

# TRENDS AND DEVELOPMENTS

## Additions to the U. S. Fleet of Fishing Vessels

A total of 31 vessels of 5 net tons and over were assigned first documents as fishing craft during March 1955, according to the U. S. Bureau of Customs. This was 37 vessels less than during the same month of last year--a decrease of 54 percent.

In the Gulf section only 11 vessels were documented for the first time as fishing craft in March as compared with 41 during the same month a year earlier. The Pacific section also had 11 additions, the South Atlantic section 3, the Middle Atlantic and Great Lakes sections each 2, and the New England and Alaska sections each 1.

U. S. Vessels Assigned First Documents as Fishing Craft, March 1955					
Section	March		Jan.-March		Total 1954
	1955	1954	1955	1954	
	. . . . . (Number) . . . . .				
New England . . .	1	2	6	3	23
Middle Atlantic . .	2	-	3	-	15
Chesapeake Bay . .	-	4	9	23	93
South Atlantic . . .	3	6	9	23	119
Gulf . . . . .	11	41	19	108	313
Pacific . . . . .	11	11	17	22	117
Great Lakes . . . .	2	1	2	3	6
Alaska . . . . .	1	3	8	7	27
Hawaii . . . . .	-	-	-	-	1
Puerto Rico . . . .	-	-	-	-	2
Unknown . . . . .	-	-	-	-	1
<b>Total . . . . .</b>	<b>31</b>	<b>68</b>	<b>73</b>	<b>189</b>	<b>717</b>

Note: Vessels have been assigned to the various sections on the basis of their home port.

During the first quarter of 1955 only 73 vessels were documented for the first time as fishing craft as compared with 189 vessels for the corresponding period in 1954--a decrease of 61 percent.



### California

**SARDINE FISHING PREDICTED GOOD FOR NEXT SEASON:** The southern California sardine industry can expect a good fishery this fall if the same relation between the amount of spawning in the spring and the availability of sardines in the fall continues as during the past three seasons.

Considerable numbers of sardines spawned this spring in the southern California center, reports the Service's South Pacific Fishery Investigations. In March sardine spawning extended as far north as San Pedro and was widespread off San Diego and Ensenada.

A relation seems to exist between the amount of spawning in the southern California center in the spring and the availability of sardines to the southern California fishery in the fall. In 1952 and 1953, when few fish spawned in this center, the fishery took only about 5,000 tons; in 1954 the fishery took over 65,000 tons.

A marked increase in sardine spawning off southern California and adjacent Baja California in the spring of 1954 preceded the encouraging recovery of the southern California sardine fishery in the fall of 1954. The southern California-northern Baja California spawning area and the one off central Baja California are the current major spawning centers. In recent years, particularly in 1952 and 1953, the southern California center decreased markedly in importance; the spawning in this area in 1954 was about 30 times greater than it was in 1953.

These studies are part of a cooperative research effort of the South Pacific Fishery Investigations, the Scripps Institution of Oceanography, the California Department of Fish and Game, Hopkins Marine Station, and California Academy of Sciences. The California Marine Research Committee directs this joint program, which is known as the California Cooperative Oceanic Fisheries Investigations.

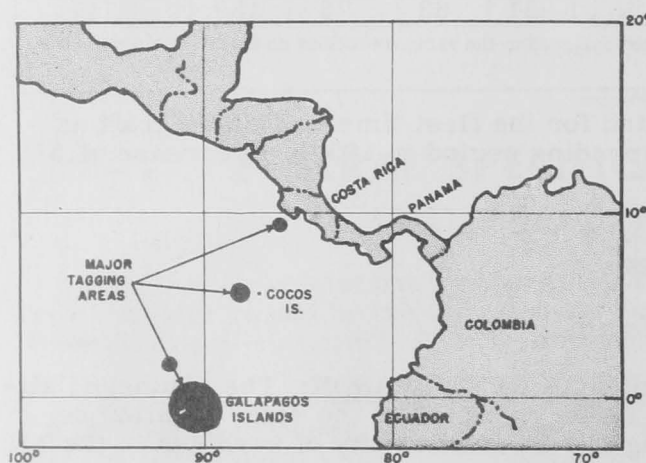
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\$1 MILLION AWARDED FOR MARINE BIOLOGICAL RESEARCH TO SCRIPPS INSTITUTION OF OCEANOGRAPHY: The Rockefeller Foundation has given the University of California \$1 million for the support of research in marine biology at the University's Scripps Institution of Oceanography, La Jolla, Calif.

The grant will be expended over an eight-year period. It will be used to strengthen present research projects and initiate new ones. A visiting professorship and four resident professorships will be established in addition to several graduate fellowships and post-doctoral fellowships. Plans also include improvements in laboratory equipment and facilities, and greater use of the University's fleet of five vessels for experimental work on marine plants and animals in the open sea.

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TUNA TAGGED BY COMMERCIAL CLIPPER "OCEAN PRIDE" (Cruise C-55-2): A total of 1,088 yellowfin, skipjack, and big-eyed tuna were tagged by the chartered commercial tuna clipper Ocean Pride on a two-month's cruise completed at San Diego on April 19 (see table). All fish were tagged with type "G" plastic tubing tags.



Cruise 55-C-2, Feb. 15-Apr. 19, 1955, of the M/V Ocean Pride.

ranging from 77° F. to 80° F., while at Cocos Island and off Costa Rica the surface water temperatures were higher, ranging from 84° F. to 85° F.

Sea-surface temperature observations were made during the entire cruise. The highest water temperature recorded was 85° F., 40 miles SW. of Cape Blanco, Costa Rica. The lowest water temperature recorded was 57° F. at Coronado Islands off Mexico. The fish caught at the Galapagos Islands were taken in surface water temperatures

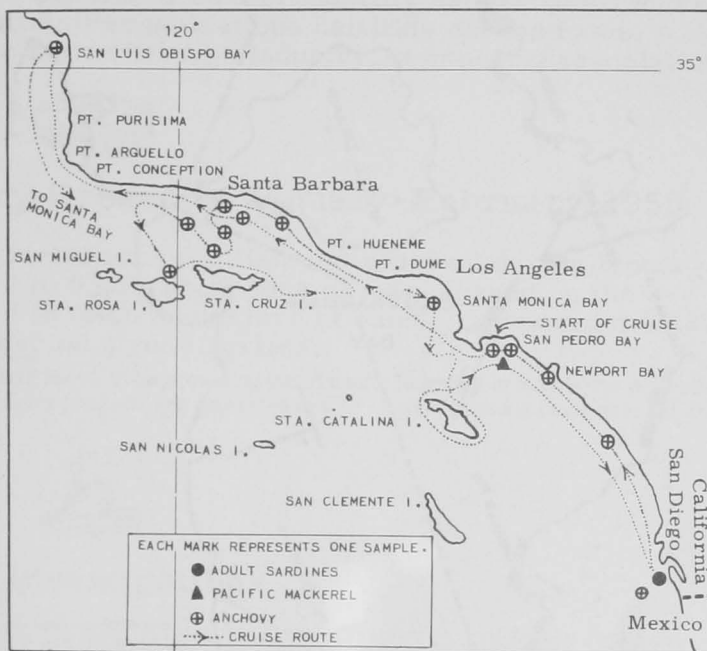
Area	Yellowfin	Skipjack	Big-eyed	Total
(Number of Fish)				
Galapagos Islands . . . . .	210	694	26	930
Cocos Island . . . . .	23	81	12	116
Costa Rica . . . . .	18	22	2	42
Total . . . . .	251	797	40	1,088

A fish tagged aboard the Ocean Pride was recovered by the same vessel after being at liberty for five days. It was recovered in the same area as released.

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**SPRING ABUNDANCE OF SARDINES, ANCHOVIES, AND MACKEREL IN CALIFORNIA WATERS ASSESSED BY "YELLOWFIN" (Cruise 55-Y-2):** The first of two 1955 cruises to assess the abundance of sardines, anchovies, and mackerel in California waters during the spring months was completed at Los Angeles on March 21 by the California Department of Fish and Game's research vessel Yellowfin. On the first half of the cruise (which began March 7) preliminary experiments were run on electrofishing with the hope of ultimately obtaining a device which will be of value in collecting fish samples at sea. Although far from conclusive, the preliminary work appeared encouraging.

Following experimental work in Los Angeles Harbor, 49 light stations were occupied between San Luis Obispo Bay and San Diego. Hauls with the blanket net resulted in 14 samples of northern anchovy, 1 sample of sardines, and 1 sample of Pacific mackerel. The anchovies were taken over the entire range of the cruise. Sardines were taken in the San Diego area and Pacific mackerel in the Los Angeles Harbor area. In addition to these, the blanket net captured sauries (7 stations), jack smelt (9 stations), top smelt (4 stations), and grunion (7 stations).



Cruise 55-Y-2, Mar. 6-21, 1955, of the M/V Yellowfin.

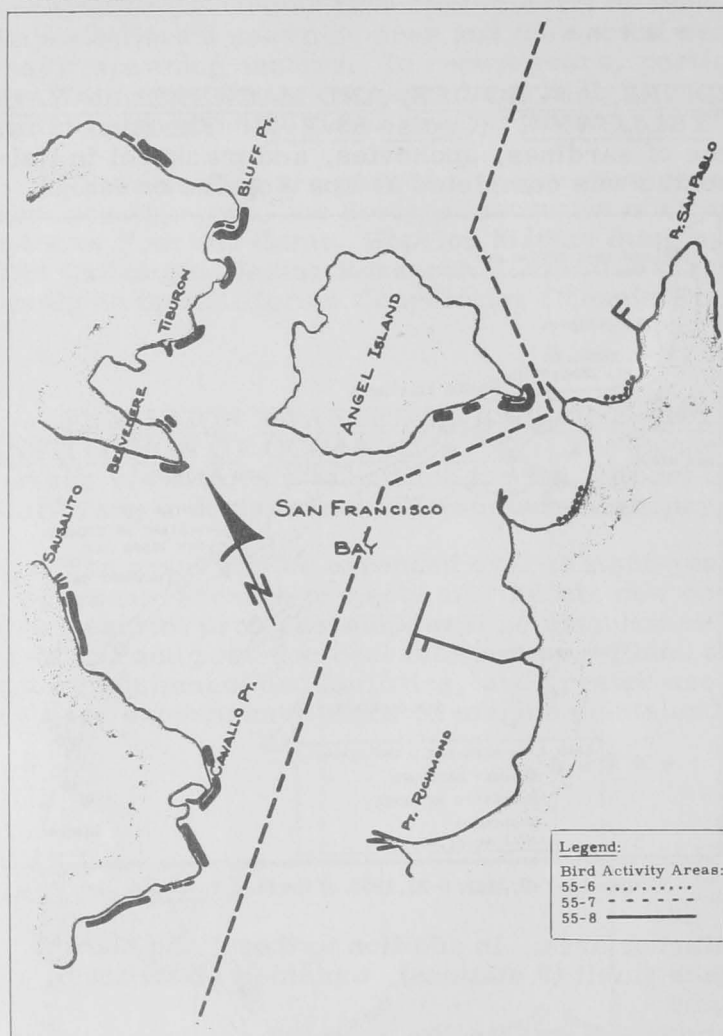
A total of 590 miles were traveled scouting for fish and a total of 141 schools were seen either visually or with the aid of the "Sea Scanar." Of the schools sighted 84 were estimated to be anchovy, 28 saury, and 8 squid. The remaining 21 schools were unidentified though many of these were probably anchovy. The heaviest concentrations of schools were encountered between Port Hueneme and Santa Barbara in the north and between Oceanside and Dana Point in the south. Although no scouting nights were lost, operations throughout the cruise were hampered somewhat by rather heavy swells and during the early part of the cruise by several hours of bright moonlight each night.

Surface temperatures, bathythermograph casts, and reversing thermometer casts were taken at each light station regardless of whether fish were observed or collected in the net.

Surface temperatures encountered on the cruise ranged from  $12.1^{\circ}\text{C}$ . ( $53.8^{\circ}\text{F}$ .) at Santa Rosa Island to  $15.75^{\circ}\text{C}$ . ( $60.4^{\circ}\text{F}$ .) in Santa Monica Bay. Anchovies were taken at both these temperature extremes. The single sardine sample was taken at a temperature of  $14.9^{\circ}\text{C}$ . ( $58.8^{\circ}\text{F}$ .) and the single sample of Pacific mackerel at a temperature of  $15.3^{\circ}\text{C}$ . ( $59.5^{\circ}\text{F}$ .)

