallop fleet was fishing off New York and New Jersey during April. Although production in the first quarter 1966 was well above a year earlier, there is some question as to how long that area can sustain heavy fishing effort.
3. The fleet must return to the fishing grounds on Georges Bank when the fishing area off New York and New Jersey is depleted for this season. Biologists of the U. S. Bureau of Commercial Fisheries see no increase in abundance for 1966 on Georges Bank, and it might possibly be less. With little competition from the United States fleet, Canadian vessels on Georges Bank in January increased their catch only 19 percent over the previous year. While the American fleet is off New York and New Jersey, the Canadian fleet can be expected to harvest scallops from the most productive areas on Georges Bank. Therefore, if the United States fleet fishes out the New York and New Jersey beds, there is the question of what will be the abundance and size of scallops on Georges Bank when the United States fleet returns to those grounds.

There is a possibility of light scallop supplies and rising prices in the last half of 1966. This is primarily dependent on how soon the Middle Atlantic grounds are fished out and the abundance of market scallops on Georges Bank. (U. S. Bureau of Commercial Fisheries, Branch of Current Economic Analysis, Shellfish Section.)



Shark

REWARD OFFERED FOR TAG RECOVERIES:

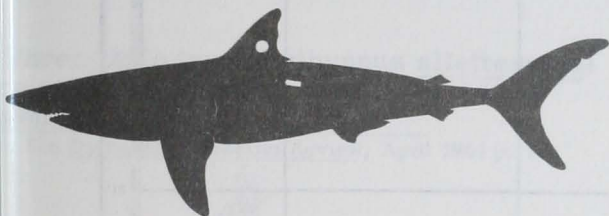
A shark tagging program covering the entire east coast is being conducted by the U. S. Bureau of Sport Fisheries and Wildlife Sandy Hook Marine Laboratory in Highlands, N.J., to determine migratory patterns and other aspects of the life histories of Atlantic sharks. A \$5.00 reward is offered for shark tags re-

turned to the Laboratory. The tag should be returned with information on date recovered, species, location, total length, and fishing method.

REWARD

\$5 FOR SHARK TAGS RETURNED TO ;

**BUREAU of SPORT FISHERIES & WILDLIFE
SANDY HOOK MARINE LABORATORY
HIGHLANDS N.J.**



To determine migratory patterns and other aspects of the life histories of Atlantic sharks, sportsmen are assisting BSF&W biologists in a tagging program covering the entire east coast. The success of this study depends on cooperation from fishermen in recovering tags. The tag, date on when & where shark was marked, and the reward, will be sent to you.

SEND TAG WITH FOLLOWING DATA:

date	location
species	total length
	fishing method

TO:
SANDY HOOK MARINE LABORATORY
FORT HANCOCK
HIGHLANDS, NEW JERSEY, 07732

While the Laboratory program is not the only shark tagging program being conducted, it is the principal one on the United States east coast. Sportsmen are assisting Bureau biologists in the program and success of the study depends on cooperation from fishermen in recovering tags. Largely through these sportsmen's efforts, over 2,500 tagged sharks are now at liberty in the Atlantic Ocean.

The yield of scientific information from these studies depends on tag recoveries. Since sharks are not fished commercially to any extent along the east coast, it is important that fishermen are on the lookout for the tagged specimens. In order to acquaint fishermen with the study, the Sandy Hook Marine Laboratory has distributed reward posters at docks, tackle shops, marinas, and other places in different areas. The Laboratory hopes to cover the coast from Maine to Texas with this information so that tag recoveries will increase as more people become aware of the program.

An important world-wide shark program is being conducted by the American Institute of Biological Sciences under the direction of Stewart Springer, U. S. Bureau of Commercial Fisheries, Stanford University, Stanford, Calif. In addition to the United States programs, biologists in Canada, South Africa, Norway, Australia, and New Zealand also have an interest in shark migration studies. Earlier tagging programs, particularly in Australia, have produced major contributions to understanding the life history of commercially valuable sharks in that area.



South Atlantic Fisheries Explorations and Gear Development

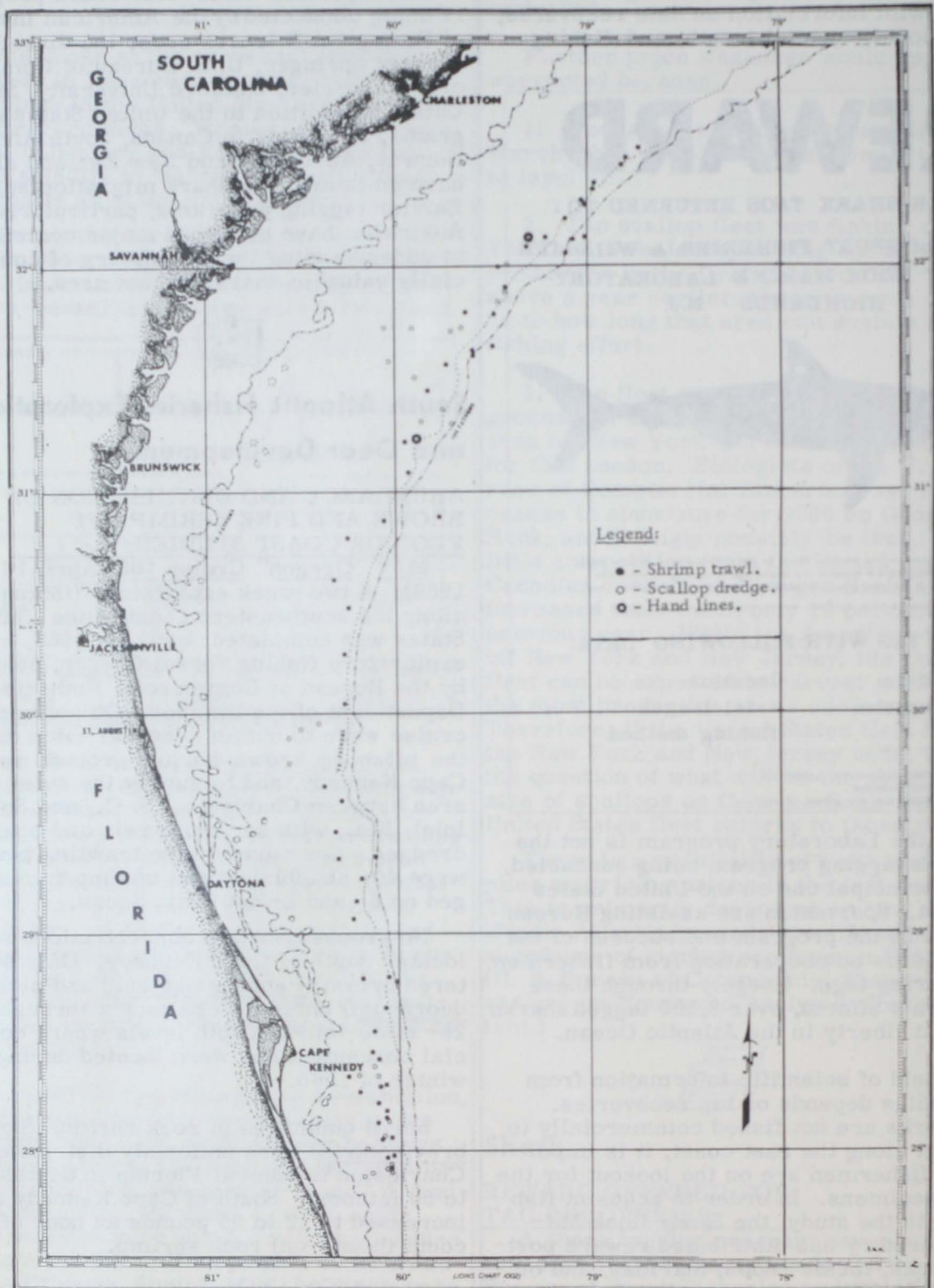
ABUNDANCE AND DISTRIBUTION OF BROWN AND PINK SHRIMP OFF FLORIDA COAST STUDIED:

