



TRENDS AND DEVELOPMENTS

TECHNICAL NOTE NO. 2--AN INEXPENSIVE SCALLOP CLEANER BUILT FROM SPARE PARTS

By Austin B. Williams*

A vacuum cleaner modified for cleaning scallop meats, and proven workable in pilot operation, produces clean meats at a rate comparable to that attained by manual shucking. Aside from an industrial machine in which heat is used for freeing the adductor muscle preparatory to vacuum cleaning (Bullis and Love 1961), little has been accomplished in mechanizing the scallop-shucking industry.

As with many of our seafood-processing operations in the Carolinas, shucking of bay and calico scallops requires much hand labor at a low rate of pay. Conditions under which the scallops are opened require that the meats be washed after shucking to remove sand, seaweed, undesired scallop tissue, etc. Often this results in an excessively soaked, inferior product. The machine-cleaning method described here eliminates the need for washing and thus assures a higher quality product. It also eliminates some of the labor from shucking.

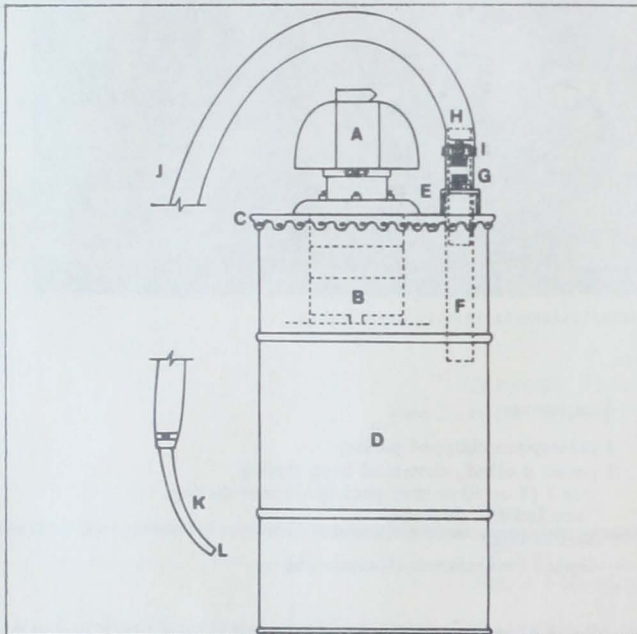


Fig. 1 - Side view of vacuum cleaner modified for cleaning scallop meats. (See text for explanation of labeled parts.)

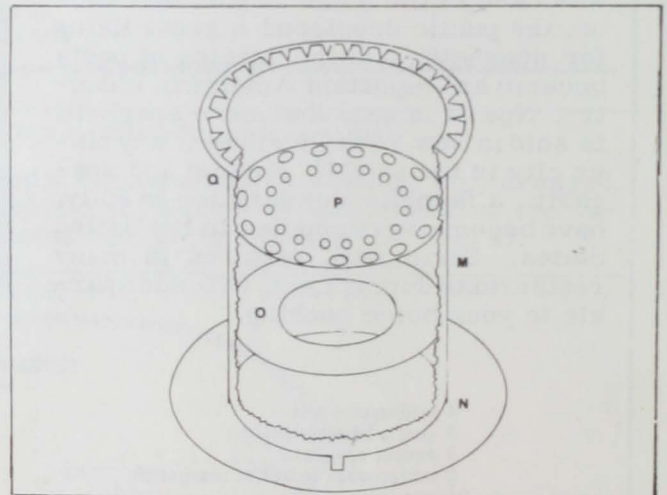


Fig. 2 - Enlarged cutaway view of baffle (part B) in fig. 1 made entirely of galvanized sheet metal: cylindrical portion (M) 6 inches in diameter by $6\frac{1}{2}$ inches deep, bottom deflector (N) separated from M by $\frac{1}{2}$ -inch space, lower internal plate (O) with $1\frac{1}{2}$ -inch center hole, upper internal plate (P) with row of $\frac{1}{2}$ - and $\frac{3}{8}$ -inch holes near circumference, relieved flange and ring (Q) for fastening to barrel lid.

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An inexpensive scallop cleaner made from commonly available spare parts was assembled and tried in a laboratory and in shucking houses. The machine (figs. 1 and 2) is simply a modification of the "shop-type" vacuum cleaner in which a barrel is substituted for the often non-waterproof dust tank, and the motor is protected from moisture. A motor and fan housing (A) from an old, home tank-type vacuum cleaner and a sheet-metal baffle (B) are bolted to a hole cut off in the center of the lid (C) of a 125-lb.-capacity grease barrel (D) in such a way that the motor and fan housing are outside of the lid, and the baffle over the suction end of the fan housing is inside the barrel when the lid is in place. A second hole cut near the opposite side of the lid, and fitted with a $1\frac{1}{2}$ -inch brass-pipe coupling (E) soldered in place, is the suction inlet to the barrel. Screwed into this coupling is a 10-inch section of $1\frac{1}{2}$ -inch pipe (F) extending below the lower level of the baffle, and a 3-inch-long nipple (G) extending upward. A $1\frac{1}{2}$ -inch chromium-plated brass automobile tailpiece pipe (H) placed inside the nipple and coupling is held in place with a slip nut (I). A $4\frac{1}{2}$ -foot length of heavy $1\frac{1}{2}$ -inch rubber gasoline hose (J) is clamped to the tailpiece, and to the hose's outer end is clamped the metal, swiveled, suction nozzle (K) originally on the vacuum cleaner hose. The sharp edge of this nozzle is blunted, to prevent cutting the meats, by inserting a short length of 1-inch I. D. copper tubing (L) soldered at the terminal edge to the vacuum nozzle. Flexibility, which allows the nozzle to be positioned conveniently for the individual operator, comes from three sources: (1) the hose; (2) the tailpiece pipe which acts as a swivel; (3) the built-in swivel in the vacuum cleaner nozzle. Suction holds the lid in place.

Total cost of parts for this machine was less than \$5.00 exclusive of motor. The round holes in the drum lid were cut by a tinsmith, but the remainder was fabricated in a home workshop.

Shuckers of bay scallops, using the conventional method, have been timed at 10-14 scallops per minute. No special effort was made to find the fastest shucker. Many do not work that fast. The women timed were asked to use the scallop cleaner, and with very little practice opened and cleaned scallops at a rate comparable to that of their accustomed method. Practice would speed the process, which consists essentially of the following steps: (1) pick up scallop; (2) remove top valve of shell with knife; (3) present all tissue cupped in lower valve to suction nozzle; (4) suction removes all tissue and debris except the adductor muscle, leaving the meat in the shell, clean and ready to be removed; (5) clip cleaned adductor muscle into meat receptacle with knife, and discard empty lower valve of shell. In this sequence it is assumed that the suction nozzle is fixed in a convenient position. It is thought that improved and larger models with valved, multiple suction nozzles could be placed in commercial use at nominal cost.

Offal, presently discarded, is trapped in the barrel for easy transferral to a dehydrator. Bullis and Love (1961) assayed this material.

The hose and nozzle can be cleaned of slime by sucking a bucketful of water into the machine. The arrangement of parts keeps the baffle dry at all times; the latter is chiefly a safeguard for the nonwaterproof motor.

The most important features of this machine are: (1) initial low cost for family enterprises; (2) cleaner, unsoaked meats; (3) a somewhat more rapid method of opening than traditional methods; (4) recovery of offal for dehydration.

LITERATURE CITED

BULLIS, HARVEY R., JR., and TRAVIS D. LOVE

1961. Applications of steaming and vacuum to shucking and cleaning scallops. *Commercial Fisheries Review*, vol. 23, no. 5 (May), pp. 1-4. (Also Sep. No. 618.)



Alaska

FOREIGN FISHING ACTIVITY OFF ALASKA, OCTOBER 1965:

U. S. S. R.: The major Soviet trawling effort in the Gulf of Alaska during the first half of October 1965, consisting of about 69 trawlers, 16 reefers, and a few support ships, operated exclusively off Dixon Entrance. After mid-month that fleet decreased to about 49 trawlers and 12 reefers, moving up the coast of southeast Alaska to Cape Ommaney. There was no Soviet activity in other areas of the Gulf until mid-October when two BMRT's appeared on Albatross Bank south of Kodiak Island. By the end of the month the Soviet fleet on Albatross Bank had increased to at least 7 BMRT factory stern trawlers.



Fig. 1 - Soviet research trawler.

In the central Aleutians a Soviet fleet of 12 trawlers and 3 reefers operated until about October 15 in the general area south of Seguam Pass. During the last half of the month, that fleet was dispersed along the south side of the Aleutians, working as far westward as Amchitka Pass.



Fig. 2 - Soviet factoryship.

The Soviet ocean perch fleet in the western Aleutians operated throughout October in the vicinity of Attu Island. That fleet decreased to about 10 trawlers and occasional support ships during the month.

A total of 7 Soviet SRT-M side trawlers reappeared on the shrimp grounds east of the



Fig. 3 - Soviet SRT side trawler.

Shumagin Islands in late October. It was the first Soviet shrimp fishing activity observed in the area since mid-September.



Fig. 4 - Soviet tanker used to service fishing vessels.

Two Soviet whaling fleets operated south of the central and western Aleutians during October. The third whaling fleet had presumably departed waters off the Alaska coast.

Japan: A Japanese trawling fleet made up of 5 factory stern trawlers fished for Pacific ocean perch in the Gulf of Alaska between Portlock Bank and Albatross Bank during October. One of the trawlers left the area by the end of the month.



Fig. 5 - Japanese stern-ramp trawler.

One Japanese large stern trawler fished in the central Aleutians during the early part of the month, at which time she either moved beyond the Alaska region covered by patrols

or returned to Japan. Three stern trawlers fished Pacific ocean perch in the vicinity of Buldir Island in the western Aleutians, with one of the trawlers departing at the end of the month.



Fig. 6 - Catch aboard a Japanese trawler.

Two Japanese whaling fleets, consisting of 2 factoryships, 14 whale killers, and 2 reefers, which had been operating in the western Aleutians since about mid-August, left that area the first week of October. Those fleets were believed had returned to Japan.

The only Japanese shrimp fishing fleet (a factoryship and 8 trawlers) remaining in the Alaska region moved during the first week of October from the known shrimp grounds near the Pribilof Islands to off the Siberian coast. The following week that fleet returned to Alaska in the vicinity of Amchitka Pass and remained there for about a week when she left the area, presumably for Japan.

Two Japanese long-line vessels, one fishing off Middleton Island and one on Albatross Bank between Trinity and Chirikof Islands, ended operations in October, while a new vessel appeared off southeast Alaska.

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JAPANESE CATCHES ON ALBATROSS BANK EXCELLENT:

A staff member of the U. S. Bureau of Commercial Fisheries spent a month during fall 1965 aboard the Japanese stern-ramp trawler Tokachi Maru. He witnessed 47 hauls for Pacific ocean perch in the Albatross Bank vicinity. Pacific ocean perch catches during that time accounted for 93 percent of the total catch tonnage. Sablefish,

blackthroat rockfish, pollock, and arrowtooth flounder made up the remainder of the catch. Even though sea conditions and weather were poor during the period (15-20 knot winds and swells of 15 to 20 feet nearly continuously), the Tokachi Maru had excellent fishing, with average catches per hour totaling over 12 metric tons. The vessels Tokachi Maru and Takachiho Maru were scheduled to fish until December, but the Daishin Maru No. 12 was reported en route to Japan. The vessels Taiyo Maru No. 82, Akebono Maru No. 53, and Koyo Maru, a new vessel, were expected to winter trawl in the Gulf of Alaska.

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LARGER SHRIMP PROCESSED AT HOMER PLANT:

A new plant in Homer started processing larger sizes of Alaska shrimp. About 1,500 to 2,000 pounds of 40-60 count heads-off shrimp were delivered each day during October. The shrimp are cleaned, sorted, and packed in 3 or 5-pound cartons for sale fresh or frozen for the institutional market. The company is also processing king and Dungeness crab.

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PROCESSING PLANT FOR BOTTOMFISH PLANNED AT KODIAK:

One of the major fish packers in Alaska has been interested in acquiring the middle section of the present city dock in Kodiak to establish a processing plant for bottomfish, scallops, and shrimp. Tentative plans are to produce both block frozen and packaged fillet products. Markets are said to have been established for the plant if it goes into production.

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NEW KING CRAB-PROCESSING PLANT AT KODIAK:

A new king crab-processing plant (a converted liberty ship) in Kodiak began processing king crab in late September 1965. The new plant adds 100 new cannery jobs and provides a market for a sizable fleet of fishing vessels.



Alaska Fisheries Investigations

SCULPIN FEED HEAVILY ON PINK SALMON EGGS:

The movements and feeding of sculpin (*Cottus aleoticus*) were studied by the U. S. Bureau of Commercial Fisheries during summer and fall 1965 at Little Port Walter in Sashin Creek. This sculpin is found in great abundance in pink salmon streams at these latitudes. Over 2,700 sculpin were marked by fin removal and branding. Subsequent recoveries showed that the sculpin exhibited little movement until pink salmon spawning began after mid-August. By mid-September, much of the sculpin population had concentrated in the upper area of the Sashin Creek spawning ground. They fed mostly on pink salmon eggs after mid-August. Observations were being continued, and the number of pink salmon eggs removed from Sashin Creek were being computed.



American Fisheries Advisory Committee

RECOMMENDATIONS AT MEETING IN CALIFORNIA:

At a 4-day meeting in San Pedro, Calif., October 25-28, 1965, the American Fisheries Advisory Committee recommended that the United States continue its efforts for international cooperation in conserving the yellowfin tuna stocks of the tropical Pacific Ocean. Participation by all nations fishing for yellowfin tuna on a substantial basis should be sought so that perpetuation of the resource can be assured, the Committee said.

The Committee also recommended: (1) an expanded oceanographic research program upon which to base wise management of the fisheries resources which are vital to the economic well-being of the United States fishermen; (2) further development and promotion of presently underutilized species to enhance the economic status of the industry; (3) further development of a fishery marketing program recognizing the capabilities and responsibilities of both industry and government; and (4) greater industry support of legislation favorable to the conservation of fisheries resources for the benefit of all Americans.

The Committee pointed out that there is a continuing need for training commercial fishermen and engineers and that greater efforts are required to protect the inshore coastal waters from the hazards of pesticides and pollution.

Discussions at the meeting included harvesting and utilization studies by the Bureau on Pacific Ocean hake, and progress made in State-Federal cooperative research and development programs under Public Law 88-309 (also known as the Commercial Fisheries Research and Development Act of 1964).

The Committee was established in 1955 under the Saltonstall-Kennedy Act to advise the Secretary of the Interior on fisheries matters. Dr. Stanley A. Cain, Assistant Secretary of the Interior for Fish and Wildlife and Parks is the Committee's chairman.

Note: See Commercial Fisheries Review, July 1965 p. 18.



American Samoa

TUNA FISHING FLEET:

During September 1965 a total of 96 foreign tuna fishing vessels were fishing out of American Samoa. They consisted of 58 Japanese, 27 South Korean, and 11 Formosan vessels. (Suisancho Nippo, October 29, 1965.)



California

ALBACORE TUNA MIGRATION STUDIES:

M/V "N. B. Scofield" Cruise 65-S-3-Albacore (May 25-June 23, 1965): To intercept schools of albacore tuna and determine their migration route into the mainland fishing grounds was the primary objective of this cruise by the California Department of Fish and Game research vessel N. B. Scofield. The cruise area ranged 700 miles offshore, between the latitudes of Guadalupe Island and Monterey, Calif. The vessel was unsuccessful in catching any albacore while trolling 7 jig lines over 2,500 nautical miles.

Another objective of the cruise was to collect oceanographic meteorological, and biological data which may be related to albacore occurrence.

Sea surface temperatures were obtained by bucket thermometer and by a thermograph which was operated continuously during the cruise. Temperatures ranged from 56.1° F. outside southern California's Channel Islands to 64.4° F. at the survey's southwestern margin.

A total of 78 bathythermograph (BT) casts was made at approximately 40-mile intervals. The BT slides were read, coded, and forwarded to the National Oceanographic Data Center in Washington, D. C., via the U. S. Bureau of Commercial Fisheries Radio Station WWD. A Nansen-bottle cast at each BT station provided temperatures at a depth of 10 meters (32.8 feet), and water samples for use in salinity determinations. Standard weather observations were made every 6 hours.

Specimens of marine life were collected at night-light stations while the vessel was on sea anchor. One pomfret (*Brama japonica*) and 330 large jack mackerel (*Trachurus symmetricus*) were caught at night with a rod and reel. Pacific sauries (*Cololabis saira*) and lanternfish (*Myctophidae*) were observed at every station worked. Saury were the most plentiful species, ranging from a few fish to schools of several hundred. Four blue sharks (*Prionace glauca*) were tagged and released for the U. S. Bureau of Commercial Fisheries. The most common invertebrates attracted to the nightlight were pteropods, cephalopods, heteropods, coelenterates, and tunicates.

Birds identified during the cruise were the black footed albatross, petrels, Xantus's murrelet, redbilled tropic bird, and a Laysan albatross.

Nothing was caught in one midwater trawl tow, and sea conditions prevented further tows.

Note: See Commercial Fisheries Review, November 1964 p. 23.

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CALIFORNIA HALIBUT TAGGING AND RELATED STUDIES:

M/V "N. B. Scofield" Cruise 65-S-4-California Halibut (August 3-19, 1965): To tag legal-sized California halibut and collect supplemental age and growth information from selected halibut was the objective of this cruise by the California Department of Fish and Game research vessel N. B. Scofield. The Ventura Flats, Channel Islands, and Santa

Barbara area comprised the general area of investigations.

During the cruise, age and growth data were taken from 27 large halibut ranging up to 36 pounds. Nineteen of those fish were large males, rarely seen in previous samples. Attempts to obtain samples of 0- and 1-ring halibut at Ventura Flats, Santa Rosa Island, Santa Cruz Island, and Goleta were unsuccessful. In all, 632 California halibut were measured, tagged, and released.

A tagged halibut released in March 1965 from the research vessel Alaska was recaptured, measured, and released. In the 162 days that fish was at liberty, it traveled 37 miles and suffered a growth loss of 0.3 inch, probably from handling and tagging shock.

A number of flatfish (*Xystreurys liolepis*, *Parophrys vetulus*, and *Pleuronichthys verticalis*) caught on the cruise were donated for research with animal chromosomes.

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ROCKFISH SPECIES COLLECTED FOR BIOLOGICAL STUDIES:

M/V "N. B. Scofield" Cruise 65-S-5-Rockfish (August 30-September 16, 1965): To obtain species of rockfish (family Scorpaenidae) for biological studies was the principal objective of this cruise in the vicinity of the southern California islands and offshore banks by the research vessel N. B. Scofield of the California Department of Fish and Game.

To save eye lenses from certain species for comparison of their proteins as a possible means of separating non-interbreeding populations was another objective. These were taken from a number of rockfish species and frozen for appraisal at the California State Fisheries Biological Laboratory.

During the cruise, hook-and-line fishing was conducted in depths from 10 to 275 fathoms, but mostly shallower than 150 fathoms because of faulty wire on the deep-sea reels. Of the 33 species of rockfish caught, the vermilion rockfish (*Sebastes miniatus*) were predominant and were taken in all general areas fished. Nearly as common were the green-spotted (*S. chlorostictus*) and pink rockfish (*S. eos*), followed by rosy (*S. rosaceus*), starry (*S. constellatus*), bocaccio (*S. paucispinis*), chilipepper (*S. goodei*), and speckled

rockfish (*S. ovalis*). The largest rockfish caught was a 22-pound cow (*S. levis*), a species that appears to favor bank habitats rather than areas adjacent to land masses.

A number of rockfish were frozen for taxonomic studies. Examination of freshly caught specimens during the cruise indicated that the species *S. rufus*, previously considered a synonym of *S. ovalis*, is a separate species.

Other than rockfish, the most commonly caught fish of the cruise was the Pacific sanddab (*Citharichthys sordidus*). Ocean whitefish (*Caulolatilus princeps*) and sheephead (*Pimelometopon pulchrum*) also were common. Blue sharks (*Prionace glauca*) were a nuisance in some of the areas fished.

Surface sea water temperatures taken varied from 61° to 69° F., but 65° F. water was the usual thing.

