TRENDS AND DEVELOPMENTS

Salmon

ABERNATHY SPAWNING CHANNEL PROVES EFFECTIVE FOR REPRODUCTION OF CHUM SALMON:

Manmade spawning channels are being developed as a method of reducing the 90 percent or more loss of salmon eggs that normally occurs during incubation stages in natural stream gravel. These severe losses are primarily caused by flood water that may erode incubating eggs from the gravel or smother the eggs by depositing silt and sand on gravel beds. Discovery of these limitations to salmon production has led to an attempt to create a controlled environment with graded permeable gravel and regulated flow of water with depths and velocity that would be optimum for the spawning and incubation of salmon. Not only has survival proven superior to that from natural streams under those conditions, but it is believed that the fry produced are as viable as fry produced in natural streams. This ability to compete and survive in the natural environment should result in good adult returns.

Egg-to-fry survivals in established spawning channels are exceeding survivals in natural streams by a significant margin and in some cases have reached maximum levels of over 90 percent. Because of their recent development, a reliable measure of adult returns has not been obtained for most spawning channels. Figures, however, are available from the Jones Creek channel in British Columbia where returning adult pink salmon have progressively increased from 400 to 5,000 in four generations.

Results in the Abernathy spawning channel are also encouraging. This 1,800-foot long channel (see figure), located on a tributary of the lower Columbia River, was constructed in 1959 by the U.S. Bureau of Commercial Fisheries. Method for operating the channel to achieve maximum production of young salmon and returning adults are now being developed.

The Abernathy spawning channel.

With one exception, the environment created in the Abernathy channel has been adequate for the successful incubation of chum salmon eggs. Deposition of sediment from the water supply as it moved through the channel has made it difficult to maintain the original permeable condition of the streambed gravel. Removing and screening the gravel in the channel provided a temporary solution to this problem. A more permanent solution will be attained with a settling basin which will remove silt and sand from the water supply before it enters the channel. With control of the sediment, the Abernathy spawning channel shows promise of providing conditions for achieving good egg-to-fry survival.

Survival studies at Abernathy are being conducted mainly with plants of eyed eggs, but some information has also been obtained with plants of green eggs and with natural spawning. Excellent survival (75-95 percent)

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Chum Salmon Egg-to-Fry Survival in the Abernathy Spawning Channel

Type of Deposition	Year	Number of Eggs Deposited	Number of Fry Produced	Percentage Survival
Plants of eyed eggs	1960/61	250,000	229,610	91.8
	1961/62	600,000	572,895	95.5
	1962/63	1,185,000	891,849	75.3
Plants of green eggs	1962/63	27,860	24,461	87.8
Natural spawning	1962/63	54,156	44,452	82.1

was observed for all three methods of egg deposition (see table). These consistent results have demonstrated that the Abernathy channel will yield maximum survival of chum salmon fry. With the development of an adult run adequate in size to fully utilize the facilities at Abernathy, such a channel can make a significant contribution to the chum salmon population of the Columbia River.

--Richard Bakkala, Fishery Biologist (Research),
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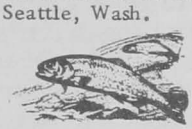
Seattle, Wash.



Design and Operation of a Tray Rack for the Study of Oysters

As a result of the serious oyster mortalities which occurred along the east coast of the United States since 1957, the U. S. Bureau of Commercial Fisheries initiated a study of these mortalities at its Franklin City Field Station on Chincoteague Bay, Va. A major portion of this research involved maintaining oysters of several age groups from various geographic regions for routine observation over a period of 5 to 7 years. To prevent destruction by predators and smothering from silt and algae, it appeared desirable to support the oysters off the bottom in trays suspended from a permanent platform readily accessible to the laboratory. This report describes the design and operation of the structure, which we have called a tray rack.

The rack (fig. 1) was erected adjoining an existing pier. Creosote-treated pilings 30 feet in length were driven 12 feet into the bottom to form the supporting frame of the structure. The walks, superstructure, and braces were made of 4 x 6 and 2 x 8-inch creosote-treated lumber. The structure consists

Fig. 1 - Overall view of tray rack showing construction of walks and position of superstructure.

of six catwalks, 3 feet wide and 26 feet long, fastened to stringers which in turn are attached to vertical pilings. The walks stand 4 feet above a mean low water depth of 5 feet and border five bays 26 feet in length and 11 feet wide. Each bay holds 16 trays, each tray being suspended from the walk by a single line and bridle. Twelve additional trays could be suspended from the outside of the two outer walks making it possible to accommodate a total of 92 trays.

A block and tackle, which travels on a monorail suspended from the overhead structure,

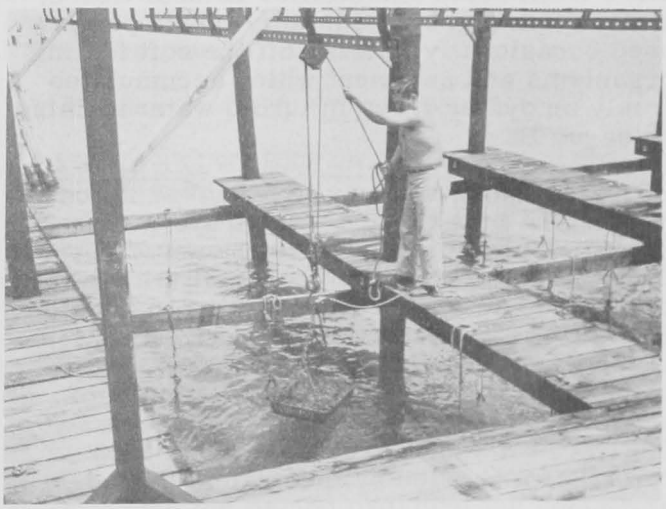


Fig. 2 - Photograph of monorails, movable block and tackle, and chicken wire cover arrangement of bridle on tray.

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is used to lift the trays out of the water and to transport them to the pier (fig. 2). The monorail tracking system is of the type used in the meat-packing industry. The tackle consists of a double and a single four-inch steel block swivel mounted and strung with $\frac{5}{8}$-inch rope. The superstructure rises 8 feet above the walks and adjoining pier and projects over the pier so that trays may be loaded on a flatbed handtruck for transport into the laboratory. The tracks and other metal parts are painted with "Esso Surett Fluid 30" to lubricate and prevent rusting.

The first trays employed in this study were constructed of woven steel rods, and were 40 inches long, 20 inches wide, and 4 inches deep. Later those were replaced with lighter trays of approximately the same size constructed of expanded steel welded to steel rods. To reduce corrosion the trays are dipped in hot roofing tar once or twice a year. Chicken wire ($1\frac{1}{2}$-inch mesh, 18 gauge) is used to cover the trays to prevent loss of oysters. Bridles on the trays are constructed of $\frac{3}{16}$-inch welded link chain fastened with lap links or "S" hooks. It was found that the less expensive ungalvanized chain showed no more corrosion or wear than galvanized, and "S" hooks showed less wear than the more expensive lap links. Polypropylene ropes of $\frac{3}{8}$-inch diameter are attached to the tray bridles and secured to cleats on the sides of the walks. This synthetic rope is not destroyed by marine bacteria in sea water and is thus preferable to rope made from hemp and similar natural fibers. Water from a gasoline motor-driven pump is used occasionally to flush off the soft fouling organisms and sediment which accumulates freely on oyster trays in turbid water in Chincoteague Bay.

As designed, the tray rack makes it possible for one man to handle the trays with a minimum of effort and little chance of accident. In addition, trays are easily lifted with the tackle and carted indoors for observation and study, an advantage of particular benefit in the winter in temperate latitudes. In Chincoteague Bay fouling by sessile organisms accumulates rapidly. A tray of oysters so fouled can weigh in excess of 300 pounds yet can still be handled by the system here described.

After a year of operation, we find this tray rack functional, efficient, and timesaving.

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Note: I wish to acknowledge the technical assistance of Paul Heister, maintenance man at the Bureau's Oxford Laboratory, in the design and construction of the structure described here.

Alaska

FOREIGN FISHING ACTIVITY OFF ALASKA:

U.S.S.R.: Soviet trawling activity off the coast of Alaska declined gradually throughout September. By the end of that month the fleet had decreased to less than 25 vessels. That fleet had been fishing from southwest Kodiak east to the vicinity of Ocean Cape off Yakutat. It appeared that the Soviets were continuing to fish for Pacific ocean perch, with little take of incidental species.

Two Soviet whaling fleets continued to operate off Alaska throughout September. One fleet worked south from the vicinity of the Pribilof Islands to south of Unimak Pass. The second fleet was whaling along the western Aleutian Chain generally in the vicinity of Amchitka Pass.

Japan: The Japanese fisheries off Alaska also declined in September as various fleets filled their catch quotas and sailed for their home ports. Two fish-meal fleets departed for Japan as the month drew to a close and both king crab fleets departed Bristol Bay about the middle of the month.

Two Japanese shrimp fleets continued to operate north of the Pribilof Islands group. The one remaining fish-meal fleet fishing in the same general vicinity was scheduled to depart shortly. A fish-meal-freezer factoryship fishing south of the Pribilofs was also expected to cease operations in the near future.

Four large new Japanese stern trawlers and two smaller side trawlers continued fishing for shrimp and Pacific ocean perch in the vicinity of southwest Kodiak Island in the Gulf of Alaska during September.

* * * * *

ALASKA SALMON PACK IN 1964:

The final 1964 weekly salmon pack report of the Alaska Department of Fish and Game

Fig. 1 - Longshoremen guiding a slingful of cases of canned salmon shipped from Alaska at a dock in Seattle.

showed the Alaska salmon pack at 3,509,400 standard cases (48 1-lb. cans). This was an increase of 853,391 cases or 32 percent as compared with the 1963 salmon pack of 2,656,009 cases.

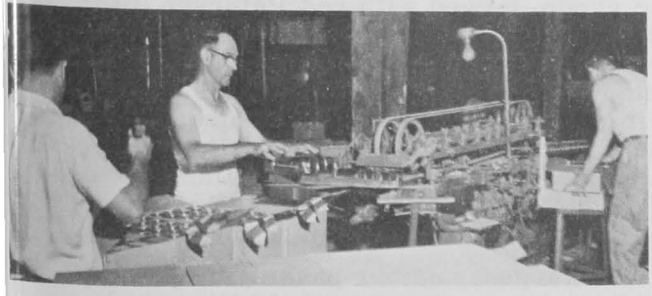

Fig. 2 - Inside a warehouse at Seattle, Wash., labelers unpack cans of unlabeled Alaska salmon onto a conveyor for labeling.

Central Alaska, with a total of 1,721,000 cases was the highest producer, while Southeastern and Western Alaska packed 1,225,300 cases and 563,100 cases, respectively. The Kodiak area was the highest in the State with 633,250 cases. The Ketchikan area was second with 580,000 cases, and Bristol Bay was third with 535,450 cases.

Pink salmon accounted for 1,903,000 cases or 54 percent of the total pack followed by red, 720,300 cases or 21 percent; chum, 689,000 cases or 20 percent; coho or silver, 155,300 cases or 4 percent; and king, 41,800 cases or 1 percent.

* * * * *

HALIBUT FISHING SEASON IN AREA 2 CLOSES:

The 1964 North Pacific halibut fishing season in Area 2 closed on September 15 and for the second straight year the catch quota was not attained. Regulations of the International Pacific Halibut Commission provided that halibut fishing in Area 2 (from Cape Spencer, Alaska, to Willapa Bay, Wash.) would close on that date or earlier if 25 million pounds of halibut were taken. A total halibut catch of 21 million pounds was expected by the time fishing stopped on statutory closing date. Last year (1963) was the first year since the Commission assumed control of the halibut fishery that the Area 2 season closed without attainment of the catch quota (28 million pounds in 1963). The catch in Area 2 totaled 25 million pounds in 1963.

* * * * *

GEAR MARKING EXPERIMENTS:

In conjunction with United States efforts to minimize gear conflicts in the Gulf of Alaska between domestic and foreign vessels, tests of gear-marking devices for possible use in the king crab fishery were conducted aboard the U. S. Bureau of Commercial Fisheries research vessel John R. Manning in the Kodiak Island vicinity. Four different types of passive radar reflectors, in combination with 2 flotation devices and 3 different poles, were tested. A variety of weather and sea conditions during the period provided the opportunity for observation of the markers in situations comparable to those which might reasonably be expected in actual use with the commercial fishery.

The results of preliminary tests were encouraging. Two of the reflectors gave prom-

ising results under all sea conditions encountered during the tests. Maximum distances at which the reflectors could be observed, using shipboard radar, were $4\frac{1}{4}$ miles under "good" weather conditions and $2\frac{3}{4}$ miles under adverse conditions.

Plans were to alter the most promising reflector buoys with the goal of increasing the effective range, and subsequently to assist certain key fishermen in testing and evaluating the markers under operational conditions.

* * * * *

SOUTHEAST ALASKA HERRING CATCH MODERATE:

The commercial herring reduction fishery ceased operations in early September 1964, after what the industry termed a "moderately successful" season. Only 23,500 tons of a 35,000-ton herring catch quota were taken. The catch was composed of about 50 percent age VI fish and 11 percent age VII fish. No younger age classes seemed strong at the time.

* * * * *

KING CRAB LANDINGS LOW AT KODIAK:

Returns of king crab tagged by the U. S. Bureau of Commercial Fisheries in its studies near Kodiak were few, as of the end of September 1964, and indicated a lower fishing effort than in 1963. This is because full king crab processing had not yet been re-established in Kodiak since the earthquake. On the Peninsula, however, processing was reported to be in high gear and another large annual pack was anticipated.

A full load of king crabs at Kodiak, Alaska.

Alaska Fisheries Explorations and Gear Development

CHARTER OF VESSEL "PARAGON" TERMINATED:

With the completion of Cruise 64-2 (June 16 - September 19, 1964) in the Gulf of Alaska and Bering Sea, the exploratory fishing vessel Paragon, chartered by the U. S. Bureau of Commercial Fisheries, terminated over 4 months of charter to the Bureau. The results of explorations by that vessel will allow for more detailed evaluation of the Gulf of Alaska shrimp resource.

Note: See Commercial Fisheries Review, November 1964 p. 17.

Alaska Fishery Investigations

SOCKEYE FRY AVAILABILITY LOW DURING SUMMER:

Widely separated studies involving summer sampling in Coville Lake with tow nets and a roundhaul seine in Auke Lake showed July-September declines in sockeye fry availability of 90 percent in Coville and 70 percent in Auke Lake for 1964. The Coville study also shows that for both 1963 and 1964 there were probably heavy mortalities of sockeye fry in early June, a stable period of low mortality in mid-summer, and another period of high mortality in late August.

* * * * *

NEW ADULT PINK SALMON RUN TRANSPORTED INTO SASHIN CREEK:

A vessel equipped with tanks for live fish was used to transport adult pink salmon from Bear Harbor, Kuiu Island, to Sashin Creek, Little Port Walter. A total of 1,866 pink salmon (including 1,139 females) were released above the weir and 150 males were released below the weir. Those released below the weir were divided into 3 groups of 50 each. One group, tagged with red Petersen discs, was released from the floating pound in Little Port Walter Bay. The second group, tagged with white discs, was released below the weir without being held in Sashin Creek. The third group, tagged with yellow discs, was held in Sashin Creek 4 days and released below the weir. About 40 of the 150 tagged fish passed upstream through the weir.

The largest number passing upstream originated from the group held 4 days in Sashin

Enumerating pink salmon fry on their outmigration at Sashin Creek, Little Port Walter, Southeastern Alaska.

Creek, and the smallest number from the group released in the bay.

There was no evidence of fish dying unspawned, and spawning occurred through the 0.6-mile length of spawning ground. Spawning density was highest in the lower 0.4-mile section, however. The transplant study was conducted cooperatively with Alaska Department of Fish and Game biologists and a privately-owned packer vessel. The results may demonstrate a feasible technique for increasing salmon production in Alaska.

American Fisheries Advisory Committee

RECOMMENDATIONS MADE AT MEETING IN NEW ENGLAND:

At a three-day meeting held in Danvers, Mass., this October (1964), the American Fisheries Advisory Committee recommended that greater emphasis be placed on programs of research and management of fishery resources, improving product quality, and development of new fishery products. It also suggested that a training program be started for commercial fishermen as a means of encouraging young people to enter the fishing industry. The Committee, which is responsible for advising the Secretary of the Interior on general fishery matters, made a number of other major recommendations.

Another recommendation by the Committee urged continuation of efforts to resolve differences between sport fishing and commercial fishing interests in both fresh-water and salt-water fisheries resources. The Committee pointed out that both groups face common problems, and solutions will require concerted efforts by both.

Other actions taken by the Committee were:

1. Endorsed provisions of the Fishing Fleet Improvement Act which calls for new fishing vessels to be of advance design, and that economic injury to existing fleets be avoided insofar as possible.

2. Recommended that the fishing industry and the Federal Government take full advantage of the Federal fisheries legislation enacted in the 88th Congress.

3. Endorsed the new Commercial Fisheries Research and Development Act as a means of providing maximum opportunities for further development of commercial fisheries at state levels.

At the meeting, representatives from the U. S. Bureau of Commercial Fisheries discussed programs of the North Atlantic Region. Highlights included the Bureau's research on quality of fresh and frozen fish; new and more efficient fishing vessels and gear; and biological and oceanographic programs seeking improved knowledge of fisheries resources. Other matters discussed included the problem of heavy fishing pressure by foreign fleets off the New England coast; the recently passed Fishing Fleet Improvement Act; and economic factors affecting the New England fishing industry.

The Advisory Committee visited the new and recently dedicated Marine Products Irradiator at Gloucester, Mass. This facility (which was constructed by the Atomic Energy Commission) will be operated by personnel of the U. S. Bureau of Commercial Fisheries, and is the first food irradiation plant in the world devoted entirely to fishery products. Members of the Committee also toured major fish processing plants in the Gloucester area.