M/V "Oregon" Cruise 108 (April 18-30, 1966): A two-week exploratory fishing cruise along the southeastern coast of the United States was completed April 30, 1966, by the exploratory fishing vessel Oregon, operated by the Bureau of Commercial Fisheries, U. S. Department of the Interior. Objectives of the cruise were to obtain seasonal catch data on the offshore brown shrimp grounds south of Cape Kennedy, and to survey the outer shelf area between Charleston, S. C., and Sebastian Inlet, Fla., with shrimp trawls and scallop dredges. Gear used in the trawling transects were 40- and 60-foot flat shrimp trawls rigged on 6- and 8-foot chain doors.

No grooved shrimp concentrations were located south of Cape Kennedy. Only scattered brown (Penaeus aztecus) and pink (P. duorarum) shrimp were caught through the 25- to 30-fathom depth levels where commercial concentrations were located during the winter of 1965.

Small quantities of rock shrimp (Sicyonia brevirostris) were uniformly distributed from Charleston to central Florida in depths of 15 to 50 fathoms. South of Cape Kennedy catches increased to 12 to 65 pounds an hour of 21-25 count (heads-on) rock shrimp.

Several good indications of bottomfish concentrations were observed during the cruise. Two-hour drags with 40-foot trawls off Daytona Beach in 25 to 30 fathoms yielded 300 to 1,300-pound catches of $\frac{1}{4}$ -pound spot (Leio-



Area of operations of M/V Oregon Cruise 108 (April 18-30, 1966).

Euthynnus xanthurus). Other food fishes were taken at the following maximum rates: rockfish (*Micropogon undulatus*), 161 pounds averaging $\frac{1}{2}$ pound each; black sea bass (*Centropomus striatus*), 208 pounds averaging $\frac{1}{2}$ pound each; and flounders (*Paralichthys* sp.), 100 pounds averaging $1\frac{1}{2}$ pounds each.

A total of 33 half-hour drags was made with a 6-foot tumbler dredge in areas neighboring the Cape Kennedy calico scallop bed extending northward along the outer shelf. No large concentrations were observed although scattered small scallops (*P. gibbus*) were found extending northward to 40 fathoms off Sapelo Island, Georgia.

Three little tuna (*Euthynnus alletteratus*) were caught on trolling lines. Two were tagged and released.

See Commercial Fisheries Review, April 1966 p. 38.



Transportation

UNIFORM HIGHWAY LOADING REQUIREMENTS FOR FROZEN FOODS ESTABLISHED:

A formal set of "Uniform Highway Loading Requirements for Frozen Foods" has been established by the Refrigerated Division, Common Carrier Conference, Irregular Route, and the Traffic and Warehousing Committee of the National Association of Frozen Food Packers. The requirements are for voluntary acceptance by shippers and carriers of frozen foods. Many of the carriers who handle fish as an exempt product are members of the Common Carrier Conference.

The requirements as set forth follow:

A. EQUIPMENT:

1. Trailers must be so constructed and properly insulated that, when equipped with appropriate refrigeration units, they will be capable of maintaining product at 0° F. or lower throughout the load in all movements.
2. All floor drain holes must be suitably closed to prevent air leakage.
3. Unless trailer is of envelope-type construction or uses freon or liquid nitrogen as a refrigerant, sidewalls

may be stripped, racked, rippled or baffled to provide clearance for air circulation around the load. (See Section C-3.)

4. If product is loaded on pallets, no floor racks are necessary.
5. If product is loaded on extruded floors, such floors must be free from any dirt and debris.
6. Equipment must be free from any dirt, debris, and offensive odors.
7. All doors must be tight fitting to prevent air leakage.
8. It is preferred that on mechanical refrigeration units, air circulation ducts extend from the circulating fans to at least three-fourths the length of the load.