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FALL 1965 PELAGIC FISH POPULATION SURVEY:

M/V "Alaska" Cruise 65-A-6-Pelagic Fish (July 22-August 6, 1965): The objectives of this cruise by the California Department of Fish and Game research vessel *Alaska* in the coastal waters of southern Baja California from Magdalena Bay to Punta Eugenia were to: (1) survey the fish and invertebrates of the inshore pelagic environment; (2) assess the distribution, abundance, density, age and size distribution, and recruitment of pelagic fish populations; (3) obtain samples for blood genetic studies by the U. S. Bureau of Commercial Fisheries; (4) bring back 1965 year-class sardines for growth studies by the U.S. Bureau of Commercial Fisheries; (5) collect eye lenses of important sport and commercial fish species for racial studies; and (6) collect sharks and rays for the Los Angeles County Museum.

This was the first of 5 cruises scheduled for fall 1965 to survey the coast between Magdalena Bay, Baja California, and San Francisco. Midwater trawl and night-light stations, and scouting at night between stations comprised the survey. Since this year's (1965) survey was shorter than usual, no special efforts were made to obtain young sardines alive, midwater trawl coverage was somewhat less intensive, and light stations were more numerous in the southern part of the survey area.

A total of 28 night-light/blanket-net stations was occupied during the cruise--16 in the Magdalena Bay area, 5 around Punta Abrejos, 5 near Punta Asuncion, and 2 near Turtle Bay. There were 22 midwater trawl tows made--4 in or near Magdalena Bay, 7 between Cabo San Lazaro and Punta Abrejos, and 11 between Punta Abrejos and Punta Eugenia. A total of 86 miles was scouted while running between light stations at night.

PACIFIC SARDINES: Sardines (*Sardinops caeruleus*) were taken in 5 midwater trawl tows and at 4 night-light stations. Six of the 9 catches were made in the Magdalena Bay-Santa Maria Bay area and 1 each near Punta San Juanico, Punta Abrejos, and Punta Eugenia. One sample from Magdalena Bay, 2 from Santa Maria Bay, and 1 from Punta Abrejos were fish-of-the-year, with most fish ranging from 100 to 130 millimeters (3.9 to 5.12 inches) long. The remaining 3 samples from the Magdalena Bay area and the sample from Punta San Juanico were subadults, with most between 130 and 170 millimeters (5.12-6.69 in.) in length. Only one sample of adults was taken; those were caught just south of Punta Eugenia and were mostly between 180 and 210 millimeters (7.09-8.3 in.) long.

Sardines were about as abundant as the previous year in the Magdalena Bay area, and young fish in almost pure schools made up a large part of the catch for the second straight year. Catches north of Punta Abrejos were poorer than in the previous 2 years, being comparable to the poor catches made in 1962.

NORTHERN ANCHOVIES: Anchovies (*Engraulis mordax*) were taken in 15 trawl tows and at 1 light station. As has been the pattern in recent years, anchovies were taken at most stations and in the largest quantities. Also fitting the pattern were the far greater number of anchovy samples taken with the midwater trawl and the small quantities in many trawl catches (7 of the 15 trawl catches yielded less than 5 pounds).

A total of 13 anchovy catches were made north of Punta San Juanico. The best catches were made between Punta Abrejos and Punta Asuncion, where 3 tows made over a 20-mile stretch yielded about 1 ton of fish each. The only successful light station was in Magdalena Bay, where a little school of small fish (39-65 millimeters or 1.5 to 2.6 inches long) was attracted to the light.

The samples caught below Punta Abreojos consisted mostly of young fish ranging up to 90 millimeters (3.5 in.) long. The anchovies taken north of Punta Abreojos were somewhat larger, with most ranging in length from 100 to 130 millimeters.

Anchovy catches were similar to those made during the previous two years, although the large concentration of young anchovies noted in Magdalena Bay in the 1964 survey was absent in 1965.

PACIFIC MACKEREL: Pacific mackerel (*Scomber diego*) were taken in 3 trawl tows and at 1 light station, all south of Punta San Juanico. All catches were small and consisted of fish under 100 quarter-centimeters long. Those catches were even poorer than during 1964, which was by far the poorest of the previous 3 years.

JACK MACKEREL: Jack mackerel (*Trachurus symmetricus*) were taken in 8 trawl tows and at 6 light stations. The trawl catches consisted of from 1 to 12 small fish (18 to 43 quarter-centimeters long) scattered throughout the survey area. Five of the 6 night-light stations where jack mackerel were attracted were in Santa Maria Bay. The best catches there consisted of fish ranging from about 75 to 85 quarter-centimeters. No larger jack mackerel were taken. That species was about as abundant as during the previous 3 years.

OTHER SPECIES: Pacific round herring (*Etrumeus teres*) were taken at 7 trawl and 3 light stations, mostly south of Punta San Juanico. Thread herring (*Opisthonema* spp.) were taken at only one trawl station.

Pacific pompano (*Palometa simillima*) were taken frequently with the midwater trawl and made up an important part of the catch. They were taken in 13 tows, with catches of up to 700 individuals. Most were small, ranging from about 70 to 160 millimeters (2.8-6.3 in.) long.

California lizardfish (*Synodus lucioceps*) were also a frequent constituent of the trawl catch. They appeared in 9 tows in amounts up to 1,100 individuals and were all quite small, ranging from about 90 to 150 millimeters (3.5-5.9 in.) long.

Pelagic red crab (*Pleuroncodes planipes*) were caught in 9 trawl tows in amounts rang-

ing up to about a ton. Most of the catches were made south of Punta Abreojos and were also present at 4 light stations. Squid (*Loligo opalescens*) were present at 10 light stations and were caught in 10 trawl tows.

OTHER ACTIVITIES: Night scouting was accomplished only while running between light stations and the coverage was quite limited. A total of 69 anchovy, 4 mackerel, and 36 unidentified schools were seen. Most of the anchovy schools were near Punta Abreojos, and most of the unidentified schools were near Punta Asuncion.

Sea surface temperatures during the cruise ranged from 13.4° C. (56.1° F.) near Punta Eugenia to 23.3° C. (73.9° F.) just north of Cabo San Lazaro. Temperatures were again quite cool north of Punta Abreojos, with most readings between 16.0° and 19.0° C. (60.8° and 66.2° F.). Weather and sea conditions were good during the entire cruise and permitted completion of all planned work.

M/V "Alaska" Cruise 65-A-7-Pelagic Fish (August 17-September 3, 1965): The coastal waters of central Baja California, Mexico, from Cedros Island to Point Canoas were surveyed on this cruise. Objectives were to: (1) survey the fish and invertebrates of the inshore pelagic environment; (2) determine the amount of recruitment from the 1965 Pacific sardine spawning and to measure the population density of older fish, (3) determine the distribution and abundance of northern anchovies, Pacific mackerel, and jack mackerel; (4) collect eye lens of various species for genetic studies.

The survey was conducted by fishing a midwater trawl and a blanketnet at night. A total of 21 midwater-trawl and 18 blanketnet stations was occupied, and 147 miles of night visual scouting were logged.

Anchovies were caught on 13 stations, sardines on 9, jack mackerel on 5, and Pacific mackerel on 2. All but 4 sardine samples and one jack mackerel sample were taken on midwater trawl stations. Night scouting detected 30 anchovy and 2 sardine schools. Squid, salps, and ctenophores were caught in small quantities, rarely exceeding 10 pounds per catch. Mechanical difficulties prevented completion of work scheduled for this cruise.

NORTHERN ANCHOVIES: Anchovies were present in the vicinity of Cedros Island and

in the northern half of Sebastian Vizcaino Bay. Extremely heavy concentrations of small fish (66-88 millimeters or 2.6 to 3.5 inches long) were schooled in South Bay, Cedros Island. A 30-minute trawl tow there took 650 pounds, the best catch of the cruise.

From Santa Rosalia Bay northward, anchovies became increasingly abundant although very few were caught less than 3 miles from shore. Adults predominated in that area, with most fish exceeding 110 millimeters (4.3 inches) in length. Catches ranged from several fish up to 2,700 fish (35 pounds).

Anchovies were very scarce in the southern half of Sebastian Vizcaino Bay where sardines were predominant. Almost all school sightings were made off Blanca Bay; they were large in area but thin in depth. Trawls on those schools yielded poor catches because the net passed beneath the fish. Blanketnet stations were totally ineffective in sampling anchovies due to negative phototactic behavior of this species. But catches were considerably better than on the previous year's survey, and adult fish made up a greater proportion of the catch.

PACIFIC SARDINES: Sardines were present in South Bay, Cedros Island, and in the southern portion of Sebastian Vizcaino Bay. The 1965 year-class appeared to be another failure, as only one definite fish-of-the-year was taken. Many adult fish were in a spawning condition. Catches were considerably better than in the previous year when sardines were scarce throughout the survey area. The sardine-anchovy distribution in Sebastian Vizcaino Bay closely resembled that of the previous several years, with each species dominating a particular area of the bay. Both types of sampling gear were equally effective in catching sardines.

JACK AND PACIFIC MACKEREL: Both those species were taken in minor quantities amounting to several individuals per sample. All fish, except one sample of jack mackerel were under 100 millimeters (3.9 inches) long. No schools were seen in the survey area.

OTHER ACTIVITIES: Round herring (*Etrumeus teres*) were frequently caught mixed with sardines, and Pacific pompano (*Palometa simillima*) were commonly taken with anchovies. Midshipmen (*Porichthys myriaster* and *P. notatus*) appeared frequently in the trawl catches.

Sea surface temperatures taken on the cruise ranged from 75° F. at Point Malarri-mo to 65.5° F. at Blanca Bay.

M/V "Alaska" Cruise 65-A-8-Pelagic Fish (September 15-October 3, 1965): The coastal waters of northern Baja California, Mexico, from Acme Rock to the international border were surveyed during this cruise by the research vessel Alaska. Objectives were to: (1) determine the distribution and abundance of northern anchovies, Pacific mackerel, and jack mackerel; (2) determine the amount of recruitment of the 1965 Pacific sardine spawning and to measure the population density of older fish; (3) field test and evaluate a 30-foot midwater-trawl as a sampling tool; (4) collect anchovy stomachs for a food study conducted by the California Academy of Sciences; and (5) make incidental collections for aquarium display and taxonomic study.

The survey was conducted at night using a midwater-trawl and a blanketnet as sampling devices. A total of 51 midwater-trawl and 29 blanketnet stations was occupied, and 374 miles were visually scouted during the cruise. The trawl caught anchovies on 43 stations, jack mackerel on 13, sardines on 5, and Pacific mackerel on 2. The blanketnet took anchovies on 3 stations, sardines on 1, and jack mackerel on 2. Anchovies were present on 4 other blanketnet stations but none could be caught. Visual scouting detected 3 anchovy schools and 6 areas of anchovy surface scatter.

NORTHERN ANCHOVIES: Concentrations of fish were found between Acme Rock and Point Canoas, off Geronimo Island and Point San Jose, and in Colnett Bay. Trawl catches of 400 to 2,000 pounds were made in those areas, and echo-sounder fish traces were quite heavy. Catches elsewhere were generally light, with about 60 percent of all tows containing less than 1,000 fish. Echo-sounder traces were very light outside the areas of anchovy concentration.

Juvenile fish (under 90 millimeters or 3.5 inches long) were especially prevalent from Todos Santos Bay northward. Fish of that size were distributed close to shore, while adult fish were generally found 5 or more miles offshore.

Anchovy catches were quite similar to those of the previous year, except a few more large catches were made in 1965. There was

a noticeably larger proportion of "pinhead" sizes (less than 70 millimeters) on this cruise. Echo-sounder school traces were considerably lighter than during the previous several years.

PACIFIC SARDINES: Sardines were scarce over the entire survey area. Catches were very small, with most consisting of only a few individuals. Adults were taken off Point Canoas and San Carlos Anchorage, and in San Quentin Bay. Most of the larger fish were in spawning condition. The sample taken in San Quentin Bay contained some of the largest fish ever taken by the survey in Mexican waters and ranged up to 235 millimeters (9.3 inches) long. Fish of the 1965 year-class were extremely scarce. Samples consisting of 1 or 2 fish were taken at 3 widely separated stations.

JACK AND PACIFIC MACKEREL: Juvenile jack mackerel were taken in small quantities by the trawl. Most fish were less than 160 millimeters long and appeared to be fish-of-the-year. Adult fish apparently were able to avoid the trawl since only a few individuals of both species of mackerel were taken. One large school of adult jack mackerel was sampled by blanketnet in San Quentin Bay.

MIDWATER TRAWL FIELD TEST: A new midwater-trawl with a 30-foot-square mouth opening was tested as a possible substitute for the 50-foot trawl being used. The smaller net fished with a mouth opening estimated at 25-27 feet. It had small hydrofoil doors at the upper corners to spread the net horizontally and a combination of curved steel quarter doors at the lower corners and floats on the headrope to spread the net vertically. Towing speeds of up to 4 knots were achieved with no difficulty.

Although no direct comparative tows were made, the smaller net appeared to catch fish as effectively as the larger one. It caught all the program species including several large Pacific mackerel, a species which is not readily taken even with a large trawl. Several catches exceeded 400 pounds, while 40 percent of the successful tows contained 1,000 or more fish.

The greatest advantage of the small net is in the speed and ease with which it can be handled. It can be set and retrieved in one-third the time, and requires one-half as many men to operate than the larger net. Also, the smaller size and weight of all components

make it much safer to handle and thus permits the vessel to operate under more adverse weather conditions. From all indications this net will make an excellent sampling tool.

OTHER ACTIVITIES: Fair weather prevailed on this cruise and all scheduled work was completed. Sea surface temperatures ranged from 69° F. off Acme Rock to 60° F. at Point San Jose.

Note: See Commercial Fisheries Review, August 1965 p. 25.

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MARINE LIFE EXPLORATIONS OFF SANTA CATALINA ISLAND:

M/V "Nautilus" Cruise 65-N-4-Exploratory (August 13-16, 1965): To conduct an ecological survey from about 100 feet of water to deep water around Santa Catalina Island was the main objective of this cruise by the research vessel Nautilus of the California Department of Fish and Game. Other objectives were to sample the marine plant and animal life of the island area with a small mid-depth trawl and lobster and fish traps. Plans were to set lobster traps in depths of 100 to 600 feet in an effort to obtain information on depth distribution of lobsters.

During the cruise, lobster traps and fish traps were wired together and fished in depths of 100 to 600 feet at 50-foot depth intervals on Farmsworth Bank in the offshore waters of Santa Catalina Island. The only trap that caught lobsters (Panulirus interruptus) was one placed at 100 feet. That trap also caught 2 swell sharks (Cephaloscyllium uter), 1 tree-fish (Sebastes serriiceps), and 1 red starfish. Traps set at 150 and 200 feet caught no lobsters but caught some fish--sheephead (Pimelometopon pulchrum), swell sharks, sculpin (Scorpaena guttata), and rockfish (Sebastes spp.). Starfish and a few snails were also taken in the traps placed at those depths.

The traps set in depths of 300 to 600 feet were lost and a three-day search for them was unsuccessful.

Shallow hauls with the midwater trawl yielded no fish, and a deeper haul at 100 fathoms resulted in a badly torn net when it snagged on what presumably was a rock pinnacle.

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MARINE SPORT FISH SURVEY
OFF SOUTHERN CALIFORNIA:

Airplane Survey Flight 65-12 (September 13, 1965): This one-day survey was one in a series of instantaneous counts of poles and fishermen along the coastline. For this purpose, the southern California coastline from the Mexican Border to Jalama Beach State Park was surveyed from the air by the aircraft Cessna "182" N9042T of the California Department of Fish and Game. The counts made will eventually be used to determine shore-fishing effort in southern California.

The coastline was surveyed from south to north between 11:05 a.m. and 3:15 p.m., with a 1-hour stop at Goleta at 1:26 p.m.

A total of 118 fishermen and poles was counted during the survey. Eighteen persons (15.25 percent) were outside the project's regular shoreline sampling frame. Areas of heaviest effort were: south Camp Pendleton to San Clemente, Newport Beach to the Long Beach Rainbow Pier, and the Hollywood and Mandalay Beach area in Ventura County. Those three areas contained 41.5 percent of the fishermen counted.

Considerable fishing effort was noted in areas not included in the scheduled shoreline sampling. These survey flights will aid in determining appropriate correction factors for those activities.

Airplane Survey Flight 65-13 (September 28, 1965): This was another one-day survey flight by the Cessna "182" N9042T for the instantaneous count of poles and fishermen along the coastline of southern California. From the Mexican border north to Jalama Beach, the coastline was surveyed between 10:00 a.m. and 2:00 p.m., with a 1-hour stop at Goleta at 12:30 p.m.

In all, 114 poles were counted with 111 attending fishermen. Thirteen percent of the poles counted were outside the regular shoreline sampling area. Greatest concentrations of fishing effort were: Leo Carrillo State Beach north to Ventura, with 37 poles tallied (32.5 percent), and the Bolsa Chica Beach to Point Fermin area (19 poles; 16.6 percent).

Considerable fishing effort again was noted taking place outside of the line areas pre-selected for sampling. As determined from eight flights in 1965, this "outside effort" amounts to about 10 percent of the total noted.

These data will be used to adjust shoreline sampling estimates for those areas not covered, and to substantiate areas of greatest fishing activity.

Note: See Commercial Fisheries Review, August 1965 p. 27.

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SEA OTTER POPULATION SURVEY:

Airplane Spotting Flight 65-11-Sea Otter (September 15, 1965): To obtain a count of California sea otters (Enhydra lutris nereis), the California coastline from Cayucos to Monterey was flown on September 15, 1965, by the aircraft Beechcraft N5614D of the California Department of Fish and Game. It was the third flight in a series of four to make aerial sea otter counts for 1965.

Weather conditions were marginal during the flight and extensive fog patches along the coast restricted visibility considerably. Weather conditions also delayed the airplane's takeoff so the count was made later than the optimum hours most effective for this type of survey. Because of the marginal flying conditions, together with the fact that the otters were widely scattered, a low count was obtained. The total count taken by three spotters was 905 otters.

Note: See Commercial Fisheries Review, May 1964 p. 13.

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ANCHOVY FISHING PROPOSALS RESET
FOR CONSIDERATION BY
STATE FISH AND GAME COMMISSION:

Proposed 1965/66 regulations to govern an experimental commercial anchovy reduction fishery in California's offshore waters were rescheduled for consideration November 12, 1965, at a California State Fish and Game Commission meeting in San Diego. (At its October 1 meeting in Los Angeles, the Commission had tentatively deferred action on the proposed anchovy regulations until December 10, and adopted a resolution requesting the Governor to place the entire question of anchovy and sardine resource management before the Special Session of the California Legislature.)

In announcing his decision to reset Commission consideration of proposed regulations and permits to the November 12 agenda, the Commission president said, in part, "Since legislative resolve of the matters identified in our resolution obviously will not be forthcoming before December 10, there appears

to be no justification for further delay of Commission action on the proposals and applications now on file"

The proposed regulations would permit an experimental fishery for the taking of up to 115,000 tons of anchovies through April 30, 1966, by commercial fishing vessels for reduction into fish meal and other byproducts. The California Department of Fish and Game recommends that 100,000 tons be taken in Southern California waters and 15,000 tons from offshore waters north of Point Conception.

The proposal emphasizes the experimental nature of the recommended regulations, and would provide that the commercial anchovy reduction fishery may be terminated at any time the Commission feels such action would be in the best interest of the pelagic fish resource.

Consideration of applications from nine commercial fishery firms for anchovy reduction permits was also scheduled for the November 12 meeting. (California Department of Fish and Game, October 30, 1965.)

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EMPLOYMENT OPPORTUNITIES FOR BIOLOGISTS WITH CALIFORNIA DEPARTMENT OF FISH AND GAME:

The California State Personnel Board has announced open nationwide examinations for qualified biologists interested in career employment with the California State Department of Fish and Game as follows:

<u>Classification</u>	<u>Monthly Salary</u>
Fishery Biologist II	\$590-717
Marine Biologist II	590-717
Fishery Biologist III	717-870
Pollution Bioanalyst II	590-717
Pollution Bioanalyst III	717-870
Pollution Bioanalyst IV	829-1,088
Marine Biologist III	717-870

For the first three positions listed, the closing date for filing applications is February 4, 1966, and written examinations will be given March 6, 1966. For the last four positions listed, the closing date for filing applications is January 28, 1966, and written examinations will be given February 26, 1966.

Written examinations and subsequent personal interviews for applicants will be held in California and such other States as the number of candidates warrant and conditions permit. Personal interviews are planned for certain major cities throughout the United States. Admission to the examinations requires a college degree in biological sciences and varying amounts of either graduate work or experience in fishery research or water pollution studies.