The next meeting of the American Fisheries Advisory Committee will be held in Washington, D. C., in the spring of 1965.

American Samoa

TUNA FLEET AS OF AUGUST 31, 1964:

A total of 33 tuna fishing vessels was reported to be fishing out of American Samoa as of August 31, 1964. They consisted of vessels from the following countries: Japan--20; Taiwan (Formosa)--7; Republic of South Korea--5; and Okinawa--1. An additional six 140-ton class tuna vessels from South Korea were expected to join the Samoan fleet after October 10. The six vessels were constructed in Japan. (Suisan Keizai Shimbun, September 26, 1964.)

Aquatic Weeds

USE OF GRASS CARP FROM MALAYSIA TO FIGHT WATER VEGETATION IN PONDS:

A species of fish known as grass carp found in Malaysia is reported to be almost completely herbivorous, preferring a diet of grass and other water vegetation rather than subsisting on insects and competing fish. The U. S. Department of the Interior announced this past September that 27 small specimens of these grass carp were imported into the United States from Malaysia in 1963 for propagation experiments and study of their feeding habits. They are being studied at experimental ponds managed by the Bureau of Sport Fisheries and Wildlife at Stuttgart, Ark. If their propagation in this country is successful, they may eventually be the means to help fight vegetation in the thousands of farm ponds where production of game fish is restricted by excessive weed growth.

In selecting this carp, scientists point out that excessive vegetation in farm ponds provides too much escape cover for small fish, which are the main source of food for larger fish. Heavy weed growth also impedes navigation and the harvest of desirable fish species. Herbicides could be used to eliminate weeds, but that approach is considered too costly and also might prove hazardous to fish. For those reasons it was decided to experiment with the test group of imported grass carp.

The Bureau says it has much to learn about the species before it would recommend its use in the United States. Even if the grass carp proves its worth at keeping vegetation out of test ponds, its ability to reproduce will be studied in carefully controlled experiments. The Bureau also wishes to know the effects the grass carp would have on other species of fish and on desirable waterfowl foods.

The Chief of the Fish Farming Experimental Station at Stuttgart said Malaysian fishery scientists report they have been unable to spawn grass carp in ponds there. He believes spawning might be induced by adding fresh water to the test ponds and by injecting hormones, if necessary. He said, "Up until 15 years ago it was believed impossible to spawn our native buffalofish in ponds, but the introduction of fresh water into ponds resulted in successful spawning." Fishery scientists are not sure why the introduction of fresh water will help induce spawning. Some think it may give the fish confidence that there will be an adequate water supply for the survival of their young.

The 27 specimens of grass carp at Stuttgart are the survivors of 70 fingerlings sent to the experiment station by air in plastic bags last year by the Malaysian Director of Fisheries.

The fingerlings, then less than an inch long, survived their trip and were divided among indoor aquaria and an outdoor pond. They were fed fish meal and canned spinach during the winter. About half the indoor group survived; only one in the outdoor pond was lost. The survivors are now about 16 inches long and weigh about two pounds each. They are fed high-protein fish meal, supplemented occasionally with a handful of grass.

The grass carp has smaller scales and a more elongated body than its cousin, the German carp, which was imported and introduced to the United States nearly a century ago as a food fish, but is not thought of very highly by sport fishermen. The German carp reproduces rapidly, muddies water, and retards the growth of plants needed for oxygen replenishment of water and competes for food with some species more desired by sportsmen. If the grass carp begins displaying any of those traits, it will be rejected by the Stuttgart researchers. The grass carp is said to be active and might be a good game fish. As far as is now known, it does not feed on other fish.

A report from England said 15,000 grass carp are being used successfully to prevent weeds from clogging water inlets at an electric power station at Barrow-in-Furness. British scientists have not yet learned if the fish will spawn there.

California

PETRALE SOLE MIGRATION STUDIES AND TAGGING:

M/V "N. B. Scofield" Cruise 64-S-4-Bottomfish (July 21-August 20, 1964): To locate and tag petrale sole (Eopsetta jordani) for migration and subpopulation studies was the principal objective of this cruise in the coastal waters off Shelter Cove, Bodega Bay, and Ventura, by the California Department of

Fish and Game research vessel N. B. Scofield. Secondary objectives were to tag sharks in cooperation with the American Institute of Biological Sciences and the U. S. Fish and Wildlife tagging program, and to collect specmens for specific studies.

All tagging on this cruise was conducted in the vicinities of Shelter Cove and Bodega Bay using commercial otter trawl gear. A total of 2,864 petrale sole was tagged and released in water shallower than 65 fathoms. The fish were caught during 95 tows, each of which lasted from 20 to 30 minutes. The condition of the fish taken from and released in shallow water was excellent.

A total of 43 tows was made in the Shelter Cove area and yielded 1,664 petrale sole for tagging. About 60 percent of those fish were of commercial size (greater than 11 inches), and were available in commercial quantity. The remaining 52 tows were made in the Bodega Bay area where 1,200 petrale were tagged. Although 99 percent of the Bodega Bay fish were of commercial size, they were less abundant than in the Shelter Cove area.

Returns from this tagging effort will give valuable information about summer migrations of petrale sole stocks, as well as additional growth data. A few tagged petrale sole were recaptured by the commercial fishing fleet before the cruise ended.

Five male dogfish shark (Squalus acanthius) were tagged and released in the Shelter Cove area. Two red Peterson disc-type tags printed in English and Spanish were secured on either side of the first dorsal fin with a stainless steel pin.

Specimens of English sole (Parophrys vetulus), petrale sole (Eopsetta jordani), Dover sole (Microstomus pacificus), rex sole, Glyptocephalus zachirus), and curl-fin turbot (Pleuronichthys decurrens) were collected for systematic studies at the California Academy of Sciences.

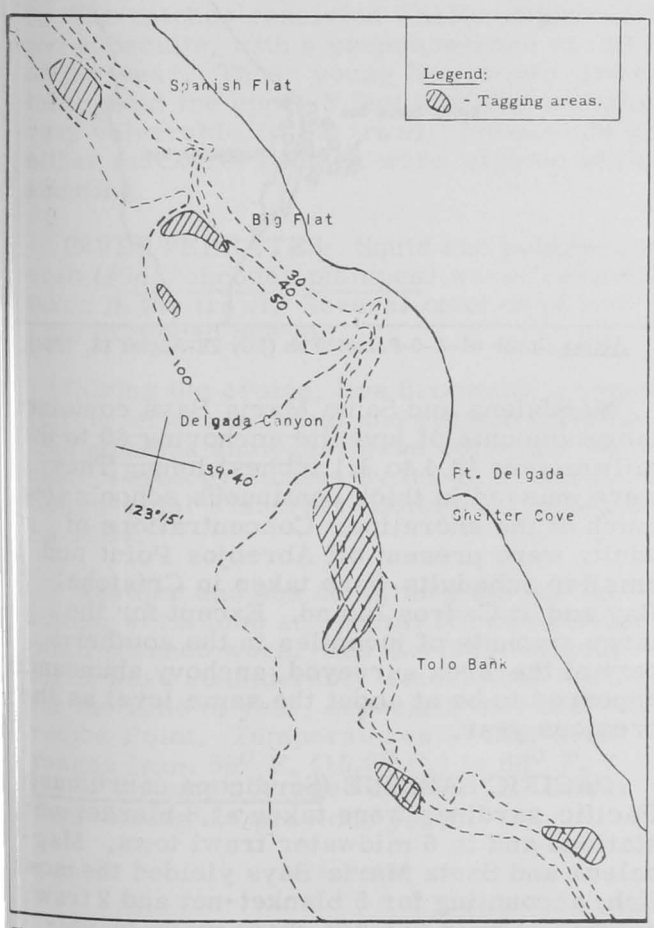

Fig. 1 - Shows Shelter Cove tagging area, N. B. Scofield Cruise 64-S-4-Bottomfish (July 21-August 20, 1964).

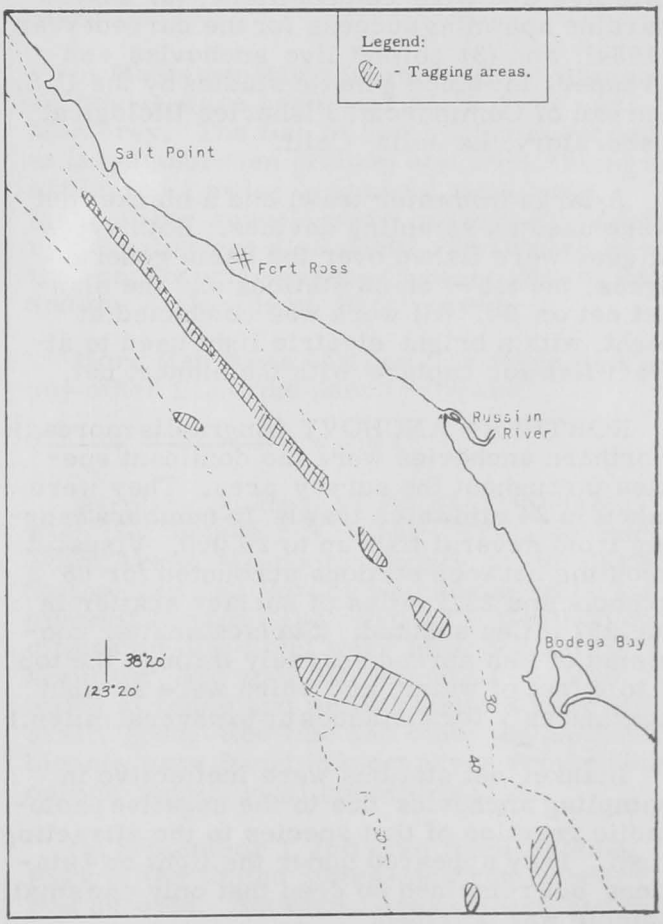

Fig. 2 - Shows Bodega Bay tagging area, N. B. Scofield Cruise 64-S-4-Bottomfish (July 21-August 20, 1964).

It had been planned to tag Pacific halibut (Hippoglossus stenolepis) with operculum tags but none were caught during the cruise. The halibut tagging project is in cooperation with the International Pacific Halibut Commission.

Three tows were made in the Ventura area to collect juvenile California halibut (Paralichthys californicus) for the California Department of Fish and Game's sportfish project at Terminal Island, but none was caught.
Note: See Commercial Fisheries Review, February 1963 p. 20.

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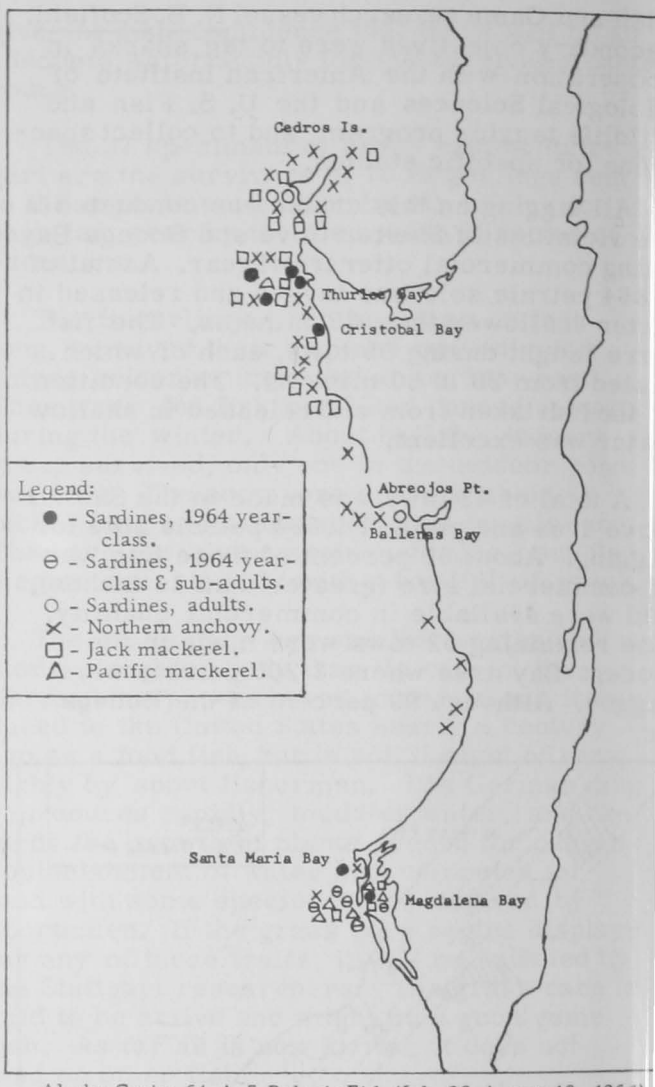
PELAGIC FISH POPULATION SURVEY CONTINUED:

M/V "Alaska" Cruise 64-A-5-Pelagic Fish (July 28-August 18, 1964): The objectives of this cruise by the California Department of Fish and Game research vessel Alaska in the coastal waters of southern Baja California, Mexico, from Magdalena Bay to Cedros Island were to: (1) survey the pelagic species to determine population densities and to ascertain age and size compositions; (2) assess sardine spawning success for the current year (1964); and (3) collect live anchovies and groupers for blood genetic studies by the U. S. Bureau of Commercial Fisheries Biological Laboratory, La Jolla, Calif.

A large midwater trawl and a blanket net were used as sampling devices. Both types of gear were fished over the same general areas; the trawl on 36 stations and the blanket net on 24. All work was conducted at night, with a bright electric light used to attract fish for capture with the blanket net.

NORTHERN ANCHOVY (Engraulis mordax): Northern anchovies were the dominant species throughout the survey area. They were taken in 24 midwater trawls in numbers ranging from several fish up to 26,000. Visual scouting between stations accounted for 68 schools and 25.5 miles of surface scatter in the 237 miles scouted. (Surface scatter consisted of fish spread sparsely through the top 3 to 4 feet of water, and which were in sight continuously for distances up to several miles.)

Blanket-net stations were ineffective in sampling anchovies due to the negative phototactic reaction of that species to the attracting light. They appeared under the light on 4 stations but remained so deep that only one small sample was obtained.



Alaska Cruise 64-A-5-Pelagic Fish (July 28-August 18, 1964).

Magdalena and Santa Maria Bays contain large amounts of juvenile anchovies 60 to 80 millimeters (2.4 to 3.1 inches) long. They were massed in thick continuous schools alo much of the shoreline. Concentrations of adults were present off Abreojos Point and smaller subadults were taken in Cristobal Bay and at Cedros Island. Except for the large amounts of juveniles in the southern part of the area surveyed, anchovy abundan appeared to be at about the same level as th previous year.

PACIFIC SARDINE (Sardinops caeruleus) Pacific sardines were taken at 8 blanket-net stations and in 6 midwater trawl tows. Magdalena and Santa Maria Bays yielded the mos fish, accounting for 5 blanket-net and 2 trawl catches. Other catches were made in Bol-

lenas Bay, Cristobal Bay, Thurloe Bay, and at Cedros Island. Juvenile fish-of-the-year predominated, with adults occurring in only three catches. The juvenile sardines were found in pure schools, a change from the usual mixture of a few young sardines in a large school of anchovies. No schools were sighted during night scouting. The 1964 year-class appears to be stronger than those of the preceding 2 years.

PACIFIC AND JACK MACKEREL (Scomber diego and Trachurus symmetricus): Pacific mackerel were taken in quantity only in Magdalena and Santa Maria Bays, where both juveniles and adults were found. The remaining catches consisted of a few individuals of subadult size. The blanket net made 5 catches and the trawl 1. Last year's (1963) survey found Pacific mackerel distributed over a much larger area and in greater quantities.

Jack mackerel were taken mainly in the northern part of the survey area. The trawl accounted for 14 catches and the blanket net 5. The catches consisted wholly of juveniles and subadults, with a preponderance of fish-of-the-year. Those young fish were scattered throughout the upper 3 feet of water and were very vulnerable to the trawl. No schools of either mackerel species were sighted while scouting.

INVERTEBRATES: Squid and pelagic red crab (Pleuroncodes planipes) were frequently taken in the trawl. Several catches of red crab exceeded one ton.

During the cruise, live broomtail grouper (Myctoperca xenarcha) and spotted cabrilla (Epinephelus analogus) were collected for blood serology studies by the U. S. Bureau of Commercial Fisheries Biological Laboratory, La Jolla.

Weather and sea conditions during the cruise were good and permitted completion of all planned work. Sea surface temperatures were considerably colder than normal for the time of year, especially north of Abreojos Point. Temperatures in that area ranged from 59° F. (15.0° C.) to 68° F. (20.0° C.) and averaged about 7° F. colder than during the previous year.

* * * * *

Airplane Spotting Flight 64-12-Pelagic Fish (August 10-12, 1964): To determine the inshore distribution and abundance of pelagic fish schools, the area from Bodega Bay to Port Hueneme, and Point Vicente to Oceanside, Calif., was surveyed from the air by the California Department of Fish and Game aircraft Cessna "182" N9042T.

On August 10, the area from Jalama Park to Port Hueneme and Point Vicente to Oceanside was scouted. Heavy smoke and haze limited air visibility in the areas flown and precluded surveying much of the southern California coastal area. From Ventura south, "red tide" restricted water visibility. North of Ventura, a total of 56 northern anchovy (Engraulis mordax) schools was noted very near the surf line. At San Onofre, a small school of Pacific bonito (Sarda chiliensis) was sighted on the surface feeding upon smaller unidentified organisms.

On August 12, the area from Bodega Bay to Mussel Point was scouted. Both air and water visibility were good except for a few patches of fog in the Morro Bay-Pismo Beach area.