B. PRECOOLING:

1. All units must be precooled to at least 20° F. before loading.

C. LOADING AND UNLOADING:

1. Product temperature must be no higher than 0° F. when tendered at tailgate to motor carrier for loading. Shipper, consignor or warehouse must not tender to a carrier any container which has been damaged or defaced to the extent that it is in an unsalable condition.
2. Carriers must provide their drivers with appropriate testing thermometers and instruction in proper procedure to enable them to determine that product they receive is at 0° F. or lower. Arrival product temperatures will be taken inside the trailer within a reasonable time after arrival and prior to any unloading. However, the carrier must continue to protect the product until such time as the consignee is ready to accept that which the carrier is ready to tender.

Note: Technical Service Bulletin No. 7 (Revised August 25, 1965), issued by the National Association of Frozen Food Packers, entitled "Frozen Food Temperatures--Their Meaning and Measurement" describes suit-

able equipment and approved procedures for taking accurate temperatures of frozenfoods.

3. No product shall be loaded in such manner that it will interfere with the free flow of air into or out of the refrigeration unit nor with the free flow of air around the load in trailers of other than envelope-type construction or those using freon or liquid nitrogen as a refrigerant.
4. It is the duty of the shipper and consignee, and not the motor carrier, to see that no product is permitted to remain on a nonrefrigerated dock longer than 20 minutes.
5. Vehicles should be loaded and unloaded within allowable free time as provided for in governing tariffs, otherwise detention charges will apply.
6. The refrigeration unit of the trailer must be turned on and doors of the vehicle kept closed during any time when loading and unloading operation cease.
7. The thermostat on the refrigeration unit must be set at 0° F. or lower.
8. Bills of lading will bear the following or similar notation: "FROZEN FOODS--To be tendered and transported at a temperature no higher than 0° F."
9. After loading has been completed and the trailer doors closed, the carrier's equipment must be checked prior to departure to make certain that the refrigeration equipment is in proper working order.



Tropical Atlantic Fisheries Investigations

BIOLOGY AND ECOLOGY OF TUNA AND LIVE BAIT INVESTIGATIONS:

R/V "Geronimo" Cruise 7 (January 24-April 20, 1966): The northeast coast of South America and the eastern Caribbean Sea were the areas covered on this cruise by the research vessel Geronimo, operated by the

Tropical Atlantic Biological Laboratory, Bureau of Commercial Fisheries, U. S. Department of the Interior. Objectives were to: (1) investigate the biology and ecology of surface tunas and other pelagic predators by sampling these fish by live-bait fishing and trolling, and by investigating their relationships to the physical, chemical and biological environment, and by testing the suitability of various fishes as live bait; and (2) test the feasibility of transmitting salinity and uncorrected temperature data to a shore station for processing and the subsequent transmission of reduced data back to the vessel; a cooperative feasibility study between the Bureau of Commercial Fisheries, Coast Guard, National Oceanographic Data Center, Navy Anti-Submarine Warfare Environmental Prediction System, and the University of Miami.

INVESTIGATION OF THE BIOLOGY AND ECOLOGY OF SURFACE TUNAS: Few fish were sighted during the fishery-oceanography survey from Miami to Trinidad (January 30 to February 7) except for some concentrations of blackfin tuna (Thunnus atlanticus) seen near island banks. One large school of tuna was observed near Anguilla Island. This school was estimated to be at 30 tons consisting of 50-150 pound yellowfin tuna (Thunnus albacares), 5-10 pound skipjack tuna (Katsuwonus pelamis), and 5-10 pound blackfin tuna. The school was accompanied by a 40-foot whale shark (Rhincodon typus). The fish were feeding on large concentrations of juvenile squirrelfish (Holocentrus sp.).

Extremely rough weather was encountered between Trinidad and the mouth of the Amazon River from February 12 to March 8. Thirty-knot winds from the northeast prevailed daily and made sightings of surface schools virtually impossible. One small school of tuna (5 tons) was sighted. This mixed school of yellowfin and skipjack occurred at 8°10' N. and 56°40' W. and was accompanied by several large baleen whales.

On the return survey to Trinidad the entire track was covered during daylight hours. A few small, scattered schools of little tuna (Euthynnus alletteratus) were observed in the turbid, nearshore waters, particularly near the mouth of the Amazon. A few schools of skipjack tuna and occasional yellowfin jumpers were sighted in the clear, offshore waters. A 5-ton school of skipjack and yellowfin was found at the same locality where the whales and tuna were sighted 15 days earlier; no whales were present at this time.

The combination of unfavorable fishing weather and few sightings would indicate that at that time of year the area holds little promise for a tuna fishery.

Between March 8 and 26 a fishery-oceanography survey along the north coast of Venezuela from Trinidad to Curacao was carried out. Heavy seas prevailed during the first portion of the survey, making it difficult to sight fish. In general, it was too rough to allow the fishermen in the racks for bait fishing. As a result most fish caught during the first portion of the survey were taken on jig lines. On March 16, two 35-pound yellowfin were caught by that method.

A total of 14 scattered schools of skipjack, 1 of yellowfin, and 3 of little tuna were sighted during the survey--all were too small for commercial bait or purse-seine fishing. A total of 2 yellowfin, 8 skipjack and 7 blackfin tuna, and 1 frigate mackerel (*Auxis* sp.) was caught, mostly on jig lines. Many large breeding schools of blackfin tuna and frigate mackerel were seen on Margarita Bank, located 5-6 miles off the harbor of Caracas, Venezuela. The blackfin were in close association with pods of baleen whales feeding on the rich concentration of plankton over the Bank. Flying fish and dolphin were numerous in these waters and more than 40 dolphin were hooked on jigs. The combination of rough weather and few fish indicated that the coastal and oceanic seas north of Venezuela during the month of March hold little promise for a commercial tuna fishery.

Between April 2 and 15 a fishery-oceanography survey from Curacao to Miami was carried out. Most of the effort was concentrated at the Lesser Antilles, especially in the area west of the islands of St. Vincent and St. Lucia. More than 20 schools of skipjack were sighted in a period of 10 days. Biological samples were collected from 276 skipjack sampled from these schools; this number resulted from attempts to catch a maximum of 25 fish from each school sighted and fished. Most fish were less than 12 pounds and many had nearly mature gonads. All schools sighted were of commercial quantity and behaved in a schooling fashion believed to be particularly well suited to the purse-seine method of fishing.

