

# TRENDS AND DEVELOPMENTS

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

Fishery-craft first documents were issued to 41 vessels of 5 net tons and over during October 1955, according to the U. S. Bureau of Customs. This was an increase of 3 vessels, compared with the number of fishing craft documented for the first time during the corresponding month of 1954.

U. S. Vessels Issued First Documents as Fishing Craft, October 1955 and Comparisons

Area	October		Jan. -Oct.		Total
	1955	1954	1955	1954	
	(Number)				
New England . . .	1	-	17	22	23
Middle Atlantic . .	1	-	12	14	15
Chesapeake . . . .	10	8	44	84	93
South Atlantic . .	11	13	61	110	119
Gulf . . . . .	15	10	92	293	313
Pacific . . . . .	3	4	110	104	117
Great Lakes . . . .	-	2	7	5	6
Alaska . . . . .	-	1	31	24	27
Hawaii . . . . .	-	-	3	1	1
Puerto Rico . . . .	-	-	-	-	2
Unknown . . . . .	-	-	-	1	1
Total . . . . .	41	38	377	658	717

Note: Vessels have been assigned to the various areas on the basis of registered home ports.

In October 1955, the Gulf area led all others with 15 newly-documented craft, followed by the South Atlantic area with 11, the Chesapeake area with 10, the Pacific area with 3, and the New England and Middle Atlantic areas with 1 each. The Great Lakes, Alaskan, Hawaiian, and Puerto Rican areas had none.

During January-October 1955, a total of 377 vessels were documented for the first

time as fishing craft, compared with 658 for the corresponding period a year earlier--a decrease of 43 percent.



## Alaska

**SECRETARY MCKAY RECOMMENDS AMENDMENTS TO LEGISLATION FOR GRADUAL ELIMINATION OF FISH TRAPS:** Secretary of the Interior Douglas McKay on January 3, 1956, recommended three amendments to proposed legislation for the gradual elimination of salmon traps in Alaskan waters which was given the Department's general endorsement late last year.

In a letter to the House Committee on Merchant Marine and Fisheries, Secretary McKay said that the people of Alaska had supported a ten-year period for elimination of the traps. In view of this, Secretary McKay said, he felt that this period should be set in the legislation rather than the five-year period proposed in H. R. 242.

The Secretary recommended that appropriate amendments be made so that fractions do not count in applying the percentage formula to determine the number of traps to be closed each year.

He also suggested that all existing traps count as a base whether they are in actual operation or have been voluntarily closed at the Department's request. The formula in the proposed legislation, he said, would work a hardship on those who have cooperated in the Department's conservation program by voluntarily closing their traps.



## American Samoa

**TUNA CANNERY EXTENDS CONTRACT WITH JAPANESE FISHING VESSELS:** The Saipan Maru, owned by a Japanese fishing company, has been operating as a floating cold-storage plant at American Samoa under a 6-months' contract with the United States firm operating the cannery on that Island. Recently the contract was renewed until November 1956, according to a translation made from Nippon Suisan Shimbum, a Japanese trade publication. The Saipan Maru (3,737 tons) was scheduled, however, to return to Japan temporarily, sailing from American Samoa about December 23, 1955. During its absence from Samoa its functions will be performed by the Chikuzen Maru (700 tons).

The number of fishing vessels to operate out of Samoa during 1956 will be 18, and the amount of fish to be taken by the United States firm will be 7,570 tons. Prices per ton to be paid the Japanese company by the United States firm will be: \$275 for albacore; for gilled yellowfin under 90 pounds \$180, from 90 to 130 pounds \$140, over 130 pounds \$100; for spearfish and miscellaneous species \$100.



## California

**PACIFIC HERRING FISHERY:** Man has been playing a part in California's Pacific herring (Clupea pallasii) drama for more than 80 years. As early as 1875 there was a well established gill-net fishery in San Francisco Bay. Continuous statistics on the State's fish landings have been available since 1916 and in that 40-year period there has been a small, moderately steady herring fishery averaging less than a million pounds per year. Gill nets, beach seines, and lamparas have made these catches. The fish are sold fresh, salted, pickled, frozen, etc., and have been used for human consumption, chicken feed, and bait, according to the December 1955, Outdoor California, published by California's Department of Fish and Game.

Over the years Tomales and San Francisco Bays have been the most consistent producers of herring but good catches are often made in Monterey Bay. In the Monterey area the fish are taken in the summer--not during the winter and spring spawning runs.

Superimposed on the small fishery described above have been three short-time booms which resulted in landings of eight million to over nine million pounds in each of the three peak years.

The first during World War I lasted four years. The bulk of the catches was canned or reduced to fish meal but the canned product was not appetizing and did not sell well. Reduction of whole fish was stopped by a law enacted in 1921 which made it necessary to obtain a reduction permit from the Fish and Game Commission. No permits to reduce California herring have been issued.

A second peak occurred in 1948. Again the fish were used for canning, but most of the product tended to break up in the can and the flavor was not such as to encourage repeat orders.

The third boom lasted three years, 1951-53. Part of the herring were canned for export and part went into canned pet food. Neither type of product sold well.

By way of contrast with the bulk of the canned herring, one very tasty product was developed, but it proved so expensive to prepare that the canner abandoned the process.

Since 1953 there has been pressure on the Commission to issue permits for the reduction of herring into fish meal, especially in the Tomales Bay area. Because of the failure of the sardine fishery, numerous sportsmen and some commercial fishermen are afraid that if the herring were thrown open to reduction this fishery would share the sardines' fate. They insist that the herring must be retained to serve as forage fish for salmon and other predacious species.

Based on studies made by California's marine biologists it was recommended that no reduction permits be issued unless the Legislature first gives the commission the power to limit the catch of herring by all methods.

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EFFECT OF TRINITY DAM ON SALMON AND STEELHEAD RUNS TO BE STUDIED: Detailed salmon and steelhead studies, to be conducted both by California's Department of Fish and Game and the U. S. Fish and Wildlife Service, will begin in 1956 to determine effects of Trinity Dam on their runs.

Groundbreaking ceremonies on the big dam, being built by the Bureau of Reclamation, were held in October 1955, but it will be several years before the stream used by the fish is blocked.

Many miles of spawning area above the site near Minerville, Trinity County, will be cut off by the dam.

Already written into the authorization legislation is a provision that no less than 150 cubic feet of water per second must be released into the river below the dam for fish life.

Operational studies at varying flows will be conducted by the California's Department and the Service to determine the best flows at various times of the year.

In addition to working closely with the Federal Government on the Trinity Project, the Department of Fish and Game is making recommendations concerning the proposed San Francisco Bay Barrier, Feather River Project, Coyote Dam on the Russian River, and many other lesser projects.

Public Law 732 (79th Congress) provides that on all water or power projects developed by Federal agencies, or over which there is Federal jurisdiction, state fish and game agencies must be consulted.

This includes privately-built power projects, which are licensed by the Federal Power Commission, according to Outdoor California (November 1955), a California Department of Fish and Game publication.

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**ALBACORE TUNA SEASONAL DISTRIBUTION EXPLORED IN EASTERN NORTH PACIFIC (Cruise 55-C-7):** In order to aid in exploring the distribution of albacore tuna in the eastern north Pacific Ocean during the season for this fishery and making biological and limited oceanographic observations which may possibly relate to the occurrence of this species, the Scripps Institution of Oceanography provided the M/V Paolina T., oceanographic equipment, and shoreside analysis of oceanographic data collected, the California Department of Fish and Game provided fishing gear and two biologists, and the South Pacific Fishery Investigations of the U. S. Fish and Wildlife Service provided plankton equipment and shoreside analysis of samples. The cruise (August 3-August 26, 1955) of the Paolina T. occurred simultaneously with NORPAC's oceanographic survey of the entire north Pacific Ocean and with the U. S. Fish and Wildlife Service Pacific Oceanic Fishery Investigations vessel John R. Manning's explorations for albacore tuna in an area to the north, northwest, and west of the Paolina T.

The following is a typical day's operation when running station lines. Forty baskets of long-line gear were set from 0600 to 0730 hours. While the gear soaked, 4 artificial lures were trolled 4 to 5 hours in the immediate vicinity of the long-line set and a standard 200-meter oblique plankton tow was made near the center buoy at 1100 hours. Retrieving of the long-line started at 1230 hours and on completion, usually 3 hours, the course was set for the next fishing station, approximately 96 miles away. En route to the next station, during daylight hours, 4 lines were trolled and a watch kept for signs of surface schools of fish and bird flocks. At night, usually commencing at 2100 hours, a plankton tow was made followed by one hour of fishing with a fine-meshed dipnet under a 750-watt light.

Bathythermograph casts, to 900 feet, were made at each end of a long-line set, while occupying a night-light station and at such intervals while under way as time permitted. The thermograph was operated continuously throughout the cruise.

At each fishing station three depths were fished. The surface was sampled by trolling artificial lures of various types. Two subsurface depths were fished by rigging 20 baskets of long line with five-fathom float lines and 20 baskets with 15-fathom float lines. Fresh-frozen sardines, 3 and 4 to the pound, were used as bait. Chemical sounding tubes were used to determine the fishing depth of each section of long line. In general, the gear was set slack with the vessel traveling at its slowest speed. In several instances, however, the gear was set taut in an attempt to place the hooks through the known shallow thermocline.

The plankton tows consisted of the standard oblique tow, a net with a one-meter opening and No. 30 bolting silk bag. In order to sample from a depth of 140 meters to the surface, 200 meters of cable was paid out.

The long lines, fishing below the surface, caught albacore at every station within the survey area except at stations 18 and 20 (see chart), located at lat. 28° 04' N.,



M/V Paolina T. Cruise (55-C-7), Aug. 3-26, 1955.

long.  $120^{\circ}40'$  W. and lat.  $28^{\circ}09'$  N., long.  $117^{\circ}22'$  W., respectively. The overall catch rate was 2.8 albacore per 100 hooks. These subsurface fish appeared to be concentrated, 9.5 albacore per 100 hooks, in a narrow band of water bounded by latitudes  $31^{\circ}$  and  $32^{\circ}$  N. and extending westward from the coast to  $122^{\circ}$  W. longitude (the western limits of the survey). To the north and south of this area the catch rate dropped to 3.22 fish per 100 hooks and less. There was no apparent pattern to the longitudinal or east-west distribution of subsurface albacore.