In Monterey Bay, large concentrations of anchovies were seen near Santa Cruz and Monterey. The fish at Santa Cruz occurred in large unbroken groups; one school being an estimated 4 miles long and $\frac{1}{4}$ mile wide. Many of the schools were in the surf. Anchovy schools were also spotted in Drakes Bay, the San Francisco area, Cayucos-Morro Bay, and the Avila-Pismo Beach areas.

More fish were seen on this flight than on any other flight the past $1\frac{1}{2}$ years.

* * * * *

Airplane Spotting Flight 64-13-Pelagic Fish (September 1-3, 1964): The area from Point Arena, Mendocino County, to the United States-Mexican Border was surveyed by the aircraft Cessna "182" N9042T. Weather conditions on this flight were ideal for aerial scouting. Air visibility extended up to 50 miles at times and water clarities were generally good. Red tide and other phytoplankton blooms were found in most areas scouted but only in small, local concentrations.

On September 1, the area from Jalama Park to the United States-Mexican Border was scouted. Between Laguna Beach and the Mexican Border, 72 schools of large Pacific bonito (Sarda chiliensis) and 1 school of Cali-

fornia barracuda (Sphyraena argentea) were counted. Northern anchovies (Engraulis mordax) were quite abundant from Dana Point south where 46 schools were tallied.

On the following day, the area from Point Arena to Point Sur was scouted. An extensive school group of anchovies (98 schools) was sighted near the surf between Bolinas Bay and San Francisco; the schools were small and indistinct. The water was a light greenish-brown and turbid. Another anchovy school group (29 schools) was found along the beaches just south of San Francisco.

On the last day of the survey, the area from Santa Cruz Point to Point Vicente was scouted. In Monterey Bay, 18 breezing schools of unidentified fish were counted, all under predation by birds. Very possibly the schools were "pinhead" anchovies. During August there were many large schools of anchovies in that area. Red tide was extensive in the northern part of the bay.

Other school groups of anchovies were found in the Cayucos (23 schools), Avila (11 schools), and Port Hueneme (25 schools) areas. Red tide also was encountered in those same areas.

* * * * *

Airplane Spotting Flight 64-14-Pelagic Fish (September 15-17, 1964): The area from Punta Banda to Cabo San Lucas, Baja California, Mexico, was surveyed by the Beechcraft N5614D. This was the third of four experimental quarterly flights scheduled for 1964 along the Baja California coastline.

On September 15, the area from Laguna Scammon to Punta del Marquis was scouted. Air and water visibility was very good throughout the area scouted. Large school groups of northern anchovies (Engraulis mordax) were observed from Bahia de San Cristobal south to Bahia de la Magdalena, the majority swimming near the surf line. The schools were rather small, compact clusters. Fish schools also abounded in Bahia de la Magdalena proper. Most were anchovies, but 12 Pacific sardine (Sardinops caeruleus) schools were noted.

On September 16, the area from Cabo San Lucas to Bahia de la Magdalena was scouted. A large school group of sardines (56 individual schools) were breezing south of the Bahia and 10 miles offshore.. Many anchovy and a few sardine schools were again seen in the Bahia proper. Air and water visibility was excellent that day.

The area from Laguna Scammon to Punta Banda was scouted on the last day of the survey. Water visibility ranged from good to poor. Air visibility was reduced by low broken clouds over part of Bahia de Sebastian Vizcaino. Scouting north of Punta Banda was terminated due to a complete cloud cover. Red water was encountered at Punta Canoas, Cabo San Quintin, Cabo Colnett and Punta Banda.

Anchovy schools were seen in Bahia de Sebastian Vizcaino, near Punta Canoas, Punta Baja and Cabo San Quintin. Five sardine schools were sighted, 3 near Punta Santo Domingo and 2 southwest of Punta Canoas. Most schools of both species were again seen near the surf line.

This flight was by far the most productive, in numbers of schools seen, of the three Beachcraft N5614D flights flown this year.

Note: See Commercial Fisheries Review, November 1964 p. 24; October 1964 p. 16.

* * * * *

HATCHERY FISH LOSSES ATTRIBUTED TO FOOD PROBLEM:

Something in a fish food formula apparently caused the excessive fish losses experienced at California State hatcheries during the summer of 1964. From mid-July through late September 1964, approximately 2,128,000 small fish died in California State fish-rearing installations. That was about 9 percent of the 23 million fish in the hatcheries when the problem arose.

As soon as the excessive death rate was noted, scientists began searching for the cause. The possibility of a disease outbreak was ruled out first. Then other avenues were investigated. When a change to different kinds of fish food began to bring the situation under control, fish culturists were led to believe that the original food might have been responsible.

Rainbow trout were hit hardest, with 1.7 million small fish lost from the 18.2 million rainbows on hand when the problem started. About 100,000 trout of other species also were lost. Although the loss was much heavier than

is normal for hatchery operations, the California Department of Fish and Game said it would still be able to meet 1965 trout requirements. Additional trout eggs can be taken, hatched, and reared to replace the lost fish.

King salmon, silver salmon, and steelhead trout were less severely affected. Among that group, losses because of the food problem were as follows: of 696,000 king salmon on hand, 130,000 were lost; of 1,880,000 silver salmon on hand, 13,000 were lost; and of 2,198,000 steelhead on hand, 185,000 were lost.

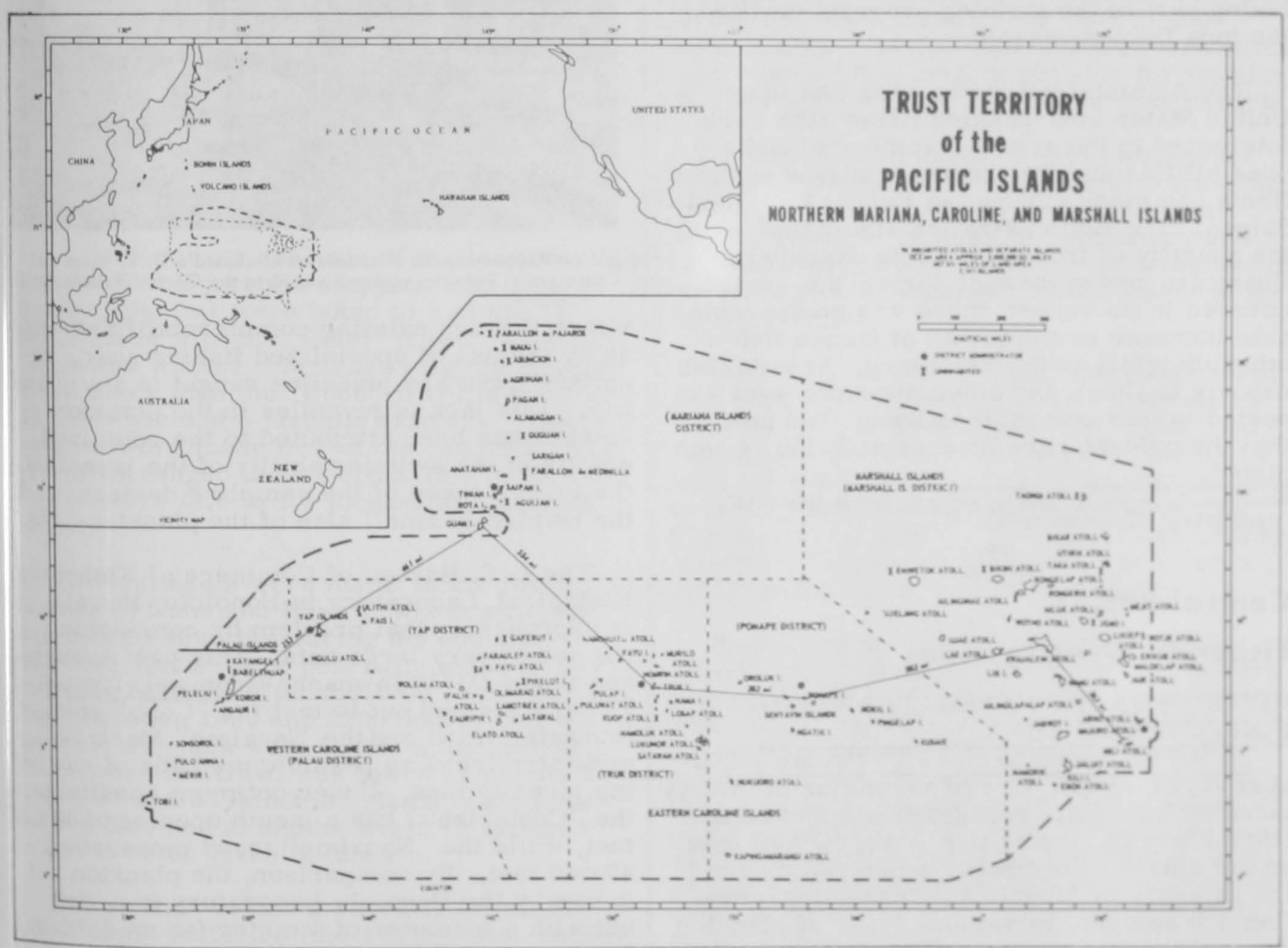
The king salmon involved were fish being raised to yearling size in an experimental program. Plants of king salmon fingerlings (totaling about 11.8 million fish) made before the food problem arose accounted for the bulk of king salmon production in California State hatcheries in 1964. Steelhead trout and silver salmon are usually planted as yearlings, although 1,512,000 steelhead were also planted as small fingerlings earlier this year.

California hatchery officials stated that although the problem seems to be under control, some further losses are anticipated due to the after effects of the food problem, particularly among king salmon. (California Department of Fish and Game, October 3, 1964.)

Caroline Islands

COMMERCIAL FISHERIES PROJECT AT PALAU BEING DEVELOPED:

A major breakthrough in commercial fisheries development in the Caroline Islands Group of the United States Trust Territory of the Pacific occurred in 1963. At that time, an agreement was signed between a California tuna-packing firm and the Trust Territory



Government for the establishment of a commercial fishery enterprise at Palau. The contract called for the development of extensive fishing operations in Palau, as well as establishing a commercial tuna-freezing plant and for the training of Micronesians ashore and at sea. Shore installations and other facilities were to be built by the United States firm with the cooperation of the Trust Territory Administation.

In its 16th Annual Report to the United Nations, the Trust Territory Administration said the opening of Palau to commercial fishing marks the first major step toward large-scale development of the most important natural resource of the Territory, and is expected in time to lead to similar enterprises in other districts. The administration reported that the Pilot Fisheries Project at Palau was in operation and that a cold-storage freezer plant had been completed. In 1964 the program to train Micronesians in live-bait tuna fishing was under way with some 25 trainees taking part in the training program on Hawaiian tuna fishing vessels.

The Administration reported that other United States tuna-packing firms also were interested in the area's commercial fishery possibilities and that representatives of those firms had made surveys in Palau, Truk, and Saipan. The Administration stated that while the quantity of frozen reef fish exported to Guam dropped somewhat during the period covered in its report, there was an appreciable increase in shipments of frozen fish to other districts in the Territory. Frozen fish exports to Guam and other districts were expected to increase materially in 1964 now that the cold-storage freezer at Palau is completed.

Note: See Commercial Fisheries Review, August 1964 p. 16; April 1964 p. 32; August 1963 p. 85.

Central Pacific Fisheries Investigations

RESULTS OF MIDWATER TRAWLING FOR JUVENILE TUNA:

M/V "Townsend Cromwell" Cruise 7 (August 10-24, 1964): One of the major problems faced by biologists engaged in studies on the life history of marine fish is the lack of data on the smaller specimens which fall under the category of juveniles. Presently, larval fish are sampled by various types of plankton nets, while data on the adults are obtained either through existing commercial fisheries or by the use of specialized fishing gear. In neither case are juveniles caught in any quantity. This lack of juveniles in the plankton catches has been attributed to the combined effects of the swiming ability of the juveniles, the towing speed of the sampling devices, and the relatively small size of the plankton nets.

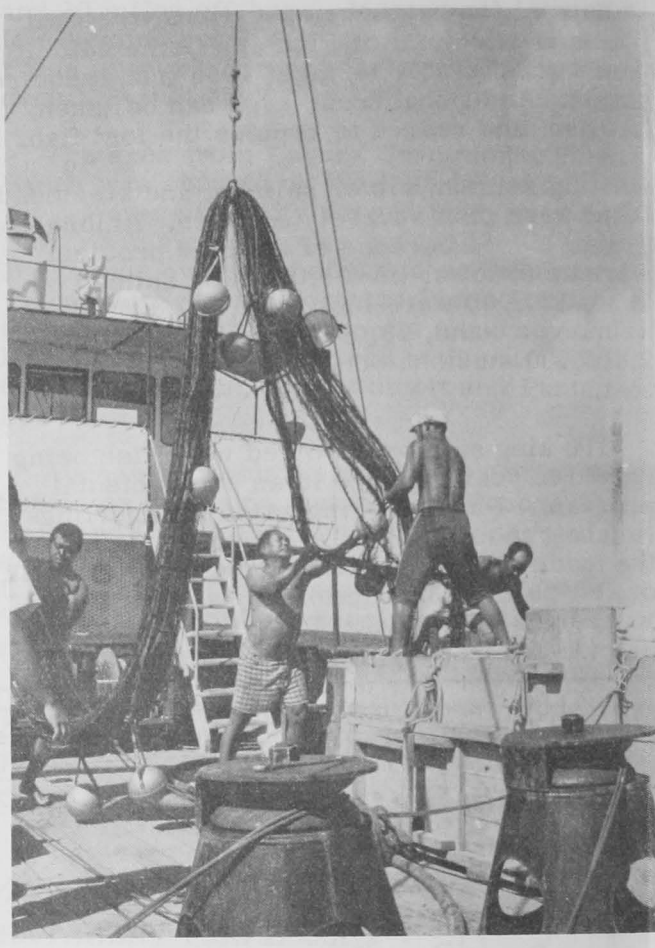


Fig. 1 - Recovering the Nanaimo trawl aboard a U. S. Bureau of Commercial Fisheries research vessel in the Central Pacific.

The U. S. Bureau of Commercial Fisheries Biological Laboratory in Honolulu, Hawaii, is approaching that problem by considering the use of very large nets. This past August, sea trials (M/V Townsend Cromwell Cruise 7) were carried out to test the "Cobb" pelagic midwater trawl and the "Nanaimo" Mark IV midwater trawl as possible methods of catching juvenile tuna. Under optimum conditions, the "Cobb" trawl has a mouth opening of 80 x 8 feet, while the "Nanaimo" trawl measures 40 x 40 feet. By comparison, the plankton net in use by the Honolulu Laboratory is a ring net with a diameter of 1 meter (about 3.3 feet). In order to retain juvenile tuna less than 30

Fig. 2 - Emptying the Nanaimo trawl.

millimeters (1.2 inches) in length, the "Cobb" and "Nanaimo" trawls used in the trials were modified by adding small-mesh cod-end liners ($\frac{1}{2}$ inch stretch-mesh nylon to the "Cobb" trawl and $\frac{1}{4}$ inch square-mesh nylon to the "Nanaimo" trawl).

A preliminary analysis of the trawl catches showed that 2 juvenile skipjack tuna (Katsuwonus pelamis) were taken in 1 of the 11 hauls made with the "Cobb" trawl. With the "Nanaimo" trawl, which had slightly smaller mesh sizes than the "Cobb" trawl, a total of 12 hauls yielded 5 juvenile skipjack. The catches were made in 2 of the 12 hauls. The juveniles ranged in size from 15.0 to 25.0 millimeters (0.6 to 1.0 inches) in standard length.

The test hauls were made in the lee of the islands of Oahu and Hawaii, where skipjack are usually plentiful during the summer months. Hauls were generally made in the morning between 0700 and 1000 hours and at night between 1900 and 2200 hours. All the juvenile skipjack were taken in the morning hauls when the trawl was towed at depths between 40 and 60 fathoms. Hauls made near the surface and at depths over 70 fathoms failed to catch juvenile tunas.

During that cruise a recently acquired trawl depth indicator (the Furuno Net-Sonde) was tried. The instrument, which is activated at a depth of 25 fathoms by a pressure switch in the transducer, was operated successfully.

On several occasions, traces of what appeared to be sizable schools of fish were picked up by the SIMRAD depth recorder. No attempt was made to fish the schools because of the time limitation. Nevertheless, several important questions arise from those traces: (1) whether the traces did indeed represent schools of commercial fish, and if so, whether they were composed of bottom fish not presently being exploited commercially, (2) whether the bottom topography surrounding the islands are suitable for trawling, and (3) whether the trawlable area is large enough and fish plentiful enough to sustain trawling on a commercial scale.

Based on recent reports on trends in trawling methods, it is quite feasible to use existing types of gear to depths of 100-400 fathoms for commercial fishing. It is noteworthy that in the Hawaiian Islands, the 100- to 400-fathom area contains over 5,000 square miles; how much of that area is suitable for trawling is not yet known, but it could be considerable.

A preliminary assessment of abundance and composition of fish available to trawling is contemplated for the future by the Bureau's Honolulu Biological Laboratory and the discovery of new fishery resources would be an important economic development in island fisheries.

On this cruise the "Cobb" midwater trawl was tested off Waianae and also a series of trawl hauls were made with the "Cobb" and "Nanaimo" midwater trawls in the lee of Hawaii for biological studies. The vessel (operated by scientists of the U.S. Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii) experimented in an area off Waianae, Oahu, and Kona, Hawaii.

Side trawling operations using both the "Cobb" and "Nanaimo" midwater trawls were accomplished successfully during this cruise. The "Cobb" trawl was used successfully without any modification in the gear. The "Nanaimo" trawl was modified considerably with the removal of the stabilizer fins, addition of chain along the entire length of the footrope and addition of 10 extra floats to the original 14 floats. The modified net performed better than the "Cobb" trawl due to smaller mesh size.

to only 1.2 percent in 1959. Among the undersized fish, the hatchery figure climbed from less than 3 percent in 1959 to 94 percent in the fall of 1963.

