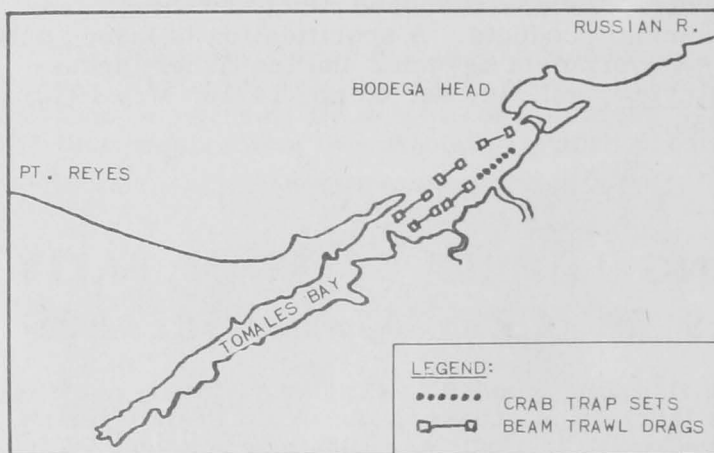


TRENDS AND DEVELOPMENTS

California

CRAB TRAP SAVINGS-GEAR STUDIES BY M/V "NAUTILUS" (Cruise 56-N-1): To conduct savings-gear studies using different size escape openings on crab traps



M/V Nautilus Crab Cruise 56-1 (May 15-26, 1956).

and to obtain samples of small crabs by beam trawling were the primary objectives of the California Department of Fish and Game cruise with the M/V Nautilus from May 15 to May 26.

A total of 24 commercial-size crab traps were fished off Central California in the Bodega Bay area; 8 were equipped with two 4 $\frac{1}{4}$ " circular escape openings each, 8 with two 4" circular openings each, and 8 with no provision for escapement. The traps were alternately set in one line, i.e. --

no escape, 4", 4 $\frac{1}{4}$ ", no escape, etc. They were spaced about 200 feet apart and covered a distance of approximately one mile. Depths fished were from 42 to 46 feet.

An 8-foot beam trawl with a 1" mesh net was used to catch small crabs.

Savings-Gear Studies: The traps were pulled and emptied every 2 days, and were set again in approximately the same place. Rockfish frames were used as bait. A total of 40 sets each were made with the no escape opening and 4"-escape-opening traps, and 39 sets with 4 $\frac{1}{4}$ " escapes. One of the 4 $\frac{1}{4}$ "-escape-opening traps was lost.

From a total of 119 trap sets, a total of 1,485 market crabs (Cancer magister) and 2 red crabs (Cancer productus) were caught. The following table is a summary of the catch for the type of escape opening used.

	MALE CRABS						FEMALE CRABS					
	No Escape Opening		4" Opening		4 $\frac{1}{4}$ " Opening		No Escape Opening		4" Opening		4 $\frac{1}{4}$ " Opening	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Legal (over 4 $\frac{3}{8}$ ")	42	15.4	55	19.2	42	32.0	28	5.4	37	18.6	38	50.6
Sublegal (4 $\frac{1}{4}$ " to 4 $\frac{3}{8}$ ")	78	28.7	126	43.9	60	45.8	23	4.4	42	21.1	8	10.7
Sublegal (4" up to 4 $\frac{1}{4}$ ")	132	48.5	105	36.6	28	21.4	151	29.0	105	52.8	8	10.7
Sublegal (under 4")	20	7.4	1	.3	1	.8	319	61.2	15	7.5	21	28.0
Totals	272	100.0	287	100.0	131	100.0	521	100.0	199	100.0	75	100.0

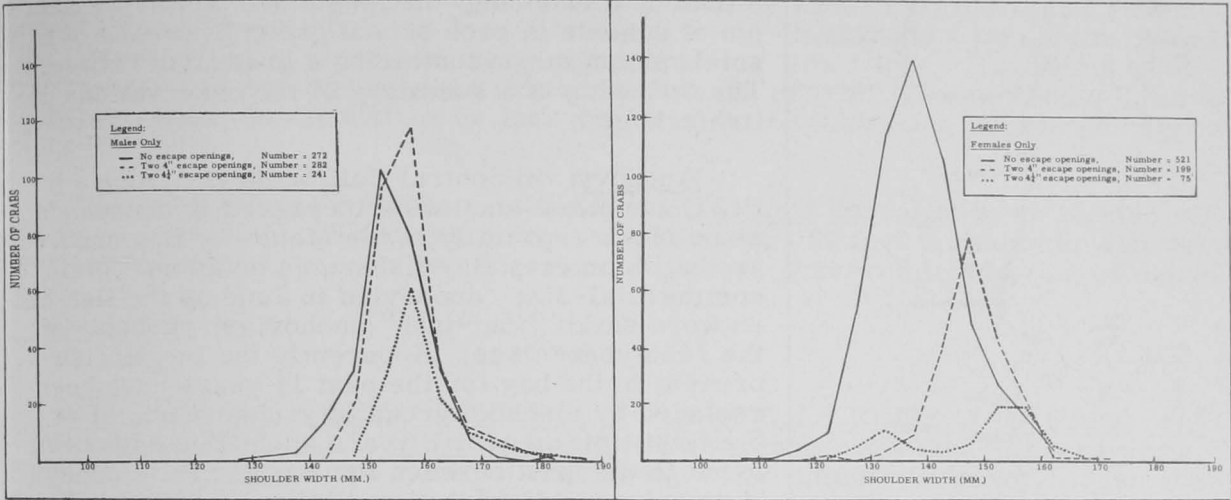
Males: 4 $\frac{1}{4}$ " to 4 $\frac{3}{8}$ " in length = 155 mm, to 159 mm, shoulder width; 4" up to 4 $\frac{1}{4}$ " in length = 145 mm, to 154 mm, shoulder width.

Females: 4 $\frac{1}{4}$ " to 4 $\frac{3}{8}$ " in length = 148 mm, to 152 mm, shoulder width; 4" up to 4 $\frac{1}{4}$ " in length = 139 mm, to 147 mm, shoulder width.

(The shoulder width is a caliper measurement just in front of the last antero-lateral spine.)

Width and weights of the total catch were taken on May 17. This catch included 100 males and 197 females.

Beam Trawling: A total of 8 drags were made with the beam trawl. These were usually of 15 to 20 minutes duration. Market crabs were taken in all drags and included several year-classes. As many as 500 crabs of an average shoulder width size of 12 mm. were taken in one tow; 174 crabs of an average shoulder width of 85



Width frequencies of market crab (*Cancer magister*)--escape opening studies for traps (May 1956, Bodega Bay).

mm. were caught in another drag. The latter are believed to be from last year's hatching. Samples of megalops (crab larvae) were obtained the first day. These were sighted swimming on the surface of the water and were scooped up with a bucket. Efforts to keep them alive on board were not too successful. However, a few were held long enough to molt into the first crab stage.

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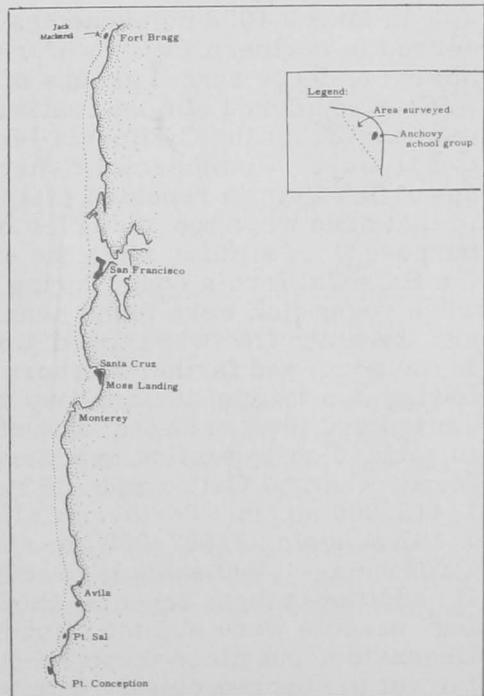
AIRPLANE FLIGHTS TO STUDY PELAGIC FISH DISTRIBUTION (Flight 56-5):

The fifth of a series of periodic flights to study pelagic fish distribution, abundance, and behavior in 1956 off the coast of California were conducted by the State's Department of Fish and Game. The inshore area between Fort Bragg and Monterey, and the offshore area around San Nicolas, Santa Catalina and Santa Cruz Islands was surveyed by Beechcraft 4758N (June 8 and June 11-13). The inshore area from Monterey to Pt. Baja, Baja California was surveyed by Cessna "170" 1359D.

As on previous flights this year anchovies dominated the inshore area over the entire extent of the coast covered, with jack mackerel and sardines occupying the offshore area.

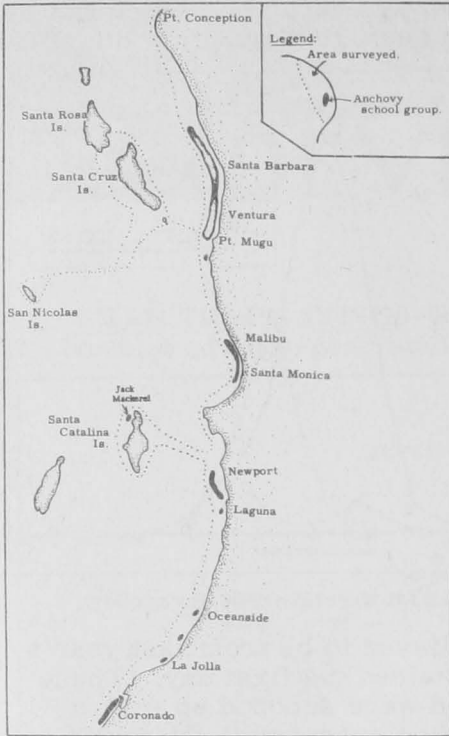
No euphausiid swarms were observed in the central California area as were found in April and May indicating that this swarming phenomenon is a seasonal behavior of the offshore shrimplike species Euphausia pacifica. Recent oceanographic studies conducted at Hopkins Marine Station have revealed the presence of such a phenomenon and the above aerial observations have confirmed the results of this more intensive study.

Commercial and live-bait fishing were active along the California coast in June, and



Airplane Spotting Flight 56-5 (June 8th and 15th, 1956).

identification of schools sighted in areas of fishing activity was confirmed by fishermen interviews.



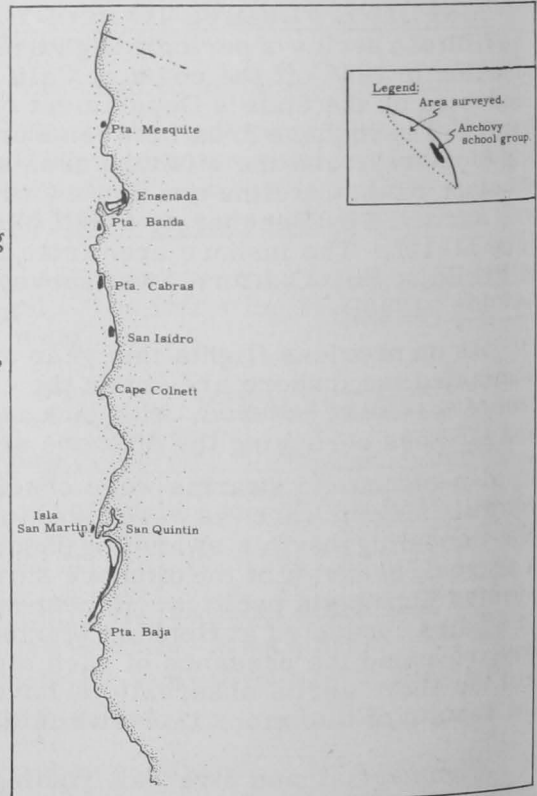
Airplane Spotting Flight 56-5 (6/11-15/56).

The total area of fish schools seen was determined by measuring the length and width of a sample of schools in each school group by means of a small prism scope containing a graduated reticle. The following is a summary of the observations of fish schools:

Anchovy: In central California (Pt. Reyes to Pt. Conception) anchovies increased in abundance since May, especially in the Monterey Bay and Avila areas. Monterey Bay fishermen could not obtain commercial-size anchovies in June as the fish taken were small "four-inch" anchovies, probably of the 1955-year class. Apparently the larger fish present in the bay for the past 1½ years have been replaced by a school group of younger fish. For the first time in over 6 years anchovies have been found in the area between Pt. Sal and Pt. Conception. This brings to light the possibility that the heretofore partially isolated group of anchovies frequenting the Avila area is an extension of the southern California-northern Baja California population.

In June, however, large school groups of anchovies were encountered almost continuously along the coast from the California-Mexico border to Pt. Baja. Commercial fishermen working out of San Quintin reported that the anchovies in that area were too small for commercial purposes. A similar situation existed along the Baja California coast during June of 1955, when young fish were found near San Quintin, and the older fish were found along the coast to the north and farther offshore. The following is a tally of the anchovy schools observed and total area (sq. ft.) of fish tallied in each 10-mile section in which fish were found: Central California--163 schools, 1,412,000 sq. ft.; Southern California--1,162 schools, 7,482,000 sq. ft.; N. Baja California--1,000 schools, 9,365,000 sq. ft. In addition to these schools, about 10 "breeding" schools were sighted offshore from Oceanside, but since these schools were too far out to observe closely with the small plane their identification was uncertain. In the same area in May a large number of young

Anchovies in southern California remained approximately the same abundance as in May 1956, however there was a considerable change in distribution of the school groups. The main concentration of anchovies in June was in the area between Goleta and Port Hueneme, whereas in May the main concentration was in the area between Pt. Vicente and Laguna.