Interested persons may obtain applications and further information by writing: State Personnel Board (Attn: Recruitment Section), 801 Capitol Mall, Sacramento, Calif. 95814.



Cans--Shipments for Fishery Products, January-August 1965

A total of 2,077,256 base boxes of steel and aluminum was consumed to make cans shipped to fish and shellfish canning plants in January-August 1965 as compared with 1,918,909 base boxes used during the same period in 1964. In 1965, there was an increase in the U. S. canned pack of Maine sardines and Gulf shrimp, but there was some decline in the pack of canned tuna and salmon.



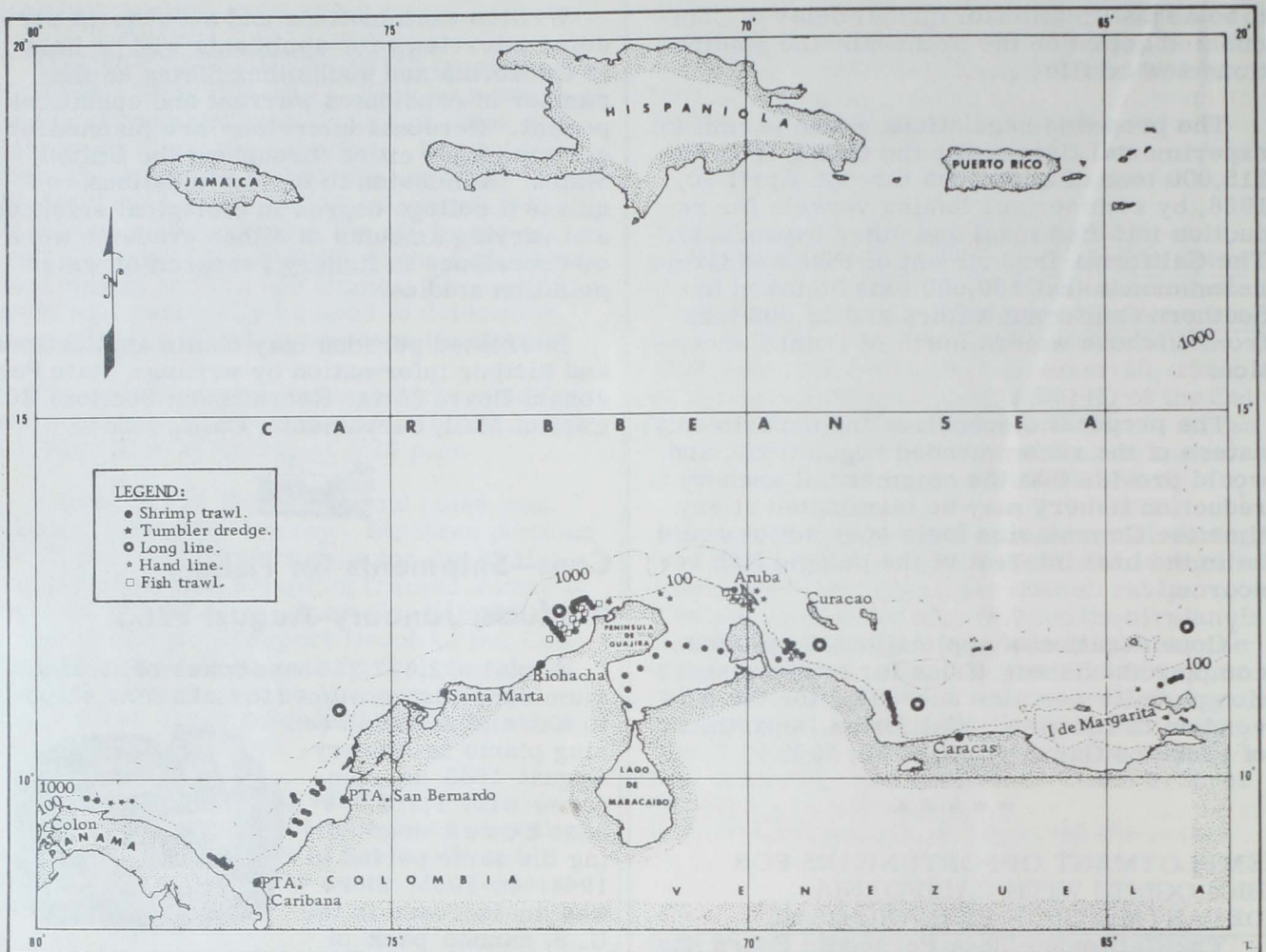
Note: Statistics cover all commercial and captive plants known to be producing metal cans. A "base box" is an area 31,360 square inches, equivalent to 112 sheets 14" x 20" size. Tonnage figures for steel (tinplate) cans are derived by use of the factor 23.7 base boxes per short ton of steel.



Caribbean and Tropical Atlantic Fisheries Explorations

TRAWLING EXPLORATIONS IN SOUTHERN CARIBBEAN:

M/V "Oregon" Cruise 104 (September 14-October 30, 1965): Exploratory fishing with trawls, long lines, and other types of gear was conducted in the southern Caribbean Sea by the U. S. Bureau of Commercial Fisheries research vessel Oregon during September and October 1965. Working in cooperation



Areas investigated during Cruise 104 of the M/V Oregon (September 14–October 30, 1965).

with the Instituto Venezolano de Investigaciones Cientificas (IVIC) and the United Nations Special Fund Caribbean Fisheries Project (UNSCFCFP), the Oregon carried out trawling explorations off central and western Venezuela, in the Gulf of Venezuela, and in the area surrounding Aruba, Netherlands Antilles. A fall-season survey of the outer shelf brown-shrimp beds off southern Colombia found by the Oregon during a trawling survey in 1964 was also completed on this cruise. Night long-lining for swordfish was carried out in coordination with the hydrographic track of the Bureau's research vessel Geronimo, which was transecting the southern Caribbean region at the same time.

During this cruise, fishing activities conducted were: 60 shrimp trawl stations (44 at shelf depths, 16 at slope depths); 15 fish trawl stations; 24 dredge stations; 5 long-line stations (500 to 890 hooks each); 5 hand-

line stations; 2 gill-net stations; and 5 night-light-dip net and 7 temperature stations.

SHRIMP: Shallow-water shrimp catches were generally poor. Exploratory drags were made with 40-foot flat trawls. Double-rig drags were made using 40-foot and 65-foot flat trawls. Hourly catch rates east of 70° west longitude were all below 5 pounds per hour. Two transects in the Gulf of Venezuela (made in cooperation with IVIC) caught brown shrimp at rates of 20 pounds per hour or less, and white shrimp at rates of 12 pounds per hour or less. Heavy seas and 65-knot winds interrupted further planned studies in the Gulf. West of Pen. de Guajira catch rates of brown shrimp were under 10 pounds per hour. Off southern Colombia, between Pta. San Bernardo and Cabo Tiburon in depths of 25 to 40 fathoms, catches of brown shrimp in mixed sizes (averaging 31-35 count heads-off) reached a high of 58 pounds in a 90-minute drag with a

65-foot trawl. Two and three-hour drags with double-rigged 40- and 65-foot nets yielded catches of 50 to 70 pounds of heads-on brown shrimp which yielded under 2 boxes of headless shrimp per night. Those catches were uniformly lower than those made during the spring 1964 cruise.

Deep-water shrimp concentrations were also low. Royal-red shrimp catches of 20 and 35 pounds, and mixed species catches of 50 pounds were made in 250 to 275 fathoms off the Golfo de Triste, Venezuela. Catches off Pena. de Paraguana, Pena. de Guajira, and southern Colombia were under 10 pounds per hour.

SWORDFISH: Two to four swordfish ranging from 25 to 225 pounds each were taken on all long-line sets, with the exception of a set made off Guajira. The Guajira set yielded a record catch of 103 sharks--101 were silkys weighing a total of 7.5 tons. Excessive gear damage was experienced, including the loss of 16 baskets (160 hooks) of long-line gear.

FISH TRAWLING: An experimental fish trawl was tested on rough bottom areas west of Aruba and off Guajira. Food fish catches were small, the best haul accounting for only 88 pounds of grouper and snapper. The catches from the Aruba area were very poor and dredge sampling indicated only "dead bottom."

TUNA OBSERVATIONS: Trolling lines were run between stations and while cruising during daylight hours. Trolling catches made consisted of 7 blackfin tuna, 7 yellowfin tuna, 9 white skipjack tuna, 1 little tuna, 13 dolphin, 1 king mackerel, 1 wahoo, 5 barracuda, 1 spearfish, and 1 frigate mackerel. Identified tuna schools off Venezuela and Colombia included 5 blackfin, 2 yellowfin, 4 skipjack, and 1 little tuna. On October 19, numerous large schools of small blackfin (estimated 3-5 pounds average) were observed and photographed 8 to 12 miles off Pta. de San Blas, Panama.

Note: See *Commercial Fisheries Review*, September 1965 p. 43; January 1965 p. 19; September 1964 p. 22.



Central Pacific Fisheries Investigations

FUNCTION OF DARK AND LIGHT MUSCLE IN TUNA STUDIED:

The backbone of the skipjack tuna is sheathed in a dark red muscle. Outside the

dark muscle lies a thicker layer of muscle lighter red in color. The two types of muscle differ sharply in their chemical makeup. This has suggested to at least one European scientist, who worked on a related species of tuna, that the relatively small dark muscle is "scarcely suited for strenuous and continued activities." He believes that the dark muscle in fish is somewhat similar to the liver in man--a storage organ in which certain substances are held until required by the body. This rather widely accepted hypothesis has now been challenged by an electrophysiologist working in Hawaii.

A study of the function of dark and light muscle in various species of tuna is being conducted under a contract between the University of Hawaii and the U. S. Bureau of Commercial Fisheries Biological Laboratory, Honolulu. The studies are being made by an Assistant Professor of Physiology of the University's Pacific Biomedical Research Center. His present work is being done at the Honolulu Biological Laboratory's Kewalo Basin Docksite, the only place in the world where living tuna are regularly available for research. There under a large circular tent are located the several pools where tuna are being used in pioneering experimental studies of behavior and physiology. The tent provides needed shade to the pools.

The University professor's research on living tuna suggests that the central dark muscle is responsible for one of the most characteristic behavioral traits of tuna--that is their ceaseless swimming. The Kewalo Basin Docksite has allowed Honolulu Laboratory scientists to document the fact that tuna never stop swimming, day or night. And although the fish is capable of bursts of considerable speed (20 miles an hour and perhaps much more), as a rule it swims quite slowly, at about 2 miles an hour. If it failed to do so, it would sink and suffocate.

This ceaseless swimming, which must begin soon after the tuna is hatched and lasts until it dies, is maintained almost exclusively by the red muscle, the professor believes. His method of documenting this is ingenious. He has constructed a plastic water-filled tank into which a tuna just fits. The fish is held gently in place by a rubber ring girdling its midsection. Oxygenated sea water flows through the gills (tuna obtain vital oxygen from the water by swimming with their mouths open, and the flowing water performs this

function for the experimental specimen. The fish's tail is free to beat in swimming movements. By sampling electrical activity from minute areas within the fish's muscles, the researcher is able to pinpoint accurately the muscle regions used in swimming movements. As a rule, these lie within the central red muscle. Only when the fish's flanks are touched and it begins to thrash about does the lighter muscle register electrical activity.

The lighter muscle thus offers the fish emergency power, which presumably is used in darting after prey or eluding predators. But it is power quickly spent. On the other hand, the dark muscle represents a source of low but constant energy. The difference resembles that between a pilot light and a flame hot enough to broil.

The professor's work casts doubt not on the biochemical evidence of the earlier investigations, but on the interpretation of it. There is no doubt that the chemical constitution of the dark muscle differs from that of the lighter. But contrary to earlier belief, the dark muscle does play a part, and it turns out to be a key part, in the muscular activity of the fish.

The professor working on the muscle study is one of three scientists using the Bureau's Honolulu Biological Laboratory's facilities to study aspects of tuna locomotion. The others are Assistant Professors of Zoology at the University of Hawaii. One of those scientists is interested in the hydrostatic aspects of tuna locomotion--how they maintain swimming depth. The other scientist is investigating oxygen consumption by the fish.

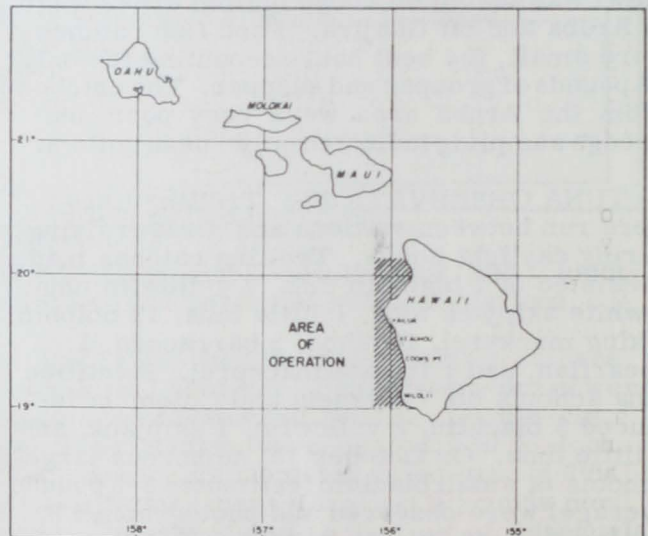
The scientist conducting the muscle study foresees the possibility that the three lines of approach will converge in the future, so that the scientists will be able to describe precisely how the tuna swims and how it affects its environment as it swims. His research is among the most sophisticated as yet performed on the skipjack tuna, "a species that before this has been largely inaccessible to experimental biologists," says one of the scientists working on tuna locomotion. The success of the electrophysiological experiments, in which the fish can be kept in a small tank for several hours, opens several new possibilities for research on tuna.

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MARINE LIFE BEHAVIOR AND RELATED BIOLOGICAL OBSERVATIONS:

M/V "Townsend Cromwell" Cruise 18
(July 25-August 27, 1965): Observations of the ecology and behavior of the marine-life community in the area of a drifting and anchored raft were among the several objectives of this cruise. The area in which the research vessel Townsend Cromwell of the U. S. Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii, operated during the cruise was within 10 miles off the west coast of Hawaii between latitude 19° and 20°10' N.

The observation raft was launched from the research vessel about 6 miles northwest of Milolii. From August 1-26, the raft drifted or was anchored off the west coast of Hawaii. During the cruise it was in the water a total of 466 hours; it was anchored for 266 hours, drifted for 168 hours, and was under tow by the vessel for 32 hours. Observations from the underwater chamber of the vessel during this phase of the cruise were made almost continuously except when the raft was being towed.



Area of operations during M/V Townsend Cromwell Cruise 18 (July 25-August 27, 1965).

Species observed around the raft were: skipjack tuna (Katsuwonus pelamis), yellowfin tuna (Thunnus albacares), dolphin (Coryphaena hippurus), triggerfish (Canthidermis maculatus), filefish (Alutera scripta), mackerel scad (Decapterus pinnulatus), jack (Seriola sp.), pilotfish (Naucrates ductor), driftfish (Psenes cyanophrys), man-of-war fish (Nomeus gronovii), rudderfish (Kyphosus cinerascens), damselfish (Abundefduf abdomi-

nalis), goatfish (Mulloidichthys auriflamma), barracuda (Sphyraena barracuda), marlin (Makaira ampla), and white tip shark (Carcharhinus longimanus). Schools of porpoise and pilot whales were also seen. About 2,800 feet of 16-mm. movies and numerous still pictures were taken.

Another objective of the cruise was to investigate the use of underwater sound as a method of influencing the behavior of tuna and other species.

Twelve days were spent in transmitting underwater sounds by J-9 transducers. Forty-six 1-hour periods of sound transmission were paired with 46 hours of silence. Sounds transmitted included swimming sounds made by schools of anchovy and miscellaneous sounds consisting of pure tones and sounds made by other marine animals.

During the 12-day period the large predators which appeared at the raft included yellowfin tuna, porpoise, pilot whales, and others, as well as smaller fish. There were no obvious overt reactions by any of those species to the transmitted sounds. The data were to be analyzed to determine if the fish were attracted to the raft by the sounds or displayed any subtle behavioral traits during the periods of sound transmission.

During this phase of the cruise, a continuous watch was maintained on a listening hydrophone. Recordings were made of the pulsed sounds which were transmitted for spectrographic analysis. No sounds attributable to fish were noted.

To investigate the use of food odor as a method of influencing the behavior of tuna and other marine life was another objective. During a 10-day experiment an odor made from squid (Loligo opalescens) was released from the anchored raft for 23 two-hour periods alternated with 23 two-hour periods during which no odor was released. Although skipjack tuna were sighted within $\frac{1}{2}$ mile of the raft, none came into the immediate vicinity during the odor experiments. There was no evidence that tuna or other fish species were initially attracted to the raft by the squid odor; excellent observations were made, however, which show that dolphin were able to detect the odor and could follow an odor gradient to its source from distances of about 65 feet.

Fish caught from around the raft were collected and preserved, and the stomach contents of 50 dolphin caught at the raft were recorded or preserved. Numerous fish were collected at the raft during night-light stations. These were brought back alive for further observation at the laboratory.

Numbered foam plastic sheets were released to obtain information on surface currents during the International Billfish Tournament. On July 26 they were released at 1-mile intervals from 1 to 5 miles west of Cook Pt., from 1 to 5 miles west of Keauhou and from 2 to 6 miles west of Kailua. The same release pattern was repeated on July 28. Ten drift cards were released with each plastic sheet. The sport-fishing fleet provided excellent assistance in the study of near-shore currents, by reporting sightings of the sheets from July 26 to 31. As a result it was possible to determine the current patterns. A pair of eddies were present offshore, with a band of easterly current between them. This onshore current split into north- and south-moving currents when it reached the coast. The location of the axis of the onshore current shifted a distance of about 15 miles southward during the week of the tournament.

Other operations during the cruise included a standard watch for fish, birds, and aquatic mammals, the usual series of bathythermograms, surface plankton tows, and collection of other oceanographic data.

Note: See Commercial Fisheries Review, June 1964 p. 12.

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SUBMARINE TESTED IN UNDERWATER RESEARCH:

M/V "Townsend Cromwell" Cruise 19 (September 16-October 17, 1965): The research vessel Townsend Cromwell and the Nenu II provided support facilities for the submarine Asherah during diving operations designed to aid in the Bureau's planning and development of a large research submarine. The Asherah is a small underwater craft leased by the Bureau's Honolulu Biological Laboratory for a 4-week period of research dives.

The Asherah made 50 dives in an area off Campbell Industrial Park near Barber's Point, Oahu. One was a shakedown dive, 19 were staff research orientation dives, and 30 had research and development as the principal objectives.

Portions of 8 dives by the Asherah were devoted to describing the plankton community and its migrations. Dives were made both day and night, and with and without artificial lights. Tuna forage organisms were enumerated and studied on portions of 13 dives, and tuna were encountered in 6 dives. These tuna, skipjack and little tuna, were encountered between 320 and 500 feet, usually in groups of 3 to 6 fish, but once in a school of 250 individuals, and another time associated with a school of 30 jack.

Tuna forage organisms consisted of four species of small fish, occurring in large schools between depths of 350 and 600 feet. Only one forage species was identified. Some schools of forage were estimated to contain as much as 300 "buckets" of bait-sized fish. Peculiar inverted circular swimming was noted for another kind of tuna forage, mackerel scad (*opelu*), on one occasion.

Two of the Asherah dives were devoted to evaluating the performance of plankton nets, and one to observing the path of fall of XBT's. None of the gear tests was particularly successful. A total of 17 dives was made for surveying the bottom, and additional information on the bottom and its resources was obtained in 10 other dives. Species lists were prepared for the depth range of 100 to 630 feet, including fish, corals (including red coral), lobsters, fish-cleaning stations, and other organisms and ecological situations.

Two dives involved measuring light attenuation by photographing plaques of known reflectance at different depths. Four dives were made to record the sounds produced by various soniferous animals. Among the sounds obtained were those of squirrelfish and triggerfish. On one dive the current was measured by suspending the submarine from a plastic float, whose drift was noted on the surface.

A diving log was kept for all dives made by the Asherah. Over 50 people participated in this cruise because of the large number of demonstrations made.

Note: See Commercial Fisheries Review, December 1965 p. 29.