In Wisconsin waters there also had been a marked increase in the abundance of juvenile lake trout in Lake Superior, due almost entirely to large plantings of hatchery fish.

Fisheries officials are particularly encouraged by signs of lake trout spawning in most areas along the Michigan shore of Lake Superior from Grand Marais westward. Last fall's spawning run was the largest since 1958 in Wisconsin's waters, and there is good reason to expect that 1964 will see another large increase of spawning fish in these and other parts of Lake Superior.

The lake trout restoration program is coordinated by the Great Lakes Fishery Commission. Federal, Canadian, and state agencies, including the Michigan Department of Conservation, are cooperating in the long-range effort. (Michigan Department of Conservation, Official News Bulletin, December 12, 1963.)

New England Fisheries

BOTTOMFISH AND SCALLOP LANDINGS IN 1963 AND FORECAST FOR 1964:

Changes in the abundance of groundfish on New England fishing banks are expected to be mixed during 1964, and the abundance of sea scallops will decline, according to the Acting Director of the North and Middle Atlantic Region of the U. S. Bureau of Commercial Fisheries. This forecast is based on information provided by biologists of the Bureau's Woods Hole Laboratory who monitor the landings of commercial fishermen, and study the population of fish and shellfish on offshore fishing banks by sampling with the Bureau's new fishing research vessel Albatross IV.

Haddock landings in New England in 1963 will be about 112 million pounds, a decline from the 117 million pounds landed during 1962. The stocks of haddock on New England banks are expected to remain in only fair supply during 1964, so landings in 1964 will not improve. The drop will be most noticeable in the scrod category because of the scarcity of small fish which has been due to the age groups spawned in 1960, 1961, and 1962 being below average in abundance.

However, things will be brighter in the haddock fishery after 1964. The survival of fish spawned in 1963 appears to have been unusually high. Both the summer and fall surveys of the offshore banks by the Albatross IV indicate the greatest abundance of young fish since the surveys were started in 1953. These young fish will reach marketable size and thus begin to be important to the fishery in the summer of 1965. This 1963 age group is expected to support the fishery for several years.

Landings of cod in 1963 will be slightly less than the 35 million pounds landed in 1962. There has been an upward trend in cod landings during the past few years, and abundance in 1964 is expected to remain at a relatively high level. Surveys by the Albatross IV show a fairly strong age group spawned in 1963 which should enter the fishery in late 1964 and early 1965.

Landings of ocean perch in 1963 will be somewhat over 100 million pounds with abundance holding steady. There is some indication that there will be more fishing in the Gulf of St. Lawrence in 1964. If so, total United States landings in 1964 will exceed those of 1963.

Yellowtail flounder landings in 1963 will be nearly 75 million pounds, an all time high. This is due to increased abundance of fish which resulted from excellent survival of the age groups spawned in 1958, 1959, and 1960. The oldest of these age groups will be of less importance in 1964, and the following age group (1961) appears to be a poor one. Therefore, abundance and landings are expected to be lower in 1964, although still at a relatively high level.

United States landings of whiting (silver hake) in 1963 will total about 92 million pounds which is slightly less than the figure for 1962. The U.S.S.R. fleet probably removed an equal quantity of whiting from the area during the year. What effect the Russian fishing will have on the stocks of whiting cannot be determined at this time, according to Bureau biologists. Thus they are withholding any estimate of the availability of this species to United States fishermen during the year 1964. There is, however, no indication at present of any serious decline in abundance.

Sea scallops have suffered a decline in abundance during 1962 and 1963 although total landings by United States and Canadian fishermen did not slip much in 1963. United States vessels landed about 19.7 million pounds of scallop meats in 1963, which was 16 percent less than the 23.5 million pounds landed in 1962. Canadian landings, however, increased from 13.9 million pounds in 1962 to 16.4 million pounds in 1963. Research vessel surveys show that the downward trend in abundance is continuing and landings are expected to decrease again in 1964.

North Atlantic Fishery Investigations

GROUNDFISH DISTRIBUTION AND ABUNDANCE STUDIES:

M/V "Albatross IV" Cruise 63-7-2 (December 2-16, 1963): To determine the fall distribution and relative abundance of groundfish species from Georges Bank to Hudson Canyon and to study marine food and its availability to a number of groundfish species were the main objectives of this cruise by the U. S. Bureau of Commercial Fisheries research vessel Albatross IV.

Around-the-clock fishing operations were conducted with a No. 36 trawl (lined). A total of 86 fishing and 2 hydrographic-plankton stations were occupied, 128 bathythermograph casts were made, and 300 sea-bed drifters were released. Otoliths were removed from 31 cod, scales were taken from 473 haddock and 1,190 yellowtail flounder, and 1,760 stomachs from many species were examined. Hy-

drographic and plankton data were collected. Temperature data were collected on a specific transect to compare with the temperature readings taken from an airplane with infrared equipment.

There were on the cruise two biologists from the Marine Fisheries Laboratory of the New Jersey Division of Fish and Game. Fluke and porgy are extremely important to New Jersey commercial and sport fishermen, and the present cruise provided an opportunity for cooperative work on the winter distribution of those two species.

Note: See Commercial Fisheries Review, Sept. 1963 p. 37.

North Atlantic Fisheries Exploration and Gear Research

TUNA DISTRIBUTION STUDIES IN NORTH ATLANTIC CONTINUED:

M/V "Delaware" Cruise 63-11 (November 13-25 and December 2-10, 1963): This exploratory long-line cruise continued seasonal coverage of the tuna populations in waters east of New England and south of Nova Scotia by the U.S. Bureau of Commercial Fisheries exploratory fishing vessel Delaware. The objectives of the cruise were to: (1) investigate the distribution, abundance, and migration of tuna and swordfish; (2) evaluate the tuna and swordfish commercial fishing potential in the Northwest Atlantic; and (3) collect descriptive oceanographic data.

Previous pelagic long-line explorations in the Northwest Atlantic during November and December had been limited to the work of the Japanese exploratory fishing vessel Shoyo Maru in December 1959, and that of the Woods Hole Oceanographic Institution research vessel Crawford in November 1960.

New information was obtained by the Delaware during cruise 63-11. The known range of albacore (Thunnus alalunga), yellowfin (Thunnus albacares), big-eyed (Thunnus obesus), and skipjack (Katsuwonus pelamis) in the late fall season was extended north to 41° latitude and east to 60° longitude by a significant catch at station No. 4 (see table). The catch of 12 albacore on 420 hooks at Station No. 8 (2.9 fish per 100 hooks) proved to be the highest known catch rate for this species in the Northwest Atlantic. The conspicuously small catch of bluefin tuna (Thunnus thynnus) suggested that this species had not moved into the oceanic (Gulf Stream front) area from continental slope waters.

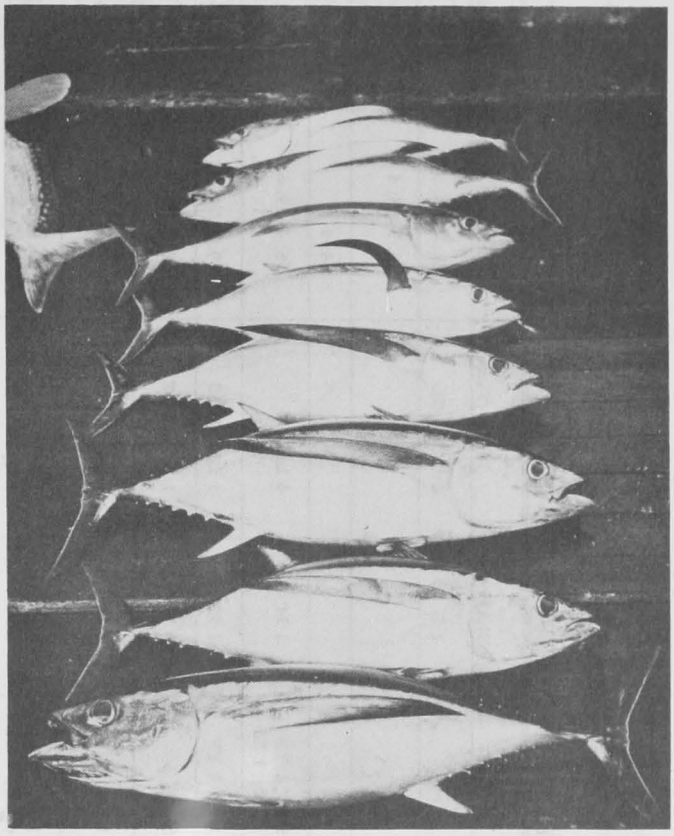


Fig. 1 - Albacore tuna from a Delaware long-line set off New England on November 23, 1963.

Of the 12 long-line sets (3,570 hooks) completed during the cruise, 8 were daylight sets and 4 were night sets. Gear consisted of Japanese-type long-line (160 fathoms of mainline with 7 branchline assemblies per "basket"). Several "baskets" were modified to test new long-line gear components: polypropylene mainline and branchline, vinyl-covered galvanized wire leaders, and aluminum leader crimping ferrules. Floatline lengths were varied at 10, 20, and 30 fathoms to determine relationships of catch to depth and temperature. A minimum of four bathythermograph casts were made at each long-line station. Squid, herring, and mackerel were used to determine bait selectivity.

Seven temperature transects between stations provided thermal environmental data to assist in positioning long-line sets. The long-line set at Station No. 4 was of particular interest because of its position across a "thermal wall;" on the warm side, the catch pro-

Station Data and Catches for M/V Delaware Cruise 63-11

Sta. No.	Date 1963	Time	Position Lat.	Position Long	Gear & Set No.	No. of Hooks	Tuna	Sharks	Misc. Fish	Surf Temp. ° F.	Remarks [1]
1.	11-15	0730-1445	42-02N	64-06W	LL#1	420		1 P	2 LL, 2 SL	52.7-53.0	
2.	11-17 11-18	2150- -0815	42-00N	62-45W	LL#2 DNNL	210				52.3-53.4	
3.	11-20	0000-0200	41-28N	60-12W	DNNL					54.5	
4.	11-20	0635-1410	41-14N	59-56W	LL#3	420	5 A, 2 YF 1 BE, 1 SJ	1 M	4 LL	55.4-69.6	1A - Lost
5.	11-21	0625-1355	40-39N	62-16W	LL#4	420	1 A, 4 YF	1 B	1 LL, 1 LS	69.3-71.9	3 YF - Tagged
6.	11-21 11-22	2150- -1050	41-00N	62-48W	LL#5 DNNL	210	6 BE	3 M	1 LL, 1 LF 2 SW	59.7-60.9	5 BE - Tagged
7.	11-22	0645-1315	41-06N	62-45W	LL#6	210	1 YF, 2 BE	1 M	1 LL	50.4-59.9	1 YF - Tagged 2 BE - Tagged
8.	11-23	0625-1415	40-22N	64-00W	LL#7	420	12 A, 6 YF 4 BE, 2 BF	1M	3 LL 1 Opah	50.6-54.5	4 A - Tagged 4 YF - Tagged 2 BE - Tagged 2 BF - Tagged
9.	12- 5	0620-1420	40-15N	64-12W	LL#8	420	6 A, 5 BE	1 M	1 LL	51.5-64.1	1 A - Tagged 3 BE - Tagged 1 A - Lost 1 M - Tagged
10.	12- 5 12- 6	2140- -1050	40-13N	65-45W	LL#9	210	1 A		1 SW, 1 C 1 LF	53.9-63.0	1 A - Tagged
11.	12- 6	0700-1305	40-12N	65-44W	LL#10	210			2 SL 1 Opah	53.9-61.8	
12.	12- 7 12- 8	2135- -1025	39-06N	66-26W	LL#11 DNNL	210	1 BE	1 B, 1 M		62.5-63.0	
13.	12- 8	0635-1235	39-07N	66-30W	LL#12	210			1 SL, 1 R	62.9-63.0	
		Totals				3,570	25 A, 13 YF, 19 BE, 2 BF, 1 SJ	1 B, 8 M 1 P	13 LL, 1 R 5 SL, 2 Opah 3 SW, 2 LF 1 C, 1 LS		6 A - Tagged 8 YF - Tagged 12 BE - Tagged 2 BF - Tagged 1 M - Tagged 2 A - Lost

1/Fish tagged and released are included in the catch; fish lost at the rail are not included in the catch.
Abbreviations: Gear: LL = Long line; DNNL = Dip net, Night light.
Tuna: A = Albacore; BE = Big-eyed; BF = Bluefin; YF = Yellowfin; SJ = Skipjack.
Sharks: B = Blue; M-Mako, P = Porbeagle.
Misc. Fishes - LL = Long-nose lancetfish; SL = Short-nose lancetfish, SW = Swordfish; R = Pelagic ray; C = Centrolophus sp.; LF = Lepidocybium flavobrunneum; LS = Longbill spearfish.

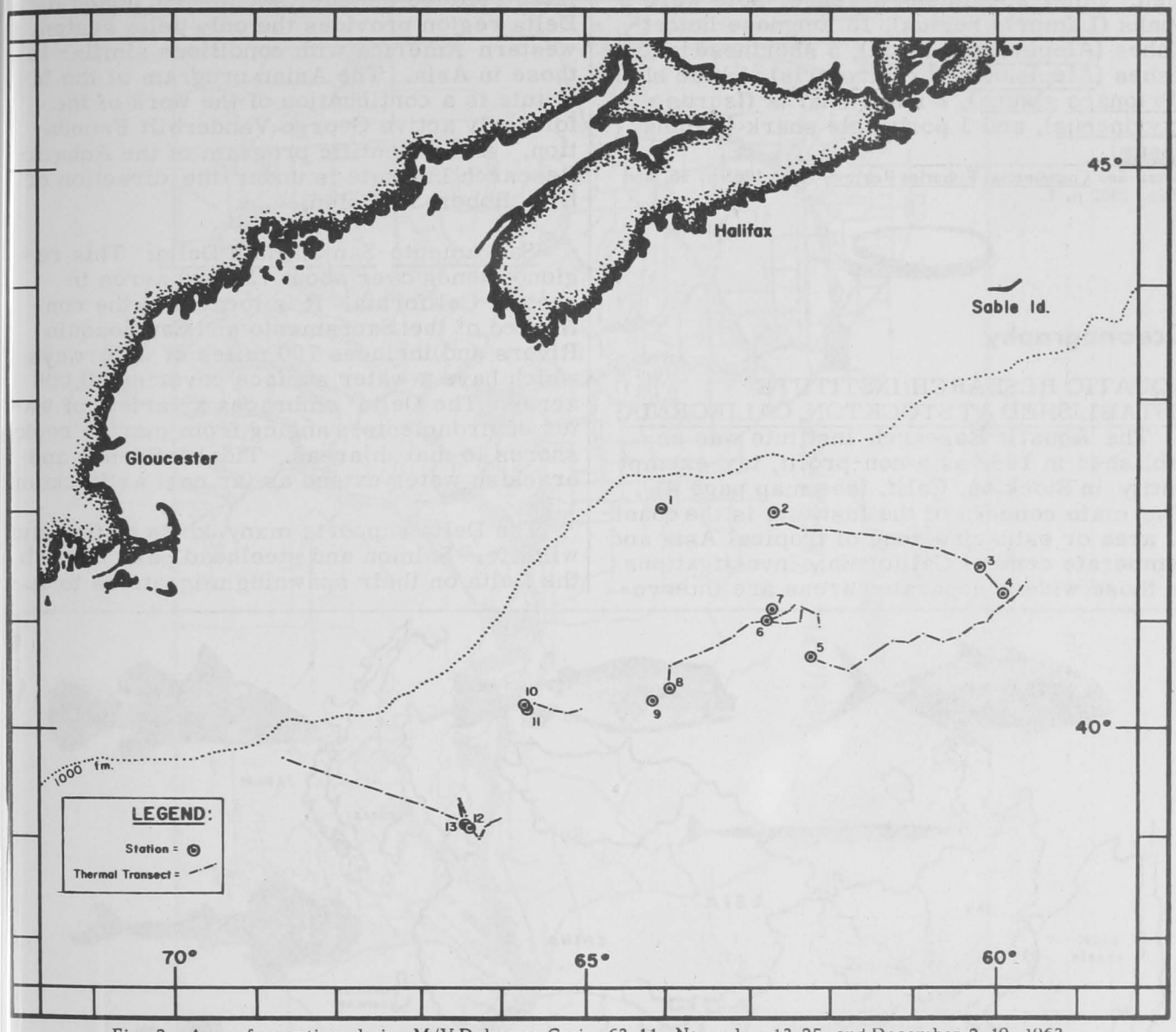


Fig. 2 - Area of operations during M/V Delaware Cruise 63-11, November 13-25, and December 2-10, 1963.

gressed from skipjack to albacore and yellowfin at the "wall," and ended with a single big-eyed tuna on the colder side of the "wall."

During the bait selectivity tests at station nos. 4, 5, 7, and 8, herring and squid baits were used on alternate "baskets." The albacore catch on herring was eight times that on the squid bait, and all yellowfin taken at those stations were caught on herring. Mackerel and squid were fished during night sets; the catch was too small to indicate a bait preference although two small swordfish (Xiphias gladius) (41 and 75 pounds) were caught on mackerel, while a 300-pound swordfish was taken with herring bait.

The average weight of the tuna in the catch were: albacore 31 pounds, big-eyed 60 pounds, yellowfin 52 pounds, bluefin 65 pounds, and skipjack 21 pounds. The only tuna that sustained shark damage was a 125-pound big-eyed. Fish that were not needed for additional study were tagged and released.

