

TRENDS AND DEVELOPMENTS

California

DUNGENESS CRAB ABUNDANCE OUTSIDE COMMERCIAL RANGE STUDIED

(M/V Nautilus Cruise 57-N-4): To determine the abundance, condition, and sizes of the Dungeness crab (Cancer magister) in areas on the outer edge and beyond the commercial range and to obtain samples of various size crabs by beam trawling was the purpose of a cruise (May 13-31, 1957) by the California Department of Fish and Game Research vessel Nautilus.

A total of 45 commercial-size crab traps were used to make trap sets. The traps were set in two strings of 21 and 22 traps each, except at the first station where 45 were set. Two traps were lost due to several days of rough weather.

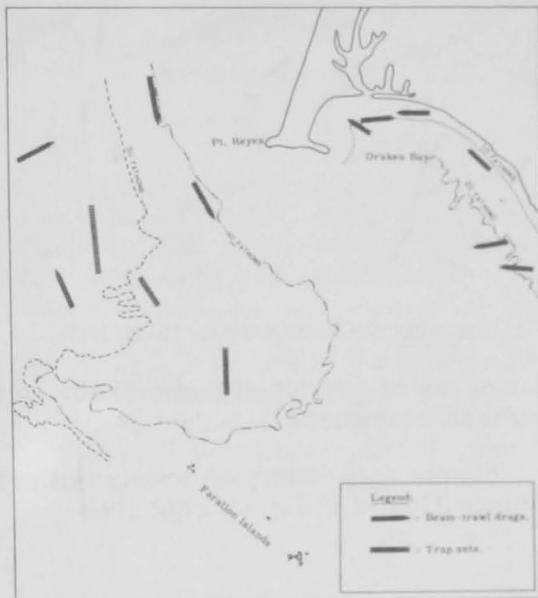
An eight-foot beam trawl with a 1-inch mesh net was used to catch crabs of the various sizes present.

A total of 174 trap sets were made in the Pt. Reyes and Farallon Island areas. These sets yielded 556 Dungeness crabs (known locally as market crabs). Of these 329 (59.2 percent) were legal (7" males), 127 (22.8 percent) were sublegal males, and 100 (18.0 percent) were females. The percentage of legal-size crabs per trap ranged from a low of 44.4 percent at a 36-fathom station SE. of the Farallon Islands to a high of 90 percent at a 45-fathom station North of the same Islands.

Very few soft legal crabs were encountered. Only 4 of 329 legal-size (1.2 percent) were in the soft condition.

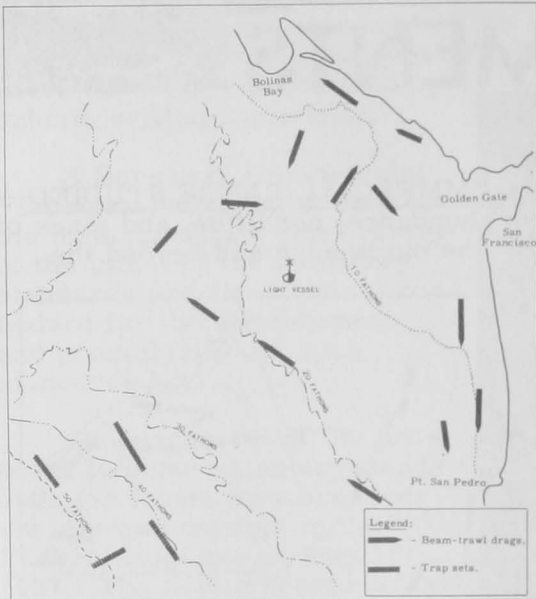
Various incidental species were also brought up in the traps. Among these were 119 sand dabs (Citharichthys sordidas) caught in 49 fathoms of water between Pt. Reyes and the Farallons. Two octopi were also caught during the cruise. These weighed approximately 30 to 40 pounds. Shoulder-width measurements were made on all crabs caught by the traps. A shoulder-width measurement is made just forward of the last antero-lateral spines.

It appears that from the amount of legal crabs caught, it is doubtful that commercial fishing in most of these areas would be profitable as late in the season as May. The catches of crabs were spotty around the 50-fathom depth. Not until the traps were set in approximately 40 fathoms of water did the catches pick up. Catch samples of commercial boats during the same period revealed that the fishermen were getting slightly more legal crabs per trap. These crabs averaged about the



M/V Nautilus Cruise 57-N-4 (May 13-31, 1957).

same size as those caught on this cruise. The fishermen were fishing in 10 to 12 fathoms of water off San Francisco (between the Golden Gate and Pt. San Pedro). An outstanding difference in the catches between the two areas was that the fishermen were handling many more females for a given amount of males.



M/V Nautilus Cruise 57-N-4 (May 13-31, 1957).

Some of the other factors that would inhibit fishing in the 40- and 50-fathom depths during the last part of the season (March through May) would be low prices, considerably more running time, more time pulling the traps, plus loss of traps resulting from ships and salmon boats fouling on the trap lines.

A total of 23 drags were made with the beam trawl to capture crabs. These drags were usually of a 30-minute duration. Depths dragged varied from $4\frac{1}{2}$ fathoms off Pt. Bonito to 60 fathoms off of Pt. Reyes. Crabs were taken in 16 out of the 23 drags.

The beam trawl was successful in capturing crabs of a greater size range than those ordinarily taken in commercial traps. Some of the smaller size crabs are usually not brought up in the traps. There are at least 3 year-classes represented. A drag over the "potato patch" off Pt. Bonito in 26 to 35

feet of water produced some crabs in the 30-69 mm. range. These sizes could not be found elsewhere.

These data with previously collected information will be used in studies of the composition of the crab resource.

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RESEARCH ON THE RED ABALONE IN MORRO BAY-SAN SIMEON AREA (M/V Nautilus Cruise 57-N-3): Red abalone (*Haliotis rufescens*) beds off California were inspected by the California Department of Fish and Game research vessel Nautilus (April 24-May 12). Also, the vessel looked for abalone tagged during 1955 and 1956; and attempted to develop methods of collecting abalone spat and transporting and transplanting techniques.

Due to a siege of particularly bad weather curtailing diving activities during the month of May, only a limited number of the planned projects were accomplished.

Of the commercial areas inspected, the majority of the abalone observed appeared to have grown less in size than usual. In the area between Pt. Estero and San Simeon, the kelp which has in recent years been present in large scattered beds, is this year almost completely absent. No young stalks were seen growing from the bottom. This kelp provides the principle source of food for the abalone in this area.

Four tagged abalone were recovered by divers in approximately the same area of release. One abalone had grown slightly more than one inch during the year, the others had grown very little if at all during the same period of time.

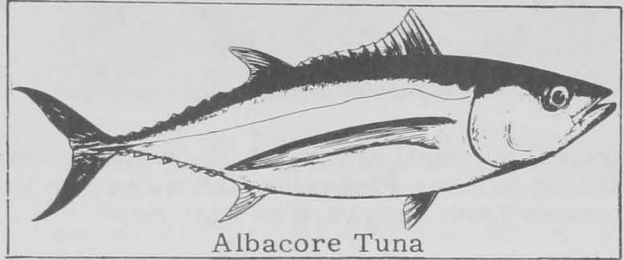
Examination of the gonads indicated the abalone were retarded in spawning development so plans for collecting spat were postponed.

Seventy abalone were collected and placed in a live box and the box deposited in the inner harbor of Morro Bay. Twelve abalone injured when collected died within a few days. The others have remained alive and are in good health, feeding only on the materials which float into the box. The 58 abalone in the holding box have remained alive for 40 days.

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ALBACORE TAG RETURNS TELL STORY OF WIDE TRAVEL: The catch of two more albacore tuna tagged by the California Department of Fish and Game has shed more light on the ocean movements of these fish. Tags from both fish were recovered off Lower California by the fishing vessel Jessie A out of San Diego.

The first albacore, caught 90 miles south of San Diego on July 3, established a new albacore record for being "at liberty." It had been tagged July 25, 1955, and was recovered 710 days later. The previous record was one year.



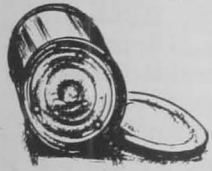
Albacore Tuna

Department spokesmen said this demonstrates that any given albacore may appear in the local fishery for at least three successive seasons. They theorize this fish could have made two round trips to Midway Island, or one long round trip to Japan. It had gained 13½ pounds while at liberty, weighing 25¼ pounds when caught.

The second fish, at liberty 306 days, was caught July 5 at 100 miles southwest of San Diego. It had been tagged September 3, 1956, off Monterey, Calif., in a group of 76 albacore, which included an albacore recovered only one month earlier (June 1) approximately 145 miles east of Tokyo. These fish, caught 5,000 miles apart, were only five fishes away from each other in sequence when they were tagged in the group of 76.



Cans--Shipments for Fishery Products, January-April 1957



Total shipments of metal cans for fish and shellfish canning during Jan. -May 1957 amounted to 54,426 short tons of steel (based on the amount of steel consumed in the manufacture of cans), compared to 44,486 short tons in Jan. -May 1956. Firms canning tuna, shrimp, Pacific mackerel, jack mackerel, and anchovies were active during the month. Packers of Maine sardines and salmon had started the 1957 season, but packs were light in May.

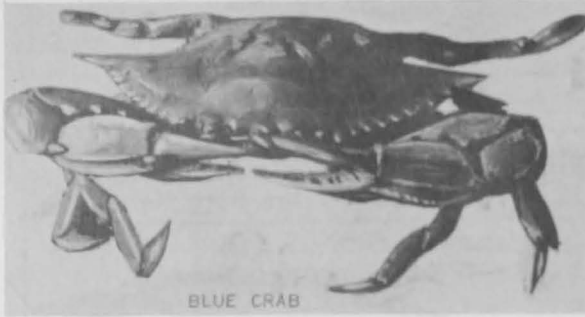
NOTE: STATISTICS COVER ALL COMMERCIAL AND CAPTIVE PLANTS KNOWN TO BE PRODUCING METAL CANS. REPORTED IN BASE BOXES OF STEEL CONSUMED IN THE MANUFACTURE OF CANS, THE DATA FOR FISHERY PRODUCTS ARE CONVERTED TO TONS OF STEEL BY USING THE FACTOR: 23.0 BASE BOXES OF STEEL EQUAL ONE SHORT TON OF STEEL.



Crabs

BLUE CRAB STUDIES INTENSIFIED: Plans for an expanded study of blue crabs, to be financed by the Federal Government, were discussed recently at a three-day conference between the Virginia Fisheries Laboratory, Gloucester Point, Va.,

recently, and the Oyster Institute of North America. A biologist at the conference pointed out: "The blue crab industry has suffered periodically from both over-production and shortage of crabs. Seventy-five thousand dollars of Federal funds,



recently set aside for crab research, is to be applied to a study of the causes of the wide variations in the catch of blue crabs along the Atlantic coast." Funds for this work are made available by the Saltonstall-Kennedy Act of 1954. The U. S. Fish and Wildlife Service has contracted with the Oyster Institute of North America to carry out some fundamental studies of the effects of certain environmental elements such as temperature, light, the amount of salt in the water, and food on the hatching, growth, and

survival of small crabs. A research group, with headquarters at the U. S. Fish & Wildlife Service Fisheries Laboratory in Beaufort, N. C., will conduct field investigations from Delaware to Florida.

The contract was awarded as the culmination of almost two years of planning by state and Federal biologists in cooperation with some of the leading crab meat packers and canners. An advisory group has been appointed for this project.

Funds have also been allocated to the University of Maryland Seafood Processing Laboratory, Crisfield, Md., for studies of the cooking, processing, and storage of crab meat.

The Acting Chief Scientist of the Oyster Institute recently visited the Virginia Laboratory and other laboratories along the Atlantic seaboard to review the work which has been already done and to exchange ideas on methods of holding and handling crabs for experimental purposes.



Films

HINTS TO HOUSEWIVES TOPIC OF PROPOSED FISHERY FILMS: Hints to housewives on how to buy fish will be given pictorially in a 14-minute, 16-mm. sound-color film just placed under contract by the Bureau of Commercial Fisheries, according to a July 26 announcement. The film, which will be ready for distribution in mid-1958, is one of a series to encourage the consumption and marketing of fish and shellfish. The picture, Fish for Sale, is being produced by the Bureau of Commercial Fisheries of the United States Fish and Wildlife Service as part of its market development program. The filming will be done by Milner Productions Inc. of Baltimore, Md. This firm will supply 125 prints to be distributed through the Bureau's film libraries.

A contract for another market promotion film, Outdoor Fish Cookery, has been awarded to the Sun Dial Films of New York City. It will be a 28-minute, 16-mm. sound-color picture. The contract also includes 125 prints for Bureau distribution. Outdoor Fish Cookery will be ready for distribution in about a year. Subjects portrayed will be an Indian salmon barbecue, a New England lobster boil, a Gulf shrimp boil, a South Atlantic oyster roast, and other traditional events, with hints to present-day arrangers of such outside events.

Both films will be financed from funds made available by the Saltonstall-Kennedy Act of 1954 to aid in the production and marketing of domestic fish and fish products.

The Bureau has produced 14 fishery films, six of which have been financed by segments of the fishing industry. Seven Bureau films have won international honors at European film expositions.



Florida

FISHERIES RESEARCH, APRIL-JUNE 1957: The following are some excerpts from the Quarterly Report on Fisheries Research, June 1957, of the Marine Laboratory of the University of Miami.

Tortugas Shrimp Fishery: The analysis of shrimp dealers' records was continued. Excellent records of shrimp sales during the years 1950 through 1956 were obtained from a Key West dealer and are being processed. Two boats which fished continuously during these years were used for a preliminary examination of the catch per unit of effort during the early years of the fishery. This very sketchy data shows that during the entire period the pounds per boat per night landed did not vary greatly. During the early years of the fishery the catch rates were not much higher than those made by the same and other boats in the later years. An interesting aspect of the trend of these catch rates from 1950 through 1953 is that they follow the production curve rather closely. After 1953 they have a downward trend as do those of the other dealers. It is possible that the catch per boat per night up to a certain point reflects abundance of shrimp on the grounds and above this point the rate of capture does not reflect abundance because it involves competition between units of gear.

The numbers of shrimp discarded by fishermen at sea is a very important aspect of the analysis of the dealers' records. Because records show sizes of shrimp sold and not those actually landed on deck, the relationship between the two figures must be determined so that sales records may be converted to the sizes of shrimp actually landed on deck. The best estimate of the amount of discard comes from samples taken on board a charter vessel. On several cruises a random sample of shrimp in the cod end of a 2-inch stretched measure net was measured and the skipper then culled and sold the catch. For example, the month of February 1956 shows that the fishermen discarded 36 percent by numbers of shrimp. Of course this must be done with nets of different mesh sizes at all times of the year for many boats to obtain figures that can be studied for reliability.

In order to gain information concerning the spawning of the Tortugas pink shrimp, three methods are being used: (1) ova diameter frequency, (2) gross appearance of male and female gonads, and (3) the ratio of gonad weight to total weight.

Although it is possible that the pink shrimp spawns more than once no conclusive evidence has been found yet.

The sex ratio (males to females) during the months of January, February, and March was 1.29 to 1.00. This sex ratio does not appear to be the result of gear selectivity because the larger shrimp (the females) would be more susceptible to being caught and in the catch would outnumber the males.

On the other hand it is possible that the number of females in the population has been reduced because they are more available to the gear.

Spotted Sea Trout: A current study of the statistics of commercial landings of black mullet and spotted sea trout show clearly that the sea trout catches were, in large measure, dependent on catches of mullet prior to the year 1952. Since that time, however, the advent of the sport fisherman as a potent factor in the fishery, has made interpretation of landing statistics more difficult.

There has been a decided shift from the mullet fishing which formerly supplied much of the spotted sea trout reported in commercial landings statistics. An unfavorable market situation has lowered the demand for Florida east coast black mullet. The result appears to have been a shift of the mullet netter to other species which are capable of sustaining a paying fishery. The sea trout, the spot, the menhaden, and various species labeled as "bottom fish" now make up the bulk of catches taken in inshore waters. Analysis of this shift in fishery emphasis is being undertaken in an attempt to anticipate the results of much increased pressure on species such as the spotted sea trout.