The surface distribution of albacore, as revealed by trolling and the occurrence of visual schools, presents a different picture from that of the subsurface distribution. Only one small area, near station 26 at lat.  $31^{\circ}00'$  N., long.  $117^{\circ}07'$  W., did a concentration of fish manifest itself. Over half of all the troll-caught albacore were taken here. Six of the seven schools of albacore sighted were also seen in this area. The seventh school was seen on the adjoining station (No. 28) to the north.

Statistical Data on <u>Paolina T</u> Cruise (55-C-7), August 3-26, 1955	
Long-line fishing stations - 15	Fish catch (Contd.):
Total baskets fished - 593	Long line:
Total hooks fished - 6,274	177 albacore
Average fishing depth--middle hook	1 broadbill
5-fathom floatline (17 observations) -	1 black striped marlin
70.8 faths.	1 opah
15-fathom floatline (14 observations) -	1 dolphin fish
76.8 faths.	141 blue sharks
Trolling time:	4 bonito sharks
On fishing stations - 55 hours 25 mins.	2 pelagic rays
Between stations - 60 " 30 "	Surface schools of albacore sighted: - 7
Total - 115 hours 55 mins.	General area: $29^{\circ}33'$ N., $117^{\circ}20'$ W. to
Fish catch:	$32^{\circ}28'$ N., $117^{\circ}49'$ W.
Trolling, on stations 8 albacore	
" , between stations 14 "	

The only apparent relationship between the long-line catch and the troll catch occurred in the area encompassed by stations 24, 26, and 28 between latitudes  $29^{\circ}30'$  N. to  $32^{\circ}30'$  N. along longitude  $117^{\circ}$  W. Within this group of three adjoining fishing stations the long-line catch dropped as the number of surface fish increased. However, it is well to note that this same relationship did not manifest itself on the four other occasions where surface fish were taken.

The length frequencies of the long line-caught albacore indicate that there were two principal groups with modes at 64 cm. (25 inches) and 81 cm. (31.9 inches). The bulk of the fish were grouped about the smallest mode which contained 16.6 percent of the total, while the largest mode had only 4.0 percent. The troll-caught fish were 40 percent one-size group with a mode at 64 cm. (25 inches). It appears from the above, plus other data from the long-line catches, that the larger fish were well below the surface while the smaller fish were dispersed vertically.

A fair portion of the long line-caught albacore were sufficiently strong on capture to warrant tagging. This suggests that the fish were caught as the line was being retrieved, either at the surface or at some other depth. The small percentage of troll-caught fish (surface) and the general absence of visual schools is a strong indication, however, that the long line-caught fish were taken at depths other than the surface layers.

All albacore in good condition were tagged with type G white spaghetti tags. Of the 93 released, 17 were caught by trolling and 76 by long lines. On 38 fish, the tag was attached in a new position, approximately  $\frac{1}{2}$  inch below the insertion of the second dorsal fin. On the other 55 fish, the tag was positioned in the customary place, below the posterior end of the second dorsal fin or under the first finlet.

Unfavorable weather conditions and mechanical difficulties on August 12 caused a major change in the original cruise plan. This involved abandoning the area due west of the commercial fishing grounds, a section of water bounded by latitudes  $30^{\circ}$  N. and  $34^{\circ}$  N. and longitudes  $124^{\circ}$  W. and  $134^{\circ}$  W. and exploring instead the southern portion of the fishing grounds, latitudes  $30^{\circ}$  N. south to lat.  $28^{\circ}$  N. and between long.  $121^{\circ}$  W. and  $116^{\circ}$  W.

On August 14, a few miles off Point Loma, San Diego, the only other surface schools of fish were seen. By their size and behavior these fish were tentatively identified as anchovies or small sardines. Several large groups of porpoise, 35 to 50 individuals per group, were actively preying on them. It was also in this area that the only large concentrations of birds (shearwaters) were seen; they were not feeding on the surfacing schools of fish.

Blackfooted albatross were found throughout the surveyed area, however, they were not very abundant. On only one or two occasions were five individuals seen together. Generally 1 or 2 birds were to be seen about the vessel and quite frequently none. Two least petrels, *Halocypterus microsoma*, were released with bands; one on August 13 at  $32^{\circ}11'$  N. lat.,  $119^{\circ}26'$  W. long., and one on August 16 at  $30^{\circ}45'$  N. lat.,  $118^{\circ}41'$  W. long. Petrels could be heard calling at almost every night-light station and while en route to the next station at night but during the day only an occasional bird was seen.

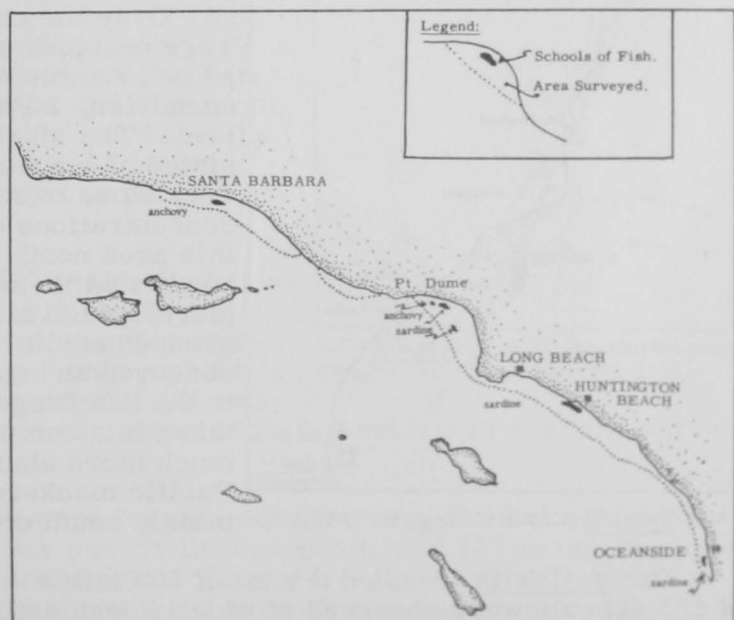
Sauries (*Cololabis saira*) were found at each night-light station; however, in general these fish were not very numerous. The sizes ranged from 12 mm. (0.47 in.) to 259 mm. (10.2 in.), with the principal mode at 33 mm. (1.3 inches). Fish 100 mm. (3.9 in.) and over were relatively scarce; they were collected at only two stations, observed on three or four others and never more than 3 or 4 individuals at a time. Several species of lanternfish were also taken quite frequently. Tunicates, primarily *Pyrosoma* sp., were fairly numerous throughout the area, not only under the light but also in the plankton tows.

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#### AIRPLANE AND VESSEL STUDY SAMPLING AND MEASUREMENT OF FISH SCHOOLS (Airplane-Spotting Flight 55-13):

In order to explore the possibilities and limitations of airplane-boat sampling and measurement of schools of fish, the California Department of Fish and Game conducted a series of tests with an airplane and the research vessel *Yellowfin* working together. It was found that the airplane and a small skiff working together and using two-way radio equipment could determine the length, width, depth, and species composition of the schools. Flights of the Department's *Beechcraft 4758 N.* took place four hours daily from November 15-16, 1955, over the inshore area from Santa Barbara to Oceanside.

Fish Behavior and Distribution: As during the same month in 1954, most of the adult sardine schools were "night" fish and



Beechcraft Flight 55-13, Nov. 15-16, 1955.

did not appear in large numbers during the daylight hours. Three small groups of sardines were sighted off Santa Monica, Huntington Beach, and Oceanside. The schools observed were small (less than 50 tons each) and were very wild. The large sardine schools off of Pt. Dume and Oceanside upon which the commercial fleet was operating at night were not visible. The migration distribution of the sardines was comparable to the November distribution of the previous season.

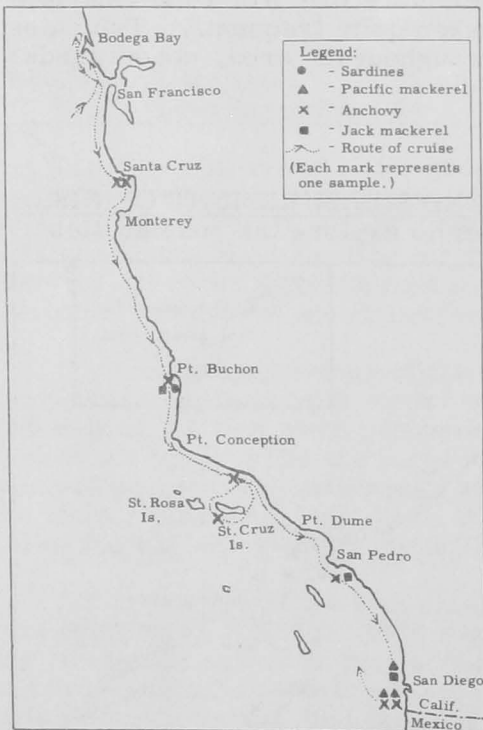
**Research:** The small school group of sardines off Huntington Beach presented an excellent opportunity for experimentation as these schools were very wild and represented the most difficult type of schools to measure and sample. A portable Bendix depth recorder was installed in the skiff so that the depth of the schools could be determined. Jig lines made up of bare silver single and treble hooks attached to monofilament line were used to obtain samples.

Attempts to cross over schools were not successful with the Yellowfin as the fish would shy away from the boat. The skiff was maneuverable and the aerial observer was able to direct the skiff over any of the schools. A sample of adult sardines was collected with jig lines while the skiff drifted over a school of fish. Estimation of the surface area of the schools could be determined by the aerial observer as the skiff passed over the school.