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**AERIAL SURVEY OF PACIFIC HERRING SPAWNING INTENSITY CONTINUED**  
(Aircraft Spotting Flights 55-6, 55-7, 55-8, and 55-9):



In order to continue the low tide shoreline survey for concentrations of birds feeding on the eggs of the Pacific herring (*Clupea pallasii*), aerial flights were made along the shore lines of San Francisco, San Pablo, and Tomales Bays by California Department of Fish and Game planes between March 5 and 31. After location of major concentrations of feeding shore birds, the information as to location and extent of spawn was relayed to ground personnel, who then made a spawning intensity check of the area.

Flight 55-6 (March 5): Light concentrations of bird activity were observed in the Richmond-San Pablo area. No activity was observed in the Sausalito or Tomales Bay areas.

Flight 55-7 (March 11): Shorebirds were located west of Golden Gate Bridge approach, also on Belvedere, Bluff Pt. and Angel Is.

Flight 55-8 (March 17): Heavy concentrations of working birds were seen in the Golden Gate Bridge approach, Sausalito, Tiburon, and Angel Is. areas. No activity was observed in Tomales Bay or the San Pablo-Richmond areas.

Flight 55-9 (March 31): No bird activity was sighted.

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**KELP BASS STUDIES BY "N. B. SCOFIELD"** (Cruise 55-S-2): In spite of poor weather conditions that severely hampered fishing and diving work, 154 specimens of kelp bass were secured by the California Department of Fish and Game's research vessel *N. B. Scofield* and an additional 166 bass were measured and released. However, the weather prevented the collection of barred perch, corbina, and yellowfin and spotfin croakers on the nine-day cruise completed at Los Angeles on April 20. The cruise covered the area off the islands of San Clemente, Santa Catalina, and Santa Cruz, near Santa Barbara and Point Dume.

Part of the bass collection featured the smallest visible sizes which have been unobtainable previously. Diving work revealed that the very small bass were abundant in two locations but could not be netted or taken by size 16 salmon-egg hooks. These small fish would take the hook but the hook could not be set for some reason. The collection was finally affected by a large trap with very small mesh webbing completely covering the wire framework.



## Canned Maine Sardine Stocks, April 1, 1955

Distributors' stocks of Maine sardines in the United States are estimated at 331,000 actual cases as of April 1, 1955, according to a recent Bureau of Census survey. Cannery stocks were reported by the Maine sardine industry at 715,000 cases (100 No.  $\frac{1}{4}$  cans) on the same date, states a Bureau of Census release of April 29.

The data on distributors' stocks are based on a probability sample of all wholesalers and warehouses of retail multiunit organizations handling canned foods. Cannery stocks are provided by the Maine Sardine Industry, a cannery association.



## Cans--Shipments for Fishery Products, January-February 1955



Total shipments of metal cans for fish and sea food during January-February 1955 amounted to 9,353 short tons of steel (based on the amount of steel consumed in the manufacture of cans), compared to 8,434 short tons in the same period a year earlier.

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



## Clam Investigations

### SOFT-SHELL CLAM SHORTAGE IN NEW ENGLAND DUE TO GREEN CRAB:

Work of the U. S. Fish and Wildlife Service's Clam Investigations began during 1948, when soft-shell clams became scarce in New England, supposedly from overdigging. The word "investigation" implies fact-finding, so the research program was designed to provide the facts regarding the clam shortage.

Catch statistics indicated depletion of soft-shell clams in Massachusetts. Production had dropped from 8.4 million pounds of meats in 1940 to 0.6 million pounds in 1948. The number of diggers in Ipswich had dropped 90 percent. A census showed few clams remaining in the flats.

What caused this shortage? Overdigging was blamed. Yet, after 5 years during which only a negligible amount of digging occurred, the clams were still scarce. Seed clams which were planted disappeared in 3 weeks. Yet, if the plots were covered with 1-inch mesh chicken wire, the clams survived and grew well. Therefore, some natural enemy must have eaten the clams.

Further research disclosed three important predators: Polinices, the boring snail; Limulus, the horseshoe crab; and Carcinides, the green crab. The most serious predator north of Cape Cod proved to be the green crab, which is now tremendously abundant. Laboratory experiments showed that each green crab could devour 15 small clams in a day, which explained the failure of unprotected clam farms.

Why should green crabs suddenly become a serious enemy of the soft clams? Records made before 1900 stated that green crabs occurred only south of Cape Cod. From 1905 to 1915 green crabs appeared in Casco Bay, Me. From 1948 to 1953 they were present all along the coast of Maine and even in Canada. From all areas diggers report that these crabs are now more plentiful than ever before in history.

The spread and increase of green crabs may be correlated with warm temperature trends. Average air temperature for the coldest month of winter has increased from 23.6° F. in the 1821-40 period to 28.4° F. in 1941-52 period. This long-term increase in temperature may be responsible for the northward extension of the range of the green crab. Short-term warm cycles such as those from 1923-1933 and 1943-1953 are believed responsible for increased abundance of green crabs and the resulting scarcity of clams. Gulf of Maine water temperatures for the coldest month of the winter averaged 31.9° F. in 1943 but rose to 37.1° F. in 1952.

How can predators be controlled? Green crabs can be trapped easily, but they are so numerous that this method has not yet proved practicable. In one 12-acre cove more than 30,000 crabs were trapped in a month, catching more on the last day than on the first. Low screen fences with a horizontal strip of sheet metal at the top partly protected one clam farm. Chicken wire laid directly over the flats protected the clams but cost \$2.75 for each bushel of clams produced. Control by poisoning and by finding enemies of the predators is being investigated, but so far the best bet seems to be a series of cold winters.

--John B. Glude, Fishery Research Biologist,  
Clam Investigation, Branch of Fishery Biology,  
U. S. Fish and Wildlife Service,  
Boothbay Harbor, Me.



## Federal Purchases of Fishery Products

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY DEPARTMENT OF DEFENSE, MARCH, 1955: Fresh and frozen fishery products purchases for the military feeding of the U. S. Army, Navy, Marine Corps, and Air Force by the Army Quartermaster Corps in March 1955 amounted to 2.6 million pounds, valued at

Purchases of Fresh and Frozen Fishery Products by Department of Defense (March and the First Three Months of 1955 and 1954)							
QUANTITY				VALUE			
March		Jan. - Mar.		March		Jan. - Mar.	
1955	1954	1955	1954	1955	1954	1955	1954
(Millions of Pounds) . . .				(Millions of Dollars) . . .			
2.6	1.4	6.4	5.1	1.2	.6	2.8	2.2

\$1.4 million (table 1). This was an increase of 48.2 percent in quantity and 52.8 percent in value as compared with February purchases, and higher by 90.1 and 80.4 percent, respectively, than in March 1954.

Army Quartermaster Corps purchases of fresh and frozen fish during the first three months in 1955 totaled 6.4 million pounds (valued at \$2.8 million), higher by 25.8 percent in quantity and 23.0 percent in value as compared with the similar period a year earlier.

Prices paid for fresh and frozen fishery products by the Department of Defense in March 1955 averaged 44.2 cents per pound as compared with 42.8 cents in February and 46.5 cents in March 1954.

In addition to the purchases of fresh and frozen fishery products indicated above, the Armed Forces generally make some local purchases which are not included in the above figures. Therefore, actual purchases are somewhat higher than indicated, but it is not possible to obtain data on the local purchases made by military installations throughout the country.



## Fishery Products Marketing Prospects, Spring 1955

**CONSUMPTION AND RETAIL PRICES:** Total supplies of fishery products in the first half of 1955 are likely to be larger than in the same period of 1954, and retail prices a little lower. Civilian per-capita consumption of these products may run a bit higher than in the spring and summer of 1954.

Total supplies of fresh and processed fishery products this spring were expected to continue larger than a year earlier, with the biggest increase in the processed commodities. Retail prices for the fishery products, judging from the Bureau of Labor Statistics wholesale prices in primary markets, were expected to average a little lower than last spring.

**FRESH AND FROZEN FISH:** More fresh fishery products were expected to be available as landings by commercial fishermen increase seasonally. More of the frozen products--especially haddock and halibut--were expected to be available this spring than last. Cold-storage holdings on April 1 were up 15 percent, and commercial freezings were expected to be expanding seasonally during the next few months. In addition, imports of frozen fish--particularly fillets and blocks--were expected to be at least as large this year as last.

**CANNED FISH:** Supplies of canned fishery products were larger this spring because of heavier stocks of canned tuna, Maine sardines, and Pacific sardines carried over from last year's packs, as well as the continued heavy imports of canned tuna and frozen tuna for canning. Although very little canned salmon is available at the packers' level, there appears to be a sufficient volume in the other channels of distribution to maintain civilian consumption of this product at about the same per-capita rate as a year ago, at least until the 1955 packs start moving to market in volume after midyear. Production of canned salmon in 1954 was moderately larger than in 1953, but civilian consumption of this product thus far during the 1954/55 marketing season has been at a slightly higher rate than a year earlier.

This analysis appeared in a report prepared by the Agricultural Marketing Service, U. S. Department of Agriculture, in cooperation with the U. S. Fish and Wildlife Service, and published in the former agency's May 2 release of The National Food Situation (NFS-70).



### Florida

**CRAB-MEAT PACKING SANITATION:** The sanitary conditions in fresh crab-meat packing plants is an immediate and pressing problem for the blue-crab industry, according to the January Commercial Fisheries Newsletter #1 of the Marine Laboratory of the University of Miami. This problem of sanitation in crab-meat plants became of particular urgency in the summer of 1953 when several cases of food poisoning, presumably due to crab meat, were reported along the Atlantic Coast. The markets most affected were Baltimore, Philadelphia, and New York City.

The U. S. Food and Drug Administration at the request of New York City authorities sent technicians and inspectors to find the source of the trouble and to establish means of correcting it. As a result of this some shipments of Florida fresh crab meat were embargoed by the Federal Government and a large percentage of meat was condemned. This caused an immediate income loss to the industry, and a far greater loss was represented in the decreasing market for crab meat.

Some producers of crab meat are unfamiliar with procedures used by Federal inspectors, and with the terms used in describing the bacteria and quality standards.

The Federal Government analyzes a small sample of fresh crab meat for the presence of the bacteria Escherichia coli. If these bacteria--usually referred to simply as E. coli--are present, the entire shipment of crab meat is condemned. The crab meat is not condemned solely because of the presence of E. coli itself, but because of what the presence of this organism represents. E. coli is used as an indicator of pollution, since it is an inhabitant of the intestinal tract of man and other animals. When E. coli is found in a food product, including crab meat, it indicates that other filth organisms, for example the typhoid germ, Salmonella typhi, may also be present and may be transmitted to a food product by a person who fails to observe the simple rules of cleanliness.

On July 12, 1954, the New York City Board of Health adopted a resolution which was to take effect January 1, 1955, to amend the Crab Meat Regulation of their health code. Before crab meat is acceptable in New York City, under the new resolution, it must fall in to one of two groups. The first group is crab meat which has been packed in a hermetically-sealed container and then sterilized; the second, crab meat which has been prepared, processed, and packed in a plant under permit of a Federal or state inspection service approved by New York City's Department of Health.

Regardless of whether a plant may pass inspection, the Health Department of New York City is empowered to exclude any packer from shipping crab meat to that city if the meat is suspected of containing bacteria in excess of the following standards:

- More than 100 hemolytic (Staphylococcus aureus) per gram of meat, or
- More than 100 coliform organisms per gram of meat, or
- More than 1,000 enterococcus organisms per gram of meat, or
- More than 100,000 colonies (groups of bacteria) per gram in the total plate count.

In order to reach a full understanding of these standards it is necessary to know what the terms mean. A gram is a unit of weight; there are approximately 454 grams in a pound or about 28 grams in an ounce. When the numbers of bacteria are reported in terms of numbers of organisms per gram, that number represents  $\frac{1}{454}$  of the theoretical total number of organisms in the pound of meat.