Black Spot Control in Shrimp: Recent experiments with sodium bisulfite have shown the chemical to be effective at the low concentration of 0.5 percent in retarding the development of black spot. The results with 0.5 percent concentration show that the lower concentration was not quite as effective as the concentration now in general use (1¼ percent) but show that a very weak solution is still useful in controlling black spot.

Studies were continued to determine the effect of Ionol (Butylated hydroxy toluene) on black spot. Results from further tests with dipping solutions of Ionol indicate that a change in the pH using citric acid has no noticeable effect on the rate of black spot formation, and in some cases a slight increase was noticed. Further tests are planned using phosphoric and ascorbic acid to change the pH.

Spoilage Control in Shrimp: Studies were continued to determine the preservative action of the antibiotic Terramycin when applied in a dipping solution. A second trip was made in May on a shrimp boat out of Key West, and samples of pink shrimp (*Penaeus duorarum*) were dipped in four concentrations of a Terramycin-sea water solution. Concentrations ranged from 30 to 500 parts per million; samples were dipped for 1, 5, and 15 minutes.

Organoleptic scores (taste and odor) and black spot evaluations showed small and probably insignificant differences with the nontreated samples. A slight improvement in taste was noted at the 100-parts-per-million level for all of the dipping times. Black spot scores showed that Terramycin in general has a slight retarding action on the development of black spot. This was especially noticeable at the 10-parts-per-million level.

Bacterial counts from this series of tests have not yet been completed. The results will be available early in July.

Rancidity in Fish: A second series of tests to control the development of rancidity in frozen fish (Spanish mackerel) were begun. The experiment was designed to provide information on the prevention of rancidity by the use of Ionol applied either as a dip or as a glaze. The mackerel used in the tests were obtained in Riviera Beach, Fla. Each sample (consisting of 16 fillets) was dipped for one minute in three gallons of freshly-prepared Ionol emulsion, packed in a five-pound waxed carton, and frozen at -10° F.

Those samples which received a glaze were treated after they were completely frozen. The entire carton was submerged in the solution for one minute, drained for a few seconds, and return-

ed to the freezer. Concentrations of Ionol ranged from 150 to 500 parts per million. The effect of 0.5-percent citric acid when applied alone or in combination with 250 p.p.m. Ionol is also being studied. Results from these tests will be reported at a later date.

A second series of tests to prevent the fading of the red pigment on red snappers was also begun. Previous experiments have shown that Ionol in the range of 200-300 parts per million was quite effective in preventing fading of the color. The present experiment was designed to provide confirmatory data on the effect of Ionol on the fading of the red pigment. Concentrations ranged from 50 to 500 parts per million. The effect of sodium bisulfite, licithin, ascorbic-citric mixtures, and glycerin are also being observed. Results from these tests will be reported later.

Smoked Fish Mold Studies: Mold develops on smoked fish held under room temperatures in from 7 to 10 days. Previous work has shown that smoked fish wrapped in Mylar 322 containing carbon dioxide showed no mold after 21 days of storage.

A second series of tests using Mylar 322 and carbon dioxide gas produced similar results after 30 days of storage. A slight "souring" was noticed at this time, however.



Fisheries Loan Fund

INTERIOR WILL CONTINUE TO ACCEPT APPLICATIONS: Applications for fishery loans will continue to be accepted and assigned case numbers for an indefinite period, despite the fact that applications exceed the \$10,000,000 provided by Congress as initial capital for a fishery loan fund, it was reported June 14 by the Department of the Interior.

Only a limited number of applications in excess of the \$10,000,000 will be investigated or further processed at this time. Applications not processed will be held by the Department until funds again become available. Applications are handled in the order in which they are received.

The \$10,000,000 fisheries loan fund is a revolving fund set up by Congress for a ten-year period to provide loans to commercial fishermen for financing and re-financing of operations, maintenance, replacement, repairs, and equipment of fishing gear and vessels and for research into the basic problems of the fisheries.



Great Lakes Fishery Investigations

OTTER-TRAWL AND GILL-NET FISHING IN LAKE ERIE BY M/V "CISCO:" Experimental otter trawling and gill-netting were tried by the Service's research vessel Cisco in Lake Erie during several cruises.

Cruise 2--May 21-June 3: The Cisco's entire operations during cruise 2 were conducted in the eastern end of Lake Erie off Erie, Pa., and Port Dover, Ontario, except for two series of bathythermograph casts between Sandusky, Ohio, and

Erie, Pa., and two trawl hauls off Cleveland, Ohio.

Yearling yellow perch, $3\frac{1}{2}$ to $4\frac{1}{2}$ inches long, predominated in the trawl samples off Cleveland. In a total of 30 minutes towing time, 1,352 of these

fish were caught. Also abundant were smelt (594), logperch (301), and emerald shiners (545). Represented in small numbers were adult perch, sheepshead, spot-tail shiners, and silver chubs.

Experimental nylon gill nets (mesh sizes 1-, 1½-, 2-, 2½-, 3-, 4-, 5-, and 6-inch) were set on the bottom in 13 fathoms off Erie and in 34 fathoms (the deepest area in Lake Erie) off Port Dover.



The Service's research vessel M/V *Cisco*.

The catch off Erie was light and consisted entirely of perch and smelt, except for one burbot and 2 blue pike. The catch off Port Dover was extremely light, consisting of only 1 smelt, 1 burbot, and 1 *Leucichthys* sp., tentatively identified as either *L. alpenae* or *L. johannae*. This latter specimen is interesting in that neither of these two species is generally listed as occurring in Lake Erie, although there is one recent report of *L. johannae* having been taken from the deeper waters.

Gill nets (2½-inch mesh) were set obliquely from top to bottom in 13 fathoms off Erie and 26 fathoms off Port Dover, and a haul net (300 feet long, 2½-inch mesh, 120 meshes deep) was set with its floats 6 feet below the surface in 13 fathoms off Erie. The oblique net off Erie caught 1 white bass and 1 smelt near the surface and 29 yellow perch and 1 blue pike near the bottom. Six smelt and 2 white bass were taken in the haul net. In the oblique net off Port Dover there were 3 perch, 4 smelt, and 2 white bass near the top half of the net and one lake herring near the bottom.

Trawling operations were carried out in 4 areas off Erie in depths ranging from 3 to 16½ fathoms and in 3 areas off Port Dover in depths ranging from 2¼ to 33 fathoms. The most outstanding feature of the trawling was the exceptionally large catches of 3- to 4-inch smelt in nearly all tows. Up to 7,500 of these smelt, believed to be yearlings, were taken in a single 20-minute tow. They seemed to be abundant in bottom tows at all but the greatest depths. In the deep water, a large catch was made at midwater levels (about 7 fathoms below the surface). Fathogram tracings indicated that they were very abundant from 6 to 10 fathoms below the surface in this area. Catches of all other species were generally small, except for a single catch of about 400 yearling perch (3 to 4 inches), taken in shallow water off Erie. The young perch in this area averaged about one-half inch shorter than those off Cleveland. Other species taken in trawls include blue pike, adult smelt, adult perch, burbot, sheepshead (2), lake herring (1), white bass, walleye (1), alewife (1), spoonhead muddler, slimy muddler, trout-perch, spot-tail shiner, emerald shiner, logperch, johnny darter, brindled madtom, black crappie (2), and rock bass (2). The latter two species were taken in very shallow water off Erie. Otherwise, catches from

the two sides of the lake did not differ greatly at comparable depths. No blue pike, however, were caught on the north side. An interesting feature of the perch catch was that practically all adults were males and appeared to be in spawning condition, although there seems little doubt that the spawning season has ended.

Seine hauls in 3 areas in and near Erie Harbor failed to produce fry of any species. A half-meter plankton net towed at night at the surface off Port Dover, however, caught several smelt fry. This tow also took several large *Pontoporeia* which had no doubt migrated to the surface after dark.

The water in the east portion of Lake Erie was only slightly stratified thermally and was generally still cold. Surface water ranged from 7.0° C. (44.6° F.) over the deep-water area to 16.6° C. (61.9° F.) off Erie.

Cruise 3--June 11-23: Both otter trawling and gill-netting in the extreme western end of Lake Erie were tried during cruise 3. Operations were conducted as far west as Lorain, Ohio, on the American side and Point Pelee on the Canadian side. Ports visited by the vessel included Sandusky and Put-in-Bay, Ohio, and Leamington, Ontario.

Gill nets of several mesh sizes (1-inch to 6-inch) were set on the bottom in 6 fathoms of water east of Pelee Island and at the surface over 6½ fathoms of water east of Kelly's Island. In each of these areas a gill net (2½-inch mesh) was also set obliquely from top to bottom. Yellow perch made up practically the entire catch in the oblique set off Pelee Island. Few perch were caught in the uppermost one-quarter of the net, but they were increasingly abundant with depth. Other fish taken were 3 smelt, one sheepshead, and one blue pike. The blue pike and one smelt were near the bottom, the others at midlevels. Yellow perch were extremely abundant in the net set on the bottom in the same area; 251 were taken in a 100-foot section of 2-inch mesh. Other species caught in small numbers were sheepshead, smelt, blue pike, white sucker, one rock sturgeon, trout-perch, and spottail shiner, the latter two species in 1-inch mesh. Sheepshead (61) and perch (42) predominated in the oblique net set off Kelly's Island. The sheepshead were most abundant at midlevels while the perch were concentrated near the bottom. Other species, scattered mostly in the top three-quarters of the net, included blue pike (5), smelt (14), white bass (3), and walleye (2). The surface net set off Kelly's Island contained the same species in a similar distribution pattern as the oblique net, with the addition of three channel catfish.

Trawls were towed in two areas off Leamington and four areas between Put-in-Bay and Lorain. Small smelt (average length about 4 inches) dominated nearly all catches where a small-mesh cod end was used. They were often as abundant at mid-water levels as on the bottom. Over 9,000 small smelt were taken in one 10-minute tow. Perch yearlings (also averaging about 4 inches in length) were second most common, but were generally on the bottom. There were no striking differences in catches at comparable depths in the different areas. Minnows and darters were more numerous in the shallower waters, but otherwise depth seemed to make little difference in the catches. It must be pointed out, however, that depths at which trawls

were towed varied only, from 3 to 7 fathoms. In addition to the large numbers of small smelt and perch caught in the trawls, fair catches of large perch and small catches of large smelt were made. Other species represented were sheepshead, blue pike, walleye, trout-perch (very numerous at times), white sucker, white bass, channel catfish, spottail shiner, emerald shiner, channel darter, sand darter, logperch, alewife (only 2), silver chub (only 5, found in only two areas), burbot, stonecat, and brown bullhead (only 1).

Midwater trawling operations at night south-east of Kelly's Island took very few fish at the surface, but were more successful at midlevels. Results of this trawling indicate that many of the species of fishes in Lake Erie may be found well off the bottom soon after dark.

A few smelt fry began showing up in the small-mesh trawls, and some very tiny fry (probably cyprinids) were caught near the surface in plankton nets. The first young-of-the-year perch were taken in seining operations near Sandusky.

Most of the deeper water of the western end of Lake Erie was stratified thermally during cruise 3, with the discontinuity layer generally near the bottom. Surface water temperatures ranged from 15.3° C. (59.5° F.) to 24.3° C. (75.7° F.). The water was clearer than during cruise 1, with secchi disc readings 6½-9½ feet, 2-5 feet greater than readings made during the earlier cruise.

Cruise 4--July 2-15: Operations during cruise 4 were carried out primarily in the east end of Lake Erie off Erie, Pa., Dunkirk, N. Y., and Long Point, Ontario. Some fishing, however, was done off Ashtabula, Fairport, and Cleveland, Ohio.

Nylon gill nets (graded mesh sizes, 1 to 6 inches) were set on the bottom off Long Point in 33 fathoms and off Erie (3½-, 4-, 5-, and 6-inch mesh) in 9½ fathoms. The gang off Long Point took only one fish, a smelt. Apparently this deepest portion of Lake Erie is practically devoid of fish at the bottom at this time of the year. Oxygen was found to be ample (10 p. p. m.) near the bottom in this area. The bottom gill net off Erie contained 6 whitefish and 14 burbot in the 3½-inch mesh, 1 whitefish and 7 burbot in the 4-inch mesh, and 1 burbot in the 5-inch mesh. All meshes caught a few smelt. The whitefish were very close in weight to the legal minimum limit of 1¼ pounds in Pennsylvania. Another gill net (1-, 1½-, 2-, 2½-, and 3-inch mesh) was set off Erie with its float line 1½ fathoms beneath the surface in 13 fathoms of water. This net took only 3 blue pike and 1 small yellow perch.

Nylon gill nets (2½-inch mesh) were also set obliquely from top to bottom in 13 fathoms off Erie and 26 fathoms off Long Point. The net off Erie contained 44 smelt, scattered from 20 feet below

the surface to the bottom, and 2 yellow perch and 2 lake herring at midlevels. The oblique net off Long Point took 10 smelt scattered from 40 feet below the surface to the bottom, plus 4 perch and 2 herring at midlevels.

Trawl hauls were made off Erie, Dunkirk, Long Point, Ashtabula, Fairport, and Cleveland. Smelt continued to dominate practically all catches. Larger smelt (older than yearlings) have, since cruise 2, become better represented in catches in the eastern portion of the lake, except in the very deepest water where they remain rather scarce. Presumably these fish move eastward to avoid the very warm water in the shallow western section of the lake. Most of the large smelt seem to stay near the bottom, at least during the daytime, while the yearlings tend to concentrate in the area of the thermocline, where there is one.

There are, however, some yearlings on the bottom even when there is a thermocline, and there is evidence that these individuals average somewhat longer than those at the thermocline. A few smelt fry were taken in bottom tows but a catch of about 600 in 7 fathoms off Cleveland represented the only sizable catch.

Whitefish were taken in the trawls for the first time this year--29 were caught off Long Point and seemed to be most abundant at about 7 fathoms.

Other species caught in the trawls in large numbers were yellow perch, trout-perch, and spottail shiners. Less common species included blue pike (14 caught in one tow off Fairport, otherwise uncommon), walleye, white sucker, lake herring (unidentified *Leucichthys* sp., possibly *L. alpenae*), slimy muddler, smallmouth bass, emerald shiner, silver chub, logperch, johnny darter, sand darter, and sheepshead. Seventy-six sheepshead were taken in two tows off Cleveland, otherwise they were rare. Most of the male sheepshead appeared ripe, and the larger females nearly so.

A sharp thermocline has developed in most portions of the central and eastern basins of Lake Erie. The thermocline is generally at about 9 fathoms. In water shallower than this there is little thermal stratification. Surface water temperatures ranged generally from 16° to 18° C. in the deeper water of the east end of the lake, with a low of 15.3° C. (58.7° F.). Maximums near shore reached 22.5° C. (72.5° F.) in the east end of the lake and somewhat higher in the middle and western parts. The water in the central portion was by far the clearest yet seen this year, with secchi disc readings up to 20 feet.

A special light penetration study was conducted in deep water near Long Point. It was found that very little light of any color penetrated to a depth greater than 15 meters where the secchi disc reading was 4.3 meters.

Note: Scientific names of species mentioned; yellow perch (*Perca flavescens*), smelt (*Osmerus mordax*), sheepshead (*Aplodinotus grunniens*), blue pike (*Stizostedion vitreum glaucum*), white sucker (*Catostomus commersoni*), rock sturgeon (*Acipenser fulvescens*), trout-perch (*Percopsis omiscomaycus*), spot-tail shiner (*Notropis hudsonius*), white bass (*Lepibema chrysops*), walleye (*Stizostedion vitreum vitreum*), channel catfish (*Ictalurus lacustris*), emerald shiner (*Notropis atherinoides*), channel darter (*Cottogaster copelandi*), sand darter (*Ammocrypta pellucida*), logperch (*Perca caprodes*), alewife (*Pomolobus pseudoharengus*), silver chub (*Hypopsis storerianus*), burbot (*Lota lota*), spoonhead muddler (*Cottus ricei*), slimy muddler (*Cottus cognatus*), stonecat (*Noturus flavus*), brown bullhead (*Ictalurus nebulosus*), johnny darter (*Etheostoma nigrum*), brindled madtom (*Schilbeodes miurus*), black crappie (*Pomoxis nigromaculatus*), rock bass (*Ambloplites rupestris*), whitefish (*Coregonus clupea formis*), lake herring (*Leucichthys artedii*), smallmouth bass (*Micropterus dolomieu*).