Education

"SEA-GRANT" COLLEGES RECOMMENDED BY NATIONAL CONFERENCE AT UNIVERSITY OF RHODE ISLAND:

A proposal that the United States develop "sea-grant" colleges was endorsed at a 2-day meeting in Newport, Rhode Island, October 28-29, 1965. Meeting was attended by 230 scientists and educators representing all the important fishery States of the Pacific, Atlantic, and Gulf Coasts, as well as the Great Lakes.

The conference on "The Concept of a Sea-Grant University," sponsored by the University of Rhode Island and the Southern New England Marine Sciences Association, also recommended that Dr. Athelstan Spilhaus of the University of Minnesota, originator of the "sea-grant" idea, be given the opportunity to outline his ideas to "appropriate Government bodies."

Dr. Spilhaus opened the conference with a call for a national "man-in-the-sea" program. He said, "It is not necessary for us to occupy the ocean now, but if we don't someone else will. We can choose peaceful exploration and colonization of the sea and in doing this we are inventing the future." There is a gap, he said, between our scientists and those who use the sea, and this gap must be filled by ocean engineers. That is one of the reasons "sea-grant" colleges are needed.

The dean of the University of Rhode Island Graduate School of Oceanography announced that nine other scientists had agreed to work with him on a "National Sea-Grant University Committee." He will serve as secretary and the only officer of the group.

The conference also went on record as favoring in general principle the proposed sea-grant legislation (S. 2439) which has been introduced in Congress by Senator Claiborne Pell of Rhode Island. He has asked that 10 percent of the Government funds received from the lease of offshore lands be used to finance "sea-grant" colleges. It has been estimated this would amount to \$10 million or more a year. The bill is now before the Senate Labor and Public Welfare Committee. Hearings are expected to be held early in 1966. (University of Rhode Island, November 2, 1965.)



Federal Purchases of Fishery Products

DEFENSE DEPARTMENT REVISES INSPECTION CRITERIA FOR FOOD ESTABLISHMENTS:

DPSC Clauses 690a, b, and c effective November 22, 1965, set forth revised criteria for food establishments supplying perishable "brand name items or commercial equivalent items" to the Defense Department. One of the approved inspection criteria under those regulations is:

"A plant processing fish and other water-foods under the continuous inspection supervision of the Bureau of Commercial Fisheries, U. S. Fish and Wildlife Service, U. S. Department of Interior, in officially listed establishments for that service, provided further that each primary container shall be stamped or printed with: (i) the U. S. Grade stamp or shield; or (ii) the words: 'Packed by (firm's name) under continuous inspection of the Department of the Interior,' or 'Packed under continuous inspection of the Department of the Interior'; or (iii) a combination of (i) and (ii)."

DPSC Clauses 690 were set forth in Headquarters Notice No. 138 (65), issued by the Defense Personnel Support Center (DPSC), 2800 South 20th Street, Philadelphia, Pa. 19101. The revised regulations supersede MSSA Clauses 500 of May 9, 1960, which are obsolete.

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DEFENSE DEPARTMENT REVISES SUBSISTENCE CONTRACTOR INSPECTION PROCEDURES MANUAL:

On November 15, 1965, the Defense Department issued DSA-DPSC Manual 4155.5, Subsistence Contractor Inspection Procedures Manual. It sets forth procedures for the use and information of contractors who are responsible for product inspection in accordance with the requirements of Defense Personnel Support Center (DPSC) Subsistence contracts. The new manual supersedes the DSA - DSSC Contractor Inspection Procedures Manual 4155.1 dated September 3, 1963, and changes Paragraphs 1 to 7 thereof.

Even though current DPSC and DSSC Articles and Clauses may reference the superseded manual or its predecessors, the new manual will be used in all solicitations, and

their resultant contracts, issued on and after November 15, 1965.



Fisheries Laboratory

NEW GAME FISH RESEARCH LABORATORY FOR TEXAS GULF COAST:

The selection of Port Aransas, Tex., as the site for another Federal marine game fish research laboratory to be operated by the Bureau of Sport Fisheries and Wildlife was announced November 5, 1965, by Secretary of the Interior Stewart L. Udall.

The Port Aransas laboratory will cost about \$2 million to build and will be the latest in a system of centers authorized by Congress in 1959 to undertake a national research program on salt-water game fish. It will be used to study marine sport fishery resources in the Gulf of Mexico west of the Mississippi Delta.

Secretary Udall said the goal of such laboratories is to find answers needed to maintain and improve marine game fish resources through conservation and wise management. He said, "Salt-water fishing has become a major recreational pursuit of Americans, supporting a multi-million dollar segment of our economy. This new laboratory will make an important contribution by increasing knowledge of this recreational resource in the western Gulf."

Federal marine game fish laboratories already established are at Sandy Hook, N. J., Tiburon, Calif., and Narragansett, R. I. The site for a fifth laboratory at Panama City, Fla., was announced in October 1965.

Note: See Commercial Fisheries Review, December 1965 p.31.



Fur Seals

INTERIOR DEPARTMENT TO ISSUE NEW PROPOSALS FOR PROCESSING ALASKA SKINS:

A second invitation for research and development proposals to firms interested in experimental processing of Alaska fur seal skins will soon be issued by the U. S. Department of the Interior. The announcement will be made by Interior's Bureau of Com-

mercial Fisheries in response to interest expressed by processors who were unable to offer proposals earlier this year.

There are only sufficient raw seal skins available for a very limited number of research contracts. Firms submitting acceptable proposals, however, will be asked to process sample seal skins as a demonstration of their capability in performing more extensive research and development work.

The first invitation for research and development proposals was issued by the U. S. Bureau of Commercial Fisheries March 31, 1965, with a closing date of May 17 for filing of proposals. A one-year contract was then awarded the Pierre Laclede Fur Co., St. Louis, Mo., to develop new fur seal products and improved techniques for dressing, dyeing, and finishing the skins. Another invitation for proposals is now being considered by the Bureau.

Following the Alaska seal skin research and development program announcement, a five-year production contract for processing and selling seven-eighths of the seal skins harvested in the years 1963 to 1967 was awarded the Fouke Fur Company, Greenville, S. C. The contract was signed April 30, 1965. Secretary of the Interior Stewart L. Udall said then that one-eighth of the seal skins harvested during those years was being reserved for experimental contracts with interested and qualified fur-processing concerns.

Under the new contracts, all seal skins used in the research remain the property of the U. S. Government. Most of the skins eventually will be sold at auction, and it is anticipated that the proceeds will offset the cost of the research and development work.

The U. S. Bureau of Commercial Fisheries manages the Alaska fur seal herd, comprising some 1,500,000 animals, under provisions of the North Pacific Fur Seal Conservation Convention. Each summer when the herd congregates on the Pribilof Islands in the Bering Sea, the Bureau harvests from 50,000 to 80,000 surplus young animals on a sustained yield basis. Under the Convention terms, in return for abstaining from harvesting fur seals at sea, Canada and Japan each receive 15 percent of the annual Pribilof Islands harvest, as well as a proportionate share of the seal skins taken by the Sovi-

et Union on smaller rookeries off the Asian coast.

Note: See Commercial Fisheries Review, November 1965 p. 79.

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PRICES FOR ALASKA SKINS AT FALL 1965 AUCTION:

The fall auction in 1965 (October 14-15) of United States Government-owned fur seal skins (11,760 dressed, dyed, machined, and finished skins and 3,138 Lakoda skins) grossed \$1.41 million. The previous auction in the spring of 1965 grossed \$1.67 million for 13,729 processed dyed skins and 5,818 Lakoda skins. Average prices at the two auctions are not entirely comparable because in the fall 1965 auction males and females were sold in mixed lots of dressed, dyed, machined, and finished (DDM&F) skins whereas in the spring the males and females were sold separately. Since higher prices are paid for straight lots of male skins, the mixed lots command a lesser price. The smaller number of females in this sale prompted the decision to sell the skins in mixed lots.

At the fall auction, the overall average price for mixed lots of male and female dyed processed skins was \$103.78, or about 13 percent below the average price for male skins in the spring auction. A breakdown of the 3 colors within the (DDM&F) group of skins shows that the fall auction included the following: Black--3,834 male and 418 female skins yielding an average of \$109.74 per skin; Kitovi--1,246 male skins yielding an average of \$94.80; and Matara--4,810 male and 1,452 female skins yielding an average of \$101.35.

The mixed lots of Matara skins showed the greatest decline (17 percent) from the average price for male skins at the previous auction. A similar comparison shows the average price of mixed lots of Black skins down about 10 percent. The Kitovi skins sold in the fall were all males and their average price was down about 2 percent.

The Lakoda (female sheared) sales at the fall auction included 1,170 Natural skins at an average price of \$80.85 (up 30 percent from the spring auction); 1,484 Brown skins at an average price of \$42.93 (down 10 percent); and 494 Black skins at an average price of \$66.97 (up 33 percent).

Note: See Commercial Fisheries Review, June 1965 p. 21, Dec. 1964 p. 40.



Great Lakes

PUBLIC HEARING HELD ON PROPOSED CHANGES IN MICHIGAN'S YELLOW PERCH FISHING REGULATIONS:

Plans of the State of Michigan Conservation Department to liberalize commercial yellow perch fishing regulations for the entire Great Lakes were heard on October 27, 1965, in Tawas City, Mich., at a joint legislative public hearing held by the State's Senate and House Conservation Committees. The hearing was on the Department's proposal to remove size limits and closed seasons for taking yellow perch in 2½-inch mesh nets used by commercial operators.

The recommended changes, tentatively approved earlier by the Conservation Commission, are geared as much to promoting better sport fishing as they are to helping commercial fishermen. Fishery specialists of the Conservation Department say that the relaxed regulations are ultimately aimed at speeding the growth of perch. This would come about, they say, from increased commercial harvests which would trigger a rapid turnover in the Great Lakes yellow perch populations to produce better fishing for all concerned.

The Department's fishery chief points out that while the lifting of commercial size limits and closed seasons will give yellow perch populations a temporary boost, the long-range forecast for that Great Lakes species presents some uncertainties. He said, "Even if our efforts to introduce predatory game fish like the coho salmon are successful in cropping down nuisance species, we can still expect the alewife to put strong pressure on yellow perch. Eventually, the alewife's competition for food and space and its predation of fish eggs is going to mean a slump in perch numbers. The goal in seeking more liberal fishing regulations for commercial operators is to ease this situation by putting perch in a healthier condition to compete with alewife. This, at least, will slow down the perch decline we expect."

The October 27 hearing was the only one held in that part of the State to meet the legal requirement of publicly airing proposed commercial fishing changes. Another public hearing on the recommended measures may take place later elsewhere in Michigan. (News Bulletin, Michigan Department of Conservation, Lansing, October 21, 1965.)

* * * * *

MICHIGAN POSTPONES PLAN TO INTRODUCE STRIPED BASS:

The State of Michigan Conservation Department has postponed its plans for planting striped bass in the lower Great Lakes during spring 1966 in order to concentrate on the introduction of coho salmon in northern streams. The State's Conservation Commission had previously approved the striped bass planting program but since then more has been learned about coho salmon which indicates that species may provide a bigger breakthrough in improving Great Lakes fishing than had been earlier thought.

The Department's fishery chief explained that "coho experts from the West, who ought to know, told us recently that we may have been underestimating the potential of this fish for making the grade in a big economic way in the Great Lakes." He said that the States of Washington and Oregon have in recent years come up with new techniques and information for raising, feeding, and planting coho salmon which have virtually revolutionized efforts for producing and increasing the survival of that species. He said this means that there is a much better chance of successfully introducing coho salmon in the Great Lakes than was previously realized. He added that striped bass plantings were not being discounted altogether and that in attempting to make Great Lakes fishing better, coho salmon seemed the more promising of the two species and that if it doesn't work, striped bass could be the possible "ace in the hole."

The Department fishery chief continued, "Our money, equipment, and personnel are thoroughly committed to the coho program and we don't want to water down this effort by shifting some of our attention at this time to a second species, namely the striper." He also said it is possible that the introduction of the striped bass could undercut the success of coho plantings and that in making a choice between those two species, consideration must be given to the coho because of its tremendous economic value, both to sport and to commercial fishing interests.

The key question in the Conservation Department's plans is whether the coho salmon, in the fresh waters of the Great Lakes will produce eggs that can be fertilized for hatching, naturally or artificially. Some idea about this will be gained during fall 1966 when the first runs of fast-maturing young male

coho salmon (called jacks) are expected to take place in Great Lakes streams. But the real answer won't come until the fall of 1967 when the first spawning runs are anticipated. After that, it should be known whether to stay with the coho or bring the striped bass into the picture.

Several other factors enter into the decision of Michigan to hold up the striped bass program. Among them is the matter of giving other Great Lakes states and the Province of Ontario time to complete their studies on that species. In the time it takes to check out the coho program, much can be accomplished in consolidating Michigan's studies with those of the other agencies before arriving at a definite decision on whether to attempt the introduction of striped bass, the Department head added. A delaying factor in the striped bass program is the lack of money to underwrite the effort. The Department chief and his staff estimate it would take \$100,000-200,000 during the first year to launch "striper" plantings which would have a reasonably good chance of being successful. (*News Bulletin, Michigan Department of Conservation, Lansing, October 21, 1965.*)

Note: See *Commercial Fisheries Review*, December 1965 p. 32.

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MICHIGAN STREAMS SELECTED FOR FIRST SILVER SALMON PLANTINGS:

The State of Michigan Conservation Department announced in November 1965 that three northern streams have been selected to receive about 750,000 silver or coho salmon during spring 1965 when the first plantings of that species will be made. The schedule calls for 250,000 of the 5-6 inch fish to go into the Platte River near Honor in Benzie County, 300,000 into Bear Creek near Bear Lake in Manistee County, and 200,000 in the Big Huron River northeast of L'Anse in Baraga County. Those fish, descendants of the Pacific Coast salmon, are expected to migrate downstream into Lakes Michigan and Superior, grow to maturity, and return to spawn in the streams where they are to be planted. Some of the faster-growing fish may attempt migrating back to their release sites during fall 1966. Results of the program will be known better in the fall of 1967 when the first general spawning runs are expected.

In selecting the three northern streams for initial releases, the Department's fish section chief said, "We were told that our

chances of having early success in this program should be best in these waters because the habitat requirements of steelheads and cohos are much the same." The Big Huron river was picked because it also offers a particularly good natural spawning area and provides some opportunity for taking eggs to help meet future rearing operations. It is considered very similar to western streams where silver spawning occurs.

In addition to being good steelhead waters, the Platte river and Bear Creek fit ideally into plans for later capturing spawners and collecting eggs from them. Also, with the two streams' release sites located near hatchery stations where silver salmon are being raised, transportation costs will be less.

Because Lake Michigan has such an abundant food supply for silver salmon--notably the alewife--the Department has planned its first-year planting program to putting about three-quarters of its silver salmon stock into the northern Lower Peninsula streams. The other one-quarter has been reserved for the Big Huron River to take advantage of the lower degree of competition the coho will face from other fish in Lake Superior.

Besides selecting the most promising streams for first releases, the Department planned another step aimed at giving its program a successful start. This was increasing the iodine content of hatchery water supplies for silver salmon. Experience on the West Coast, where silver salmon waters are rich in iodine, shows that this mineral is a key factor in the production of fertile silver salmon eggs. It is hoped that the fortified water supplies of hatcheries will tide the fish over after they reach the Great Lakes which are deficient in iodine.

With plans taking more solid shape for the initial release of that salmon species this coming spring, the Michigan Conservation Department was notified that the State of Oregon would meet Michigan's request for 1.2 million silver salmon eggs. The first shipment of about 600,000 eggs was scheduled to be flown into Pellston, Mich., about late November. Most of those eggs and the remaining 600,000 expected to reach Michigan shortly thereafter were to be taken to the State's Oden hatchery. Some also were to go to the State's Harrietta and Thompson hatcheries in northern Michigan. Before the end of 1966, another 50,000 silver salmon

eggs of specially adaptable strains were expected to be delivered from Alaska. Also included in Michigan's planting program for 1967 is the anticipated delivery of 1.2 million silver salmon eggs from the State of Washington. (*News Bulletin*, Michigan Department of Conservation, Lansing, November 11, 1965.)

Note: See *Commercial Fisheries Review*, April 1965 p. 21.



Great Lakes Fisheries Explorations and Gear Development

LAKE SUPERIOR TRAWLING STUDIES CONTINUED:

M/V "Kaho" Cruise 29 (September 9-October 14, 1965): A 36-day exploratory fishing cruise in Lake Superior was completed October 14, 1965, by the U. S. Bureau of Commercial Fisheries research vessel *Kaho*. The cruise, covering the entire south shore, was the sixth exploration undertaken for the purpose of determining the potential for developing more effective and efficient methods for catching Lake Superior fish. The work is part of the Bureau's technical assistance program designed to help the Lake Superior commercial fishing industry overcome problems related to changing fish populations and resulting economic setbacks.

Primary objectives of the cruise were to: (1) determine the availability of various species of fish to bottom trawls, (2) locate additional areas suitable for bottom trawling, and (3) study vertical and horizontal distribution patterns of fish concentrations. Other objectives were to: collect fish and bottom samples for botulism and pesticide studies; collect sculpin, chub, and smelt samples for technological studies; and collect longnose sucker for biological studies. Records were kept of fin-clipped lake trout caught, and studies were continued on trout-releasing techniques. A length-weight composition study of chub was also undertaken.

Chub accounted for 53 percent of the 14,079 pounds of fish taken during the cruise; smelt accounted for 19 percent of the total catch, sucker 18 percent, lake trout 3 percent, and other species 7 percent. Trawling in depths of less than 35 fathoms yielded a catch that was about equally divided between chub, smelt, and sucker. But chub made up 84 percent of the catch taken from depths of over 35 fathoms.

Cruise highlights included the continued success of trawling for chubs at various locations along the south shore. Catch rates for chubs were generally lower than those in several previous explorations, possibly as a result of stormy weather experienced during the October cruise. A 1,200-pound catch of smelt, of which 25 percent were jumbo (6-7 fish a pound), was taken in Huron Bay. Another outstanding catch of over 1,250 pounds that included 900 pounds of longnose sucker and 250 pounds of chub was taken in a drag off Black River. A total of 28 trawl-fishing stations was established west of the Keweenaw Peninsula in addition to those located during initial operations in that area in June 1965. In setting up the new stations, depth-series evaluations were made at 7 to 60 fathoms off Ontonagon; 22 to 50 fathoms off Little Girls Point; 25 to 50 fathoms off the Brule River; and 4 to 40 fathoms off Duluth, Minn.

As on previous cruises, chub production was highest at 35-45 fathoms while trout catches were highest at 20-30 fathoms. During the October cruise, the highest average chub catch rate (on a lake-wide basis) of 217 pounds per 30-minute drag was obtained at 40 fathoms. At that depth, the average trout catch was 3 pounds (5 fish) per 30-minute drag. In shallower water, chub catches decreased while trout catches increased (75 percent of the total pounds of trout landed during the cruise was taken in water shallower than 35 fathoms). Chub catches in the eastern half of the lake were slightly higher than those west of the Keweenaw Peninsula. The best individual chub catches were 950 pounds taken at 40 fathoms in Shelter Bay and 525 pounds taken at 35 fathoms off Eagle Island north of Cornucopia. Smelt were most concentrated in 15-20 fathoms; in all drags at those depths smelt catches averaged 100 pounds per half-hour. West of the Keweenaw Peninsula, longnose sucker contributed significantly to the catch, with the largest landings (190-900 pounds) from between 30-40 fathoms.

FISHING OPERATIONS: A total of 91 drags made during the Cruise with a 52-foot (head-rope) Gulf of Mexico-type fish trawl. Forty-eight drags were conducted between Whitefish Bay and the Keweenaw Peninsula and 43 from the Keweenaw Peninsula west to Duluth. All drags were of 30-minute duration, except 12 which were terminated early due to encounters with snags, rough bottom conditions, or the presence of set-fishing gear. Three oth-

er drags were ended early because small lake trout were known to be in certain shoal waters. Snags resulting in major gear damage occurred during 2 drags and minor damage was caused by snags in 4 other drags; 22 drags involved encounters with logs, 6 of which caused major trawl damage and 14 of which caused minor damage.

FISHING RESULTS (Whitefish Bay to Keweenaw Peninsula): Chub catches in the Whitefish Bay to Munising area were light compared to previous explorations in that area; 17 drags produced a total of only 325 pounds, 40 percent of which was chub. Stormy weather probably accounted for the decline.