Enterococcus is a group of bacteria. Like E. coli it indicates human or animal contamination when present in food. Enterococci bacteria are easily recognized, and their presence is more reliable as indicators of animal pollution since they are not as abundant as E. coli.

Hemolytic Staphylococcus aureus is another kind of bacteria. These bacteria are known as pathogens or disease producers. They secrete a poisonous material which produces an acute stomach and intestinal inflammation. This poisonous substance is not destroyed by heat, and pasteurization at temperatures less than 170° F. probably have no effect on it.

Staphylococcus aureus is found on the skin and mucous membranes of the animal and human body, especially of the nose and mouth, where they often occur in large numbers under normal conditions. It is also the cause of boils, carbuncles, and internal abscesses in man and of mastitis in cows. Hence crab meat can become infected with this organism if handled by careless persons.

The total bacteria plate count merely expresses the total number of organisms in a one-gram sample, without attempting to distinguish one type of bacteria from another.

This type of examination indicates the general sanitary conditions under which the meat was packed.



As a result of the efforts of the Federal Government, the City of New York, and the health departments of the states concerned, the industry has become conscious of quality. One of the most direct methods of contamination of crab meat is from the hands of the pickers or other crab-plant employees. If the hands of the pickers are kept constantly clean this major source of contamination will be removed. Cleanliness in this respect does not mean the mere washing of the hands, it means that the hands and fingernails must be scrupulously clean at all times.

Contamination also occurs if flies, rodents, or roaches come into contact with the crab meat or with utensils used in the processing of the meat. Since these pests frequent the sources of contamination, they must be kept under control if clean crab meat is to be produced.

The above does not attempt to give details on complete sanitation control in a crab plant, but merely to emphasize basic rules of cleanliness that are apt to be forgotten in a daily routine. The dealer must realize that the problem of running a sanitary plant is his responsibility and that it is not a part-time, but rather a full-time job, and will require his complete attention.

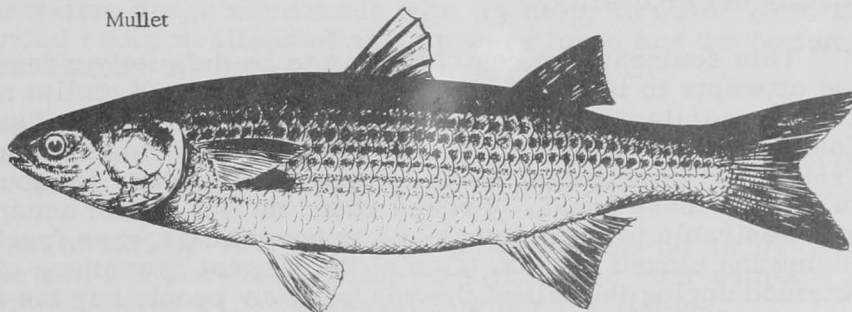
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FISHERIES RESEARCH, JULY-DECEMBER 1954: Marketing (Mainly Mullet): A survey of the existing literature of the problems of marketing of fresh fishery products of Florida origin was made in the third quarter of 1954 by the University of Miami Marine Laboratory. To obtain first-hand information as to what the present problems are, two extensive field trips were made, one along each coastline of Florida. Fifty-three of the

larger wholesale dealers were interviewed and some of the larger retail dealers and fishermen were queried. Information was obtained about the status of each fisherman as to production, the problems he faced, the supply and demand, of the desirability of his produce to the public,

price fluctuations and their causes, quality of production, and methods of handling. Opinions were asked as to what each fisherman thought were the determining factors in upsetting the fresh-fish market and suggestions were recorded as to what could be done, in the opinion of the fisherman, about improving the situation and rehabilitating the fresh-fish market. Particular references were made to mullet but information on other food fishes was recorded.

Mullet



Opinions on the establishment of processing plants in Florida to compete with northern fishery products which have apparently pushed Florida fish off the market were gathered from all of the major dealers with special reference given to the geographic, financial, and economic problems involved in such a proposal. Frozen filets, canned and smoked fish, and fish sticks were discussed as a new market for fresh fish, and dealers were asked if they would be able to financially support the undertaking of a processing plant, sell to a processing plant, or would show no interest in a processing plant.

With a basic general knowledge of the marketing and production problems confronting the Florida fresh-fish industry, the next step was to get actual statistics on the past and present fluctuations in the market for fresh fish. Particular reference is being paid to mullet due to its preponderance in the Florida catch. Inasmuch

as 90 percent of the mullet produced in Florida is sold out of the state, the problem will be to find out where these are sold, how many, and how this distribution has fluctuated in space and time. Attitudes of wholesale buyers to mullet will be obtained, and chief competitors of mullet will be studied.

Research is being undertaken to compile a list of alternate names for mullet in view of the unpleasant connotations of this fish on local markets. These names will be reviewed and an alternate name will be submitted to the U. S. Food and Drug Administration for use as a substitute name to acquire northern markets and regain many lost southern markets.

The preliminary phases of the marketing study were completed in the final quarter of 1954. These included a canvas of the wholesale fish dealers of the state to obtain their opinions concerning the feasibility of increased production of processed fish in Florida, methods of improving quality, the price structure, improved production methods, and publicity methods. The valuable information thus gained is being organized and reduced to usable form.

The other major field activity in this investigation during the October-December 1954 period was a trip to the major markets for Florida fish, chiefly mullet, outside the state. The investigator interviewed 31 wholesale and distributing dealers in Georgia, Tennessee, North Carolina, and South Carolina. It was found that the largest market for Florida mullet appears to be in Georgia, particularly in south Georgia. Most of the mullet is bought in Florida but some comes from Alabama. During certain seasons the Carolinas produce smaller fish but despite their size they appear to compete successfully with Florida mullet because of their frequently better quality.

This southeastern region seems to be definitely a fresh-fish consuming area, and attempts to introduce a market for processed mullet might be unsuccessful. The per-capita consumption appears to be quite high. The market for processed fish seems to increase toward the periphery of this region, such as Chattanooga, Tenn.; and Charleston, S. C. Perhaps canned mullet could be successfully introduced into these areas. Frozen round mullet, while acceptable, is considerably less desirable to these areas and is bought only when fresh mullet are unobtainable during the closed season. One of the biggest promoters of fresh mullet is the roe obtained during the fall of the year. Many people buy the mullet for the roe alone.

Preliminary observations seem to indicate that the market for mullet has fallen off only at the outer fringe of the southeastern area. However, this area is being rapidly invaded by less expensive, and sometimes fresher, northern fish such as fresh and frozen scup or porgy (*Stenotomus*), croaker, and whiting. These species appear to offer serious competition, mainly on the basis of the low price (one-half to one-third the cost of mullet). Since this area can be considered rather typical of the lower-income bracket, a low-price fish in fairly fresh condition seems to be the biggest seller in this region. These fish may in time push the sales area of mullet further south so that the market may dwindle further.

Frozen fish, either domestic or foreign, does not appear to offer any considerable competition with fresh fish from Florida. Many of the chain stores are freezing mullet in the round and wrapping them in cellophane. These are somewhat preferred to frozen fish sticks and fillets such as ocean perch, whiting, and haddock.

The over-all picture seems to be that the southeastern area is very satisfied with the taste and quality of mullet, but that this region, at present the market for about 90 percent of Florida mullet, may further dwindle due to lower-price fresh fish from New York and Virginia. Due to an extremely bad crop year, the economic situation is poor and people are interested in low-priced products. The low cost of meat and poultry at certain seasons has resulted in a loss of a market for a considerable

amount of fresh fish from all areas. Even if it is possible to produce mullet at a lower cost, it does not appear that it will result in any considerable regaining of these lost markets. While people will of course like a low-priced fish, these areas appear satisfied with the price in accordance with the quality and the extra roe.

A shipment of mullet was sent to a smoker in Baltimore to determine the reaction of markets in this area to smoked mullet. If results are favorable, further shipments to this and other areas will be made to attempt to create new markets for the Florida production of mullet and other species.

A new canned fish product, canned Florida mullet, has been developed by the Food Technology Department of the University of Miami. Canned mullet has a good texture and a pleasant flavor, very similar to canned salmon. The product was first prepared as a student laboratory exercise, but it has undergone four years of storage tests, and further research on methods of commercial production and handling are under way. By providing a low-priced product, canned Florida mullet may be a means of increasing the utilization of this fish.

Shrimp Explorations: In June 1954 the Diesel Engine Sales Company of St. Augustine loaned the new trawler Goodwill to the Tampa Shrimp Producer's Association for exploratory shrimp fishing. At the request of the Association a scientist from the University of Miami Marine Laboratory accompanied the vessel on several cruises to assist in the planning of the operation and to make observations. These trips extended over about 2½ months.

The first cruises were in the area between Tampa and Cape San Blas and Tampa and Anclote Light. Thirty-five drags were made with try nets, in water 10 to 60 fathoms deep. No commercial concentrations of shrimp were found and the bottom was made hazardous for trawling by the presence of sponge and coral.

At 29°05' N. latitude and 85°25' W. longitude an interesting discovery was made of a scallop bed about 6 miles long. The scallops caught were of commercial variety, 1¼-3 inches long. The bed is large enough to be of commercial importance.

In early July a small bed of shrimp was found off Tarpon Springs (at 28°07' N., 83°10' W.). The catch rate was 275 pounds of heads-on shrimp per hour with a 375-mesh flat trawl. Seventeen boxes were caught in two nights of fishing.

Tests were made with the "Shrimplupe," an electronic detection device. It was useful in locating obstructions but it could not be said to have detected shrimp.

In August 1954 the Goodwill operated between Tampa and the Middle Ground area. No large concentrations of shrimp were found. The few shrimp caught were large in size, 10-20 count per pound (heads on).

Fourth quarter 1954 exploratory shrimp fishing was done in the Gulf of Guacanaybo on the south coast of Cuba. Results were not encouraging. Shrimp caught (Penaeus schmitti, a white shrimp, and P. duorarum, the pink-grooved shrimp) were small and catches were poor. Indications were that only about one box (100 pounds) of headless 30-count shrimp could be caught per night in this area.

Blue Crabs: Encouraging progress in the blue-crab investigations was reported by the University of Miami Marine Laboratory. In August 1954 the operation of the Chesapeake Bay crab scrape at Punta Gorda was not successful, due perhaps to the high water temperatures prevailing. In September, however, the scrape caught considerable quantities of "prepeelers." These were put in floats built for the purpose, and a small but steady production of soft-shell crabs has resulted. A profit is being shown by the operator engaging in this experimental project. Expansion is

planned, and other areas will now be tested to study the feasibility of establishing soft-shell crab operations in other parts of Florida. Markets have already been established for the product.

Advice and encouragement has also been given to crab dealers who wish to attempt canned "pasteurized" crab meat. This product is not fully sterilized and is not comparable to a fully heat-processed canned product, but will keep longer than the meat marketed fresh. Several dealers are trying this method with apparent success.

Trials were initiated with a fyke net to determine whether crabs could be caught in this gear. Results were expected in January 1955.

Considerable work was done to discover if the method of processing crab meat by pasteurization could be adopted to the Florida industry. This method was developed by a Maryland crab producer in conjunction with the U. S. Fish and Wildlife Service. Taste panel tests showed that properly pasteurized crab meat compares favorably with the fresh product and some companies are in production while others are showing interest in the method.

Advice and assistance was given to established and new crab processors in the problems of sanitation and quality control. This problem has been made particularly serious by much stricter quality rules set up by some important northern markets. Most Florida plants are now meeting the new requirements or are making the necessary changes to meet them in the near future.

Scallops: No commercial scallop fishery operated in the summer of 1954 in Lee County, Florida. The scallops were presumably killed by a "red tide" outbreak. Investigations of the grounds showed that one to three bushels of scallops could be caught per day in either of two small areas, but no other area of the Sound yielded any catch. Small samples were available for study.

The Lee County scallop fishery research was completed in the final quarter of 1954 and a final report was in preparation. No attempt is made here to summarize the whole report, but one interesting aspect of local scallop life history concerning spawning and growth is presented in brief.