SEA LAMPREY CONTROL REPORT LISTS RESULTS OF CHEMICAL TESTS:
Painstaking routine and faithful observation were employed by Fish and Wildlife Service scientists in the all-out attack on the sea lamprey, Assistant Secretary of the Interior Ross L. Leffler said when he released Special Scientific Report--Fisheries No. 207--Toxicity of 4,346 Chemicals to Lamprey and Fishes.

The goal of this phase of the campaign against the sea lamprey was to find a substance toxic to lamprey larvae but harmless to fish.

The report, strictly uninteresting to the casual reader but full of information for the industrial chemist, toxicologist, physiologist, fishery scientist, and others with scientific interest, is largely an alphabetical listing of each chemical tested with its effect on specimens of lamprey larvae, trout, and bluegills, beginning with acetaldehyde and ending with zinc silicofluoride.

Opposite the name of each chemical is the result of each 24-hour test, showing either negative results or the time necessary to kill or otherwise affect the objects of the test.

In addition to the 3,939 named chemicals there is a list of 407 compounds submitted by chemical companies but identified only by the company's own code.

The Fish and Wildlife Service researchers have discovered two chemicals which, in the laboratories, will kill lamprey larvae and not harm fingerling trout and young bluegills. These are being given rigid tests in the streams before definite pronouncements of their value will be made.

Sea lamprey showed up on Lake Huron more than 20 years ago and then moved into Lake Michigan. In each lake the lamprey has ruined the commercial trout fishery. In Lake Michigan the annual trout harvest dropped from 6,500,000 pounds in 1946 to a mere 34 pounds in 1955. In recent years the lamprey has entered Lake Superior and is seriously damaging the trout resource there.

The program to control the sea lamprey has developed along two major lines--the use of electric fences to kill adult lamprey as they attempt to enter their spawning streams, and the project to find a selective poison which will kill only lamprey larvae.

Lamprey larvae remain in the bottoms of the streams for six years before becoming adult marauders which ruin lake trout fisheries. Hence, a successful poison plus the electrical blockade should rapidly reduce the lamprey population and aid in the rebuilding of the trout resources.

Canada and the United States and the affected Great Lakes States and Provinces are working cooperatively on the lamprey program under the direction of the Great Lakes Fishery Commission, an international body.

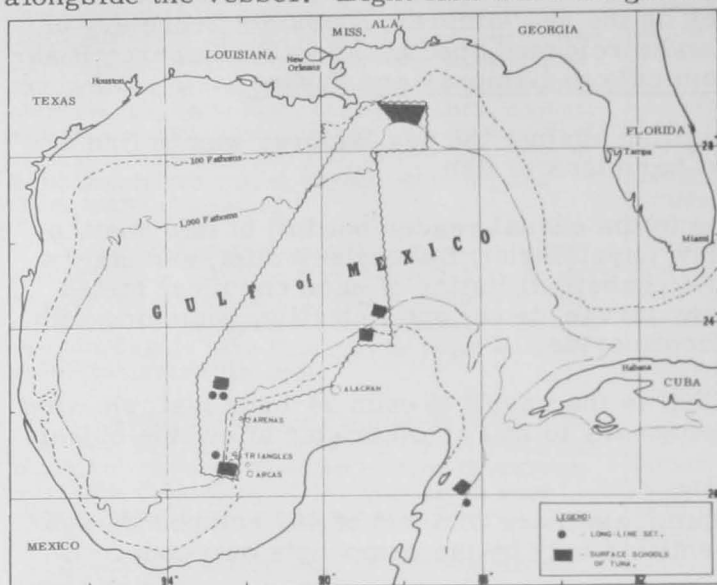


Gulf Exploratory Fishery Program

SURFACE-TUNA EXPLORATIONS BY M/V "OREGON" (Cruise 45): Exploration for surface tuna in the Gulf of Mexico was the purpose of the two-month cruise (ended July 29) by the Service's exploratory fishing vessel Oregon.

During June, 117 schools of predominately little tuna (E. alletteratus) and white skipjack (K. pelamis) were observed in the northern Gulf. Approximately 75 of these were worked with live bait and jack poles; 16 schools responded to the bait

and worked under the fishing racks, but at no time would the fish take the squids alongside the vessel. Eight fish were caught on squids trolled 15 feet to 20 feet behind the vessel. The anchovies used for live bait were too small to be used for baiting hooks. The schools were found only in 85°-87° F. green water and exploration into adjacent blue water revealed no surface schools. Five schools of white skipjack were observed on the northern edge of the Campeche Banks, but bad weather made it impossible to work them. During July, breezing schools of skipjack and yellowfin tuna were observed in the southern Gulf on the shelf, west of Cay Arcas, but no bait was aboard at this time. Commercial long-line vessels reported surface schools of yellowfin and white skipjack northwest of Cay Arenas during this period.



M/V Oregon Cruise 45 (for two months ending July 29) in eastern Gulf of Maine

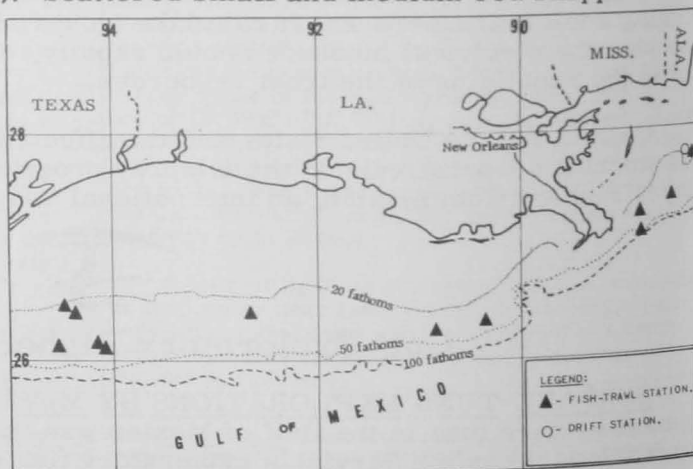
Three test long-line sets in the southwest Gulf in July yielded 14 tons of yellowfin tuna. The over-all catch rate for these sets was 14.6 yellowfin per 100 hooks.

Live bait was obtained at night with a light and a trap-lift net. In the northern Gulf, 14 bait stations were made. The catches were primarily small anchovies, and it was possible to land 200-300 scoops an hour. Twelve bait stations were made on Campeche Banks in the vicinity of Arcas, Arenas, Alacran, and the Triangles. Although numerous schools of *Sardinella* and *Jenkensia* were found throughout the area, difficulty was experienced in catching sufficient quantities with the trap-lift net. The best catch for a single night was 80 scoops.

Three test long-line sets in the southwest Gulf in July yielded 14 tons of yellowfin tuna. The over-all catch rate for these sets was 14.6 yellowfin per 100 hooks.

EXPLORATORY TRAWLING FOR RED SNAPPER IN NORTHERN GULF OF MEXICO (M/V Silver Bay Cruise 1): Scattered small and medium red snapper were

found in the Northern Gulf area from the Mississippi coast to the area off Freeport, Tex., by the Service's chartered exploratory fishing vessel *Silver Bay* during a two-week cruise which ended July 1 at Pascagoula, Miss. A combination of mechanical difficulties and severe sea conditions due to hurricane "Audrey" restricted trawling operations.



M/V Silver Bay Cruise 1 (June 12-July 1, 1957)

Twelve trawling stations were made from the Mississippi Coast to off Freeport, Tex., in depths of 17-56 fathoms. Scattered small and medium red snapper were found in each area trawled. The best drag, at 28°08' N. latitude, 94°35' W. longitude, yielded 260 red snapper weighing 350 pounds. This drag also caught 67 pounds of grouper and porgy. Other catches ranged under 100 pounds of red snapper per hour tow.

One tow, in 30 fathoms at 28°19' N. latitude, 90°18' W. longitude, caught 500 pounds of medium butterfish.

Very little difficulty was experienced in trawling over broken bottom using 52-foot and 60-foot fish trawls rigged with roller gear. On two occasions, the trawls hung up on coral lumps, but were hauled back with minor tears.

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SHELLFISH AND SARDINELIKE FISH POTENTIAL EXPLORED IN EASTERN GULF OF MEXICO (M/V Silver Bay Cruise 2): Shellfish potential and the scouting

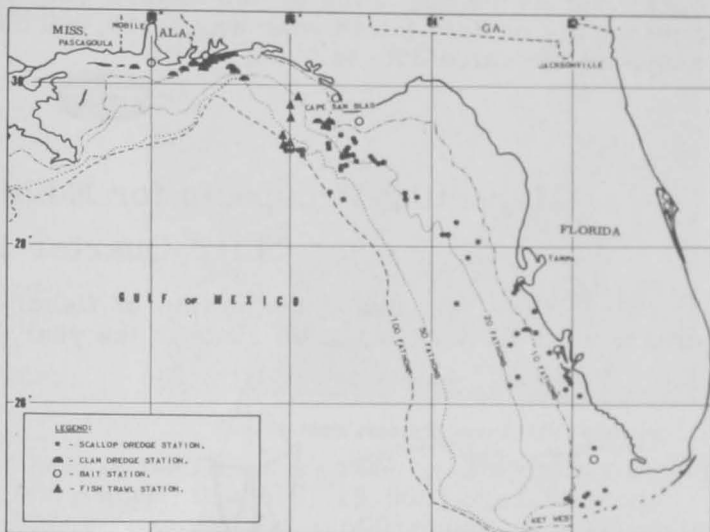
and sampling of sardinelike fish stocks were the objectives of the 17-day cruise of the Service's chartered exploratory fishing vessel Silver Bay. A total of 98 fishing stations were made on the Continental Shelf along the Florida west coast during this cruise which ended on July 29.

Using an 8' scallop dredge, 66 drags were made from Pensacola to Key West in depths of 3 to 105 fathoms. Gulf scallops (Pecten gibbus) were taken in most of the hauls inside of 50 fathoms. The best catches were made in an area south of Cape San Blas (latitude 29°05', longitude 85°16').

Up to six bushels of P. gibbus were taken in 30-minute tows in 19-20 fathoms. Yield was approximately 2 quarts of meats per bushel.

A total of 19 offshore drags with a 14-tooth quahog dredge were inconclusive, due to the dredges being consistently torn up by the hard sand and rock bottom. The dredges are to be modified to enable dredging on hard sand bottom.

Numerous surface schools of thread-herring (Opisthonema oglinum) were observed inside the 10-fathom curve from Port St. Joe southward. Greatest numbers (200-300 schools sighted per day) were seen in the offings between Tampa Bay and Charlotte Harbor. Attempts to sample these schools at night with a trap-lift net were generally unsuccessful. Subsurface fish schools sampled with trawls in the Cape San Blas area contained round herring, Etrumeus (in 20 fathoms), and an unidentified shad, Pomolobus (in 90-110 fathoms).



M/V Silver Bay Cruise 2 (July 12-29, 1957)



Maine Sardines

CANNED STOCKS, JULY 1, 1957: Distributors' stocks of Maine canned sardines totaled 212,000 cases on July 1, 1957--58,000 cases, or 38 percent, more than the stocks on hand July 1, 1956. Stocks held by distributors on June 1, 1957, amounted to 230,000 actual cases, according to estimates made by the U. S. Bureau of the Census--18,000 cases less than stocks held on July 1, 1957.

Canners' stocks on July 1, 1957, totaled 895,000 cases (100 3¼-oz. cans)--a substantial increase (580,000 cases) over the year-ago stocks and twice as much as on June 1, 1957.

The new Maine sardine packing season opened on April 15, and there have been significant amounts packed through June. The season ends December 1, 1957.

Type	Unit	1956/57					1955/56				
		7/1/57	6/1/57	4/1/57	1/1/57	11/1/56	7/1/56	6/1/56	4/1/56	1/1/56	11/1/55
Distributors	1,000 actual cases	212	230	295	344	388	154	160	268	326	354
Cannery	1,000 std. cases 1/	895	416	465	879	1,016	315	64	152	475	625

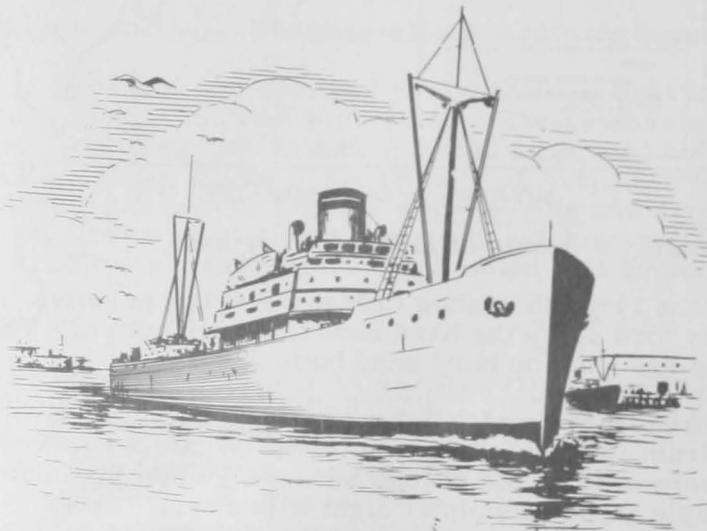
1/ 100 3 1/4-oz. cans equal one standard case.

The pack April 15 to July 1, 1957, was 700,000 cases (100 3 1/4-oz. cans) and the carryover at the beginning of this season was 426,000 cases. This meant the available supply on July 1 this year was 1,126,000 cases as compared with 1,945,000 cases on the same date in 1956.



Marketing Prospects for Edible Fishery Products, Third Quarter 1957

Per capita civilian consumption of fishery products during the next several months is expected to be close to the year-earlier rate. Judging from the wholesale level in primary markets, retail prices have averaged somewhat higher thus far this year than last and are expected to continue higher this summer.



Commercial landings of edible fish and shellfish through mid-1957 were a little lower than a year earlier. Decreases were indicated for tuna and several other important species of fish and shellfish.

Freezings of edible fishery products in the continental United States through midyear were 2 per cent less than a year earlier. May was the only month in which freezings were higher this year than

last. July 1 cold-storage holdings of edible fishery products were about as large as on the same date last year. Stocks of these frozen commodities will trend upward during the remainder of 1957 as supplies are built up for distribution during the seasonally low production period next winter.

Through early spring, imports of major fishery products were a little lower than in the same part of 1956. The percentage declines for major canned products and for frozen fillets and blocks were about the same. For fresh and frozen products other than fillets and blocks the total was about as large as a year earlier.

Canned fish exports, the major group of domestic edible fishery products sold abroad, were much lower through early spring this year than last. The reduction in tonnage was mainly in canned California sardines, the pack of which was very poor last year.

This analysis appeared in a report prepared by the Agricultural Marketing Service, U. S. Department of Agriculture, in cooperation with the U. S. Fish and Wildlife Service, and published in the former agency's July 29, 1957, release of The National Food Situation (NFS-81).



North Atlantic Fisheries Exploration and Gear Research

BOATLOAD OF BRINE-FROZEN GROUND FISH LANDED BY M/V "DELAWARE" FOR STORAGE AND HANDLING TESTS (Cruise 57-6): A total of 72,500 pounds of groundfish was caught and either brine-frozen or iced aboard the Service's exploratory fishing vessel Delaware during this cruise which was completed on July 29, 1957. The 12-day otter-trawl cruise utilized a standard #41 net (headrope 100 feet, footrope 79 feet, $4\frac{1}{2}$ " manila mesh) with a $4\frac{1}{2}$ " synthetic cod end. All fishing was conducted on Georges Bank north of Corsair Canyon. The best catch during the trip was 4,000 pounds of haddock taken in 55 minutes.

