



A 14-tooth 'Fall River' clam dredge rigged with an accumulator-chain modification--used for exploratory fishing by R/V 'Silver Bay' off North Carolina. (Photo: J. B. Rivers)

U.S. FISH CONSUMPTION IN 1968 WAS HIGHEST SINCE 1954

The average American ate more fishery products in 1968 than he had in any of the preceding 14 years. The per-capita consumption figure was 11.1 pounds, edible weight--0.4 of a pound more than the 10.7 of 1967. Retail prices averaged 2% more.

The rise in fish consumption heartened some industry observers who had waited impatiently for the first hard evidence with which to measure the impact of the ending of "meatless Friday" by the Catholic Church in early 1967.

How 11.1 Was Divided

Of the 11.1 pounds, fresh and frozen fishery products totaled 6.2 pounds, a rise in this category over 1967. Most of the increase was in fresh fillets and frozen fish sticks and portions. U.S. production declined for haddock, halibut, ocean perch, tuna, king crab, and blue crab.

Canned fishery products were an estimated 4.4 pounds per capita, a slight increase over 1967. There were large increases in the canned packs of salmon, Maine sardines, and California mackerel--and slight increases in shrimp, oysters, and anchovies. Imports of canned products rose slightly.

Completing the 11.1 pounds was one-half pound of cured fishery products, virtually unchanged from previous years.

Over 2 Billion Pounds

The use of fresh and frozen fish and shellfish was estimated at 1,224 million pounds--about 66 million pounds greater than in 1967.

Use of canned seafood was estimated at 870 million pounds--30 million pounds higher than in 1967.

U.S. Position Has Changed

In less than 20 years, the U.S. has changed from an overall domestic producer to a net importer of fishery products. The U.S. is the world's largest importer and may have the largest market for aquatic products.

In 1968, U.S. fishermen could produce only 40% of the Nation's needed supply of edible fishery products--and about 15% of its needs for industrial fishery products.

More U.S. Supplies in Future

In the future, more supplies of fishery products are expected to come from still-undeveloped U.S. fisheries: a scallop fishery off the South Atlantic Coast and another off Alaska--and shrimp resources off the Pacific Northwest and New England.



UNITED STATES

Forecast Abundance of Groundfish & Sea Scallop on New England Banks

The abundance of groundfish and sea scallops fished by New England fishermen has been forecast by BCF's North Atlantic Region. The forecast is based on information provided by biologists of BCF's Woods Hole Laboratory. They monitor landings of commercial fishermen and study populations of fish and shellfish on offshore banks by sampling from the 'Albatross IV.'

Haddock landings in New England dropped from 98 million pounds in 1967 to 71 million pounds in 1968. There were fewer fish, primarily on Georges Bank. Natural causes and heavy fishing by foreign fleets in 1965 and 1966 were to blame. Recovery of these depleted stocks is not expected within the next two years.

The annual fall groundfish survey of the Albatross IV revealed a very poor 1968 year-class of haddock, the fifth consecutive one. (The last good year-class was in 1963.) As a result, abundance will continue to decrease during 1969 and 1970 because Georges Bank haddock do not reach marketable size before they are two. On Browns Bank, where the 1963 year-class has been important during the last few years, haddock abundance is expected to decrease. There has been no strong year-class there since 1963.

Cod

Cod landings in New England in 1968 were 48 million pounds, 4 million pounds above 1967. Georges Bank cod abundance was slightly higher in 1968 than in 1967. The Albatross IV groundfish survey indicates an increase in young-of-the-year cod, as in 1967. So a slight increase in abundance is expected for 1969.

Whiting

Whiting landings for food increased from 60 million pounds in 1967 to 72 million in 1968. Abundance increased slightly over 1967. Abundance on Georges Bank was somewhat lower, but increased considerably in

Gulf of Mexico. Higher landings in 1968 resulted from increased fishing in Gulf of Maine. Whiting abundance probably will not change markedly in 1969.

Yellowtail Flounder

Yellowtail flounder landings in 1968 were 65 million pounds, 13 million above 1967. This increase resulted from greater abundance due to relatively strong 1964 and 1965 year-classes. Later year-classes are not quite as large, and 1969 abundance is expected to be the same or slightly lower than in 1968.

Ocean Perch

Ocean perch (redfish) landings were 63 million pounds in 1968, compared to 71 million pounds in 1967. Although abundance increased on all ocean-perch grounds during year, low fishing effort resulted in the catch decrease. The 1969 landings will depend largely on market demand.

Industrial Fish

Industrial red hake and whiting catches from southern New England grounds were 22 million pounds in 1968 and 20 million in 1967. Abundance in 1968 was somewhat higher than 1967; abundance in 1969 is expected to be the same or slightly higher than 1968.

Total southern New England industrial fish landings (all species) by otter trawl were 76 million pounds--2 million lower than 1967. This was due to decreased fishing effort because abundance of industrial fish species increased slightly in 1968. This abundance level is expected to continue through 1969.

Sea Scallops

Sea-scallop landings were 9 million pounds of meats in 1968, 8 million in 1967. Of the 9 million, 2 million were from Georges Bank, and 7 million from Middle Atlantic grounds.

Georges Bank landings in 1968 were about the same as in 1967, while Middle Atlantic landings were up 1 million pounds. Abundance of sea scallops on Georges Bank decreased in 1968; a further decrease is expected during 1969.



Sealskin Harvest

The 1968 harvest of Pribilof fur sealskins was shipped by rail to the processor during January 1969. The U.S. share of the harvest was 40,970 skins (533 barrels), and the Japanese Government's share was 8,781 skins (116 barrels). Total blubber production was 476 barrels, consisting of 6 barrels for the Canadian Government, 28 barrels for Japan, 130 barrels to be used in processing the U.S. skins, and 312 barrels bought by the Fouke Company.



5 of 6 U.S. Fishing Vessels Have Electronic Equipment

In 1967, there were 11,021 fishing vessels in the U.S. 5 gross tons and over, according to the Bureau of Customs. Five of 6--9,403 vessels--had some electronic gear. Loran, a long-range, radio direction finder, was aboard 2,767 vessels. The rest had less sophisticated, but useful, navigational equipment.



Ferro Cement Fishing Boats Are Being Built

Two cement fishing vessels are under construction at the Marine View Boat Building Co. in Tacoma, Wash. A 32-foot troller was recently launched. Under construction, upside down, is a 50-foot combination fishing vessel for a Sitka, Alaska, fisherman.

These are the first ferro cement fishing craft to be built in the Pacific Northwest. Because of low cost and speed of construction, this may set a trend in fishing-vessel construction. The hull is formed of 1-inch thick cement reinforced with steel webbing. This material has another advantage: there is virtually no maintenance cost because cement is free of rust and impervious to destructive marine organisms.



Groundfish Fillet Import Tariff-Rate Quota Set for 1969

The reduced-tariff-rate import quota on fresh and frozen groundfish (cod, haddock, hake, pollock, cusk, and ocean perch) fillets and steaks for 1969 is 26,465,631 pounds. This was announced by Bureau of Customs in the Feb. 15, 1969, "Federal Register." Divided into quarterly quotas, this means that 6,116,407 pounds of groundfish fillets and steaks may be imported at the $1\frac{7}{8}$ cents-per-pound rate of duty, and any imports over the quarterly quota will be dutiable at the rate of $2\frac{1}{2}$ cents a pound.