It has been found that spawning occurs during all four seasons of the year; however, for any one group of scallops the time of spawning appears to be of shorter duration. As a result, scallops of various sizes may be found on the grounds throughout the year. The proportion of each size group changes throughout the year due to the varying spawning times, and differential growth and mortality rates.

The biggest group may come from a late spring and early summer spawning. This group attains a size of approximately  $1\frac{1}{2}$  inches by the winter when growth is slower, and then grows rapidly in size until the following winter. Mortalities remove most of this group before their second summer.

A minor group may appear during the late summer, fall, and winter and grow to a size of less than one inch prior to the early spring season when growth becomes rapid. This group survives the next winter at a size larger than two inches. These may remain in the fishery until they are about two years of age when most or all disappear.

The largest scallops found in this area had a shell length measurement of slightly over 3 inches; however, this size is rarely attained.

From 1950 to 1953 over 70 percent of the Florida scallop landings have come during June, July, and August. There was essentially no production in this area

during 1954 due to the heavy mortalities suffered that year. The situation will be watched carefully to see if the fishery is able to re-establish itself during the next few years.

Electrical Fishing: The analysis of the results of the shrimp electrical experiment was completed. In the course of this investigation, it was shown that pulsed direct current could be successfully used to cause pink-grooved shrimp, Penaeus duorarum, to swim tail first to the positive pole. The optimum electrical conditions that caused this forced movement were determined.

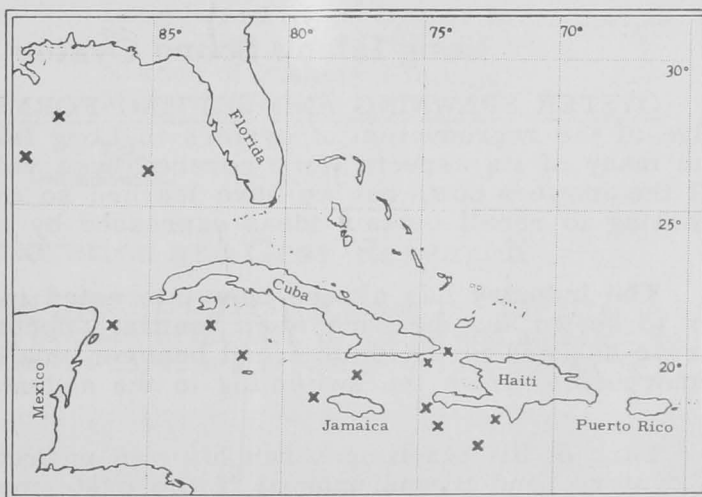
Using this basic information, calculations were made of the power requirements necessary to electrify a conventional shrimp trawl. These calculations show that the use of electrical current as a commercial fishing aid is impractical at this time. Both the cost and size of the electrical generator would prevent its use.

There are further indications from the data of this experiment that electrical fishing might be possible if suitable electronic equipment could be developed which would employ electrical impulses of high intensity and short impulse duration. Condenser and battery discharge are systems which lend themselves to this application with resultant lowering of power requirements.



## Gulf Exploratory Fishery Program

GOOD LONG-LINE TUNA FISHING FOUND IN CARIBBEAN BY "OREGON"  
(Cruise 30): Good long-line tuna fishing was found east of Jamaica and in the Windward Passage area by the Service's exploratory fishing vessel Oregon. During the four-week cruise (April 6-May 2) eleven 42-basket long-line sets were made in the northwestern Caribbean and three sets were made in the central Gulf of Mexico. Yellowfin tuna were caught at 6 of the 7 stations east and north of Jamaica and in the Windward Passage at rates of 1 to 2.6 yellowfin per 100 hooks. At each of these 6 stations from one to six 50- to 60- pound albacore tuna (Thunnus alalunga) were also caught. Considerable difficulty was encountered during two sets at the head of the Windward Passage due to large numbers of giant bluefin tuna in that area. At each of these stations 8 bluefin tuna were landed weighing from 400-600 pounds each. Judging by broken gear, at least that many more were caught and lost.



Location of long-line sets (x) during Oregon's Cruise 30, 4/6-5/2/55.

The four sets made between the Yucatan Channel and the western tip of Jamaica caught no yellowfin or albacore tuna. One large bluefin was caught north of Grand Cayman and another was caught on a set east of Cozumel Island.

Three sets were made in the Gulf of Mexico. A single yellowfin was caught on the last set of the trip (May 1) 180 miles south of Mobile. This fish weighed 190 pounds and is the largest yellowfin that has been caught in the Gulf to date. At the

same station a 14-foot false killer whale became entangled in the long-line gear and was landed.

In cooperation with a staff member of the Woods Hole Oceanographic Institution, 18 of the marlin taken on the long lines were tagged and released. Two big-eyed tunas weighing 175 pounds each were taken on a set made near the southwest tip of Hispaniola. Plankton collections and night-light collections were made by the Fishery Biologist assigned to the cruise from the Service's station at Galveston.

To further explore potential red shrimp beds with commercial-scale trawls, the Oregon was scheduled to leave Pascagoula on May 17 (Cruise 31). Additional trawling exploration was to be carried out on extensive areas of apparently good trawling bottom in the red-shrimp depth ranges in the Florida Straits area and southeast of Cay Sal Bank. In April 1954 a series of shrimp-trawl drags south of Dry Tortugas in depths of 170-250 fathoms yielded promising catches of deep-water red shrimp (Hymenapenaeus robustus). Due to damage sustained when a trawling obstacle was encountered, drags with larger commercial-type trawls were not made at that time.

Tuna long-line sets were to be made between Cuba and the Bahama Bank as a further check on the seasonal range of commercially-valuable tunas in the Gulf and Caribbean area. The Oregon was scheduled to return to Pascagoula on June 14.



## Long Island Sound Oyster Investigations

OYSTER SPAWNING AND SETTING FORMULAE: About 25 years ago knowledge of the reproduction of oysters in Long Island Sound was rather limited and many of its aspects were covered by a veil of mystery. We do not know all the answers now, but we have learned so much since that time that it is amusing to recall certain ideas expressed by some of the old-timers.

The industry has always been interested in the time when the oysters begin to spawn and the time when "setting" occurs. The oysters "set" when the larvae descend to the bottom and become small oysters. This change, or metamorphosis, from the swimming to the sedentary stage is known as setting.

Each of the old-timers had his own unshakable opinion about the behavior of oysters, and it was unusual if two oystermen agreed on any subject. For example, some insisted that setting occurred only in August, others thought that it took place only during the third week of September, and still others--and this is a fact--maintained that some oysters spawn and set even in winter. Further, some oystermen said that all oysters of a new generation set on the same day all over the Sound, while other oystermen believed that there were 2 or 3 distinct sets--perhaps 6 weeks apart. Many other opinions were also supported vigorously.

To sum up, nobody knew much about the subject. Yet, the dates of the beginning of spawning and especially of setting were--and still are--of great practical importance to the industry, for by the latter date the oystermen should have the grounds fully prepared to receive the new generation of oysters. This preparation consists of cleaning the oyster beds and planting clean oyster shells (the cultch) to provide attachment for the descending oyster larvae. Some of the largest oyster companies of Long Island Sound plant as many as a million bushels of shells every year, and that quantity indicates that the planting is a rather extensive and expensive undertaking. Obviously, planting shells at the proper time is essential. If they are planted too late, they will miss the set. If they are planted too early, they may become fouled and become unsuitable for attachment of the larvae.

Systematic and persistent research of biologists eventually helped to clear up many mysteries. Several years ago the U. S. Fish and Wildlife Service was able to offer the industry the following formulae:

In Long Island Sound the beginning of spawning should be expected on June 30  $\pm$  4 days, and the beginning of setting should be expected on July 19  $\pm$  4 days.

These formulae have held up rather well thus far, and now the industry fully depends on them.

Many other data, such as the extent of the setting period, intensity of setting in relation to time and depth, and growth and survival of young oysters under different conditions, have given the oystermen much needed practical information since the Service's studies began.

--Victor J. Loosanoff, Research Biologist,  
Long Island Sound Oyster Investigation,  
U. S. Fish and Wildlife Service,  
Branch of Fishery Biology,  
Milford, Conn.



## Maine Herring Exploration and Gear Research

"THEODORE N. GILL" SAILS ON INITIAL CRUISE (Cruise 1): The first of a series of exploratory herring fishing cruises in the Gulf of Maine and adjacent waters was commenced on April 19 when the Service's research vessel Theodore N. Gill departed Boothbay Harbor, Me.

These explorations will be made in an attempt to locate herring schools and to follow them on their migrations inshore as the season progresses.

On this cruise it is planned to cover the entire Gulf from Cape Cod to Cape Sable in two weeks by running parallel transects at 10-mile intervals from the coast line to 170 miles offshore. These courses will be run while sounding for herring with a vertical echo sounder, and a "Sea Scanar" which sounds to the sides and a-



Service's research vessel Theodore N. Gill.

head of the vessel as well as below it. Lift nets will be operated to sample the schools encountered. Plankton tows will be made and continuous water-temperature records kept during the cruise.

The northeastern part of the Gulf east of 67°30' W. longitude will be covered by the Canadian research vessel Harengus, sounding with the same type of gear during the same period of time. Results of the two cruises will be integrated to give an indication of distribution of herring schools and the size of the fish that comprise them. Any schools located will be followed during successive cruises to be made by the two vessels as the season progresses.



## Michigan

GREAT LAKES COMMERCIAL FISHERIES PRODUCTION, 1954: Commercial fishermen took 27 million pounds of fish from Michigan's Great Lakes waters during 1954, one million pounds above the average annual catch, a recent bulletin from the Michigan Department of Conservation reports.

Herring provided 8.5 million pounds and smelt ran second with an all-time record of 4.9 million pounds. Chubs, carp, lake trout, and yellow perch combined made up another 9 million pounds, and 16 other types of fish comprised the remainder.

Only 85 pounds of lake trout were taken in Lake Michigan and none was caught in either Lake Huron or Lake Erie during the year. Until the sea lamprey depletions of recent years, lake trout from these lakes provided the bulk of a \$2 million industry. Now, lake trout come mostly from Lake Superior where the sea lamprey is still found only in small numbers. In 1954, 1.6 million pounds were produced from Superior.

Lake Michigan produced 14.2 million pounds of the total catch, Lake Superior 5.8 million pounds, Lake Huron 5.4 million pounds, and Lake Erie about 1.8 million pounds.



## Montana

DIRECT-CURRENT FISH-SHOCKING TECHNIQUE DEVELOPED: The development of a direct-current fish-shocking technique using two negative electrodes and one floating positive electrode was reported by fishery biologists assigned to a "test stream" study conducted in Flint Creek near Philipsburg, Mont., by the Montana Fish and Game Department.

The technique is described as follows:

"Fish are 'repelled' from the two negative electrodes near the stream banks and 'attracted' to the floating positive electrode near the center of the stream channel. This system is particularly advantageous in Flint Creek where dense willows along the banks would make netting of shocked fish extremely difficult if it were not possible to 'attract' the fish into the open channel. Fish attracted to the positive electrode in water ranging from 1.4 to 3.5 feet per second line up at the surface of the water along the downstream edge of the triangular wooden electrode frame and are easily captured in a dip net. In water of lower velocities, it is necessary to move the positive electrode in such a way that 'attracted' fish will swim along at the trail-



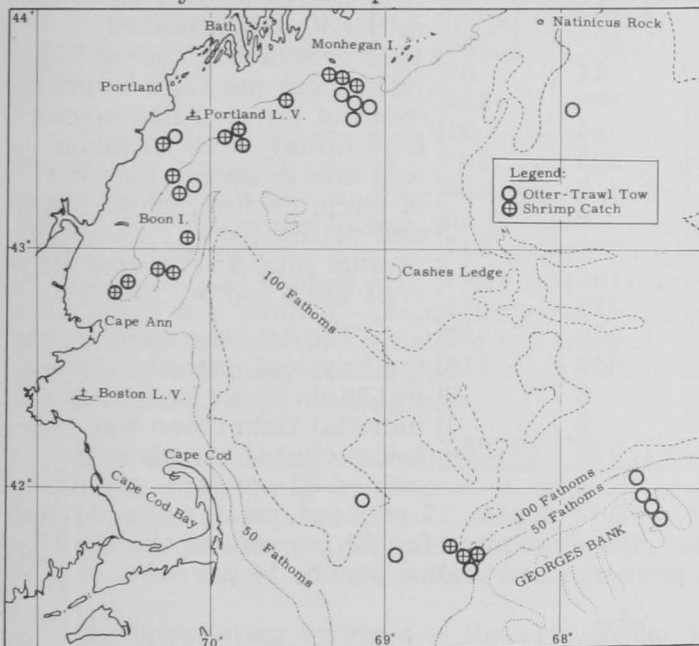
ing edge until netted. In water of higher velocity than 3.5 feet per second, the shocked fish are simply swept downstream by the water current and are captured later in a more favorable spot.