Aside from the tuna and swordfish catch, several other specimens of scientific interest were taken during the cruise, including the longbill spearfish (Tetraturus pfluegeri), 1 specimen; the gempylid (Lepidocybium flavo-brunneum), 2 specimens; the black ruff (Centrolophus niger), 1 specimen; and the pelagic stingray (Dasyatis violacea); 1 speci-

men. Other specimens of lesser note were 2 opahs (Lampris regius), 13 longnose lancetfishes (Alepisaurus ferox), 5 shortnose lancetfishes (Alepisaurus brevirostris), 1 blue shark (Prionace glauca), 8 mako sharks (Isurus oxyrinchus), and 1 porbeagle shark (Lamna nasus).

Note: See Commercial Fisheries Review, Aug. 1963 p. 36, and Feb. 1962 p. 1.

Oceanography

AQUATIC RESEARCH INSTITUTE ESTABLISHED AT STOCKTON, CALIFORNIA:

The Aquatic Research Institute was established in 1962 as a non-profit, tax-exempt entity in Stockton, Calif. (see map page 41). The main concern of the Institute is the coastal area or estuarine zone of tropical Asia and temperate central California. Investigations in those widely separated areas are interrelated because the Sacramento-San Joaquin Delta region provides the only delta system in western America with conditions similar to those in Asia. The Asian program of the Institute is a continuation of the work of the formerly active George Vanderbilt Foundation. The scientific program of the Aquatic Research Institute is under the direction of Dr. Robert R. Rofen.

Sacramento-San Joaquin Delta: This region extends over about 738,000 acres in central California. It is located at the confluence of the Sacramento and San Joaquin Rivers and includes 700 miles of waterways which have a water surface covering 50,000 acres. The Delta embraces a variety of water environments, ranging from marine rocky shores to marsh areas. Tidal influence and brackish water extend as far east as Stockton.

The Delta supports many kinds of fish and wildlife. Salmon and steelhead pass through the Delta on their spawning migrations to up-

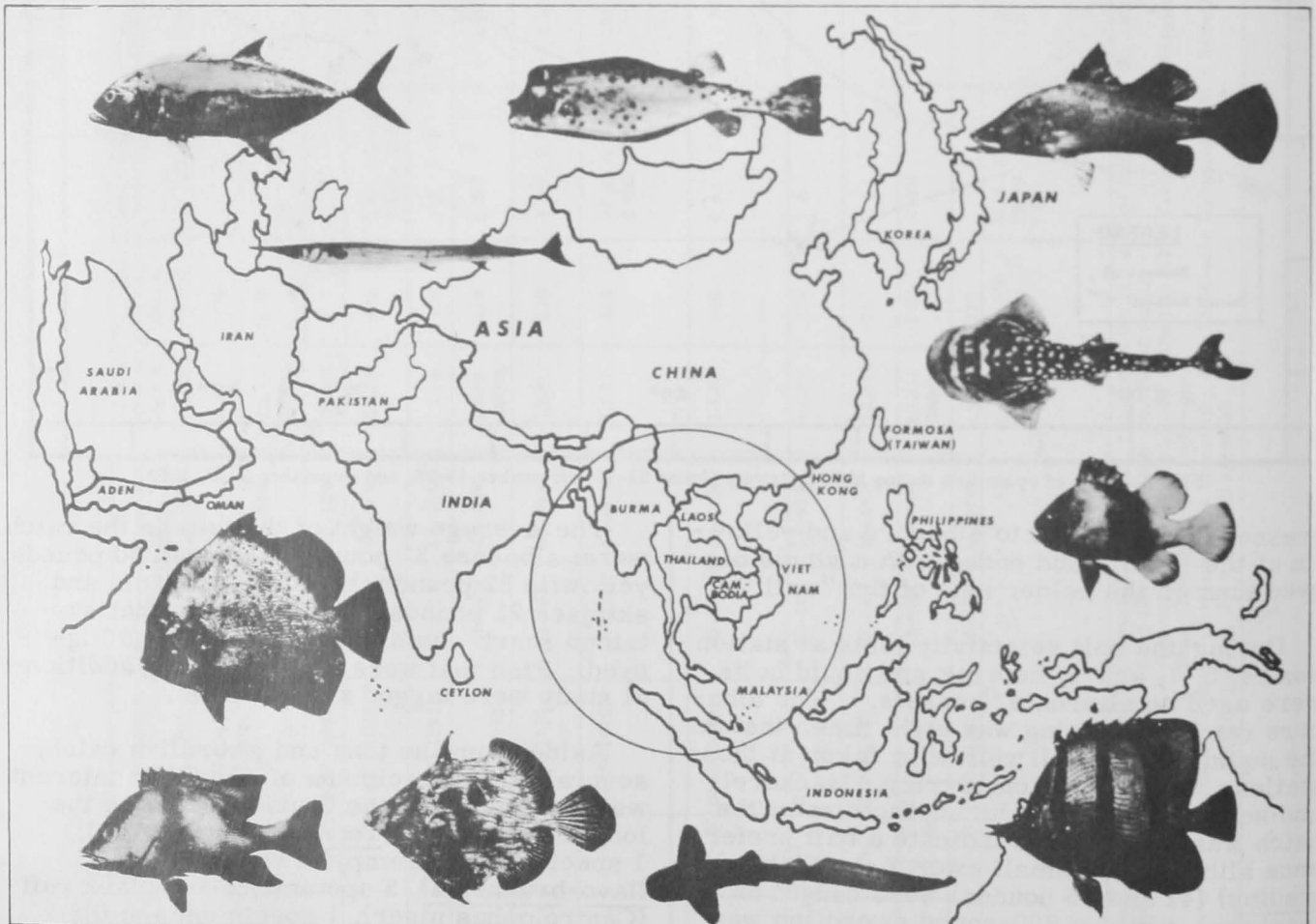


Fig. 1 - Shows the Asiatic region (where one-half of the world's people live) with its seas and estuaries, good sources of food if fishery resources can be properly developed.

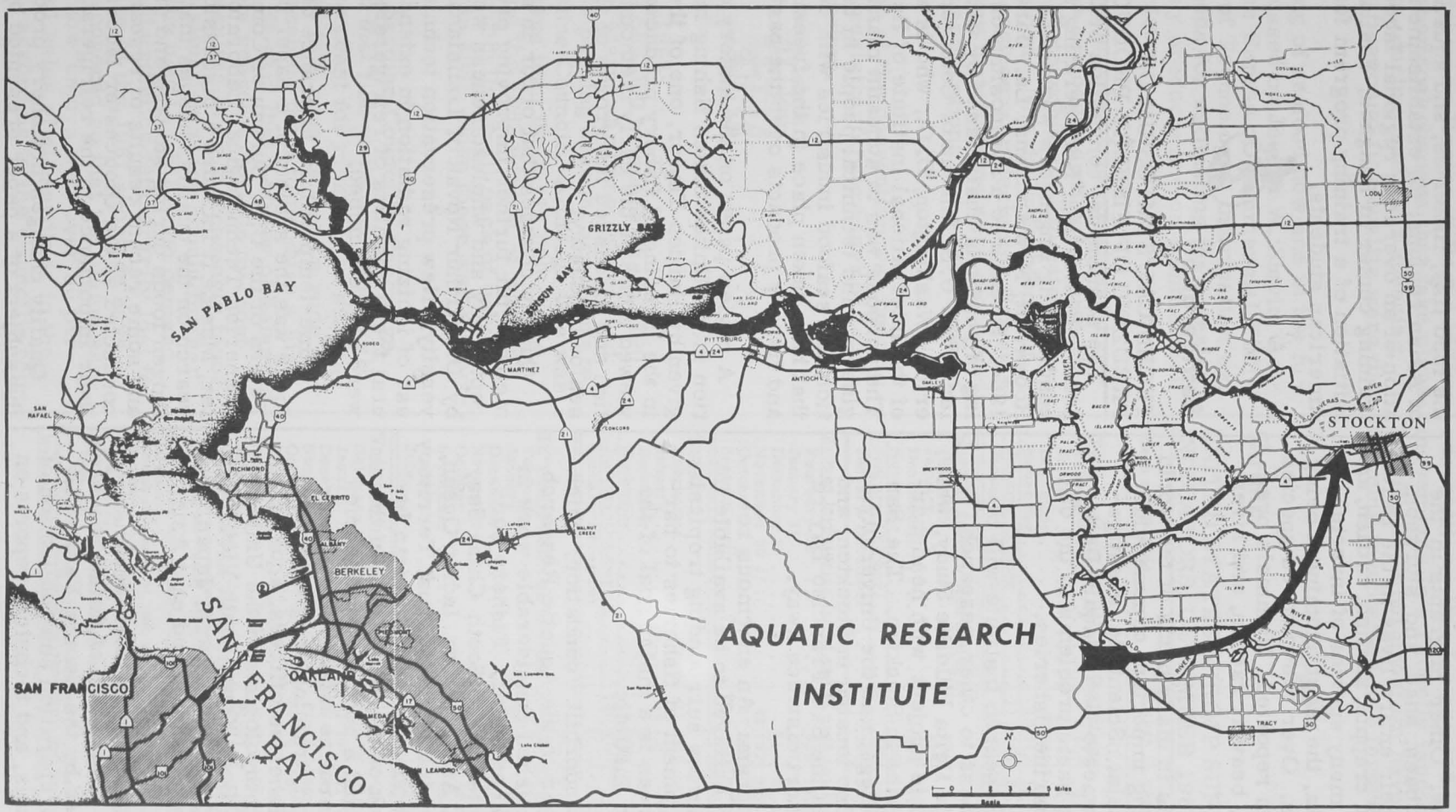


Fig. 2 - Shows the Sacramento and San Joaquin Delta area in central California.

stream tributaries. Other migrants in the Delta are striped bass, shad, and sturgeon. Fish which live their entire lives in the Delta area include bass, crappie, sunfish, catfish, and carp. There are many species of invertebrates in the Delta, the most prominent being shrimp and clams. Over two hundred species of birds have been reported. Mammals present include mink, beaver, racoon, and river otter.

Tidal estuaries in many parts of the world today are providing important commercial quantities of protein. Scientific investigations in the Sacramento-San Joaquin Delta can aid in solving basic problems in the development of estuarine fisheries.

The Aquatic Research Institute will be aided by its nearness to other research groups such as the Delta Wildlife Study, which is a California State project with headquarters and laboratories in Stockton. The San Joaquin Delta College, and the University of the Pacific are also located in Stockton, and the universities in the San Franciso Bay region are only a short distance away.

The Asian Program: An enormous resource of food is believed to be available in the seas and estuaries surrounding tropical Asia. The development of fisheries to harvest those resources is a major goal of the Aquatic Research Institute.

The George Vanderbilt Foundation, which was the forerunner to the Aquatic Research Institute, accomplished considerable work in Asia between 1950 and 1961. Fishery surveys were conducted in the South China Sea, Gulf of Thailand, Andaman Sea, Indian Ocean, French Oceania, Line Islands, Trust Territory of the Pacific Islands, and the Hawaiian Islands. A handbook of the food fishes of the Gulf of Thailand and a book on the fisheries of the Western Caroline Islands were completed. In addition, training programs were carried out for fisheries officers, aquatic biologists, and ichthyologists of the United States, Thailand, Hong Kong, South Viet Nam, Philippines, South Korea, Taiwan, Japan, and other countries of southeast and east Asia.

The plans of the Aquatic Research Institute call for: (1) completion of Asian research programs initiated by the George Vanderbilt Foundation; (2) preparation and publication of handbooks, manuals, and technical reports on the food fish, fisheries, and aquatic ecology of Asian regions; (3) establishment and operation of an overseas regional laboratory and training center in Bangkok, Thailand; and (4) initiation of a training program for Asian and American students.

Refrigeration

TECHNICAL SYMPOSIUM ON FREEZING OF FISHERY PRODUCTS:

The semiannual convention of the American Society of Heating, Refrigerating and Air-conditioning Engineers was held at the Hotel Roosevelt, New Orleans, La., January 27-29, 1964. It featured a symposium on the freezing of seafoods chairmaned by Charles Butler of the U. S. Bureau of Commercial Fisheries, Washington, D. C., who is a member of the International Institute of Refrigeration. The purpose was to acquaint managers, engineers, and technical people in the refrigeration and seafood industries with developments that have taken place in the freezing of fish and fishery products over the past 40 years.

A review paper on the history of refrigeration in the United States fishing industry was given by Harden Taylor, one of the pioneers in the freezing of fishery products. It reviewed some of the early methods of freezing fish and discussed the growth of the frozen seafood industry.

Quality changes that occur in shrimp and methods for further improving product acceptability and wholesomeness were discussed by Dr. Arthur Novak of Louisiana State University. New preservation techniques on the use of ionizing radiation in extending the natural fresh qualities of refrigerated shrimp were also described.

Time-temperature tolerance of frozen foods was the subject of a paper by John Peters of the U. S. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass. It included a discussion of research on the quality changes that occur in frozen foods during storage and distribution; and some recent results of research being conducted at the Gloucester laboratory and their importance to the refrigeration industry.

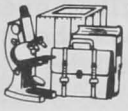
Quality changes in fishery products was the subject of a paper presented by Dr. William

Dyer of the Fisheries Research Board of Canada. The biochemical changes that take place in fish prior to, during, and after freezing, and their significance to fish quality were discussed.

The freezing of seafood now and in the future was discussed by Joseph W. Slavin, Acting Chief of the Bureau of Commercial Fisheries Branch of Technology. Information was given on methods for estimating the freezing rates of fishery products and on commercial freezing techniques.

A paper on the role of the refrigeration engineer in the seafood industry by Luke St. Onge of V. C. Patterson and Associates concluded the session. The daily problems of refrigeration engineers in designing fish storage and freezing installations were discussed; some specific applications were dealt with in detail.

Registration at the convention was open to the public and registrants were invited to attend the symposium.



Sardines

MAINE PACK, 1963:

A total of 1,584,000 standard cases (100 3¾-oz. cans) of Maine sardines was canned during the 1963 packing season, according to the Maine Sardine Council. Although this was considerably less than the 2,117,000 cases produced during the 1962 season, it was well ahead of the critically small pack of only 671,000 cases in 1961, when there was a shortage of fish.

The Maine Sardine Council's Executive Secretary said that fish were abundant in all areas along the coast for most of the season in 1963 and that this gave canners a wide selection which enabled them to produce a high quality pack. He said that a policy of balanced production from season to season by most canners had resulted in an increasingly favorable inventory situation which should further improve with the usual high Lenten demand. "Markets and distribution temporarily lost to imports because of the 1961 shortage have been mostly recovered so that the Maine sardine industry now enjoys well over 50 percent of the total sales of all sardines in the United States," according to the Council's representative. He also pointed out that volume movements in a recently launched export market development program have further helped to bring inventories into favorable balance.

Shrimp

UNITED STATES SHRIMP SUPPLY INDICATORS, DECEMBER 1963:

Item and Period	1963	1962	1961	1960
	. . . (1,000 Lbs., Heads-Off). . .			
Total landings, So. Atl. and Gulf States:				
February	3,986	4,123	3,910	3,784
January	3,993	3,833	5,686	5,402
December	10,300	8,615	6,538	7,099
November	13,212	12,177	9,996	14,454
January-October	115,448	85,047	74,861	119,481
January-December	138,960	105,839	91,396	141,035
Quantity canned, Gulf States 1/:				
February	281	241	90	204
January	592	492	183	266
December	2,180	1,879	816	894
November	2,400	2,727	2,175	1,535
January-October	24,752	18,604	11,508	23,965
January-December	29,332	23,210	14,500	26,394
Frozen inventories (as of end of each mo.) 2/:				
February 28	28,039	19,012	37,612	29,063
January 31	28,487	21,328	37,842	34,332
December 31	3/	31,577	19,755	40,913
November 30 4/	42,142	27,500	20,668	37,264
October 31 4/	37,418	21,315	17,811	31,209
September 30	27,356	12,843	13,361	24,492
Imports 5/:				
February	12,100	10,599	8,932	7,657
January	13,139	12,907	12,338	8,596
December	3/	15,798	15,442	12,411
November	14,759	17,964	14,852	13,516
January-October	120,474	107,421	95,988	87,492
January-December	3/	141,183	126,268	113,418
	(¢/lb., 26-30 Count, Heads-Off)			
Ex-vessel price, all species, So. Atl. and Gulf Ports:				
February	85.7	78.9	53.5	51.8
January	85.0	76.3	52.5	49.5
December	6/54-65	82.9	75.2	54.2
November	6/52-62	84.5	73.5	54.0
October	6/51-64	90.0	68.7	53.0
September	6/55-64	90.9	70.1	52.2
August	59.0	83.6	66.1	52.0
July	63.5	82.1	55.8	54.6
Wholesale price froz. brown (5-lb. pkg.) Chicago, Ill.:				
February	102-106	93-95	69-71	65-67
January	102-106	91-94	69-71	64-66
December	75-82	101-107	91-92	68-70
November	71-78	105-110	89-92	69-73
October	67-75	108-115	83-90	69-73
September	73-77	113-118	87-90	65-70
August	75-81	110-112	76-91	64-67
July	77-97	3/	70-75	72-77

1/Pounds of headless shrimp determined by multiplying the number of standard cases by 30.3. The figures in the section (Quantity canned, Gulf States) have been completely revised beginning with February 1963 on the basis of a new conversion factor (formerly 33.0 pounds per case).
2/Raw headless only; excludes breaded, peeled and deveined, etc.
3/Not available.
4/Inventory of September 30, 1963, includes 2,868,000 pounds; and November 30, 1963, includes 1,189,000 pounds for firms not reporting previously.
5/Includes fresh, frozen, canned, dried, and other shrimp products as reported by the Bureau of the Census.
6/Range in prices at Tampa, Fla.; Morgan City, La., area; Port Isabel and Brownsville, Texas, only.
Note: December 1963 landings and quantity used for canning estimated from information published daily by the New Orleans Fishery Market News Service. To convert shrimp to heads-on weight multiply by 1.68.

