



Cleaning fish aboard Gloucester, Mass., gill netter. (Photo: USIA/National Archives)

# UNITED STATES

## U. S. Seeks Contractor for FPC Pilot Plant

The Department of the Interior has invited proposals from private contractors to build the Government's first pilot plant for producing fish protein concentrate (FPC). The plant is intended to show the practicability of manufacturing FPC by using the BCF isopropyl-alcohol process--and to serve as a guide to private companies in designing and building full-scale plants.

The deadline for the proposals is July 10. They must meet BCF standards and involve a plant able to process 50 tons of raw fish in 24 hours. The FPC produced in pilot plant will be used in studies of ways to make the concentrate part of the foods consumed in the U. S. and abroad.

BCF plans to award the contract during the summer and to have the plant working by Spring 1968.

The Pacific Northwest has been picked as the location for the pilot plant because BCF exploration off the coast found vast amounts of hake, which are used in the BCF process. The exact spot for the plant waits on the selection of a contractor.

President Johnson's 1968 budget for Interior Department asks for \$1 million for design and construction of the plant and \$700,000 to operate and maintain it and for related research.



## A Machine to Skin Fish

A portable machine that can skin "almost any size fish--up to 9 inches wide and any length," its Seattle, Wash., makers say, has been put on the market. It sells for \$4,750, and was demonstrated recently by the Marine Construction & Design Co. E. L. Grimes, of the company's fisheries-development division, says: "It is a simple and economical machine designed to meet the needs of the small and medium-sized producer."

The filleted fish, tail first, enters the aluminum-stainless steel machine. An adjustable knife blade in a chute catches, clamps down, and strips the skin as the fish moves down onto a conveyor. Grimes explains: "It strips rather than cuts. It leaves the white membrane under the skin, allowing for extra recovery of food." The blade can be adjusted to the skin thickness.



He points out that the machine will handle large halibut fillets without problems. "It even handles dogfish, which is extremely difficult to skin by hand. At first I didn't think the machine could process it." The Canadians provide much dogfish for England's famous institution--"fish 'n chips." Shark is becoming more popular in Europe, and it too can be skinned by the machine.

Grimes stated that the machine can skin as many as 75 small fillets per minute. "In Canada, where we have sold several of these, they have found 2 persons are needed to feed the machine to keep up with its capacity speed."

The machine is run by a 1½-horsepower motor and needs 220-volt electricity and a ½-inch water supply.



## Sub Studies Bottom of Lake Michigan

For 2 weeks this month, Dr. David C. Chandler of the University of Michigan will dive 920 feet to the bottom of Lake Michigan in a space craft-shaped midget sub, the "Star II." "There are 300-foot-deep canyons in the bottom of Lake Michigan, and we want to get a good look at them," explained Dr. Chandler, an aquatic biologist and director of the University's Great Lakes Research Division. The university leased the 17.7-foot, 4.7-ton sub from the General Dynamics Corporation to determine whether a sub is a useful research tool. If its 17 scheduled dives prove valuable, Dr. Chandler added, he may conduct later comprehensive underwater explorations of the Great Lakes. His current project involves the first use of a sub in these waters.

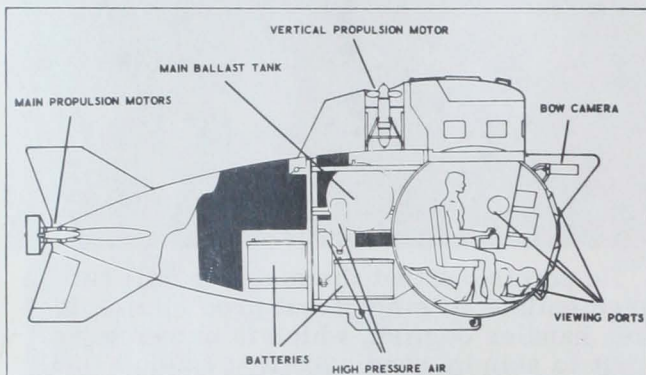


Fig. 1 - Cutaway of Star II.