The western side of the Lesser Antilles is characterized by turbulent eddies formed where these islands intercept the westward moving arms of the Guiana Current. An intensive grid of

bathythermograph and hydrographic, as well as biological, stations was occupied in a 550-square-mile area to determine time-space changes in the distribution of these eddies. Preliminary analysis of the distribution of temperature reveals that the eddies may be relatively permanent features and may act as mechanisms for biological enrichment, depending upon the direction of eddy rotation.

Measurements of temperature, salinity, inorganic phosphate, and oxygen were taken at depths down to 500 meters (1,640 feet) using standard Nansen bottle casts. Plankton samples, measurements of primary productivity using C-14, neuston net tows, and nightlight samples were taken. A continuous daytime watch was maintained for fish schools, birds, and mammals. The fish caught were sampled for length, weight, and sex determination; stomach contents, gill rakers, and gonads were preserved for later study. Samples for biochemical analysis also were taken from the fish. These included eye lenses, external median flank muscle, gonad, heart, liver, caecal mass, and stomach. Blood samples were taken from 100 tuna for serological analysis by the U. S. Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii. Tissue samples were collected for analysis of possible insecticide concentration by the Bureau's Biological Laboratory at Gulf Breeze, Fla. Miscellaneous fish specimens for systematic studies were collected at a number of locations; shore collections were made at the Marquesas Keys in Florida.

INVESTIGATION OF THE BIOLOGY AND ECOLOGY OF BAIT FISHES: An unsuccessful attempt was made to collect bait fish (from January 24-27) in the vicinity of Fort Myers Beach, Fla., but bad weather hampered operations. The few fish attracted to the night light were harassed by large cobia (*Rachycentron canadum*).

Live bait was obtained (February 11-12) at the U. S. Naval Base, Trinidad, by fishing a lampara net during the day. The bait included Spanish sardines (*Sardinella* sp.), herring (*Harengula* sp.) and juvenile leatherjackets (*Oligoplites saurus*). The bait survived only 3 days because of extremely rough weather.

A total of 150 scoops of Spanish sardines was purchased (March 14) from fishermen in the Gulf of Cariaco, Venezuela. An additional supply was obtained at Punta de Araya.

Large schools of bait were common in that area. These fish survived well and proved to be good bait. Samples of the fish used as bait were preserved for future study.

COOPERATIVE (ADP) FEASIBILITY STUDY: During the fishery-oceanography survey from Miami to Trinidad hydrographic data, including uncorrected temperatures and salinities, were relayed by radio message to Miami. Temperature data were corrected and the corrected temperatures and salinities were transmitted by teletype from Miami to the National Oceanographic Data Center (NODC) in Washington, D. C., for comparison with historical records for the area. Quality control messages were returned to the vessel. The feasibility study was successful.

Meteorological and bathythermograph (BT) data were taken daily throughout the cruise and transmitted respectively to the U. S. Weather Bureau and Anti-Submarine Warfare and Environmental Prediction System (ASWEPS).

Note: See Commercial Fisheries Review, April 1966 p. 38.

* * * * *

R/V "Undaunted" Cruise 2 (February 7-April 9, 1966): To investigate (1) the biology and ecology of surface tuna and other pelagic predators and (2) the biology and ecology of fish suitable for use as live bait for sampling tuna and other pelagic predators were the objectives of this cruise by the research vessel Undaunted of the U. S. Bureau of Commercial Fisheries Tropical Atlantic Biological Laboratory. The areas of operation were the western Atlantic Ocean adjacent to the Lesser Antilles, and the Caribbean Sea.



Fig. 1 - R/V Undaunted operated by the U. S. Bureau of Commercial Fisheries Tropical Atlantic Biological Laboratory.

MISSION 1: Investigations of the Biology and Ecology of Surface Tuna: A total of 44 fish schools was observed during the cruise and 18 of those were sampled by live bait fishing or by trolling techniques. From those schools, 508 tuna (25 yellowfin tuna (Thunnus albacares), 483 skipjack tuna (Katsuwonus pelamis), 1 frigate mackerel (Auxis sp.), 43 dolphin (Coryphaena hippurus), 3 wahoo (Acanthocybium solanderi), 1 crevalle jack (Caranx hippos), 1 horse-eye jack (C. latus), 1 rainbow runner (Elagatis bipinnulatus), and 1 almaco jack (Seriola rivoliana) were caught.