Reduced-Tariff-Rate Import Quota for Fresh and Frozen Groundfish Fillets, 1955-1969

Year	Quota	Year	Quota
	1,000 Lbs.		1,000 Lbs.
1969	26,466	1961	32,601
1968	24,895	1960	36,533
1967	24,883	1959	36,920
1966	23,591	1958	35,892
1965	24,384	1957	37,376
1964	24,862	1956	35,197
1963	24,875	1955	35,433
1962	28,571		

Quota Higher Than 1968's

The reduced-rate import quota for 1969 is up from the 1968 quota of 24,894,900 pounds. From 1951 to 1960, the quantity of fresh and frozen groundfish fillets permitted to enter the U.S. at the reduced rate of duty of $1\frac{7}{8}$ cents a pound had increased 24.7 percent. In 1961, however, the trend was reversed significantly for the first time. This occurred because in 1960 frozen fish fillet blocks with bits and pieces were no longer dutiable under the Tariff category of "frozen groundfish fillets."

Kennedy Round

U.S. concessions granted in the 1964-67 trade conference (Kennedy Round) at Geneva reduced the rate of duty on fish blocks (with bits and pieces) from 1 cent a pound to 0.8 cent a pound on Jan. 1, 1968, and 0.5 cent a pound on Jan. 1, 1969. Concessions on fish blocks are being put into effect in 5 annual stages; the final reduction will become effective Jan. 1, 1972, when fish blocks will be made duty free.

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Crab and Shrimp Pasteurization Lengthens Their Storage Life

The report of an EDA-financed study shows that pasteurization can extend the low-temperature storage life of Dungeness crab and shrimp. The study was conducted at the Seafood Research Laboratory, University of California San Francisco Medical Center.

The Findings

The researchers found that shrimp and crab meat can be pasteurized in boilable plastic pouches at 82.2° C. (180° F.) for 5 minutes (center temperature). This extends by about 50 days the storage life at 1.1 to 4.4° C. (34 to 40° F.).

The incidence of potential pathogens on commercial shrimp and crab meat is low--but these bacteria were able to grow. In some cases, these bacteria produce toxin over a relatively wide temperature range. While no *Cl. botulinum* was found in the 128 samples tested, the probability of this organism surviving the pasteurization process still exists.

The researchers conclude that pasteurization of shrimp and crab meat is a feasible and potentially useful procedure. But, for safety sake, the pasteurized products should not be stored at temperatures above 2.2° C. (36° F.).



Southeastern Fisheries Association Meets June 13

The Southeastern Fisheries Association and its subsidiary, the Florida Shrimp Assoc., will hold their 17th Annual Convention in Tampa, Florida, at the Manger Motor Inn, June 13-16, 1969.

A boat and equipment show is planned. Members and guests will be able to visit BCF's 'Oregon II', scheduled to tie up at the Inn for a day or two.



EDA Funds Help Sea Industries Study

The Commerce Department's Economic Development Administration (EDA) has made available \$143,220 to help determine the feasibility of cultivating oysters, fish, and fishing worms on the Lummi Indian Reservation in Washington. The study will demonstrate whether scientific production of the three sea products in the 5,000-acre estuary bordering the reservation can become a stable source of income for the tribe.

The resources of fish and shellfish in nearby waters--Bellingham Bay, the Strait of Georgia, Hale Passage, and the Nooksack River--are the only potential source of income. The tribe says the reservation lands are unsuitable for farming, and industrial jobs developed in the area recently have not benefited its members.

650 Jobs Possible

The tribe expects about 650 jobs to result in worm, oyster, and fish culture. Additional jobs would be created in processing, distributing, and marketing the products.

Scientific research on methods of production and environmental factors will be conducted in Federal and State cooperating laboratories and the Lummi Island Laboratory. The latter is sponsored by Western Washington State College of Bellingham. Indian trainees will aid in the research. In addition to EDA funds, the applicant, Lummi Business Council, is providing \$288,000 from other sources. The Bureaus of Commercial Fisheries and Sport Fisheries and Wildlife will furnish some equipment, fish egg stocks, facilities, and technical advice for the study.



Lobster Tagging Produces Interesting Information

The lobster research program of BCF's biological laboratory at Boothbay Harbor, Maine, is paying off. In 1968, 2,634 lobsters were tagged and released offshore in the Gulf of Maine; 76, 2.9%, have been recaptured.

Of the 66 fully documented recaptures, 29% had migrated less than 10 nautical miles, 45%

between 10 and 50 miles, and 26% over 50 miles. The lobsters moved both north-south and east-west.

Released In 80 Fathoms

The tagged lobsters were released in an average of 80 fathoms. From April-November 1968, the lobsters recaptured were in an average of 57 fathoms; from November 1968-mid-February 1969, the average was 153 fathoms. These data support hypothesis that offshore lobsters move into shoal water during spring and summer--and return to deep water in fall and winter.

Molting and Growth

Thirteen of the lobsters returned to the lab had molted. Growth increments ranged from 12.4% to 20%; the average was 16.7%. Average growth increment for 'inshore' lobsters is 12-13%.



Thread Herring Schools Detected at Night

Schools of thread herring have been detected at night in the Gulf of Mexico by BCF's Pascagoula (Miss.) Exploratory Fishing and Gear Research Base. During test flights in January 1969, aboard U.S. Coast Guard aircraft, base personnel detected more than 80 large schools.

The Equipment

The night-vision equipment consists of an image intensifier developed by the Army, closed-circuit TV, and a video-taped system.

The image intensifier can amplify available light 55,000 times. It can be used to locate fish schools at night from altitudes of at least 5,000 feet.



Drift Bottle Found After 7 Years

A sealed beer bottle that was set adrift in the Pacific in 1961 by BCF's Biological Laboratory in Honolulu, Hawaii, has come ashore after more than 7 years and 10,000 miles in

the ocean. The bottle was recovered at Cannon Beach, Oregon, in January 1969. It had traveled a straight-line distance of 3,090 miles. A BCF oceanographer, however, estimated the actual distance as 10,000 to 12,000 miles.

The Honolulu lab also has used cards in plastic to study surface currents of the central Pacific.



Fishermen Shown How to Construct Trawl Economically

An expert from BCF's Seattle (Wash.) Exploratory Fishing and Gear Research Base, Jerry Jurkovich, recently lectured and demonstrated to fishermen the most economical method of cutting and tapering webbing in the construction of trawls. The project was organized in cooperation with the Oregon State University's Extension Service.

This was the Seattle Base's first effort in its Aid-to-Industry Program to talk to groups of fishermen on more efficient methods of fishing and gear construction. The response was considered excellent: 40-45 fishermen attended at Astoria, 20 at Newport, and 20 at Coos Bay.



BCF Scientist Honored by Wildlife Society

Dr. Stanford H. Smith, a Senior Fishery Research Biologist in BCF's Biological Laboratory at Ann Arbor, Michigan, received the annual Fisheries Publication Award of The Wildlife Society in Washington, D. C., on March 3.

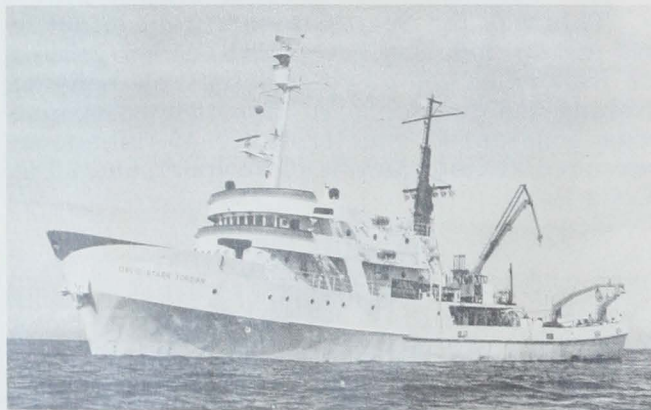
He was honored for his paper, "Species Succession and Fishery Exploitation in the Great Lakes," which appeared in the "Journal Fisheries Research Board of Canada," in 1968.