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**"YELLOWFIN" COMPLETES FINAL 1955 CRUISE TO ASSESS ABUNDANCE OF SARDINES, MACKEREL, AND ANCHOVY (Cruise 55-Y-9):**

The final 1955 cruise (November 3-22) covered the most northerly sector of the coast between Bodega Bay and San Diego. In addition to studies of the relative abundance of sardines, Pacific mackerel, jack mackerel, and anchovies, the California Department of Fish and Game's vessel Yellowfin resurveyed the area south of Point Conception and attempted to sample schools of fish close to where the commercial fleet was operating. During daylight hours (November 15-16) the Yellowfin worked in conjunction with a State-owned airplane in survey and sampling work.



M/V Yellowfin (Cruise 55-Y-9), Nov. 3-22, 1955.

Over the entire area worked, 69 light stations were occupied and sets with the blanket net yielded one sample of adult sardines, 8 of northern anchovies, 3 Pacific mackerel, and 3 jack mackerel. The single sardine sample obtained consisted of large fish (9.5-11 in. total length) taken very close to shore at Port San Luis (Avila). No concentrations of fish schools were seen around this area north of Pt. Conception and it seems likely that these sardines represented only "stragglers" which moved inshore from the spawning grounds earlier in the season. Anchovies were observed and sampled from Monterey Bay south to the San Diego area. Jack mackerel, though taken in a sample as far north as Avila, were much more abundant south of Point Conception. Pacific mackerel appeared to be concentrated mainly south of the Los Angeles area.

The Yellowfin traveled a total of 500 miles scouting for fish schools. A total of 135 schools were observed of which it was estimated that 37 were composed of sardines, 38 northern anchovies, 2 jack mackerel, 3 Pacific mackerel, 33 sauries, and 22 which were unidentified. The sampling activities south of Pt. Conception

were greatly hampered by adverse weather conditions. This was particularly true in the areas where the concentrations of sardines were judged to be the highest (Port Hueneme-Pt. Dume and Newport Beach to Oceanside). Surface temperatures, bathythermograph casts, and reversing-thermometer casts were taken at all possible stations. Surface temperatures ranged from a minimum of 10.4° C. (50.7° F.) at Half Moon Bay, to a maximum of 16.3° C. (61.3° F.) at Santa Barbara.

Experimental daytime work was conducted in the Newport Beach area using the State airplane, the Yellowfin, and a whale boat. This area contained numerous small schools of sardines and by means of radio communication the plane was able to direct the vessels over the schools. Preliminary attempts at sampling these fish proved successful, and although much experimental work must be done, we are hopeful that future survey work can be considerably expedited by an increased use of aerial observation.

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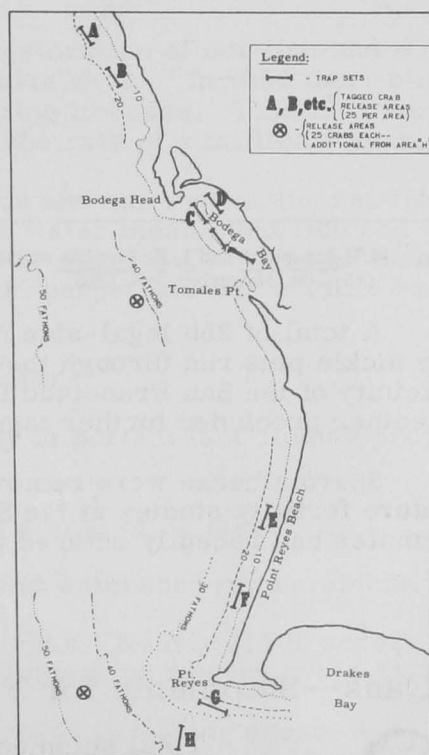
**MARKET CRAB ABUNDANCE UNDER STUDY: "Robert Croll" and "Donna"** (Cruise 55-C-8): The services of the two commercial fishing vessels Robert Croll and Donna were made available to California's Department of Fish and Game (1) to determine the abundance and condition of the market crab (Cancer magister), (2) to conduct escape-opening tests, (3) to tag 300 legal-size male crabs, and (4) to sample female crabs for fertility studies. The cruise (October 22-November 2, 1955) was conducted along the central California coast between the mouth of the Russian River and Point Reyes in depths of 5-36 fathoms.

A total of 60 traps were used to make 160 sets in crab fishing areas off Duncan's Landing, Bodega Head, and Pt. Reyes. A total of 138 of the 159 sets (one trap lost) were sampled at random.

A total of 2,367 market crabs were caught in the 138 sampled traps. Of these 1,580 (67 percent) were legal 7-inch males and 786 (33 percent) were sublegal size. Only 6 females were caught. The percentage of legal-size crabs per trap ranged from 52 percent at Outer Bodega Bay to 90 percent off Pt. Reyes. Three percent of the legal-size crabs and 20 percent of the sublegals were soft. Seven-inch crabs in the Outer Bodega Bay area ranged from 2-11 percent soft. In area "H" off Pt. Reyes only one percent of the legal-size crabs were soft.

Circular escape openings of 4 $\frac{1}{4}$ " inside diameter were on 64 traps. An average of 10.2 legal-size crabs per trap were caught with 4 $\frac{1}{4}$ " escape openings as compared to an average of 9.8 legal-size crabs per trap without escape openings. There was an average of 4.2 sublegal-size crabs per trap with escape openings as compared to 8.0 sublegal-size crabs per trap with no provision for escapement.

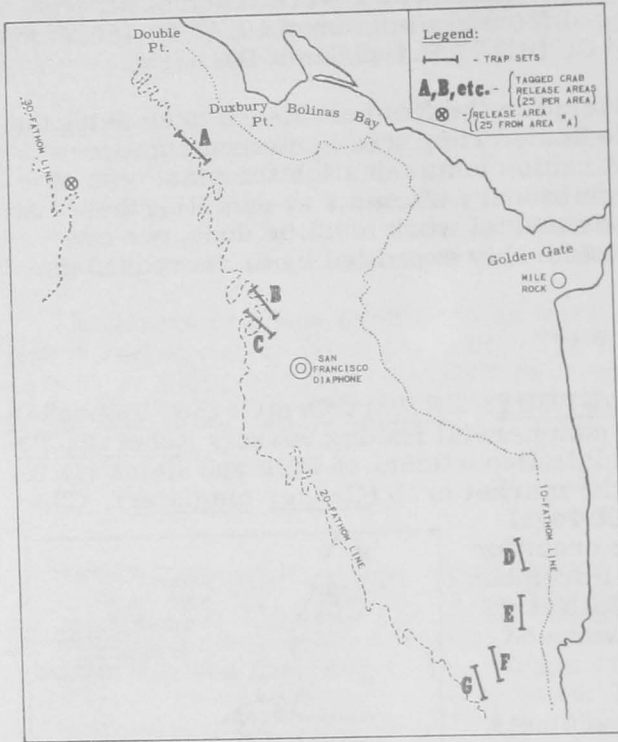
A total of 300 legal-size crabs were tagged--50 were tagged off the Russian River area, 125 in Outer Bodega Bay and off Bodega Head, and 125 in the Pt. Reyes area. Plastic Petersen disk tags were used. Tags were placed on the carapace near the outermost spine. A nickel pin was run through the carapace, holding one disk on top and another on the underside of the carapace.



M/V Robert Croll and Donna market crab Cruise (55-C-8), Oct.22-Nov.2, 1955.



"Josephine" and "J. F. Pomilia" (Cruise 55-C-9): Two other commercial fishing vessels donated their services to California's Department of Fish and Game to determine (1) the abundance and condition of the market crab (*Cancer magister*), (2) to tag 300 legal-sized male crabs, and (3) to sample female crabs for fertility. The area covered by the cruise of these vessels was extended along the coast of California from Double Point in the north to Point San Pedro in the south.



M/V Josephine and J. F. Pomilia market crab Cruise (55-C-9), November 3-9, 1955.

During the cruise (November 3-9, 1955), a total of 71 crab traps were used to make 142 sets; 73 sets were sampled at random. Sets were made off Double Point, San Francisco Lightship, and Pt. San Pedro in depths of 13 to 30 fathoms.

A total of 2,595 market crabs were caught in the 73 sampled traps. Of these, 2,077 (76 percent) were legal 7-inch males and 509 (24 percent) were sublegal. Only 9 females were caught. The percentage of legal-size crabs per trap ranged from 67 percent in the San Francisco Lightship area to 90 percent off Pt. San Pedro. Six percent of the legal-size crabs and 42 percent of the sublegals were soft. Seven-inch crabs ranged from 10 percent soft in the Double Point area to 2 percent in the Pt. San Pedro area.

A total of 250 legal-size male crabs were tagged with Petersen disks attached by nickle pins run through the carapaces--50 were tagged off Double Point; 50 in the vicinity of the San Francisco Lightship; and 150 in the Pt. San Pedro area. Rough weather precluded further tagging operations after November 9, 1955.

Spermathecae were removed from all females captured on all crab cruises for future fertility studies at the Stanford laboratory. It was noted that several of the females had recently entered the egg-bearing stage.



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



Total shipments of metal cans for fish and sea food during January-November 1955 amounted to 97,599 short tons of steel (based on the amount of steel consumed in the manufacture of cans), compared to 102,533 short tons for the same period last year.

The packs of canned tuna, Maine sardines, and salmon in 1955 were all lower than in 1954.

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



## Federal Aid Programs Help Restoration

On a thousand fronts, in every section of the country, fish and game specialists are fighting the fight to keep America's fish and wildlife resources apace with or ahead of the ever-increasing demand.

The huge conservation program which is being carried on aggressively by each of the 48 states and the Territories is bolstered by a Federal aid program which during the last fiscal year made nearly \$16 million available to the states, Acting Secretary of the Interior Clarence A. Davis announced December 16.

The money is used on state projects which have promise of fish and game restoration and are approved by the Fish and Wildlife Service. These projects may be of a physical nature--acquisition of land and waters, development of fishing lakes, feeding and breeding areas or sanctuaries; or they may be research efforts designed to increase the fish and game supply by solving the many problems for which the specialists have no answer.

The objective of the Federal aid program--the restoration of fish and wildlife--is further buttressed by vigorous, effective, and varied projects conducted with state funds, and by the farflung refuge, research, and hatchery program of the Fish and Wildlife Service.