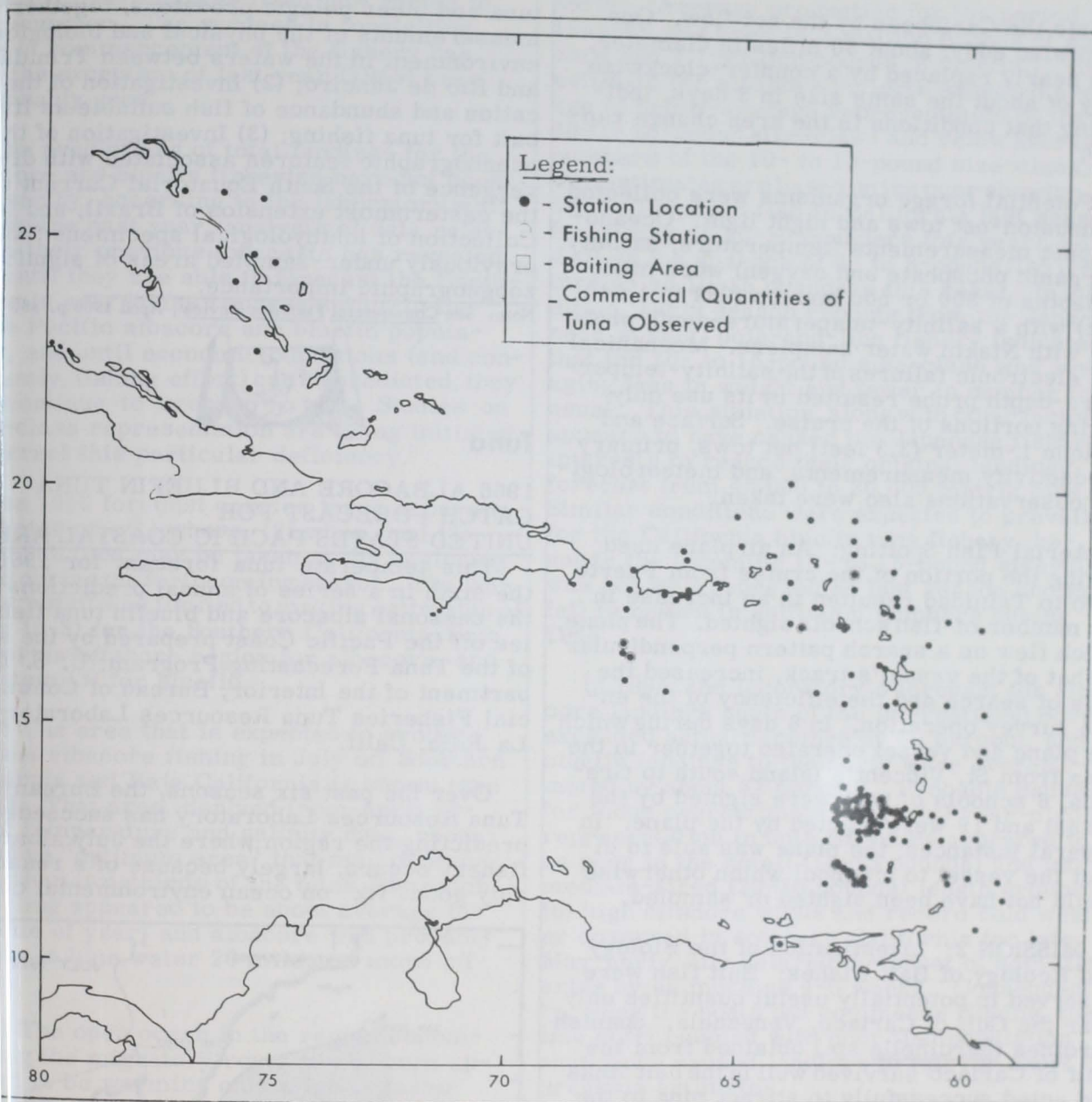


Fig. 2 - Shows a deck sample of skipjack tuna caught by R/V Undaunted during cruise 2.

The majority of the tuna schools sighted were in the southern Lesser Antilles between Martinique and Trinidad. No schools were sighted in the Bahama Islands and only 2 schools were sighted off the southwestern coast of Puerto Rico.

Seven large schools of skipjack were sampled in a 45-by 30-mile area west of St. Vincent Island. Individual fish ranged in size from 5 to 35 pounds; most fish weighed between 5 and 12 pounds. The schools varied in size from 5 to 200 tons. In the same area one mixed school of yellowfin and skipjack tuna was sampled. The fish were located at 12°56' N, 62°04' W, and ranged in size from 30 to 160 pounds. A conservative estimate of the size of the school was 500 tons.

Biological data collected from each specimen included length, weight, sex, and stomach



Area of operations of R/V Undaunted Cruise 2 (February 7-April 9, 1966).

contents. In addition, samples of muscle, gizzard, and eye lens tissue were collected from one school of skipjack tuna for electrophoretic analysis of proteins.

Small specimens (50 millimeters or 2.0 inches, total length) of the serranid Paranthias furcifer were collected in the area of the yellowfin tuna school and one of the schools of skipjack tuna. This forage species was prominent in the stomach contents and, in the latter instance, was observed swimming in dense aggregations in the area of collection.

The water properties on the eastern and the western sides of the Lesser Antilles were significantly different. Turbulent eddies in the upper 300 meters (984 feet) and increased plankton values in the upper mixed layer characterized the area west of St. Vincent Island. The greater abundance of fish schools observed in this area may be associated with these conditions. The eddies observed in this area are probably the result of currents flowing into the Caribbean Sea from the Atlantic Ocean, past St. Vincent Island and other nearby islands. The eddies appear to be carried

on into the Caribbean by the net flow. One clockwise eddy, about 30 miles in diameter, was nearly replaced by a counter-clockwise eddy of about the same size in 3 days, indicating that conditions in the area change rapidly.

Potential forage organisms were collected by neuston-net tows and night light. Oceanographic measurements (temperature, salinity, inorganic phosphate and oxygen) were made to depths of 300 or 500 meters (984 to 1,640 feet) with a salinity-temperature-depth probe and with Niskin water samplers. Mechanical and electronic failures of the salinity-temperature-depth probe resulted in its use only during portions of the cruise. Surface and oblique 1-meter (3.3 feet) net tows, primary productivity measurements, and meteorological observations also were taken.

Aerial Fish Spotting: An airplane used during the portion of the cruise from Puerto Rico to Trinidad resulted in an increase in the number of fish schools sighted. The plane, which flew on a search pattern perpendicular to that of the vessel's track, increased the area of search and the efficiency of the entire survey operation. In 6 days during which the plane and vessel operated together in the area from St. Vincent's Island south to Grenada, 6 schools of tuna were sighted by the vessel and 19 were sighted by the plane. In several instances, the plane was able to direct the vessel to a school which otherwise would not have been sighted or sampled.

MISSION 2: Investigation of the Biology and Ecology of Bait Fishes: Bait fish were observed in potentially useful quantities only near the Gulf of Cariaco, Venezuela. Spanish sardines (*Sardinella* sp.) obtained from the Gulf of Cariaco survived well in the bait tanks and acted successfully to attract tuna to the vessel. No bait fish in sufficient quantities were observed in the Bahamas, the Lesser Antilles, nor at Puerto Rico.

The R/V *Undaunted* was scheduled to start Cruise 5 on July 18, 1966. The area of operations for this cruise will be the northeast and east coasts of South America between Trinidad and Rio de Janeiro, and in the vicinity of the islands of Ilha Trindade and Martin Vaz, Atol das Rochas, Fernando Noronha, and Roche dos Sao Paulo.