Except for one 950-pound catch made at 40 fathoms north of Shelter Bay, chub catches in the Minising Bay to Huron Bay region were also light and amounted to only 40 percent of the total catch of slightly over 3,200 pounds for all species in 14 drags.

In the Keweenaw Bay to Bete Grise Bay area, 17 drags produced a total of 1,240 pounds of chub--nearly 60 percent of the total catch of almost 2,100 pounds for all species. The best catches of chubs, 245 to 430 pounds a drag, were obtained at 35 to 40 fathoms off Grand Traverse and Bete Grise Bays. Due to the presence of set-fishing gear in that area it was not possible to monitor stations where high production rates of chub had occurred during previous explorations by the Kaho. In Keweenaw Bay, major gear damage occurred in 6 of 11 drags as a result of picking up large logs in the trawls.

Two catches of common whitefish, 60 and 180 pounds a drag, were taken at 10 and 35 fathoms in Munising Bay. Smelt catches of 100 pounds and over were taken at 15 fathoms in Huron Bay and between 20 and 30 fathoms in Keweenaw Bay. The best smelt catch, 1,200 pounds, was obtained in 15 fathoms in Huron Bay; 25 percent of that catch were jumbo fish (6-7 fish per pound). Catches of lake trout amounted to a total of 189 pounds for all drags and 85 percent of the trout catches (161 pounds) occurred in depths of 35 fathoms and under. Two drags in Keweenaw and Huron Bay at 30 fathoms produced 14 cisco weighing 28 pounds. Suckers in amounts of over 100 pounds a drag were caught at 15 and 20 fathoms in Huron Bay and Keweenaw Bay, respectively. Catches of other species were insignificant.

FISHING RESULTS (Houghton to Duluth): In this area, echo-soundings showed that the largest concentrations of fish were off the bottom. That was probably due to an extended period of adverse weather. From Houghton to Duluth, chub were the most abundant species caught, followed by sucker and smelt. The depth distribution of chub varied within the area. From Ontonagon to Bayfield, the best catches (325 and 350 pounds) were made in 40 fathoms. In the Apostle Islands area, 300 pounds were taken in the South Channel of Madeline Island at 22 fathoms. From Cornucopia to Duluth the best catches (from 250-525 pounds) were made in 30 to 35 fathoms. The best individual landing of 525 pounds was taken from 35 fathoms off Eagle Island.

Lake trout concentrations were noted only at 30 fathoms off the Porcupine Mountains where 60 trout (45 pounds) were landed and at 22 fathoms off Madeline Island where 166 trout (60 pounds) were taken. Only 22 trout totaling 12 pounds were taken in the 18 drags from Cornucopia to Duluth. The break-off depth for trout west of the Keweenaw Peninsula was at the 35-fathom level, with 84 percent of the total trout landings made in shallower water.

Good catches of sucker were made with regularity from Ontonagon to Duluth. Six drags produced over 100 pounds and the best catch was 900 pounds. Sucker appeared at all depths from 4 to 40 fathoms with good individual catches occurring throughout that range. An average of 62 pounds a drag was obtained in 35 drags made in depths of 40 fathoms or shallower. Of the sucker catch, 81 percent by weight were longnose, the rest were common.

Smelt were generally scattered with the heaviest concentrations found at about 15 to 20 fathoms. Off Duluth, the best smelt catches were 225 pounds taken in 20 fathoms and 150 pounds from 4 fathoms. Another fair catch of 75 pounds was taken at 22 fathoms off Little Girls Point. An average of 30 pounds of burbot occurred in 75 percent of the drags west of the Keweenaw Peninsula. Catches of cisco and whitefish were minimal. Alewives occurred in only 4 drags at an average rate of only two pounds. An outstanding catch containing over 200 young-of-the-year yellow pike or walleye was made at 4 fathoms off Duluth.

HYDROGRAPHIC DATA: Thermal gradients were recorded with bathythermograph and continuous surface-temperature recorder instruments. Bottom temperatures ranged from 39° to 55° F. and surface temperatures ranged from 48° to 58° F.

Note: See Commercial Fisheries Review, Nov. 1965 p. 20, Sept. 1965 p. 25.



Great Lakes Fishery Investigations

BIOLOGICAL RESEARCH AND SEA LAMPREY CONTROL, OCTOBER 1965:

Some of the highlights of Great Lakes biological research by the U. S. Bureau of Commercial Fisheries Biological Laboratory, Ann Arbor, Mich., during October 1965:

Lake Superior: The spawning stocks of lake trout in the Apostle Islands region of Lake Superior were sampled during October 1965. Large-mesh gill nets (4½- to 6-inch mesh) fished on Gull Island shoal yielded 683 spawning lake trout of which 74 were females. Forty-five (6.6 percent) of the spawners were fin-clipped. Catches included 30 recaptures which had been tagged and released on the shoal in former years. The catch per unit of effort was nearly the same as that in 1964, the highest recorded since the collection of records began in 1951. The lake trout ranged from 20.5 to 33.5 inches (average, 27.0 inches) long. Only one fish had a fresh lamprey wound; old scars were present on 49 percent of the lake trout.

Small-mesh gill nets (1½- and 2½-inch mesh) fished on Gull Island shoal yielded longnose suckers, round whitefish, lake herring, and lake northern chubs. Several stomachs were examined of each species and lake trout eggs were found only in the stomach of one longnose sucker. Several trawl hauls made off Outer Island and Cat Island did not yield any young-of-the-year lake trout.

Lake Erie: Commercial fish landings along the entire south shore of Lake Erie, Saginaw Bay, and Green Bay were sampled during October 1965. Experimental trawling with the U. S. Bureau of Commercial Fisheries research vessel Musky II was unproductive on the sampling grounds when the fish moved into deeper areas of the lake because of unusually early cooling of the water.

Lake Michigan: In the program on the interrelationships of the alewife with native

species in Lake Michigan, studies on food preferences were continued by the Bureau's laboratory staff. Additional information was developed on the changes in growth, length, and weight of bloaters in Lake Michigan.

Sea Lamprey Control and Research: Chemical treatment of streams ended on Lake Superior with the completion of 3 river systems (Gratiot, Huron, and Buck Bay Creek). Treatment operations on Lake Michigan also ended for the season when 4 tributaries of the St. Joseph River were treated by the end of October. Bioassay ranges in those southern streams were high, ranging from 11.0-29.0 ppm.

The tagging of parasitic-phase sea lampreys has been intensified by the Bureau and the Fisheries Research Board of Canada has joined in the operation. Through October 31, 1965, a total of 1,003 sea lampreys had been tagged. Tags were recovered by commercial fishermen from 46 of the sea lampreys tagged during fall 1965.

Fyke nets were fished in 10 streams tributary to Lake Superior and 5 streams in northern Green Bay.

The experimental population of sea lamprey larvae in the Big Garlic River produced its first parasitic-phase lampreys. Two were taken at the incline trap during October.



Gulf Fisheries Explorations and Gear Development

SHRIMP GEAR STUDIES CONTINUED:

M/V "George M. Bowers" Cruise 62 (October 11-November 5, 1965): A 26-day exploratory cruise in the northeastern and north central Gulf of Mexico by the U. S. Bureau of Commercial Fisheries research vessel George M. Bowers was completed on November 6, 1965. Original purpose of the cruise was to photograph bottom trawling conditions and marine life on the royal-red shrimp grounds of the north central Gulf. This was to be in preparation for working on those grounds with a modified deepwater electric shrimp trawl, and also for additions to the Atlas of Gulf Bottom Conditions being compiled by the Bureau.

Because of mechanical failures of camera and winch in deep water, complete objectives were not attained. The vessel spent the latter part of the cruise searching for an area of shallow water shrimp concentrations adequate for commercial testing of the electrical shrimp trawl. Shallow water shrimp stocks were found to be light and not adequate at that time in the north central or northeastern Gulf for commercial testing of the electrical trawl alongside conventional trawls.

Note: See Commercial Fisheries Review, December 1965 p. 33.



Gulf Fishery Investigations

SHRIMP DISTRIBUTION STUDIES:

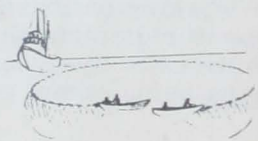
M/V "Gus III" Cruise GUS-34 (October 28-31, 1965): White shrimp were predominant in the catches made during this cruise by the research vessel Gus III chartered by the U. S. Bureau of Commercial Fisheries. As part of a continuing Gulf of Mexico shrimp distribution study, 3 statistical areas were covered and 11 standard 3-hour tows with a 45-foot flat trawl were made. Other operations included 23 plankton tows, 5 dredge hauls, 19 bathythermograph (BT), and 162 water (Nansen bottle) casts.

The largest catches of white shrimp made on the cruise were in area 13. The up to 10-fathom depth of that area yielded 61 pounds of 21-25 count white shrimp, and 17 pounds of 15-20 count were taken in the 11-20 fathom depth. The three depth ranges worked in that area yielded only very small quantities of small brown shrimp.

Area 14 yielded 43 pounds of 26-30 count brown shrimp from the over 20-fathom depth. Other depths in that area were mostly unproductive and accounted for only a scattering of brown and white shrimp.

Large brown shrimp (9 pounds of 12-15 count) were caught in the over 20-fathom depth of area 16. Hauls from the other two depths yielded nothing.

Note: See Commercial Fisheries Review, December 1965 p. 33.



Gulf States

FISHERY LANDINGS, 1964:

Fish and shellfish landings during 1964 in the Gulf States (west coast of Florida, Alabama, Mississippi, Louisiana, and Texas) amounted to 1.3 billion pounds valued at a record \$99.3 million ex-vessel. This was a decline from the previous year of about 82 million pounds, but an increase of \$508,000.



Medium trawler at the dock in Westwego, La.

The lower quantity in 1964 resulted chiefly from a marked decline in landings of menhaden (904 million pounds)--down 64 million, and shrimp (179 million pounds)--down 24 million. Smaller losses occurred in landings of hard blue crabs and oysters. The principal increase was in landings of unclassified species used for bait, reduction, and animal food (87 million pounds)--a gain of more than 6 million pounds as compared with 1963. Landings of red snapper (13.3 million pounds) were slightly greater than the previous year, and only 300,000 pounds less than the record production of 1902.

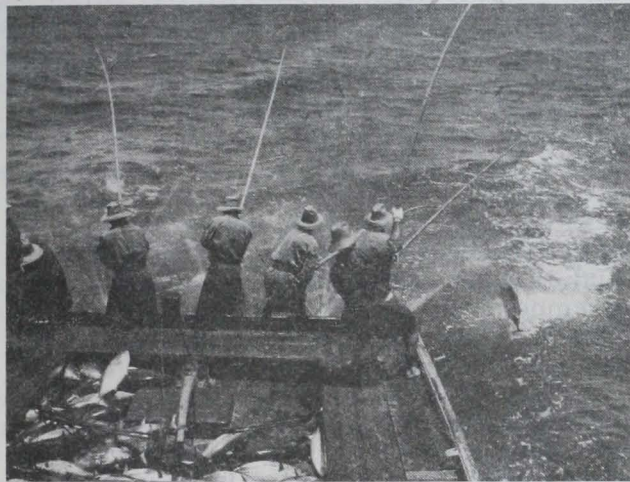
Three States (Louisiana, Mississippi, and Texas) accounted for 1.2 billion pounds (89 percent) of the total quantity; while Louisiana, Texas, and the west coast of Florida accounted for \$87 million (88 percent) of the value.

In 1964, there were 25,171 fishermen engaged in the Gulf fishery--688 more than in the previous year. Commercial fishing craft operating in those States during 1964 consisted of 3,582 vessels of 5 net tons and over, 10,149 motor boats, and 595 other boats.

Hawaii

FISHERY LANDINGS, 1964:

Commercial landings of fish and shellfish in the State of Hawaii in 1964 were 12.7 million pounds valued at ex-vessel \$2.8 million. Compared with 1963, this was a gain of about 1.0 million pounds (8 percent) and \$168,500 (6 percent).



Hawaiian sampan fishing skipjack tuna.

The increase in both quantity and value of the 1964 catch resulted principally from greater landings of skipjack (9.0 million pounds--up 924,000) and yellowfin tuna (500,000 pounds--up 115,000). Other species showing production gains were striped marlin, jack crevalle, and bigeye scad. There were slight declines in landings of big-eyed tuna, dolphin, and jack mackerel.

Oahu led the islands in landings with 10 million pounds--80 percent of the total. The Island of Hawaii was next with 1.6 million pounds, followed by Maui with 712,000 pounds. The remainder of the catch was landed in the Islands of Kauai, Molokai, and Lanai.

The 1964 catch was taken by 743 fishermen--77 less than in 1963. Fishing craft operated during the year included 57 vessels of 5 net tons and over, 350 motor boats, and 24 other boats.

Note: See Commercial Fisheries Review, June 1964 p. 16.



Industrial Fishery Products

U. S. FISH MEAL AND SOLUBLES:

Production and Imports, January-September 1965: Based on domestic production and imports, the United States available supply of fish meal for the first 9 months in 1965 amounted to 445,878 short tons--108,217 tons (or 19.5 percent) less than during the same period in 1964. Domestic production was 1,460 tons (or 0.7 percent) less, and imports were 106,757 tons (or 30.0 percent) lower than in January-September 1964. Peru continued to lead other countries with shipments of 204,345 tons.

U. S. Supply of Fish Meal and Solubles, January-September 1965			
Item	Jan.-Sept.		Total 1964
	1/1965	1964	
. . . (Short Tons) . . .			
<u>Fish Meal and Scrap:</u>			
<u>Domestic production:</u>			
Menhaden	150,690	143,455	160,349
Tuna and mackerel	19,674	15,493	21,113
Herring	11,118	7,744	8,881
Other	15,236	31,486	44,909
Total production	196,718	198,178	235,252
<u>Imports:</u>			
Canada	32,623	42,819	54,769
Peru	204,345	285,770	348,025
Chile	5,132	11,302	12,942
Norway	49	-	-
So. Africa Rep.	2,900	13,087	18,581
Other countries	4,111	2,939	4,826
Total imports	249,160	355,917	439,143
Available fish meal supply	445,878	554,095	674,395
<u>Fish Solubles:</u>			
<u>Domestic production 2/</u>			
	80,082	81,655	93,296
<u>Imports:</u>			
Canada	1,253	1,226	1,553
So. Africa Rep.	-	935	987
Other countries	2,504	1,735	1,965
Total imports	3,757	3,896	4,505
Available fish solubles supply	83,839	85,551	97,801
<small>1/Preliminary. 2/50-percent solids.</small>			

The United States supply of fish solubles during January-September 1965 amounted to 83,839 tons--a decrease of 2.0 percent as compared with the same period in 1964. Domestic production dropped 1.9 percent and imports of fish solubles decreased 3.6 percent.

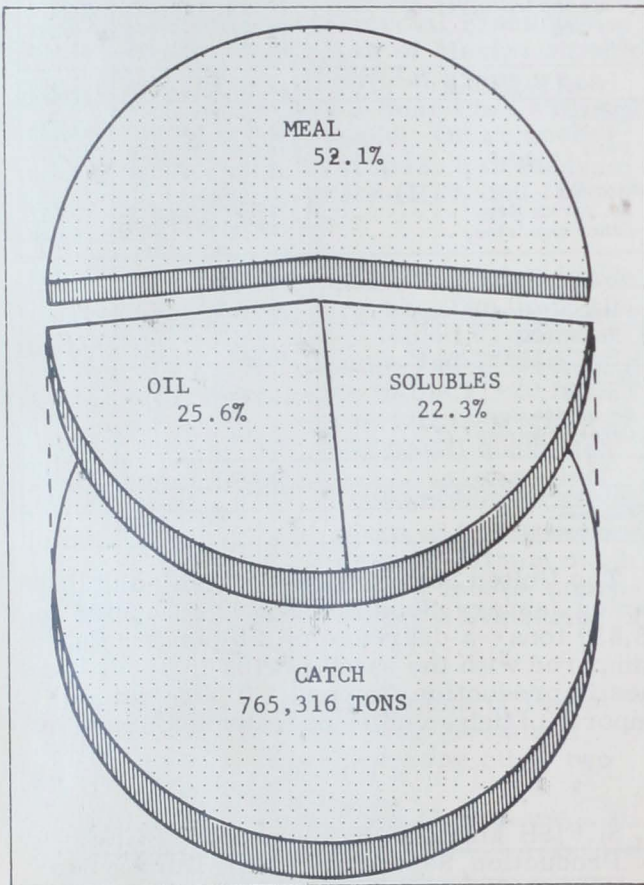
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U. S. FISH MEAL, OIL, AND SOLUBLES:

Production, September 1965: During September 1965, a total of 19,637 tons of fish meal and about 17.7 million pounds of marine-animal oil was produced in the United States. Compared with September 1964 this was a decrease of 3,181 tons of fish meal and 2.1

U. S. Production of Fish Meal, Oil, and Solubles, September 1965 ¹ with Comparisons				
Product	Sept.		Jan.-Sept.	
	1/1965	1964	1/1965	1964
. (Short Tons)				
Fish Meal and Scrap:				
Herring	1,464	646	11,118	7,744
Menhaden 2/	14,659	18,034	150,690	143,455
Tuna and mackerel	2,511	2,463	19,674	15,493
Unclassified	1,003	1,675	15,236	31,486
Total	3/19,637	3/22,818	3/196,718	3/198,178
Fish solubles:				
Menhaden	7,403	7,764	64,535	62,070
Other	1,632	2,184	15,547	19,585
Total	9,035	9,948	80,082	81,655
. (1,000 Pounds)				
Oil, body:				
Herring	884	343	7,009	9,536
Menhaden 2/	15,793	18,073	155,552	140,911
Tuna and mackerel	570	583	3,506	3,422
Other (inc. whale)	416	781	4,180	6,677
Total oil	17,663	19,780	170,247	160,546

¹Preliminary data.
²Includes a small quantity of thread herring.
³Does not include a small quantity of shellfish and marine animal meal and scrap because production data are not available monthly.



U. S. menhaden catch and products, 1964.

million pounds of marine-animal oil. Fish solubles production amounted to 9,035 tons --

a decrease of 913 tons as compared with September 1964.



Inland Fisheries Explorations and Gear Development

OAHE RESERVOIR TRAWLING STUDIES:
 Reservoir Research Vessel "Hiodon"
 Cruise 4 (September 1965): To (1) find areas for effective bottom trawling and (2) collect catch and biological data were the main objectives of this cruise in Oahe Reservoir located in South and North Dakota. This trawling operation by reservoir fishery research vessel Hiodon of the U. S. Bureau of Commercial Fisheries was carried out in Zones 1 and 3 (reservoir miles 8 and 63) during September 8-10 and in Zone 6 (reservoir miles 122-123) on September 15, 21, and 24, 1965.

FISHING OPERATIONS: A 52-foot trawl was used to make seven 15-minute drags in Zones 1 and 3, and 18 drags in Zone 6. All drags were made over inundated flats at depths ranging from 24 to 90 feet.

FISHING RESULTS: Zones 1 and 3: Seven drags in the lower reservoir caught 3,280 fish (age group II or older) that weighed a total of 1,315 pounds, for an average of 469 fish or 188 pounds per drag. Carp and yellow perch combined made up 94.6 percent of the catch by number and 86.6 percent by weight. About 75 percent of the carp were small and averaged 14.7 inches and 1.5 pounds, whereas larger carp averaged about 22 inches and 3.2 pounds. Perch averaged slightly over 0.1 pound and were in the 6-inch class.

Goldeye was the only other species taken in substantial numbers and made up 3.8 percent of the catch by number and 8.6 percent by weight.

The most productive drag took 1,658 fish that weighed 563 pounds and consisted primarily of carp (125 fish or 306 pounds) and perch (1,516 fish or 224 pounds).

Yearling fish taken were 4 sauger and one each of yellow pike or walleye, black bullhead, and channel catfish.

Young-of-the-year fish were taken in 5 of the 7 drags. The young-of-the-year catch consisted of 291 white bass, 3 northern pike, 3 white crappie, 1 drum, and 1 channel catfish.

Zone 6: The 18 drags in Zone 6 caught 2,031 fish, age group II or older, that weighed a total of 2,462 pounds, for an average of 113 fish or 137 pounds per drag. The dominant species taken was carp (53.2 percent by number and 73.5 percent by weight). The catch of carp was made up of 96 percent small fish (age groups II and III) and 4 percent large fish (age group IV and older). The average weight of small carp was 1.6 pounds and of large carp 3.9 pounds.