"The need for this continuous, all-out effort at restoration of our fish and wildlife resources is substantiated by cold statistics," Davis said. "In 1954 there were 18.5 million persons in this country holding state fishing licenses. This is twice the number held ten years ago and it is increasing at the rate of a million a year.

"Add to this the fact that our increasing population and our increasing need for homes and for farm and industrial lands and for more water means that fish and game habitats are shrinking faster than new ones can be developed. Then an idea of just what kind of task lies ahead for those who would perpetuate our wildlife resources is apparent."

Some of the accomplishments in fish restoration were:

Forty-three states engaged in one or more vitally important fact-finding projects.

Thirteen states eliminated undesirable fish from a total of 36 lakes.

Six states had projects for stream development and watershed improvement.

Sixteen states purchased land for public fishing areas. Nearly 2,700 acres were purchased and an additional 56,000 acres were leased for fishery projects.

Seventeen states and Alaska constructed access roads to fishing areas.

Considerable knowledge was gained by research on poisoning of a lake or stream to rid waters of trash fish without unduly harming sport fish.

Studies were in progress on ways and means of making reservoirs more productive and better able to fill the need for more public fishing waters.

Marine fish and fishing came under the scrutiny of biologists in 12 of the coastal states. Studies varied from survival of ocean salmon in California to Atlantic salmon migration in Maine.



## Federal Purchases of Fishery Products

**FRESH AND FROZEN FISHERY PRODUCTS PURCHASES BY THE DEPARTMENT OF DEFENSE, OCTOBER 1955:** For the use of the U. S. Army, Navy, Marine Corps, and Air Force, the Army Quartermaster Corps during October 1955 purchased 2.0 million pounds (valued at \$0.9 million) of fresh and frozen fishery products. This was an increase of 11.0 percent in quantity and 6.1 percent in value as compared to September purchases. October 1955 purchases were higher by 0.9 percent in quantity and 1.8 percent in value, than purchases for October 1954.

QUANTITY				VALUE			
October		Jan. -Oct.		October		Jan. -Oct.	
1955	1954	1955	1954	1955	1954	1955	1954
. (Millions of Pounds) .				. (Millions of Dollars) .			
2.0	2.0	21.3	21.0	0.9	0.9	9.2	8.6

Purchases of fresh and frozen fish for the first ten months in 1955 totaled 21.3 million pounds (value \$9.2 million)--higher by 1.4 percent in quantity and 6.1 percent in value as compared with the first ten months of 1954.

Prices paid for these fishery products by the Department of Defense in October averaged 43.9 cents as compared with 45.9 cents in September 1955 and 43.5 cents in October 1954.



## Great Lakes Fishery Investigations

**"CISCO" RETURNS FROM SURVEY TRIP OF NORTHERN LAKE MICHIGAN (Cruise XI):** Weather conditions during the cruise (November 1-12) of the Great Lakes Fishery Investigations research vessel Cisco were extremely unfavorable. Rough seas were prevalent during practically the entire cruise so that some of the scheduled operations could not be completed. The cruise was the fourth in a series covering the same general areas of northern Lake Michigan.

Experimental nylon gill nets were set at 25, 50, 80, and 135 fathoms off Frankfort, Mich., and at 25 and 50 fathoms off Sturgeon Bay, Wis. Bloaters (Leucichthys hoyi) predominated in the 25- and 50-fathom sets on both sides of the lake. The catches at both depths were heavier on the east side of the lake. Leucichthys kiyi was the most abundant species in the 80-fathom sets, and was practically the only species in a very large catch at 135 fathoms. Most of the L. kiyi taken in the deeper set were of a small-medium size and were caught in the smaller mesh sizes (2 and 2½ inch, stretched measure). Many L. kiyi were spawning and ripe specimens were taken at all depths fished. Three of the scarce blackfin (L. nigripinnis) were caught in the sets off Frankfort and three alewives (Pomolobus pseudo-harengus) were taken off Sturgeon Bay.

Hydrographic transects were made across northern Lake Michigan from Frankfort to Sturgeon Bay and from Manitowoc, Wis., to Ludington, Mich. Three hydrographic stations were visited along each transect. Bathythermograph casts were made at 5-mile intervals and drift bottles were released at several points along the transects.

Thermal stratification is present in northern Lake Michigan only in the very deep water. Surface waters, which ranged in temperature from 4.6° C. (40.3° F.) to 10.7° C. (51.3° F.), were generally somewhat warmer on the east side of the lake than on the west side.

Night midwater trawling operations were carried out at 25 fathoms where the water was homothermous from top to bottom. Very little was caught. It appears that chubs do not become concentrated at midlevels except in connection with a sharp thermocline.



## Maine

**CANNED MAINE SARDINE, CONSUMER-ACCEPTANCE TESTS:** A nationwide program of consumer-acceptance tests covering the various packs of Maine sardines will be launched early in 1956, according to news releases from the Maine Sardine Industry. The Executive Secretary of the group said on December 24, 1955, that more than 4,200 families in 12 cities will be personally interviewed for what is considered to be an adequate cross-section of the country's population.

From the tests, the Maine Sardine Industry hopes to obtain valuable information on the consumer side of the sardine market which will assist the packers in planning for the future.

Families will be asked to state their preferences for the different packs after actually tasting and examining samples which will be opened for them by the interviewer.

Eight different processes will be tested, including conventional, baked, fried, mustard, tomato, raw pack, can-cooked, and Belgium cooker.



## Maryland

**1955/56 OYSTER SEASON GOOD:** With the advent of cooler weather in the fall of 1955, sales of oysters were brisk and prices on the Chesapeake were high for the season. A short supply in the more northern states and heavy losses that occurred in some parts of Virginia in the summer of 1955 greatly augmented the demand for local oysters. Large fleets of tongers were busily engaged in harvesting the 1955/56 crop and were making exceptionally high earnings in some areas where supplies are abundant. Favorable weather was a substantial factor in favoring good catches, states the December 1955 Maryland Tidewater News.

As a rule early September 1955 catches contained relatively few "fat" oysters. Oysters consume much stored food during spawning in summer. The organisms upon which they feed are less abundant in warm water and oysters also suffer from the ills to which they are prey. The result then is that oysters typically are in their poorest condition at the end of the summer. With the coming of fall weather the surface waters, which produce the tiny microscopic plants upon which oysters feed, become heavier as they cool off. These heavier surface waters then sink and displace the warmer bottom water with its summer-long accumulation of rich fertilizing ingredients that have resulted from decomposition of aquatic organisms. The enriched water, now brought to the surface where sunlight can stimulate plant growth, quickly produces an abundance of the tiny plants needed to make oysters fat and tasty. The heavy rains from the summer hurricanes, destructive, though they were in some areas, contributed further to the waters' richness. The result was that oysters fattened rapidly and towards the latter part of 1955 were in top condition in most areas. It is significant that fattening takes place earlier on up-river and up-bay bars where the water cools more rapidly and where the nutrients brought in by streamflow first reach oyster-producing waters.

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UNDERWATER BREATHING APPARATUS USEFUL TO BIOLOGISTS: The biologists at the Chesapeake Biological Laboratory at Solomons have made good use of a relatively new tool in aquatic research in recent months--a self-contained underwater breathing apparatus or SCUBA. This equipment, such as the "Aqualung," the "Northill," and the "Scott Hydropak," opens up new vistas for research on aquatic life. For example, it is one thing to study the life history of oysters, clams, and other bottom forms from samples brought to the surface; it is quite another thing to be able to study these forms undisturbed in their natural environment. The diurnal migrations of aquatic forms, their spawning behavior, and the efficiency of various types of nets and collecting gear in sampling the species that are present, all can be studied to very great advantage by a biologist equipped with SCUBA.

SCUBA has been used to observe the operation of a small experimental trawl used in collecting specimens of aquatic organisms, according to the November 1955 Maryland Tidewater News of the Maryland Department of Research and Education. There had been some doubt as to how well this trawl had been fishing, what the width of its path across the bottom was and how the floats kept the mouth of the net. A biologist wearing the Northill apparatus was towed behind the boat pulling the trawl in 15-20 feet of water during mid-September 1955. It was observed from close quarters that the trawl doors kept the net well extended and that the floats were sufficient to keep the headline up. The net ballooned out behind with the cod end floating off the bottom and the trawl doors slid along on their metal-clad lower edges. At higher speeds there was a tendency for the whole net to lift off the bottom but notes were made on the highest possible speed consistent with the net skimming on the sand. Fish were scarce, but many blue crabs were observed to swim ahead as the net disturbed them until they were finally engulfed.

The apparatus is also being used in the collection of toadfish used in a cooperative study to shed new light on the causes of diabetes. In a rotenone project, SCUBA was used to ascertain what proportion of the suffocated fish sank to the bottom. Divers from the Department of Research and Education and the Chesapeake Bay Institute swam along survey lines laid across the bottom of a cove collecting all fish which had sunk along these predetermined paths. This contributed greatly to the accuracy of the estimate of the fish population. Research on the soft-shell clam (manninose), Mya arenaria, will be greatly facilitated by the use of this equipment allowing a biologist to observe the clam areas underwater. In clamming areas in other states the tides uncover clam flats and experimental work and observations can be carried out at that time. Since the clam flats are almost always covered in tidewater, SCUBA may be the answer to work with soft-shell clams in their natural environment in Maryland.



### National Canned Salmon Week

A nationwide canned salmon publicity campaign--"National Canned Salmon Week"--will be featured again this year. The Pacific Coast Canned Salmon Brokers selected February 12-22, 1956, as the dates for this year's "Canned Salmon Week."

Trade publications, daily and weekly newspapers, radio, television, and other effective media will be used to publicize and popularize canned salmon. Some firms will join in with brand advertising.

Publicity will emphasize the economical nutritious food value of canned salmon as a concentrated, cooked, vitamin-rich protein food, "ready to eat right out of the can," or served in salads or hot dishes.