"The floating wooden triangle of the positive electrode is attached to its handle by a strap hinge which gives the desired flexibility as well as sufficient control over movement in the horizontal direction. Thin-wall conduit (either  $\frac{3}{4}$  inch or 1 inch in size) provides light yet sturdy handles and frames for dip nets and electrodes. Common copper screen (16 mesh per inch) is used for the electrode surface of the positive electrode, and copper tubing ( $\frac{1}{8}$  inch) is used for the grids on the negative electrodes."

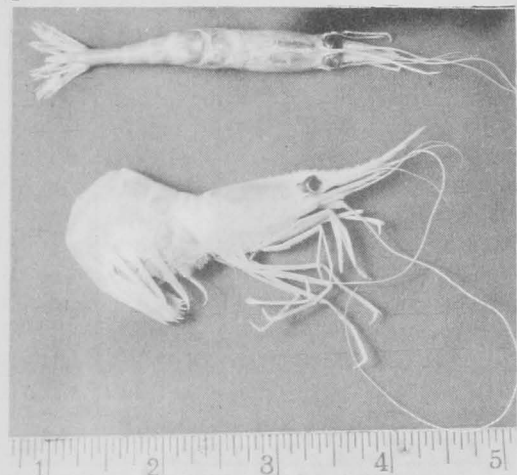


## New England Exploratory Fishery Program

"DELAWARE" FINDS SHRIMP IN GULF OF MAINE (Cruise 4): Northern shrimp (*Pandalus borealis*) were not taken in commercial quantities in any of the tows made by the Service's exploratory fishing vessel Delaware in the Gulf of Maine on an 11-day cruise completed at East Boston on April 28. As was the case in Cruise



M/V Delaware--Exploratory Fishing Trip No. 4--April 18-21, 1955



Two specimens of Atlantic Coast northern shrimp (*Pandalus borealis*). Characteristics of this species are: (1) a tubercle or small spine on the dorsal surface of the rear half of the third abdominal segment; (2) a bifid rostrum, with the lower tip projecting beyond the upper tip. Note the eggs on the larger specimen. (Large specimen does not have legs in normal position.)

3, the greatest catches of shrimp were made in the vicinity of Wood Island, Me.; an area that produced shrimp in commercial quantities in the late 1940's.

This was the fourth cruise of a series to determine the present abundance of northern shrimp in waters which formerly supported a commercial fishery in the winter months.

A total of 32 tows was made (see chart), most of them with a small-meshed No. 36 net.

The female northern shrimp, virtually all of which were egg-bearing in February, had mostly shed their eggs by the time of this cruise.

Nets were torn on several of the tows along the Maine Coast, and two fishing days were lost due to stormy weather.

The Delaware was scheduled to depart May 9 on Cruise 5. This 12-day cruise will be the third of a series to explore the commercial potential of groundfish on the edge of the continental shelf, in water deeper than is ordinarily fished commercially.



## Ohio

Species	1954	1953	1952	1951
	(1,000 Lbs.)			
Blue pike . . . . .	4,576	6,853	5,531	1,867
Bullheads . . . . .	94	52	58	44
Burbot . . . . .	91	148	230	178
Carp . . . . .	2,618	1,792	2,108	1,559
Catfish . . . . .	1,844	1,330	1,492	1,258
Cisco . . . . .	48	26	21	92
Goldfish . . . . .	82	98	100	126
Mooneye . . . . .	6	12	14	21
Sauger . . . . .	76	189	203	388
Sheepshead . . . . .	1,691	1,896	3,513	3,503
Sturgeon . . . . .	2	1	6	10
Suckers . . . . .	333	319	587	517
White bass . . . . .	2,820	1,102	765	944
Whitefish . . . . .	145	136	213	375
Yellow perch . . . . .	3,991	3,208	1,556	2,397
Yellow pickerel . . . . .	4,971	5,752	4,840	5,418
Buffalofish . . . . .	41	35	8	2
Miscellaneous . . . . .	6	2	2	1
Total . . . . .	23,435	22,951	21,247	18,700

### LAKE ERIE COMMERCIAL FISHERIES, 1954:

The total catch of fresh-water fish by Ohio's commercial fisheries of Lake Erie amounted to 23.4 million pounds in 1954, a 2-percent increase over the 23.0 million pounds landed in 1953, reports a recent bulletin from the Ohio Department of Natural Resources (see table). The increase was due to larger catches of carp, catfish, white bass, and yellow perch. Landings of blue pike and yellow pickerel were lighter in 1954.

The leading species on the basis of quantity landed by Ohio's Lake Erie commercial fishermen was yellow pickerel, which comprised 21 percent of the

total; followed by blue pike, 20 percent; yellow perch, 17 percent; white bass, 12 percent; and carp, 11 percent. In 1953 blue pike accounted for 30 percent of the total catch; followed by yellow pickerel, 25 percent; and yellow perch, 14 percent.



## North Atlantic Fisheries Investigations

VARIOUS MESH-SIZE COD ENDS TESTED IN HADDOCK FISHING BY "ALBATROSS III" (Cruise 59): A six-day fishing cruise to determine the selectivity of sizes of haddock caught with cod ends of 7-, 7½-, and 8-inch meshes (between centers) was completed at Woods Hole, Mass., on April 12 by the Service's research vessel Albatross III.

Mesh Sizes When New <sup>1/</sup>	Mesh Size When Used and Wet <sup>1/</sup>	50-Percent Point
Inches	Inches	cm.
8	6	54
7½	6	52
7	5½	48

<sup>1/</sup>Inside measurements.

Favorable quantities of fish were found south of La Have Bank when 34 tows were made. Up to 4,000 pounds were taken. Selection curves for the three cod ends were established (see table).

Four sets were made SE. of "The Leg" on Georges Bank. Good quantities of scrod haddock were obtained and 125 live haddock were returned to the Woods Hole laboratory for tagging and growth studies.

Otoliths, cleithra, scales, length, and maturity information were collected from haddock caught on La Have and Georges banks.



## Pacific Oceanic Fisheries Investigations

STEEL TUNA LONG LINES SUCCESSFULLY TESTED IN LINE ISLANDS WATERS BY "JOHN R. MANNING" (Cruise 24): The new steel "D" ring long-line tuna gear was found easier to handle than the standard cotton line on a three-week tuna-fishing cruise by the Service's research vessel John R. Manning in the rich yellowfin tuna grounds near the equator south of Hawaii. The cruise was completed at Honolulu on April 15. The steel gear developed only few bad tangles even with the abundance of sharks in the area and the frequent catch of large marlin. Thirty baskets of steel long-line gear were fished together each day. The addition of swiveling "D" rings to the steel gear and the use of nylon droppers reduced considerably the loss of fish and dropper lines previously experienced with the steel gear. In setting the steel gear a new device was used for automatically attaching the dropper lines.

The underlying purpose of these attempts to mechanize the long-line method of fishing for tuna, heretofore used on a large scale only by the Japanese, is to cut down the amount of manpower required and thus make it economically feasible for American fishermen to exploit the resources of deep-swimming tuna that only the long line can reach. The newly-developed fishing gear features a steel main line which is set and hauled with reels powered by a small winch. At appropriate intervals along this cable D-shaped rings are fitted for the attachment of the branch lines, which bear the hooks. A device has been developed to snap the branch lines on these rings automatically as the gear is payed out, a task which must be done by hand on the traditional type of long line.

Ten days fishing with 60 baskets of gear set each day produced a total of 128 yellowfin tuna, 4 big-eyed tuna, 2 skipjack tuna, 9 marlin, and 133 sharks. The yellowfin catch totaled about 6 tons. The best day's catch (42 yellowfin) was made off Christmas Island; the second best catch (21 yellowfin) was made at Washington Island. The open ocean catches were generally poor.

An interesting incident of the cruise was the landing of a huge white marlin, estimated to have weighed around 1,500 pounds, which had in its stomach a freshly killed yellowfin tuna 5 feet in length and weighing 157 pounds. Some light was thrown on the question, often debated by fishermen, of the use that marlin make of their bills in capturing their prey--the tuna had been speared clean through its body twice before being swallowed.

On 6 fishing days on which the John R. Manning and the Charles H. Gilbert set long-lines in close proximity, the daily catches of the 2 vessels were almost identical.

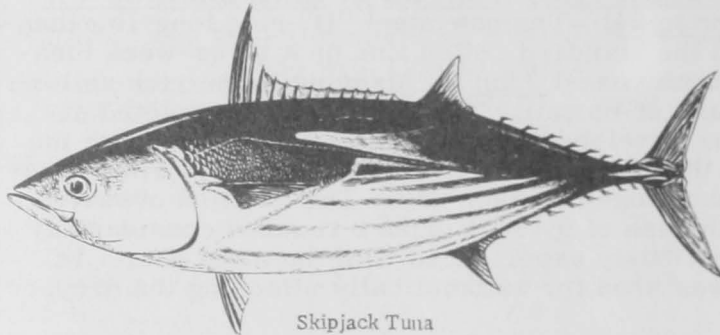
Quantitative pelagic trawl collections were obtained at 13 stations and will provide material for examining variations in abundance of forage organisms in the open ocean and along the Line Island chain.

Eleven yellowfin and 3 big-eyed tuna, all over 150 pounds in weight, were butchered into loins and labeled, wrapped, and dry frozen for subsequent experiments in canning by the Pauley Process.

During the long-line fishing, 47 yellowfin tuna were brought aboard alive, tagged, and released. A record was kept of tuna schools, bird flocks, and aquatic mammals sighted. Surface trolling was conducted during daylight hours on the runs to and from the fishing grounds.

\* \* \* \* \*

SKIPJACK TUNA TAGGED BY "HUGH M. SMITH" (Cruise 28): A total of 107 skipjack tuna were tagged by the Service's research vessel Hugh M. Smith on a one-month cruise in the area around the Hawaiian Islands, completed at Honolulu on April 8. The California-type plastic tube tag was used and the fish were released in apparently viable condition. The fish were all small (3- to 7-pound size) and caused



Skipjack Tuna

no difficulty in tagging. One slow biting school was fished and tagged with considerable ease and effectiveness as 62 of the 70 skipjack caught were marked and released. These fish were tagged in 17 days of scouting and fishing prior to the onset of the summer fishing season with hopes of obtaining some recoveries during the season to check for injuries and survival caused by tagging.

This makes a total of 285 fish marked since the tagging work was initiated last summer. The recapture of any of these tagged tuna would give invaluable information, not only about their migratory movements, but also about their age and rate of growth, matters which otherwise can only be deduced by indirect methods. All commercial and sport fishermen are therefore urged to report without fail the recapture of any tagged skipjack with the fullest possible information on the time and place of capture.

This cruise was the latest in a continuing series planned to survey the seasonal changes in the abundance of this small striped tuna species, which in the summer is the basis of the largest fishery and the only fish-canning industry in the Hawaiian Islands, but which becomes very scarce in local waters in the winter. By scouting for skipjack schools at all seasons of the year, and by tagging and releasing captured fish, the Service hopes to obtain information on the movements of the fish that may enable fishermen to enlarge their fishing grounds over greater areas and to extend their season of highly productive fishing over a greater part of the year.

A total of 35 bird-flock-attended schools were sighted--6 were identified as skipjack; 1 a mixed school of skipjack, yellowfin, and mahimahi (dolphin); and 28 unidentified. Most of the promising fish schools were seen beyond 35 miles from land especially in areas south of Oahu, Molokai, and Lanai, while in the vicinity of Kauai they were sighted within 20 miles of land. Schools encountered at this time, however, were generally fast or erratic in their movements and proved troublesome in fishing. Live-bait fishing was attempted on 15 schools but fish were caught from only 3 of these schools.