The cruise missions will be: (1) Investigation of the biology and ecology of surface

tuna and other pelagic predators, together with measurements of the physical and biological environment in the waters between Trinidad and Rio de Janeiro; (2) Investigation of the location and abundance of fish suitable as live bait for tuna fishing; (3) Investigation of the oceanographic features associated with divergence of the South Equatorial Current off the easternmost extension of Brazil; and (4) Collection of ichthyological specimens from previously under-sampled areas of significant zoogeographic importance.

Note: See *Commercial Fisheries Review*, April 1966 p. 38.

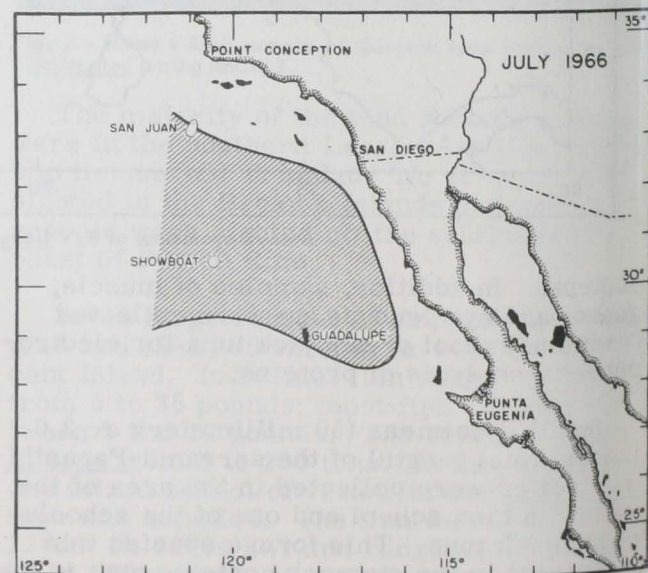


Tuna

1966 ALBACORE AND BLUEFIN TUNA CATCH FORECAST FOR UNITED STATES PACIFIC COASTAL AREA:

This temperate tuna forecast for 1966 is the sixth in a series of annual predictions for the seasonal albacore and bluefin tuna fisheries off the Pacific Coast prepared by the staff of the Tuna Forecasting Program, U. S. Department of the Interior, Bureau of Commercial Fisheries Tuna Resources Laboratory, La Jolla, Calif.

Over the past six seasons, the Bureau's Tuna Resources Laboratory has succeeded in predicting the region where the July albacore fishery occurs, largely because of a reasonably good "fix" on ocean environmental condi-



Cross-hatched area delineates the area expected to produce about two-thirds of the total July 1966 albacore tuna catch off southern California and Baja California (Mexico).

ons and their changes from late spring to mid-summer. The success in foretelling the time of commencement of the fishery has, with the exception of last year (1965) been reasonably good.

The predictions of total landings for the albacore and bluefin fisheries have not been noteworthy, according to the laboratory staff. During the past year, analysis of data relative to their previous forecasts has revealed that until they are able to forecast the fluctuations in year-class representation in the North Pacific albacore and bluefin populations, and until economic conditions (and consequently, fishing effort) can be predicted, they will continue to score poorly. Studies on year-class representation are being initiated to correct this particular deficiency.

The 1966 forecast carries three separate estimates of: (1) where, (2) when, and (3) how much tuna may be taken at the beginning and during the forthcoming season. The laboratory staff was limited to making estimates of items (1-3) for the Southern California-Baja California offshore region for albacore, and only item (3) for bluefin.

(1) The area that is expected to produce the best albacore fishing in July off Southern California and Baja California is shown (see chart). That area, derived from April 10-mer temperature and salinity data, represents the "optimum area" that may produce more than two-thirds of the total July catch. Swelling appeared to be about average for the time of year, and albacore will probably remain in blue water 20 miles or more offshore.

(2) The open ocean in the region encompassing the migratory route of albacore appeared to be warming only slightly faster than average, indicating that the first fish of the shoreward migration would probably appear in the first week of July. (Waters off Oregon and Washington began to warm appreciably from mid-April to mid-May. If that trend were to continue uninterrupted, the Pacific Northwest fishery should get off to a good start late in July.)

(3) It was estimated that July landings in Southern California would be below average. This year, it was expected that about 8.6 million pounds of albacore would be taken from the region south of the U. S.-Mexico border, and about 6.0 million pounds of bluefin to the

north. (Average production for the period 1945-62 has been 14.2 million pounds of albacore and 7.7 million pounds of bluefin.) The estimate for albacore reflects expected average to below-average representation of the 20- to 30-pound size-class and below average numbers of the 10- to 15-pound size-class. The estimates are based on the poor showing of 10- to 15-pound fish in California last season (returning as 20-30 pounders this year), as well as the absence of 6- to 8-pound fish (returning as 10-15 pounders this year). In addition, early season reports from the Japanese spring pole-and-line fishery indicated that the 10- to 15-pound size-class was averaging less in weight and fewer in number than usual. This situation, along with other factors, appears to have caused the Japanese fishery interests to reduce their original landings forecast from 45,000 to 30,000 metric tons. Similar conditions were expected to prevail for the California bluefin tuna fishery, because the incoming 10- to 15-pound size-class was not well represented last season and may fail to return in sufficient numbers during 1966.

In 1965, the laboratory's forecast for albacore landings south of the International Border exceeded actual landings by 60 percent, and bluefin landings to the north were overestimated by about 62 percent. Probable causes for those overestimates are: (a) year-class representation in both fisheries appeared to be poor in the small (10-15 pounds) and intermediate-sized (20-30 pounds) length groups; (b) high offshore winds and record cold weather observed in southern California for late May-early July delayed the onset of both fisheries by as much as 4-6 weeks. Consequently, when the boats did commence fishing, the late start coupled with poor fish population abundance caused landings to fall far short of previous estimates.

In 1965, U. S. West Coast albacore tuna landings would have been among the poorest on record if the Pacific Northwest fishery had not materialized. Oregon-Washington landings proved to be the best since 1948, and totaled slightly over 14.0 million pounds. Consequently, the United States total came to 37.1 million pounds, or 4.8 million pounds short of the 21-year average.