Fig. 2 - Star II.

Dr. Chandler has watched underwater research with subs off the Pacific Coast but has never dived in a sub. He will be accompanied by an engineer.

### A Geologic Probe

He said the first dive would concentrate on geologic probes: "We know a lot about rock formations in Wisconsin and Michigan on either side of the lake, but Lake Michigan itself is a big gap. We hope to learn more about the nature of the lake basin."

The researchers will observe and take samples of the face of rock ledges using outboard equipment. (The sub has observation portholes and carries 250 pounds of scientific apparatus.) They will study the life of lake fish, their food, and bottom sediments.

To date, scientists have explored the Great Lakes mostly by lowering instruments to obtain samples, underwater TV and cameras--and through the observations of SCUBA divers who went down to about 200 feet.

### Coast Guard Lends A Vessel

Dr. Chandler's efforts are being backed up by the U. S. Coast Guard, which has a



Fig. 3 - U. S. Coast Guard tender Woodbine (WLB-289).  
(Photo: U.S. Coast Guard)

policy of assisting scientists in Great Lakes research. It is making available the cutter "Woodbine," a sea-going buoy tender that will lower and retrieve the Star II.



# OCEANOGRAPHY

## Soviet Scientist Joins "Oceanographer"

A Soviet scientist, Alexei Metalnikov, joined U. S. scientists aboard the Oceanographer when it stopped over in Odessa on the Black Sea last month. The U. S. Embassy said he would travel as a "guest scientist" on a scientific voyage to India. The Oceanographer is on a round-the-world voyage. While in Odessa, it held openhouse.



The U. S. Coast & Geodetic Survey research vessel Oceanographer. (ESSA photo)

The vessel is attached to the U. S. Commerce Department's Environmental Science Services Administration.



## Most Extensive Survey of Massachusetts Coast Under Way

The Coast and Geodetic Survey began work last month off Ipswich on a 5-year hydrographic survey of the Massachusetts coast from Cape Ann to Cape Cod. It will be the most extensive survey of these waters in 100 years.



Fig. 1 - The U. S. Coast & Geodetic Survey ship "Explorer."

The USC&GS ship "Explorer" operating out of Boston will conduct the survey until October, and resume each year until the job is done. The 1,900-ton, 219-foot vessel carries 14 officers and 69 crew and is equipped with the most modern electronic devices for hydrographic surveying.