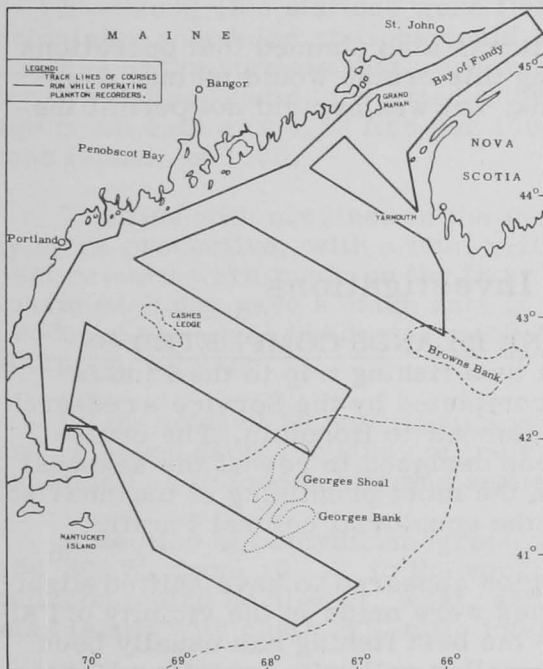
Special canned salmon menus for display on dining cars will be printed by the Great Northern Railway to observe the week, calling attention to salmon, the great natural resource of Alaska, Puget Sound, and Columbia River areas.

Union Pacific, Southern Pacific, Pennsylvania Railroad, the New York Central System, and the Wabash Railroad Company are still other rail-dining services which will feature canned salmon dishes during the special week and throughout Lent.

State restaurant associations will serve as important distribution mediums for material on canned salmon quantity recipes and "Silver from the Sea" menu clip-ons. Plans for such distribution were completed with restaurant associations of Tennessee, West Virginia, Iowa, Wisconsin, Arkansas, Kansas, Louisiana, Alabama, New York, and North Carolina.



## North Atlantic Herring Research



Young herring sought on Cruise 8 of the Service's research vessel Theodore N. Gill.

herring) as they are drawn through the water, collecting it on a moving strip of graduated silk gauze, and winding it onto a spool. These spools of gauze are returned to the laboratory for analysis.

The cruise was originally planned for the period of November 7 to 17, but due to time lost because of adverse weather, an additional trip from November 28 to December 3 was required in order to finish the outlined work.

Temperature records were made of the surface water with a recording thermograph and of the subsurface water with a bathythermograph.

**"THEODORE N. GILL" SEARCHES FOR YOUNG HERRING (Cruise 8):** In order to capture young herring or larvae and to obtain some measure of their abundance in the Gulf of Maine, a plankton survey of the Gulf of Maine, Georges Bank, and the Bay of Fundy was made in November and December 1955 by the Service's research vessel Theodore N. Gill (Cruise 8, November 7-17, 1955, and November 28-December 3, 1955).

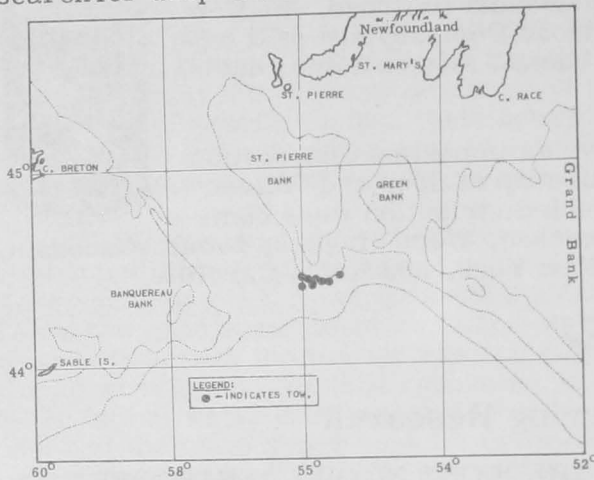
This work is being done in an effort designed to learn (1) where herring larvae are produced, (2) the degree of success of this year's spawning, (3) the degree of survival, (4) factors influencing survival, and (5) the patterns of drift of the larvae.

Plankton was collected with a one-meter silk net and with "Hardy" continuous plankton recorders. Two of these recorders were operated while running full speed (approximately 9 knots) along a predetermined course. One machine was towed at the water's surface and one at the 10-meter depth. These recorders strain out a sample of plankton (including young



## North Atlantic Fisheries Exploration and Gear Research

**DEEP-WATER OCEAN PERCH FISHED BY "DELAWARE" (Cruise 12B):** A search for deep-water ocean perch was the principal mission of this cruise (November 30-December 15, 1955) of the Service's exploratory fishing vessel Delaware. Operating south of St. Pierre Bank, the largest catch of the cruise consisted of 2,000 pounds of medium-size ocean perch taken at 225 fathoms.



Area explored by the Service's exploratory vessel Delaware for deep-water ocean perch (Cruise 12B).

water trawling at the western edge of Grand Bank, but weather did not permit the carrying out of this objective.

The vessel's explorations of fishery resources in deep water at the edge of the Continental Shelf were extended eastward by this cruise. However, storms permitted only eight one-hour drags with the otter-trawl gear. During one particularly violent storm, winds attained a velocity of 75 miles an hour, with gusts up to 100 miles an hour.

It was also planned that operations during this cruise would include deep-

## Pacific Oceanic Fishery Investigations

**YELLOWFIN TUNA FISHING TRIP OFF LINE ISLANDS COMPLETED BY "JOHN R. MANNING" (Cruise 27):** A five-week tuna fishing trip to the Line Islands, about 1,000 miles south of Hawaii, was completed by the Service's research vessel John R. Manning on October 29 when it returned to Honolulu. The cruise was part of a year-round program of observations designed to reveal the seasonal fluctuations in the abundance of yellowfin tuna in the most promising of the tuna fishing grounds discovered by Service scientists in the equatorial central Pacific.

The center of yellowfin abundance in the region appeared to have shifted slightly to the northward, and the best long-line catches were made in the vicinity of Palmyra Island instead of Christmas Island, where the best fishing has usually been found on previous cruises. Surface schools of smaller yellowfin (weighing 30 to 50 pounds each) accompanied by flocks of birds were very abundant around Washington Island, but the schools were wild and tended to disperse when the vessel approached, which made it difficult to fish them effectively by trolling.

A considerable number of small yellowfin were taken on the trolling lines, however, and most of them were successfully tagged and released alive. The tagging done on this cruise brings to a total of more than 900 the number of yellowfin tuna marked and released by POFI scientists in the Line Islands region. It is anticipated that recaptures of these tagged fish, either by Hawaii-based vessels in the central Pacific, by Japanese fishermen in the equatorial western Pacific, or by the California tuna fleet in the eastern Pacific, may reveal important information on the migrations and growth of this commercially-valuable species.

Frequent observations of surface and subsurface water temperatures were made during the cruise. A permanent temperature-recording device which had been installed off Christmas Island on another recent POFI cruise was serviced. The data

so obtained will be analyzed for evidence of shifts in currents and water masses that may be related to changes in the abundance of tuna on the equatorial fishing grounds.

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SEASONAL TUNA ABUNDANCE IN LINE ISLANDS STUDIED BY "JOHN R. MANNING" (Cruise 28): Long-lining and trolling for yellowfin tuna around the islands of Christmas, Fanning, Washington, and Palmyra in the Line Islands group (about 1,000 miles south of Hawaii) was the purpose of the one month's cruise by the Service's research vessel John R. Manning, which returned to Pearl Harbor on December 17. This experimental fishing was part of a year-round program to chart the seasonal and longer-term fluctuations in tuna abundance in an area pioneered as a tuna-fishing ground by U. S. Fish and Wildlife Service vessels. Although valuable data were collected and 40 yellowfin tuna were successfully tagged and released, the level of abundance encountered on this cruise was unusually low by comparison with past cruises. At the best long-line station, northwest of Christmas Island, the tuna catch rate was only 1.5 fish per 100 hooks, while the waters off Palmyra Island, where the best trolling was found, produced only slightly over 2 tuna per hour of fishing.

Five long-line stations were fished, 3 of 60 and 2 of 99, 11-hook baskets. The remaining scheduled stations could not be fished because of line-hauler breakdowns. Catches at the stations that were made, from south of Christmas Island to the vicinity of Fanning Island, indicated a low level of abundance of yellowfin tuna. The average catch rate was 0.53 fish per 100 hooks, with a maximum, northwest of Christmas Island, of 1.55.

Trolling with six lines in the immediate vicinity of the islands was only slightly more productive, with a total yellowfin catch of 64 for 108 hours of fishing. The best catches were made on the first 2 days off Palmyra, when the taking of 18 yellowfin each day gave a catch rate of slightly more than 2 fish per hour. Trolling produced the usual incidental catches of wahoo, the day's record being 53 taken at Washington Island.

Of the total of 80 un mutilated yellowfin taken by both methods, 40 were tagged and released alive for study of their growth and migrations. The remaining 40 were examined as to food habits and sexual maturity.

A section of bathythermograph casts at frequent intervals was made down 156°30' W. from 10° N. to the equator. A series of three 10-mile BT. sections was completed northwest, west, and southwest out of the London anchorage at Christmas Island with casts at 1-mile intervals.