Airplane Spotting Flight 56-5 (6/13-14/56).

In March 1956 no anchovies were observed in northern Baja California. In June, however, large school groups of anchovies were encountered almost continuously along the coast from the California-Mexico border to Pt. Baja. Commercial fishermen working out of San Quintin reported that the anchovies in that area were too small for commercial purposes. A similar situation existed along the Baja California coast during June of 1955, when young fish were found near San Quintin, and the older fish were found along the coast to the north and farther offshore. The following is a tally of the anchovy schools observed and total area (sq. ft.) of fish tallied in each 10-mile section in which fish were found: Central California--163 schools, 1,412,000 sq. ft.; Southern California--1,162 schools, 7,482,000 sq. ft.; N. Baja California--1,000 schools, 9,365,000 sq. ft. In addition to these schools, about 10 "breeding" schools were sighted offshore from Oceanside, but since these schools were too far out to observe closely with the small plane their identification was uncertain. In the same area in May a large number of young

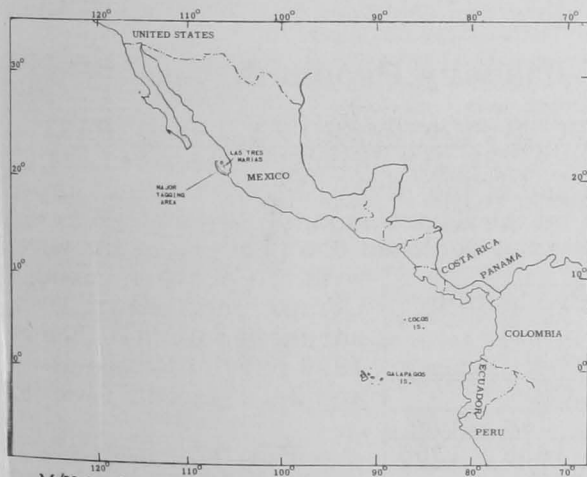
anchovy schools were sighted in this area and it is possible that these schools have moved farther offshore.

Sardine and Mackerel: Seven mixed jack mackerel and sardine schools were sighted off the east end of Santa Catalina Island. Commercial fishermen reported similar schools at San Clemente, Santa Rosa, and Santa Cruz islands. No pure schools of sardines were sighted during this flight. The pattern of distribution of sardine schools is comparable to that of June in 1955. Twelve schools of fish presumed to be jack mackerel were sighted near Fort Bragg on June 8th.

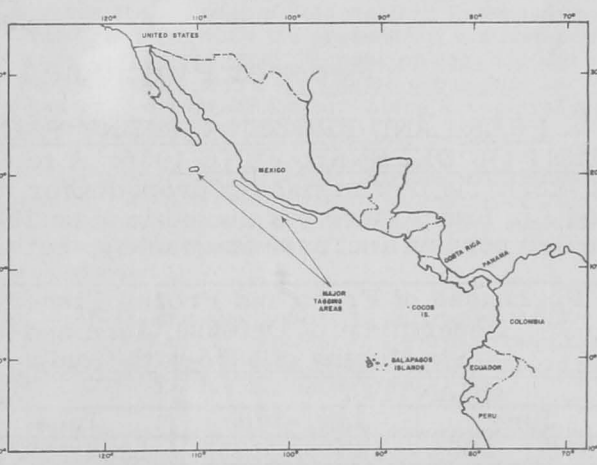
Other Species: Five schools of yellowtail (*Seriola dorsalis*) were sighted off La Jolla on June 11. These schools averaged around 60 feet in diameter and were very near the surface. On two occasions fish were observed leaping out of the water.

* * * * *

TWO TUNA-TAGGING CRUISES (M/V "HEROIC," CRUISE 56-C-1 AND M/V "SOUTHERN PACIFIC," CRUISE 56-C-2): Two commercial tuna clippers while on regular tuna-fishing trips were utilized by the California Department of Fish and Game to tag tuna off the west coast of Mexico. The purpose of the cruise was (1) to tag yellowfin and skipjack tuna with white tubular plastic tags, type G, with center protective covering removed; (2) to make collections of fish by live-bait fishing, from bait hauls, and under a light at night; (3) to carry on other phases of tuna studies incidental to main tagging work; and (4) to test tag retention in two different body positions; a new location under the second dorsal fin and under the first finlet, which is the usual position.



M/V Southern Pacific tuna-tagging Cruise C-2-56 (May 15-June 17, 1956).



M/V Heroic tuna-tagging Cruise C-1-56 (Mar. 4-May 24, 1956).

The tuna clipper *Heroic* (Cruise 56-C-1) sailed on March 4, 1956, and returned on May 4 to San Diego. The area of operations was off the Revilla Gigedo Islands and off the west coast of Mexico. During this cruise 140 yellowfin, 244 skipjack, and 3 black skipjack tuna were tagged, for a total of 387.

Also, during this cruise 36 night-light stations were occupied while drifting at night. Numerous specimens were taken during night and day bait hauls and fishing while anchored. Frozen specimens and 76 bottles of specimens were collected on this cruise.

The tuna clipper *Southern Pacific* (Cruise 56-C-2) sailed on May 15 and returned June 17 to San Diego. Area of operations was in the vicinity of the Las Tres

Marias Islands, Mexico. A total of 122 fish, 74 skipjack and 48 yellowfin tuna, were tagged and released during the cruise. Porpoise schools were encountered and these areas fished extensively from May 23 to June 10. The fish in these schools were almost entirely two-pole yellowfin tuna; a size too large for practical tagging. Most of the tagging occurred on June 11 and 12, when schools of skipjack and one-pole yellowfin tuna were fished.

Specimens of larvae fish, small fish, and other marine organisms were taken on nine night-light stations, four bait-making stations, and from three hook-and-line stations.



Cans--Shipments for Fishery Products, January-May 1956



Total shipments of metal cans during January-May amounted to 43,555 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 34,027 tons in January-May 1955. The increase in January-May 1956 over that for the same period in 1955 reflects the heavier pack of canned tuna as compared with the January-May 1955 period, when production was curtailed due to oversupply. Many packers of canned fishery products make heavy purchases in April prior to the spring and summer packing season.

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.



Federal Purchases of Fishery Products

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY THE DEPARTMENT OF DEFENSE, JUNE 1956: A total of 2,737,268 pounds (valued at \$1,234,608) of fresh and frozen fishery products for the use of the Army, Navy, Marine Corps, and Air Force were purchased in June 1956 by the Quartermaster Corps. This was an 0.8 percent increase in quantity, but the value declined 6.6 percent as compared

QUANTITY				VALUE			
June		Jan.-June		June		Jan.-June	
1956	1955	1956	1955	1956	1955	1956	1955
. . . (1,000 Pounds) (\$ 1,000) . . .			
2,737	2,289	12,231	13,114	1,235	988	6,090	5,628

with the previous month. Compared with June 1955, purchases were higher by 19.6 percent in quantity and 24.9 percent in value.

For the first six months of 1956 purchases totaled 12,230,924 pounds valued at \$6,089,821--a

decline of 6.7 percent in quantity but an increase of 8.2 percent in value as compared with the first six months of 1955.

Prices paid for fresh and frozen fishery products by the Department of Defense averaged 45.1 cents a pound, 3.6 cents less than in May 1955 but higher by 1.9 cents a pound than the June 1955 average.

In addition to the purchases of fresh and frozen fishery products, the Armed Forces generally make some local purchases which are not included in the data given above. 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.



Florida

FISHERIES RESEARCH, APRIL-JUNE 1956: The following are some excerpts from the Quarterly Report on Fisheries Research, June 1956, of The Marine Laboratory of the University of Miami.

Mullet: Racial investigations on Florida mullet recently completed indicate that they fall into four populations: (1) an east coast population in the area from Jacksonville to Miami; (2) a west coast population from Everglades northward to Steinhatchee; (3) a northwest coast population of Apalachicola and St. Marks; and (4) a Pensacola population. It is possible that there exists a fifth, at Homosassa, but evidence is too sparse to justify such a conclusion at this time.

On the basis of tagging results, it appears that these populations intermingle somewhat with each other but that in general they represent rather concrete entities. From the tagging results it appears that about 90 percent of these fish stay within 20 miles of their respective home grounds, and that 97 percent stay within 100 miles of their home grounds.

Small Shrimp Studies: Trips during April, May, and June were made on the vessel Manboy to the Tortugas area. On these trips a $2\frac{1}{4}$ -inch mesh cod end was used. Samples were taken and the escape-ment from this mesh size cod end is being evaluated.

An opportunity to intensify this work was presented when the U. S. Fish and Wildlife Service made the exploratory fishing vessel George M. Bowers available to the Marine Laboratory for four nights' work on the Tortugas grounds. It was possible with this vessel to sample inshore areas where smaller shrimp are encountered and some sampling was also done further offshore in depths of 19 fathoms which is deeper than the usual depths worked by the Manboy. Larger shrimp were taken in the deeper waters.



A 2-inch mesh size cod end was used for the inshore work aboard the George M. Bowers and the $2\frac{1}{2}$ -inch mesh size for the offshore drags.

Hydrographic, weather, and fishing data were collected on the trips.

Spotted Sea Trout: Nine months of data are now at hand on the life history study of the spotted sea trout, Cynoscion nebulosus, in Florida. This information is providing us with facts concerning the age composition of the population sampled, its growth rate, the location and period of spawning, and the reproductive capacity of the species.

There have been reports of an apparent decline in the fishery. It seems that increased fishing pressure is being placed on this inshore species by sport fishermen and that environmental changes such as dredging, filling, and pollution may also have far-reaching effects on the spotted sea trout as well as other desirable species. Catch records over an extended period of years, from both the commercial and sport fisheries for this species, are being studied to aid in determining the catch per unit of effort and changes which may have occurred.

Fish taken in the samples ranged in size from less than one inch to 34 inches. It appears from the analysis of scale marks and statistical treatment of length frequencies that the oldest were 8 years of age.

Growth appears to be rapid in the first year when an average length of about 6 to 7 inches is attained. Growth is fairly constant throughout life which seems to indicate favorable feeding and activity the year around.

There are indications of a resident population which remains in the Indian and Banana Rivers through the year and a nonresident group which arrives at the onset of cold weather in the north. This is evidenced by the presence of a mixed population of true sea trout, Cynoscion regalis, and the spotted sea trout, Cynoscion nebulosus, in "sea-run" colors off the surf along the central and upper east coast of Florida.

Black Spot in Shrimp: 1. Further experiments with butylated hydroxy toluene ices were carried out to retard black spot in shrimp. Ices containing both the antioxidant BHT and antibiotics were also studied.

2. BHT was also applied to shrimp as a dip. One-percent and $2\frac{1}{2}$ -percent dips were prepared. The shrimp were dipped at sea and then stored at the Laboratory in nontreated ices.

3. Tests were conducted to determine sodium bisulfite concentrations obtainable with a flake ice machine.

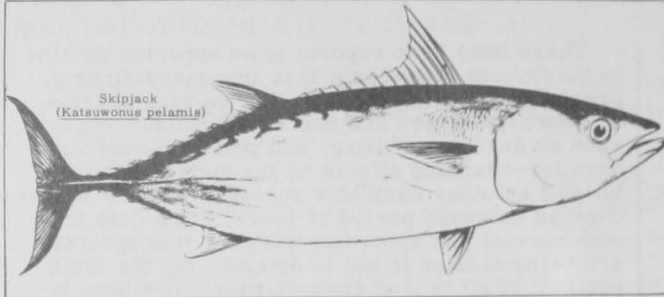
Antibiotic Ices for Shrimp: Further tests were carried out to extend the freshness of shrimp through the use of aureomycin and terramycin ices.

Spoilage Determination Tests for Shrimp: Chromatographic analyses of the amino acids in shrimp were continued. The object of this study is to determine whether and what type of relationship exists between the degree of spoilage of shrimp and the quality and quantity of certain amino acids present. It is hoped to use such a relationship as an indicator of recipient spoilage in shrimp.



Gulf Exploratory Fishery Program

EXPERIMENTAL LONG-LINE TUNA FISHING IN NORTH-CENTRAL GULF BY M/V "OREGON" (Cruise 40): Eight days of experimental long-line tuna fishing



in the north-central Gulf of Mexico were completed by the Service's exploratory fishing vessel Oregon during Cruise 40 which ended on July 27 at Pascagoula. Seven sets, averaging 80 baskets (800 hooks) each, were made covering several depth intervals from the surface down to 200 fathoms to obtain further information on depth ranges of Gulf yellowfin tuna stocks.

A total of 157 yellowfin (16,770 pounds), ranging from 42 to 177 pounds each, were landed. Fourteen percent of the catch was damaged to some extent by sharks. Average yellowfin catch rates at the various depth intervals fished were as follows: surface--4.0/100 hooks; 10 fathom buoy lines--4.6/100 hooks; 20 fathoms--3.3/100 hooks; 50 fathoms--3.3/100 hooks; 75 fathoms--2.3/100 hooks; 100 fathoms--1.8/100 hooks; 150 fathoms--no yellowfin catch; 200 fathoms--0.4/100 hooks.

The catch included 15 white skipjack, 14 blackfin tuna, 2 small broadbill swordfish, 14 white marlin, 1 blue marlin, 13 dolphin, 31 sharks, and 1 opah. During the line-hauling operations, 53 white-tipped sharks were killed using a broad-headed lance.