The most productive drag in Zone 6 produced 223 fish that weighed 335 pounds. Carp comprised 87 percent by weight of the fish taken in that drag.

The catch of 615 yearling fish in Zone 6 was dominated by goldeye (408 fish) and crappie (108 fish). Other yearlings taken were 36 channel catfish, 30 white bass, 16 sauger, 8 drum, 5 northern pike, 2 carpsucker, 1 white sucker, and 1 carp.

Young-of-the-year fish were taken in all drags in Zone 6. Crappie and white bass dominated the young catch. Of 1,683 young-of-the-year taken, crappie (white and black combined) made up 75 percent and white bass 20 percent. Other young taken included carp, goldeye, sauger, black bullhead, drum, big-mouth buffalo, and perch.

Note: See Commercial Fisheries Review, Dec. 1965 p. 37, Nov. 1965 p. 24.



Inventions

NEW FISHERY PROCESSING METHODS PATENTED:

Following are brief descriptions of patented devices and methods for processing fishery products, as reported in Food Technology, September 1965:

Scallop Evisceration: L. C. Renfro issued U. S. Patent No. 3,177,522, April 13, 1965: Automated apparatus for severing the viscera of scallops in a manner to permit the scallop muscle to rotate about its own axis when the viscera attached to the muscle

is engaged by the leading edge of a cutting element.

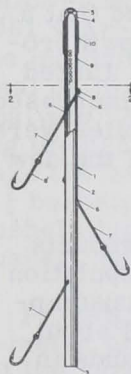
Shrimp Deveining: T. S. Gorton, Jr., Riverside Inc., issued U. S. Patent No. 3,178,765, April 20, 1965: A hand instrument for deveining and removing the shells of shrimp.

Tuna Packer: E. H. Carruthers issued U. S. Patent No. 3,181,957, May 4, 1965: A fish-packing method in which fish loins of the required weight for a single container are broken into pieces and reformed into a chunk pack by pressure, thus retaining their chunk appearance.

Fish Processing: S. H. Lassen, Ralston Purina Co., issued U. S. Patent No. 3,180,738, April 27, 1965: Cooked tuna-like fish are cooled preparatory to canning in an atmosphere of inert gas.

NEW FISHING TACKLE DEVICE PATENTED:

The inventor of a new fishing tackle device describes it as a multibait device that is not easily tangled and which is especially useful to keep live bait separated but active while fishing.



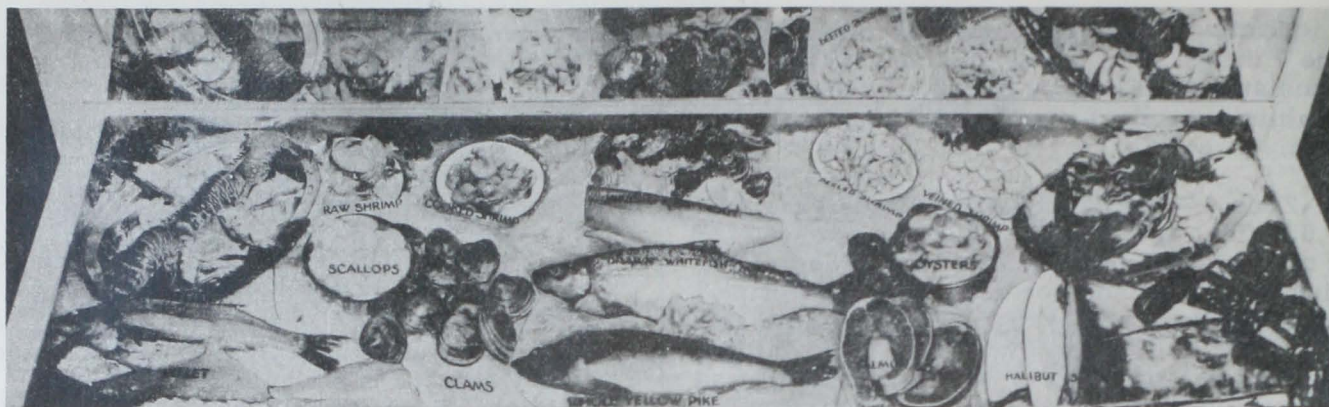
Includes a (colored) translucent plastic tubular body having a number of leaders with hooks extending transversely--thereby eliminating separate floats, weights, and swivels, yet retaining their general functions. It has a simple device by which varying amounts of air may be trapped in the tubular body to vary the buoyancy of the device and keep it upright in the water. Since the bait, hooks, and tubular body are thus compactly arranged at the end of the fishing line, the device may be easily cast and successfully used even by inexperienced fishermen. (Pat. No. 3,183,620 granted Emil J. Dockal, 8606 Kellett, Houston, Tex. 77028.)



Marketing

EDIBLE FISHERY PRODUCTS, JANUARY-AUGUST 1965 AND OUTLOOK FOR 1966:

Total supplies in the United States of edible fishery products during the first 8



Attractive fresh fish display.

months of 1965 were just above those of a year earlier. The status of frozen stocks changed only little. But landings of major edible species ran about 3 percent below 1964, with haddock, salmon, tuna, Pacific mackerel, and ocean perch landings well below the previous year. Shrimp was the only major species with a considerable gain.

The lower landings during the period were offset by a 7-percent increase in imports of edible fish, due mainly to a large increase in frozen fish blocks and slabs and frozen shrimp. At the beginning of 1965, it appeared that a shortage of fish blocks might cut down production of fish sticks and portions. United States imports of frozen fish blocks increased during the 8-month period and supplies were expected to be ample at the start of the new year.

The small increase in fishery products supplies is not keeping pace with population growth. United States per capita consumption of fishery products in 1965 was about 10.5 pounds compared with 10.6 pounds in 1964. Consumption of fresh and frozen fishery products was estimated at 5.8 pounds per capita, down from 5.9 pounds; for canned fishery products it was unchanged at 4.2 pounds, and also unchanged for cured products at 0.5 pound.

With slightly lower fishery products supplies per capita and increased prices of competing products, retail prices for fishery products as of November 1965 averaged above a year earlier. Prices strengthened in the fourth quarter of 1964 and continued an upward trend in the first 3 quarters of 1965. Prices in 1965 averaged above 1964 by about 3 percent, halting a 2-year downward trend.

No appreciable change in United States supplies is expected for 1966, although some increase appears likely. High prices in 1965 may stimulate a little more fishing effort by the fishing fleet. Higher prices, however, are more likely to result in increased imports.

Note: This analysis was prepared by the Bureau of Commercial Fisheries, U. S. Department of the Interior, and published in the U. S. Department of Agriculture's November 1965 issue of the National Food Situation (NFS-114).



North Atlantic

SOVIET FISHING ACTIVITY OFF COAST, NOVEMBER 1965:

Soviet fishing activity in the North Atlantic during November 1965 declined to its lowest level since the beginning of 1965. It was estimated that the total number of vessels during the month did not exceed 25. Of those, 16 were identified as 12 fish-factory stern trawlers, 3 processing and refrigerated-factory stern trawlers, and 1 refrigerated fish transport. This compared with 74 vessels sighted in October of this year and 26 in November 1964.

The observations were made by the staff of the Fisheries Resource Management Office, U. S. Bureau of Commercial Fisheries, Gloucester, Mass., which conducts weekly reconnaissance flights cooperatively with the U. S. Coast Guard. Weekly sightings to about mid-November averaged about 5 vessels; by the end of the month they rose to 20 vessels.

Their fishing operations were widely scattered over a 50-mile area from the Cultivator Shoals to the "southeast part" of Georges



Fig. 1 - Rumanian factory stern trawler Constanta on Georges Bank during October 1965.

Bank, 60 miles east to 140 miles southeast of Cape Cod, at depths of 30 to 50 fathoms. Despite gale force winds which prevailed during most of November, the majority of vessels were actively engaged in fishing operations, with the moderate to small catches observed on deck mostly whiting. Because of the limited number of vessels scattered over the banks it was presumed they were acting as scout vessels in search of fish concentrations.



Fig. 2 - Polish factory stern trawler Finwal was fishing on Georges Bank in October 1965.

The decrease in Soviet fishing activity in November was not limited to Georges Bank only. A gradual decline in activity off the eastern Nova Scotian areas was also observed during the month.

Note: See Commercial Fisheries Review, December 1965 p. 40.



North Atlantic Fisheries Investigations

LOBSTER AND SEA HERRING POPULATION STUDIES CONTINUED:

M/V "Delaware" Cruise 65-12 (Lobster Investigations, October 28-November 2; Her-

ring Investigations, November 3-8, 1965): To sample lobster and sea herring populations in the North Atlantic Ocean (Hudson Canyon, southeast part and northern part of Georges Bank) was the principal objective of this cruise by the U. S. Bureau of Commercial Fisheries research vessel Delaware. Other objectives were to: (1) obtain related environmental data, (2) obtain lobster and herring blood samples, and (3) make plankton tows for lobster and herring larvae.

FISHING OPERATIONS: Lobster: Six trawl sets made at the station worked in waters of 45 fathoms yielded 140 lobsters--77 females (6 berried) and 63 males. Two lobsters (males) were soft-shelled. The average weight of the lobsters was $1\frac{1}{2}$ pounds and the range in weight was from $\frac{1}{3}$ to $6\frac{1}{2}$ pounds. A total of 25 lobster blood samples was obtained for analysis.

Herring: Seven herring trawl sets were made at stations covered. The sets made in waters of 40 to 62 fathoms yielded a total of 12 bushels (about 850 pounds) of herring ranging from 24.5 to 33.2 centimeters (about 9.6 to 13.0 inches) long. The 1960 year-class was dominant in the herring catches, followed in percentage occurrence by the 1961 year-class. Examination showed that the majority of the herring had spawned. A total of 30 blood samples was obtained for analysis. Other species of fish caught during the cruise were: haddock (23 bushels), hake (14 bushels), pollock (2 bushels), cod ($1\frac{1}{2}$ bushels), anglerfish (1 bushel), whiting ($\frac{1}{2}$ bushel), butterfish ($\frac{1}{2}$ bushel), lemon sole ($\frac{1}{4}$ bushel), dab ($\frac{1}{4}$ bushel), and 1 halibut.

PLANKTON OPERATIONS: Lobster: One 1-meter net plankton tow lasting 15 minutes (at the surface) was made during the cruise but no lobster larvae were obtained. Herring: Fourteen 1-meter net plankton tows lasting 15 minutes each (5 minutes at 10 meters, 5 minutes at 5 meters, and 5 minutes at the surface) were made during the cruise. Herring larvae with an average length of 19 millimeters (0.7 inches, range 0.4 to 1.1 inches) totaled 72.

HYDROGRAPHIC OBSERVATIONS: Seabed drifters and drift bottles were released at various stations and at each hydrographic station bathythermograph (BT) casts were made, surface salinities collected, and weather observations recorded.

Note: See Commercial Fisheries Review, December 1965 p. 41.

* * * * *

FALL DISTRIBUTION OF LARVAL HERRING IN GULF OF MAINE STUDIED:

M/V "Rorqual" Cruise R-6-65 and R-7-65 (October 20-28 and November 1-10, 1965):

To determine the fall distribution and relative abundance of larval herring in the Gulf of Maine and to examine their microdistribution with special emphasis on dispersion was the objective of this cruise by the U. S. Bureau of Commercial Fisheries research vessel Rorqual. The area where the vessel operated was from Cape Ann to Grand Manan Channel and inshore within Casco Bay, Sheepscot and Damariscotta estuaries.

BIOLOGICAL OBSERVATIONS: Oblique tows with a Gulf III sampler were made from the surface to 20 meters (65.6 feet) at most of the stations worked. At a number of stations, tows were made at the surface, mid-depth, and bottom. Four transects of the standard tow of 3 miles were run--2 with the BB #1 trawl equipped with a fine-mesh liner and 2 with the Gulf III sampler. Each 3-mile tow was repeated as two 1½ mile tows and again as four ¾-mile tows. The length of transects were: Casco Bay 3 miles, New Meadows River 6 miles, Sheepscot River 6 miles, and Damariscove Island 9 miles. Paired tows using the Gulf III and BB #1 trawl were made in the Sheepscot and Damariscotta estuaries. Buoy nets were set overnight in the Sheepscot estuary.

PRELIMINARY FINDINGS: Large catches (110 to 422) of herring larvae were made near Cape Porpoise and offshore of the Saco Bay area and good catches (34) were made in Saco Bay and Casco Bay. Two weeks later catches in that same area were very small. Other fluctuations in larval abundance occurred in Casco Bay where two catches on one day of 36 larvae with the trawl was reduced to only a few larvae on the following day. Off Damariscove Island an abundance of larvae was found on November 8 and 36 hours later only a single larvae was taken at the same station.

A hydrographic station was occupied at 12 continuity stations and surface salinometer measurements were obtained at all other stations.

Note: See Commercial Fisheries Review, September 1965 p. 38; February 1965 p. 35.



North Pacific Fisheries Explorations and Gear Development

MODIFIED PELAGIC TRAWLS TESTED:

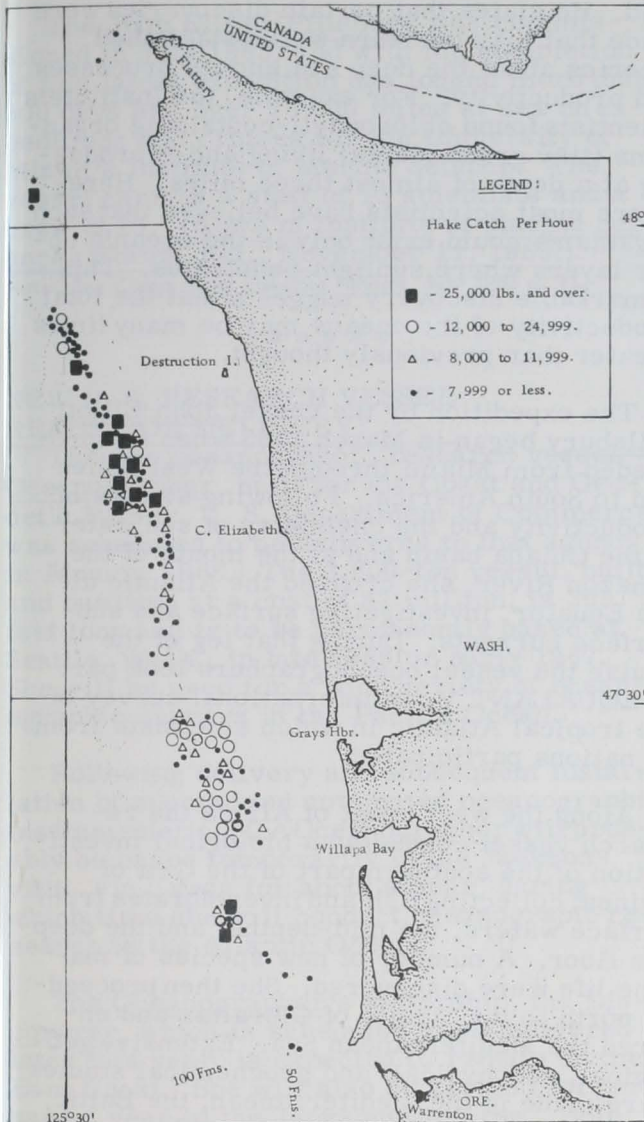
M/V "Western Flyer" Cruise 6 (July 16-October 22, 1965): To determine the commercial production potential of Pacific hake (Merluccius productus) when fished with experimental "Cobb" pelagic trawls and accessory equipment was the primary objective of this 99-day cruise off the Washington coast. The exploratory fishing vessel Western Flyer was chartered for that purpose by the U. S. Bureau of Commercial Fisheries. Other objectives included the collection of related data such as: (1) economic factors related to commercial exploitation; (2) ruggedness and reliability of experimental gear; (3) catch rates in time and space; (4) analysis of catching technique and fishing methodology; and (5) relative effectiveness of various loading and unloading methods and procedures.

AREA OF OPERATIONS: Fishing was conducted along the coast of Washington from Cape Flattery to the Columbia River. Major areas of hake concentrations were found off Willapa Bay, Grays Harbor, Cape Elizabeth, and Destruction Island. Bottom depths ranged from 30 to 100 fathoms, although most drags were made between the 50- and 65-fathom contours. Hake were usually found from 2 to 10 fathoms off the bottom.

All fish caught during the cruise were delivered to a reduction plant at Warrenton, Oreg. (near the mouth of the Columbia River).

EQUIPMENT: The Western Flyer is a 70-foot seine-type vessel powered by a 290-hp. engine and was operated with a four-man crew. Deck machinery includes separate drum trawl winches, trawl-net reel, and dual hoists--all hydraulically operated. The vessel's hold is fitted with a watertight aluminum tank for holding live king crab. Calculated capacity of the tank is about 65 tons.

Fishing on this cruise was conducted with "Cobb" pelagic trawls constructed of either conventional multifilament or ribbon-type monofilament webbing. A dual unit depth telemetry system with electrical core towing cables provided depth readings at each hydrofoil-type otter board. A patented closing device (Holland clip) was used in place of the conventional "hangmen's" knot to secure the cod end of the net.



Areas of explorations during M/V Western Flyer Cruise 6 (July 16-October 22, 1965).

AVAILABILITY OF FISH: On the basis of 1964 exploratory fishing, it was expected that large schools of hake would be available within a short running distance of the Columbia River. In contrast, no large concentrations of hake were found in that area although it had repeatedly been surveyed by the Western Flyer, another chartered vessel the St. Michael, and the Bureau's exploratory fishing vessel John N. Cobb. Low availability of fish may have been due to unusually high water temperatures along the Washington and Oregon coasts.

Occasional good catches were made on small isolated schools of fish along the central and northern coast of Washington. Schools

seemed to disperse rapidly, making it difficult to set back on the same school of fish. Eleven days of the cruise were spent seeking scattered schools of hake.

CATCHES: A total of 170 drags made during the cruise yielded 872 tons of fish, with the largest single catch 60,000 pounds. Catches exceeding 25,000 pounds an hour were made during 13 tows. Twenty-seven tows had catches ranging between 12,000 and 25,000 pounds an hour. Twenty-seven tows yielded catches ranging between 8,000 and 12,000 pounds an hour, and 90 tows were made having catches below 8,000 pounds an hour. A total of 13 tows had no significant catch. The length of time for each tow varied but was usually about 60 minutes.

GEAR PERFORMANCE: Very few difficulties were experienced while using the experimental nets, cable, and depth telemetry system. The gear was operated by commercial fishermen under production conditions and found to be suitable for sustained fishing.

No significant difficulties developed in transferring fish from the net to the hold. The "Holland clip," a patented cod-end closing device, aided greatly in rapid splitting of 1-ton lifts directly from the water into the hold. About 1,000 pounds of hake a minute were loaded.

At first it was necessary to unload catches from the Western Flyer using pitchforks and tubs. Later, a pump was installed at the reduction plant which successfully removed the fish after numerous mechanical difficulties were overcome. About 8 hours were required to remove fish by hand whereas the pumping operation was completed in about 4 hours.

Severe gilling of hake occurred at times in the 3-inch trawl body web. The average size of hake taken in 1964 was 54 centimeters (21.3 inches) whereas in 1965 it was 52 centimeters (20.5 inches). During several trips in 1965 the average length was only 48 centimeters (18.9 inches).

A comparison of catch rates per drag made by two types of "Cobb" pelagic trawls appeared significant. A total of 135 drags made with the conventional multifilament net yielded 1,062,270 pounds of fish for an average yield of 7,870 pounds per drag. Thirty-five drags with the monofilament net yielded

436,630 pounds for an average catch of 12,480 pounds per drag--about 60 percent more effective (preliminary evaluation).

WEATHER: The weather was good during the first 80 days of the cruise. But unfavorable conditions of the Columbia River bar often delayed the vessel's arrival in port by several hours. On one occasion a 10-ton deckload was swept overboard.

About 62 days of the cruise were actually spent at sea hunting and fishing hake. The remaining 37 days were lost to unloading, bad weather, mechanical failures on the vessel, and other disruptions.