After-use data on the synthetic cod-end was collected throughout the trip. Measurements on the amount of stretch and subsequent regain were made on various portions of the cod end during fishing operations.

All cod were examined for a copepod parasite whose frequency of occurrence is presently under study by the Service's biological staff at Woods Hole.

The 70,500 pounds of fish brine-frozen and stored in the refrigerated hold of the Delaware consisted of haddock (Melanogrammus aeglefinus): round, 23,000 pounds; dressed, 13,000 pounds; scrod: round, 33,000 pounds; pollock (Pollachius virens): round, 1,500 pounds. Approximately 2,000 pounds of haddock was iced for comparative quality tests with the frozen fish.

Frozen haddock and scrod will be distributed to industry for storage and handling tests. Distribution is being made in cooperation with the New England Groundfish Industry Committee.

The Delaware will resume exploratory fishing operations during cruise 57-7 scheduled to depart from East Boston on August 7. Scallop explorations and gear tests are planned primarily in the northeast peak of Georges Bank. This marks the continuation of scallop explorations in the areas not being commercially fished in an effort to locate areas of commercial potential. During the two-week cruise samples of scallops are scheduled to be frozen at sea using several methods of initial freezing. The samples will then be subjected to technological quality tests at the Service's East Boston Laboratory.



The Service's research vessel M/V Delaware.

North Atlantic Fisheries Investigations

STUDIES ON NONTIDAL DRIFT OF HADDOCK EGGS AND LARVAE CONTINUED (M/V Albatross Cruise 95): The fifth in a series of cruises for the purpose of surveying the nontidal drift of Georges Bank and its relation to the drift of haddock eggs and larvae was made by the Service's research vessel Albatross III between June 5-12, 1957. The study for the 1957 spawning season was ended with this cruise.

Approximately 1,500 miles of continuous plankton tows were made at the surface and 10 meters with Hardy Plankton Recorders; 151 Bathythermograph lowerings,

75 salinity samples, and 14 meter-net surface tows were made; 552 drift bottles were released. Two transponding buoys were picked up. Buoys "November" and "India" were not found.

Haddock larvae were found on the southeast part of Georges Bank. Buoy drift indicated a very strong westerly drift along the southern edge of Georges Bank.

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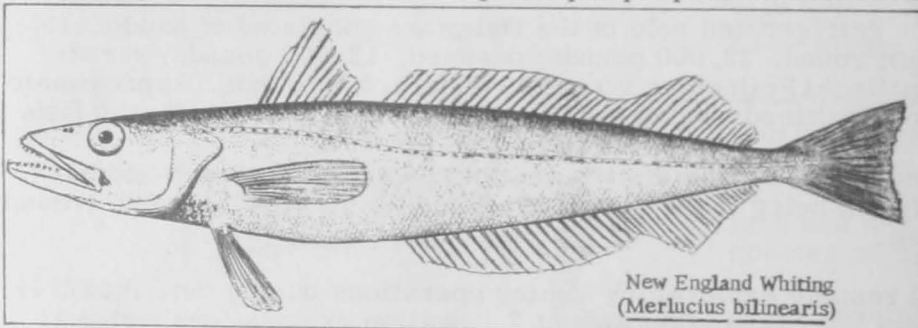
WHITING BEHAVIOR IN TRAWLS STUDIED WITH UNDERWATER TELEVISION (M/V Albatross III Cruise 97): In order to study the behavior of whiting in trawls with underwater television, the Service's research vessel Albatross III sailed from Boston on July 10 and returned on July 13. The vessel operated on the western and eastern sides of Great South Channel.

Fish capture was observed with the camera positioned inside the belly of the trawl and between cover and cod end of a typical covered cod end rig used for selectivity experiments.

Too few fish were found in water of the proper depth and clarity to provide good film records of behavior. Good progress was made in working out the details of camera positioning, however.

* * * * *

WHITING TAGGING (M/V Albatross III Cruise 98): The tagging and collection of whiting (silver hake) was the principal purpose of this cruise of the Service's re-



search vessel Albatross III. The vessel, which sailed from Provincetown, Mass., on July 14 and returned to Woods Hole, Mass., on July 19, operated four miles northwest of the Cultivator whistle buoy.

A total of 21 tows were completed. A total of 1,094 whiting were tagged, 706 otoliths were taken, and 3,260 length measurements by sex were recorded.

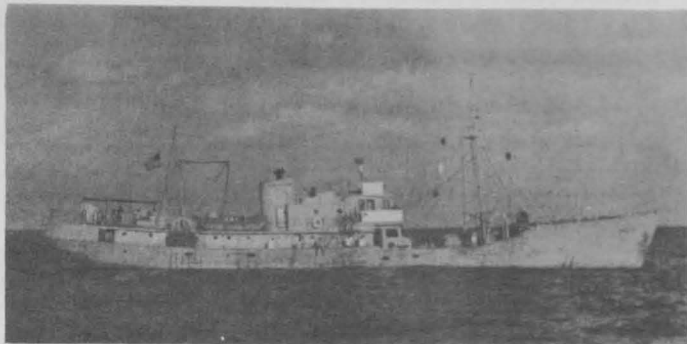
Cruise 100 on August 14 was a one-day demonstration trip for members of the New England fishing industry.

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VERTICAL DISTRIBUTION OF OCEAN PERCH AND HADDOCK FRY SAMPLED IN GULF OF MAINE (M/V Albatross III Cruise 99): Sampling the vertical distribution of ocean perch and haddock fry in the western part of the Gulf of Maine was the objective of this cruise (July 25-August 2) by the Service's research vessel Albatross III.

A series of 84 tows was made with the Isaacs-Kidd midwater trawl at 8 stations in the western Gulf of Maine. The trawl was rigged as an opening-closing net and was towed at a series of depths, top to bottom, at each station. The trawl operated well most of the time. Minor gear failures suggested changes needed to improve the trawl depressor for operations in these waters.

Larval fishes were collected at all stations in the following order of abundance: ocean perch or redfish, hake or rockling, haddock, flatfish, whiting, and mackerel. Collections of more than 1,000 ocean perch were made at several stations. Ocean perch ranged from 12-40 mm. in length. Haddock were widely distributed and occurred in small numbers, primarily in tows where the jellyfish *Cyanea* was present. The haddock appeared to fall into two size ranges, 4-8 cm. and 9-14 cm. These are the largest collection of small ocean perch and haddock ever taken in midwater in the western Atlantic.



Service's research vessel Albatross III.

The greatest numbers of fish were taken at 20 meters depth during both day and night. Few fish were caught below 40 meters. A highlight of the collections was the capture of a large ocean perch (29 cm.) during the night at a depth of 40 meters over waters of 110 fathoms. There are few records of adult ocean perch taken at mid-depths, and little is known of the diurnal, vertical migration.



North Pacific Exploratory Fishery Program

TRIALS OF NEW ELECTRICAL DEPTH-TELEMETER FOR MIDWATER TRAWLS SUCCESSFUL (M/V John N. Cobb Cruise 31): Successful trials with a new electrical depth-telemeter for midwater trawls highlighted this Cruise of the Service's exploratory fishing vessel John N. Cobb. The vessel returned to Seattle

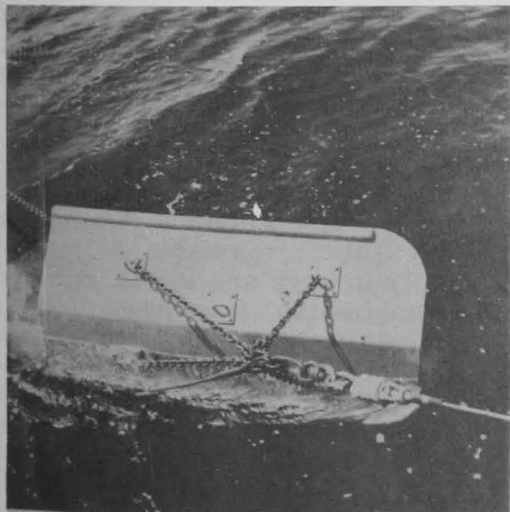


Fig. 1 - New electrical telemeter located ahead of trawl door. Telemeter housing contains pressure gage which converts water pressure to electrical resistance. Trawl door is new type constructed of aluminum and designed for use in midwater or bottom trawling.

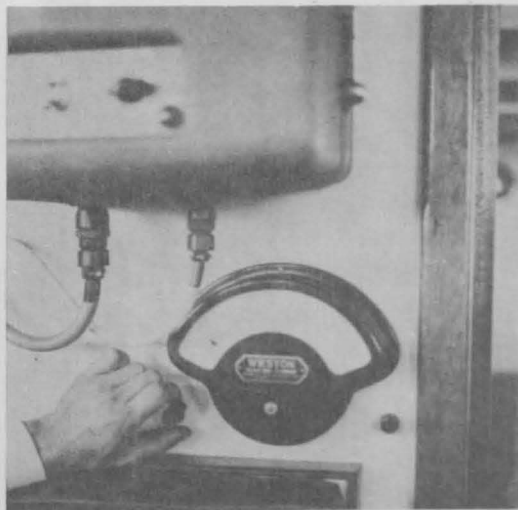


Fig. 2 - View of meter measuring electrical resistance gradient for conversion to depth readings. Meter is mounted below regular depth-sounder in pilot house of John N. Cobb.

on June 21 after completing almost two months of midwater trawling experiments off the coasts of Washington and British Columbia.

During the last three weeks of the cruise, the acoustic depth-telemeter was replaced by the new electrical device, which operated accurately after several minor

failures were remedied. The electrical telemeter, about the size of a baseball, was attached just ahead of one of the trawl doors. Accurate depth of the gear was determined continuously by a gage converting water pressure to electrical resistance. The resistance gradient was transmitted to the vessel through an electrical-conductor-core trawl cable. A meter mounted in the wheelhouse next to the echo-sounders and "Sea Scanar" converted the electrical-resistance to depth readings. It was thus possible to keep the net at any desired depth by varying the speed of the vessel and adjusting the length of cable.

In general, during the entire cruise few schools of fish were located in mid-water and catches were small. A total of 37 tows was made with the midwater trawl on depth-sounder indications. Hake, herring, dogfish, smelt, rockfish, turbot, and several other species were caught in varying amounts. The largest catch of herring was 500 pounds. On many tows large numbers of euphausiids were caught in the nylon twine of the 64-foot square trawl.

One large school of hake was located near the bottom in 48 fathoms. A 22-minute tow, during which the trawl was near or touching the bottom part of the time, caught an estimated 10,000 to 20,000 pounds of hake. The trawl burst open at the surface, and all the hake were lost except 1,000 pounds landed on the first split.

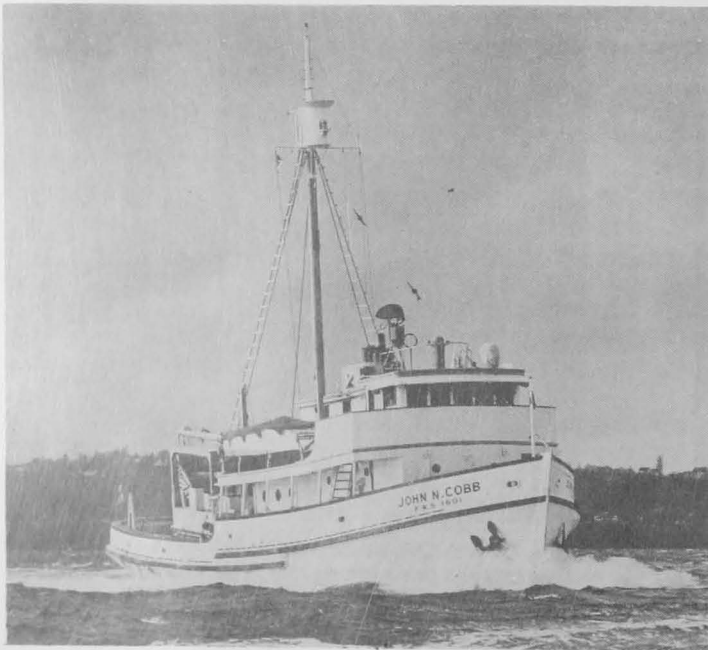
A new pair of aluminum trawl doors, designed to be fished either in midwater or on bottom, was also used successfully for the first time on the John N. Cobb. The doors were patterned after those recently developed at the Nanaimo Biological Station of the Fisheries Research Board of Canada.

Note: See Commercial Fisheries Review, June (1957) p. 30.

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HERRING EXPLORATIONS IN OFFSHORE WATERS OF ALASKA UNDER WAY:

Herring explorations in offshore Alaskan waters are being conducted by the Service's exploratory fishing vessel John N. Cobb. The vessel left Seattle on July 15 (cruise 33). Explorations will extend for a seven-week period and the vessel was expected back in Seattle on August 30.



The Service's exploratory fishing vessel John N. Cobb.

Although a commercial herring fishery has existed in Alaska for 50 years, the catch has been taken entirely in bays and inlets with occasional fishing a few miles off the coast in certain areas. Fishing vessels crossing the Gulf of Alaska at times have reported seeing schools of herring in the open ocean, but more information is needed on the existence, abundance, and availability of offshore herring stocks. It is important to know to what extent the inshore herring migrate offshore, and also to determine if there are stocks of offshore herring and what contribution they may make to the inshore fisheries.

The John N. Cobb was expected to explore the waters off Baranof Island in southeastern Alaska and work up to Prince William Sound. A series of zigzag

courses were to be run out to a minimum distance of 50 miles offshore, with at least one tract line extending out to the middle of the Gulf of Alaska. A "Sea Scanar" was to be used to assist in locating herring schools. Midwater trawls and gill nets were to be the principal types of gear employed for catching herring. Detailed records were to be kept of the location, numbers, size, composition, movements, and availability of all herring schools located offshore.

The offshore explorations were to be closely coordinated with the inshore herring research program administered by the Service's Marine Fisheries Investigations in Juneau.



Oregon

TAGGED ALBACORE CAUGHT BY JAPANESE: A 20-pound albacore tuna that had been "branded" with a tubular plastic spaghetti type tag on August 11, 1956, about 300 miles off the Oregon coast by Fish Commission of Oregon biologists was reported caught by a Japanese vessel. On June 3, 1957, the tagged albacore was caught by a Japanese vessel off the coast of Japan. During the ten months the fish was at liberty, it had doubled its weight, the Commission announced in July.

The Commission research director said the albacore tag recovery further substantiates the theory that albacore caught sporadically in Oregon waters during late summer are destined for Asiatic waters. California biologists have reported similar recoveries of albacore tagged off southern California.

* * * * *

SOFT-SHELL CLAMS TRANSPLANTED: Approximately 9,000 soft-shell clams have been planted in the tide flats of the Siuslaw River by the Fish Commission of Oregon. The clams began their sedentary lives 150 miles up the Oregon coast in Nehalem Bay, a July news release from the Commission points out.

The clam transplant is being made by the Commission in an attempt to restore the former high production of soft-shell clams in the Siuslaw area. In all, about 2,000 pounds (15,000 clams) will be "planted." Close to 1,300 pounds were transferred in late June.



Soft-shell Clam

At the Siuslaw planting site, the seeding area was staked off and clams were set out in rows, not unlike potato planting. Holes were made with a makeshift planting tool. Each clam then had to be hand-planted and covered with tide-flat muck. The clam transplanting is being accomplished by a crew of four biologists. Seed stock is purchased at the going market price from a commercial digger at Nehalem Bay.

Such transplanting has been successful on the East Coast. Encouragement of success is gained from the fact that all soft-shell clams on the West Coast are believed to be the result of early-day transplants from the Atlantic seaboard.

"We do know that the abundance of clams in Siuslaw Bay has been at a low level since 1953," says a State biologist. "If overdigging was a major factor in the decline, introduction of more spawning stock may be the answer."

But, there is a good possibility that the environment for clams has changed in the Siuslaw River. If this is the case, the biologist is pessimistic about benefits from seed stocking the area until original conditions are restored.