Large schools of mixed blackfin tuna and white skipjack were observed daily. On one occasion, 35 skipjack and 4 blackfin (averaging 15 pounds each) were caught on jackpoles during a 10-minute period while one of these schools fed on a small school of young carangids that had gathered under the stern of the Oregon.

Stomach analyses and fork-length measurements were obtained for the entire catch. Bathythermograph casts were made at each end of the long line. Plankton and night-light dip-net samples were obtained at each station for future study by Service biologists.

A series of 55 yellowfin tuna of different size groups were subjected to various handling and freezing conditions, and samples were frozen for laboratory study by the Service's Technological Section.



Maine Sardines

CANNED STOCKS, JULY 1, 1956: Distributors' stocks of Maine sardines amounted to 154,000 actual cases as of July 1, 1956, a decrease of 81,000 cases (34 percent) from July 1 a year ago. July 1, 1956, stocks were 172,000 cases less than January 1, 1956, according to estimates based on the results of the fifth in a



Cruise 40 of the M/V Oregon.

series of five measurements for the 1955/56 marketing season by the U. S. Bureau of Census.

Canners' stocks as reported by the Maine Sardine Industry totaled 315,000 cases on July 1, 1956. Canners' stocks for the same month in 1955 amounted to 723,000 cases and on January 1, 1956, totaled 475,000 cases.

Type of Stocks	Unit	1955/56 Season					1954/55 Season				
		7/1/56	6/1/56	4/1/56	1/1/56	11/1/55	7/1/55	6/1/55	4/1/55	1/1/55	11/1/54
Distributors	1,000 actual cases	154	160	268	326	354	235	n. a.	331	n. a.	n. a.
Canners	1,000 standard cases ^{1/}	315	64	152	475	625	723	575	715	1,239	1,410

^{1/} 100 $\frac{3}{4}$ -oz. cans equal one standard case. n. a. - not available.

The Maine sardine pack April 15 (the beginning of the season) to July 1, 1956, totaled 473,000 cases, which added to an April 15 carryover of 120,000 cases gave a total available supply at the canners' level of 593,000 cases. On December 1, 1955, the carryover was 690,000 cases, plus the pack for 1955 of 1,255,000 cases, gave a total available supply of 1,945,000 cases for the 1955/56 marketing season compared to an available supply of 2,875,000 cases for the 1954/55 season.



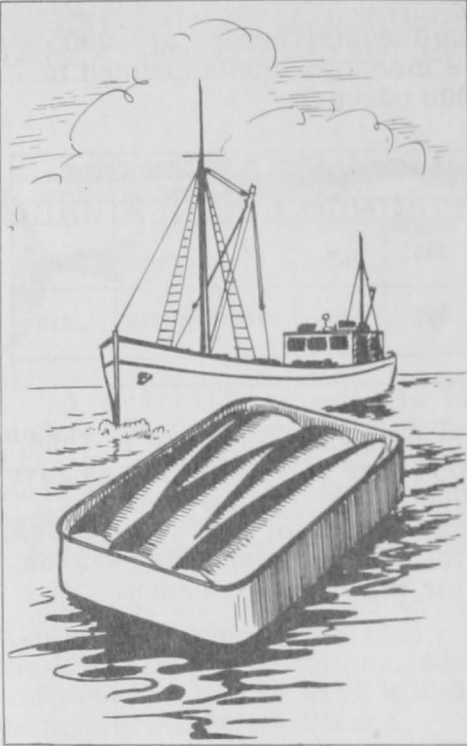
Maine

LANDINGS OF FISHERY PRODUCTS, 1955:

During 1955 over 255 million pounds of fishery products, valued at more than \$16 million ex-vessel, were landed at Maine ports. This represented a decrease of 28 million pounds or 10 percent in quantity and 772 thousand dollars or 5 percent in value as compared with the previous year. Compared with 1954, herring landings (99.4 million pounds) decreased 24 million pounds and ocean perch receipts (67.7 million pounds) decreased nearly 12 million pounds. Whiting landings (25 million pounds) increased almost 16 million pounds during the year. Landings at Portland totaled 68.2 million pounds valued at 2.3 million dollars during 1955 while Rockland landings amounted to 48.8 million pounds valued at 1.6 million dollars in the same period. Three species, ocean perch, whiting, and sea herring, made up 85 percent of the quantity of finfish landed and 77 percent of the value. Comparable figures for 1954 were 83 percent in quantity and 78 percent in value. In the shellfish group, lobsters contributed 81 percent of the quantity and 82 percent of the value as compared with 76 percent in quantity and 78 percent in value in 1954.

Species	1955		1954	
	1,000 Lbs.	\$1,000	1,000 Lbs.	\$1,000
Fish:				
Cod	2,467	141	3,252	192
Haddock	4,009	276	4,885	390
Hake, White	2,398	103	3,175	150
Pollock	5,052	125	4,127	103
Cusk	903	34	724	42
Halibut	134	37	91	29
Mackerel	1,011	79	473	60
Flounders:				
Gray sole	1,182	91	1,273	93
Lemon sole	17	1	2	-
Yellowtail	30	3	24	2
Blackback	918	66	1,191	93
Dab, sea	1,386	84	1,654	90
Ocean perch	67,685	2,577	79,671	3,206
Whiting	25,114	266	9,318	116
Wolffish	111	4	131	6
Shark	27	1	37	2
Tuna	26	3	3	-
Alewives	3,779	33	3,296	27
Herring, Sea	99,416	1,353	123,602	1,770
Smelt	127	39	107	25
Butterfish	177	16	20	2
Eels	33	6	11	2
Menhaden	4,016	42	5,877	47
Miscellaneous	7,610	62	12,496	101
Total Fish	227,328	5,442	255,440	6,548
Shellfish, etc.:				
Crabs	499	26	520	27
Soft clams	2,621	949	3,722	1,360
Hard clams	250	74	292	100
Lobsters	22,718	8,716	21,668	8,087
Oysters	3	2	6	4
Sea scallops	1,114	581	708	334
Mussels	105	3	81	2
Periwinkles	8	3	6	2
Sea urchins	58	2	55	3
Bloodworms	203	167	240	201
Sandworms	179	110	284	167
Sea moss	125	5	465	7
Miscellaneous	220	6	422	13
Total Shellfish, etc.	28,103	10,642	28,469	10,307
Grand Total	255,431	16,084	283,909	16,855

ADVERTISING CAMPAIGN LAUNCHED BY SARDINE CANNERS: The Maine Sardine Industry on July 21 launched a 13-week concentrated advertising and merchandising campaign in 10 southern states--Virginia, South Carolina, North Carolina, Georgia, Louisiana, Florida, Alabama, Tennessee, Mississippi, and Texas.



The Executive Secretary of the Maine Sardine Industry said that newspapers would be used in 47 cities plus a schedule of more than 18,000 radio spots over 97 stations in 70 cities. He stated that the advertising would be supported by an aggressive merchandising program.

The theme of the campaign will feature "Sardines from Maine or Maine sardines in the familiar flat can that you and your folks have been buying for years" as an all-around low-cost convenience food.

The Executive Secretary said that the Industry enjoyed almost a 100 percent retail food-store distribution in the 10-state area and that the activity was designed to "further develop this big and important market."

A similar campaign is planned for the winter-Lenten period, he stated.

SARDINE INDUSTRY DEVELOPMENT PROGRAM: New England and New York bankers were given a first-hand look at the Maine sardine industry in July. They not only toured a couple of plants on the Portland waterfront, but were given a thorough briefing on the industry's 25¢-a-case State-financed development program. A total of 22 bank officials and 25 representatives of the various sardine-canning firms attended.

The bankers were told that they had been invited so they could be concisely and expertly informed of developments which have "caused competent outside observers to state that the industry has made more advances in the fields of processing, quality control, and merchandising in the past five years than in the previous eighty," states a July 26 release from the Maine Sardine Industry.

These were among the opening remarks of a member of the Council and President of the Maine Sardine Packers Association.

He emphasized that this program was made possible through the self-imposed tax which enabled the industry, by pooling its funds and problems, to have the same advisory and counseling services as are used by America's largest and most successful corporations.

The tax is collected from the packers by the State and expenditures are under the direction of a seven-man State-appointed Council of packers with disbursements being made through the office of the State Controller.

Asserting that the development work was becoming progressively beneficial to the packers, he added that it was also helping to bolster the economy of the State in general and especially the many communities which are largely dependent upon the sardine fishing and processing operations. He also felt that few industries in the United States were acting collectively to better effect and with such a unified approach as the Maine sardine canners.

A resume of the industry's scientific, technical, and grading research programs was given by the Research Director, who expressed high hopes that the use of a common grading system would do much to enable the packers to improve and modernize their product. He also told of several applications of new scientific developments which might, after further investigation, produce better control of processing and possibly operating economies.

A New York auditing firm reviewed the industry's cost-research activities while a market research firm summarized the conclusions reached as a result of the industry's three-year market and research program. The industry's advertising agency illustrated the ways which market research was being put to use in planning the advertising campaigns for Maine sardines.



North American Wildlife Conference

MEETING TO BE HELD MARCH 4-6, 1957: Lloyd W. Swift, Technical Sessions program chairman for the 22nd North American Wildlife Conference, announces that chairmen have been selected for the six technical sessions of this forthcoming international conservation conference that will be held March 4-6, 1957, in the Statler Hotel, Washington, D. C., according to the Wildlife Management Institute, sponsor of these large annual meetings.

Swift, who is representing The Wildlife Society, the organization of professional fish and game workers that formulates the technical sessions program of these annual conferences, is Chief of the Division of Wildlife Management, U. S. Forest Service.

All persons having papers that merit consideration for presentation during the technical sessions program of this large international conference should send them to the appropriate session chairman before the deadline date, November 15.

The three-day North American Wildlife Conference consists of three general and six technical sessions. The General Session program committee has been meeting, and the complete conference program will be announced in the near future.

Among the technical sessions listed are: Marine and Coastal Resources (Chairman: Clarence P. Idyll, Marine Laboratory, University of Miami, Coral Gables, Fla.), March 5; Wetlands and Inland Water Resources (Chairman: Frank C. Bellrose, Jr., Illinois Natural History Survey, Urbana), March 4; and Conservation Education (Chairman: John D. Bulger, National Wildlife Federation, Route 2, Grooton, N. Y.), March 6.



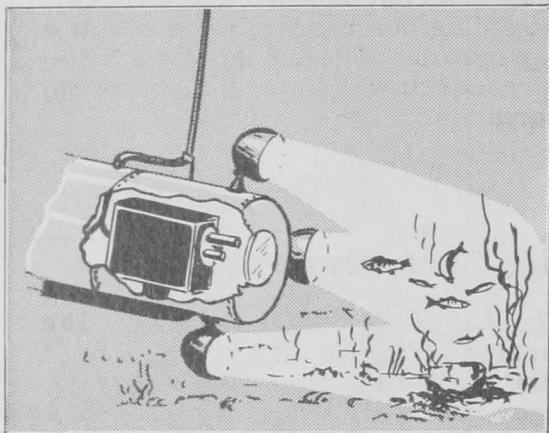
North Atlantic Fisheries Investigations

GEORGES BANK SEA SCALLOP BEDS SURVEYED BY M/V "ALBATROSS III"
(Cruise 77): A survey of the sea scallop beds of Georges Bank by means of dredging and underwater photography and the tagging of as many scallops as possible was the purpose of Cruise 77 (July 5-11, 1956) of the Service's research vessel Albatross III.

A total of 22 stations were occupied with the 11-foot scallop dredge. All scallops were measured and 2,075 of them were tagged and released. Drops of tagged scallops were made at 10 different locations.

Heavy winds and sea restricted the use of the underwater camera. Photographs (250 individual pictures) were taken at six stations, however.

UNDERWATER TELEVISION AND COMMUNICATIONS TESTED BY M/V "ALBATROSS III" (Cruise 78): In order to test underwater television chain, underwater communications, and related equipment the Service's research vessel Albatross III operated in Buzzards Bay on July 16-17.



Artist's conception of equipment for underwater television.

Several lowerings of the camera were made with the assistance of SCUBA divers in 40-45 feet of water. Several additional lowerings were made to depths of 100 feet without the assistance of divers.

The underwater communications system developed at the Service's Woods Hole Biological Laboratory performed excellently in the tests.

Extreme turbidity restricted tests of the range of visibility and resolution of the camera. Sufficient natural illumination was

available for operation to depths of 80-90 feet.

Stable operation of the television equipment resulted from the use of a portable 60-cycle gasoline generator.

TAGGING IN GULF OF MAINE BY M/V "T-79" (Cruise 2): Tagging in the Gulf of Maine was the purpose of the Service's research vessel T-79 cruise 2 (June 28-July 14, 1956). The cruise was carried out in three phases using Gloucester, Mass. as the base of operations. Phase I covered the period June 28-July 2; phase II took place July 4-9; and phase III was completed July 10-14.

Thirteen sets were made, each consisting of two tubs of line-trawl gear. Frozen herring and frozen squid were used as bait. Haddock were tagged with the following types of tags:

Petersen discs--white, yellow; through the gill cover or through the back in front of the first dorsal fin.

Lea bridle--in front of the first dorsal fin.

Combination tag using a Lea hydrostatic connected to an internal anchor.

Stainless steel pins and wire were used to fasten the disc tags.