Other work carried out on the cruise included: (1) recording thermograph was operated continuously out at sea; (2) whenever possible, BT observations were made at three-hour intervals on all scouting runs and also immediately after fishing; (3) some good traces of skipjack schools were obtained on the Bendix.

\* \* \* \* \*

PROPOSED PROGRAM FOR 1955: At a meeting between Service representatives and the POFI Tuna Industry Advisory Committee on April 4-5 at Terminal Island, Calif.; the following program was proposed for the Service's 1955 Pacific Oceanic Fishery Investigations:

Equatorial Tuna: (1) Help insure successful commercial fishing of yellowfin tuna in equatorial waters by ascertaining the effect of changes in weather and currents of the quantities and sizes of yellowfin.

(2) Continue improving the steel and fiber gear used in the long-line method of fishing.

(3) Estimate the contribution of the countercurrent and upwelling in the eastern Pacific to tuna production in the central equatorial Pacific by joint operations with West Coast agencies.

(4) If it is found within the legal responsibility of POFI, develop a program of investigation of the tuna stocks in Southeast Polynesia.

Hawaiian Skipjack Tuna: (1) Learn more of the off-season distribution of skipjack tuna by sight scouting and echo ranging.

(2) Use new electronic scanning device to study the behavior and movement of skipjack schools; and experiment with tagging as a means of learning skipjack migrations in the vicinity of the Hawaiian Islands.

(3) Complete the analysis of conventional oceanographic surveys of the waters surrounding the Hawaiian Islands and continue specialized observations on the eddy system in conjunction with (1) and (2).

Tuna Bait Studies: (1) Continue developing, with sea tests, motile lures which combine movement with appear-

ance, taste, and smell this to be augmented with studies of the structure and use of the tuna eye to learn more about the ways in which tunas can be attracted to catching devices.

(2) Continue studies of electro-fishing on tuna in ponds in order to design an electrical unit for sea tests.

(3) Continue observations of occurrence of live bait as opportunity affords in (a) Leeward Islands; (b) Around equatorial islands; and (c) Investigate open-ocean saury baiting in northern waters.

Albacore Tuna: (1) Continue studies of the winter distribution of albacore tuna and the related oceanographic conditions in the North Pacific.

(2) Cooperate with West Coast agencies in locating small albacore in advance of the Pacific Coast season and in investigating the causes of shifts in time of appearance of albacore, as well as the marked change in amount taken by the Pacific Coast fishery from year to year.

(3) Study the summer vertical and horizontal distribution of egg, larvae, and adult albacore north of Hawaii. Cooperate with oceanographic groups in the United States, Canada, and Japan in a comprehensive North Pacific oceanographic and plankton survey.

(4) Try to catch albacore on the high seas by live bait, deep and surface trolling, and long lines.

(5) Develop a Pacific-wide albacore core tagging program.



## Saltonstall-Kennedy Act Fisheries Projects

FISHERY STATISTICAL OFFICE OPENED IN LA CROSSE, WIS.: A statistical office for the collection of fishery data was opened recently at La Crosse, Wis., by the U. S. Fish and Wildlife Service's Branch of Commercial Fisheries. Activities of the La Crosse office will include obtaining detailed data on employment in the fisheries, the number of craft and quantity of gear operated, and the catch of fishery products in the upper Mississippi River area. The office is located in the Service's Fish-Cultural Station at La Crosse. The address is Post Office Box 862. Kevin J. Allen, who was formerly engaged in the seafood business in the New Bedford, Mass., area is in charge of the office.

This project is being financed by funds provided by the Saltonstall-Kennedy Act (68 Stat. 376).

\* \* \* \* \*

SERVICE OPENS FISHERY STATISTICAL OFFICE IN BILOXI, MISS.: A statistical office for the collection of fishery data was opened recently at Biloxi, Miss., by the Service's Branch of Commercial Fisheries. Activities of the Biloxi office will include obtaining detailed data on employment in the fisheries, number of craft and quantity of gear operated, the catch of fishery products, and related activities in Mississippi; as well as the collection of certain data on the fisheries of Alabama. Detailed statistics on the shrimp fishery will be obtained for Biloxi and nearby ports in connection with the Service's expanded program for the collection of shrimp statistics.

Hermes G. Hague, who has engaged in fishing operations in the Gulf and who was, for a time, employed by the Service in its exploratory fishing program in the Gulf, will be in charge of the office.

This project is being financed by funds provided by the Saltonstall-Kennedy Act (68 Stat. 376).

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PROGRESS ON BRANCH OF COMMERCIAL FISHERIES PROJECTS (MAY 1955): This is a report of the status as of mid-May 1955 of the various Saltonstall-Kennedy Act projects under way in the U. S. Fish and Wildlife Service's Branch of Commercial Fisheries and financed by funds provided by P. L. 466 (83rd Congress).

1. North Atlantic Fisheries Exploration and Gear Research: A program to explore the fishery resources of the North Atlantic area and to develop more effective fishing gear for use in that area. The program is based at East Boston, Mass.; and is in full operation using the Service's exploratory fishing trawler Delaware.

The Delaware was outfitted with new electronic fish finder and additional trawling cable, which will allow fishing to depths of 400 fathoms.

Seven cruises were completed to explore deep-water grounds on the edge of Georges Bank and to explore potential shrimp areas in the Gulf of Maine--1,000 pounds of 10-pound lobsters were caught in a single drag; shrimp appear to have moved from grounds fished some years ago; and catches of other fish have not been large.

Cost of project: \$160,000 a year.

2. Maine Herring Exploration and Gear Research: A project to determine more fully the availability of herring in New England waters in order to smooth out the fluctuations in supply that have been plaguing the Maine sardine industry.

The Service research vessel T. N. Gill was transferred to Boothbay Harbor, Me.; and outfitted with a "Sea Scanar" and experimental gear for sampling surface and subsurface herring schools.

The first exploratory cruise in the Gulf of Maine began on April 19. The research program was laid out in cooperation with the Branch of Fishery Biology and the Canadian Department of Fisheries, and with the advice of the Maine Sardine Industry.

Cost of project: \$76,000 a year.

3. Research on Methods of Handling, Freezing, and Packaging Southern Oysters: A project to study improvements in the methods of handling, freezing, and marketing Southern oysters.

The College Park, Md., laboratory completed analyses on representative samples of oysters collected to measure seasonal variability in composition. These data will provide background information for research contractors at a later date. Contracts for research were let with these Gulf area universities: Louisiana State University, Tulane University, and Florida State University.

The first group discussion of research under way at each of these universities was held in New Orleans on April 24.

Cost of project: \$40,000 a year.

4. Development of Voluntary Standards of Grade and Condition for Fishery Products: A program to develop voluntary grades and standards for various fishery products.

(a) A contract was awarded the National Fisheries Institute for industry liaison assistance in the development of grades and standards. The contractor has now completed a survey of producers, packers, and distributors in the principal production and marketing areas throughout the United States. A complete report of this survey was being prepared. Preliminary information indicates that cooked fish sticks will have the highest priority for development of grade standards. Second priority probably will be assigned to breaded shrimp, and third to ocean perch frozen fillets.

(b) Personnel have been recruited for the Service research phases of standards development and are now engaged in research. Two other contracts for research on the standards project were awarded. The University of Washington is evaluating the principal chemical methods for the measurement of freshness of fishery products on a one-year contract. Massachusetts Institute of Technology is developing new objective tests for freshness of fish and fishery products under a one year contract.

(c) At the Service's Boston laboratory a semifinal draft of standards of grading conditions for cooked fish sticks was completed. It is now being reviewed by industry producers and buyers for their comments. Scale models of cooked fish sticks showing salient characteristics, such as variations in size and shape and major defects, were prepared for use in the application of standards.

Cost of projects: \$100,000 a year.

5. Development of a Quality Index for Fish Meals and the Devising of New Industrial Uses for Fish Oil: These projects will determine through research

studies possible new uses for fish oils and develop a standard quality index for fish meals. The personnel required for the Service portion of the meal and oil research program were recruited and are now at work.

**QUALITY INDEX FOR FISH MEALS:** Agreement was reached on the following contracts for research on the quality index of fish meals: University of Delaware, short-term growth response and longer-term broiler feeding tests of screened meal samples; Maryland State College, nitrogen distribution studies of fish meals; and Reedville Oil and Guano Co., Reedville, Va., pilot-scale and commercial-plant studies.

**NEW USES FOR FISH OILS:** The fish oil research program was likewise firm-ed up through discussions with individual members of the industry. Basic research contract proposals under consideration include: University of Minnesota, chemistry of inclusion type complexes; University of Minnesota, composition of the unsaturated and saturated fractions in fish oils; and University of Minnesota, the chemistry of odors in fish oils.

**APPLIED RESEARCH ON FISH OILS:** A part of the research effort will be placed on the modification of oils for increased use in known fields or for the recovery of former markets lost to competing products. Among the proposals under consideration are: University of Cincinnati, application of fish oils in the leather trade; Florida Southern College, use of fish oils and metallic compound complexes as fungicides and insecticides for citrus orchards; University of Connecticut, evaluation of fish oils in high energy rations for chickens; North Carolina State College, determination of physical-chemical characteristics of fish body oils in different seasons and geographical locations; Texas A. & M. chromatography of fish oils; and Oregon State College, use of fish oils in swine rations.

**MEAL AND OIL RESEARCH IN GENERAL:** Arrangements were being completed for the use of pilot-scale reduction equipment in one of the principal menhaden processing plants as a part of the Service research program. Samples will be taken at the same time of the meal and

oil prepared from the full-scale commercial equipment in this plant. Samplings will also be taken routinely of oils produced at specified places throughout the entire United States. Analyses of these oils will provide valuable background information on the variability with locality, season, and type of equipment used.

Fish-meal sampling will be carried out on a somewhat similar basis at the reduction plant. Service staff members will study problems of heating and piled fish meal and in warehouse storage of sacked fish meal.

Cost of projects: \$234,000 for first year.

6. Regular Educational and Market Development Program: These are existing programs formerly financed by the annual transfer of funds from the Department of Agriculture. The equivalent of the \$175,000 was allocated for carrying out the same work as previously, which features market promotional activities, educational activities, and school-lunch demonstration programs.

**EXAMPLES OF ACTIVITIES:** School-lunch demonstrations, numbering 78, have been conducted in North Carolina, Virginia, Missouri, and Kentucky during this spring semester.

Two industry-financed Service-produced fishery educational motion pictures are in production. They are 16 mm. color sound films. One entitled Shrimp Tips from New Orleans is financed by a Gulf manufacturer of shrimp peeling machines; the other entitled Fishing with a Kicker is financed by two larger outboard motor manufacturers.

Exhibits were sponsored at the major food association conventions of the American Dietitians Association, American School Food Association, National Frozen Food Wholesalers Association, and the National Restaurant Association.

The preparation and publication of Commercial Fisheries Abstracts, Commercial Fisheries Outlook, "Fishery Notes," and "Test Kitchen Series" have proceeded according to schedule.

The program is completely staffed and on schedule.

Cost of project: \$167,000 a year.

**EXPANSION OF REGULAR EDUCATIONAL AND MARKET DEVELOPMENT PROGRAM:** An additional allocation expands the regular programs. It is primarily for increasing in number and scope the school-lunch demonstration program, for increasing the emphasis on promoting the purchase of fish through locker plants, and for conducting special marketing programs to aid segments of the fishing industry that are faced with excessive inventories.

A contract was awarded to the University of Miami Marine Laboratory to study the development of new markets for Florida fishery products. It is well under way.

Beginning in January a special industry-government special marketing program was undertaken to aid the distressed Boston haddock industry. As a result of the program, cold-storage stocks in Boston dropped almost 45 percent from January 1 to March 30.

A similar industry-government cooperative marketing program had been started with the Pacific Coast tuna canning industry, in which the industry will concentrate on consumer markets and the Service will concentrate on institutional markets.

Arrangements for similar programs are under consideration for the halibut and shrimp industries.

The school-lunch program is being expanded in the Pacific Coast, Gulf, and Middle Atlantic States.