The Siuslaw River east of U. S. 101 has been closed to all clam digging and will remain so until at least October 1, 1959, to protect the new seed stock. Biologists will make periodic checks of the area during the next two years to see how the planted clams are progressing.



Pacific Oceanic Fishery Investigations

ANNUAL REPORT FOR FISCAL YEAR 1957: During the year (July 1, 1956-June 30, 1957) efforts of the Service's Pacific Oceanic Fishery Investigations (POFI) were centered around three large programs. The first was a descriptive survey designed to ascertain the tuna resources, especially skipjack, of the southeastern Pacific. The results of the first cruises, centering around the Marquesas Islands, will be used to plan the final year's field work during fiscal year 1958. The second major area of operations centered around the skipjack population in the Hawaiian waters. Here, the Hawaiian fishery is being used as a laboratory situation for the study of oceanic skipjack in general. Most of the effort during the year revolved around understanding the nature of the population of skipjack and completion of field work designed to show whether fluctuations in the fishery can be rationalized on the basis of changes in the environment. The third major subdivision, albacore research, was focused on the newly discovered mid-ocean resource lying between Hawaii and Alaska, and the development of an elaborate survey program off the Pacific coast during the summer of 1957. In addition, a number of important studies were conducted independently of the major programs. These projects, aligned by discipline, such as tuna larva studies, are designed to produce results applicable to tuna in general and so are treated separately.

Finally, an approach new to POFI, the study of tuna behavior, was started in a small way by devising a system that permits direct observation of tuna behavior during chumming. This opens the way to development of an intensive research program in this field, a field that holds great promise of contributing directly to raising the efficiency of tuna fishing.

Equatorial Tuna Program: The year marked a drastic curtailment of the equatorial program in the vicinity of the Line Islands. Emphasis was shifted to begin evaluation of the tuna resources of northeastern French Oceania, with concurrent broad-scale oceanographic coverage of that area.

Multiple-vessel surveys were conducted during August-September 1956, and January-March 1957; the southern hemisphere winter and summer, respectively. Times of the cruises were selected to afford the greatest contrast of environmental conditions, and of tuna availability.

Preliminary results of these cruises reveal the following:

1. In the immediate vicinity of the Marquesas Islands, skipjack tuna were very abundant during the summer. Approximately three times more schools were seen during the summer than winter.

2. During the times of the surveys, surface schools of skipjack greatly outnumbered surface schools of yellowfin tuna in the Marquesas area.

3. There are supplies of live bait (Marquesan sardines) in the bays of the Marquesas adequate for a fishery of limited size.

4. Catches of deep-swimming tuna in the Marquesas area also indicated that their availa-

bility was about 3 times greater during the summer.

5. Surprisingly, one index of the productivity of the area, the volumes of zooplankton from the surface to 200 meters, indicates a picture contrary to general expectations: the volumes obtained in the general area of the Marquesas were about twice as large during the winter as summer. To the east of the Marquesas, longitude 130° W., volumes were about equal, winter and summer. South of the area (south of 18° S.) is what appears to be an extremely unproductive area with volumes from the 0- to 200-meter tows less than 10 cubic centimeters per 1,000 cubic meters, both summer and winter.

6. Another index of productivity, the concentration of inorganic phosphate at the surface, confirms the picture derived from the study of zooplankton volumes. In the whole broad area covered these values were appreciably lower during the southern hemisphere summer than winter. It is probably significant that the variability of inorganic phosphate concentration was much greater during the winter, especially around the Marquesas-Tuamotus area. This may be indicative of the role these land masses play in bringing enriched water into the euphotic zone.

7. Water flow at the surface through the Marquesas and Tuamotus was a large clockwise eddy.

Variability and significance of this feature is not yet fully known.

The August-September cruises also represented POFI's participation in Operation EQUAPAC, which was a quasi-synoptic oceanographic survey of the entire central and western equatorial Pacific. EQUAPAC was conducted by 11 oceanographic vessels of Japan, the United States, and France, including 2 POFI vessels.

POFI's contribution to the International Geophysical Year (IGY) began on June 21-23, 1957 with the preliminary occupation of an oceanographic station offshore from Oahu. The plan is to occupy this station once every month during the 18-month period of the IGY. This station involves the determination of density conditions between the surface and 300 meters at the time of high and low tides on the day of each station. Biological observations include the rate of carbon fixation as determined with the C^{14} isotope, and the standing crop of zooplankton.

Mid-Ocean Skipjack Program: THE FISHERY: The commercial fishery had a slightly better than average year in terms of total pounds landed. Between January 1 and December 31, 1956, 11,132,222 pounds of skipjack (aku) were landed in the Territory of Hawaii. Since 1948, there have been only 3 years (1951, 1953, 1954) in which more skipjack were caught. Estimated landings for January 1 to June 30, 1957, are considerably lower than last year, or even 1952, the poorest of the past 9 years. Further, "season" skipjack (18- to 22-pound fish) have not appeared in quantity in Hawaiian waters so far in 1957.

Existing catch records show us only the weight of skipjack landed, the area in which the catch was made, and the value of the catch. As a means of obtaining more information concerning the skipjack fishery, log books were placed aboard 5 sampans. In these log books the fishermen record all schools sighted, whether fished or not, and estimates of the fish and school size. Two bits of information may be gained from these records: (1) the proportion of schools fished, and (2) an estimate of the number of schools of small skipjack. The latter is especially important because there is considerable selection by the fishermen as to the size of skipjack caught. These books have been on the sampans six months and a preliminary examination shows we are getting most of the desired information.

ENVIRONMENTAL STUDIES: The collection of environmental data in the area of the fishery adjacent to Oahu has continued. During F.Y. 1957 two comprehensive surveys and a number of monitoring surveys by POFI and the Territory of Hawaii Division of Fish and Game were completed. We now have observations covering a 20-month period and can discern differences in the environment between two skipjack seasons. During the 1956 skipjack season (May-September) mean temperatures off windward Oahu were 1°-2° F. colder than off leeward Oahu. Salinities were 0.11 ‰ higher in the windward than in the leeward areas. During the off-season, temperature and salinity on the two sides of Oahu were very similar. The time at which the divergences in temperature and salinity occurred was also the time at which the 1956 skipjack landings increased sharply. During the early 1957 season, there have been no such divergences in temperature and sal-

inity, and the skipjack landings have been low, with small landings of "season aku" (18- to 22-pound fish). There is thus a strong indication that the appearance of "season" skipjack in 1956 was causally associated with a change in the environment.

COOPERATIVE TEMPERATURE AND SALINITY SAMPLING PROGRAM: During February and March 1957, the collection of sea surface water temperatures and salinity samples was begun at the following locations by the agencies indicated: (1) Ocean Weather Station Victor at 34° N. latitude, 164° E. longitude (U. S. Weather Bureau); (2) Midway Island (U. S. Navy); (3) French Frigate Shoals (U. S. Coast Guard); (4) Upolu Point, Hawaii (U. S. Coast Guard); (5) Johnston Island (U. S. Air Force); and (6) Wake Island (U. S. Weather Bureau). Observations and collections made at these points should enable us to anticipate changes in the general circulatory pattern of the waters which bathe the Hawaiian Islands, and the results should eventually permit long-range prediction of mid-ocean skipjack.

In addition to the new sampling sites listed, observations were continued near Koko Head, Oahu. Temperatures at this site were 0.5°-2.0° F. colder in 1957 than in 1956 during February to June. In June 1957, water temperatures were higher than in June 1956. Salinities between February and June were from 0.0 ‰-0.5 ‰ higher in 1957 than in 1956. This is a further indication, in addition to data from the monitoring surveys, that there is a distinct difference in environmental conditions between 1956 and 1957.

TAGGING: During June of 1956 new all-plastic dart tags were placed on a small number of skipjack. In October one of these tags was recovered. Encouraged by this relative success, the tag was modified and in April-May 1957, 1,978 skipjack were tagged with the D-2 dart tag, and released in Hawaiian waters. As of June 30, 1957, we have recovered 9 of these tags. This is a slightly better rate of recovery than that observed in previous years using the spaghetti-type tag.

Previous tagging had not shown movement of the skipjack from one island to another. Skipjack tagged this year moved from Oahu to Kauai, and Molokai to Hawaii. Each year of tagging has added to our knowledge of tag construction and growth and migrations of skipjack, but we encounter puzzling situations which we suspect may be related to these same migrations. Why do we get several recoveries of skipjack released in one school and none from skipjack released in many other schools?

During the period of skipjack tagging, the stomachs of large tuna and marlin were examined at one Honolulu auction market. This was done to find out whether or not there was a loss of tagged fish due to predation. Seven skipjack were found in 176 stomachs and none were tagged fish. Of the seven, 3 were about one pound and 4 were 3-5 pounds in weight. These results show no evidence of predation on tagged skipjack.

Special Studies: LARVAL TUNA: Drawings of larval *Auxis* and *Euthynnus* and a rough draft of the species descriptions were completed. All specimens were sorted by area of capture, and work was started on a world-wide distributional study. In general terms, the larvae of *Euthynnus lineatus* are quite distinctive from those of *E. yaito* and *E. alletteratus*, but the latter two are not easily sep-

arable from each other. So far as known, there are at least two species of *Auxis*, only one of which occurs in the Atlantic, but both species occur together in various parts of the Pacific. Two types of *Auxis* larvae were found in all oceans but these become indistinguishable at a certain size. In addition, larval *Scomber japonicus* were identified, reducing the number of unknowns by one.

An effort was made to develop more efficient means of sampling larvae in the field.

TUNA FORAGE ORGANISMS: The 53 mid-water trawl collections obtained on the EASTROPIC expedition and about half the collections made on EQUAPAC were analyzed in the laboratory. An initial examination of the EASTROPIC data showed a peaking in volume of forage organisms in the region of convergence and the southern boundary of the Countercurrent, between 3° N. and 6° N. latitude and about 300 miles north of the peak in zooplankton abundance. Longitudinally the largest catches occurred in the central region between 125° W. and 145° W. These results, after further study and analysis, should increase our understanding of both the time and space aspects of trophic succession from basic productivity to the tunas.

FOOD OF SKIPJACK: This study has produced several results of interest.

1. By volume, 703 skipjack were found to have eaten 73 percent fish, 22 percent molluscs, and 4 percent crustaceans. Molluscs, particularly the squid, were much less important in the food of skipjack than in the food of yellowfin and big-eyed. In all 3 species of tuna, fish formed a high percentage by volume--60 to 75 percent.

2. In respect to composition of the food, the main fish families represented in the food of skipjack were Thunnidae, Carangidae, Molidae, and Gempylidae; of yellowfin: Bramidae, Gempylidae, Thunnidae, and Suididae; and of big-eyed: Gempylidae, Bramidae, and Suididae, in order of importance. Larval or juvenile skipjack composed 8 percent of the food of skipjack. Juvenile tunas were also prominent in the food of yellowfin but scarce in big-eyed.

3. The average volume per stomach increased from 15.5 cc. for skipjack of less than 60 cm. to 27.4 cc. for skipjack over 60 cm. With an increase in size, the feeding shifted from crab larvae to the more pelagic amphipods and euphausiids, and from chaetodonts, acanthurids, and synodonts to Decap-terus, molids, and gempylids, the latter being the more oceanic in distribution.

4. There was no definite trend in respect to distance from land when captured from land and average volume per stomach, but there was a shift in composition with littoral forms being replaced by more pelagic forms in an offshore direction.

5. Differences associated with method of fishing were apparently most closely related to the distance from land of the place of capture and also to the depth of fishing. For example, the frequency of occurrence of fish dropped from 89 percent for surface-caught skipjack to 33 percent for subsurface- (long-line) caught skipjack. Molluscs (mostly squid) increased from 9 percent for the surface to

59 percent for subsurface-caught fish, and Crustacea were less plentiful at the subsurface level.

6. Judging by the volume of food remains, the highest rate of feeding in skipjack took place just before noon and again in the late afternoon. The lowest rate was during early morning and early afternoon. The highest percentage of squid was found in the early morning and late afternoon hours. These data upon further analysis may contribute information on feeding depth and vertical migration.

VERTICAL AND HORIZONTAL DISTRIBUTION OF ZOOPLANKTON: Laboratory measurements on approximately 450 zooplankton samples collected on the EASTROPIC expedition were completed. Although the results have not as yet been thoroughly studied the following points were evident:

1. The day-night variation was only of importance in hauls that sampled near the surface, and it was evident that the great bulk of the plankton occurred in the upper 60 meters.

2. The effects of enrichment from such features as the equatorial upwelling and the shallow thermocline along the northern boundary of the Countercurrent were more pronounced in shallow hauls than in deep hauls, and in night hauls than in day hauls.

3. Within the divergent and convergent zones (1½° S. to 5° N. latitude) the abundance of zooplankton decreased from east to west varying directly with the drop in winds and the degree of upwelling, but inversely with thermocline depth.

4. Within the South Equatorial Current between 1½° S. and 8° S., there was an increase in abundance from east to west, thus discounting the importance of the Peru Current as a factor contributing to the enrichment of these latitudes in the central Pacific.

TILAPIA CULTURE: In the spring of 1956, the Hawaiian Tuna Packers, Ltd., and the Pacific Oceanic Fishery Investigations joined forces in an informal agreement for the purpose of seining supplies of small bait-size tilapia and testing these fish at sea to determine their qualities as skipjack bait. Seven full-day and 2 half-day seining expeditions yielded 630 pounds of small tilapia. These were obtained principally from fresh-water ponds and therefore had to be acclimatized to sea water before the sea tests.

The effective use of tilapia as skipjack bait was examined on 14 vessel days at sea in waters off Oahu. It was the prime objective of these tests to compare the ability of nehu (the standard bait) and tilapia in attracting and holding schools of skipjack at the stern of the vessel. A summary of the results shows that 21 (56 percent) of the 37 schools first chummed with nehu surfaced and responded to the bait, also that 10 (56 percent) of the 18 schools first chummed with tilapia gave a favorable response to the bait.

Skipjack were caught from 9 schools at the rate of 3.5 fish per minute and 12.2 fish per bucket of tilapia used. This is not as good as the catch rate of 4.8 skipjack per minute and 15.3 per bucket of bait obtained with nehu from 23 schools, but there is every reason to believe that with experience

chummers will learn to use the new bait more effectively.

It is our conclusion that tilapia is an adequate bait for catching skipjack. In some respects it may be slightly inferior to nehu, but it has several compensating qualities. It is an exceedingly hardy fish and can survive in bait tanks for much longer periods than the nehu. The larger tilapia tend to sound when thrown out as chum, but this trait is not prevalent in fish $1\frac{1}{2}$ " to 2" in length, which is the optimum size for skipjack bait. Our studies indicate that if economically-feasible rearing methods can be developed, the tilapia can alleviate the great need in the Hawaiian skipjack fishery for additional bait supplies.

Our experiences during the past summer have shown that the culture of tilapia in "natural" ponds or reservoirs is not a very efficient way of rearing the fish. Such ponds do not provide enough natural food for the fish, extra feeding is necessary, cannibalism is a major problem, and it is not easy to remove the fish. Sorting the bait-size fish from the large fish is also a problem.

In October 1956, we constructed 3 redwood tanks on the laboratory grounds to determine if a hatchery-type operation would be biologically and economically feasible in rearing tilapia as bait. From December 20, 1956, when production of young fish started, until June 30, 1957, 126 adult females produced about 77,000 fry. We have experienced a fairly high mortality among the young fish due to cannibalism and probably to low oxygen concentrations; both of these factors will be reduced in importance by the improved and enlarged fry-rearing facilities which are presently being constructed.

The practicality of rearing tilapia as bait in the presently available fish ponds and reservoirs is receiving further study this summer. In February and March 1957, 8,749 adult tilapia in two ponds, one a natural brackish-water pond and the other an artificial, fresh-water reservoir, were marked by fin-clipping. Seining will be carried out at intervals during the summer to determine the production of young and to obtain estimates of the total adult population in each pond.

In December 1956, POFI instigated the formation of a "Bait Fish Research Coordinating Committee." Membership on the Committee includes representatives from POFI, the fishing industry, the University of Hawaii, and the Territorial Division of Fish and Game. The purpose, of course, is to coordinate the activities of the various groups here in the Territory that are working on different phases of the general bait-fish problem and to keep members informed on what the other agencies are doing.