Cod and halibut were tagged with the combination tags only. Dogfish were tagged with Petersen discs through the nose or through the dorsal fin.

Scales for age and growth analysis were taken from haddock tagged during phase III.

A total of 259 haddock, 138 cod, 120 dogfish, and 12 halibut were tagged.

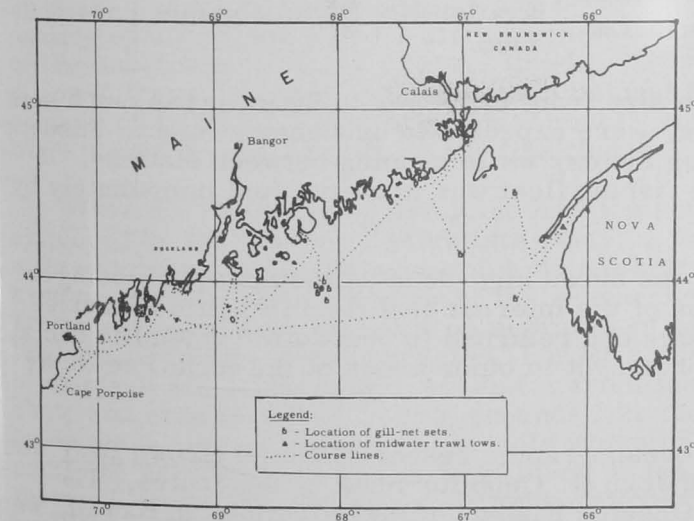
North Atlantic Herring Research

SHOAL WATERS NEAR ISLANDS EXPLORED FOR HERRING OFF MAINE AND CANADA BY M/V "METACOMET" (Cruise 4): Fishing and fish-finder soundings for herring were continued on Cruise 4 by the Service's chartered exploratory fishing vessel Metacomet in United States waters of the Gulf of Maine from Cape Porpoise to Eastport, and in the Canadian waters of Grand Manan Island, Grand Manan Shoals, St. Marys Bay, and Lurcher Shoal.

Emphasis was placed on exploring and sampling the shoal waters near islands and rocks offshore for herring in an effort to gain more information concerning the occurrence, and distribution of this species in and near areas where sardine-size fish were still reported scarce or absent at the time of this cruise which began July 10 and ended July 21.

Herring gill-net sets and tows with a British Columbia-type midwater trawl were made at the points indicated in the chart.

Three bushels of herring were taken in 4 half-hour to one-hour tows of the midwater trawl near Petit Passage in St. Marys Bay, Nova Scotia.



U. S. Fish and Wildlife Service Cruise 4 of chartered vessel M/V Metacomet.

A good showing of fish near the surface was observed between Pemaquid Point and Seguin Island the evening of July 20. A sample obtained with the midwater trawl established these fish as whiting.

The Metacomet was expected to depart on Cruise 5 on July 31, 1956, for 11 days. Coastal and offshore waters of the Gulf of Maine were to be explored with



Metacomet, vessel chartered by the Fish and Wildlife Service to continue program of exploratory fishing and gear development for the Maine herring.

in these tows were herring brit which averaged 2.1 inches and sardine-size herring of 4.7 inches average length. The larger fish comprised nearly all of the 3-bushel catch. A good showing of herring was observed on the fish-finder throughout the night in this area. Small quantities of large herring ranging in size from 8.0 inches to 14.0 inches were taken in gill nets at Fisherman Island near Boothbay Harbor, at Mt. Desert Rock, at Yellow Head Island and Howard Cove in Machias Bay, and off Old Proprietor Whistle Buoy on the southeast side of Grand Manan Island. The best showings of herring were observed on the fishfinder at Mt. Desert Rock, in Machias Bay, and in St. Marys Bay.

the fish finder and fished for herring in an effort to learn more of the occurrence of these fish at this season. Gill nets and a midwater trawl were to be used.



North Pacific Exploratory Fishery Program

ALBACORE AND SALMON OFFSHORE DISTRIBUTION STUDIES IN NORTH PACIFIC (M/V "JOHN N. COBB," Cruise 28): Offshore gill-netting to determine the distribution of albacore tuna and salmon in a section of the northeastern Pacific Ocean will be the primary objective of a 7-week cruise by the Service's exploratory fishing vessel John N. Cobb, which was scheduled to leave Seattle on July 16, 1956.

The Cobb was expected to cover the waters from 42° N. latitude to 50° N. latitude and west to 145° W. longitude, an area from the Oregon-California border to northern Vancouver Island extending up to 800 miles offshore, an area approximately 300,000 square miles.



Removing albacore from the gill net. Roller at right takes off from the main winch.

Landing of albacore in Washington and Oregon reached an all-time high of 34 million pounds in 1944, but fluctuated greatly and declined to less than 3 million pounds in 1952. In recent years practically no albacore have been caught north of California. It is hoped that this year's coordinated research program will help to throw some light on the mysteries of albacore movements, distribution, and availability to the commercial fishermen.

Nylon gill nets, ranging in mesh size from 3¼ inches to 8½ inches to catch both large and small salmon and albacore, were expected to be fished at night. Albacore trolling gear were to be fished during the day while running between stations. If schools of albacore are located, the fishing fleet was to be notified immediately by radio.

The salmon research is part of the broad high-seas salmon program being carried out this year by member nations of the International North Pacific Fisheries Commission. The catch will be frozen and returned to Seattle for scientific racial analysis and comparison with salmon caught in other areas of the north Pacific by other research vessels.

The University of Washington's oceanographic research vessel Brown Bear was to work in close conjunction with the John N. Cobb for most of the cruise. The John R. Manning, from the Pacific Oceanic Fisheries Investigations in Hawaii, was to operate north of Hawaii and west of 145° W. longitude. The three vessels will attempt to keep in radio contact at sea to exchange fishing information and other observations.



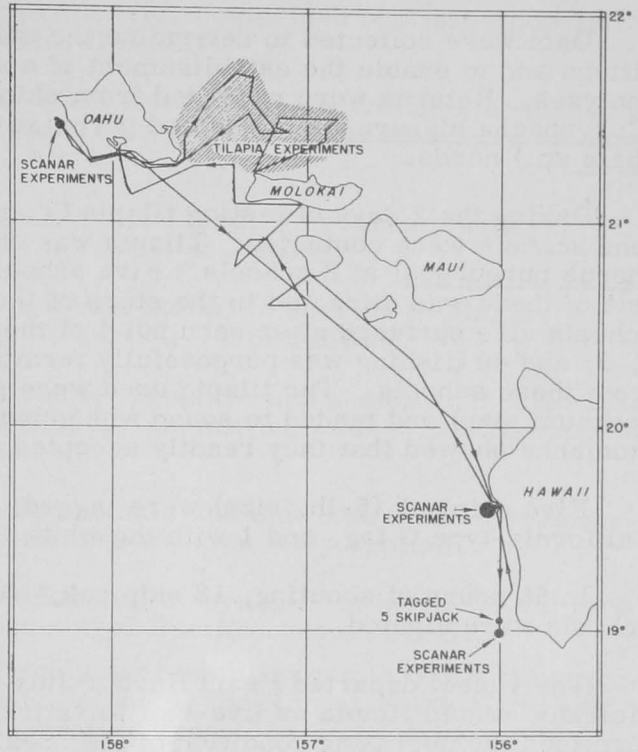
Pacific Oceanic Fishery Investigations

"CHARLES H. GILBERT" USES ELECTRONIC FISH FINDER TO SCOUT FOR TUNA (Cruise 29): The whereabouts and movements of Hawaii's skipjack and large tuna (aku and ahi) may soon be an open book to fishery scientists of the U. S. Fish and Wildlife Service, judging by the results of experiments recently carried out off the Island of Hawaii aboard the research ship Charles H. Gilbert using the vessel's new "Sea Scanar." This is a long-range sonic fish finder which detects fish under the water by bouncing sound waves off their bodies, picking up the echoes, and making them visible on a radarlike screen. According to the director of the Pacific Oceanic Fishery Investigations, the calm waters off the Kona coast of Hawaii were chosen as an ideal setting for testing the capabilities of the device on various natural and artificial targets and for training the scientific personnel who will use it to locate and track fish schools.

The scientists aboard the vessel, reported that metal targets suspended under water were detected as much as 2,000 feet from the ship under favorable calm sea conditions. A dead skipjack tuna similarly suspended was spotted at a range of 1,000 feet, as was a much smaller herring, the well-developed air bladder of which acts as a resonating chamber and gives a strong echo of the fish-finder's sound waves. In addition to these "planted" targets, such natural features of the Kona seascape as schools of skipjack, dolphinfish (mahimahi), blackfish (a small whale), and porpoise were picked up and studied on the fish finder.

When the technique of using the new instrument has been worked out, it will be employed by the fisheries scientists studying the tuna resources of the central Pacific to locate schools of tuna which do not betray their presence by signs on the surface of the ocean. At present the researchers, like the commercial fishermen, are almost entirely dependent on sightings of bird flocks over feeding schools to lead them to fish. It is suspected, however, that there may be large concentrations of skipjack and other tuna in areas far from land where sea birds are not very abundant, and even in active fishing grounds like the waters close to the Hawaiian Islands there may be many tuna schools which escape notice because they do not happen to be accompanied by flocks of birds at the times when fishing boats pass near them. If there actually are such hidden fishery resources within the area covered by POFI investigations, the fish finder should reveal them. It is expected, too, that the instrument will provide more exact knowledge of the magnitude of the schools of tuna that are at present located and fished by conventional methods, for it seems likely that for many schools the fish seen and taken at the surface may, like the visible part of an iceberg, represent only a small fraction of what is hidden beneath the sea.

During the cruise period of July 11 to 22, in addition to the special experiments off Kona, the vessel scouted for tuna sonically and by conventional methods between Hawaii and Oahu and around the islands of Molokai, Lanai, and Maui.



Charles H. Gilbert Cruise 29 (7/11-22/56).

Experiments conducted with the "Sea Scanar" to determine the maximum range of positive returns from various targets gave the following results: 24-inch stainless steel triplane (each plane a circle of 24-in. diameter)--2,180 ft., 12-in. aluminum triplane (each plane a 12-in. square)--2,080 ft., 3-in. brass triplane (each plane a 3-in. square)--1,800 ft., 1 skipjack (20 lb., frozen)--1,020 ft., 1 herring (18 cm., dead)--1,100 ft.

Data were collected to determine the amount of sea return under various conditions and to enable the establishment of a sound search procedure. These await analyses. Returns were recorded from skipjack (Katsuwonus pelamis) and dolphin (Coryphaena hippurus) schools and porpoise (unidentified) and blackfish (Globicephala sp.) herds.

During the 2 days of testing tilapia (T. mossambica) as live-bait, 12 skipjack tuna schools were contacted. Tilapia was chummed at 9 schools and nehu (Stolephorus purpureus) at 8 schools. Five schools responded to the tilapia by surfacing. One of these was attracted to the stern of the vessel but no fish was caught. Five schools also surfaced after nehu but 4 of these were attracted to the vessel. Two, 5, 9, and 40 (fishing was purposefully terminated after 40) skipjack were caught from these schools. The tilapia used were generally 3 to 4 inches long (larger than optimum size) and tended to sound when chummed. Examination of the skipjack stomachs showed that they readily accepted the tilapia as food.

Five skipjack (5-lb. size) were tagged; 3 with plastic dart tags, 1 with the blue California-type G tag, and 1 with the white California-type G tag.

In 66 hours of scouting, 18 skipjack, 10 dolphin, 1 yellowfin, and 9 unidentified schools were sighted.

The vessel departed Pearl Harbor July 11, 1956. In the vicinity of Oahu and Molokai, tested tilapia as live-bait for attracting skipjack on July 11 and 12. Determined the operating condition of the "Sea Scanar" off Waianae, Oahu, on July 13. Conducted "Sea Scanar" experiments off Kailua, Hawaii, from July 15-20. Scouted for fish schools en route to Oahu from Hawaii, July 20-22. Arrived Pearl Harbor July 22.

REVIEW OF FISCAL YEAR 1956 OPERATIONS: The significant developments by the Service's Pacific Oceanic Fishery Investigations (POFI) during Fiscal Year 1956 (July 1, 1955-June 30, 1956) may be briefly summarized as follows:

Elucidation of a hypothesis to account for fluctuations and trends in the success of long-line fishing for yellowfin tuna in the Line Islands area of the central equatorial Pacific, based on a positive correlation between catch rate and water temperature.

Development of a new method of handling long-line gear to effect a saving of manpower.

Drastic curtailment of the program in the vicinity of the Line Islands and formulation of broad general plans to investigate the tuna resources in the area of the Marquesas, Tuamotus, and Society islands and eastward.

Initiation of an intensified skipjack tuna investigation aimed at explaining variation in fishing success in terms of meteorology, oceanography, and fish behavior.

Discovery of an apparent relationship between the summer skipjack catch and the prevalence of trade winds during the spring.

Demonstration that albacore tuna occurrence in the central North Pacific is associated with the Polar Front, which shifts seasonally and which may be regarded as a migration pathway.

Discovery of unfished albacore resources 200-500 miles off the coast of Oregon.

Evidence that the albacore, unlike the yellowfin, comprises one large population with its primary source in the western central Pacific.

The first recoveries of tuna tagged by POFI were made (including 2 albacore, 2 big-eyed, 12 skipjack, and 1 yellowfin tuna), thus justifying this method of studying tuna migration in the Pacific.

Initiation of a Pacific-wide cooperative albacore tagging program, with POFI sparking the venture in mid-ocean and off the coast of Japan.