The staff of the Bureau's Tuna Forecasting Program states that its understanding of the normal progression of events during the fishing season has improved in recent years, and

that it is now better prepared to monitor environmental changes over short time intervals. Significant changes which occurred between issuance of this forecast and commencement of the fishery were reported by radio broadcasts for the benefit of the fishing industry starting June 1. In addition, as the summer season progresses, it was planned to update and project ahead the oceanographic information and catch reports so that fishermen at sea can make maximum use of the data available.

Note: See Commercial Fisheries Review, July 1965 p. 49.



U. S. Fishing Vessels

DOCUMENTATIONS ISSUED AND CANCELLED, JAN.-FEB. 1966:

U. S. Fishing Vessels 1/--Documentations Issued and Cancelled, by Areas, Jan.-Feb. 1966 with Comparisons						
Area (Home Port)	Jan.		Feb.		Jan.-Feb.	
	1966	1965	1966	1965	1966	1965
 (Number)					
Issued first documents:						
New England	1	3	1	3	2	6
Middle Atlantic	1	1	-	2	1	3
Chesapeake	3	4	5	-	8	4
South Atlantic	5	3	4	5	9	8
Gulf	22	9	12	24	34	33
Pacific	10	6	10	9	20	15
Great Lakes	1	-	-	-	1	-
Total	43	26	32	43	75	69
Removed from documentation 2/:						
New England	3	1	2	5	5	6
Middle Atlantic	2	1	5	3	7	4
Chesapeake	7	1	6	4	13	5
South Atlantic	3	7	9	8	12	15
Gulf	10	6	4	10	14	16
Pacific	14	8	2	3	16	11
Great Lakes	1	2	1	1	2	3
Hawaii	1	1	-	-	1	1
Total	41	27	29	34	70	61

1/Includes both commercial and sport fishing craft. A vessel is defined as a craft of 5 net tons and over.
 2/Includes vessels reported lost, abandoned, forfeited, sold alien, etc.
 Source: Monthly Supplement of Merchant Vessels of the United States, Bureau of Customs, U. S. Treasury Department.

FIRST VESSEL COMPLETED UNDER U. S. FISHING FLEET IMPROVEMENT ACT:

Completion of the first vessel constructed with assistance of the United States Fishing Fleet Improvement Act was announced May 19, 1966, by the U. S. Department of the Interior's Bureau of Commercial Fisheries. The vessel was to be delivered to its new owners in New Bedford, Mass., and will be used to fish for scallops, groundfish, flounder, and swordfish.

Scheduled to be christened Victor, the 88-foot vessel was built at a Lake Michigan shipyard and made the trip to New Bedford via Lakes Michigan, Huron, Erie, and Ontario and the St. Lawrence Seaway.

The United States Fishing Fleet Improvement Act authorizes payment of up to 50 percent of the difference in the cost of building a vessel in the United States and in less expensive foreign shipyards. To qualify for a differential payment, a vessel must be of advanced design, capable of fishing in expanded areas, and must meet certain other conditions required by the Act.

When the Victor is finally accepted by the owners, approximately \$153,000, which represents 43 percent of its \$355,800 cost, will be paid by the Government and the balance by the owners.



U. S. Foreign Trade

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA:

United States imports of tuna canned in brine during January 1-April 30, 1966, amounted to 24,355,597 pounds (about 1,159,790 standard cases), according to preliminary data compiled by the Bureau of Customs, U. S. Treasury Department. That was considerably more than the 9,599,442 pounds (about 457,116 standard cases) imported during January 1-May 1, 1965.

The quantity of tuna canned in brine which can be imported into the United States during the calendar year 1966 at the 12½-percent rate of duty is limited to 65,662,200 pounds (or about 3,126,771 standard cases of 48 7-oz. cans). Any imports in excess of that quota will be dutiable at 25 percent ad valorem.

AIRBORNE IMPORTS OF FISHERY PRODUCTS, 1965:

Shrimp from Venezuela continued to be the main airborne fishery import into the United States during the last quarter of 1965. In 1965, airborne imports of fishery products into the United States totaled 12.1 million pounds with a value of \$7.3 million. Airborne fishery imports increased 13.8 percent in 1965 as compared with 1964 when smaller quantities of

U. S. 1/Airborne Imports of Fishery Products, Oct.-Dec. 1965 and the Year 1965 with Comparisons

Product and Origin 2/	Oct.-Dec. 1965		Year 1965		Year 1964	
	Qty. 3/	Value 4/	Qty. 3/	Value 4/	Qty. 3/	Value 4/
	1,000 Lbs.	US\$ 1,000	1,000 Lbs.	US\$ 1,000	1,000 Lbs.	US\$ 1,000
From foreign countries	198.9	170.1	861.6	821.3	438.1	138.3
Shrimp:						
Venezuela	416.2	291.0	9,247.4	4,809.6	7,120.4	3,486.9
Panama	103.4	73.5	918.8	606.0	1,262.9	789.4
Costa Rica	-	-	104.8	50.2	350.4	187.3
El Salvador	-	-	28.1	19.1	170.2	102.8
Other countries	4.6	2.6	60.3	34.4	133.5	73.1
Total shrimp	524.2	367.1	10,359.4	5,519.3	9,037.4	4,639.5
Finfish other than shrimp:						
Canada	0.3	0.3	25.8	9.5	316.6	175.2
Mexico	15.4	21.9	24.1	31.8	14.4	9.9
British Honduras	98.9	162.6	270.0	345.5	368.5	337.3
Honduras	18.3	27.9	43.1	44.6	80.3	82.6
Paraguay	9.6	5.1	119.1	120.1	70.7	69.1
Costa Rica	2.0	2.9	15.9	16.2	62.1	54.7
Jamaica	24.4	32.0	78.1	91.4	75.6	83.4
Other countries	114.1	131.3	260.8	251.0	128.3	104.6
Total shellfish (except shrimp)	283.0	384.0	836.9	910.1	1,116.5	916.8
Grand total	1,006.1	921.2	12,057.9	7,250.7	10,592.0	5,694.6

Imports into Puerto Rico from foreign countries are considered to be United States imports and are included. But United States trade with Puerto Rico and with United States possessions and trade between United States possessions are not included.
 When the country of origin is not known, the country of shipment is shown.
 Net weight of shipments, including the weight of containers, wrappings, crates, and moisture content.
 4, b. point of shipment. Does not include U. S. import duties, air freight, or insurance.
 5. These data are included in the overall import figures for total imports, i.e., these imports are not to be added to other import data published.
 Source: United States Exports & Imports by Air, FT 785, January through December 1965, U. S. Bureau of the Census.

shrimp were shipped by air from Venezuela.