BCF Scientists Assess Effect of Oil Spillage in Santa Barbara Channel

On Jan. 30, 1969, Union Oil Alpha Drilling Tower, located 3 miles offshore from Santa Barbara, Calif., began leaking crude oil at a rate of about 20,000 gallons per day. The leak continued, on and off, to the end of February, when this report was written, despite all efforts to halt it. A total spillage of perhaps 5,000,000 gallons was spread over the Santa Barbara Channel, including 30-40 miles of coastline, and the offshore island of Anacapa.

The most obvious biological effects of the spillage were on the nearshore fauna of the kelp beds, the intertidal zone (where State and university ecologists were actively working), and on marine birds and mammals. BCF-La Jolla decided that a short cruise of its 'David Starr Jordan' would be mounted by staff of the Fishery-Oceanography Center to investigate effects on the offshore pelagic ecosystem, primarily to determine if reduced viability of fish eggs and larvae could be detected.



(Photo: George Mattson)

Investigation Plan

The scientists hoped to detect the effects of oil pollution on pelagic fish eggs and larvae in two ways: 1) By a direct and rapid series of observations of unpreserved material taken from plankton hauls in water covered, or recently covered, with floating oil, oil-detergent mixtures, or both; the viability of the material would be compared with plankton samples taken as controls outside the oiled areas. 2) By comparing the viability, specific and age composition of pelagic eggs and larvae from samples taken under oil with data from a long-time series available for nearby CalCOFI station no. 83.40.

It was also hoped to observe effects of oil cover on: phytoplankton and microzooplankton; near-surface oxygen and nutrients; and light transmittance. Part of these objectives were to be the responsibility of ecologists from Scripps Institution of Oceanography, who participated in the cruise with Bureau scientists led by Dr. Paul Smith.

Jordan In Action

Jordan was in the polluted area on Feb. 11, 1969. The scientists first made a visual reconnaissance at Alpha Tower of light transmittance. Beneath primary slicks of brown crude oil, before they had aggregated to tar or spread to the iridescent form, ambient light at about 2 m. below the oil was only 0.3. This was 10% of what it was at the same depth below clean water just outside the slick, so light absorption by floating crude oil appears to be extremely high. This is an important factor to remember in phytoplankton ecology where such cover remains *in situ* for long periods (Fig. 1).

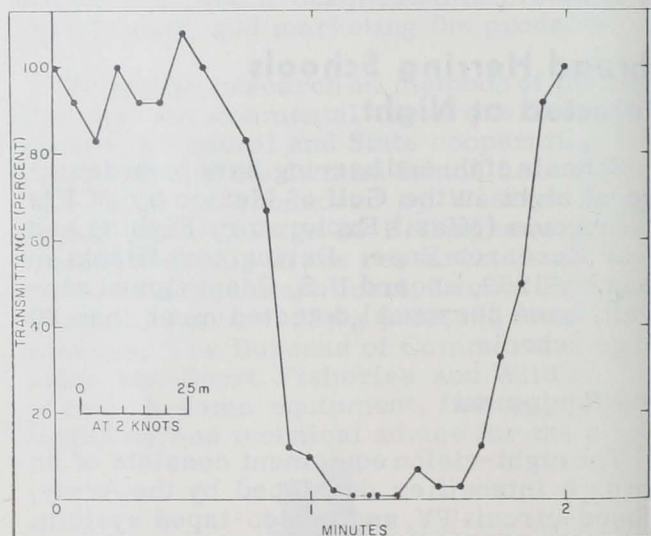


Fig. 1 - Light transmission under crude oil.

Pump samples of phyto- and microzooplankton were taken by Andrew Soutar of Scripps Institution. He reports that phytoplankton counts were significantly lower than at a nearby station in January. The present low values were repeated at a series of pump stations taken right across the Santa Barbara Channel.

Analysis of near-surface nutrients of water taken from under the oil slick (nitrite, nitrate, silicate, and phosphate) showed no

apparent differences when compared to samples taken from nearby clear water. Dissolved oxygen readings, however, were significantly lower under the heavy oil slick than in clear water. The importance of this difference may be as an indicator of a trend—rather than having immediate physiological importance to marine organisms.

A series of 6 standardized zooplankton tows were taken in polluted locations. The oil was cleared by a fire pump in order to lower and retrieve the nets. A control series was taken in clean water.

Findings

Examination of the eggs and larvae of fish sorted from the samples from polluted water indicated (1) no gross evidence of dead or deformed larvae or eggs, and (2) no gross departure from the expected specific composition of the ichthyoplankton at CalCOFI station 83.40.

At this station, the long-term (> 10 years) ratio of anchovy eggs: anchovy larvae is 1: 0.65, while this ratio in the 6 polluted samples was 1: 0.78. This indicated no apparent increase in mortality over normal.

The oil leak began on January 30 and more than 2% of all larvae in the polluted series of samples were spawned before that time. This is a normal percentage of older larvae (> 7 mm.) for unpolluted samples.

In addition to anchovy larvae, there were 33 hake larvae (*Merluccius productus*) between 2.0 and 5.5 mm, 46 *Sebastes* spp. (rockfish) larvae between 4.0 and 5.5 mm; 659 *Cynoscion* sp. larvae (a sciaenid); 9 *Citharichthys* sp. larvae (a sand dab); 9 *Parophrys* sp. larvae (English sole); 7 *Leuroglossus* sp. (deep-sea smelt); and 1 *Pleuronichthys* sp. larva (a flounder). These are the expected species in about the expected numbers for samples in this area.

Investigation to Continue

In assessing these results, it must be remembered that oil slicks move downwind much faster than the water some meters below the surface in which most eggs and larvae occur. Further, there are considerable tidal and other currents in the area. Because a larva some days old is taken below floating crude oil does not necessarily mean that it

has been there very long. It is extremely difficult to measure pollution effects (except perhaps for neuston) under such circumstances.

Monitoring the wider effects on pelagic eggs and larvae by the present year's CalCOFI survey will continue. Jordan will be sent through the area again in the course of routine survey. We are confident that if the Santa Barbara leakage continues, and if it produces a significant effect upon spawning and viability of pelagic species, this effect will be detected in the present year's sampling program.

Chemical Dispersant Used

A chemical dispersant, said to be nontoxic to marine life (COREXIT 7664) was used widely in the area around the leaking oil well but only slightly in the near-shore area. A sample was obtained from the manufacturers. Its toxicity was tested in a preliminary manner by Dr. Lasker.

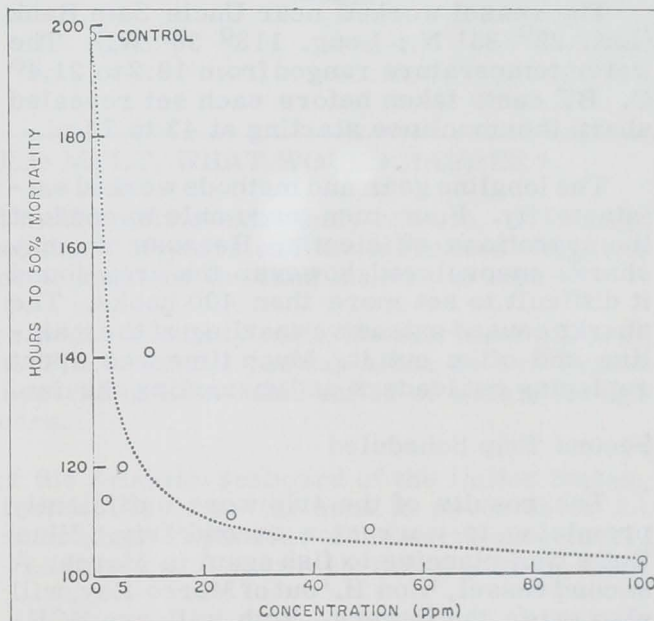


Fig. 2 - The effect of the dispersant COREXIT on *Engraulis mordax* (northern anchovy) eggs & larvae.