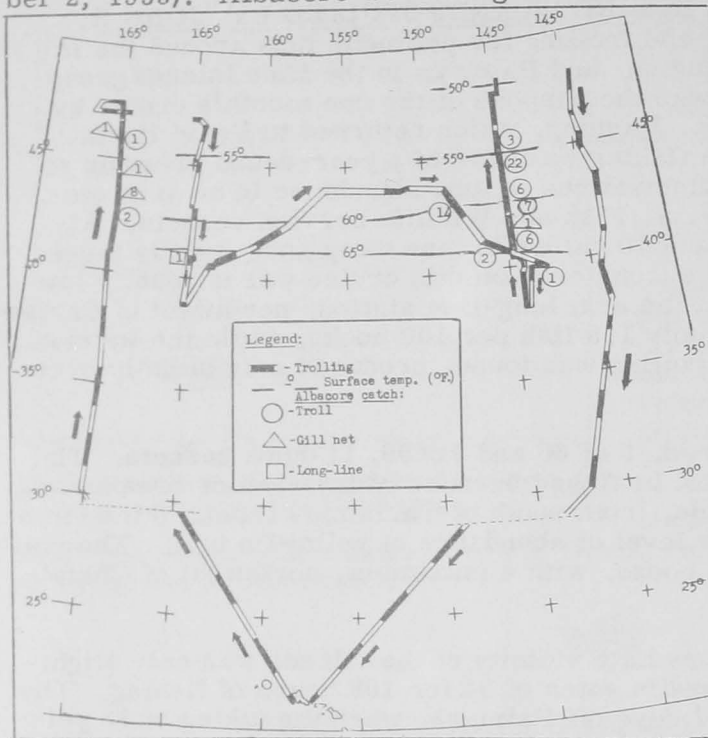
Fishing was attempted on a commercial scale by setting 100 baskets of tuna long-line gear out of a revolving tub in which the main line is flaked down continuously instead of being disassembled into 11-hook units as it is hauled. Despite minor defects, the tub proved highly successful on the haul and lightened the fishermen's labor considerably. The 1,003-1,042 hooks fished on two stations compares well with the average of 1,500 fished by Japanese long-liners employing 3 times as many fishermen as the John R. Manning.

Five night-light stations were made at various anchorages and in the open sea; records were made of sightings of tuna schools and other biological phenomena; stomachs of the 4 skipjack captured were preserved; records of meteorological and hydrological observations by resident observers were picked up at Christmas and Palmyra Islands.

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**ALBACORE TUNA SURVEY IN NORTH PACIFIC BY "CHARLES H. GILBERT"**  
(Cruise 23): An intensive seven-week survey of the albacore tuna in the North Pacific between Hawaii and Alaska was conducted by the Pacific Oceanic Fishery Investigations research vessel Charles H. Gilbert (Cruise 23, September 15-November 2, 1955). Albacore were caught over a broad area approximately 1,200 miles



Fall albacore tuna survey in North Pacific between Hawaii and Alaska by the research vessel Charles H. Gilbert (Cruise 23). For clarity the northbound leg on 165° W. and southbound leg on 145° W. have been displaced.

in good condition, 52 were tagged and released for study of their migrations and growth. Recent recaptures in the western and central North Pacific of albacore tagged off the California coast have already given evidence of the great range of the migrations of this species, and recoveries of the fish released by research vessels north of Hawaii would help greatly to clarify the course and seasonal schedule of these Pacific-wide wanderings.

This cruise was one of a series planned to continue through several years. The objectives of these cruises are to study the life history of the albacore in relation to the currents and water masses of the North Pacific and to determine whether or not a profitable commercial fishery for this tuna can be established in the waters north of Hawaii. This study is one of several financed under provisions of the Saltonstall-Kennedy Act.

Trolling with 3 to 8 lines took a total of 64 albacore (fig. 1). Thirteen of the 37 additional strikes were identified as albacore. The best troll catch was made on October 17 on a trolling run between 43° 52' N., 144° 48' W. and 44° 56' N., 144° 49' W. when 22 albacore were landed. Except once, no surface signs of fish were seen, e.g., logs, "working" birds, or fish breaking water. The troll-caught albacore ranged in size from 6 to 28 pounds and averaged 12 pounds.

On 165° W. longitude albacore were taken between 42° 30' N. and 46° 00' N. latitude with surface temperatures ranging from 56° to 60° F. Along 145° W. longitude albacore were taken in a wider latitudinal band extending from 40° 00' N. to

north of the Hawaiian Islands. These catches indicate that there has been a migration of the commercially-valuable white-meat tuna into this area since a similar survey in the spring, which showed an almost complete absence of the species.

Albacore abundance was sampled using long lines, gill nets, and trolling lines, and all of these methods caught tuna. The long lines, fishing deep during the daytime, took the largest fish, weighing about 60 pounds each. Albacore taken in the gill nets, which were fished just below the surface and at night, were the smallest, averaging around 7 pounds each. Trolling took medium-size albacore averaging 12 pounds each, and this was the fishing method employed most, as bad weather during part of the cruise made long-lining and gill-netting difficult. Only one albacore school was observed (45° N., 145° W.).

Of the albacore brought aboard

46°00' N. latitude with the surface temperatures ranging from 53° to 66° F. In addition to the albacore, 5 skipjack and 3 dolphin were taken on the trolling lines.

A total of 8 long-line stations was occupied. At each station 40 baskets of 13-hook gear were fished. Only one albacore weighing 58 pounds was taken on the long-line gear at 41°04' N., 164°29' W. The remaining catch on the long-line gear consisted of 5 big-eyed tuna, 18 *Alepisaurus* sp., 54 great blue shark, 1 mako shark, 8 dolphin, and 1 skipjack.

Gill nets were set on five occasions during the cruise. At each station six shackles (two each of 5-inch, 6-inch, and 7-inch stretched mesh gear) were set at dusk and retrieved at daybreak. Each shackle was 50 fathoms long and 100 meshes deep. A total of 11 albacore ranging in size from 6 to 21 pounds was taken by the gill nets. The highest single catch of 8 albacore was made at 43°22' N., 164°40' W. The rest of the catch by the gill nets consisted of 23 great blue sharks, 2 pomfrets, 1 cuttlefish, and 1 fur seal.

The recording thermograph was run continuously throughout the cruise. Along 165° W. longitude the most drastic change in surface temperature occurred at 42° N. latitude where a drop of 4° F. (65° to 61° F.) was recorded in 10 nautical miles. Along 145° W. the major temperature change occurred at 47° N. latitude where the surface temperature dropped 2° F. (53° to 51° F.) in less than 1 nautical mile.

The vertical temperature picture (as obtained with the bathythermograph) showed a very sharp thermocline at approximately 100 feet throughout the northern sections.

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#### SKIPJACK TUNA-SCOUTING TRIP COMPLETED BY "CHARLES H. GILBERT"

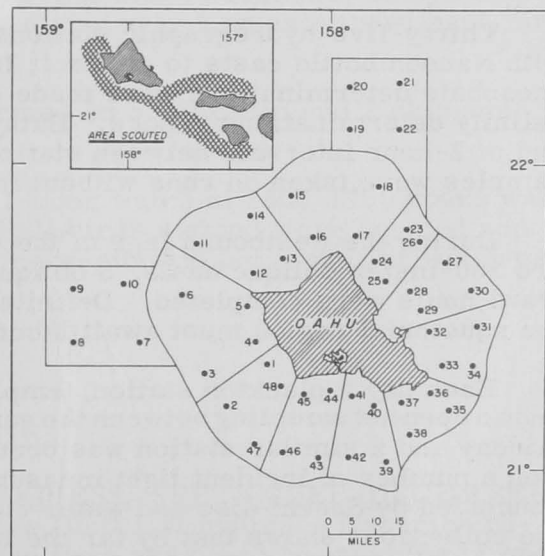
(Cruise 24): Two days were spent scouting for skipjack tuna by the Service's research vessel Charles H. Gilbert (Cruise 24, Nov. 14-30, 1955) in each of the following areas with negative results: (1) west and north of Oahu, (2) between Oahu and Lanai, and (3) north of Molokai.

A total of 48 stations were occupied as shown on the chart. Plankton collections, with the one-meter net, were made to a depth of 200 meters (656 feet) at even-numbered stations and to just above the thermocline, which was between 200-300 feet at most stations, at odd-numbered stations.

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#### FERTILITY OF EASTERN TROPICAL PACIFIC STUDIED BY "HUGH M. SMITH"

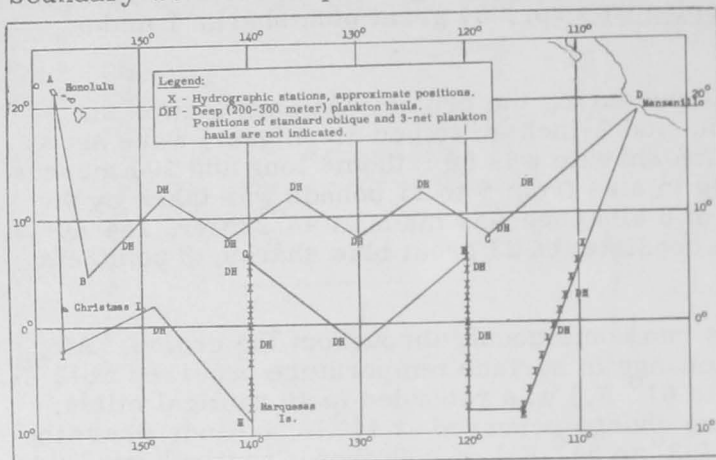
(Cruise 31): The study of the productivity or fertility of a vast area of the eastern tropical Pacific (Hawaii to Mexico) through observations of the ocean currents, the distribution of oxygen and nutrient chemicals in waters, the amount of plankton and other fish food, and the abundance of tuna schools was the object of the 86-day cruise of the Service's research vessel Hugh M. Smith, which returned to Honolulu on December 17, 1955. The cruise included a bait fish survey in the Marquesas Islands, and a brief stop in the Line Islands. The observations covered an area of the ocean larger than the continental United States. This cruise was part of a series



Charles H. Gilbert Cruise 24 (Nov. 14-Nov. 30, 1955).

being conducted jointly by the U. S. Fish and Wildlife Service, Japan, Canada, and private scientific institutions to study the physical oceanography, biological conditions, and other scientific phenomena over wide areas of the Pacific Ocean.

Eight crossings (see chart) of the northern boundary of the counter-current boundary were accomplished on the eastbound leg with bathythermograph lowerings at 2-hour intervals. Contrary to expectation the location of the current boundary did not show much



Cruise 31, Hugh M. Smith, September 27-December 17, 1955.

along the northern boundary of the countercurrent a total of 42 closing-net hauls sampling at 3 levels, 42 standard 200-meter oblique hauls, 8 oblique hauls between 200 and 300 meters, and 21 pelagic trawl hauls were completed during this period of the cruise. Zooplankton volumes were found to increase from west to east as far as 123° W. longitude and then drop off. The trawl catches did not vary greatly with longitude.