The data as issued do not show the state call products--fresh, frozen, or canned-- but it is believed that the bulk of the airborne imports consists of fresh and frozen products.



Wholesale Prices

EDIBLE FISH AND SHELLFISH, MAY 1966:
 Wholesale prices for edible fishery products (fresh, frozen, and canned) were up slightly in May 1966. At 126.9 percent of the 1957-59 average, the index rose 0.3 percent from April to May. As compared with May 1965, the overall index this May was up 16.2 percent. May 1966 prices were considerably higher for all items--sharply higher for some--than in the same month a year earlier. The exception was in prices for canned Maine sardines which were at the same level as May 1965.

The subgroup index for drawn, dressed, whole finfish rose 2.8 percent from April to May. The index rise was due largely to higher prices at Boston for ex-vessel large

haddock (up 10.3 percent) because of lighter supplies, and higher prices at Chicago for Lake Superior fresh whitefish (up 33.3 percent). May 1966 prices for western king salmon (up 0.3 percent) were slightly higher than in the previous month but remained unchanged for western halibut. Supplies of those species in May were still mostly frozen and market receipts of the fresh product from the early seasonal fishery were not much more than a trickle. Compared with May 1965, prices this May were higher by 13.0 percent. Prices were higher than in the same month a year earlier for all items in the subgroup, with substantial increases for large haddock (up 37.2 percent), whitefish (up 20.6 percent), halibut (up 17.3 percent), and yellow pike (up 15.4 percent).



Shows shellfish section of New York City's wholesale Fulton Fish Market.

Lower prices in May 1966 for fresh small haddock fillets at Boston (down 6.3 percent), and shucked standard oysters (down 1.5 percent) were offset by higher prices for fresh South Atlantic shrimp at New York City (up 9.1 percent). As a result, the subgroup price index for processed fresh fish and shellfish rose 3.6 percent from April to May. As compared with May 1965, the subgroup index this May was 13.4 percent higher because of substantially higher prices for all items in the subgroup. May 1966 fresh shrimp prices were up 14.3 percent from the same month a year earlier, small haddock fillets (up 13.6 percent), and shucked standard oysters (up 12.2 percent).

The May 1966 subgroup index for processed frozen fish and shellfish rose only slightly from the previous month (up 0.7 percent). Prices were higher than in April at Boston for ocean perch fillets (up 1.6 percent) and for frozen shrimp (up 0.9 percent) at Chicago. May prices remained unchanged for frozen floun-

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, May 1966 with Comparisons								
Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ (\$)		Indexes (1957-59=100)			
			May 1966	Apr. 1966	May 1966	Apr. 1966	Mar. 1966	May 1965
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					126.9	126.5	126.7	109.2
<u>Fresh & Frozen Fishery Products:</u>					127.8	125.0	125.3	112.9
<u>Drawn, Dressed, or Whole Finfish:</u>					119.9	116.6	118.5	106.1
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.13	.12	101.5	92.0	89.8	74.0
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.48	.48	140.5	140.5	140.5	119.8
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.87	.86	120.9	120.5	121.2	115.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.70	.53	104.4	78.3	105.9	86.6
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.75	.85	122.8	139.1	139.1	106.4
<u>Processed, Fresh (Fish & Shellfish):</u>					134.8	130.1	129.4	118.9
Filletts, haddock, smll., skins on, 20-lb. tins	Boston	lb.	.38	.40	91.1	97.2	94.8	80.2
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	1.20	1.10	140.6	128.9	123.0	123.0
Oysters, shucked, standards	Norfolk	gal.	8.00	8.13	134.9	137.0	143.3	120.2
<u>Processed, Frozen (Fish & Shellfish):</u>					123.8	123.0	122.8	109.4
Filletts: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.43	.43	109.0	109.0	106.4	98.8
Haddock, smll., skins on, 1-lb. pkg.	Boston	lb.	.39	.39	112.9	112.9	114.3	109.9
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.33	.32	114.0	112.2	112.2	105.2
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	1.10	1.09	130.4	129.2	128.6	109.7
<u>Canned Fishery Products:</u>					125.6	129.6	129.6	103.0
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	28.50	28.50	124.2	124.2	124.2	91.5
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	13.69	14.85	121.5	131.8	131.8	102.6
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	8.00	7.63	135.7	129.3	129.3	120.9
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	10.25	10.25	131.5	131.5	131.5	131.5

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.
Source: U. S. Department of Labor, Bureau of Labor Statistics.

der and haddock filletts. As compared with May 1965, the subgroup index this May was up 13.2 percent. Prices were higher for all items, with the more substantial increases indicated for frozen shrimp (up 18.9 percent) and flounder filletts (up 10.3 percent).

The wholesale price index for canned fishery products dropped 3.1 percent from April to May as a direct result of lower prices for canned tuna (down 7.8 percent). Prices for canned California jack mackerel during May

1966 were up 4.9 percent from the previous month but were unchanged for canned pink salmon and Maine sardines. As compared with the same month a year earlier, the index this May was 21.9 percent higher. Prices were sharply higher than in May 1965 for canned pink salmon (up 35.7 percent) because of the very light 1966 pack; prices for canned tuna were up 18.4 percent and jack mackerel up 12.2 percent. Prices for canned Maine sardines were unchanged. (U. S. Department of the Interior, Bureau of Commercial Fisheries, Market News Service.)