* * * * *

POSTLARVAL STUDIES INDICATE POSSIBLE VALUE AS INDEX OF ADULT POPULATION:

The first year of the postlarval shrimp study being made by the Mississippi Gulf Coast Research Laboratory under a U. S. Bureau of Commercial Fisheries contract was completed in October 1963. Although identification of all specimens to species has not been completed, it seems likely that a satisfactory index for prediction of the adult population of commercial species of shrimp is being established. Retention of all samples has produced a large quantitative collection of many species living along the shores of Mississippi Sound and adjacent bays. Records of hydrographic data are extensive.

The contract with the Bureau has been renewed and data for another year will be collected and compared to what has already been completed.

Smoked Fish

STATUS REPORT ON SMOKED FISH-PROCESSING STUDIES CONDUCTED IN GREAT LAKES REGION:

The progress made on smoked fish processing studies to test the effects of certain process time/temperatures for the production of smoked chub is outlined in a report issued on January 10, 1964, by the Regional Director, U. S. Bureau of Commercial Fisheries, Ann Arbor, Mich. The studies were conducted at the Bureau's Great Lakes Technological Laboratory in Ann Arbor.

One of the first objectives of these smoked fish-processing studies was to evaluate product quality as affected by interim processing guidelines provided by the U. S. Food and Drug Administration (FDA) and States concerned with the subject. Initial tests were completed by early January, and procedures that were used, results obtained, and their significance to the fishing industry follow:

General Procedures:

1. Raw Material: Fifty-pound blocks of dressed "medium" chub frozen at 0° F. in alginate were used.

2. Thawing of Blocks: The 50-pound blocks were removed from frozen storage and thawed by immersing in a tank of cold tap water for periods of time ranging from 8-12 hours.

3. Brining: The brining operation was conducted in a large plastic tank. Granulated salt was poured into the empty tank in an amount estimated to make a sufficient quantity of brine. Cold tap water was then added to the tank by use of a hose. Hose pressure was used to stir the mixture to facilitate solution. Salometer readings were made at frequent intervals to achieve desired brine strength.

4. Smoking: After brining, the fish were individually hung head-down on "smoke-sticks." The weight of fish on each stick was then obtained to the nearest 0.1 pound for "brined weight." These sticks have a series of pairs of sharp-pointed nails protruding on two sides. The fish are hung on the sticks by skewering them at the tail-end on the nails. Each stick held about 5 pounds of fish, and 2 sticks were used to evaluate each of the subsequent treatments.

Traditional wood-fired ovens were used for tests 1 and 2. For subsequent tests, a small gas-fired smokehouse was used in order to achieve controlled conditions of temperature (no control of relative humidity).

During each test, thermocouples were inserted into several representative fish and others were left exposed in several locations within the smokehouse. Continuous recordings were made of internal temperature of product and smokehouse temperature by use of a gas-fired 24-point recording potentiometer.

For all tests using the gas-fired oven, the smokehouse remained cold until the fish were loaded therein. After loading, heat was applied to the oven, at which time the smoke generator was turned on and smoking was continued throughout the process.

After processing, the fish were removed from the smokehouse and placed in a 0° F. freezer for a minimum of one hour to cool. After cooling, the fish were weighed to the nearest 0.1 pound to obtain "smoked weight."

5. Holding Conditions: Upon completion of weighing, the fish were packaged either in bulk or vacuum packs, and either frozen at 0° F. or stored at 36° F.

Yield: Percentage yield was obtained by the following formula:

$$\frac{\text{smoked wt.}}{\text{brined wt.}} \times 100 = \% \text{ yield}$$

Results:

1. Raw Fish: Analyses of frozen, raw control samples were as follows:

% water - 75.9
% fat - 7.0
% salt - 0.1

2. Smoked Fish: Analyses of smoked samples heated to various internal temperatures were as follows:

Test No.	Brine Strength	Maximum Internal Temp. °F.	Percentage of Water	Fat	Salt	Yield
1	25° - 12 hrs.	165°	68.7	9.6	4.0	70
2	25° - 12 hrs.	180°	63.4	9.3	4.5	57
3	25° - 15 hrs.	180°	69.0	8.2	4.9	72
4	25° - 15 hrs.	180° for 30 min.	67.3	7.2	6.0	67
5	25° - 15 hrs.	160° for 5 hrs.	57.8	9.5	7.6	54

Note: Unless otherwise indicated, product was removed from oven when maximum internal temperature was attained. Otherwise, maximum internal temperature was maintained for time period indicated.
Tests 1-2 conducted in wood-fired smokehouse.
Tests 3-5 conducted in gas-fired smokehouse.
Tests 3-4 total process time of $2\frac{3}{4}$ hours.
Test 5 total process time of $6\frac{3}{4}$ hours.

3. Pasteurization after Smoking: Samples of smoked fish were vacuum-packaged in plastic pouches and placed in water heated to 190° F. It required 40 minutes for the internal temperature of the product to reach 180° F.; this temperature was then maintained for an additional 30 minutes.

The plastic pouch used for water-bath pasteurization was a lamination of cellulose and polyethylene. Although the pouch remained intact during the treatment, it acquired a "frosted" appearance. However, more suitable materials would be readily available commercially.

It was noted that little or no moisture or oil was rendered from the smoked fish into the pouch as a result of pasteurization such that the product's appearance would be objectionable. The meat of the pasteurized fish remained firm and moist.

Discussion:

The primary purpose of the tests was to determine the effect on product quality of processing smoked chub to an internal temperature of 180° F. for 30 minutes. The attribute of quality was considered, for this purpose, to be the general eating qualities of flavor, texture, and degree of moistness of the edible portion, plus the general appearance of the product as contrasted with that of chub smoked in the traditional manner. Also considered were such economic factors as percentage of yield of smoked product and time required to process.

The results of the tests indicated that chub can be processed in a controlled smokehouse to an internal temperature of 180° F., maintained at this temperature for 30 minutes, and produce an acceptable product in terms of eating quality. Comparison of this product to chub smoked to lower internal temperatures (i.e., 165° F.) in wood-fired ovens permits the following general observations:

1. Over-all appearance of the new product seemed reasonably acceptable. Some wrinkling of the skin was noted, but was not judged to be excessive. Color was poor (light), but could probably be corrected with a more suitable smoke generator.

2. Yield of products smoked conventionally in a wood-fired smokehouse equalled 70 percent. Yield of products processed to 180° F. for 30 minutes in a gas-fired smokehouse equalled 67 percent (total process time = $2\frac{3}{4}$ hrs.).

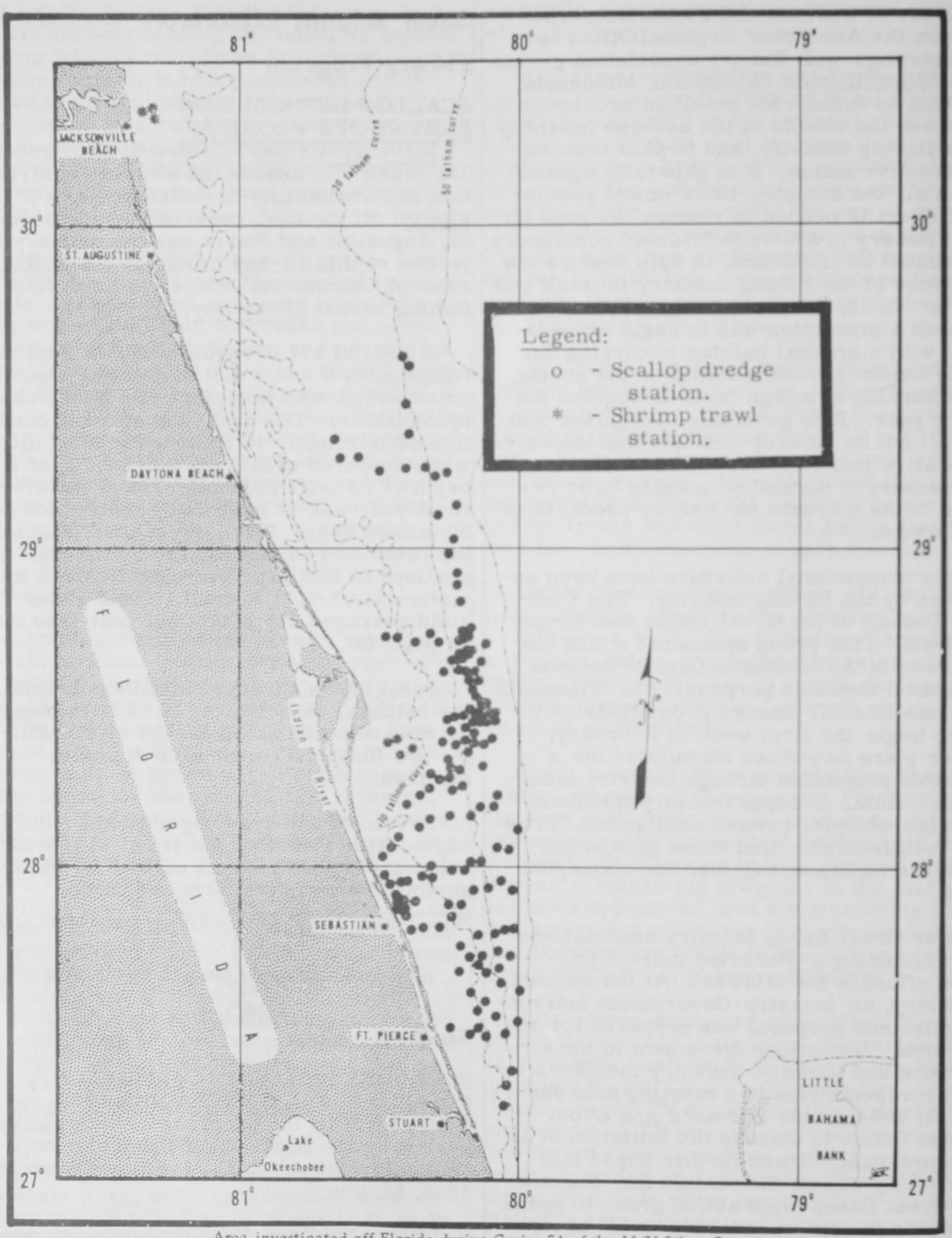
3. Incidence of fish dropping from the smoke sticks during heating was extremely low (of 300 pounds processed, a total of 3 fish fell to the bottom of the oven).

4. Taste test indicated the meat to be somewhat less moist than the conventional product, but not objectionably so.

5. Texture of meat was somewhat firmer than the conventional product.

6. Preliminary comparisons of frozen versus refrigerated samples clearly indicated significant "softening" of the texture as a result of freezing.

Smoked Fish Manual: One action the Bureau of Commercial Fisheries planned was the preparation of a manual that would describe good commercial sanitary processing and handling techniques and the significance



Area investigated off Florida during Cruise 51 of the M/V Silver Bay.

three 12 x 12 foot concrete tanks. The overflow in the tanks was arranged so that each tank held approximately 1,350 gallons of water. Approximately 100 oysters were used in each experiment. Each feeding experiment lasted 30 days. Individual oysters used for controls in one experiment were fed in the second experiment. In some experiments the situation was reversed and oysters which had been fed during one month were used as controls during the second month. In all experiments those oysters which were fed with various forms of carbohydrates increased in weight over the control experiments. In broad generalities, the gain in weight of the fed oysters was usually three times that of the controls. Further work will continue on the supplemental feeding of oysters.

Shrimp Studies: Brown shrimp were slightly more numerous at regular survey stations during the last half of 1963 than in that period of 1962. White shrimp, however, were almost five times less plentiful at regular survey stations from July through December of 1963 as during that time in 1962. Of the major kinds of commercial fish and shellfish sampled by experimental trawling, white shrimp were the only species which showed a marked decline during the last half of 1963 as compared with that period in 1962. The reasons for the decline in the numbers of white shrimp this year are not known, but it is possible that the extremely cold winter of 1962/63 was responsible. White shrimp, considerable numbers of which normally winter-over in coastal sounds and rivers, disappeared from inshore waters during the winter of 1962/63 and very few roe shrimp appeared in the spring of 1963.

Fin Fish: Experimental trawling at regular stations from July through December revealed that croakers were slightly more abundant in inshore waters during that period than during the same period of 1962. The catch for spot was also approximately the same during the two periods, indicating that there has been no major changes in population of those fish during the past two years.

Fish Tagging: Through December 1963, over 300 fish of various species had been tagged with Peterson disc tags and released throughout coastal waters. Only five tags were returned (all by sports fishermen) as of the end of 1963. The principal species tagged were croaker, spot, flounder, pigfish, whiting, sea trout, and black fish. Tags from two croakers, two pigfish, and one large king whiting were returned. The croakers and pigfish had moved only short distances from the place where they originally were caught and tagged, in spite of the fact that one fish had been free for 85 days before it was caught. The king whiting was caught on hook and line about one month after being tagged and released, approximately 22 miles from where it was originally captured.

This study will continue during 1964 and it is felt that valuable information will be obtained concerning the movements, growth rates, etc., of various species of marine fishes in South Carolina waters.

Blue Crabs: Blue crabs were slightly more abundant in experimental trawling in coastal waters during July through December 1963 as compared with that period of 1962. The average catch per unit of effort for immature crabs at regular survey stations for the July-December period of 1963 was 9.9 crabs, as compared with a catch per unit of effort of 7.5 in 1962. The average catch per unit of effort for adult blue crabs was 15.2 during the 1963 period, whereas in 1962 the average catch per unit of effort was 13.9.

Large female blue crabs were very plentiful in sounds and offshore during November and early December, but the sudden drop in water temperatures in mid-December apparently caused a migration to deeper waters offshore as trawl catches declined markedly at this time.

Pond Cultivation: Two one-acre ponds were harvested in October 1963. One of the ponds, the "fish pond," had been allowed to stock naturally by opening the flood gates on March 11 and allowing postlarval shrimp to "flow" into the pond until it was closed on May 7. The flood gates were reopened again from June 25 to August 30 for further inflowing of postlarval shrimp. The other pond, the "oyster pond," was stocked by hand during May to September with approximately 1,100 shrimp of mixed species. Both ponds were treated with rotenone on May 7 and August 7, 1963 (each pond treated twice), to remove predaceous fishes. Crab pots were used in each pond to remove crabs. As food for the shrimp over 500 pounds of chopped trash fish was put in each pond during June to September.

In 1963 the fish pond yielded 14 pounds of shrimp, heads-on, in $7\frac{1}{2}$ months. However, in

1962 the same pond treated in the same manner yielded a harvest of 163 pounds of shrimp, heads-on, in 4 months.

In 1963 the oyster pond, hand-stocked with 1,100 shrimp, gave a harvest of 855 shrimp weighing 43 pounds 6 ounces in $7\frac{1}{2}$ months. In 1962 the same pond, hand-stocked with 8,164 shrimp, gave a harvest of 15,500 shrimp weighing 238 pounds 14 ounces in 4 months. Obviously in addition to the hand-stocking some shrimp as postlarval or as small juveniles entered the pond naturally when exceptionally high tides forced open the flood gates.

The difference in the yield of the ponds, particularly the fish pond, seems to be a reflection of the scarcity of postlarval shrimp in estuarine waters of South Carolina.

New Research Vessel: On September 7, 1963, the hull of the new research vessel for Bears Bluff Laboratories was launched at Cainhoy, S. C. The boat was designed to fit specifications for estuarine research. She is 58 feet long with a beam of 18 feet and draws only 42 inches of water. After launching, the boat was towed to Wadmalaw Island and a Diesel motor was installed by the staff of the Laboratories. Carpenter work and finishing of cabin, laboratory space, and living quarters is now under way. Trial runs to check the engine were made just before Christmas. The performance of the boat was excellent.

Note: See Commercial Fisheries Review, August 1963 p. 51.

Sports Fishing

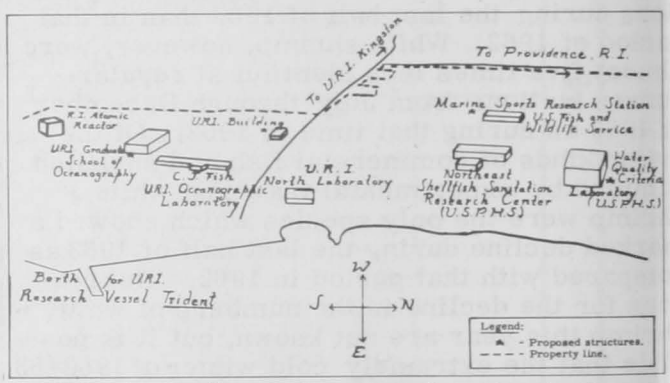
NEW FEDERAL SPORTS FISHING RESEARCH LABORATORY TO BE BUILT ON UNIVERSITY PROPERTY:

One of the final steps to locate a Federal sports fishing research laboratory in Rhode Island, was taken when the University of Rhode Island President reported on December 16, 1963, that the University and the U. S. Department of the Interior had reached an agreement, allocating a three-acre site of land for the laboratory. The University is processing the deed which will give the Federal Government a parcel of land on its Narragansett Bay Campus, directly to the west of the Northeast Shellfish Sanitation Research Center.

The Narragansett Bay Campus of the University of Rhode Island is well on its way to becoming one of the world centers for research in the marine sciences, the University's President stated. He added, the location of a third Federal facility in the area will give added impetus to this trend.

He also stated that the area will be of great benefit to the economy of Rhode Island and the nation. Though popularly neglected, there is a growing feeling that research into the sea may hold as great a potential for the future as space science.

The initial Federal investment in the area is expected to exceed $3.5 million. Counting the staff at the headquarters for the University of Rhode Island Graduate School of Oceanography, this will result in the employment of over 300 scientists, technicans, and staff people.



Sketch showing the site and where proposed structures for the new Federal sports fishing research laboratory is to be built on the University of Rhode Island's Narragansett Bay Campus.