Thirty-five hydrographic stations were completed during the westbound legs with Nansen bottle casts to either 1,200 or 1,000 meters. Oxygen and inorganic phosphate determinations were made at sea, and water samples were retained for salinity determinations ashore. Bathythermograph lowerings were made on station and at 2-hour intervals between stations. In addition surface phosphate and salinity samples were taken on runs without full hydrographic stations.

During the westbound legs of the cruise a total of 72 closing-net hauls, 80 standard 200-meter oblique hauls, 8 oblique hauls at 200-300 meters, and 33 pelagic trawl hauls were completed. Definite conclusions on the variations in abundance in the equatorial region must await laboratory analysis of the collections.

Each day a plankton station, employing closing-nets sampling at three levels and an open-net sampling between the surface and 200 meters, was occupied just before midday and a similar station was occupied just before midnight. On each day-station a number of incident light measurements were recorded and each station was concluded by Secchi disc and water color observations. Superficial examination of the collections shows that by far the largest volume of plankton was taken near the surface and that it differed in composition from that of lower levels. It was evident that about  $1\frac{1}{2}$  to 2 times as much plankton was taken in the night as in the day hauls.

The 746 bathythermograph casts made during the cruise were well distributed across the area of study. As was expected, on the eastbound leg of the cruise along the northern boundary of the countercurrent, the depth to 70° decreased from west to east, from 130 feet at 156° W. to 90 feet at 122° W. and then deepened to 130 feet at 115° W. On the westbound portion of the cruise doming in the isotherms did not always occur on the equator--sometimes it was slightly to the north, sometimes to the south. On two sections the temperature characteristics at the equator suggested an easterly flow. Surface temperature along the equator increased from 69° at 112° W. to 76° at 157° W.

The wheel watch maintained a lookout for tuna schools and bird flocks during all daylight hours that the vessel was under way. A total of 45 schools were sighted, most of which were thought to be skipjack. The insular influence, with its greater bird life and possibly greater fish life, was clearly evident. The number of schools sighted on the eastbound leg between  $140^{\circ}$  and  $120^{\circ}$  W. longitude was definitely higher than the average for the open ocean. Surface trolling during daylight hours yielded poor results; the total catch for the cruise consisted of 13 dolphin, 5 wahoo, 2 skipjack, and 2 black skipjack.

Six days were spent in the Marquesas scouting for bait or in running between islands with a lookout for tuna schools and with the surface trolling lines out. Only 4 schools of tuna (2 skipjack and 2 unidentified) were sighted close to the islands.

A small sardine, *Harengula vittata*, occurs in the bays of the islands, apparently at times in marked abundance, but during the time of our survey it was scarce. With considerable effort we obtained about 130 buckets of these fish which we hoped to bring back for stocking in Hawaiian waters. The majority were lost at sea, however, during rough weather. About 20 buckets of the sardines survived the cruise and were released close-in to the leeward coast of Oahu.

At the beginning of the cruise some excellent records of the evening rise in the scattering layer were obtained with the EDO depth sounder.

With equipment provided by the University of Hawaii, the rate of carbon-14 uptake and plant pigment determinations were made either once or twice daily through the westbound portion of the cruise. The samples were filtered at sea and the millipore filters returned to the laboratory for analysis.

A prominent front with  $4^{\circ}$  F. temperature change was found at  $4^{\circ}08'N.$  -  $120^{\circ}32'W.$  About 15 hours were spent in the frontal area during which we made 29 bathythermograph casts, 7 surface plankton hauls with a 1-meter net, 1 pelagic trawl haul, and 2 night-light stations.

Morphometric measurements were performed on 5 yellowfin and 2 skipjack caught by surface trolling.

In addition to the regular wheel watch, a 1-hour watch at 1600-1700 hours was maintained each day throughout the cruise and all birds sighted were counted and identified as accurately as was possible. On the westbound leg a similar watch was carried out each morning at 0600-0700 hours.



## South Carolina

FISHERIES BIOLOGICAL RESEARCH PROGRESS, SEPTEMBER-DECEMBER 1955: Finfish Research: The work of the Bears Bluff Laboratories fisheries research vessel gave additional information on the time and place of spawning of spot and croaker. Hitherto, during the shrimp survey (begun in December 1952) one croaker was found in spawning condition inshore in St. Helena Sound. A few were noted last winter in 5 and 6 fathoms of water about 3 and 4 miles offshore of Edisto Beach. During November and December 1955, croaker and spot in fair numbers were located some 40 to 45 miles southeast of North Edisto Inlet in 250 feet of water. Practically all these fish were in spawning condition, according to Progress Report No. 26 from Bears Bluff Laboratories at Wadmalaw Island, S. C.

Shrimp Research: In November and December the research vessel made a total of 55 experimental drags, most of which were made at night. Rock shrimp,

*Sicyonia brevirostris* (30 count, heads off), were taken in abundance in from 27 to 47 fathoms of water. A few large (maximum 8 inches) brown shrimp, *Penaeus aztecus*, were found in 35 to 40 fathoms. The females had attached spermatophores. The lone male had well developed spermatophores. No white shrimp were found outside the commercial fishing area. The brown shrimp were not numerous enough to be fished commercially.

**Salt-Water Ponds:** On November 28 and on November 29, two of the one-acre experimental ponds at Bears Bluff were drained and the fish, shrimp, and crabs harvested. These ponds had previously been drained and cleaned out on August 15, 1955. From August 23 to the end of the month, both ponds were restocked with small white shrimp, *P. setiferus*. In addition, one of the ponds--the oyster pond--was stocked with about 450 mullet, a few spot, and croaker.

November 1955 Shrimp Harvest of Ponds Stocked Latter Part of August 1955		
Item	Fish Pond	Oyster Pond
Number stocked . . . . .	1,735	1,747
Weight of stocked shrimp . . . . .	198.2 oz.	209.6 oz.
Number harvested . . . . .	739	1/757
Weight of harvested shrimp . . . . .	568.0 oz.	538.1 oz.
Mortality . . . . .	57.4 percent	56.7 percent
Size increase, length . . . . .	2 times	2 times
Weight increase, mass . . . . .	2.86 times	2.57 times
Weight increase, individual . . . . .	6.72 times	5.93 times

1/ It is possible that of these shrimp 12 were recruits. Counting these the mortality could have increased to 57.0 percent.

Some of the mortality can be attributed to 3 or 4 Hooded Mergansers which continually lived in the ponds from the latter part of October, and to an otter which fished the ponds regularly.

In one of the ponds 10 white shrimp were tagged with Petersen disk tags; were held in cages in the pond until recovery from tagging was insured, and then released. Only one tagged specimen was recovered.

The 446 mullet stocked in the oyster pond weighed a total of 40 pounds. They were from 3 to 7.5 inches in length when stocked. The dominant size was around 4 inches. A total of 216 were recovered on draining the pond on November 28. These weighed 62 lbs. 3.5 oz. Mortality apparently was 52 percent; the increase in length from 1.6 to 2 times the original size. The total actual weight of all mullet recovered was, despite the mortality, 1.55 times that of those stocked. The individual weight increase of the mullet was 3.2 times in the three months period.



## United States and Alaska Fisheries Production, 1955

The United States and Alaska 1955 catch of fish and shellfish was estimated about 4.6 billion pounds, a drop of 2 percent from the 4.7 billion pounds caught in 1954. (Catch statistics for fish and crustaceans are based on the weight as caught, while mollusks are reported as the weight of the meats.) The ex-vessel value of the 1955 catch was estimated at about 10 percent less than the \$360 million for 1954. The drop in ex-vessel value was due primarily to the sharp declines in the catches of high-priced species, especially salmon, tuna and halibut. The loss in volume (but not the value) of these varieties was compensated to a great extent by increases in the catches of lower-priced varieties such as whiting, Alaska herring, and a record catch of menhaden.

Menhaden accounted for almost 40 percent of total United States and Alaska catch, which includes nearly 200 items. Menhaden are used for reduction into fish

meal and oil. The meal is used in various animal foods and most of the oil is exported to Europe.

The pack of canned salmon in 1955 was 3,225,000 cases (the lowest pack since 1906), more than 900,000 cases below the 4,162,000 cases packed in 1954 and only a little over one-third of the record 8,955,000 cases packed in 1936.

The year saw a record production of fish meal and a good production of fish oils. Production of fish sticks, a recently-created specialty, reached a new high of between 65 million and 70 million pounds, compared with 50 million pounds for 1954, and 7.5 million pounds in 1953 when the production of this product was first undertaken.

Shrimp and haddock fillets, which early in 1955 showed extremely high inventories and a depressed market, are now practically in balance, with demand good and supplies adequate. Special marketing campaigns to move haddock, in which the Fish and Wildlife Service cooperated under provisions of the Saltonstall-Kennedy Act, aided in moving the heavy haddock inventories into consumption channels.

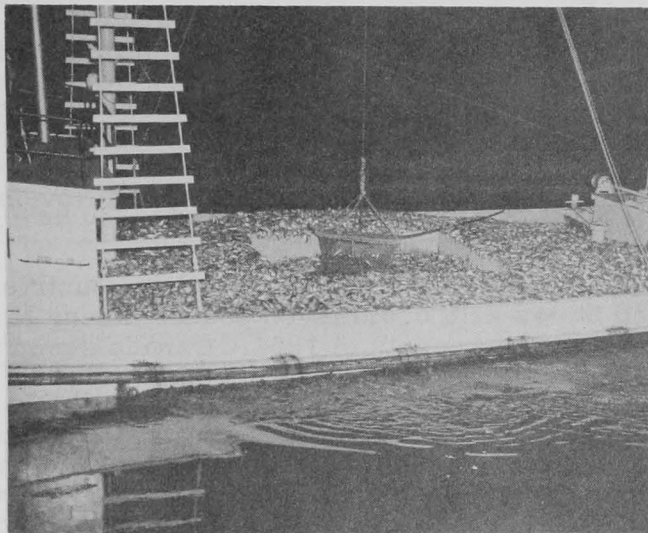
Shrimp is the United States' most valuable fishery on the basis of ex-vessel value. The high inventories which existed early in 1955 had a somewhat adverse effect. The 1955 catch was slightly below that of the previous year and the ex-vessel value was somewhat less than the \$70 million paid in 1954.