CONCLUSIONS: (1) Availability of hake in 1965 was less than in 1964; (2) electric towing cable for telemetry on commercial fishing vessels is feasible; (3) on the basis of available data, the "Cobb" pelagic trawl may be more effective when constructed of monofilament webbing; (4) hake can be held for 3 days without ice or refrigeration and processed successfully; (5) the "Holland clip" aids materially when splitting fish aboard; (6) the after portion of a commercial "Cobb" pelagic trawl body should be constructed of 2½", 24-thread web to reduce damage from gilling and fish teeth; (7) vessel hold should have an effective sump pump to remove excess water taken aboard with fish; (8) a 290-hp. engine cannot control the "Cobb" pelagic trawl in strong cross tides; (9) the hold must be watertight to prevent odors from passing forward in the bilge.

Note: See *Commercial Fisheries Review*, October 1965 p. 44; September 1965 p. 40.



Oceanography

RESEARCH VESSEL "JOHN ELLIOTT PILLSBURY" COMPLETES 8-MONTH EXPEDITION:

A 23,500-mile 8-month oceanographic research expedition in the Atlantic Ocean, the Mediterranean, and the Baltic and Black Seas by the research vessel John Elliott Pillsbury ended November 15, 1965. The 176-foot vessel is operated by the Institute of Marine Science, University of Miami, Miami, Fla.

It will take many months to compile and evaluate the scientific data obtained on this important expedition, the Institute director

said. He states that certain discoveries were made that may overturn well-established theories about the deep sea and its processes and productivity. For example, the Institute's scientists found chlorophyll-containing organisms (tiny green plants) living and reproducing at a depth of almost three miles. Heretofore most scientists have believed that such organisms could exist only in the ocean's upper layers where sunlight penetrates. This remarkable discovery suggests that the total productivity of the oceans may be many times greater than previously thought.

The expedition by the vessel John Elliott Pillsbury began in March 1965 when she proceeded from Miami through the West Indies and to South America. Following studies of productivity and the chemistry of sea water in the Guiana basin and at the mouth of the Amazon River, she crossed the Atlantic at the Equator, investigating surface and subsurface currents. During that leg of the cruise the vessel oceanographers took part in EQUALANT V, an international survey of the tropical Atlantic in which scientists from 11 nations participated.

Along the west coast of Africa the research vessel conducted a biological investigation of the southern part of the Gulf of Guinea, collecting fish and invertebrates from surface waters, the mid-depths, and the deep-sea floor. A number of new species of marine life were discovered. She then proceeded north to the Straits of Gibraltar and entered the Mediterranean Sea. Extensive geological, geophysical, and geochemical studies were made in the Mediterranean, the Baltic, and the Black Seas. Submarine volcanoes were investigated and studies of deep-sea sediments, currents, and bottom topography carried out. In the Black Sea, deep-sea photographs were obtained of dead fish lying intact on the bottom where they had sunk from surface waters. Because of the lack of oxygen in the deep water of the Black Sea, the bodies of surface animals that sink do not decompose in the usual manner. The bottom sediments of the Black Sea were studied for clues to the origin of petroleum about which very little is known.

The return trip of the vessel was westward across the Atlantic, from the Straits of Gibraltar and on to her home base in Miami. On this leg she conducted coring and dredging operations.

The John Elliott Pillsbury was commissioned in July 1963, and with the completion of this latest expedition has logged more than 500 days and over 73,000 miles at sea on expeditions and cruises for the University of Miami's Institute of Marine Science. The vessel carries a staff of 13 scientists and a crew of 21. (News of Institute of Marine Science, Miami, Fla., November 11, 1965.)

Note: See Commercial Fisheries Review, July 1965 p. 41.

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NEW U. S. RESEARCH VESSEL READY FOR DELIVERY:

The new oceanographic research vessel Oceanographer, built for the Coast and Geodetic Survey, U. S. Department of Commerce, was scheduled to be delivered to that agency in January 1966. The 3,800-ton vessel, built and outfitted at a cost of \$7 million, is 303 feet long and is to be permanently based at Seattle, Wash., in late 1966 or early 1967. She will be used for a wide variety of oceanographic surveys in the Pacific Ocean.

Following delivery and subsequent installation of specialized automated oceanographic instrumentation, the Oceanographer will probably be based temporarily in the Jacksonville, Fla., area for about a year, during which time she will conduct oceanographic research in the Atlantic Ocean.

The Oceanographer's sistership, the Discoverer, which is scheduled to be delivered later this year, is expected to remain on the East Coast. She will also be berthed for perhaps a year in the Jacksonville area. Both vessels were built at a Jacksonville shipyard and it was necessary to base them near the construction site during the "shakedown" period which follows delivery.

Each vessel will have a cruising range of 16,000 miles and will carry a normal complement of 13 officers, a crew of 39, and 45 technical and scientific personnel, with additional accommodations for 8 visiting scientists. All scientific working areas will be air-conditioned with interconnecting communications. Closed circuit television will be provided throughout the engine room, where a centralized control system will provide remote starting and stopping of machinery, programming of the fuel and ballast system, and the automatic recording of operating data at a master control station.

Another feature will be a center well running vertically through each vessel which will enable special experimental equipment to be lowered and SCUBA divers to enter and leave the vessel. Special bow-viewing ports below the water line will permit underwater observations. Laboratory space of over 4,100 square feet will be provided. (U. S. Coast and Geodetic Survey, November 12, 1965.)

Note: See Commercial Fisheries Review, June 1964 p. 23.



Oregon

WILLAMETTE RIVER SPRING CHINOOK SALMON RETURNS FOR 1965:

A record number of adult spring chinook salmon arrived at the Oregon Fish Commission's Dexter Dam trapping facility on the Middle Willamette River east of Eugene during the 1965 season, according to the Commission's fish culture director. Some 6,600 chinook were counted into the holding ponds at Dexter compared with 5,100 during the 1964 season and 6,000 in 1963. Observations by hatchery personnel were that there was a substantial spawning population in the river below Dexter, probably at least as many as the previous year when about 1,000 spawners were counted during a check by helicopter.

At Minto Pond below the Detroit Dam on the North Santiam River, where spring chinook are taken primarily to supply eggs for the Marion Forks Hatchery, the take of 1,900 adults was lower in 1965 than in both 1963 and 1964 when 2,900 and 2,600, respectively, were counted, but still ranked fifth in the number of fish during the 15 seasons since the dam was constructed. The Minto trap was out of operation until September 1, 1965, because of repairs to the water supply diversion dam at the site. Ordinarily the trap would have been operating from May into the fall months to take spring chinook moving upriver. The fish stayed in the river during the summer since they were unable to enter the trap. It was considered doubtful that this had any effect on the number of fish handled at Minto.

The Marion Forks egg harvest in 1965 was considered excellent, with 5.6 million eggs taken compared with 4.9 million in 1964. The average egg take at that station during the past 10 years has been 2.6 million. The 1965 egg harvest at Dexter was also excel-

lent, with the season's total at 9.6 million eggs. This exceeded the previous year's 9.4 million but was below the 12 million egg take in 1963. The average egg harvest at Dexter over the past 10 years has been 3.9 million. There was a substantial loss of fish from "Columnaris" at Dexter, with about 1,200 adults succumbing to the effects of that disease. It was estimated that the reduction in the egg take caused by these mortalities was 3.5 million.

Despite the good hatchery showing, the 1965 run of spring chinook in the Willamette was calculated at 41,000 fish, about 9,000 below the average of the past 20 years; but in 7 of those 20 seasons there have been smaller runs with a low of 24,800 fish in 1950. Sport fishermen landed about 9,000 chinook during the 1965 season, down about one-quarter from the 20-year average catch of 12,000 fish. This catch by sport fishermen was 22 percent of the run compared to the 20-year average of 27 percent. The Willamette Falls count was 29,000 compared with the 20-year average of 36,000.

The Willamette spring chinook run is not harvested to any extent by the commercial fishery in the Columbia River since the peak of that run passes up the Columbia and into the Willamette between the winter and spring gill-net seasons.

Hatcheries operated by the Oregon Fish Commission on the Willamette River system, including the Willamette, McKenzie, South Santiam, and Marion Forks stations have a combined rearing capacity of 7 million spring chinook yearlings. So far, some 4.5 million spring chinook eggs have been transferred to the U. S. Fish and Wildlife Service for rearing at the Eagle Creek National Fish Hatchery in the Clackamas River drainage, and transfer to other Federal hatcheries in the Columbia River Basin. Over 10 million additional eggs remain in Commission hatcheries to be used in the rearing program or for research studies associated with new dams on Willamette tributaries.

About 30 percent of the chinook salmon passing over Willamette Falls in spring 1965 eventually were handled at Commission holding ponds indicating the substantial contribution the hatcheries are making in maintaining the Willamette River run. (Oregon Fish Commission, November 1, 1965.)

SURPLUS SILVER SALMON FROM COASTAL HATCHERIES USED TO SEED OTHER WATERS:

In the fall of 1965, most Oregon State fish hatcheries in the coastal area were receiving a surplus of silver salmon spawners. The excess salmon were replanted in streams which can support larger salmon runs. The Oregon State Fish Commission hatchery director emphasized that sufficient fish are allowed to escape upstream beyond hatchery racks to take full advantage of whatever natural spawning area is available. Only after both hatchery and natural spawning area needs are taken care of are fish hauled to other waters, the hatchery director stated. (Oregon State Fish Commission, November 17, 1965.)



Salmon

U. S. PACIFIC COAST CANNED STOCKS, NOVEMBER 1, 1965, AND NEW SEASON PACK:

On November 1, 1965, canners' stocks (sold and unsold) in the United States of Pacific canned salmon totaled 2,614,869 standard cases (48 1-lb. cans)--757,344 cases less than on November 1, 1964, when stocks totaled 3,372,213 standard cases.

On the basis of total stocks of 3,478,830 actual cases (consisting of cans of 1/4-lb., 1/2-lb., 1-lb., etc.), red salmon accounted for 1,938,736 cases (mostly 1-lb. and 1/2-lb. cans) or 57.0 percent of the total canners' stocks on November 1, 1965; pink salmon accounted for 793,674 cases or only 22.8 percent (546,934 cases were 1-lb. talls). Next came chum (328,219 cases, mostly 1-lb. talls), followed by coho or silver (232,458 cases), and king salmon (140,743 cases).

Table 1 - Total Canners' Stocks of Pacific Canned Salmon, November 1, 1965

Species	Nov. 1, 1965	July 1, 1965	Nov. 1, 1964
 (No. of Actual Cases)		
King	140,743	24,850	104,399
Red	1,938,736	109,129	750,483
Coho	232,458	62,709	250,162
Pink	793,674	399,169	2,109,841
Chum	328,219	262,259	817,515
Total	3,478,830	858,116	4,032,400

Carryover stocks at the canners' level totaled 733,575 standard cases on July 1, 1965, the approximate opening date of the Pacific salmon packing season. Adding the 1965 new season pack of 3,541,187 standard cases brought the total available supply for the 1965/66 market season to 4,274,762 standard cases.

Table 2 - Total Canners' Stocks on Hand November 1, 1965 (Sold and Unsold), By Species and Can Size

Case & Can Size	King	Red	Coho	Pink	Chum	Total
(Actual Cases)						
48 1/4-lb.	7,795	274,249	77,739	4,515	67	364,365
48 1/2-lb.	116,088	696,677	90,534	214,269	63,806	1,181,374
48 1-lb.	16,187	1,008,590	52,907	546,934	252,561	1,877,179
12 4-lb.	673	4,220	11,278	27,956	11,785	55,912
Total	140,723	1,983,736	232,458	793,674	328,219	3,478,830

Table 3 - Canners' Shipments from July 1, 1965, to November 1, 1965, By Species and Can Size

Case & Can Size	King	Red	Coho	Pink	Chum	Total
(Actual Cases)						
48 1/4-lb.	6,405	150,799	47,099	3,978	-	208,281
48 1/2-lb.	52,764	286,338	42,014	198,071	30,286	609,473
48 1-lb.	4,544	452,033	55,193	502,703	245,982	1,260,455
12 4-lb.	418	5,239	2,991	29,983	4,836	42,631
Total	63,295	894,409	147,297	734,735	281,104	2,120,840

Table 4 - Pacific Canned Salmon Pack by Species and Can Size, 1965

Case & Can Size	King	Red	Coho	Pink	Chum	Total
(No. of Actual Cases)						
48 1/4-lb.	12,451	391,848	116,056	7,378	45	527,778
48 1/2-lb.	148,693	924,106	119,880	334,036	72,351	1,609,066
48 1-lb.	17,875	1,443,614	68,314	723,541	267,060	2,520,404
12 4-lb.	169	9,448	12,796	54,285	7,608	84,306
Total	179,188	2,769,016	317,046	1,129,240	347,064	4,741,554

Shipments at the canners' level of all salmon species from July 1 to November 1, 1965, totaled 1,659,839 standard cases. The carry-over of 733,575 standard cases on July 1, 1965, the beginning of the 1965/66 sales year, was substantially lower (37.6 percent) than the carryover of 1,175,588 cases a year earlier.

The 1965 U. S. pack of Pacific canned salmon (including Alaska) of 3,541,187 standard cases was 9.7 percent below the 1964 pack of 3,922,356 cases. By species, the new pack was made up of (1964 pack in parentheses): king, 95,503 standard cases (78,155); red, 2,013,077 cases (831,815); coho, 170,064 cases (202,610); pink, 951,688 cases (2,055,311); chum, 310,855 cases (754,465).

Data on canned salmon stocks are based on reports from U. S. Pacific Coast canners who packed over 94 percent of the 1965 salmon pack. (Division of Statistics and Economics, National Cannery Association, December 1, 1965.)

Note: See Commercial Fisheries Review, Sept. 1965 p. 41.



Shrimp

BREADED PRODUCTION, JULY-SEPTEMBER 1965:

United States production of breaded shrimp during the third quarter of 1965 amounted to about 21.0 million pounds -- a decrease of about

Table 1 - U. S. Production of Breaded Shrimp by Areas, July-September 1965

Area	1/July-Sept. 1965		July-Sept. 1964	
	No. Plants	Quantity 1,000 Lbs.	No. Plants	Quantity 1,000 Lbs.
Atlantic	15	6,542	14	7,936
Gulf	16	12,809	21	13,790
Pacific	8	1,615	8	2,044
Total	39	20,966	43	23,770

1/Preliminary.

Table 2-U. S. Production of Breaded Shrimp by Months, 1964-65

Month	1/1965	1964
. . (1,000 Lbs.) . .		
January	6,926	7,347
February	6,632	8,045
March	7,771	7,249
April	6,120	7,027
May	6,023	6,171
June	5,855	6,588
July	6,410	8,641
August	7,255	7,299
September	7,301	7,830
October	-	9,169
November	-	7,852
December	-	7,460
Total	-	90,678

1/Preliminary.

2.8 million pounds or 11.8 percent as compared with the same period in 1964.

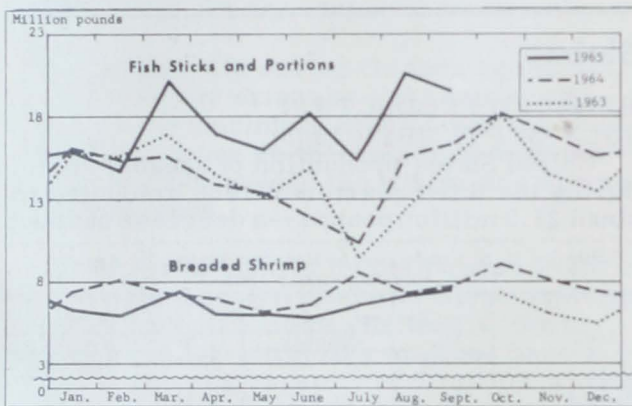
The Gulf States ranked first in the production of breaded shrimp with 12.8 million pounds, followed by the Atlantic States with 6.5 million pounds, and the Pacific States with 1.6 million pounds.



United States Fisheries

FISH STICKS AND PORTIONS, JULY-SEPTEMBER 1965:

United States production of fish sticks and fish portions amounted to 55.6 million pounds during the third quarter of 1965, according to preliminary data. Compared with the same quarter of 1964, this was an increase of 13.4 million pounds or 31.6 percent. Fish portions (36.5 million pounds) were up 10.8 million pounds or 42.2 percent, and fish sticks (19.1 million pounds) were up 15.3 percent.



U.S. production, 1963-65.

Cooked fish sticks (17.8 million pounds) made up 93.2 percent of the July-September 1965 fish stick total. There were 36.0 million pounds of breaded fish portions produced, of which 27.6 million pounds were raw. Unbreaded fish portions amounted to 453,000 pounds.

Table 1 - U. S. Production of Fish Sticks by Months and Type, July-September 1965 1/

Month	Breaded			Un-breaded	Total
	Cooked	Raw	Total		
	. . . (1,000 Lbs.). . .				
July	4,883	414	5,297	101	5,398
August	6,147	380	6,527	121	6,648
September	6,784	509	7,293	231	7,524
Total 3rd Qtr, 1965 1/	17,814	1,303	19,117	453	19,570
Total 3rd Qtr, 1964 2/	15,017	1,570	16,587	489	17,076
Total 1964 2/	67,810	5,722	73,532	2,541	76,073

1/Preliminary.
2/Revised.

Table 2 - U. S. Production of Fish Portions by Months and Types, July-September 1965 1/

Month	Breaded			Un-breaded	Total
	Cooked	Raw	Total		
 (1,000 Lbs.).				
July	2,910	7,861	9,871	101	9,972
August	3,310	10,561	13,871	121	13,992
September	3,116	9,173	12,289	231	12,520
Tot. 3rd Qtr, 1965 1/	8,436	27,595	36,031	453	36,484
Tot. 3rd Qtr, 1964 2/	5,029	20,140	25,169	489	25,658
Total 1964 2/	20,956	82,135	103,091	2,541	105,632

The Atlantic States continued to lead in the production of both fish sticks and fish portions, with 14.9 and 22.6 million pounds, respectively. The Inland and Gulf States ranked second with 2.3 million pounds of fish sticks and 13.2 million pounds of fish portions.

NATIONAL ANADROMOUS FISHERY PROGRAM ACT:

Far-reaching benefits to the Nation's sport and commercial fisheries will result from legislation recently signed into law by President Johnson, announced Secretary of the Interior Stewart L. Udall on November 18, 1965. Public Law 89-304, the National Anadromous Fishery Program Act, authorizes cooperative projects between the Federal Government and the various States to conserve and enhance the United States fisheries for salmon, shad, striped bass, and other anadromous fish that live in the sea or Great Lakes, and migrate up streams to spawn.

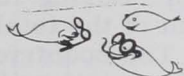
The Act authorizes future appropriations not to exceed \$25 million for the period ending June 30, 1970. Not more than \$1 million can be obligated in any one fiscal year in any one State. Funds for financing the cooperative program have yet to be appropriated by Congress.

Projects authorized under the law include investigations and research into anadromous fish problems "as may be desirable to carry out the program." These include (1) improving access to spawning areas; (2) construction and operation of facilities to improve feeding and spawning conditions; (3) improving facilities for free migration of fish; and (4) construction and operation of fish hatcheries.

Work under the anadromous fish program will be covered by agreements between the

Secretary of the Interior and a State or several States acting jointly. The agreements will describe the actions to be taken by the cooperating agencies, benefits expected, estimated costs, the Federal share of the costs which cannot exceed 50 percent of the total, duration of the agreement, and conditions for disposing of any property acquired by the Secretary following termination of the project.

Representatives of the Department of the Interior in the near future will confer with directors of State fish and game departments concerning proposed cooperative agreements, the Interior Secretary said.



U. S. Fishing Vessels

DOCUMENTATIONS ISSUED AND CANCELLED, JULY 1965:

During July 1965 a total of 53 vessels of 5 net tons and over was issued first documents as fishing craft as compared with 56 in July 1964. There were 35 documents cancelled for fishing vessels in July 1965 as compared with 41 in July 1964.

U. S. Fishing Vessels 1/--Documentations Issued and Cancelled, by Areas, July 1965 with Comparisons				
Area (Home Port)	July		Jan.-July	
	1965	1964	1965	1964
 (Number). . . .			
Issued first documents 2/:				
New England	6	5	23	24
Middle Atlantic	-	-	7	5
Chesapeake	3	1	21	24
South Atlantic	6	5	43	30
Gulf	23	22	167	142
Pacific	15	23	128	103
Great Lakes	-	-	1	1
Hawaii	-	-	-	1
Puerto Rico	-	-	1	1
Total	53	56	391	331
Removed from documentation 3/:				
New England	1	9	24	26
Middle Atlantic	-	3	11	15
Chesapeake	4	3	22	20
South Atlantic	3	1	46	25
Gulf	16	5	70	59
Pacific	10	20	57	102
Great Lakes	1	-	10	9
Hawaii	-	-	2	-
Puerto Rico	-	-	1	-
Total	35	41	243	256

1/Includes both commercial and sport fishing craft. A vessel is defined as a craft of 5 net tons and over.
 2/There were 6 redocumented vessels in July 1965 previously removed from the records. Vessels issued first documents as fishing craft were built: 36 in 1965; 1 in 1961; 1 in 1960; 1 in 1956; and 14 prior to 1948.
 3/Includes vessels reported lost, abandoned, forfeited, sold alien, etc.
 Source: Monthly Supplement of Merchant Vessels of the United States, Bureau of Customs, U.S. Treasury Department.