Demonstration of the possible use of plankton indicator species to identify water masses and potential albacore waters in the central North Pacific.

Initiation of a worldwide tuna larva exchange program and acquisition of a worldwide collection of tuna larvae taken by the Dana, permitting a more positive approach to the problem of tuna larva identification.

Demonstration that yellowfin exhibit electrotaxis and that their movements can be directed with rather moderate power sources when suitably applied.

Successful participation in Norpac and Eastropic, synoptic cooperative surveys of the North Pacific and of the eastern equatorial Pacific, respectively.

Selection of POFI as the locale for a highly successful informal international conference for the exchange of Norpac data, planning the Norpac Atlas of results, and formulating plans for Equapac, a cooperative synoptic survey of the central and western equatorial Pacific.

Cooperation with other research agencies in conducting fishing surveys of the North Pacific, particularly with United States and Canadian agencies of the International North Pacific Fisheries Commission, in pooling resources for sampling the stocks of oceanic salmon and albacore.

Initiation of close collaboration with the University of Hawaii in terms of cooperative research, assistance in graduate training, and providing part-time employment for students. The latter is particularly important because it augments the supply of qualified fishery workers.

Equatorial Yellowfin Tuna: A program of year-round sampling of the yellowfin populations in the Line Islands area, initiated in January 1955, was completed this year. The results of this program show that long-line or deep-swimming tuna were generally scarce during the year. Catches fluctuated from 1 per 100 hooks to about 3 per 100 hooks with little indication of the seasonal variation evident in earlier years. The low availability of deep-swimming tuna was paralleled by a low availability of troll-caught surface tuna.

With respect to troll fish the highest catches were made during March and April. It was also evident that the catch rates of surface fish were higher in the northern Line Islands. These islands lie in or near the Countercurrent, an area that has been previously shown to support larger numbers of surface fish than the waters to the north and south.

It is particularly significant to note that during this period of low yellowfin abundance water temperatures at Christmas Island were unusually low,

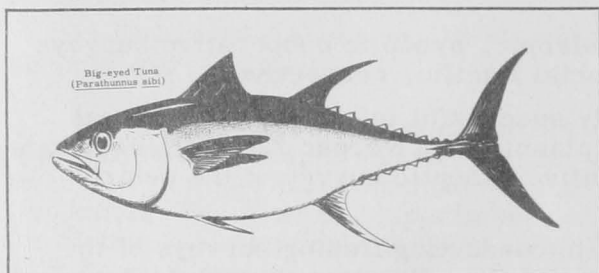
that is, relative to the 1950-53 period, providing additional evidence supporting our hypothesis in respect to fluctuations in equatorial deep-swimming tuna. Briefly this theory proposes that near the equator cooler water indicates newly enriched water in which the biota to support a large yellowfin population has not yet developed. Conversely warmer water near the equator is thought to be upwelled water that has been in the euphotic zone long enough to develop a food supply for tuna. In this connection ocean water temperatures at Christmas Island station took an upward turn during the spring of 1956, suggesting that the environmental conditions associated with the high level of abundance during this period 1950-53 may reassert themselves this year.

Incidental to the study approximately 1,000 yellowfin tuna were tagged during the course of the one year program. To date there has been but a single recovery, a yellowfin tagged and recovered at Fanning Island. The fish had been at liberty for

six months prior to its recovery on April 3, 1956. This single recapture is of considerable interest in that it supports the contention that there are small localized populations of yellowfin tuna associated with each of the small islands in the central Pacific.

The central Pacific program is essentially complete, and future effort will be focussed on the Marquesas and eastward. As time permits, observations designed to test the hypotheses outlined will be completed.

Hawaiian Skipjack Distribution and Abundance: A major effort this year has been the initiation of a detailed program designed to ascertain the ecological requirements of skipjack and the factors in the ocean responsible for their presence and absence, both seasonally and geographically. The program involves measurement and analysis of hydrographic factors, and measurement and analysis of plankton in terms of level of abundance and distribution in the ocean. Major reliance is being placed on the Hawaiian commercial fishery for information on the distribution and abundance of skipjack in space and time. In this connection analyses have been initiated on the statistics of the local catch, utilizing small areas and short periods of time as sampling units. In order to encourage maintenance of good records, brochures have been prepared and distributed to skipjack fishermen, introducing them to the general program and soliciting their support.



An additional phase of the skipjack program is examination of existing oceanographic and meteorological material in order to ascertain the reasons for annual fluctuations in the supply of skipjack. A preliminary hypothesis has been developed based on the relationship between the windflow over the island area and the skipjack catch. Briefly there is a high, positive correlation between the amount of catch during the summer or "season" months and the direction and strength of the winds during the late spring. It appears that the winds may affect the environment of the skipjack through their control of oceanic circulation. The hypothesis appears to form a valuable starting point for exploring this question of annual fluctuation, which is so important to the Hawaiian fishery as well as to similar fisheries elsewhere.

In order to learn something of the migrations and growth of skipjack, a total of 945 fish were tagged in Hawaiian waters with California-type spaghetti tags. To date there have been 12 recoveries; 9 recaptured by live-bait fishing and 3 found in the stomachs of long-line caught big-eyed tuna and yellowfin tuna taken by commercial fishermen around Hawaii. The recoveries have indicated rather limited movement, the maximum net distance traveled being about 40 miles. All but one of the fish were out for less than 3 months. However, one was at liberty for slightly over 8

months and during this period grew about 7 pounds. This growth rate agrees very well with past studies on the growth of Hawaiian skipjack based on size-frequency analysis.

As implied above, the modified and augmented skipjack program is only a few months old. At least one year's work is needed for a preliminary evaluation of the results.

North Pacific Albacore Program: One objective of this program is to explore the area north and east of the Hawaiian Islands for potential fishing grounds and to collect basic chemical and physical data to use in the analysis of our fishing results. The second has been to work "upstream" of the American coastal albacore fishery to investigate the biological and physical causes of the violent fluctuation in the catches of this fishery. In support of these studies, investigations are also being made of the oceanwide distribution of albacore, albacore growth rate and spawning, races of albacore, North Pacific weather, and the distribution of plankton.

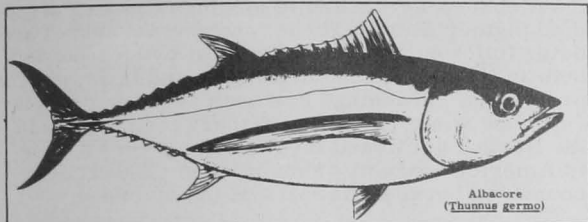
As in the past, in order to obtain the most efficient use of available vessels and personnel, POFI cooperated closely with other agencies in the planning and execution of the field program. Formal coordination of the exploratory fishing program with those of research agencies of the Pacific states was through the Albacore Steering Committee. Informal cooperation through the Eastern Pacific Oceanic Council resulted in Norpac, a quasi-synoptic physical, chemical, and biological survey of the North Pacific during July and August 1955, which involved vessels from the United States, Canada, and Japan. A significant contribution to the summer distribution of albacore was also made by U. S. Fish and Wildlife Service vessels surveying the salmon distribution during July-September 1955 when they fished far enough south to show the northern limit of albacore in mid-ocean.

Three exploratory fishing cruises were made during the year to determine the distribution and abundance of albacore to the north and east of the Hawaiian Islands.

The surveys during the past have been directed primarily towards determining the limits of distribution of albacore tuna and associated environmental factors. As data have been accumulated and analyzed emphasis has shifted from subsurface to surface fishing and the principal gear to be used in the future will be the gill net supplemented by trolling. It is hoped that the results obtained by these fishing methods will enable us to define the areas of commercial abundance.

Data concerning catch rates and length frequencies of albacore tuna were compiled from all possible sources in the literature in order to form the basis of a working hypothesis for their distribution and abundance in the North Pacific. The data were not extensive but they seem to indicate that there is a single population of albacore which has its primary nucleus and source in the waters of the islands of the western central Pacific. Literature search and analysis of this type of data will be continued.

Through the Albacore Steering Committee POFI has encouraged a Pacific-wide albacore tagging program, the general objectives of which are to more clearly define the migratory routes of the albacore and to clarify the relationships between the fish taken on both sides of the Pacific and within the central Pacific. Continuing its pioneering program, during 1956 the California Department of Fish and Game agreed to tag some 2,000 fish off the West Coast with the assistance of the Oregon Fish Commission. POFI agreed to tag as many



fish as possible in midocean, and to provide tags for the albacore that might be caught during salmon research cruises of vessels of Canada, the U. S. Fish and Wildlife Service, and the University of Washington. In addition, in May a team of two POFI biologists was sent to Japan to tag albacore and to instruct Japanese technicians in tagging methods. There was considerable interest in this work and through the excellent cooperation of the Japanese, the POFI representatives tagged 270 albacore off the coast of Japan. Based on this experience the Japanese are planning to tag 2,000 albacore during the spring of 1957.

Since the inception of the albacore program POFI has tagged and released 201 albacore and 82 big-eyed tuna in the central North Pacific. Four recoveries were reported this year, 2 of albacore and 2 of big-eyed.

Economical Means of Harvesting Tunas: A new method for handling cotton long-line gear was developed during the year. This method involves flaking down a continuous mainline into a large tub rather than breaking the gear into individual baskets. Using this method we have been able to rather easily fish up to 1,000 hooks a day. Though there were 11 men on the fishing vessel, it appeared that this amount of gear could have been rather easily fished by 6 men. This indicates a more efficient operation than that of Japanese commercial fishermen who fish around 2,000 hooks with crews of 25 to 30 fishermen. Further tests of this method are needed before it can be stated with certainty that it has commercial possibilities. However, all indications to date are favorable.

Steel gear, which had been tested earlier, was finally shown to be rather inefficient when applied to tuna long-line fisheries. Though it, too, holds promise of getting more hooks in the water with fewer men, there are rather severe problems associated with its use. For one thing, steel is expensive and does not last long in the field because of excessive kinking under the strain of holding heavy fish. Perhaps even more important, however, the steel gear does not appear to capture tuna as efficiently as cotton gear. There is evidence to indicate that this is because of its lack of resiliency and its failure to provide a drag on the fish's struggle to escape.

Sonic Ranging: A new and potentially promising sonic scanning device was received in December. To date most of the effort has been devoted to ironing out bugs in design and construction. It appears we are now in a position to (a) learn how to use it effectively, and (b) apply it where pertinent to our present studies on tuna behavior and distribution.

Contract Research: Contracts with the University of Hawaii enable us to utilize the services of experienced faculty researchers in specialized fields of biology, physics and chemistry in coping with basic research problems of importance to our program. Three projects were actively pursued during the year as follows:

TUNA VISION: This project, started in June 1955, stemmed from our unsuccessful attempts to devise a substitute for tuna livebait, our observation that vision was the predominant sense in tuna feeding, and our belief that fundamental research on vision might suggest a new approach to the solution of the tuna bait problem. The objectives for the first year were (a) to determine if there were anatomical or morphological differences in the eyes of different sizes and species of tuna which might be associated with different habits and habitats, and (b) to determine the optical potentials of the tuna eye. Comparison of the eyes of small and large skipjack (surface fish) with large yellowfin (deep-swimming fish) so far has revealed no basic differences in shape, structure, musculature, or retinal mosaic pattern, despite the difference between species in habit and habitat. Fresh whole eyes, with an artificial opaque viewing screen covering an aperture in the retinal-chorioid layer, and a movable pin-point light source were immersed in a long trough of sea water to determine the distance of acute vision. Problems arose because of variation in the position of the lens at rest and the difficulty of devising an apparatus to move the lens and thus to simulate accommodation. These problems have not been solved as yet. A new contract for a comparative histological study of the retina of different tuna species, with special emphasis on the distribution and ratio of the rods and cones was initiated June 1, 1955.

ELECTROFISHING: An investigation of the possibility of using electrostaxis as a means of harvesting tuna was continued. Last year, based on preliminary experiments with wholehole in a small tank, an apparatus was devised which theoretically should create an electric field sufficient to control the movements of tuna in a large concrete tank, 35x11x4 feet in size. The apparatus, employing pulsed D. C. generated by intermittent charging and discharging of a bank of condensers and powered by 10 6-volt storage batteries, was tested on tuna and other fish during the year. With this apparatus, it was possible to control the movements of 8- to 10-pound yellowfin over a distance of 16 feet, using a frequency of 18-20 cycles per second. These results are regarded as highly significant (a) because they are the first demonstration that tuna respond electrostatically, (b) because of the relatively low power source, and (c) because of the probability that the dissipation of energy in the well-grounded tank was comparable in magnitude to that which would be encountered in the open sea. However, the principle

of condenser discharge was not pursued further because of problems which would be encountered on board ship in devising a satisfactory mechanical or electronic current interruptor. Rather, attention was directed to the possibility of using a modified amplidyne-generator assembly to produce a field of sufficient strength between widely spaced electrodes to control the movements of tunas in the open sea. Preliminary experiments on modifying available generator units have shown promising results. The 1955 contract was extended to August 31, 1956, to complete this phase of the study.