Samples, each of 50 late-development anchovy eggs, used for bioassay indicates toxicity, as measured by time to 50% mortality, at all levels of dilution in natural sea water which were tested. Concentrations of only 2 ppm, COREXIT 7664 reduced the 50% mortality time of eggs and larvae to 57% of the control, while the higher concentrations were only slightly more detrimental (see Fig. 2).

California Vessel Longlines Broadbill Swordfish

M/V 'Blue Belle' returned to San Diego, Calif., on Feb. 8, 1969, with the first load of longline-caught broadbill swordfish by a California commercial vessel. She fished a total of 4,200 hooks and caught 33 swordfish (average 0.8 fish per 100 hooks). Total dressed weight of the landed fish was about 2.5 tons. Each of 10 sets produced at least 1 swordfish; the two best catches were 9 fish on 392 hooks and 8 fish on 336 hooks. The swordfish ranged in fork length from 91 to 277 cm. (20 to 360 lbs., dressed). Gonads collected from 29 fish showed that 27 were females, none in advanced stage of development.

The catch also included several dolphinfish, one striped marlin, and about 1,500 sharks, most were blue sharks. In addition, 2 tons of yellowfin and skipjack tuna were taken on trolling gear.

The vessel worked near Uncle Sam Bank (Lat. 25° 35' N.; Long. 113° 30' W.). The water temperature ranged from 19.2 to 21.4° C. BT casts taken before each set revealed sharp thermoclines starting at 43 to 72 m.

The longline gear and methods worked satisfactorily. Four men were able to conduct the operations efficiently. Because of many sharks encountered, however, the crew found it difficult to set more than 400 hooks. The sharks caused extensive snarling of the mainline and often cut it. Much time was spent replacing cut leaders and unsnarling the line.

Second Trip Scheduled

The results of the trip were sufficiently promising to warrant a second trip. Blue Belle was planning to fish again in March. A second vessel, 'Ron H.' out of Morro Bay, will also enter the fishery. Both will use BCF-designed gear and methods. The experience gained will increase knowledge of distribution and life history of the swordfish and lead to establishment of a profitable fishery.



Juvenile Tropical Fish Raised in Lab

For the first time, eggs and larvae of important tropical fishes from the western Atlantic Ocean have been raised to juvenile size in the laboratory, reports the University of Miami's Institute of Marine Sciences.

Charles A. Mayo, a graduate student, succeeded in rearing 13 species of fishes, representing 12 fish families, from egg to juvenile. The fishes are herring, anchovy, sea trout, flounder, flyingfish, pigfish, grunt, sea robin, pinfish, spadefish, goby, dragonet, and trunkfish. All form important links in the sea's ecologic balance.

Dr. F. G. Walton Smith, Institute Director, stated: "This well-established success in rearing many species of young tropical Atlantic fishes is unprecedented. Furthermore, the techniques developed and proved successful by the Institute can be used for rearing species most often sought by commercial and game fishermen, including tuna, sailfish, marlin, dolphin, and king mackerel, and this is one of the goals of our study."

Mayo's Work

Mayo collects eggs for his fish nursery by towing a plankton net far out in the Gulf Stream, and from the Institute's dock in Bear Cut. Once the eggs have hatched in laboratory tanks, the larval fishes feed on zooplankton. To provide an abundant supply of food, Mayo has created an 'in-the-laboratory food chain.' Zooplankton feed the fish larvae, and the zooplankton is fed phytoplankton maintained on organic and inorganic nutrients added to the tanks.

The development of eggs and larval fishes is watched closely by Mayo. He records observations, takes photos, and preserves individual specimens. Many fishes are difficult to identify until long after they have hatched, states the Institute. Data from this study provide information on the "functional structure, behavior, and growth of fishes in their early stages of development."



Young Indians Tour BCF's Miami Lab

Forty young American Indians traveled from their ancestral camp in the Florida Everglades to the scientific environment of a modern marine research laboratory on March 14. They visited BCF's Tropical Atlantic Biological Laboratory (TABL). All were students at the new Miccosukee Day School on the Tamiami Trail at Forty Mile Bend, Florida. The Miccosukee people were settled in Florida long before the white man came. They are not related to the better known Seminole Tribe.

A Full Day

The 10- to 17-year old students were accompanied by an interpreter (they speak little English) and by Robert Pinard, Director of Student Activities. They saw a film on marine life and the ecology of the oceans. They toured the lab and later visited the Miami Seaquarium as guests of the management.

Later, they toured the TABL research vessel 'Undaunted' and TABL staff explained some procedures followed on marine scientific cruises.

Marine Science Job Opportunities

The theme emphasized throughout the visit was that marine science could lead to rewarding careers for nature-oriented American Indian youths. They were told about the many jobs in the expanding field for trainees, ships' crew members, technicians, and scientists, particularly in Florida. Laboratory and school officials hoped to encourage in the young Miccosukee "an awareness of the natural affinity between their innate understanding of the wilderness and the doctrines of the marine scientist, and perhaps to stimulate an ambition to study subjects that will equip them for careers in marine science."



IF ALL THE ICE IN THE WORLD SHOULD MELT, WHAT WOULD HAPPEN?

The possibility that all the ice in the world would melt is extremely remote. If it should happen, the time span would be measured in thousands of years and the increased weight of the water would probably cause the ocean basins to sink and the land masses to rise.

In the unlikely event that all the world's ice would suddenly melt, the sea level all over the world could rise as much as 500 to 600 feet. The Antarctic ice cap alone covers 6 million square miles and, if melted, would yield about 6.5 million cubic miles of water, enough to feed the Mississippi for more than 50,000 years.

A rise of even 100 feet would flood most of the Atlantic seaboard of the United States, including all the major cities. A rise of 600 feet would cause the seas to cover 85 or 90 percent of the earth's surface (the oceans now cover about 71 percent of the earth's surface). The United States would be split in two by the "Mississippi Sea" which would join the Gulf of Mexico with the Great Lakes.

On the basis of evidence gathered from all over the world, Dr. Rhodes Fairbridge of Columbia University concludes that some 6,000 years ago the oceans rose about 14 meters within a few centuries, flooding almost all the areas where man had begun to found civilizations. He believes this to be the same Great Flood described in the Bible, in Buddhist records, and in legends handed down in many lands.

There is also the possibility that the ice age is not yet over and that the ice caps may again increase in size. If another glacial advance comparable to the last one should occur, many of the important manufacturing and agricultural areas of the world would be covered, forcing widespread migrations. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

Fishery Legislation Proposed in Congress

The bills introduced recently into both Houses of the 91st Congress show that members are concerned about quality and the need for sanitation controls over fish and fish products.

On Feb. 19, Sen. Hart, Mich., introduced S. 1092. This bill proposes inspection of fish and fishery products, inspection of facilities used in their harvesting and processing, and cooperation with States in regulating interstate commerce.

The bill would authorize the Secretary of Health, Education, and Welfare to survey the fishing industry and, within 1 year after the act's effective date, issue minimum standards of sanitation and quality control in processing. These standards, effective 1 year after issuance, would apply to fish-processing establishments, fishing vessels, transportation, and storage. Sen. Hart noted that all fish products would have to bear an official mark or inspection legend before they could be sold at retail; also, no edible fish or fishery product could be imported into the U.S. unless processed in a country whose inspection program was 'at least equal' to that of the U.S.