All programs are well under way and all vacant personnel positions have been filled.

Cost of expansion: \$85,000 a year.

7. Information on Foreign Production, Marketing, and Technical Advances in the Field of Fishery Products: These projects will assist domestic producers of fishery products to compete more effectively with imports of foreign fishery



products and to develop and reestablish foreign markets.

A unit has been established and work is under way to improve the receipt and analysis of foreign consular dispatches and other sources of information on foreign production, processing techniques, and markets.

Arrangements have been made to have specialists in the Department of Agriculture conduct special investigations of foreign production facilities and markets for fishery products while on related projects in foreign countries.

Cost of project: \$48,000 a year.

8. Surveys on Fish Consumption and Industry Segments: An economic survey of the shrimp industry is well under way. Field work has commenced for the purpose of obtaining foreign and domestic costs of production. This work is being done by the Federal Trade Commission. Contracts with nongovernmental organizations are under consideration or have been let to cover the following types of survey work with the indicated organizations: Harwell, Knowles and Associates, Inc., Coral Gables, Fla., survey of efficiency of shrimp vessel; First Research Corporation, Inc., Miami, Fla., survey of efficiency of processing plants in the shrimp industry; University of Miami, Coral Gables, Fla., economic analysis of production and primary marketing operations in the shrimp industry; A. C. Nielsen Co., Chicago, Ill., survey of secondary distributors and retailers of shrimp products to obtain suggestions for improving marketing conditions.

These proposals are under consideration: First Research Corporation, Inc., Miami, Fla., time and motion studies of shrimp fishing; Northeastern University, Boston, Mass., economic analysis of freezing fish at sea in the New England fisheries; Bureau of the Census, fish consumption in public eating places (a questionnaire form has been pretested; Census Bureau will survey approximately 4,000 public eating places to determine the answers to various problems in marketing fish and shellfish among these outlets).

Cost of projects: \$143,000 a year.

9. Increased Coverage and More Rapid Collection and Release of Fishery Statistics: These programs will speed up the existing procedures in the collection, tabulation, and publication of fishery statistics; increase the coverage of inland fisheries and obtain more detailed statistics on shrimp in the South Atlantic and Gulf area for biological and marketing uses.

Supervisory personnel have been employed in Washington to help expedite compilation and issuance of statistics. Additional personnel have been employed in the Mississippi River, South Atlantic, Eastern Gulf, and Pacific Coast areas. Employment of personnel required to complete the Section's staff is proceeding as rapidly as suitable employees can be located.

Bulletins on the domestic production of canned fishery products, byproducts, and packaged fish already were released several months earlier than has been possible in previous years.

A contract for expediting tabulation of production data is under consideration with the State of California.

Arrangements were made for collection and joint state-Federal publication of monthly statistics on landings of fishery products in the states of North Carolina and Georgia. Release of these data will begin during the summer.

Full cooperation has been sought and in most cases received from state fishery agencies in this program.

Cost of project: \$160,000 a year.

10. Study of Improvement of Cold-Storage Statistics: This project will investigate means of improving the collection of statistics on the freezing and holdings of fishery products and expedite their issuance in a monthly bulletin which is widely used by the trade.

To aid the Service the National Fisheries Institute has conducted, without charge, a preliminary survey to determine the effectiveness of the present coverage. In-

formation has been obtained on the number of firms not submitting data on their freezings and holdings. Arrangements have been made for the temporary employment of a man who has many years' experience in the fishing industry, and is well acquainted with the need for and use of cold-storage information. He

will conduct a detailed survey of the collection and publication of fishery cold-storage information and prepare recommendations for improving the monthly cold-storage report.

Cost of project: \$5,000 for first year.

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PROGRESS ON BRANCH OF FISHERY BIOLOGY PROJECTS (MAY 1955): The status, as of mid-May 1955, of the various Saltonstall-Kennedy Act projects under way in the Service's Branch of Fishery Biology is as follows:

1. Research on the Identity of Stocks of Salmon in the High Seas of the North Pacific: A senior biologist has been engaged to take charge of the sampling program on the high seas and ashore. Arrangements have been made with the Japanese Government and fishing companies for biologists to work aboard the Japanese high-seas fleet in 1955.

Preliminary results from serological research on the identity of salmon stocks have been encouraging. Red-cell samples produced antisera in laboratory animals which showed differences according to geographical origin of the salmon from which the blood was taken.

Growth patterns of ridges on salmon scales have also exhibited differences according to geographical origin of the fish. Spectroscopic examination of scales from young salmon fed bismuth distinguishes them from fish fed a normal diet, indicating a method of marking young fish for subsequent identification when caught on the high seas.

The research vessel John N. Cobb has been readied for experimental fishing, and fishing gear is being assembled.

A contract was awarded the Fisheries Research Institute of the University of Washington for a high-seas tagging program. It is understood that the Institute has made preliminary arrangements for charter of a vessel and procurement of supplies.

A contract has been let to the University of British Columbia for research leading to identification of salmon runs by means of scales.

Cost of project: \$130,000 for initial year.

2. Research on the King Crab of the Bering Sea: All preliminary work for the 1955 research at sea was accomplished. Bids were secured for charter of a vessel. A pattern of stations for experimental crab fishing has been laid out.

Cost of project: \$50,000 for initial year.

3. Research to Develop Methods of Controlling Oyster Predators and to Improve Efficiency of Seed Collection: The staffs of the Milford, Conn.; Annapolis, Md.; and Pensacola, Fla.; shellfish research laboratories have been increased by the employment of four biologists and a statistician in order to provide personnel to carry out the project. A contract was let to a chemical firm to provide substances for use in developing a drill control agent.

A contract was awarded the Florida State University for a survey of predators on oyster reefs in the Gulf of Mexico. Also, a contract is being negotiated with the Texas A. and M. Research Foundation for a survey of the currents near Pensacola, leading to the determination of better locations for the attachment and growth of oyster spat.

Cost of project: \$75,000 a year.

4. Atlantic Herring Research--Boothbay Harbor, Me.: Available biological and statistical information concerning the Atlantic herring is being reviewed and a report is being prepared in collaboration with Canadian investigators. Knowl-

edge to date will be used for design and conduct of future research.

Samples of herring were obtained from New Jersey, Rhode Island, Connecticut, Maine, Massachusetts, and New Brunswick for analysis to detect races or sub-populations.

The research vessel T. N. Gill was assigned to the herring project and was outfitted for biological and scouting surveys to determine the annual distribution and abundance of herring and to obtain samples from offshore areas.

Eight of eleven staff members were recruited. Cost of project: \$74,000 for first year.

5. North Atlantic Trawl Fish Investigations--Woods Hole, Mass.: WHITING: Mesh selectivity experiments were conducted to determine the mesh size required to catch whiting of various sizes. Results show that marketable sizes can be caught without catching or harming smaller fish. Methods of aging whiting are being studied and use of scales appears to be a promising method.

OCEAN PERCH: Analysis of ocean perch catch statistics shows that catch per unit of effort in the Gulf of Maine for 1954 was 7.4 thousand pounds per day which is near the average for the last five years. Methods of age analysis of ocean perch have been perfected. Current work is directed towards obtaining a reliable measure of yearly brood size through sampling and age analysis.

SEA SCALLOPS: Present knowledge of scallop biology was reviewed. Equipment, such as an underwater camera, dredges, and tags, was designed and is being procured.

The research vessel Albatross III was dry-docked, equipped, and placed in operation. Three cruises to Georges Bank and the Gulf of Maine were completed.

Project leaders and staff biologists for these projects were recruited. Cost of these projects: \$206,000 for first year.

6. Atlantic Menhaden--Beaufort, N. C.: Headquarters were established at Beaufort, N. C. A sampling and age analysis program was being developed to determine relative size of year broods. A series of menhaden larvae, in graduated sizes, is being collected for use in identifying later collections. Tows with fine meshed nets are made biweekly at Indian River, Del.

Staff partially recruited. Two biologists and a statistician of a staff of seven plus several seasonal aids are to be recruited.

Cost of project: \$33,000 for FY 1955.

7. Florida Red-Tide Studies--Fort Myers, Fla.; and Galveston, Tex.: Sampling for Gymnodinium brevis, the microorganism which causes fish kills, was increased through use of a float plane. Trial flights have shown that water samples can be easily and quickly obtained by landing in the inside water. Red-tide outbreaks will be detected in early stages by the intensive sampling and patrol. G. brevis distribution is now limited to one small area off Everglades, Fla.

The research vessel Kingfish was operated on observational and sampling cruises during the past year.

Cost of project: \$53,000 for first year.

8. Gulf of Mexico Shrimp Studies--Galveston, Tex.: Research, by contract, was under way to develop techniques for marking shrimp and to identify shrimp from different areas by anatomical means. Field and laboratory studies were started to determine conditions which govern shrimp survival and development from the egg to the adult.

Five staff members were added. Experimental equipment was obtained.

Cost of project: \$80,000 for first year.

9. Pacific Sardines and Related Studies--La Jolla, Calif.: The research vessel

Black Douglas was placed on operation after being laid up for three years. Surveys indicate that fair numbers of sardines are spawning in Southern California waters this spring. Last year a relation between spring spawning and the fall catch was noted. If the same relation holds this year, the catch of sardines off Southern California should be 60,000 tons or greater.

Research cruises are being continued in cooperation with the California Department of Fish and Game and the Scripps Institution of Oceanography.

Cost of project: \$125,000 a year.

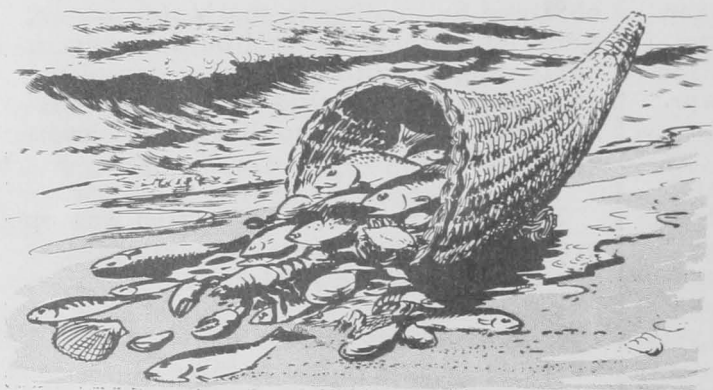
10. North Pacific Albacore Studies--Honolulu, Hawaii: Four cruises were conducted in waters north of Hawaii to define the distribution and abundance of albacore tuna. Results to date indicate that albacore are located in areas where currents converge and where the temperature change is most rapid from south to north. Albacore have been caught consistently in these areas but not in commercial quantities.

Cost of project: \$234,000 a year for vessel operation.



## U. S. Canned Fish and Byproducts--1954

United States (including Alaska, American Samoa, Hawaii, and Puerto Rico) production of canned fishery products and byproducts registered healthy advances in both quantity and value in 1954, according to an annual summary report (canned fish and byproducts--1954, C.F.S. No. 1127) released May 5 by the U. S. Fish and Wildlife Service.



quantity and 8 percent in value as compared with the previous year.

Fishery byproducts in 1954 were valued at \$82 million, a gain of 10 percent over 1953.

The 1954 gain in production in canned items can be attributed to increased packs of tuna, Maine and Pacific sardines, salmon, and the fish packed for pet food.

The pack of tuna and tunalike fishes exceeded that of any other item in both quantity and value, and amounted to almost 11 million standard cases (214 million pounds), valued at \$142 million. Compared with 1953, this was an increase of over 1 million standard cases in quantity, and almost \$16 million in value. The tuna pack was worth 54 percent more than that of salmon which ranked second in value. Tuna was packed in seven States, Hawaii, Puerto Rico, and (for the first year) American Samoa.

The pack of canned salmon in 1954 amounted to 4 million standard cases (200 million pounds), valued at \$92 million to the canners--an increase of 6 percent in quantity and 11 percent in value as compared with 1953. The largest pack of sockeye salmon in the Puget Sound area since 1913 and an unusually large pack of chum salmon in southeastern Alaska were responsible for the gain.

Pacific sardines returned to southern California waters in 1954 after an almost complete absence during 1952 and 1953. The catch of 133 million pounds was used to produce a pack of over 1 million standard cases (60 million pounds), compared with less than 64,000 cases in 1953. Had there been a market for additional supplies of canned sardines, it is estimated that the pack could have been doubled.