OFF-COLOR TUNA: In initial attempts at commercially fishing the yellowfin tuna resources discovered in the central equatorial Pacific, a relatively large percentage of the catch was rejected at the cannery because of a "green" or "off-color" condition which developed during processing. Contract work was undertaken to identify the pigment responsible for this condition and to determine the chemical processes involved. In other words, the project was aimed at providing basic information which might be useful to industry in their problem

of identifying the incipient condition in raw fish and in preventing its appearance during processing. It was found (a) that in raw fish the pigment associated with incipient "greening" was a peroxidase-like or myoglobin-like heme-protein, (b) that oxidation of this pigment is involved in the formation of the condition, (c) that substances, such as ascorbic acid, which may act as reducing agents, tend to inhibit the condition, and (d) most important, that the "green" appearance following pre-cooking is not due to the production of a green pigment, but rather is due to an abnormal lack of red-dish pigmentation. These fundamental studies are being followed with great interest by technologists both in Hawaii, on the mainland, and in Japan. The problem of "greening" has been encountered in the Japanese winter long-line fishery for albacore in the North Pacific and may become of importance to American industry should large albacore be encountered between Hawaii and the mainland.

A new contract continuing the study of "off-color" tuna was negotiated June 1, 1956.



Public Eating Places Survey

FISH AND SHELLFISH QUALITY STANDARDS NEED RECOGNIZED BY MOST EATING PLACES: Two-thirds of all the operators of public eating places serving fish and shellfish in the United States who expressed an opinion on the question "Do you believe that there is a need for grade or quality standards for the fish and shellfish you buy?", indicated that grade or quality standards are needed. About 1 out of 5 who were asked the question were undecided. When the establishments are classified on a regional basis, the opinions are quite similar to those found for the

Recognition of Fish and Shellfish Quality Standards Need by Public Eating Places Serving Fish or Shellfish, by Geographic Region										
Geographic Region	All Public Eating Places		Need Grade or Quality Standard		Do Not Need Grade or Quality Standard		Do Not Know		No Reply	
	No.	%	No.	%	No.	%	No.	%	No.	%
United States Total	208,100	100.0	105,200	50.6	52,100	25.0	46,700	22.4	4,100	2.0
By Region:										
Northeast	68,000	100.0	33,700	49.5	16,500	24.3	17,200	25.3	600	.9
North Central	59,700	100.0	29,700	49.8	17,400	29.1	10,900	18.3	1,700	2.8
South	45,900	100.0	22,900	49.9	10,800	23.5	10,900	23.8	1,300	2.8
West	34,500	100.0	18,900	54.8	7,400	21.5	7,700	22.3	500	1.4

United States as a whole. The findings are based on a scientific sample survey of 4,500 establishments representative of all public eating places in the United States, including 208,000 serving fish and shellfish.

Final results of the survey, which is being financed by funds made available under the Saltonstall-Kennedy Act of 1954, are scheduled for publication this year.

FREQUENCY OF FROZEN FISH AND SHELLFISH SALES TO EATING PLACES
According to the results of a scientific sample survey of 4,500 establishments representing all public eating places in the United States, most of them order frozen

fish and shellfish supplies weekly. Many of them, however, order supplies daily; others as infrequently as once a month.

Almost 90,000, or 43 percent, of the 208,000 public eating places serving fish and shellfish in the United States order frozen fish and shellfish supplies once each week. About 16 percent order supplies every 2 to 4 days. Another 9 percent place orders for fish and shellfish 1 to 3 times a month. Only 6 percent of the public eating places order supplies daily.



Many of the larger restaurants (annual sales from food of \$100,000 or more) are included in the 6 percent ordering frozen fish and shellfish daily. About 30 percent of these large restaurants order daily and an additional 34 percent order 2 to 4 times a week. Only 16 percent of these restaurants order on a weekly basis.

Frequency of Frozen Fish and Shellfish Sales to Public Eating Places

Item	All Public Eating Places		Every Day		2 to 4 Times A Week		Once A Week		2 or 3 Times A Month		Once A Month		Less Than Once A Month		Whenever Needed		No Reply or Not Applicable	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
United States Total	208,100	100.0	12,900	6.2	32,600	15.7	89,800	43.1	10,000	4.8	7,700	3.7	2,700	1.3	12,000	5.8	40,400	19.4
By Region:																		
Northeast	68,000	100.0	4,300	6.3	8,000	11.8	26,800	39.4	2,500	3.7	2,500	3.7	1,100	1.6	4,300	6.3	18,500	27.2
North Central	59,700	100.0	3,200	5.4	8,800	14.7	32,900	55.1	2,700	4.5	2,600	4.4	600	1.0	2,800	4.7	6,100	10.2
South	45,900	100.0	2,800	6.1	8,500	18.5	17,900	39.0	1,800	3.9	1,700	3.7	600	1.3	3,600	7.9	9,000	19.6
West	34,500	100.0	2,600	7.5	7,300	21.2	12,200	35.4	3,000	8.7	900	2.6	400	1.1	1,300	3.8	6,800	19.7
By Type of Establishment:																		
Restaurants	105,700	100.0	6,900	6.5	17,900	16.9	50,300	47.6	4,700	4.5	3,600	3.4	1,400	1.3	5,600	5.3	15,300	14.5
Cafeterias	4,300	100.0	200	4.6	800	18.6	2,200	51.2	100	2.3	100	2.3	-	-	300	7.0	600	14.0
Restaurants or cafeterias in hotels	15,300	100.0	3,500	22.9	3,100	20.2	4,900	32.0	700	4.6	300	2.0	-	-	600	3.9	2,200	14.4
Drug or proprietary stores with fountain service	9,800	100.0	300	3.1	800	8.2	2,500	25.5	1,500	15.3	700	7.1	100	1.0	100	1.0	3,800	38.8
Other ^{1/}	73,000	100.0	2,000	2.7	10,000	13.7	29,900	41.0	3,000	4.1	3,000	4.1	1,200	1.6	5,400	7.4	18,500	25.4
By City Size (Population):																		
500,000 or more	42,600	100.0	3,600	8.5	6,500	15.3	16,400	38.5	1,500	3.5	900	2.1	400	.9	2,100	4.9	11,200	26.3
100,000 to 499,999	26,100	100.0	3,700	14.2	5,600	21.4	9,200	35.3	800	3.1	1,100	4.2	400	1.5	1,300	5.0	4,000	15.3
25,000 to 99,999	27,400	100.0	2,100	7.7	4,400	16.1	13,100	47.8	1,200	4.4	800	2.9	400	1.4	900	3.3	4,500	16.4
2,500 to 24,999	39,900	100.0	1,600	4.0	6,000	15.0	18,500	46.4	2,000	5.0	1,700	4.3	400	1.0	3,700	9.3	6,000	15.0
Less than 2,500	72,100	100.0	1,900	2.6	10,100	14.0	32,600	45.2	4,500	6.3	3,200	4.4	1,100	1.5	4,000	5.6	14,700	20.4
By Annual Sales Size (from Food):																		
\$100,000 or more	15,300	100.0	4,600	30.1	5,200	34.0	2,500	16.3	400	2.6	100	.7	100	.7	1,000	6.5	1,400	9.1
\$40,000 to \$99,999	24,800	100.0	3,000	12.1	5,900	23.8	11,200	45.2	1,100	4.4	100	.4	200	.8	800	3.2	2,500	10.1
\$10,000 to \$39,999	62,600	100.0	2,700	4.3	10,000	16.0	32,400	51.8	3,000	4.8	2,300	3.7	600	.9	2,500	4.0	9,100	14.5
Less than \$10,000	91,600	100.0	1,500	1.6	9,900	10.8	38,300	41.8	4,800	5.2	4,600	5.0	1,700	1.9	7,000	7.7	23,800	26.0
No reply	13,800	100.0	1,100	8.0	1,600	11.6	5,400	39.1	700	5.1	600	4.3	100	.7	700	5.1	3,600	26.1

^{1/} Includes drinking places, lunch counters, and refreshment stands.

According to the survey the availability of storage facilities for frozen fish and shellfish and the distance of the supplier from the public eating place are not the important factors which determine how frequently supplies of frozen fish and shellfish are ordered. One factor which may have an effect on deliveries is the number of days a week fish and shellfish are included on the menus. There is some indication that many public eating places still offer fish and shellfish meals on Friday only, while most of the larger restaurants offer fish and shellfish more often.

The survey is financed by funds made available under the Saltonstall-Kennedy Act of 1954.



Salmon

COLUMBIA SALMON STUDY PLANNED FOR IDAHO STREAMS: Idaho's fabulous Salmon River, the "river of no return," haunt of "mountain men" and hardy fishermen, "top of the stream" for part of the Columbia River salmon and steel-head trout, and upper limit of the vast \$23 million Columbia River salmon program, is due for special attention this year, according to Fred A. Seaton, Secretary of the Interior in an August 5 news release.

Initial funds up to \$200,000 for the improvement of the Salmon River and possibly the Clearwater River, for salmon and steelhead production, are available this year for expenditure on approved projects.

A preliminary survey of needed improvements on the Salmon will begin soon in cooperation with the Idaho Department of Fish and Game under the Columbia River Fisheries Development program.



This is a cooperative program with the States of Oregon, Washington, and Idaho.

At the present time there are no dams on the Salmon River which interfere with the runs but one dam is under construction on the Snake River below the mouth of the Salmon River. This is at Ice Harbor, not far from where the Snake River joins the Columbia. There are possibilities, however, of major dams at the Lower Monumental, Little Goose, and Lower Granite sites, all below the mouth of the Salmon River.

On the Columbia River itself below the mouth of the Snake River is the recently-constructed McNary Dam, the proposed John Day Dam, The Dalles Dam now under construction, and the Bonneville Dam which has been in existence since 1938. On the Columbia, also, are Grand Coulee and Chief Joseph dams, 600 miles from the sea, too high for fish ladders or elevators. Chief Joseph marks the upper limit of the salmon run on the main river.

In 1949, when it was evident that dams constructed or proposed would seriously damage the salmon and sea-run trout fisheries, Congress authorized the current salmon program which, when completed, will include 30 hatcheries (seven of which are in existence and being remodelled), more than 30 fishways and numerous stream clearance projects. These developments are designed to hold salmon and steelhead production at the highest possible level, although maintenance of the current production of 32 million pounds annually will also depend on continued availability of up-river spawning areas.

Of the 30 hatcheries, 8 will be operated by the Fish and Wildlife Service, 13 by Oregon, and 9 by the State of Washington. The total cost of the entire program will be about \$23,000,000 of which \$11,451,000 had been made available by the Congress before July 1, 1956. Of this amount, Washington has been apportioned \$4,291,000; Oregon, \$3,404,000; and the Fish and Wildlife Service, \$3,756,000. For the 1957 fiscal year, \$1,400,000 is available for construction and \$1,250,000 for operation and maintenance.

Under the program the natural spawning beds, like those of the Salmon River and elsewhere, will be utilized to the fullest extent. Streams, which because of numerous natural obstructions have not supported salmon runs for years have been cleared and new runs established. Hatcheries supply young fish to supplement the natural spawning results and for the reestablishment of runs. Fish ladders have been installed over dams and waterfalls. Fish screens have been placed at irrigation headgates to prevent loss of downstream migrants. Similar activities now will be undertaken in Idaho streams accessible to salmon and steelhead trout.

Special problems relative to fish ladders and screens are being studied by biologists who are improving fishway design and developing electrical guidance apparatus which, when perfected, will increase the efficiency of the fishways and drastically cut the losses in downstream migrants. These studies are among regular and continuing Service programs in cooperation with the Corps of Engineers and the fisheries agencies of Oregon, Washington, and Idaho.



Saltonstall-Kennedy Act Fisheries Projects

AMERICAN FISHERIES ADVISORY COMMITTEE TO MEET IN CHICAGO: A special meeting of the American Fisheries Advisory Committee will be held on October 11 and 12, 1956, in Chicago, Ill. This meeting has been called because of the recent passage of the Fish and Wildlife Act of 1956, which provides, in part, for the extension of the Saltonstall-Kennedy Act on a permanent basis, and makes available annually hereafter the full 30 percent of the duties on imported fishery products, thereby removing the former \$3,000,000 annual expenditure limitation of these funds.



Shrimp

DYEING LATEST AID IN TAGGING: Shrimp with heads of pastel colors are not dreams nor are they passing fads or fancies for the biologists of the Institute of Marine Science of the University of Texas, working on a U. S. Fish and Wildlife Service research project, have discovered a safe, sure, easy, way of identifying shrimp for study.

The biologists have found that certain dyes introduced into a shrimp's body by hypodermic needle or food will color the head of the shrimp but will not color the edible portions. The dye persists in the heads for several months. Various colors can be used, with the hypodermic needle method of introducing dye into the shrimp providing the wider selection.

This solves a problem which has been hampering scientific studies of shrimp for decades. Because shrimp molt periodically as part of the process of growth, the usual methods of tagging have only been partially satisfactory.

The identification work is part of a study of the movements and migrations of shrimp populations, which in turn is part of a comprehensive study of shrimp now being conducted by the Fish and Wildlife Service with funds supplied by the Saltonstall-Kennedy Act of 1954.

Another part of the research is being done by Tulane University where the first comprehensive anatomical study ever to be made of shrimp is being pursued. A third study is being made on the structure and chemistry of shrimp tissues at the Texas A. and M. Marine Laboratory while still another project to determine the effects of various environmental factors on shrimp is being made by the Fish and Wildlife Service biologists at Galveston, Tex.