At the same time, Sen. Hart introduced S. 1091. This bill would give the Department of the Interior specific authority to provide technical assistance--and to make loans to the commercial fishing industry in order to meet the requirements of the new legislation. The fisheries loan fund would be increased by \$15 million for that purpose.

In the House, Rep. Rodino, N.J., introduced H.R. 7905 and H.R. 7907, covering the same ground as S. 1091 and 1092.

Disease Control

On Feb. 25, Sen. Moss, Utah, introduced S. 1151, a bill to protect the fish resources of the U.S., including freshwater and marine fish-culture industries, from the introduction and dissemination of fish and shellfish diseases.

Sen. Moss noted that the bill authorizes Federal fishery workers, whenever a serious outbreak warrants, to seize, quarantine, or dispose of any fish posing a disease threat to U.S. fisheries. This would include both imported fish and fish transported in interstate commerce.

The proposal calls for development of State-Federal cooperative programs to control fish disease. It prohibits interstate transportation of diseased fish or shellfish by common carrier or by personal means.

The bill spells out penalties for violation of fish disease-control laws. It provides protection for employes carrying out their assigned duties. It authorizes the Secretary of the Interior to compensate growers for losses due to fish disease-control programs.

Sen. Moss also referred to 3 resolutions on fish disease control: One, passed at the U.S. Trout Farmers Association convention in Oct. 1968, asks Federal assistance in controlling whirling disease of trout and other salmonids. The other resolutions, passed at the American Fisheries Society meeting in Sept. 1965, asked for establishment of a national reporting service on fish diseases, and for help in preventing importation of viral hemorrhagic septicemia.

Fishing Fleet Replacement & Expansion

Sen. Stevens, Alaska, introduced S. 936, to promote the replacement and expansion of the U.S. nonsubsidized merchant and fishing fleets.

Harassment of U.S. Fishing Vessels

Rep. Van Derlin, Calif., introduced H.R. 5277, a bill to instruct the President to impose a ban on fishery imports from countries interfering with our fishermen outside the 12-mile limit. He said the bill would be more widely applicable than the cutoff provisions of the Fishermen's Protective Act because it would cover all cases of illegal harassment--regardless of whether the fishermen involved had suffered actual financial loss.

--Barbara Lundy



OCEANOGRAPHY

Grand Banks 1969 International Ice Patrol

The U.S. Coast Guard Oceanographic Unit will conduct the oceanographic support program for the 1969 International Ice Patrol during April 1-June 30, 1969. Two oceanographic cruises to the Grand Banks region are scheduled aboard the 'Chincoteague' and 'Cook Inlet'.

The main purpose will be to conduct oceanographic surveys of the Grand Banks region to furnish real time marine environmental analysis to the Commander, International Ice Patrol. The secondary purpose will be to study the structure and migration of the semi-permanent eddy at the Tail-of-the-Banks, and to delineate the cold core of the Labrador Current.

The Operation

The temperature and salinity data will be collected by Nansen casts and/or a Salinity-Temperature-Depth Sensor System from the surface to 1500M at each station along the section survey. Temperature data will also be obtained by bathythermograph. All data will be processed at sea by digital computer and transmitted to Commander, International Ice Patrol in New York for operational use.

Data will be available at the National Oceanographic Data Center about 2 months following these cruises. These data, with analysis, will be published in the U.S. Coast Guard Oceanographic Report Series (CG-373).



Gulf of Mexico Knolls Are Salt Domes, Oil Core Analysis Indicates

The Sigsbee Knolls, extensive mounds on the floor of the Gulf of Mexico under 12,000 feet of water, have been demonstrated 'almost conclusively' to be salt domes. The find was made following laboratory analysis of oil- and gas-bearing cores taken in 1968 during an early phase of the Deep Sea Drilling Project (DSDP). The work was conducted by Scripps

Institution of Oceanography under contract to the National Science Foundation.

A series of tests was made in several laboratories expert in analysis of cores containing oil, gas, and other minerals commonly found with salt domes. Scripps reported the tests demonstrated that "the oil is relatively young, that the rock is mainly calcite and sulphur, and that the rock contains an accumulation of palynomorphs (fossil pollen, primarily) of Jurassic age (about 160 million years old)."

The Knolls

All these characteristics are found in salt domes productive of oil and gas on or near shore in the Gulf of Mexico. The test results and earlier geophysical profiling support the long-held belief that the knolls are sea-floor mounds produced over upward-thrusting salt formations.

The Knolls were discovered in 1954 as topographical features by Dr. Maurice Ewing of Columbia University's Lamont-Doherty Geological Observatory. He predicted they were salt domes and urged that drilling into one dome be given high priority on the Deep Sea Drilling Project.

In 1960, more evidence that the Knolls were salt domes was obtained by Dr. J. Lamar Worzel and John Ewing, when continuous seismic reflection profiling showed there were many buried domes in the vicinity.

'Glomar Challenger' Proves Case

At first, there was strong doubt that these structures were salt domes. It was based on the difficult problem of explaining how a great bed of salt could have been deposited on the floor of a basin as deep and as large as the Gulf of Mexico. The doubt persisted until the Glomar Challenger drilled into a dome on the first leg of DSDP.



Investigate Unseen 1,000-Mile-Long Planetary Waves in Pacific

An extensive investigation is being made in the Pacific for unseen and elusive ocean waves thought to be about 1,000 miles long and which take 2-4 weeks to complete one cycle. This is reported by the Commerce Department's Environmental Science Services Administration (ESSA).

The waves will be recorded by 15 tide gages on islands of the Caroline and Marshall groups--on an east-west line stretching 2,500 miles across the Pacific, about 500 miles north of the Equator.

Known as planetary waves, they are believed caused by the gravitational attraction of the sun and moon on the earth, and are therefore special tides. Once initiated, however, the waves apparently are very largely

governed by water depth and by the effect of the earth's rotation on its axis.