Miscellaneous Research: "SEA SCANAR:" In the first quarter of the fiscal year the "Sea Scanar" was put through a series of experiments and sea trials. Under ideal sea conditions good returns

were received from manufactured triplane targets at a maximum distance of 2,180 ft., a single dead skipjack at 1,070 ft., and a single dead herring at 470 ft. Records of aggregations of skipjack, dolphin (*Coryphaena*), porpoise, and blackfish were obtained. Returns from an albacore school were recorded in the second quarter. Failure of the instrument precluded further use for the rest of the year.

HAWAIIAN LONG-LINE FISHERY: Big-eyed and yellowfin data from the Hawaiian long-line fishery for the period 1948-1956 were analyzed and a draft of the manuscript completed. The results show that the increase in big-eyed landings and the decline in yellowfin landings during this period were associated with the differential availability of these two species in the windward and lee areas and also with shift in fishing area by the larger vessels from the lee of the northern islands to the windward waters of the southern islands.

Big-eyed were more available in the windward areas than in the lee, while the reverse was true with the yellowfin which were more available in the lee areas.

The larger vessels showed an annual increase of effort expended in the windward areas of the southern islands from a low of 22 percent of the total trips made during 1948-1949 to a high of 88 percent during 1953-54.

INTRODUCTION OF MARQUESAN SARDINE: Approximately 175 pounds of Marquesan sardine (*Harengula vittata*) were released near shore on Oahu. These were in two lots; the first containing 2,500 individuals was released in Hanauma Bay, Oahu, on September 26, 1956, and the second of about 12,000 individuals was released in Pokai Bay, Oahu, on March 22, 1957. Eight individuals have been recovered by tuna bait fishermen, the last on June 4, 1957. To date there is no evidence the species has been established in Hawaiian waters.

Contract Research (University of Hawaii): TUNA VISION: A report on the histology of the retina of small and large skipjack has been received. The retina in both instances appear to differ little from a general vertebrate eye.

GREEN TUNA: This work is in its closing phases. There now appears to be a well-established relation between "greening" and the presence of fat peroxide. There is some evidence that a green pigment may actually exist in "green" tuna.

ELECTROFISHING: Some experiments looking towards controlling the field and pulsing with an amplydne were completed. However, essentially the project has not advanced significantly during the past year. It is anticipated that direct University of Hawaii participation in this work will cease when a final report is submitted. The contract ended in August 1956.

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NORTH PACIFIC ALBACORE INVESTIGATIONS FOR FISCAL YEAR 1957: The third year (July 1, 1956-June 30, 1957) of albacore tuna investigations in the North Pacific under the Saltonstall-Kennedy Act has been completed. The keynote of these

investigations has been the coordination of efforts with those of other interested government agencies through the Albacore Steering Committee of the Pacific Marine Fisheries Commission. This committee has been particularly effective in facilitating integration of field work and in making most efficient use of the available vessels and personnel.

Distribution: Studies were primarily oriented toward (1) mapping the early summer distribution of albacore; (2) further defining the concentrations of albacore lying in a band between Hawaii and the Aleutians during the summer; and (3) surveying the fall distribution of albacore from approximately 145° W. eastward to the Pacific Coast. Primary emphasis during the year was given to gill-netting and surface trolling, both of which have been shown to effectively catch albacore.

During the summer the research vessel John R. Manning took albacore in a narrow zone between



The Service's research vessel John R. Manning.

175° W. and 145° W. East of 145° W. the John N. Cobb conducted surveys from there to the coast, capturing widely scattered albacore. As is well known by now, commercial fishermen following up these catches, and in part guided by the successful fishing of the John R. Manning off the coast during the summer of 1955, moved offshore and located

The results of the survey by the John R. Manning between Hawaii and Alaska are summarized in figure 1. The vessel took large numbers of albacore from the most western leg of her survey (175° W.) by gill net and trolling. The region of high abundance extended as far east as 160° W. longitude. From this point to 145° W. longitude, abundance progressively decreased. During the first part of the survey along 175° W., albacore were most abundant between 41° N. and 46° N., with centers of abundance around 43° N. and 45° N. The second portion of the survey, the eastward trolling and gill-net leg, yielded relatively abundant catches somewhat farther north.

The John R. Manning caught a total of 602 fish, representing approximately 4.5 tons of albacore. Of these, 451 were taken in gill nets, 104 on troll lines, and 47 in trammel nets. The fish ranged in weight from 7 pounds to 30 pounds. Particularly noteworthy is the large catch by gill net, despite the fact that the 12 shackles were not all of suitable mesh size for optimum catch. High catches such as these, made on small amounts of gear, suggest that there are commercial possibilities in this area. These possibilities are enhanced by the proximity of Aleutian bases for logistic support and the fact that the area is readily available to halibut fishermen who have experience with fishing conditions in this general area.

Despite the fact that trolling was conducted from dawn to dusk of each day, it produced fewer albacore than gill-netting. However, the catches in general verified the centers of abundance as revealed by the gill nets.

It is believed that the success during this summer cruise was at least in part the result of an exceedingly shallow thermocline in this region. During some days the layer of warm surface water in which the albacore live was so shallow that the ship's propeller brought up the deeper, colder

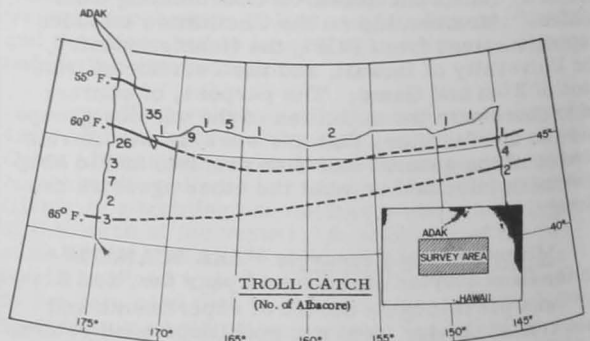
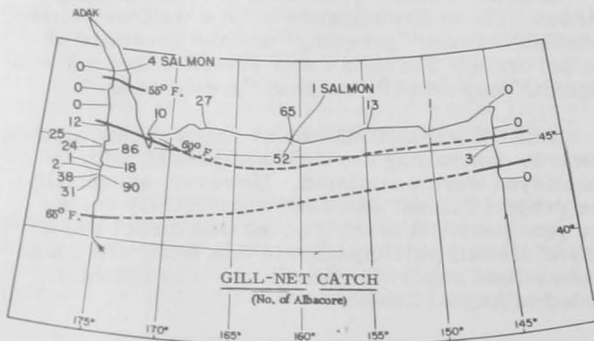


Fig. 1 - Summer albacore survey (Cruise 32, July 17-September 12, 1956) by John R. Manning, research vessel of the Service's Pacific Oceanic Fishery Investigations; a total of 602 fish were caught.

albacore in commercial quantities. Thus there developed the first sizable albacore landings off the Oregon coast in several years.

water. Under such environmental conditions we suspect that the albacore are restricted to a thin surface layer of water and are particularly vulnerable

to gill nets. Some of the evidence for this belief lies in the observation that following a storm, which deepened the thermocline, the gill-net catches dropped off. Later, during the fall surveys, when the thermocline was about 200 feet below the surface, the gill net did not catch appreciable numbers of albacore.

The fall surveys by the John R. Manning and Charles H. Gilbert were designed to describe the distribution of albacore between Hawaii and the United States west coast (fig. 2) at a time when the coastal fishery was diminishing. Trolling was conducted throughout both cruises. Whenever

Analysis of data collected since the start of the program in 1954 has enabled the postulation of a general hypothesis concerning the migration of albacore in the North Pacific. In the spring, these fish perform a rapid and purposeful migration from mid-ocean to the coast of California. During the summer, the migration continues with the route gradually shifting to the north. At the same time the albacore now in the coastal waters also tend to move northward following optimum temperature conditions. Toward late summer the migration toward the coast ceases and there is a gap in the oceanic distribution from about 140° W. to 160° W. longitude at about 45° N. latitude. This gap coin-

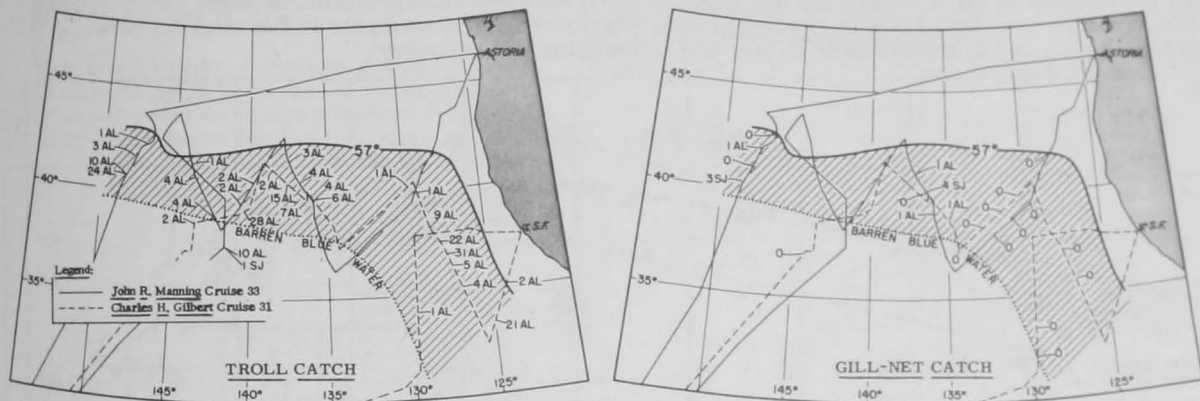


Fig. 2 - Fall albacore surveys by John R. Manning and Charles H. Gilbert.

weather permitted, gill nets were set at night. If the weather was too bad for gill-netting, the vessels either jogged or reduced their speed at night to avoid large gaps in the trolling coverage.

Albacore were taken in significant numbers over a wide area extending from the western border of the survey to the west coast a few miles north of San Francisco. The results are particularly gratifying because the distribution of albacore can be rather logically associated with the distribution of environmental properties. All catches were made in an area with well-defined limits. To the north and east catches were confined by the 57° F. surface isotherm. The southern limit was the northern boundary of the barren, blue, central, northeastern Pacific water as indicated on the chart. This boundary could be readily determined from the bathythermograph sections and also from the clarity of the water.

In the barren central water the color was an intense blue, and the Secchi disc could be seen to a depth of 18 fathoms. In the more productive transition zone where albacore were caught the transparency as measured by the Secchi disc was reduced to 10 or 12 fathoms and the color became blue-green. In the coastal water, which did not contain albacore, the Secchi disc could be seen only to depths of 7 to 9 fathoms and the color was green.

The fall distribution of albacore, extending from the coast to well offshore in a fairly continuous band, suggests that a migration away from the coast is taking place and that it is a gradual exodus rather than a rapid, purposeful migration as may have occurred when the albacore were approaching the coast in the spring.

cides in time with the formation of the well-developed thermocline in the central North Pacific and the associated high concentrations of surface albacore as shown in figure 1. In the eastern North

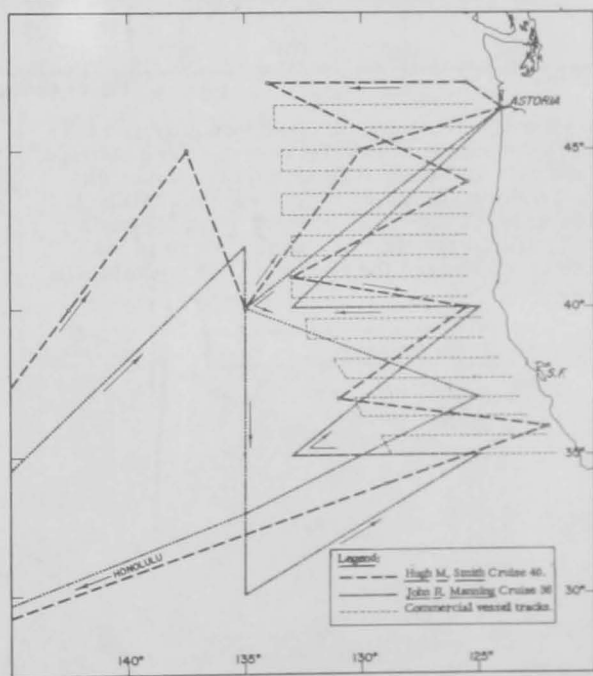


Fig. 3 - Northeastern Pacific albacore survey.

Pacific the albacore are scattered along the entire west coast of the United States. During the fall they undertake a gradual westerly movement away from the coast bridging the gap (fig. 2) and ultimately appearing in the Japanese winter fishery.

This hypothesis is partly confirmed from tagging results.

In the future field studies will be largely in the areas which have shown commercial promise. Surveys will be continued to ascertain the migration routes into these areas and the oceanographic and biological parameters which govern these movements. Within the areas emphasis will be on the microdistribution and ecology of the albacore.

The Northeastern Pacific Albacore Survey (NEPAS), a concentrated survey of the waters off the northern California, Oregon, and Washington during the current summer marks the beginning of such studies. The John R. Manning has already begun a survey of the offshore waters and

of Japan and one was recovered in California coastal waters. The recoveries give considerable support to the contention that there is only one albacore population in the North Pacific. In particular, note the two recoveries from fish tagged in 1955. Although they were released within a few miles of each other, one was recaptured by a Japanese live-bait vessel about a thousand miles off Japan on June 24, 1956, and another was recovered off Baja California on August 1, 1956. The two recoveries were made about 5 weeks apart; the distance between the points of recovery is about 4,350 miles. These returns may not seem to be strictly in accord with our hypothesis of migration but their interpretation depends on an unknown factor--their movements in the interval between tagging and recovery.

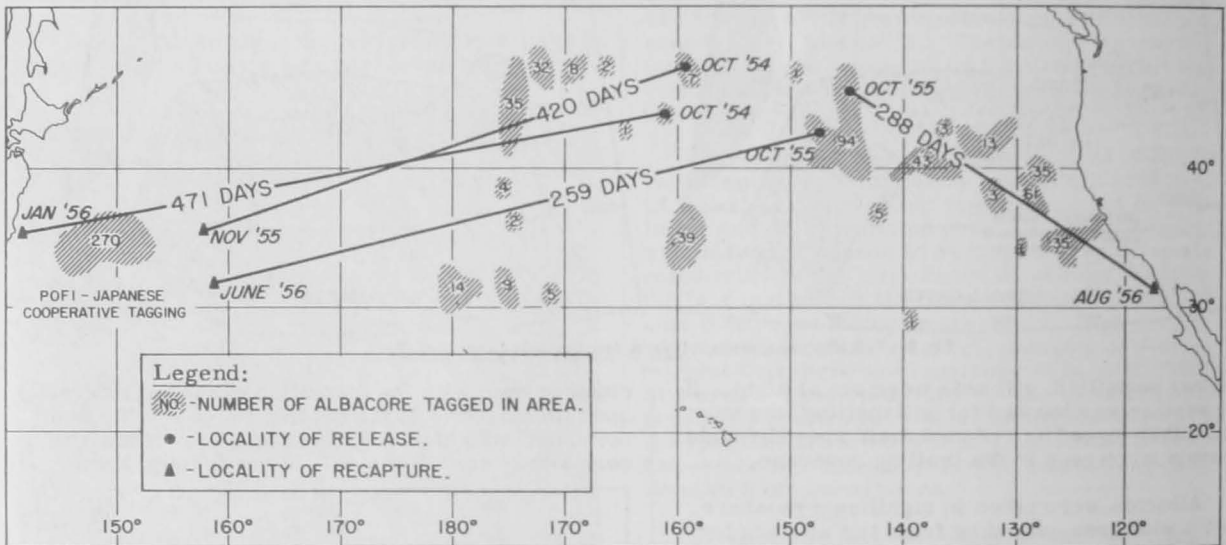


Fig. 4 - Albacore tagging.

was joined by the Hugh M. Smith on July 1, 1957. In addition nine commercial vessels were utilized in late July and early August to make a concentrated fishing survey of a band approximately 350 miles wide off the coast between Point Arguello, Calif., and Grays Harbor, Wash. During this phase of the survey the two research vessels will

In line with the policy of attempting to tag albacore over the entire North Pacific, POFI sent two biologists to Japan to conduct tagging and to instruct Japanese technicians in tagging methods. The Japanese showed great interest in this work, and with their help we were able to tag 270 albacore in the area indicated in figure 4. As a result of this motivation the Japanese have initiated a tagging program in their 1957 albacore live bait fishery with a goal of 1,500 releases. However, we have no data on the success of this program to date.