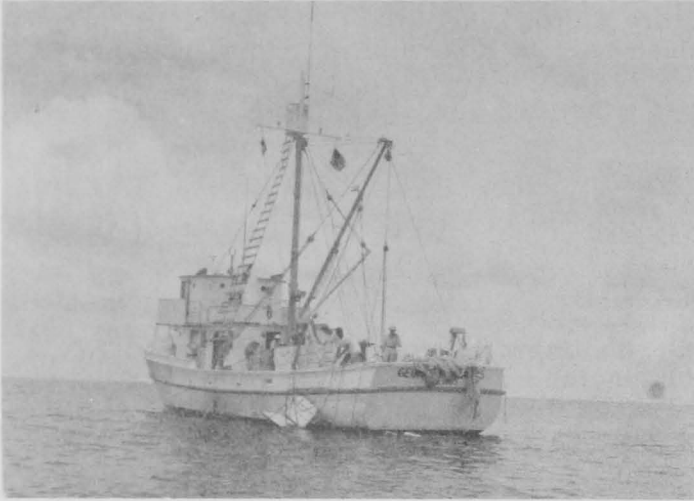
Shrimp is America's largest fishery in terms of ex-vessel value--more than \$70,000,000 a year--and most of the United States production is in the Gulf of Mexico. The purpose of the study, together with an enlarged statistical program, is to enable biologists and members of the fishing industry to maintain a watchful eye on the shrimp fishery in the interests not only of the more than 7,000 trawler owners and crews and the processors who depend upon shrimp fishing for a livelihood, but for millions of Americans who consider shrimp one of the finer foods.



South Atlantic Exploratory Fishery Program

GEAR RESEARCH ACTIVITIES BY M/V "GEORGE M. BOWERS" (Cruise 5):

Gear research activities were the objective of a nine-day cruise of the Service's gear research vessel George M. Bowers during the period July 23 to July 31. These operations featured the use of divers using SCUBA gear, a controllable diving sled, movie and still-recording cameras, and underwater television in the shallower waters of Little Bahama Bank adjacent to Matanilla Shoal at 79°05' west longitude and 27°20' north latitude.



The Service's research vessel George M. Bowers.

During 16 diving operations emphasis was placed on observations of modifications to rigging of a 40-foot bottom trawl for use in experimental fishing operations on the bottom, off the bottom, and in midwater. By use of the diving sled it was possible to observe the trawls from all angles at distances ranging from approximately 50 feet to actual physical contact. Photographic recordings of the gear in action were taken during varied weather and light conditions.

It was determined that with minimum modification to placement of floats, lead line, trawl doors, and towing legs this particular trawl design was easily adaptable to experimental fishing just off the bottom or for midwater use.

During operations with the underwater television vehicle, an evaluation was made of a new and classified Vidicon television camera tube. A preliminary analysis indicated approximately twice the photosensitivity for the new tube as compared to commercially available equipment.

Two schools of tuna were sighted at Matanilla Shoal July 28 and July 29. During periods when lighting conditions were unfavorable to underwater operations, trolling was conducted at the 100-fathom contour. Seven blackfin tuna (Thunnus atlanticus) from 4 to 6 pounds each were taken. Gonad examinations revealed the female fish were nearly sexually mature.

The M/V George M. Bowers was scheduled to depart Miami August 14, 1956, for a 16-day experimental fishing cruise on the Tortugas shrimping ground. Principal objective will be to learn more of the occurrence and distribution of shrimp off the bottom and in midwater. On at least three previous cruises Service explor-



Fig. 2 - Exploratory fishing personnel aboard the George M. Bowers preparing to dive with SCUBA gear to observe action of shrimp trawls being towed on the bottom.

atory vessels have taken commercial species of shrimp when the trawl was not on the bottom. Fishing operation will be conducted with 40-foot commercial-scale gear modified for use off bottom and in midwater in bad bottom trawling areas.



Tuna

ALBACORE TUNA INVESTIGATION IN NORTH PACIFIC: The M/V Brown Bear, a University of Washington oceanographic research vessel sailed the latter part of July for a seven-week large-scale albacore tuna investigation in the off-shore waters of the North Pacific. State and Federal agencies are cooperating in this albacore research which is being coordinated by the Pacific Marine Fisheries Commission, an agency created by a compact between California, Oregon, and Washington in 1947.

Some of the objectives of the cruise are: (1) investigation of factors such as water properties and abundance of plankton and other potential fish foods which may have an influence upon the distribution of albacore and salmon; (2) detection of possible changes in the above factors which might occur during a period of a few weeks; (3) collection of further information on the outflow of diluted water from the Columbia River and the Juan de Fuca system; (4) determination of the distributional pattern of any albacore which might be sighted in the area under observation.

During the 5,300-mile cruise, scientists aboard the Brown Bear will make observations at approximately 50 oceanographic "stations." The cruise will consist of two parts, with a port of call at Astoria about August 4. During portions of both parts of the cruise, the vessel will be operating in conjunction with the U. S. Fish and Wildlife Service exploratory fishing vessel John N. Cobb.

Plans have been made to rapidly forward to the tuna fishing fleet any information regarding schools of tuna which might be encountered during the course of the study. The Brown Bear will attempt to maintain radio contact periodically with the commercial fishing vessels in the general area.

INDUSTRY-GOVERNMENT SALES PROMOTION PROGRAM: In response to requests from the Pacific Coast tuna industry, the Secretary of the Interior announced July 24 that the Fish and Wildlife Service was giving full support to a joint industry-Government sales promotion program designed to move the plentiful supplies of canned tuna into normal trade channels.

The nationwide program, which was set up to move big stocks of canned tuna rapidly, was directed toward both institutional and home-consumer markets and reached a climax during the period of September 13 through 22.



Due primarily to excellent fishing this spring and summer, normally a season of light production, record stocks of canned tuna are available at the lowest price in several years. National advertising by the tuna industry and the emphasis of the tie-in features of canned tuna aided tremendously in the sales effort.

The Fish and Wildlife Service aided the industry's promotional efforts through special work with schools, institutions, and food-trade groups. Informational and educational activities were increased in order to attract greater consumer attention.

The Department of Agriculture cooperated through use of the facilities of the Federal Extension Service and the Food Distribution and Information Divisions of the Agricultural Marketing Service. Canned tuna in oil was included on the list of plentiful foods during September.

Canned tuna is available in a number of varieties. The solid pack consists of tuna loins packed in oil; the chunk pack, as the name implies, is a pack of chunks in oil; the grated pack is the grated or shredded portion of the tuna loin; the flake pack is the broken or mixed segments of the loin. A number of speciality packs are also available, such as "tonno" consisting of solid-meat tuna packed in olive oil; baby food packs, and others. For the past several years a "dietetic" pack has been prepared for those persons who must avoid salt in their diets. Practically all of these varieties are available in white or light meat.

CANNERS PETITION FOR STANDARDS OF IDENTITY: The Department of Health, Education, and Welfare on July 18 was petitioned for standards of identity and fill of container for canned tuna by the National Cannery Association along with 20 domestic canners of tuna. Accompanying the petition was information supporting the request and suggesting a proposed text for the standards.



United States Fishing Fleet^{1/} Additions

A total of 89 vessels of 5 net tons and over were issued first documents as fishing craft in June 1956--29 more than in June 1955. The South Atlantic and Pacific areas led with 25 each, followed by the Gulf area with 17, and the Chesapeake area with 14, according to the U. S. Bureau of Customs.

Table 1 - U. S. Vessels Obtaining First Documents As Fishing Craft, by Areas, June 1956 and Comparisons

Area	June		Jan.-June		Total
	1956	1955	1956	1955	1955
	(Number)				
New England	1	3	9	10	18
Middle Atlantic	2	1	15	9	13
Chesapeake	14	9	43	24	54
South Atlantic	25	2	49	30	65
Gulf	17	13	55	48	103
Pacific	25	21	48	60	117
Great Lakes	-	3	2	5	9
Alaska	5	8	27	23	35
Hawaii	-	-	-	2	3
Virgin Islands	-	-	-	-	1
Total	89	60	248	211	418

Table 2 - U. S. Vessels Obtaining First Document as Fishing Craft, by Tonnage, June 1956

Net Tons	Number
5 to 9	42
10 to 19	17
20 to 29	14
30 to 39	8
50 to 59	1
60 to 69	1
100 to 109	1
110 to 119	1
120 to 129	4
Total	89

Note: Vessels assigned to the various sections on the basis of their homeports.

In the first six months of 1956, 37 more vessels were issued documents as fishing craft than in the same period of 1955.

^{1/} Includes both commercial fishing and sport fishing craft.



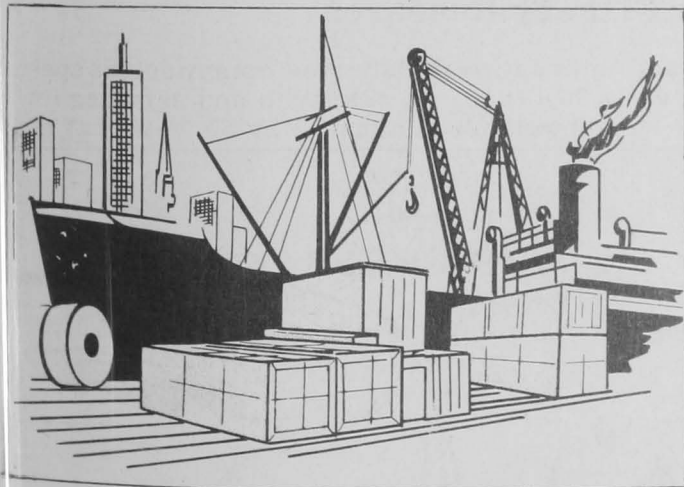
U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, APRIL 1956: Imports of edible fresh, frozen, and processed fish and shellfish for this April increased about 6.7 percent in quantity and 1.1 percent in value as compared with March 1956. Compared with April 1955 the imports for April 1956 increased 17.1 percent in quantity and 20.4 percent in value. The dollar value in April 1956 was close to 26.4 cents a pound, compared with 25.7 cents a pound in April 1955. The increases for April 1956 over the same month a year ago were due largely to higher imports of frozen fish fillets and canned fish.

Exports of processed fish and shellfish in April 1956 decreased about 40 percent from the March 1956 total, and were also down 58 percent from April 1955. The value of exports in April 1956 declined 38.5 percent when compared with March 1956 and 69 percent below April 1955.

Item	Quantity			Value		
	April	Year	Year	April	Year	Year
	1956	1955	1955	1956	1955	1955
	(Million of Lbs.)			(Millions of \$)		
Imports:						
Fish & Shellfish:						
Fresh, frozen & processed ^{1/}	67.0	57.2	768.3	17.7	14.7	206.4
Exports:						
Fish & Shellfish:						
processed ^{1/} only (excluding fresh & frozen)	3.8	9.0	91.0	0.8	2.6	21.8
^{1/} Includes pastes, sauces, clam chowder and juice, and other specialties.						

GROUNDFISH FILLET IMPORTS UP IN JULY 1956: United States imports of groundfish (including ocean perch) fillets during July 1956 totaled 16.1 million pounds--27 percent greater than in the corresponding month of last year (see chart 7 in this issue). The principal cause for this gain was a 4.6-million-pound increase in imports from Canada. Imports from Norway, Denmark, and Miquelon and St. Pierre were also somewhat greater. Icelandic groundfish fillet exports to the United States during July 1956 were down 1.5 million pounds as compared with exports reported for the preceding July. There were no imports from Sweden, United Kingdom, France, Japan, and the Union of South Africa during July 1956.



total fillet imports. Canada accounted for 80 percent of the groundfish fillet imports during the same month of 1955.

Total groundfish and ocean perch fillet imports during the first seven months of 1956 amounted to 82.6 million pounds--an increase of 7.4 million pounds or 10 percent as compared with the amount reported for the same period last year. Canada (59.5 million pounds) and Iceland (15.5 million pounds) led all other countries during the seven-month period of 1956--both accounting for 91 percent of the total.

IMPORTS AND EXPORTS OF SELECTED FISHERY PRODUCTS, JANUARY-MAY 1956: A comparison of United States imports and exports of selected fishery

United States Foreign Trade of Selected Fishery Products, January-May 1955-56			
	Jan. - May		Percentage Increase or Decrease
	1956	1955	
	(1,000 Lbs.)		%
IMPORTS:			
Tuna, fresh or frozen . . .	58,900	65,158	- 10
Tuna, canned	13,824	11,765	+ 18
Bonita, canned	6,801	7,703	- 12
Salmon, fresh or frozen . .	1,566	4,070	- 62
Salmon, canned	10,480	1,038	+910
Sardines, canned	8,458	8,638	- 2
Shrimp	26,123	16,645	+ 57
Lobsters, fresh or frozen .	20,332	20,420	$\frac{1}{2}$
Crab meat, canned	1,979	1,273	+ 55
Groundfish fillets	41,940	30,026	+ 40
Groundfish blocks and slabs	13,503	23,206	- 42
Swordfish.	7,759	8,011	- 5
EXPORTS:			
Salmon, canned	662	4,307	- 85
Sardines, not in oil, canned	20,676	19,105	+ 8
Fish oils, inedible	45,995	43,624	+ 5

$\frac{1}{2}$ A decrease of less than one-half percent.

products during the first five months of 1956 with the same period of 1955 shows substantial gains in imports of canned tuna, salmon, and crab meat; fresh and frozen shrimp, groundfish fillets; and fish meal. There were declines in imports of canned bonito, fresh or frozen tuna, salmon, and blocks or slabs of groundfish fillets.

Principal changes shown in exports were increases in canned sardines and fish oil and a decline in canned salmon.

Fish meal imports during January-May 1956 of 51,167 tons were 7 percent higher than the 47,967 tons for the same period a year earlier.