Shortly after receipt of an allotment for site selection and engineering design, the Chief of the Division of Sports Fisheries of the Interior Department's Bureau of Sport Fisheries and Wildlife said his Unit wanted to find out what it takes to produce game fish and how they can spawn in large numbers, and get enough food.

In addition, the Division is interested in studying the effects of pollution and pesticides on fish. The Rhode Island facilities would also be used as a base to move up or down the coast to check fish migration.

Previously, the University donated 5.3 acres of land for the $1,165,000 Northeast Shellfish Sanitation Research Center, now nearing completion, and 7.2 acres for the proposed $1,750,000 Water Quality Laboratory. Still another parcel was given to the Rhode Island Atomic Energy Commission for the $1

illion nuclear reactor. (Public Information epartment, University of Rhode Island, Dember 13, 1963.)

riped Bass

AG RETURNS SOUGHT FROM
ONG ISLAND MARKING PROGRAM:

A total of 579 large striped bass have been gged along the south shore of Long Island by e New York State Bureau of Marine Fishies. The fish--ranging in size from 6 to 50 unds--were marked with red and white plasc disc tags.

The Fish Research Unit of the New York ate Bureau of Marine Fisheries late in 1963 d completed a three-year program of tagng striped bass from the surf along the south ore of Long Island (Fire Island), New York. nly fish of six pounds or heavier were tagged an effort to learn more about the moveents and seasonal migration of larger, mare striped bass. Although many thousands striped bass have been tagged at various mes and stations along the Atlantic Coast, ry few of the fish have been of considerable ze.

Biologists of the U.S. Bureau of Commerial Fisheries, having consolidated and anazed data from several sources in North arolina and Chesapeake Bay, concluded that rge striped bass which concentrate on the rth Carolina coast in winter and in Chesake Bay in later winter and spring move rthward as far as Massachusetts in spring d summer. It is important to know, from e point of view of striped bass management d utilization, if this great movement is anally cyclic and to learn if fish from the ore northern part of this species' extensive nge return in the fall as far south as the rth Carolina coast and the major southern awning grounds.

During the past three years almost 4,200 riped bass from the ocean front along Fire land Beaches were carefully examined and, those, 579 (about 14 percent) were in the large ategory. The larger fish--ranging from 6 to pounds--were marked with two red and hite plastic, serially numbered Petersen isc tags by fastening the discs on the upper ck between the dorsal fins with a stainless eel pin.

For efficient management and utilization, it is important to investigate further the extent and time of striped bass migrations. Cooperation of fishermen is needed to insure the success of the current study. Tags recovered from the striped bass tagged off Long Island should be returned, together with the date and location of capture, to New York State Conservation Department, D-J Fish Research Unit, Oakdale, New York, 11769. A nominal reward of one dollar, as well as information concerning the tagged fish, will be given for each set of red and white discs.

Transportation

RATE INCREASE SOUGHT BY
NEW ENGLAND TRUCKERS:

The New England Motor Carrier Rate Bureau held public hearings on December 18, 1963, on its proposal to increase rates and wages approximately $8\frac{1}{2}$ percent to cover higher cost of labor and supplies. Over 100 shippers and trade associations voiced strenuous opposition to the proposal.

This proposal is not intended to cover any increases in wages which may result from the current negotiations between the Teamsters Union and the trucking industry for nationwide wage increases totaling $200 million a year. It is reported that an official of the Teamsters Union opened the negotiations with a statement that truckers will be required to increase rates 7 percent to cover the cost of increased wages, and should get a 15-percent increase to cover past increases.

* * * * *

REA EXPRESS FILES TARIFFS
TO INCREASE CHARGE:

Tariffs have been filed by REA Express which would increase charges on all express movements by 25 cents per shipment effective January 27, 1964. On February 8, 1962, an increase of 10 cents per shipment was effected by this carrier and a widespread adjustment to fishery rates was made in November 1961.

Any protests by the fishing industry on the proposed increase were to be filed with the Interstate Commerce Commission (ICC) before January 17, 1964.

* * * * *

ALASKA-WASHINGTON RAIL-BARGE SERVICE EXPANDED:

A West Coast firm announced the launching, on December 11, 1963, of the Kenai, a hydro-train barge, reported as being the largest ocean vessel of that type ever built. The barge is 342 feet long with a capacity of 42 normal length railroad cars. The Kenai is to be used in weekly sailings from Seattle, Wash., to Whittier, Alaska. It will supplement the service provided by the Clair Engle, the original barge link in the all-rail route between Seattle and Whittier.

Tuna

RESULTS OF BLUEFIN TAGGING IN ATLANTIC OCEAN BY WOODS HOLE OCEANOGRAPHIC INSTITUTION:

Included in the Cooperative Game Fish Tagging Program of the Woods Hole Oceanographic Institution is the bluefin tuna in the Atlantic Ocean. The 1963 report on the game fish-tagging program points out that the most important results concern the bluefin tuna. Increasing commercial pressure on that species is shown by the dramatic increase in returns from the northwestern Atlantic fishing area, from Maryland waters to off southern New England. These rose from a total of 6 for the years 1954-1962 combined to 19 for the 1963 season alone. No less than 7 of 29 bluefin marked in the inshore waters of that area last summer have been already recaptured, as have 4 of 29 marked further offshore early in June, about 120 miles southeast of Nantucket. The other 1963 returns were obtained from 4 fish marked in 1962, 3 in 1961, and 1 in 1960. These returns suggest that in the 1963 season a group of bluefin in the 100-pound class moved west southwest from off Oceanographer Canyon to coastal waters off Ocean City, Md., then northward and eastward to off Block Island and finally into Massachusetts Bay, while smaller individuals moved from off Montauk eastward toward the Martha's Vineyard grounds and then back to the westward again. Unfortunately these samples are too small to be of conclusive statistical significance.

More tags from all species of game fish tagged by the Institution's cooperative game fish-tagging program were returned in 1963 than in the 8 previous years combined.

Since May 1954, about 1,500 bluefin tuna, 4,350 Atlantic sailfish, 2,350 white marlin, 950 Pacific sailfish, 600 striped marlin, 200 blue and black marlins, 750 greater amberjack, 200 yellowfin tuna, and 875 other fish have been marked--a grand total of nearly 12,000 fish. Returns have been obtained fro 32 bluefin tuna, 31 Atlantic sailfish, 3 white marlin, 1 striped marlin, 70 greater amberjack, 2 yellowfin tuna (from only 6 Pacific taggings), 7 striped bass, 5 crevalle jack, 1 bar jack, 3 dolphin, 2 great barracuda, 1 flul and 1 sea bass--a total of 159 returns.

Participation by individuals and clubs co tinues to increase, the Institution reports. Acknowledged is the valuable cooperation from the U. S. Bureau of Commercial Fisheries in marking fish and also in recovering tags with the necessary data. Assistance in the latter endeavor has also been furnished by the Inter-American Tropical Tuna Commission and by the Cape Cod Tuna Corporation, Eastport, Maine, and the Maryland Tun Corporation, Cambridge, Md. Basic financi support for the program is from the National Science Foundation, supplemented by grants from the Charles W. Brown, Jr. Memorial Foundation, the National Geographic Society, the Sport Fishing Institute, the International Game Fish Association, the Van Camp Foundation, the Associates of the Woods Hole Oceanographic Institution, and numerous oth er organizations and individuals.

Increased tagging of Atlantic bluefin tuna in all possible areas is the Institution's mos urgent objective at present. The importanc of prompt and accurate reporting of tagging is emphasized. Some very important returns have proved of dubious value due to lack of tagging data.

U. S. Fishing Vessels

FISHERIES LOANS AND OTHER FINANCIAL AID FOR VESSELS, OCTOBER 1-DECEMBER 31, 1963:

From the beginnning of the program in 1956 through December 31, 1963, a total of 1,341 loan applications for $35,872,047 were received by the U. S. Bureau of Commercial Fisheries, the agency administering the Federal Fisheries Loan Fund. Of the total, 689 applications ($15,737,240) have been approve

49 ($11,531,721) have been declined or found ineligible, 157 ($6,084,422) have been withdrawn by applicants before being processed, and 36 ($2,733) are pending. Of the applications approved, 273 were approved for amounts less than applied for. The total reduction was $675,931.

The following loans were approved from October 1, 1963, through December 31, 1963:

New England and Middle Atlantic Areas: Medford Reed, Boothbay Harbor, Maine, $800; Silver Sea, Inc., Boston, Mass., $5,000; Agatha and Patricia, Inc., Medford, Mass., $50,000; Dias Fishing Corp., New Bedford, Mass., $18,296; and Peter Edson Sprague, Narragansett, R. I., $32,000.

California Area: Michael F. Schroeder, Atos, $5,365; Dean Holder, Crescent City, $1,000; and Donald E. Dodson, Santa Cruz, $10,000.

Pacific Northwest Area: Frank A. Taylor, Newport, Oregon, $3,000.

Alaska Area: Fred L. Birch, Auke Bay, $1,472; Albert Lauth, Craig, $2,600; and Walter R. and Leota Farmer, Valdez, $6,000.

Under the Fishing Vessel Mortgage Insurance Program (also administered by the Bureau) during the last quarter of 1963, 6 applications for $330,162 were received and 1 application for $36,412 was approved. Since the program began (July 5, 1960), 36 applications were received for $3,889,129. Of the total, 28 applications were approved for $3,359,046 and 8 applications for $1,503,750 were pending as of December 31, 1963. Since the mortgage program began, applications received and approved by area are:

New England Area: Received 10 ($1,025,365), approved 8 ($775,365);

California: Received and approved 1 ($57,000);

South Atlantic and Gulf Area: Received 18 ($1,180,468), approved 12 ($437,164);

Pacific Northwest: Received 6 ($1,486,296), approved 4 ($507,546);

Alaska: Received 1 ($40,000). Not yet approved.

No applications for the Fishing Vessel Construction Differential Subsidy were received from July through December 31, 1963, as the authority to accept applications expired on June 12, 1963. Since the beginning of that program on June 12, 1960, 13 applications were received for $1,101,770, of which 6 applications were approved for $546,103, and 7 applications for $555,667 were pending.

* * * * *

DOCUMENTATIONS ISSUED AND CANCELLED:

November 1963: During November 1963, a total 37 vessels of 5 net tons and over was issued first documents as fishing craft, as

Table 1 - U. S. Fishing Vessels 1/--Documentations Issued and Cancelled, by Areas, November 1963 with Comparisons

Area (Home Port)	Nov. 1963	Nov. 1962	Jan.-Nov. 1963	Jan.-Nov. 1962	Total 1962
	(Number)				
Issued first documents 2/:					
New England	1	2	21	27	28
Middle Atlantic	1	-	17	2	3
Chesapeake	6	6	60	41	43
South Atlantic	6	6	71	46	47
Gulf	20	12	229	106	110
Pacific	2	5	152	127	130
Great Lakes	1	1	5	5	5
Puerto Rico	-	2	2	2	2
Total	37	34	557	356	368
Removed from documentation 3/:					
New England	2	1	43	20	24
Middle Atlantic	2	1	44	34	39
Chesapeake	4	1	23	23	23
South Atlantic	2	3	49	38	38
Gulf	11	3	111	98	104
Pacific	7	11	82	103	111
Great Lakes	1	3	14	21	22
Hawaii	-	-	3	3	3
Puerto Rico	-	-	-	1	1
Total	29	23	369	341	365

1/For explanation of footnotes, see table 2.

Table 2 - U. S. Fishing Vessels--Documents Issued and Cancelled, by Tonnage Groups, November 1963

Gross Tonnage	Issued 2/	Cancelled 3/
	(Number)	
5-9	6	9
10-19	8	8
20-29	3	5
30-39	1	-
40-49	1	2
50-59	-	2
60-69	3	-
70-79	12	-
80-89	1	3
290-299	1	-
450-459	1	-
Total	37	29

1/Includes both commercial and sport fishing craft. A vessel is defined as a craft of 5 net tons and over.
2/Includes 2 redocumented vessels in November 1963 previously removed from records. Vessels issued first documents as fishing craft were built: 27 in 1963; 1 in 1956; and 9 prior to 1951.
3/Includes vessels reported lost, abandoned, forfeited, sold alien, etc.
Source: Monthly Supplement to Merchant Vessels of the United States, Bureau of Customs, U. S. Treasury Department.

compared with 34 in November 1962. There were 29 documents cancelled for fishing vessels in November 1963 as compared with 23 in November 1962.

* * * * *

October 1963: During October 1963, a total of 36 vessels of 5 net tons and over was issued first documents as fishing craft, as compared with 25 in October 1962. There were 28 documents cancelled for fishing vessels in October 1963 as compared with 30 in October 1962.

Table 1 - U. S. Fishing Vessels 1/--Documentations Issued and Cancelled, by Areas, October 1963 with Comparison

Area (Home Port)	Oct. 1963	Oct. 1962	Jan.-Oct. 1963	Jan.-Oct. 1962	Total 1962
	(Number)				
Issued first documents 2/:					
New England	2	1	20	25	28
Middle Atlantic	-	-	16	2	3
Chesapeake	9	6	54	35	43
South Atlantic	6	3	65	40	47
Gulf	15	7	209	94	110
Pacific	4	7	150	122	130
Great Lakes	-	1	4	4	5
Puerto Rico	-	-	2	-	2
Total	36	25	520	322	368
Removed from documentation 3/:					
New England	3	-	41	19	24
Middle Atlantic	-	2	42	33	39
Chesapeake	3	3	19	22	23
South Atlantic	2	6	47	35	38
Gulf	13	9	100	95	104
Pacific	7	10	75	92	111
Great Lakes	-	-	13	18	22
Hawaii	-	-	3	3	3
Puerto Rico	-	-	-	1	1
Total	28	30	340	318	365

1/For explanation of footnotes, see table 2.

Table 2 - U. S. Fishing Vessels--Documents Issued and Cancelled, by Tonnage Groups, October 1963

Gross Tonnage	Issued 2/	Cancelled 3/
	(Number)	
5-9	11	7
10-19	6	13
20-29	2	5
30-39	-	1
40-49	1	1
60-69	5	-
70-79	5	1
80-89	1	-
100-109	1	-
140-149	2	-
160-169	1	-
240-249	1	-
Total	36	28

1/Includes both commercial and sport fishing craft. A vessel is defined as a craft of 5 net tons and over.
2/Includes 3 redocumented vessels in October 1963 previously removed from records. Vessels issued first documents as fishing craft were built: 29 in 1963; 1 in 1962; 5 prior to 1951; and 1 unknown.
3/Includes vessels reported lost, abandoned, forfeited, sold alien, etc.
Source: Monthly Supplement to Merchant Vessels of the United States, Bureau of Customs, U. S. Treasury Department.

U. S. Foreign Trade

IMPORTS OF CANNED TUNA UNDER QUOTA

United States imports of tuna canned in brine during January 1-November 30, 1963, amounted to 48,238,342 pounds (about 2,297,0 std. cases), according to data compiled by the Bureau of Customs. This was 6.9 percent less than the 51,796,996 pounds (about 2,466,524 std. cases) imported during January 1-December 1, 1962.

The quantity of tuna canned in brine whic could be imported into the United States dur ing the calendar year 1963 at the 12½-percen rate of duty was limited to 63,130,642 pounds (or about 3,006,221 std. cases of 48 7-oz. cans). Any imports in excess of the quota were dutiable at 25 percent ad valorem.

* * * * *

IMPORTS OF FISH MEAL AND SCRAP BY CUSTOMS DISTRICTS, OCTOBER 1963:

U. S. imports of fish meal and scrap in October 1963 totaled 31,449 short tons, a decline of 9.3 percent from the 34,666 tons imported in the previous month, but a sharp increase from the 12,732 tons imported in October 1962.

About 87.9 percent of the fish meal and scrap imports in October 1963 entered through the Customs Districts of Maryland, Georgia, Mobile (Ala.), Galveston (Tex.), Los Angeles (Calif.), San Francisco (Calif.), and Washington.

U. S. Imports of Fish Meal and Scrap by Customs Districts, October 1963

Customs Districts	October 1963
	Short Tons
Maine and New Hampshire	120
Maryland	6,338
North Carolina	1,378
Georgia	4,253
Mobile (Ala.)	4,435
Sabine (Tex.)	1,114
Galveston (Tex.)	2,989
Los Angeles (Calif.)	2,639
San Francisco (Calif.)	4,063
Washington	2,943
Dakota	195
Duluth (Minn.) and Superior (Wis.)	456
Michigan	397
Other Customs Districts	1/129
Total	31,449

1/Includes 30 tons of fish meal classified as fertilizer.
Note: A list of the entry ports included within each Customs District is given in Schedule D, Code Classification of United States Customs Districts and Ports, which may be obtained free from the Foreign Trade Division, Bureau of the Census, U. S. Department of Commerce, Washington, D. C. 20233.

* * * * *

TRENDS IN UNITED STATES EXPORTS OF FISHERY PRODUCTS BY COUNTRY, 1962:

In 1962, the annual value of United States exports increased slightly over 1961. The value of fishery products exported during 1962 was $35,728,000, up 3 percent from the previous year.

Table 1 - Value of United States Exports of Fishery Products, 1953-1962

Year	Edible	Inedible	Total
	(US$1,000)		
962	22,470	13,258	35,728
961	19,594	15,116	34,710
960	25,622	18,543	44,165
959	26,747	17,495	44,242
958	19,440	11,564	31,004
957	20,549	15,403	35,952
956	22,939	16,564	39,503
955	24,923	15,054	39,977
954	16,238	15,289	31,527
953	17,084	10,794	27,878

Trend by Countries: During 1962, U.S. fishery products ere exported to 103 countries. Of total exports, 63 per- nt was shipped to five countries: Canada, United King- m, Netherlands, Switzerland, and West Germany (table 2).