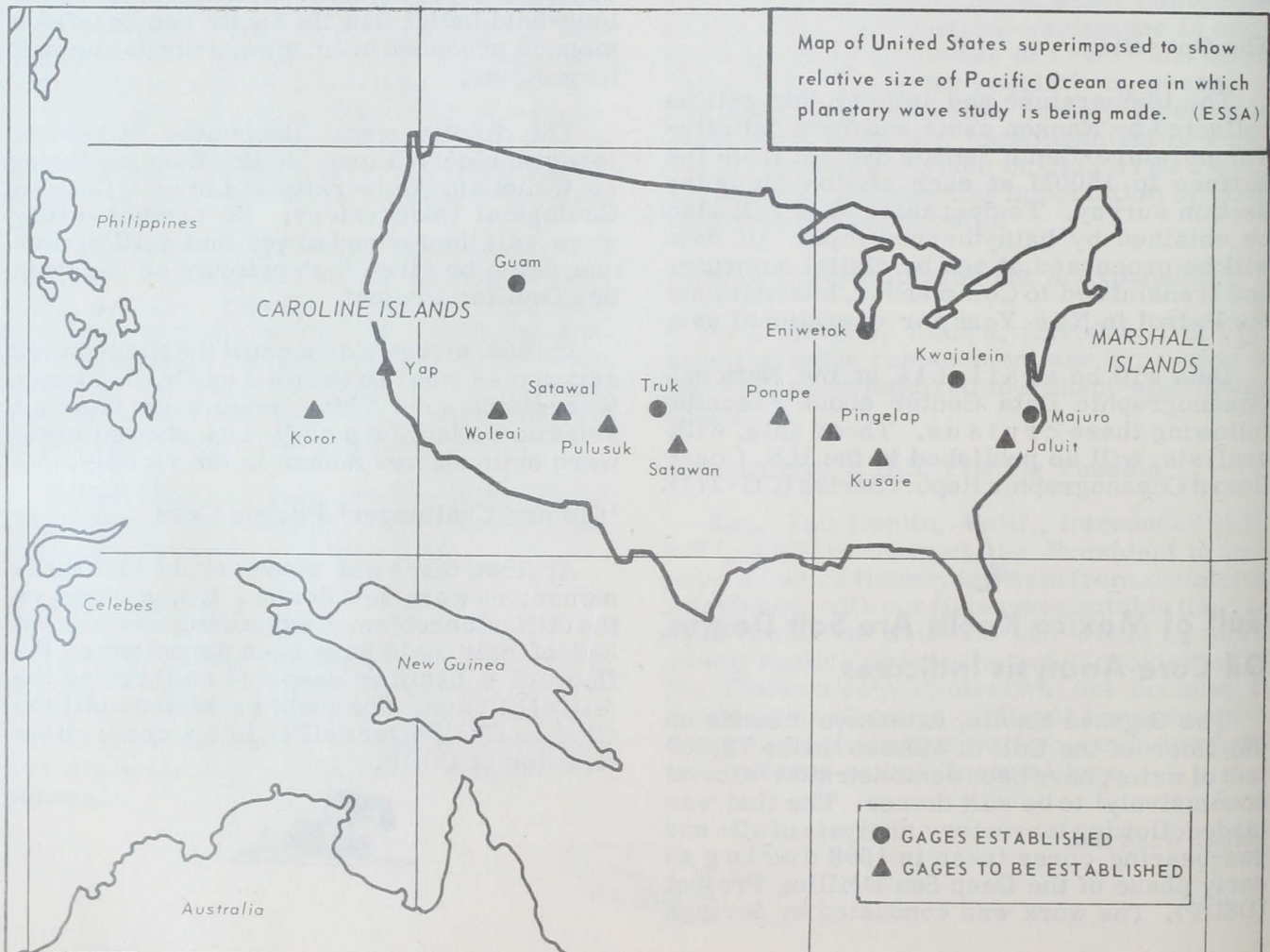
ESSA-MIT Study

The investigation is being undertaken by scientists of ESSA and the Massachusetts Institute of Technology. Data about the planetary waves will be gathered by the gages for 4 years. Then the data will be subjected to analysis by high-speed electronic computers at ESSA and MIT.

The investigation is being conducted by 3 physical oceanographers: Prof. Henry M. Stommel and Prof. Carl I. Wunsch of MIT, and Steacy Hicks, head of oceanographic research for ESSA's Coast and Geodetic Survey.

Planetary Waves

Hicks said that existence of planetary waves was established only in the present



Planetary wave observation sites.

decade primarily through work by Wunsch. Because of the waves' length and the time required to complete a cycle from beginning to end, the waves are not easily detected.

The investigators hope to answer: Do the waves move across the ocean, or do they merely oscillate back and forth in a specific area, like water sloshing in a bathtub? How high are they? What is their significance?

The researchers will look for similarities with the well-known planetary waves of the atmosphere, discovered years ago by the late Carl-Gustaf Rossby, a noted MIT meteorologist.

Hicks said: "Planetary waves of the atmosphere serve an important function in governing changes in weather. Does it follow that those of the ocean serve a similar function? In other words, what effect do planetary waves have on changes in the ocean environment? These are some of the things we will also be looking for when we study the data recorded by our gages."

Pacific Good Study Area

Planetary waves are believed to exist in all oceans, but the Pacific is regarded as particularly well-suited for the study. Numerous islands dot the area and permit correct spacing for locating the waves. Also, weather fluctuations, which would tend to complicate the records, are relatively small in this region near the Equator. However, many other waves found will have to be filtered out by a mathematical process before data can be studied.



Scripps' 'Argo' Sails To Study Drilling Sites

Only about a month after ending a 57,200-mile, globe-girdling, cruise on Jan. 30, 1969, Scripps Institution of Oceanography's Argo sailed from San Diego on March 4 on a 11½-month, 38,340-mile expedition in the Pacific. Argo will traverse north and south Pacific Ocean in counterclockwise direction.

During Expedition SCAN, scientists and technicians will study and select 36 sea-floor sites to provide the best geological conditions for the drilling ship, 'Glomar Challenger,' as

she conducts Pacific Ocean phase of Deep Sea Drilling Project (DSDP).

SCAN's Main Purpose

Prime purpose of SCAN, supported by National Science Foundation and Office of Naval Research, is to investigate types of sediments and geological formations which Challenger will drill.



New Evidence Reported of S. Atlantic Sea-Floor Spreading

Two scientists of the Woods Hole (Mass.) Oceanographic Institution have revealed new evidence of sea-floor spreading in the South Atlantic. Their findings suggest that Africa and South America were joined about 150 million years ago.

The sea-floor spreading has measured about 1 inch per year for the last 70 million years. It appears symmetrical about the axis of the Mid-Atlantic Ridge, which bisects the ocean floor between Africa and South America. The mechanism causing the spreading is not known.

These are the tentative conclusions of the Co-Chief Scientists of Leg III, Deep Sea Drilling Project, Drs. Arthur E. Maxwell, Associate Director of the Woods Hole Oceanographic Institution, and Richard P. Von Herzen, Associate Scientist. They were members of a 15-man team aboard the drilling ship 'Glomar Challenger' from Dakar to Rio de Janeiro, Dec. 1, 1968, to Jan. 24, 1969.

The Operation

Scientific teams of the Deep Sea Drilling Project are drilling and conducting preliminary core descriptions following plans of the Joint Oceanographic Institutions for Deep Earth Sampling.

Maxwell and Von Herzen said 10 holes had been drilled. More than 90% of the attempted corings resulted in recovered cores. Dr. Maxwell added: "This is a highly successful rate, even on land, let alone at sea, where the conditions are much more difficult."

The drilling took place on the flanks of the Mid-Atlantic Ridge, where the structure and

movement of the earth's crust were studied. Sedimentation revealed the age of the ocean floor at varying distances.

"The ages of the sediments, and their respective distances from the Mid-Atlantic Ridge, indicate that two points at equal distances on each side of the Ridge axis at 30 degrees south latitude have been spreading apart at the rate of two inches per year for the past 70 million years."



New Bathymetric Chart of Washington Coast Now Available

A new Bathymetric Chart of the coast of Washington covers an area from southern British Columbia to south of the Columbia River. It shows the sea floor from the coastline to approximately ninety miles west. It covers the continental shelf slope and as it descends into deep water.

The Chart is 5 feet long, 32 inches wide, and uses a cartographic technique that combines subtle shadings of color with contour lines to give a 3-dimensional portrayal of the ocean's floor.

The 2 U. of Washington oceanographers who created it--Dr. Dean McManus and Noel McGary--began working on the concept about 2 years ago with ESSA and the U.S. Geological Survey. They were aided by State of Washington agencies.

Navigation by Sounding

The Chart can be used for navigation by sounding. Coordinates can be transferred to standard charts for pinpoint surface navigation. Because of the accuracy used in assembling the 3-D portrayal of the ocean floor, the new map makes an excellent educational tool, the Oceanographic Commission of Washington states.

The Oceanographic Institute of Washington--200 Second Avenue North, Seattle, Wash. 98109--is selling the new chart for \$3.50, plus 25¢ to cover mailing.