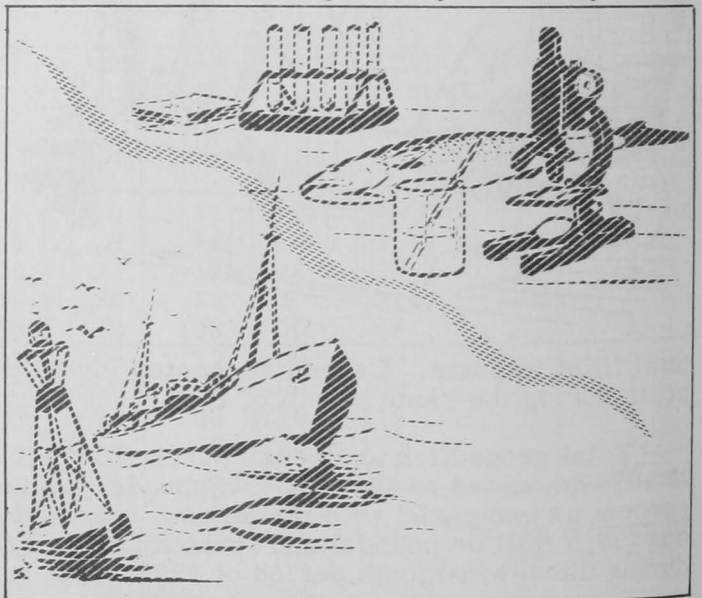
United States Governmental Expenditures in Fiscal 1956 for Fishery Research

United States and state agencies and international fisheries commissions spent \$13,975,000 in the fiscal year ending June 30, 1956, on research and services for commercial fisheries, according to a report released August 2 by Secretary of the Interior Fred A. Seaton.

Categories considered in the report include expenditures for biological research, hatchery and river basin studies, exploratory fishing and gear research, technological studies (refrigeration, utilization of products, etc.), collection and publication of statistics and market news data, economic studies, market development and education activities, and various other types of research and services.

Of this total expenditure, \$9,292,000 was from regular Fish and Wildlife Service appropriations (\$2,811,000 of which was from funds made available by the Saltonstall-Kennedy Act), \$4,015,000 was supplied by States, and \$668,000 by International Commissions.

Of all the funds spent on fishery research, the report shows that \$4,733,000 was spent in salmon research and services; tuna activities got \$1,504,000 of which



\$1,386,000 was spent on the Pacific fishery; oysters got \$1,068,000 of which \$984,000 was spent on Atlantic and Gulf of Mexico problems; for sardines \$1,184,000 was spent with \$957,000 going to the Pacific; while \$613,000 was spent on the Atlantic and Gulf of Mexico shrimp fishery. The menhaden and halibut fisheries each got \$245,000. Research and services for all varieties of fresh-water fish amounted to \$917,000. The remainder of the funds were distributed among numerous other fish including rockfish, flounders, ocean perch, mackerel, mullet, striped bass, scallops, clams, crabs, and northern lobsters.

More than half of the \$4,015,000 supplied by States went to three varieties of fish: salmon research and development work getting \$983,000, eastern and southern oyster projects receiving \$706,000, and \$638,000 for work on the Pacific sardine.

Funds of the international fisheries commissions were distributed in the interests of three fisheries: salmon, \$282,000; tuna, \$198,000; halibut, \$188,000.

The annual catch of fish varies from year to year but approximates 4.5 pounds. The value of the catch also varies but it approximates \$350 million a year.

The report puts shrimp in first position in value of the catch at the boat, third at the level of the processor and primary wholesaler, and second at the retailer level. Tuna ranks first for the processor and primary wholesaler, first for the retailer, and second for the fisherman and boat owner. Salmon is second for the processor and primary wholesaler, third for the retailer, and third for the fisherman and boat owner.

As far as volume is concerned, menhaden is far ahead with a catch of about 1.7 billion pounds annually, or about 38 percent of the total catch. Menhaden, which is used for meal and oil, ranks in sixth, seventh, and ninth positions in value, respectively, to the processor, fisherman and boat owner, and retailer.

Alaska is first among the states and territories in number of fishermen with 14,000 out of a total of 153,000. California heads the list of fishing craft in operation with more than 10,000 out of a total of about 87,000 craft. California, Massachusetts, and New Jersey are rated one, two, three in volume of catch; California, Massachusetts, and Florida are one, two, three in the value of the catch.

The report, Major Commercial Fisheries with Data, on Research Expenditures, Fishery Leaflet 435, may be obtained from the Division of Information, Fish and Wildlife Service, Washington 25, D. C.



U. S. Production of Fishery Byproducts, 1955

FISH MEAL AND SCRAP: Production of fish meal and scrap in the United States and Alaska during 1955 amounted to 264 thousand tons. Compared with the production reported for 1954, this was a 3-percent increase. The largest production recorded for a single month during 1955 was in July when nearly 53 thousand tons were processed (table 1).

Table 1 - U. S. Production of Marine-Animal Scrap and Meal, 1955 and 1954

Product	1955		1954	
	Quantity	Value	Quantity	Value
	1,000 Short Tons	\$1,000	1,000 Short Tons	\$1,000
Meal and Dried Scrap:				
Alewife	0.3	43.2	-	-
Anchovy	0.2	29.9	0.2	25.4
Crab, blue	8.1	445.2	10.1	598.1
Crab, dungeness2	9.2	0.2	10.3
Fur seal	0.3	19.6	0.3	33.5
Groundfish ("white fish") incl. ocean perch	6.1	815.5	7.2	934.6
Herring	7.7	1,163.5	7.0	928.9
Menhaden	190.6	25,449.3	183.1	23,783.4
Sardine (Pilchard)	7.0	968.9	6.5	842.6
Salmon	0.7	88.6	1.2	137.5
Shrimp	0.5	34.3	0.9	50.3
Tuna and Mackerel	23.4	3,120.3	21.5	2,845.2
Unclassified	19.2	2,542.2	18.7	2,558.0
Total	264.3	34,729.7	256.9	32,747.8

MARINE ANIMAL OIL: The total yield of fish oils during 1955 amounted to 24.8 million gallons, compared with 21.5 million gallons for the preceding year (table 2).

Table 2 - U. S. Production of Fish Oils, 1955 and 1954

Product	1955		1954	
	Quantity	Value	Quantity	Value
	1,000 Gals.	\$1,000	1,000 Gals.	\$1,000
Body Oil:				
Anchovy	16.1	9.3	9.3	5.0
Fur seal	40.5	26.4	40.2	19.9
Herring	1,091.0	668.7	760.9	434.3
Menhaden	21,115.2	12,131.8	18,641.4	9,755.3
Sardine (Pilchard)	897.7	521.6	755.9	420.5
Salmon	145.6	91.7	183.0	141.9
Tuna and Mackerel	544.9	264.2	584.9	243.5
Unclassified	710.9	502.5	652.4	393.1
Total	24,561.9	14,216.2	14,216.2	11,413.5
Liver and Viscera Oil:				
Cod	148.9	129.6	161.5	133.8
Shark	47.2	176.7	26.3	298.4
Miscellaneous	22.7	282.4	48.9	959.7
Total	218.8	588.7	236.7	1,391.9
Grand Total	24,780.7	14,804.9	21,864.7	12,805.4

CONDENSED FISH SOLUBLES AND HOMOGENIZED CONDENSED FISH: The production of condensed-fish solubles during 1955 (157.1 million pounds) was 9 per cent below 1954. The homogenized-condensed fish production during 1955 totaled 41.2 million pounds, compared with 47.1 million pounds the preceding year (table 3).

Table 3 - U. S. Production of Fish Solubles and Homogenized-Condensed Fish, 1955 and 1954

Product and State	1955		1954	
	Quantity	Value	Quantity	Value
	1 Million Pounds	\$1 Million	1 Million Pounds	\$1 Million
Fish Solubles:				
Maine, Massachusetts, Rhode Island	14.1	0.5	9.9	0.5
New York, New Jersey, Delaware . . .	62.1	2.1	64.7	3.1
Virginia	3.1	0.1	20.7	1.1
North Carolina, Florida	6.9	0.3	7.3	0.4
Mississippi	10.2	0.4	5.5	0.3
Louisiana, Texas	15.4	0.6	13.1	0.6
California, Oregon	45.3	2.0	51.0	2.3
Total	157.0	6.0	172.2	8.3
Homogenized-Condensed Fish:				
Massachusetts, Rhode Island	41.2	1.5	57.9	2.3
Grand Total	198.2	7.5	230.1	10.6



Wholesale Prices, July 1956

The usual mid-season lull in landings and production was responsible for the higher prices in July for most edible fresh and frozen fishery products. The July 1956 over-all wholesale index (114.6 percent of the 1947-49 average) for all edible fish and shellfish (fresh, frozen, and canned) rose 4.5 percent over the previous month and 10.7 percent over that for July 1955.

Although weather conditions were ideal in all fishing areas, fish were scarce, particularly in the North Atlantic. Lighter landings for fresh haddock at Boston and the evenly-distributed landings of halibut on the Pacific Coast caused the prices for these products to go up considerably from June to July 1956, and these products were priced substantially higher than in July 1955. Salmon prices dropped slightly from June to July 1956 because of more liberal landings on the Pacific Coast. Among the fresh-water fish, July 1956 whitefish prices were lower because supplies were fairly plentiful, but lake trout and yellow pike prices were higher because catches were light. The drawn, dressed, or whole finfish subgroup in July 1956 was 15.2 percent higher than the previous month and 22.6 percent higher than in the same month a year earlier.



Trawlers unloading at the Boston Fish Pier.

There were only slight changes in the prices for processed fresh fish and shellfish between June and July. Lower prices for fresh shrimp at New York were more than offset by substantially higher prices for fresh haddock fillets at Boston. However, both of these products in July 1956 were priced considerably higher than in July a year ago. Shrimp landings in the South Atlantic were moderate to liberal.

The July 1956 index for the fresh processed fish and shellfish subgroup was only 0.7 percent higher than the previous month, but 19.1 percent above the same month in 1955.

Higher prices for frozen shrimp at Chicago, because of excellent demand, accounted for the 5.0-percent increase in the subindex for processed frozen fish and shellfish from June to July 1956. Higher prices for nearly all items in the subgroup were responsible for the 10.3-percent increase in this subindex from July 1955 to July 1956. Only frozen ocean perch fillet prices dropped from June to July because of liberal stocks.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, July 1956 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices ^{1/} (\$)		Indexes (1947-49=100)			
			July 1956	June 1956	July 1956	June 1956	May 1956	July 1955
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					114.6	109.7	111.7	103.5
<u>Fresh & Frozen Fishery Products:</u>					125.9	117.5	120.6	106.3
<u>Drawn, Dressed, or Whole Finfish:</u>					122.5	106.3	113.3	99.9
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.09	.06	92.2	56.3	70.9	57.4
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.40	2/.34	122.2	107.3	123.8	90.8
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.64	.64	142.7	144.4	140.5	130.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.48	.53	119.0	131.4	153.7	81.8
Whitefish, L. Erie pound or gill net, rnd., fresh	New York	lb.	.65	.69	131.4	139.5	148.6	131.4
Lake trout, domestic, No. 1, drawn, fresh . . .	Chicago	lb.	.60	.58	122.9	117.8	104.5	93.2
Yellow pike, L. Michigan & Huron, rnd., fresh .	New York	lb.	.54	.34	126.7	78.6	68.0	161.8
<u>Processed, Fresh (Fish & Shellfish):</u>					128.6	127.7	126.1	108.0
Fillets, haddock, sml., skins on, 20-lb. tins . .	Boston	lb.	.33	.25	112.3	85.1	91.9	78.3
Shrimp, lge. (26-30 count), headless, fresh . .	New York	lb.	.80	.82	126.4	129.3	124.8	105.9
Oysters, shucked, standards	Norfolk	gal.	5.50	5.50	136.1	136.1	136.1	117.5
<u>Processed, Frozen (Fish & Shellfish):</u>					117.7	112.1	115.2	106.7
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.39	2/.39	102.1	102.1	103.4	102.1
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.28	.28	86.3	86.3	91.0	83.2
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.27	.28	109.8	110.8	114.8	106.7
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.82	.75	126.6	116.1	118.1	108.8
<u>Canned Fishery Products:</u>					98.7	98.7	99.0	99.2
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs. . .	Seattle	cs.	2/22.65	2/22.65	120.0	120.0	120.0	109.6
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	10.60	10.60	76.4	76.4	76.4	92.3
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	7.50	7.50	87.5	87.5	87.5	88.1
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	8.20	8.20	87.3	87.3	89.9	71.3

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

^{2/}Revised.

Note: The canned salmon price shown in the index for January, February, March, April, May, and June (Commercial Fisheries Review: March 1956, p. 25; April 1956, p. 27; May 1956, p. 34; June 1956, p. 51; and July 1956, p. 55; respectively) was incorrect and should have been \$22.65 a case. However, the canned index for each of these months was not affected and was correct as shown.

Canned fishery products prices remained unchanged from June to July 1956 and were only 0.5 percent lower than in July 1955. In July 1956 the canned tuna pack was greater than for the same period a year earlier, and the same was true for the canned Maine sardine and canned salmon packs. However, the good demand for nearly all canned fishery products accounted for the steadiness in prices. Prices in July 1956 as compared with the same month in 1955 were substantially higher for canned salmon and Maine sardines but were almost offset by the lower prices for canned tuna and California sardines.