Table 2 - United States Exports of Fishery Products by Selected Countries of Destination, 1958-62

Country	1962	1961	1960	1959	1958
	(US$1,000)				
anada	8,846	10,265	10,309	8,644	9,200
nited Kingdom	8,249	4,554	8,460	8,928	5,785
etherlands	2,273	2,385	4,350	4,352	2,007
witzerland	1,712	738	1,082	762	387
est Germany	1,467	1,555	2,201	2,888	3,043
weden	1,076	1,665	2,613	3,176	681
rance	1,073	1,007	1,048	766	68
apan	939	2,984	3,295	928	501
aly	869	423	643	303	158
elgium and Luxembourg	547	351	537	746	948
reece	487	364	313	306	136
orway	403	2,390	1,390	1,296	1,063
ong Kong	383	368	269	229	127
exico	375	459	616	663	393
hilippines	320	582	2,494	5,587	2,578
enezuela	274	360	461	614	641
uba	243	-	175	787	490
ustralia	198	458	444	157	31
cuador	171	82	293	193	236
ther	5,823	3,720	3,172	2,917	2,531
otal	35,728	34,710	44,165	44,242	31,004

CANADA: Canada has been the principal market for nited States fishery products. In 1962, Canada took prod- s valued at $8,846,000 or about 25 percent of the total .S. exports of fishery products. Fresh or frozen fish and ellfish made up most of the U.S. exports of fishery prod- s to Canada. Some of the important commodities ex- rted to Canada were:

	1962	1961
hrimp, fresh or frozen	$2,081,000	$ 1,675,000
hrimp, canned	1,462,000	1,570,000
eal furs	1,024,000	1,777,000
ish, fresh or frozen	766,000	891,000
ish, shellfish, and other marine animal products, inedible	703,000	703,000
hellfish, fresh or frozen	1,874,000	2,928,000
ther	936,000	722,000
Total	$8,846,000	$10,266,000

UNITED KINGDOM: In 1962, exports to the United King- om rose to the 1959 and 1960 level of $8,000,000, an 81-percent increase over 1961. Sharp increases in the major commodities accounted for this rise as fish oil alone more than doubled in value. Major fishery commodities exported to the United Kingdom were:

	1962	1961
Salmon, canned	$5,622,000	$3,056,000
Fish and marine-animal oils	1,511,000	568,000
Shrimp, canned	682,000	557,000
Salmon, fresh or frozen	138,000	141,000
Other	296,000	232,000
Total	$8,249,000	$4,554,000

OTHER COUNTRIES: Exports to Norway, Sweden, Netherlands, and West Germany consisted mainly of fish oils. Switzerland took largely seal furs. Principal products exported to Japan were frozen shrimp and unmanufactured shells. France received significant amounts of frozen salmon and canned and frozen shellfish.

Trend by Areas: During 1962, Europe remained the principal destination for fishery products exported from the United States (table 3). Products valued at $18,800,000 or 53 percent of total exports went to Europe. North America was second with $10,856,000 or 30 percent.

Table 3 - United States Exports of Fishery Products by Area of Destination, 1962

Area	Edible	Inedible	Total
	(US$1,000)		
North America	8,104	2,752	10,856
Asia	2,234	1,385	3,619
Europe	9,957	8,843	18,800
South America	572	135	707
Africa	1,220	97	1,317
Oceania	383	46	429
Total	22,470	13,258	35,728

Trend by Commodities: Canned salmon was the principal dollar earner among U.S. fishery exports. Fish oil was second in importance. Exports of seal furs showed some gain with Canada and Switzerland taking 65 percent of the total.

Table 4 - Value of United States Exports of Fishery Products by Selected Commodities, 1958-62

Commodity	1962	1961	1960	1959	1958
	(US$1,000)				
Fish oils	6,047	8,908	10,688	11,902	7,761
Seal furs	3,851	3,097	3,309	2,580	1,511
Shells, unmanufactured	1,285	1,380	2,636	977	624
Miscellaneous fish (mostly freshwater), fresh or frozen	1,135	809	947	622	1,036
Oysters, shucked	311	448	497	575	567
Salmon:					
Fresh	872	647	1,677	659	476
Cured	528	593	435	372	357
Canned	7,292	5,580	9,830	10,639	6,669
Mackerel, canned	671	581	211	135	333
Miscellaneous fish (mostly California anchovies), canned	460	391	355	326	496
Sardines, canned not in oil	1,285	1,336	3,443	5,843	3,231
Shrimp:					
Fresh or frozen	3,299	3,694	2,303	1,682	1,463
Canned	2,572	2,487	3,383	2,898	2,548
Squid, canned	729	353	691	906	501

* * * * *

TRENDS IN UNITED STATES FISHERY IMPORTS, BY COUNTRY 1962:

The value of annual imports of fishery products entering the United States increased to a new high in 1962. In that year, 113 countries shared in the United States market for fishery products. The value of fishery products imported was $475,248,000--19.7 percent over the 1961 value. The imports of edible fishery products amounted to $400,882,000; inedible $74,366,00.

Trend by Countries: Canada, Japan, and Mexico continued to be the leading suppliers of fishery products to the United States (table 1). These countries accounted for 58 percent of the value of fishery imports. Canada provided 24 percent of the total, Japan 22 percent, and Mexico 11 percent. Peru, South Africa Republic, Norway, Australia, and Iceland were the next leading suppliers with imports ranging from $11,000,000 to $24,000,000. Imports from Brazil, El Salvador, Ecuador, Panama, Portugal, India, and Denmark, each were valued over $5,000,000.

CANADA: Canada, with fishery products valued at $116,168,000, continued to be the principal supplier of fishery products to the United States. The value of fishery imports increased 7.5 percent over 1961. Leading commodities were as follows:

	1962	1961
Fresh or frozen:		
Lobster	$ 15,000,000	$ 14,570,000
Fresh-water fish	11,737,000	12,173,000
Fish blocks	15,162,000	14,294,000
Groundfish fillets	12,526,000	11,581,000
Salmon	5,298,000	5,860,000
Halibut	7,791,000	6,133,000
Flounder fillets	5,422,000	5,210,000
Fresh-water fillets	2,187,000	5,404,000
Scallops	4,810,000	3,322,000
Other fresh or frozen	7,310,000	5,110,000
Canned lobster	5,507,000	4,682,000
Fish meal and scrap	5,193,000	3,544,000
Cod, haddock, etc., pickled or salted	6,698,000	7,420,000
Other fishery products	11,527,000	8,732,000
Total	$116,168,000	$108,035,000

JAPAN: The value of fishery imports from Japan was $105,246,000, an increase of 19 percent over 1961. Tuna and pearls remained the leading commodities. U.S. imports of fishery products from Japan were as follows:

	1962	1961
Fresh or frozen:		
Albacore	$ 9,759,000	$ 8,544,000
Albacore loins and discs	669,000	1,127,000
Other tuna	16,025,000	9,462,000
Other loins and discs	3,118,000	1,626,000
Shrimp	2,740,000	1,201,000
Swordfish	6,232,000	6,391,000
Fresh-water trout	747,000	776,000
Frog legs	1,362,000	740,000
Canned:		
Light meat tuna in brine	12,053,000	11,269,000
White meat tuna in brine	7,912,000	7,487,000
Salmon	2,238,000	2,667,000
Crab meat	4,635,000	5,756,000
Clams	809,000	972,000
Pearls, cultivated	17,934,000	16,136,000
Other	19,013,000	14,107,000
Total	$105,246,000	$88,261,000

MEXICO: Mexico ranked third as a supplier of fishery products to the United States. Shrimp was the principal commodity. Mexico furnished 51 percent of the total value of all U.S. shrimp imports. The value of imports from Mexico is:

	1962	1961
Shrimp	$46,700,000	$40,094,000
Other	6,827,000	5,672,000
Total	$53,527,000	$45,766,000

OTHER COUNTRIES: Other leading suppliers of fishery products to the United States market are listed below showing the principal product shipped and the value of U.S. imports of that product:

South Africa Republic - Rock lobster tails	$14,277,000
Peru - Fish meal	16,828,000
Australia - Lobster, frozen	13,867,000
Panama - Shrimp	7,787,000
Norway - Sardines in oil, not skinned	7,625,000
El Salvador - Shrimp	4,982,000
Brazil - Rock lobster tails	4,538,000
Ecuador - Shrimp	1,823,000
Portugal - Sardines in oil, skinned	3,001,000

Area of Origin: During 1962, North American countries continued to be the principal source of supply for fishery products imported into the United States (table 2).

Products valued at $192,624,000 or 41 percent of total fishery imports came from North American sources. Imports from Asian countries were second, Europe third.

Table 1 - Value of United States Imports of Fishery Products (Edible and Inedible) by Selected Countries of Origin, 1962 1/

Country	1962	1961	1960	1959	1958
	(US$1,000)				
Canada	116,168	108,035	102,877	101,967	107,005
Japan	105,246	88,263	85,256	96,226	84,872
Mexico	53,527	45,766	36,705	32,869	28,005
Peru	24,819	16,729	14,270	16,374	10,907
So. Afr. Rep.	19,688	14,468	12,030	12,090	9,332
Norway	18,937	15,101	12,506	16,405	12,087
Australia	14,884	10,856	9,839	8,180	7,665
Iceland	11,602	11,528	9,306	10,000	8,775
Repub. of Pan.	7,884	6,707	5,767	6,458	5,852
Brazil	6,825	5,074	3,916	3,002	2,359
Denmark	6,553	5,246	4,342	8,239	5,728
Ecuador	6,443	4,619	4,467	4,159	3,510
Portugal	5,983	6,525	5,289	5,452	5,177
India	5,638	2,777	2,363	2,239	1,547
El Salvador	5,100	5,510	4,215	1,297	660
W. Germany	4,499	4,160	4,100	1,814	1,805
Netherlands	2,997	1,736	2,562	2,628	1,509
France	2,457	2,087	2,317	2,230	1,169
United Kingdom	2,520	2,309	1,759	2,388	1,787
Chile	2,155	2,089	2,630	1,282	2,007
Angola	554	500	267	3,023	2,065
Cuba	98	1,793	3,901	4,810	5,542
Other	50,671	35,180	29,381	23,368	17,806
Total	475,248	397,058	360,065	366,500	327,171

1/Value at the foreign port of shipment.

Table 2 - Value of United States Imports of Fishery Products, by Area of Origin, 1962 1/

Area	Edible	Inedible	Total
	(US$1,000)		
North America	184,885	7,739	192,624
South America	30,493	23,114	53,607
Europe	51,177	10,504	61,681
Asia	89,551	29,979	119,530
Oceania	20,727	480	21,207
Africa	24,049	2,550	26,599
Total	400,882	74,366	475,248

1/Value at the foreign port of shipment.

Table 3 - Value of United States Imports of Fishery Products, by Selected Commodities, 1958-62 1/

ommodity	1962	1961	1960	1959	1958
	.....(US$1,000).....				
ible Products:					
resh or frozen:					
Shrimp.....	91,898	68,538	56,406	52,306	43,162
Tuna	45,715	30,228	31,713	29,728	25,377
Groundfish fillets and blocks	46,937	42,595	33,265	38,759	30,431
Lobster	57,182	49,039	44,768	38,635	35,661
Other.....	71,822	63,547	61,845	60,940	63,243
Total fresh or frozen	313,554	253,947	227,997	220,368	197,874
anned:					
Tuna	22,884	22,175	19,142	21,688	16,882
Salmon.....	3,435	3,545	7,541	11,130	11,271
Sardines.....	16,291	12,543	9,115	8,370	8,564
Crab meat....	4,701	5,780	5,514	7,947	6,116
Lobster	5,811	4,779	5,239	6,441	3,952
Other.....	18,878	17,530	16,067	17,083	15,561
Total canned .	72,000	66,352	62,618	72,659	62.346
her edible products.....	15,328	15,458	16,765	18,006	19,992
dible products:					
ish meal.....	24,298	16,740	11,068	15,884	11,335
earls	18,935	16,925	14,563	13,678	10,944
ther.....	31,133	27,636	27,054	25,905	24.680
Total inedible .	74,366	61,301	52,685	55,467	46,959
tal fishery imports	475,248	397,058	360,065	366,500	327,171

1/ Value at the foreign port of shipment.

Duties Collected: Duties collected on imports of fishery oducts into the United States during 1962 were $17,910,000 6 percent higher than in 1961. Duties collected (with the erage ad valorem equivalent) for the years 1958-62 are ed below:

ar	Duties Collected	Average Ad valorem Equivalent (Percent)
2	$17,910,000	3.8
1	16,904,000	4.3
0	15,837,000	4.4
9	17,737,000	4.8
8	16,645,000	5.1

holesale Prices

DIBLE FISH AND SHELLFISH, ECEMBER 1963:

The December 1963 wholesale price index for edible fish d shellfish (fresh, frozen, and canned) rose 1.3 percent om the previous month as a result of higher prices for ost fishery products. Compared with December 1962, the dex in December 1963 at 107.5 percent of the 1957-59 erage was lower by 11.1 percent. Prices during the same onth a year earlier were substantially higher for nearly l items in the index.

The drawn, dressed, or whole finfish subgroup index opped 2.2 percent from November to December 1963 and

was down 14.0 percent from December 1962. Prices at New York this December were lower for frozen dressed king salmon (down 4.8 percent) and frozen western dressed halibut (down about 1.0 percent). A sharp drop in prices for fresh Lake Superior whitefish (down 26.8 percent) at Chicago was partly offset by higher prices for Great Lakes round yellow pike at New York and an increase in prices for ex-vessel large haddock (up 6.7 percent) at Boston because of lighter landings. Compared with December 1962, wholesale prices in December 1963 were lower for all products in the subgroup--halibut (down 24.4 percent), king salmon (down 12.7 percent), fresh large haddock (down 7.5 percent), and Lake Superior whitefish (down 40.6 percent).

Higher prices in December 1963 for South Atlantic fresh shrimp (up 12.4 percent) at New York City and for fresh haddock fillets (up 5.3 percent) at Boston were responsible for a 4.0-percent increase from the previous month in the subgroup index for processed fresh fish and shellfish. December prices for standard shucked oysters at Norfolk were down 3.2 percent from the previous month as production got into full swing. Compared with December 1962, fresh shrimp prices in December 1963 were down 22.4 percent. Prices for other items in the subgroup also were lower than a year earlier bringing the December 1963 subgroup index down by 13.2 percent.

Higher prices in December 1963 for all processed frozen fish and shellfish products caused a 2.7-percent increase from the previous month in the subgroup index. A rising trend in frozen shrimp prices (wholesale price up 2 cents a pound at Chicago) was indicated in December 1963 although those prices were still sharply lower (down 24.8 percent) than a year earlier. Prices for small haddock fillets and ocean perch fillets also rose from November to December because of seasonally light landings. The December 1963 subgroup index was down 13.0 percent from the same month a year earlier mainly because of lower frozen shrimp prices and a slight drop in prices for flounder fillets.

Prices for canned fish products were generally higher in December 1963 as a result of low end-of-the-year stocks and the subgroup index rose 1.3 percent from the previous month. As compared with December 1962, prices in December 1963 were lower for all canned fish and the subgroup index was down by 6.3 percent.

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, December 1963 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ ($)		Indexes (1957-59=100)			
			Dec. 1963	Nov. 1963	Dec. 1963	Nov. 1963	Oct. 1963	Dec. 1962
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					107.5	106.1	106.8	120.9
Fresh & Frozen Fishery Products:					110.5	109.0	110.0	127.6
Drawn, Dressed, or Whole Finfish:					114.4	117.0	121.6	133.1
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.17	.16	133.0	124.7	104.0	143.8
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.33	.33	96.1	97.1	129.9	127.1
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.85	.89	118.0	124.0	132.7	135.2
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.41	.56	61.2	83.6	78.3	103.0
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.51	.46	83.5	75.3	83.5	88.5
Processed, Fresh (Fish & Shellfish):					111.5	107.2	106.6	128.5
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.57	.54	138.0	131.1	114.1	139.8
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.82	.73	95.5	85.0	87.9	123.1
Oysters, shucked, standards	Norfolk	gal.	7.50	7.75	126.5	130.7	128.6	132.8
Processed, Frozen (Fish & Shellfish):					101.3	98.6	97.5	116.4
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.39	.39	98.9	98.9	100.1	100.1
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.40	.38	115.8	111.4	114.3	107.0
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.35	.34	121.0	119.2	118.4	117.5
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	.78	.76	91.9	89.5	86.0	122.2
Canned Fishery Products:					102.5	101.2	101.7	109.4
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	23.50	23.25	102.4	101.3	102.4	111.1
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.06	10.88	98.2	96.6	96.6	104.4
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	5.75	5.75	97.5	97.5	97.5	2/100.0
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	8.96	8.84	114.9	113.3	113.3	119.4

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/ New product replaced California canned sardines starting December 1962; entered wholesale price index at 100 under revised procedures of Bureau of Labor Statistics.

DDT RESISTANCE SEEN IN MINNOW-LIKE FISH

Mosquitofish (Gambusia affinis), a top-feeding minnow found in the southern United States and other warm climates, is believed to be the first fish to demonstrate an apparent resistance to DDT. Mosquitofish are valuable in the destruction of mosquito larvae because of their surface feeding habits.

Three Mississippi scientists reported that mosquitofish from waters near cotton fields that had been long treated with chlorinated hydrocarbon pesticides showed a marked resistance to DDT compared with fish from areas where insecticides had not previously been used. They tested 1,175 fish.

In the past mosquitofish usually died within a few hours after exposure to DDT. Among vertebrates, fish are notable for their susceptibility to pesticides, although resistance among insects is quite common, and two species of frogs have been found resistant.

Scientists from Mississippi State University, said "one could easily imagine that a genetically resistant population (of mosquitofish) might result from periodic applications of insecticide." (Science News Letter, 83:73, February 2, 1963.)