International Guide for Maritime Distress Being Prepared

An International Guide for Maritime Distress is being prepared by a committee of the Intergovernmental Maritime Consultative Organization (IMCO), reports the U.S. Coast Guard.

The guide is intended to provide instructions to merchant vessels in distress, and to those in position to assist other vessels. If accepted by IMCO, all commercial vessels flying the flags of IMCO's 67 member nations may be required to carry and comply with the guide.

New Guide's Information

At present, there are no internationally accepted standards for search and rescue--except those set up by the International Civil Aviation Organization (ICAO) to rescue downed fliers. The Coast Guard says: "The new guide will provide similar coverage for shipping. It will include instructions on emergency communications, rescue and care of survivors, and plans and coordination of large-scale searches. It will explain what actions might be expected of a distressed vessel, and how an assisting vessel can be most effective."



Foreign Fishing Off U.S. in January 1969

NORTHWEST ATLANTIC

Continuous bad weather, especially in the Mid-Atlantic Bight, restricted aerial surveillance during Jan. 1969. Nevertheless, 39 individual fishing and support vessels from the Soviet Union, and 2 from Japan, were observed. It was estimated that 25 to 30 more Soviet vessels were in the area, but these were not sighted.

Off Southern New England

Soviet: Early in the month, 8 to 10 factory stern trawlers were scattered 30 to 35 miles south of Martha's Vineyard and Nantucket. From mid-month, 10 to 15 stern trawlers were in a 20-mile area, 65 to 70 miles south of Block Island, just beyond the eastern boundary of the 'no fishing' zone in ICNAF Sub-area 5. Moderate-to-heavy catches of red hake and some whiting were observed on deck and, usually, dehydration plants were operating. A few vessels fished red hake and whiting south of Nantucket.

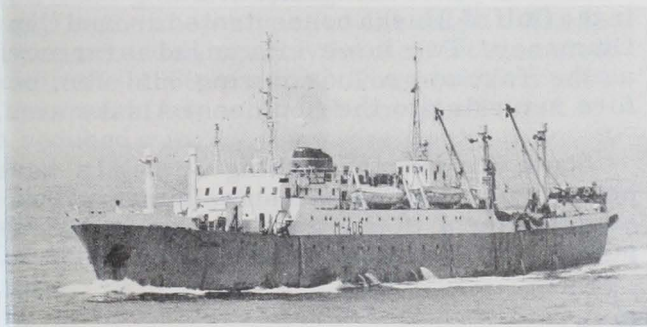


Fig. 1 - Soviet factory stern trawler 'Sputnik' fishing for red hake south of Block Island, R.I., during January 1969.



Fig. 2 - Aerial view showing substantial catch of red hake on board Soviet factory stern trawler observed during January 1969 while fishing 65 to 70 miles south of Block Island, R.I.

(Photos: Resource Management, BCF)

Off Mid-Atlantic

Soviet: Fishing activity increased early in Jan. when about 25 medium side trawlers and support vessels began fishing 25 to 30 miles off New Jersey. By month's end, the fleet had increased to an estimated 50 vessels dispersed over an 80-mile area, 20 to 25 miles offshore from east-southeast of Sandy Hook to east of Cape May. Catch was reported to be herring and some mackerel. On Jan. 29, U.S. fishermen sighted 25 to 30 side trawlers fishing herring and mackerel about 60 miles east of Cape Henry, Va.

On Feb. 4, one Japanese, 3 Polish, and 53 Soviet vessels were sighted off the New Jersey Coast.

Japanese: On Jan. 8 and 23, the stern trawler 'Sekishu Maru' was observed fishing 65 to 70 miles southeast of Cape May, in the U.S.-USSR 'no fishing' area. On Jan. 17, the stern trawler 'Shirane Maru' was sighted 70 miles south of Martha's Vineyard off Massachusetts. No catches were noted on either vessel.

U.S.-USSR Mid-Atlantic Fisheries Agreement

No violations were observed in Jan. 1969. During the first half of the month, Soviet trawlers and transports used the designated loading zones off Long Island and New Jersey. As many as 8 vessels at a time were reported in the zones.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels were reported in Jan. 1969.

OFF CALIFORNIA

No foreign fishing vessels were sighted in Jan. 1969; 15 Soviet fishing and support vessels were sighted in Jan. 1968.

OFF PACIFIC NORTHWEST

One Japanese longliner was sighted off Washington late in the month; catch was not identified. No Soviet fishing vessels were observed.

OFF ALASKA

Soviet: Over 130 fishery vessels had been sighted by the end of Jan. 1969 -- about 40 more

than in Dec. 1968, and 20 more than in Jan. 1968. Most fished herring and flounder in the central and eastern Bering Sea, respectively.

One medium trawler fished Pacific perch in the Gulf of Alaska, along the 100-fathom curve south of Kodiak Is. Perch fishing in other areas off Alaska had ceased by early January.

The herring fleet north of the Pribilofs grew from about 48 vessels in late Dec. 1968 to about 70 by end of Jan. 1969. Trawlers had good catches during the month. ABCF-Coast Guard fisheries patrol observed the herring fleet in mid-month. Stern and side trawlers' average drags lasted 1 hour. Catches ranged from 1 to 15 metric tons and averaged 6-7 tons per haul. Many trawlers appeared to be using midwater gear--the first known use of such gear in this fishery.

Eastern Bering Sea flounder fishery vessels increased from about 40 to 50 during the month.

The Soviets abandoned the groundfish trawl fishery in the central Bering Sea during early Jan. The 5 medium trawlers operating there presumably moved to the herring fishery. At least 1 reefer and 12-15 medium trawlers fished north of the Fox Is. throughout the month.

Japanese: About 40 vessels were reported in Jan., comparable to the number in Dec. 1968, but about 5 less than a year ago.

Six stern trawlers were in the Gulf of Alaska ocean perch fishery--4 fished primarily off southeast Alaska and 2 principally in the central Gulf. The 12-13 stern trawlers fishing perch in the central Bering Sea shifted to herring fishing south of St. Matthew Is. in early Jan.

Two factoryships and 14 trawlers, producing fish meal and oil and minced fish meat, operated in the eastern Bering Sea. During first 3 weeks in January, 1 factoryship and 8 trawlers fished the Continental Shelf edge, north of Fox Is. to south of St. George Is., primarily catching Alaska pollock. The factoryship returned to Japan in late Jan. The other factoryship and 6 trawlers remained on the traditional flounder grounds north of Unimak Is.

During second week of Jan., a Coast Guard Fisheries patrol, with a BCF agent aboard, observed about 12 Japanese stern trawlers and 2 side trawlers fishing herring at about 65 fathoms, northwest of the Pribilofs in the central Bering Sea. The Soviet herring fleet also fished in this area.

Four Japanese longliners fishing sablefish in the Gulf of Alaska concentrated around Cape Ommaney. Two, however, ranged as far north as the Yakutat grounds during mid-Jan. before returning to the southeast Alaska area.

South Korean: No fishing vessels have been reported since early January. Presumably the 1 stern trawler previously reported off Alaska has left.



STATES

Alaska

STATE BIOLOGISTS MAKE 1969 SALMON FORECASTS

Biologists of Alaska's Fish and Game Department have the following 1969 salmon outlook for these areas:

Bristol Bay: A preliminary forecast is for a red-salmon run of more than 18 million fish. This excludes the Japanese high-seas harvest. The run will be a decided improvement over the disaster years of 1967 and 1968. Last season, the run was about 8.5 million fish; of these, 5.5 were allowed for spawning, and 3 million were harvested. The probable red-salmon harvest in 1969 is estimated at 9 million fish.