The Maine canned sardine pack of 1,300,000 cases was the lowest since 1940 and well under 1954's pack of 2,900,000 cases. The quality of the 1955 pack, however, is considered better than in any recent year due to the small size of the individual fish. The reason for the small catch this year is due to the absence of sardines in Maine waters.

The salmon catch was valued at \$24 million ex-vessel or \$10 million below that of 1954. The catch in 1955 was 286 million pounds as compared with 323 million in 1954.

Halibut landings of 37 million pounds were down 6 million pounds from 1954. In 1955 for a number of weeks during the season bad weather curtailed fishing. This, added to a decline in price, accounts for the drop in ex-vessel value from \$8 million in 1954 to \$5.4 million in 1955.

The catch of tuna was about 20 percent less than the 323 million pounds taken in 1954. The ex-vessel value of the tuna catch, based upon incomplete data, is estimated at \$35 million compared with \$52 million in 1954. During the first 10 months of 1955, about 129 million pounds of frozen tuna and nearly 42 million pounds of canned tuna and tunalike fishes were imported into the United States. In the same period in 1954, there were 111 million pounds of frozen tuna and 41 million pounds of canned tuna and tunalike fishes imported.



Unloading a boatload of menhaden at Pascagoula, Miss. Menhaden accounted for 40 percent of the total United States and Alaska catch.

## U. S. Foreign Trade

**GROUND FISH FILLET IMPORTS DOWN 6 PERCENT IN NOVEMBER 1955:** Imports of groundfish fillets (including ocean perch fillets) during November 1955 amounted to 11.1 million pounds as compared to 11.8 million pounds for the corresponding month the previous year, a decrease of 6 percent. (See chart 7 in this issue). The decline was caused primarily by somewhat lower imports from Canada and Iceland. Compared with the same month in 1954, Norway and Denmark also exported less groundfish fillets to the United States during November 1955. Groundfish fillets were also imported from Sweden, the United Kingdom, and France during November 1955, although none were brought in during the same month of 1954 from these countries. The Netherlands, West Germany, and Greenland exported somewhat more fillets to this country in November 1955 than in the same month a year earlier.

Canada continued to lead all other countries exporting groundfish fillets to the United States with 6.5 million pounds during November 1955--7 percent less than during the same month of 1954. Canada accounted for 58 percent of the total groundfish fillet imports during that month.

Groundfish fillet imports into the United States during the first 11 months of 1955 amounted to 124.8 million pounds, compared with nearly 132.0 million pounds during the same period a year earlier. This was a decrease of 5 percent. Canada, with 92.5 million pounds, led all other exporting countries during the 11-months period of 1955, followed by Iceland with 19.8 million pounds. These two countries accounted for 90 percent of the imports for the period.

\* \* \* \* \*

United States Foreign Trade in Edible Fishery Products, September 1955 with Comparisons						
Item	Quantity			Value		
	Sept.		Year	Sept.		Year
	1955	1954	1954	1955	1954	1954
	(Millions of Lbs.)			(Millions of \$)		
<b>Imports:</b>						
Fish & shellfish; fresh, frozen, & processed <sup>1/</sup>	58.2	60.3	801.7	16.4	15.3	202.8
<b>Exports:</b>						
Fish & shellfish; processed <sup>1/</sup> only (excluding fresh and frozen)	4.1	5.4	50.8	1.7	1.3	13.2

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

**EDIBLE FISHERY PRODUCTS, SEPTEMBER 1955:** United States imports of fresh, frozen and processed edible fish and shellfish in September 1955 amounted to 58.2 million pounds (valued at \$16.4 million), according to a U. S. Bureau of the Census summary report (see table). This was a decrease of 18.1 percent in quantity and 11.2 percent in value as compared with August 1955. Compared with a year earlier, September 1955 imports were lower by about 3.5 percent in quantity, but increased 6.3 percent in value.

Exports of processed edible fish and shellfish in September totaled 4.1 million pounds (valued at \$1.7 million), a decrease of 29.3 percent in quantity 1955 exports were lower by 24.1 percent as compared with the September 1954 exports.



Wholesale Prices, November 1955

Winter and stormy weather at sea curtailed catches all along the Atlantic and Gulf Coasts, and supplies of fishery products during November 1955 were light. Wholesale prices in that month rose for nearly all types of fishery products except for canned fish, which sold at slightly lower prices. For November 1955 the over-all index of edible fish and shellfish (fresh, frozen, and canned) was 112.0 percent of the 1947-49 average (see table)--higher than the previous month's by 4.3 percent and above November 1954 by 8.9 percent.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, November 1955 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices <sup>1/</sup> (\$)		Indexes (1947-49=100)						
			Nov. 1955	Oct. 1955	Nov. 1955	Oct. 1955	Sept. 1955	Nov. 1954			
			ALL FISH & SHELLFISH (Fresh, Frozen, & Canned) . . . . .								112.0
<b>Fresh &amp; Frozen Fishery Products:</b> . . . . .					118.5	2/110.1	113.8	106.8			
<b>Drawn, Dressed, or Whole Finfish:</b> . . . . .					119.3	115.6	125.0	115.6			
Haddock, lge., offshore, drawn, fresh . . . . .	Boston	lb.	.12	.10	125.7	106.3	58.5	114.8			
Halibut, West., 20/80 lbs., drsd., fresh or froz. . . . .	New York	lb.	.27	.32	84.6	99.3	133.1	93.4			
Salmon, king, lge. & med., drsd., fresh or froz. . . . .	New York	lb.	.60	.60	133.7	135.1	140.4	127.5			
Whitefish, L. Superior, drawn, fresh . . . . .	Chicago	lb.	.75	.65	185.9	161.1	235.5	154.9			
Whitefish, L. Erie pound or gill net, rnd., fresh . . . . .	New York	lb.	.85	.80	171.9	161.7	222.4	115.2			
Lake trout, domestic, No. 1, drawn, fresh. . . . .	Chicago	lb.	.65	.57	132.2	116.8	123.0	128.1			
Yellow pike, L. Michigan & Huron, rnd., fresh . . . . .	New York	lb.	.44	.32	102.0	75.1	211.0	82.1			
<b>Processed, Fresh (Fish &amp; Shellfish):</b> . . . . .					117.1	108.9	107.8	99.5			
Fillets, haddock, sml., skins on, 20-lb. tins . . . . .	Boston	lb.	.36	.30	122.5	102.1	78.3	105.5			
Shrimp, lge. (26-30 count), headless, fresh . . . . .	New York	lb.	.64	.55	100.5	87.1	94.5	77.4			
Oysters, shucked, standards . . . . .	Norfolk	gal.	5.50	5.50	136.1	136.1	129.9	123.7			
<b>Processed, Frozen (Fish &amp; Shellfish):</b> . . . . .					109.7	2/93.3	93.8	88.9			
Fillets: Flounder (yellowtail), skinless, 1-lb. pkg. . . . .	Boston	lb.	.40	.39	104.7	102.1	102.1	98.2			
Haddock, sml., skins on, 1-lb. pkg. . . . .	Boston	lb.	.29	.27	89.5	84.7	84.7	91.0			
Ocean perch, skins on, 1-lb. pkg. . . . .	Boston	lb.	.27	.27	108.8	106.7	108.8	109.8			
Shrimp, lge. (26-30 count), 5-lb. pkg. . . . .	Chicago	lb.	.71	.54	110.0	83.3	84.1	72.5			
<b>Canned Fishery Products:</b> . . . . .					102.6	103.4	102.7	96.8			
Salmon, pink, No.1 tall (16 oz.), 48 can/cs. . . . .	Seattle	case	21.70	21.70	114.8	114.8	114.8	104.4			
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs. . . . .	Los Angeles	case	12.60	12.80	90.8	92.3	92.3	93.0			
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs. . . . .	Los Angeles	case	7.38	7.55	86.1	88.1	88.1	3/			
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs. . . . .	New York	case	8.20	8.20	87.3	87.3	81.9	71.3			

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

<sup>2/</sup>Revised.

<sup>3/</sup>Not available.

Except for lower prices on Western halibut and salmon at New York City, November 1955 prices for all other items in the drawn, dressed, or whole finfish subgroup were higher than the previous month and the same month a year earlier. Lighter landings in New England and Middle Atlantic ports were responsible for the limited salt-water finfish supplies available during the month, and stormy weather and closed seasons on the Great Lakes curtailed the supplies of the more popular fresh-water fish. Compared with the previous month, the fresh drawn, dressed or whole finfish subgroup index for November 1955 was 3.2 percent higher than the previous month and the same month in 1954.



Higher prices prevailed in November 1955 for the processed fresh fish and shellfish covered in the index, and the subgroup index for this category was 7.5 percent above October 1955 and 17.7 percent higher than in November 1954. Fresh haddock fillets and shrimp prices in November 1955 were substantially higher than the previous months and for the same month a year earlier.



Retail store in St. Louis, Mo., fluorescently illuminated with tiling and stainless steel trimming throughout, including interior and exterior of cases. Transparent lucite covers on cases.

zen fillet stocks were only moderate and demand was good, and in some instances supplies of frozen haddock and cod fillets were not considered adequate to meet the demand.

Ample supplies of canned tuna and California sardines and a moderate demand were responsible for the lower shading in prices which took place during the month. November 1955 canned tuna prices were 2.4 percent lower than in the same month in 1954. The subgroup index for all canned fish from October to November dropped 0.8 percent, but was still 6.0 percent higher than in the same period a year earlier because of higher prices for the limited supplies of canned salmon and canned Maine sardines. Tuna and sardine catches on the West Coast were reported good. The shore workers-cannery management dispute, which had practically closed down tuna and sardine canning for more than a month, was settled on October 31 and the canneries were packing full time again in November.



#### ACID-PRESERVED FISH SCRAP

Ensilage prepared from cod and haddock and preserved by  $H_2SO_4$  has been fed successfully to pigs and chickens in Nova Scotia, Canada.

--Trade News (Canadian), January 1955.