U. S. Foreign Trade

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA:

United States imports of tuna canned in brine during January 1-October 30, 1965, amounted to 37,954,445 pounds (about 1,808,200 standard cases), according to preliminary data compiled by the U. S. Bureau of Customs. That was an increase of 2.1 percent from the 37,162,653 pounds (about 1,769,650 standard cases) imported during January 1-October 31, 1964.

The quantity of tuna canned in brine which can be imported into the United States during the calendar year 1965 at the 12½-percent rate of duty is limited to 66,059,400 pounds (or about 3,145,685 standard cases of 48 7-oz. cans). Any imports in excess of that quota will be dutiable at 25 percent ad valorem.

TRENDS IN UNITED STATES EXPORTS OF FISHERY PRODUCTS, 1964:

In 1964, the value of United States exports of fishery products totaled \$64,204,000--a 13-percent increase over the previous year and a record high for the export of fishery products. The value of fishery exports in 1964 was 63 percent higher than the average of the previous ten years. In 1964, canned salmon replaced fish oil as the principal fishery product exported by the United States.

Year	Edible	Inedible	Total
 (US\$1,000)		
1964	42,878	21,320	64,204
1963	30,376	26,229	56,605
1962	22,470	13,258	35,728
1961	19,594	15,116	34,710
1960	25,622	18,543	44,165
1959	26,747	17,495	44,242
1958	19,440	11,564	31,004
1957	20,549	15,403	35,952
1956	22,939	16,564	39,503
1955	24,923	15,054	39,977
1954	16,238	15,289	31,527

Trends by Countries: U. S. fishery products are marketed in well over 100 countries throughout the world. The United Kingdom, Canada, and Japan buy over half of U. S. exports of fishery products. In 1964, eleven countries each received U. S. fishery exports valued over US\$1.0 million. Together the eleven countries accounted for 87 percent of total U. S. exports of fishery products.

Table 2 - United States Exports of Fishery Products by Selected Countries of Destination, 1960-1964

Country	1964	1963	1962	1961	1960
(US\$1,000)					
United Kingdom	15,102	13,081	8,249	4,554	8,460
Canada	10,434	11,156	8,846	10,265	10,309
Japan	9,200	7,819	939	2,984	3,295
Sweden	6,425	4,473	1,076	1,665	2,613
Netherlands	4,879	2,593	2,273	2,385	4,350
West Germany	3,146	3,638	1,467	1,555	2,201
France	2,325	1,889	1,073	1,007	1,048
Switzerland	1,284	2,229	1,712	738	1,082
Belgium	1,115	445	547	351	537
Norway	1,064	1,539	403	2,390	1,390
Philippines	1,043	403	320	582	2,494
Italy	656	1,643	869	423	643
Hong Kong	603	388	383	368	269
Greece	471	566	487	364	313
Australia	426	203	198	458	444
Mexico	417	263	375	459	616
Venezuela	238	183	274	360	461
Ecuador	39	1	171	82	293
Other	5,337	4,094	6,066	3,720	3,347
Total	64,204	56,606	35,728	34,710	44,165

UNITED KINGDOM: Exports of fishery products to the United Kingdom have increased steadily since 1961. For the second year in a row the United Kingdom was the leading export market for U.S. fishery products. Exports of fish oil practically ceased in 1964. However, this decrease was offset by the 92-percent increase in exports of canned salmon and the 52-percent increase in exports of fresh and frozen salmon. The major fishery commodities exported to the United Kingdom were:

Commodity	1964	1963
(US\$1,000)		
Fish and marine-animal oil	214	5,142
Salmon, canned	11,559	6,006
Salmon, fresh or frozen	1,178	777
Shrimp, canned	1,116	798
Other	1,035	358
Total	15,102	13,081

CANADA: In 1964, Canada (traditionally the major market for exports of U.S. fishery products) remained in second place as an export market. The value of fishery products exported to Canada declined 6 percent from the previous year. The principal items exported to Canada were:

Commodity	1964	1963
(US\$1,000)		
Shrimp, fresh or frozen	2,214	2,165
Shrimp, canned	1,847	1,592
Seal furs	2,004	1,935
Fish, fresh or frozen	1,001	1,043
Canned fish	124	1,002
Fish, shellfish and other marine-animal products, inedible	589	879
Fish, marine-animal, and liver oil	73	543
Salmon, fresh or frozen	547	581
Other	2,035	1,416
Total	10,434	11,156

OTHER COUNTRIES: The values of the principal fishery products exported in 1964 to other major markets were:

Country & Product	US\$1,000
Japan:	
shells, unmanufactured	1,487
shrimp, frozen	4,304
salmon, fresh or frozen	1,947
Sweden, fish oil	
Netherlands, fish oil	5,901
West Germany, fish oil	2,853
France:	
salmon, fresh or frozen	1,290
seal furs	144
Switzerland, seal furs	
Belgium, canned salmon	988
Norway, fish oil	638
Philippines, canned mackerel	1,026
Italy, seal furs	553
	536

Trends by Areas: During 1964, Europe imported 59 percent of the total U.S. fishery products exports. The countries of the European Free Trade Association (EFTA) imported fishery products valued at \$24,956,000 or 39 percent of U.S. fishery products exports. Members of the European Economic Community (EEC or Common Market) imported fishery products valued at \$12,121,000 or 18 percent of the total fishery products exported. Products valued at \$13,008,000 or 20 percent of the total exports went to North America. Exports to Asian countries ranked third followed by South America and Africa.

Table 3 - United States Exports of Fishery Products by Area of Destination, 1964

Area	Edible	Inedible	Total
(US\$1,000)			
Europe	21,639	16,414	38,053
North America	9,865	3,143	13,008
Asia	10,019	1,575	11,594
South America	343	112	455
Africa	314	36	350
Oceania	698	46	744
Total	42,878	21,326	64,204

Trends by Commodities: Significant increases in the exports of several major prod-

Table 4 - Value of United States Exports of Fishery Products by Selected Commodities, 1960-1964

Commodity	1964	1963	1962	1961	1960
(US\$1,000)					
Fish oils	13,096	15,636	6,047	8,908	10,688
Seal furs	4,706	5,877	3,851	3,097	3,309
Shells, unmanufactured	1,606	2,136	1,285	1,380	2,636
Misc. fish (mostly fresh-water, fresh or frozen)	1,664	1,858	1,135	809	947
Oysters, shucked	301	191	311	448	497
Salmon:					
fresh or frozen	5,371	2,530	872	647	1,677
cured	743	509	528	593	435
canned	14,852	8,239	7,292	5,580	9,830
Mackerel, canned	1,140	681	671	581	211
Miscellaneous fish, canned	596	628	460	391	355
Sardines, canned not in oil	485	666	1,285	1,336	3,443
Shrimp:					
fresh or frozen	7,103	7,748	3,299	3,694	2,303
canned	3,664	3,054	2,572	2,487	3,383
Squid, canned	662	742	729	353	691

ucts were important factors in record-high exports of U. S. fishery products in 1964. Canned salmon exports increased 80 percent over the previous year and replaced fish oil as the most important among fishery products exported. Exports of fresh and frozen salmon more than doubled; canned mackerel exports increased 67 percent and shucked oysters 58 percent. The value of fish oil exports decreased 16 percent. Notable decreases also occurred in the exports of seal furs and unmanufactured shells.



Virginia

CATCH FORECASTS FOR MAJOR FISHERIES IN 1966:

Catch forecasts for major Virginia fisheries in 1966 were issued in October 1965 by the Virginia Institute of Marine Science. The predictions were based on sampling work done in the summer of 1965. Following are the Institute's forecasts:

Shellfish: SEED AND MARKET OYSTERS: Setting in the James River remains far below necessary levels for a suitable seed area. Seed supply will probably meet light demand. Supply of market oysters remains low due to continuing presence of MSX; no significant change is foreseen.

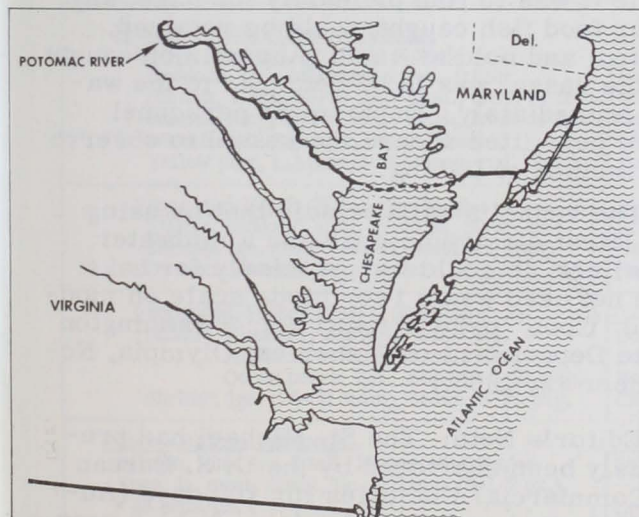


Fig. 1 - Virginia fishing areas.

BLUE CRAB: Marked increase in abundance; above average catches expected in 1966.

CLAMS: Insufficient data are available to predict how abundant hard or soft clams will be in the future. The supply of each is adequate to support the fishery, and both are probably under-exploited in Virginia waters.

SCALLOPS: Between April and September 1965, well over 1.5 million pounds (shucked weight) of sea scallops worth more than \$900,000 were dredged off the Virginia coast. This new fishery may become important to Virginia fishermen, but the extent of the scallop beds as well as the potential yield has not yet been determined.



Fig. 2 - Druggers unloading at Hampton, Va.

Fish: SPOT: Some decline in abundance expected because of weak year-classes of 1964 and spring 1965.

CROAKER: Reasonably good year-classes in 1964 and again in 1965 should insure improvement in this fishery in 1966. The 1965 catch exceeded the 1964 catch substantially, although the landings were still far below the 20-year average.

SEA TROUT: Continued light supply expected in 1966 because of a series of poor year-classes. Some improvement is expected in numbers of small market-size trout in 1966 summer season. Population has been fairly stable at very low level for the past 4 years.

MENHADEN: The year-class produced during the winter of 1964/65 was relatively weak. That was the third weak year-class in succession. The 1966 summer season should be no more satisfactory than the 1965 season. No real improvement can be expected through 1967.

SUMMER FLOUNDER: Unusually large numbers of juvenile flounder appeared in Chesapeake Bay during 1964-65 and should enter the commercial and recreational fishery in 1966. Summer flounder catches should increase in 1966, unless those observations reflected only a localized situation.

OTHER FISH (alewife, herring, striped bass, shad, and sea bass): No significant change in stocks is expected, although only a limited amount of information is available for those species.



Washington

RECORD SALMON RELEASES FROM HATCHERIES IN JANUARY-JUNE 1965:

In the first 6 months of 1965, the 24 salmon hatcheries of the Washington Department of Fisheries planted 93.4 million young salmon of all species in Washington State waters. Most of those--75.2 million--were reared to migratory size before release. The remaining 18.2 million were fry that were planted in experiments and, in some instances, because of lack of rearing space or of food.

Fall chinook topped the list of releases with 54.0 million fingerlings (reared to migratory size in 3 months) and 14.8 million fry. Releases of silver yearlings (reared for a year) totaled 17.2 million, plus 1.8 million fry and 1.4 million fingerlings; spring chinook yearlings totaled 1.3 million; chum, 250,000 fry and 2.6 million fingerlings; and sockeye, 38,250 fry.

Total poundage of salmon planted by the Washington State hatcheries in January-June 1965 was a new record of slightly over a million pounds.

The supervisor of the Washington State Fisheries Hatchery Division said hatchery production had tripled in the past 10 years and that production could be tripled again in the next 10 years. Major items necessary to achieve this goal are some increases in water supplies, and an increase in rearing ponds and fish food, he said. The increased production can be accomplished with little, if any, increase in manpower.

The hatchery official said that since the State's hatcheries began rearing most salmon to a larger migratory size (the same age, but larger size than the natural stocks migrating to salt water) production had increased substantially. In an experiment, fish liberated at 35 to the pound had a return to the hatchery of 0.47 percent; an increase to 25 per pound resulted in a return of 1.31 percent; and releases of salmon 17 to the pound

resulted in a return of 2.81 percent. Ordinarily, a return to the hatchery of 1 percent is considered good. For each salmon returning to the hatchery, 3 or 4 are caught in the commercial and sport fisheries.

It was emphasized that the entire Washington State hatchery operation was assessed on a strict cost-production basis. Washington State estimates that each dollar spent returns at least three dollars worth of salmon to the State's commercial and sport fisheries. (Washington State Department of Fisheries, November 19, 1965.)

* * * * *

TEST FISHING FOR HAKE IN PUGET SOUND:

Test fishing for hake was carried out in Puget Sound waters in November 1965 by the trawler St. Michael under a program of the Washington State Department of Fisheries. (Hake are generally fished in offshore waters.) Under a permit issued by the Department of Fisheries, the test fishing was planned to find out if stocks of hake inside Puget Sound were abundant enough to support a fishery. Large quantities of hake have been caught in offshore experimental fishing, revealing the presence of considerable concentrations.

Under the permit issued, the vessel was to comply with all food fish licensing requirements of the State of Washington, and while it was to fish primarily for hake, any other food fish caught would be retained, sorted, and sold as such. Any salmon caught by the vessel was to be returned to the water immediately. Department personnel were permitted aboard the vessel to observe the method of fishing.

The vessel's skipper said that by using the latest electronic gear and a midwater trawl net, he could fish precisely for hake. The net used was a two-thirds scale on modified "Cobb" pelagic trawl net. (Washington State Department of Fisheries, Olympia, November 19, 1965.)

Editor's Note: The St. Michael had previously been chartered by the U. S. Bureau of Commercial Fisheries for 100 days (August-November 1965) of pelagic fishing gear research in Puget Sound and off the coasts of Washington, Oregon, and California. Two modified "Cobb" pelagic trawls were then tested.

Note: See Commercial Fisheries Review, October 1965 p. 44, and pp. 42-44 of this issue.



Wholesale Prices

**EDIBLE FISH AND SHELLFISH,
NOVEMBER 1965:**

From October to November 1965 prices were higher for a number of selected items (frozen dressed salmon, shrimp, oysters, canned sardines); lower for several other items; and some were unchanged. At 119.4 percent of the 1957-59 average, the overall wholesale price index for edible fishery products in November rose 1.2 percent from the previous month. As compared with the same month a year earlier, the index this November was up 9.6 percent; prices ranged from higher to substantially higher for nearly all items in the index.

Lower prices at Boston for ex-vessel large haddock (down 20.8 percent) from October to November were responsible for a 2.6-percent drop in the November 1965 subgroup index for drawn, dressed, or whole finfish. But November prices at New York City were higher than in the previous month for frozen king salmon (up 4.5 percent) and round

fresh yellow pike (up 27.0 percent), and at Chicago for Lake Superior fresh whitefish (up 9.6 percent). As compared with the same month a year earlier, the subgroup index this November was up 15.0 percent because of much higher prices for all items--some up to one-third higher than in November 1964.

Higher wholesale prices at New York City from October to November for South Atlantic fresh shrimp (up 4 cents a pound) and at Norfolk for standard shucked oysters (up 4.5 percent) were responsible for a 4.3-percent advance in the November 1965 subgroup index for fresh processed fish and shellfish. Prices for fresh haddock fillets were down 3.0 percent from the previous month. The subgroup index this November was up 11.8 percent as against the same month in 1964--prices were higher for all items with shucked oysters up 20.8 percent.

In the subgroup for frozen processed fish and shellfish, prices this November were up for all items except haddock fillets and the index rose 3.1 percent. From October to No-

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, November 1965 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ (\$)		Indexes (1957-59=100)						
			Nov. 1965	Oct. 1965	Nov. 1965	Oct. 1965	Sept. 1965	Nov. 1964			
			ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)								119.4
Fresh & Frozen Fishery Products:					122.7	121.1	117.9	113.0			
Drawn, Dressed, or Whole Finfish:					128.5	131.9	135.8	111.7			
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.18	.23	143.4	181.0	142.1	107.8			
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.48	.48	140.5	142.0	150.8	112.4			
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.88	.84	122.3	117.0	131.0	115.6			
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.58	.53	85.8	78.3	85.8	74.6			
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.78	.61	126.9	99.9	155.5	106.4			
Processed, Fresh (Fish & Shellfish):					124.2	119.1	107.3	111.1			
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.48	.49	115.4	119.0	116.6	106.9			
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.91	.87	106.6	101.4	93.7	102.5			
Oysters, shucked, standards	Norfolk	gal.	8.75	8.38	147.6	141.2	122.3	122.2			
Processed, Frozen (Fish & Shellfish):					110.9	107.6	105.3	110.8			
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.41	.40	103.9	100.1	100.1	88.7			
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.40	.40	117.3	117.3	111.4	112.9			
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.32	.31	112.2	107.0	108.7	103.4			
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	.91	.87	107.3	102.6	101.4	112.7			
Canned Fishery Products:					114.0	113.0	113.7	102.2			
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	27.00	27.00	117.7	117.7	117.7	92.6			
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.56	11.56	102.6	102.6	102.6	102.6			
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	7.13	7.13	120.9	120.9	120.9	105.9			
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	10.25	9.50	131.5	121.9	128.3	128.3			

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



Fresh East Coast shrimp on display at one of the stands at Fulton Fish Market, New York City.

November, prices at Chicago for frozen shrimp were up 4.6 percent and at Boston for flounder and ocean perch fillets up 3.8 and 4.9 percent, respectively. Prices for haddock fillets were the same as in the previous month. As

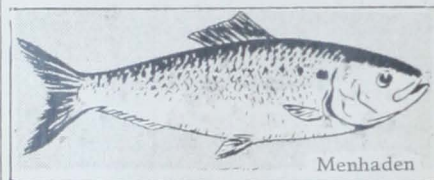
compared with November 1964, the subgroup index this November was up only slightly (0.1 percent). While prices this November were generally higher than a year earlier, frozen shrimp prices were down 4.8 percent.

The November 1965 subgroup index for canned fishery products rose 0.9 percent from the previous month because of higher prices for canned Maine sardines (up 7.9 percent). Despite a substantial increase over the previous season in the 1965 pack of canned sardines, the market strengthened. The total available supply of canned sardines on November 1, 1965, was 5 percent more than a year earlier and prices this November were 2.5 percent higher. November 1965 prices for other canned fish in the index were unchanged from the previous month. As compared with November 1964, the subgroup index this November was up 11.5 percent--prices for canned pink salmon were 2.7 percent higher because of the very low 1965 pack, and for California jack mackerel up 14.2 percent. Prices for canned tuna were unchanged.



MENHADEN

The menhaden is not only the most important of the Middle Atlantic fisheries, but also the most important United States fishery in respect to the quantity landed by the commercial fishermen. For many years it has ranked second in dollar value in the region. Most of the catch is made with purse seines in coastal waters and landed at New Jersey, Delaware, and Virginia ports.



The menhaden is valuable for the industrial products (oil and meal) made from it. Practically none of the catch is used directly for human food. About one-third of all the fish meal prepared in the United States and one-fourth of the oils processed from sea animals come from menhaden taken in the Middle Atlantic region. Most of the meal is used as a supplement in feed of hogs and chickens; the oil is used in a variety of commercial products--margarine, paints, insect sprays, printer's ink, soaps, and lubricating oils--and in leather tanning and aluminum casting.

The region's 220-million-pound menhaden catch of the 1930's has increased to nearly a billion pounds in recent years with an annual ex-vessel value of about \$10 million--the result of an abundant supply of fish, larger and speedier boats, radio-equipped aircraft to spot and report the location of menhaden schools, larger purse seines and power blocks to haul them, and introduction of suction pumps to bring the fish quickly into the vessel hold and later unload them at the dock.

--Conservation Note 17, *The Big Bite*
(Commercial Fisheries of the Middle Atlantic Coast),
U. S. Fish and Wildlife Service, Washington, D. C.