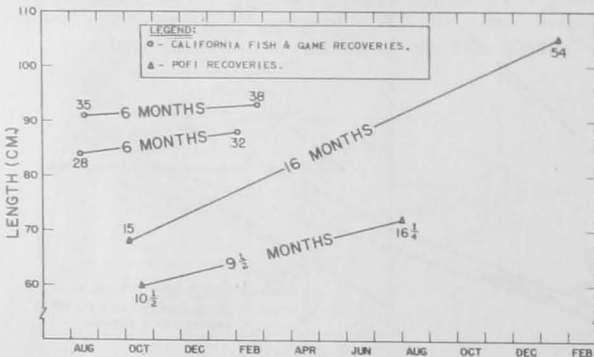


Fig. 5 - Albacore growth.

patrol the area collecting detailed oceanographic and biological data to attempt to determine the conditions which govern the occurrence and movement of the albacore.

Tagging: Four albacore tag recoveries have been reported, all of them rather long-term, the period of release ranging from 259 to 471 days. As shown in figure 4, all four fish were tagged in mid-ocean; three were recovered off the coast

Spawning and Maturity: Examination of all ovary samples collected in the north and equatorial Pacific has been completed. There is no evidence of albacore spawning in the temperate waters in which the Japanese coastal and American coastal fisheries are conducted or in the temperate waters north of Hawaii. In these three areas all the fish taken have been either sexually immature or, in the case of the larger winter-caught fish, there is no evidence of ovary development.

Good evidence has been found of albacore spawning in the subtropical Hawaiian waters and those to the south of the equator. In these areas the small, immature albacore so typical of the temperate waters have not been found.

From the above it is hypothesized that albacore are spawned in subtropical or tropical waters. During their second year of life they migrate to feeding grounds in temperate waters where they remain for two or more years. Following this

they return to the tropics to spawn. Thus an adequate understanding of the albacore fisheries may involve studies of the albacore population and its environment which encompasses the waters of the Pacific Ocean extending from 50° N. to well south of the equator.

Analysis of the landing records from the tuna cannery in American Samoa shows considerable albacore are now landed each month from the area ranging from the equator south to 28° S. latitude between longitudes 160° W. and 180°. These landings offer an opportunity to determine whether or not and at what season they spawn in this area and arrangements are being made to get a sampling program under way in Samoa.

Age and Growth: Albacore growth studies based on hard parts have forced us to conclude that it is not possible to age albacore from their scales or their bones for the following reasons:

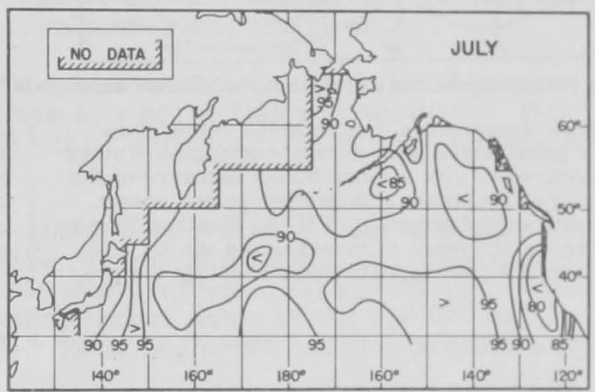
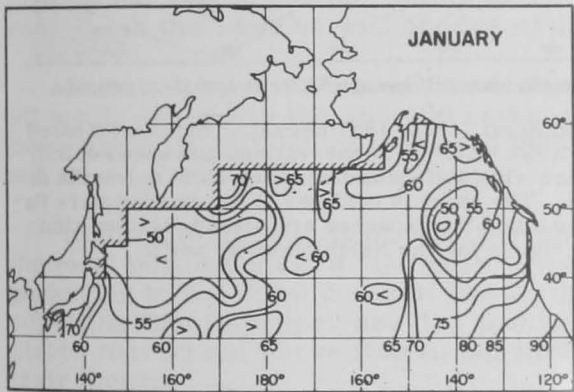


Fig. 6 - Frequency of fishing weather.

- (1) the rings found on the scales and bones cannot be counted with reasonable consistency;
- (2) the increments that are noted do not appear to give either a reasonable or a consistent pattern of growth;
- and finally, (3) the results are not consistent with growth as evidenced by tag returns.

The best estimate of albacore growth stems from the tag recoveries. Even this evidence is not as good as we would like, for there have been rather few recoveries and there is always the problem of obtaining reliable measurements at the time of tagging and recovery. The best results we have, shown in figure 5, suggest a moderately rapid growth rate. The annual rate of increment for the several fish ranges from 6 to 27 pounds with the average closer to the lower value. Checking this material against hard parts has shed no light on the interpretation of the rings on the vertebrae and scales.

Perhaps one should not expect to be able to age albacore from the hard parts. They are not subject to the same extremes of summer and winter conditions as most fish of the north temperate zone, for they migrate to areas where food is available and water temperature is suitable for growth. Thus, as they seem to spend their life under fairly uniform conditions, "winter" rings would not necessarily develop on their scales and vertebrae.

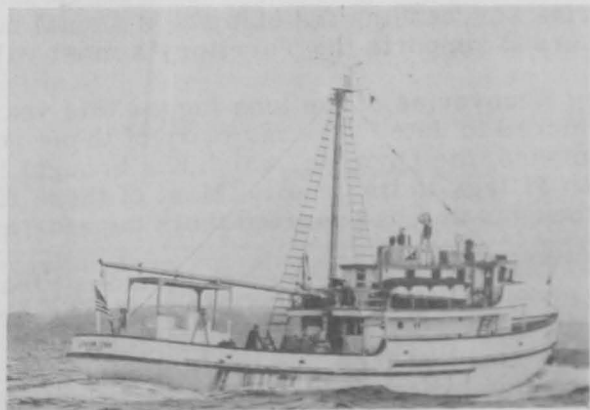
North Pacific Weather and Climate: Two studies of North Pacific weather and climate were

conducted as a part of the albacore program. They should be of general interest to fishermen and research workers in the North Pacific. The operational analysis of the winds was completed and a pilot study was made to determine the feasibility of preparing synoptic charts of the sea surface temperature from the data contained in ship's weather reports.

The wind analysis was prepared, with the operational requirements of a small research ship or fishing vessel in mind, from unpublished data obtained from the U. S. Weather Bureau. The aim was to show the expectation of suitable fishing weather in the North Pacific in all areas and months of the year. Sample contour charts for January and July showing the percentage of wind observations of 20 knots or less are illustrated in figure 6.

As an example of their use, it may be determined from the July chart that, in the area from

145° W. to 175° W. longitude, between 43° N. and 49° N. latitude, suitable fishing weather is present during 90 percent of the month, i. e., 9 out of every 10 days. The John R. Manning made excellent gill-net catches in this area during July and August 1956. Her records showed that 109 out of 121, or 90 percent, of the 6-hourly wind observations made on board were 20 knots or less and also that 23 out of 26, or 89 percent, of the nights were suitable for gillnetting, thus illustrating the reliability of the charts.



The Service's exploratory fishing vessel John N. Cobb.

The quasi-synoptic charts of sea surface temperature are the result of an attempt to utilize

synoptic weather data for mapping the seasonal and annual changes in oceanographic conditions.

ration of accurate and detailed charts such as the sample chart (fig. 7) for the Northeastern Pa-

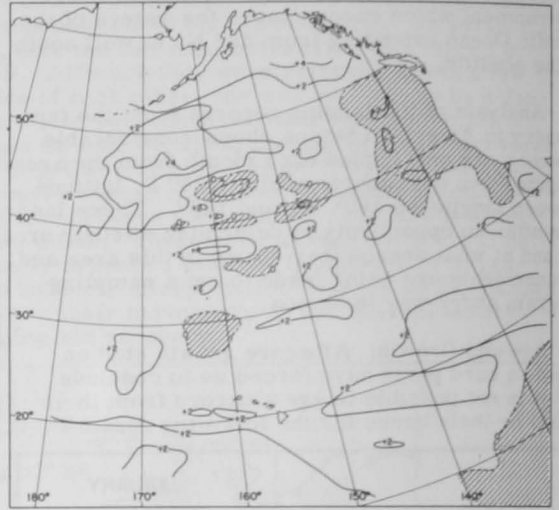
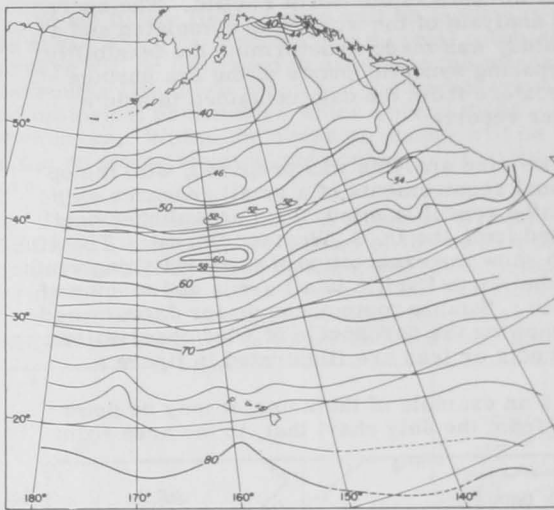


Fig. 7 - Quasi-synoptic chart of Northeastern Pacific surface temperature in °F. and deviations from normal in °F. for the April 11-20, 1957 period.

Surface temperature was selected rather than other parameters such as wind and pressure since it appeared to give a more direct measure of the net effect of climate and weather on the ocean. The intensified program of U. S. Weather Bureau during recent years to increase the quality and number of ships' reports made possible the prep-

cific April 11-20, 1957 period. This chart is based on 1,883 individual observations and shows up both ocean wide and local deviations from normal in detail. The chart is confined to the Northeastern Pacific since the Japanese are already issuing similar charts for the Northwestern Pacific.

* * * * *

DISCOVERY OF "SKIPJACK HOLE" AIDS LARGE-SCALE TUNA TAGGING IN HAWAIIAN WATERS: The discovery by U. S. Fish and Wildlife Service fishermen and scientists of a "skipjack hole" off the island of Lanai, where this tuna species can be found and fished practically all the time, has resulted in record numbers of releases and recaptures of tagged skipjack this summer, according to the Pacific Oceanic Fishery Investigations. Between July 3-13 the research vessel Charles H. Gilbert released 1,624 specimens of the small striped or skipjack tuna (known locally as aku) in a small area off Cape Kaea, Lanai, bringing to a total of 3,602 the number of skipjack tagged in Hawaiian waters this year. The fish are marked with a barb-pointed plastic tube inserted into the muscles of the back, a method developed at the Service's Honolulu Laboratory and being used for the first time this year. The Service biologists expect that recaptures of the tagged fish will clear up the mysteries surrounding the skipjack's annual summer migration into the Hawaii area, where it supports the Territory's most valuable commercial fishery.

Recoveries of the tuna tagged this year have been at a high rate, with 146 fish returned to date. The majority of these recaptures have been the work of two Maui sampans, the Olympic, which has brought in 67 tagged skipjack and the Amberjack, with 31 tags to its credit. Most of these fish had been at liberty only a short time, although some had carried their tags for more than two months.

Detailed studies are being made at the Lanai "skipjack hole" to find out what features of water temperature, salinity, plankton, or currents, and other conditions of the environment cause skipjack to congregate and remain more or less permanently resident there, in preference to other nearby spots, of apparently similar character, where they are rarely found. If the answer to this question can be discovered, it should be of value in determining the whys and wherefores of the pattern of skipjack occurrence in the open ocean. The site off Cape Kaea is thus a sort of

natural experimental laboratory, with the great advantage that the experimental animals, the skipjack, can pretty generally be relied upon to be there when the biologists want to work with them.



Public Eating Places Fish Utilization

When a customer--whether he be in the north, south, east, or west--wants shellfish, his first choice is shrimp in two out of three of the Nation's public eating places which serve fish or shellfish, according to a survey by the Bureau of Commercial Fisheries.

But if he wants fish, and he lives in the northeastern part of the country, his choice in public eating places will be tuna, flounder, haddock, and halibut in the order named. If he lives in the north-central area, his choice will be ocean perch, pike, haddock, and catfish; in the south it will be catfish, sea trout, flounder, and cod; and in the west he will choose halibut, salmon, tuna, and flounder.

The study also indicates that fish or shellfish is the main dish in 17 percent of all meals served in the 208,100 eating places that serve fish and shellfish. But there are still 190,000 of the total 398,000 public eating places which for some reason do not serve fish or shellfish.

Replies to questions on fish portions (uniform servings of fish) to determine the most popular size of fish serving may be the key to efficient and streamlined packaging to cut down costs of producing too many different size portions. Also, supplying fish in proper serving portions may induce some of the 190,000 eating places that do not serve fish to put this nutritious and profit-making protein food on their menus.

The purpose of the survey was to secure information which would help the fishing industry improve old markets and develop new ones. Such research is part of a broad program which the Bureau of Commercial Fisheries is conducting for the benefit of both the fishing industry and the consumer.

The survey was made by the Bureau of the Census of the Department of Commerce for the Bureau of Commercial Fisheries. A representative sample of more than 4,500 public eating places was covered in the study. The work was financed by funds made available by the Saltonstall-Kennedy Act of 1954 for the improvement of the domestic fishery.

Note: The findings of the survey have been published in the report *Fish and Shellfish Consumption in Public Eating and Drinking Places*, Special Scientific Report; Fisheries No. 218



Tuna

JOINT JAPANESE-AMERICAN CANNED TUNA ADVERTISING MEETING IN LOS ANGELES: Representatives of the Japanese tuna industry and the American tuna canning industry met in Los Angeles, Calif., on August 15 and 16 to discuss the possibility of a joint advertising campaign to promote the increased sale of canned tuna in this country. Attendance was by invitation only.

At the request of the domestic tuna canning industry, Donald L. McKernan, Director of the Bureau of Commercial Fisheries of the U. S. Fish and Wildlife Service, presided as chairman during the meetings. In addition to McKernan, the

Department of the Interior was represented by William Redmond of the Solicitor's Office, Harry Shooshan of the Technical Review Staff, and Donald Aska of the Bureau of Commercial Fisheries, all of Washington, D. C. The Japanese Consul at Los Angeles and S. Ross Hatton, a Bureau of Commercial Fisheries representative stationed at San Pedro, Calif., attended as observers. A representative of the Federal Trade Commission also was expected to meet with the group.

The following committee was selected by the domestic tuna canners: Charles R. Carry, Executive Director, California Fish Cannery Association, Terminal Island, Calif.; Ed. L. Morris, Director, Tuna Research Foundation, Terminal Island, Calif.; M. J. Gorby, California Marine Curing & Packing Company, Terminal Island, Calif.; Donald P. Loker, Star-Kist Foods, Inc., Terminal Island, Calif.; John McGowan, Columbia River Packers Assn., Astoria, Ore.; Arthur Mendonca, F. E. Booth Company, Inc., San Francisco, Calif.; and William Dugan, Van Camp Sea Foods Company, Terminal Island, Calif.

The Japanese tuna industry was represented by the following: Takechiyo Matsuda, President, International Tuna Association of Japan and a member of the Japanese House of Representatives; Tatsuro Kanbe, resident officer in New York of the International Tuna Association of Japan; Ichiro Miyake, Deputy-Director, National Frozen Food Export Marine Industry Assn., and also Executive-Director of the Japan Cold Storage Co.; Yoshihiro Adachi, Managing Director, National Frozen Food Export Marine Industry Assn.; Hiroto Aramaki, interpreter (resident officer in Los Angeles of the Taiyo Fisheries Co.); Tomohachi Ueda, Director, Japan Canned Tuna Export Marine Industry Association, and also President, Shimizu Foodstuff Co.; Takeo Baba, Managing Director, Japan Canned Tuna Export Marine Industry Association; and Fumio Kinoshita, resident officer in New York of the Japan Canned Tuna Distributing Co.