The pack of Maine sardines amounted to almost 3 million standard cases (60 million pounds), valued at \$18 million to the packers. Compared with the previous year, this represented an increase of 5 percent in quantity and 7 percent in value.

VALUE OF CANNED FISH AND BYPRODUCTS 1934 - 1954			
YEAR	CANNED	BYPRODUCTS	TOTAL
1954. . .	\$331,026,000	\$81,571,000	\$412,597,000
1953. . .	306,873,674	74,371,996	381,245,670
1952. . .	305,829,198	67,991,631	373,820,829
1951. . .	301,210,295	69,313,027	370,523,322
1950. . .	331,335,347	77,188,366	408,523,713
1949. . .	295,503,905	78,472,495	373,976,400
1948. . .	336,181,000	79,866,000	416,027,000
1947. . .	310,679,000	80,592,000	391,271,000
1946. . .	227,629,000	76,643,000	304,272,000
1945. . .	152,800,000	58,211,000	211,011,000
1944. . .	152,914,000	63,299,000	216,213,000
1943. . .	141,189,000	59,136,000	200,325,000
1942. . .	144,997,000	50,897,000	195,894,000
1941. . .	138,684,000	56,801,000	195,485,000
1940. . .	94,182,000	30,554,000	124,736,000
1939. . .	96,627,000	34,039,000	130,666,000
1938. . .	83,446,000	30,576,000	114,022,000
1937. . .	105,175,000	36,804,000	141,979,000
1936. . .	94,564,000	34,969,000	129,533,000
1935. . .	74,999,000	29,520,000	104,519,000
1934. . .	80,021,000	22,598,000	102,619,000

In the byproducts field a new record was attained through the production of 256,915 ton of fish meal worth \$33 million. This was nearly 18,000 tons more than in 1953 and 13,000 tons above the previous record production in 1936.

The production of marine-animal oils in the United States and Alaska during 1954 amounted to 22 million

gallons, valued at \$13 million to the producers. This was an increase of 9 percent in quantity as compared with 1953, but was only 55 percent of the record 1936 production when 40 million gallons of oils were produced.

Other important byproducts produced during the year were marine pearl-shell, oyster-shell, and fresh-water products valued at \$16 million. Byproducts were manufactured in 227 plants in 25 States, Alaska, American Samoa, and Puerto Rico in 1954.

The Service's Branch of Commercial Fisheries has made annual statistical surveys of the domestic production of canned fishery products and byproducts since 1921. The data collected include statistics on the production and value of each canned commodity by can sizes and trade classification.



### U. S. Fish-Stick Production, January-March 1955

United States production of fish sticks continued to rise during the first quarter of 1955, reaching a total of 18.0 million pounds, according to Fish Stick Report,

January-March (C.F.S. No. 1132), published by the U. S. Fish and Wildlife Service (see table). This was 8.0 million pounds more than was produced during the same period of 1954 and 2.7 million pounds more than the production during the last quarter of 1954.

U. S. Fish-Stick Production, Jan. -Mar. 1955 and 1954						
Month	Cooked		Uncooked		Total	
	1955	1954	1955	1954	1955	1954
(Millions of Pounds)						
January	4.4	2.5	.7	.3	5.1	2.8
February	4.9	2.9	.9	.3	5.8	3.2
March	6.2	3.6	.9	.4	7.1	4.0
Total	15.5	9.0	2.5	1.0	18.0	10.0

A total of 5.1 million pounds was packed during January, 5.8 million pounds during February, and 7.1 million pounds during March. The largest amount previously reported was in October 1954--5.6 million pounds.

During the first quarter of 1955, 86 percent of the fish sticks were precooked. This was only a slightly smaller proportion than the 87 percent reported during the entire previous year.

This bulletin, the first in a series is available free from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C.



## U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, FEBRUARY 1955: United States imports of fresh, frozen, and processed edible fish and shellfish in February 1955 amounted to 55.4 million pounds (valued at \$13.6 million), according to a Department of Commerce summary tabulation (see table). This was an increase of 1 percent in quantity but a decrease of 4 percent in value as compared with January imports of 54.9 million pounds (valued at \$14.2 million). Compared with a year earlier, February imports were about the same in quantity but 7 percent less in value.

United States Foreign Trade in Edible Fishery Products, February 1955 with Comparisons						
Item	Feb. 1955		Feb. 1954		Year 1954	
	Quantity	Value	Quantity	Value	Quantity	Value
. . . . . (In Millions of Lbs. & \$) . . . . .						
<b>Imports:</b>						
Fish & shellfish: fresh, frozen, & processed <sup>1/</sup> .	55.4	13.6	55.4	14.7	801.7	202.8
<b>Exports:</b>						
Fish & shellfish: processed <sup>1/</sup> only (excluding fresh and frozen) . . . . .	6.7	1.5	2.4	0.8	50.8	13.2

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

Exports of processed edible fish and shellfish (excluding fresh and frozen) in February 1955 totaled 6.7 million pounds (valued at \$1.5 million)--a decrease of 45 percent in quantity and 35 percent in value as compared with January exports of 12.2 million pounds (valued at \$2.3 million). February exports were higher by 179 percent in quantity and 88 percent in value as compared with a year earlier, due to larger exports of California sardines.



## Virginia

OYSTER GROUNDS INVESTIGATIONS IN HAMPTON ROADS: The Virginia Fisheries Laboratory and the Chesapeake Bay Institute are conducting a joint investigation of oyster grounds in the Hampton Roads area. The Virginia Department of Highways has employed a construction firm to build a combination bridge and tunnel across this famous waterway to link the Newport News area with Norfolk.

Two large artificial islands are being built, one on each side of the ship channel, each to be joined to the adjacent shore by a bridge. The tunnel, which will cross the channel from one island to the other, is to be made of precast sections which will be laid in a dredged trench and covered with sand.

This bridge-tunnel crosses or adjoins some of the most productive oyster bottom in Virginia. The oystermen have voiced concern that their oysters may be damaged or their grounds destroyed by deposition of silt during the dredging operations. The two laboratories are making studies to determine the transport of silt from the dredging operations, and to investigate the effects, if any, upon the oysters. The results of the work should have far-reaching application in other problems of a similar nature.



## Wholesale Prices, April 1955

Increased production and lighter demand for fresh and frozen fish and shellfish caused a further drop in wholesale prices from March to April. The over-all index of edible fish and shellfish (fresh, frozen, and canned) in April 1955 was 98.7 percent of the 1947-49 average (see table)--2.0 percent less than in March and 6.6 percent below April 1954.

Lower prices for Western halibut, salmon, and yellow pike at New York in April 1955 more than offset higher prices for large haddock at Boston and most fresh-

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, April 1955 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices <sup>1/</sup> (\$)		Indexes (1947-49=100)			
			Apr. 1955	Mar. 1955	Apr. 1955	Mar. 1955	Feb. 1955	Apr. 1954
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned) . . . . .					98.7	100.7	101.8	105.7
Fresh & Frozen Fishery Products: . . . . .					98.1	101.1	103.0	109.8
Drawn, Dressed, or Whole Finfish: . . . . .					89.1	96.3	100.4	111.8
Haddock, lge., offshore, drawn, fresh . . . . .	Boston	lb.	.06	.06	64.2	60.3	80.8	76.6
Halibut, West., 20/80 lbs., drsd., fresh or froz. . . . .	New York	lb.	.22	.24	68.1	74.8	79.4	94.9
Salmon, king, lge. & med., drsd., fresh or froz. . . . .	New York	lb.	.50	.53	112.4	118.0	119.7	120.2
Whitefish, L. Superior, drawn, fresh . . . . .	Chicago	lb.	.73	.68	179.7	167.3	161.1	241.7
Whitefish, L. Erie pound or gill net, rnd., fresh . . . . .	New York	lb.	.75	.65	151.6	131.4	96.0	313.5
Lake trout, domestic, No. 1, drawn, fresh . . . . .	Chicago	lb.	.69	.68	141.4	133.3	133.2	166.0
Yellow pike, L. Michigan & Huron, rnd., fresh . . . . .	New York	lb.	.28	.69	64.5	161.8	123.1	129.0
Processed, Fresh (Fish & Shellfish): . . . . .					105.2	104.2	104.3	111.1
Fillets, haddock, sml., skins on, 20-lb. tins . . . . .	Boston	lb.	.26	.23	88.5	78.3	100.4	95.3
Shrimp, lge. (26-30 count), headless, fresh . . . . .	New York	lb.	.64	.62	101.1	98.0	91.7	109.1
Oysters, shucked, standards . . . . .	Norfolk	gal.	4.63	4.75	114.4	117.5	120.6	117.5
Processed, Frozen (Fish & Shellfish): . . . . .					95.3	96.8	97.4	99.4
Fillets: Flounder (yellowtail), skinless, 1-lb. pkg. . . . .	Boston	lb.	.42	.41	110.0	106.0	104.7	98.2
Haddock, sml., skins on, 1-lb. pkg. . . . .	Boston	lb.	.23	.29	86.3	89.4	89.4	102.0
Ocean perch, skins on, 1-lb. pkg. . . . .	Boston	lb.	.28	.28	111.8	111.8	111.8	117.8
Shrimp, lge. (26-30 count), 5-lb. pkg. . . . .	Chicago	lb.	.55	.56	84.1	85.6	86.8	88.0
Canned Fishery Products: . . . . .					99.4	100.0	100.0	99.6
Salmon, pink, No. 1 tall (16 oz.), 48 can/cs. . . . .	Seattle	case	20.70	20.70	109.6	109.6	109.6	99.1
Tuna, lt. meat, chunk, No. 1/2 tuna (8-1/2 oz.), 48 cans/cs. . . . .	Los Angeles	case	12.70	12.90	91.6	93.0	93.0	102.4
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs. . . . .	Los Angeles	case	7.30	7.30	85.2	85.2	85.2	2/
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs. . . . .	New York	case	7.20	7.20	76.6	76.6	76.6	87.3

<sup>1/</sup>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.

<sup>2/</sup>Not available.

water varieties at New York and Chicago. This accounted for the 7.5-percent decline in the drawn, dressed, or whole finfish subgroup index from March to April 1955. Compared with April 1954, all items were considerably lower in April 1955 and the index for the subgroup was down 10.3 percent.



Boxes of fish stacked up in the shipping and receiving room of a wholesale firm in Chicago's Fulton Market.

Fresh haddock fillet prices rose from March to April, the first increase for some months, due to improved demand. Fresh shrimp prices were also higher as production continued good and demand improved. Oyster prices were down slightly from the previous month because the season drew to a close at the end of April. The April 1955 index for the fresh processed fish and shellfish subgroup was 1.0-percent higher than March but 5.3 percent below April 1954.

Lower prices for frozen haddock fillets and frozen shrimp caused a 1.5-percent decline from March to April in the index for frozen processed fish and shellfish. Flounder fillets were priced higher in April, while ocean perch fillet prices remained unchanged. April 1955 prices for frozen processed fish and shellfish were down 4.1 percent as compared with a year earlier--prices for all items were lower except flounder fillets which were priced considerably higher.

The only price change from March to April in the canned fishery products subgroup was a slight drop for tuna; all other items were the same. Canned tuna inventories are reported heavy. Compared with the same month a year earlier, April prices for tuna and Maine sardines were substantially lower and salmon prices were significantly higher.



### IRISH MOSS

"Irish Moss" is the trade name for the seaweed, Chondrus crispus, which is used commercially in the manufacture of carageenin. Carageenin is used in the making of prepared foods, drugs, and cosmetics, as it has remarkable thickening, suspending, emulsifying, gelling, and stabilizing powers. At present its most important use is as a stabilizer in chocolate milk. It is also used in prepared cheeses, ice-cream toppings, salad dressings, syrups, puddings, candies, etc. Irish moss was originally imported from Europe, but in 1835 was discovered in abundance along the rocky shores of Massachusetts. It is found in quantity along the Atlantic coast from New Jersey to Newfoundland.

--Sea Secrets, July 20, 1954  
The Marine Laboratory, University of Miami,  
Coral Gables, Florida.