Kodiak: The highlight will be the return of the odd-year pink-salmon cycle from the disastrous low of 1967.

Cook Inlet: In summer 1969, pink and chum salmon are expected to be in short supply in the major part of the Inlet. These species provided most of the district's canned pack in the 1968 season. The northern part of the area is expected to be most affected by the reduced run.

No forecasts were made on the Cook Inlet red-salmon runs. However, it is generally believed 1969 returns will be a little less than normal.

Prince William Sound: The area hit hardest by the 1964 earthquake is recovering. Some of the tighter restrictions imposed then are being eased.

Pink salmon runs in permitted areas will total an estimated 5.8 million, over twice the 1968 runs.

Southeast Alaska: It faces a poor salmon season and the State has issued restrictive regulations.

Pink salmon usually are the bulk of the Southeastern salmon packs. In 1968, the run was nearly 30 million, the largest in 17 years. It produced a pack of 972,000 cases.

The 1969 forecast is for only about 8 million pinks, of which 5 million will be needed for seed stocks. The low forecast is based on the poor parent year 1967 and on spawning-stream studies.

* * *

RALSTON PURINA TRIPLES PROCESSING CAPACITY AT KODIAK

Ralston Purina has installed 3 more new-type shrimp-peeling machines at its Royal Reefer plant in Kodiak. The plant now will operate two 10-hour shrimp shifts and its production capacity will be increased 300%. It will be able to handle a total of 64,000 pounds of shrimp a day.

The firm also has arranged to add 3 more large vessels to the shrimp fleet: the 'Peggy Jo,' 'Robbie,' and the 'Alaskan'.

The firm has moved steadily towards shrimp production to supplement king-crab processing.



California

TO RECOMMEND RISE IN SHRIMP CATCH QUOTA

The California Department of Fish and Game will recommend to the Fish and Game Commission a 50-percent increase in the commercial shrimp quota for Area A off the Humboldt-Del Norte County coast in 1969--to 3 million pounds, a million over 1968.

The recommendation followed a meeting of marine biologists with industry representatives in Crescent City on Feb. 11, 1969, to review the Department's management proposals for shrimp in Area A. The Department's marine biologists said the 1968 fall population survey indicates a population of 8.8 million pounds of shrimp on Area A beds.

Population Model Built

By constructing a population model with the aid of a computer, the biologists concluded

that a population of 7.1 million pounds will allow a harvest of 1.7 million pounds on a sustained basis. The surplus above 7.1 million pounds may be harvested safely without endangering basic breeding stocks. That would provide a basic sustained or equilibrium harvest of 1.7 million pounds, plus 1.7 million pounds of surplus shrimp, for the 1969 season. The 400,000 pounds more than the proposed quota of 3 million pounds are allowed arbitrarily for harvest by Oregon vessels. These take some shrimp off the northern portion of Area A beds.

Survey Cruise

A tentative state-industry agreement calls for a joint "in-season" population survey cruise during the 1969 season. The cost of the expensive surveys would be shared. Also, the cruise will enable the Department to draw on the talent, knowledge, and specialized fishing gear of the commercial industry. A joint survey was made during the 1968 season. It resulted in the recommendation that the quota be raised from 1.5 million to 2 million pounds. Industry also cooperated with the Department in a 1964 survey cruise.

California-Oregon Cooperation

The Department also plans to work more closely with Oregon fishery officials than in the past--on seasons and other regulations affecting the ocean resources of the 2 states.

The season for Area A--the Pacific Ocean between a line extending due west of False Cape, near Cape Mendocino, and the Oregon border--usually is May 1 through October 31, or until the quota is reached.



Washington

SHELLFISH CATCH RISES 12%

From January through October 1968, the shellfish catch in Washington State totaled 15.4 million pounds. This was an increase of 1.6 million pounds, or 12%, over the 1967 period.

Landings of Dungeness crabs reached 8.8 million pounds, up 31%. The shrimp catch of 1.2 million pounds was an increase of 9%. The production of Pacific oysters from Washing-

ton Coast was 2.8 million pounds, a rise of 12%.

There were decreases in production of hardshell and razor clams, Olympia oysters, and Puget Sound Pacific oysters.

* * *

CHINOOK SALMON FLOWN TO NEW YORK

In December 1968, the University of Washington airlifted 100,000 selected chinook salmon eggs to the New York State Department of Conservation for spring 1969 planting in Lake Ontario. New York ordered the eggs after watching the results of plantings in Lake Michigan and Lake Superior by Michigan and Wisconsin.

New York will hold the eggs until they hatch this spring and put them in streams that feed Lake Ontario. Conservation Department officials hope the fingerlings will stay put in Lake Ontario--as their cousins did in Michigan and Superior. In the latter two, the original coho, and later chinooks, thrived on a rich food supply and the absence of natural predators. Both breeds revitalized sport fishing and business in neighboring communities.

College of Fisheries Active

The University of Washington breeds salmon selectively each year and produces more than 5 million salmon eggs. Its College of Fisheries uses a half-million for research and development projects. The remainder are available, under strict supervision, to stock non-Washington waters.

In addition to the New York shipment, eggs were sent to Michigan, Wisconsin, Japan, and the Quinault Indian Reservation in Washington State.



Virginia

EDA EXTENDS OYSTER STUDY

The Commerce Department's Economic Development Administration (EDA) has approved technical assistance funds of \$45,254 to help continue the feasibility study of establishing oyster hatcheries in the lower

Chesapeake Bay area of Virginia. The funds will be supplemented by \$15,200 from the applicant--the Windmill Point Oyster Co. of Irvington, Va.

The study, begun mid-1966 to revive declining oyster production in the James River area, will be extended one year. The study has developed data on oyster spawning and setting of larvae.

1969 Program

Research this year will develop and evaluate the use of cultch-free oyster seed produced in hatcheries. It will seek to determine costs, resistance to disease, predation of young oysters--and effects on their growth of water depth, tidal currents, salinity, storms, and seasons.

The cultch-free oysters are cultivated in baskets or trays off the bay bottom. This method was developed by Windmill researchers to save the many man hours needed to operate the equipment used to handle the heavy cultch.



Maine

SARDINES PROMOTED

The Maine Sardine Council has requested ECF assistance in a nationwide educational program to encourage sardine consumption because of heavy production, large inventories, and a declining share of the market for Maine sardines.

In 1968, production was 1.6 million pounds; in 1967, 1.2 million pounds. On Jan. 1, 1969, inventories for domestic canners were 165,000 cases; on Jan. 1, 1968, 340,000 cases. Since 1957, U.S. market share has decreased from 65% to 35%.

The program is aimed at extension agents, school lunch administrators, institutional managers, professional food groups, retailers and others in the food trades through the use of newspapers, radio & television, and personal contacts.



Commonwealth of Puerto Rico

TUNA INDUSTRY GROWS

Puerto Rico's tuna industry continues to grow, reports the island's Department of Agriculture. During 1968, over 126,000 tons of tuna were unloaded and processed, 6,000 tons more than in 1967.

The established tuna cannery in Ponce, on the southern coast, will be expanded by the construction of more freezers, a warehouse, and packing lines. Another cannery will be built. In Mayaguez, on the west coast, the 3 plants have increased their facilities and plan further expansion.



Tuna seen from observation chamber of research vessel.

A Tuna Canning Center

Tuna canning is the most important food-processing industry. It employs 2,200 people. In 1968, production was over 6.3 million cases, excluding pet food, and was worth more than \$80 million. "If the upward trend continues," the Department of Agriculture says, "the Island will soon be the tuna canning center of the world."