U. S. Fish Stick Production

APRIL-JUNE 1957: United States production of fish sticks during the second quarter of 1957 totaled 11.4 million pounds, according to the Bureau of Commercial Fisheries of the U. S. Fish and Wildlife Service. Compared with the second quarter of last year, this was an increase of 191,000 pounds or 2 percent.

Table 1 - U. S. Production of Fish Sticks, April-June 1957

Month	Cooked	Raw	Total
	(1,000 Lbs.)		
April	4,024	479	4,503
May	2,971	401	3,372
June	3,118	422	3,540
Total 2nd quarter 1957	10,113	1,302	11,415
Total 2nd quarter 1956	10,022	1,202	11,224
Total 1st 6 months 1957	23,294	2,807	26,101
Total 1st 6 months 1956	24,339	3,152	27,491

eries of the U. S. Fish and Wildlife Service. Compared with the second quarter of last year, this was an increase of 191,000 pounds or 2 percent.

Production in the Atlantic Coast States made up 84 percent of the total. Inland, Gulf, and Pacific Coast states accounted for the remaining 16 percent.

Of the total production in the second quarter, 10.1 million pounds, 89 percent, were cooked and 1.3 million pounds, or 11 percent, were raw fish sticks.

During the first 6 months of 1957, a total of 26.1 million pounds of fish sticks was produced. Compared with the same period of last year, this was a decline of 1.4 million pounds.

Table 2 - U. S. Production of Fish Sticks by Areas, April-June 1957-56

Area	April-June			
	1957		1956	
	Number of Firms	1,000 Lbs.	Number of Firms	1,000 Lbs.
Atlantic Coast States	25	9,557	27	9,080
Inland & Gulf States	5	948	6	1,242
Pacific Coast States	11	910	10	902
Total	41	11,415	43	11,224

The largest quantity of fish sticks produced during a single month of 1957 occurred during February with 5.3 million pounds. March followed with 5.1 million pounds.

Note: Also see Commercial Fisheries Review, May 1957 p. 40.



U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, MAY 1957: United States imports of edible fresh, frozen, and processed fish and shellfish in May 1957 were lower by 5.1 percent in quantity but 18.6 percent higher in value as compared with the previous

month. Compared with May 1956, the imports for this May were up 5.0 percent in quantity and 17.9 percent in value. Included in the imports this May were more of the higher-priced commodities like shrimp, spiny lobster, and scallops since imports for May 1957 averaged 34 cents a pound as compared with 31 cents a pound for the same month in 1956.

Item	Quantity			Value		
	May		Year	May		Year
	1957	1956	1956	1957	1956	1956
	(Million of Lbs.)			(Millions of \$)		
Imports:						
Fish & shellfish:						
Fresh, frozen & processed 1/.....	59.4	56.6	786.6	20.4	17.3	231.6
Exports:						
Fish & shellfish:						
Processed ^{1/} only (excluding fresh & frozen	5.5	4.7	82.8	1.0	0.9	19.2

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

May 1957 imports were up as compared with the same month last year because of increased imports of frozen fillet blocks, frozen wolffish fillets, shrimp, scallops, frozen spiny lobsters, and canned tuna. These increases were not offset by lower imports of canned sardines, canned salmon, canned crab meat, groundfish fillets, frozen tuna, and bonito.

Exports of processed edible fish and shellfish in May 1957 increased about 72.6 percent in quantity from the previous month and were also 15.9 percent above April 1956. The May 1957 value of these exports was up by 42.9 percent as compared with the previous month, and higher by 11.1 percent from the same month a year ago.

GROUND FISH FILLET IMPORTS, JULY 1957: During July 1957, imports of groundfish fillets and blocks amounted to 15.4 million pounds. Compared with the same month last year, this represented a decrease of 666,000 pounds or 4 percent.

The principal cause for this decline was a 2.5-million-pound drop in imports from Canada.

Icelandic exports to the United States increased 1.4 million pounds. Imports from Norway, Denmark, the Netherlands, West Germany, and Greenland, compared with July 1956, represented a net increase of 659,000 pounds. This gain, however, was not great enough to offset the over-all decline caused by the sharp drop in imports of Canadian fillets. There were no imports of groundfish fillets from Miquelon and St. Pierre during July 1957 although 162,000 pounds were reported during the same month of last year.

Imports of groundfish and ocean perch fillets and blocks into the United States during the first seven months of 1957 totaled 81.9 million pounds--a decrease of 700,000 pounds as compared with the corresponding period of 1956. Canada led all other countries exporting fillets to this country with 60.8 million pounds. Iceland followed with 14.2 million pounds. The remaining 6.9 million pounds was accounted for by Norway, Denmark, the United Kingdom, the Netherlands, France, West Germany, Greenland, and Miquelon and St. Pierre.

Note: See Chart 7 in this issue.

* * * * *

IMPORTS AND EXPORTS OF SELECTED FISHERY PRODUCTS, JANUARY-MAY 1956-57: A summary of imports and exports of fishery products during the first five months of 1957, prepared by the Bureau of Commercial Fisheries, shows substantial increases over the same period for 1956 for many items (see table).

Commodity	January-May		Percentage Increase (+) or Decrease (-)
	1957	1956	
	.. (1,000 Lbs.)..		.. (Percent)..
<u>Imports:</u>			
Tuna, fresh and frozen	55,751	58,900	- 5
Tuna, canned in oil	433	245	+ 77
Tuna, canned in brine	16,007	13,579	+ 18
Bonito, canned in oil	5,365	5,426	- 1
Salmon, fresh and frozen	2,725	1,566	+ 74
Salmon, canned	7,161	10,480	- 32
Sardines, canned in oil	7,838	8,182	- 4
Sardines, not canned in oil	596	276	+166
Shrimp	23,732	26,123	- 1
Lobsters, fresh and frozen	22,519	20,332	+ 11
Fillets, (including blocks) of groundfish and ocean perch	55,998	55,443	+ 1
Swordfish	5,910	6,607	- 11
 (Tons)		
Fish meal	39,971	51,167	- 22
<u>Exports:</u>			
Salmon, canned	1,199	662	+ 84
Mackerel, canned	10,497	not available	
Sardines, canned, not in oil	8,145	20,676	- 61
Fish oils, inedible	55,740	45,995	+ 21

* * * * *

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA PROVISIO: The quantity of tuna canned in brine which may be imported into the United States during the calendar year 1957 at the 12½-percent rate of duty is limited to 44,528,533 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem.

Imports under the quota from January 1-June 29, 1957, amounted to 17,764,752 pounds, according to data compiled by the Bureau of the Customs. This leaves a balance of 26,763,781 pounds of the quota which may be imported during the balance of 1957 at the $12\frac{1}{2}$ -percent rate of duty.



Virginia

FISHERMEN URGED TO WATCH FOR TAGGED FISH: Sports and commercial fishermen are urged to watch for bright red discs on the fish they catch this year in the Middle Atlantic States. The tags are being attached by the Virginia Fisheries Laboratory at Gloucester Point, Va.

Tags carry the following words: "Virginia Fisheries Lab., Gloucester Point, Va. Reward." On the reverse side is a serial number. Records at the Virginia Fisheries Laboratory show where and when each tag was attached.

Fishermen who catch a tagged fish should return the tag as soon as possible to the Laboratory at Gloucester Point, telling where and when the fish was caught. In return they will receive a 25¢ reward and information on where the fish was tagged, how far it had traveled, and how long its trip took.

Since April more than 1,000 croakers, spot, and flounders have been tagged, and about 50 of these tags have been returned by fishermen. Most of these fish did not travel far, but greater wanderings are expected as time goes on. One tagged croaker was found in a fish market in Pittsburg, Pa. and another in Roseboro, N.C., but both of these probably were caught in Chesapeake Bay.

The Laboratory also tagged numbers of striped bass (rockfish) last spring in cooperation with the U. S. Fish and Wildlife Service. The labels on these tags say "Fish & Wildlife Serv., Wash. D. C. \$1 Reward." There is also a serial number on the reverse side. About 1,400 striped bass were tagged in Virginia this year, and about 85 of these have been returned. The longest migration to date was from the York River to Rock Hall near Baltimore. The Fish and Wildlife Service tags also can be returned to the Gloucester Point Laboratory.

Tags have been attached to the fish by a stainless steel pin, or with a nylon filament. With the pin, a blank disc is used at the crimped end.



Wider Dissemination of Simple Fish Recipes Recommended by Marketing Survey

Frying is the most common way of cooking fish. About three out of four housewives prepare fish in this way, a West Coast fish marketing and consumption survey revealed. Yet a leading reason for not serving fish more often or not using it at all was the housewife's objection to the odors caused largely by the frying method.

Asked about reasons why they don't buy more fish, twice as many housewives complained about fish-cooking odors than about fish prices, according to this survey recently made by Oregon State College for the United States Fish and Wildlife Service with Saltonstall-Kennedy funds.



Industry groups, magazines, newspapers, and food editors, as well as others have put out numerous fish cookery recipes using broiling, baking, and poaching methods. The survey recommends the much wider distribution of good simple recipes using these methods rather than frying as a means of promoting fish consumption.

The survey also recommends that the budgets for advertising fresh and frozen fishery products be increased because it was found that the present budgets were well below one percent of sales--a low figure compared with other food industries. A stepped-up educational campaign directed toward better fish cookery would pay off well in terms of improved sales.



Wholesale Prices, July 1957

The July 1957 over-all edible fish and shellfish (fresh, frozen, and canned) wholesale price index (119.9 percent of the 1947-1949 average) was up 2.3 percent as compared with the previous month and also higher by 4.6 percent from July 1955.

From June to July, higher prices for fresh large drawn haddock (up 24.6 percent), Pacific Coast halibut (up 13.8 percent), and Great Lakes yellow pike (up 60.9 percent), more than offset lower prices for fresh-water round and drawn

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, July 1957 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices ^{1/} (\$)		Indexes (1947-49=100)			
			July 1957	June 1957	July 1957	June 1957	May 1957	July 1956
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					119.9	117.2	117.0	114.6
Fresh & Frozen Fishery Products:					133.3	128.5	128.2	125.9
Drawn, Dressed, or Whole Finfish:					122.5	111.2	107.9	122.5
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.09	.08	95.3	76.5	77.4	92.2
Halibut, West., 20/30 lbs., drsd., fresh or froz.	New York	lb.	.37	.33	114.5	100.6	89.0	122.2
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.63	.62	140.5	139.3	145.2	142.7
Whitefish, L., Superior, drawn, fresh	Chicago	lb.	.53	2/.63	130.2	154.9	166.1	119.0
Whitefish, L., Erie pound or gill net, rnd., fresh .	New York	lb.	.55	.88	111.2	176.9	161.8	131.4
Lake trout, domestic, No. 1, drawn, fresh . . .	Chicago	lb.	.61	.60	125.0	121.9	106.5	122.9
Yellow pike, L. Michigan & Huron, rnd., fresh .	New York	lb.	.70	.44	164.1	102.0	82.1	126.7
Processed Fresh (Fish & Shellfish):					141.7	140.6	143.2	128.6
Fillets, haddock, sml., skins on, 20-lb. tins . .	Boston	lb.	.30	.30	100.4	102.1	108.9	112.3
Shrimp, lge. (26-30 count), headless, fresh . .	New York	lb.	.95	.94	150.1	147.8	151.7	126.4
Oysters, shucked, standards	Norfolk	gal.	5.75	5.75	142.3	142.3	142.3	136.1
Processed, Frozen (Fish & Shellfish):					129.0	130.1	130.9	117.7
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.39	.40	102.1	103.4	103.4	102.1
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.27	.29	83.2	91.0	92.6	86.3
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.27	.28	108.8	112.8	114.8	109.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.97	.95	149.3	145.8	145.8	126.6
Canned Fishery Products:					100.8	101.2	101.2	98.7
Salmon, pink, No.1 tall (16 oz.), 48 cans/cs. . .	Seattle	cs.	22.65	22.65	120.0	120.0	120.0	120.0
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.20	11.20	80.8	80.8	80.8	76.4
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	9.00	9.00	105.0	105.0	105.0	87.5
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans cs.	New York	cs.	7.45	7.70	79.3	81.9	81.9	87.3

^{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.

whitefish (down 37.1 and 15.9 percent). Other changes in the fresh fish varieties entering the drawn, dressed, and whole finfish subgroup were slight. The July 1957 index for this subgroup increased by 10.2 percent over June this year. Compared with the same month a year ago, the July 1957 subgroup index was unchanged. Fresh halibut, salmon, and round Lake Erie whitefish were lower this July as compared with July 1956, but increases of 1.7 to 29.5 in the other four items balanced out these declines. Supplies of Lake Erie round whitefish improved this July as compared with the previous month and the same month a year ago, but yellow pike supplies were lower for the same periods.

Fresh processed fish and shellfish prices in July were higher by a fraction of 1 percent as compared with the previous month due to slight increases for small haddock fillets at Boston and fresh headless shrimp at New York. Compared with July 1956, prices for fresh processed fish and shellfish were higher by 9.6 percent this July. Lower fresh haddock fillet prices (down 10.6 percent) were more than offset by an increase of 18.8 percent in fresh shrimp prices and a 4.6 percent increase in oyster prices.

There were only slight changes (down 0.8 percent) in the wholesale prices for the frozen processed fish and shellfish

from June to July. Lower frozen fillet prices at Boston (down about 0.8-8.6 percent) were offset largely by continuing firm frozen shrimp prices which were up 2.4 percent. However, the subgroup index this July was higher by 9.6 percent than for the same month in 1956 due primarily to a 17.9-percent increase in frozen shrimp prices at Chicago.

Canned fishery products in July were down slightly (0.4 percent) from June due to a drop in the canners' price for Maine sardines. Catches of Maine sardines were good during July and price declines for the canned product forced some plants to curtail production. The subgroup index this July was higher by 2.1 percent as compared with the same month in 1956. Canned Maine sardines were lower by 9.2 percent this July as compared with July 1956 but higher canned tuna and California sardine prices more than compensated for this decline. As of the end of July prospects were good for an increased pack of Maine sardines, the canned salmon pack was running about 20 percent lower than a year ago this July, and the domestic canned tuna pack was lower, but still at a high level, with the market upset due to fluctuating raw tuna prices and heavy imports.



COLLEGE TRAINING COURSES FOR FOOD INDUSTRY PERSONNEL

Plans to expand the college training program for personnel development in the food industry were announced at a supplier-distributor meeting at Michigan State University early in May, according to a trade journal. Michigan State is the only University in the country which offers courses in food distribution in which students can earn a bachelor or master degree.

Six food-chain organizations originally contributed \$100,000 in 1950 to make possible the curriculum at Michigan State. Many food companies are providing scholarships of \$1,000 for the employees of the food industry. According to one of the firms which supplied scholarships, "All management is seriously concerned with constantly rising costs, but we have seen many good plans for reducing costs go astray because of the inadequate executives below the top level. We believe that many store managers and supervisors could get that necessary vision, experience, association, and education here and they do."

The article went on to say that one company was allocating scholarships from funds previously used for Christmas gifts to customers. A number of customers he said had requested that the company refrain from sending Christmas gifts. "We sent everyone on our list a letter extending Christmas greetings and stating that in place of a gift we were using the money for a scholarship which would benefit the industry in the entire country."

Another food executive stated that "the growth of the industry in the past 30 years and its increased competition demand that we bring into our company and train young executives capable of meeting the problems which go along with these factors. We need specialists who know automation, communication, marketing, and other fields. We need executives with broader interest who can become well-rounded general executives."

Certainly the fishing industry is not without its personnel problems and either individually or through their associations may wish to investigate the possibility of training some of their selected personnel in these food distribution courses.