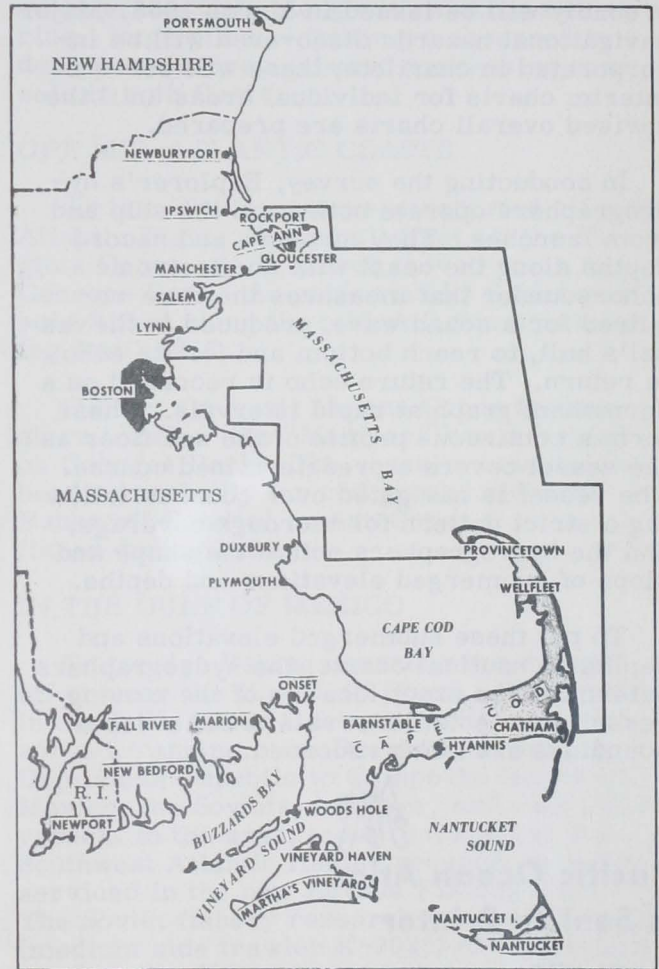


Fig. 2 - Box indicates area of Massachusetts coast to be surveyed by Coast & Geodetic Survey, ESSA, as part of a 5-year program.

The survey will not cover recently surveyed Cape Cod Bay or the waters in and around Boston Harbor, except the Winthrop area extending north of President Roads. But the survey will include all other harbors from Cape Ann to Cape Cod, including Rockport, Gloucester, Manchester, Beverly, and Salem.

Area of 1,350 Square Miles

The survey will cover about 1,350 square nautical miles--from 4-5 miles offshore to

20-25 miles--where it will merge with surveys already completed over the continental shelf.

The data obtained will be incorporated into a new, small, craft chart (613-SC) of the area from Boston to Portsmouth, N. H.; this will probably be issued in 1968. About 20 existing charts also will be updated to include the latest data from the survey and data from other U. S. agencies. The first revised chart probably will be issued in March 1968. Major navigational hazards discovered will be incorporated in chartlets; these will serve as interim charts for individual areas until the revised overall charts are prepared.

In conducting the survey, Explorer's hydrographers operate both from the ship and from launches. They measure and record depths along the coast with an electronic echo-sounder that measures the time required for a sound wave, produced in the vessel's hull, to reach bottom and for its echo to return. The return echo is recorded on a permanent graph at rapid intervals. These form a continuous profile of the sea floor as the vessel covers a predetermined course. The vessel is navigated over courses following a strict pattern for thorough coverage, and the hydrographers obtain the shape and slope of submerged elevations and depths.

To put these submerged elevations and depths on nautical charts, the hydrographers determine the exact location of the moving vessel at selected intervals while depth soundings are being recorded.



## Pacific Ocean Atlas Is Sent to Printer

The "Oceanographic Atlas of the Pacific Ocean" has been delivered to the University of Hawaii Press. Publication is scheduled for the coming year. The atlas is the work of Richard A. Barkley, oceanographer at the BCF Biological Laboratory in Honolulu, who spent 5 years preparing it.

John C. Marr, BCF Area Director, explains that the atlas resulted from oceanographic station data collected in the Pacific Ocean during the past 50 years by 28 laboratories and institutions of 10 nations and assembled, summarized, analyzed, and charted at the laboratory.

Previously, this great collection of data--3 million measurements of temperature, salinity, dissolved oxygen, and depth--had been published and used piecemeal on a regional basis. At most, a small percent had been selected and processed by hand to produce a few oceanwide charts. But the advent of high-speed electronic computers made it physically and economically possible, for the first time, to use all of the data in one definitive compilation. The atlas--in 156 charts and graphs to be published in one volume--makes all this information available to scientists, fishermen, mariners, and anyone who wants information on the physical and chemical characteristics of the Pacific Ocean.

## Has Remarkable Detail

Every effort was made to retain all usable detail on the final published charts showing distributions of temperature, salinity, dissolved oxygen, and density at 12 different levels. For example, on one chart, a narrow tongue of relatively high salinity water at middepth just south of the Aleutians can be clearly identified--although it is less than 100 miles wide and only slightly more saline than water on the other side of the Aleutian ridge, just 60 miles north.

The Pacific-wide perspective of the atlas makes it possible to trace that high salinity tongue on the same chart over 16,000 miles; eastward to Alaska, southward along the American coast to the Equator, west along the Equator to the Solomon Islands, then south to Tasmania. There, the water originates in a pool of high-salinity surface water that forms just south of Australia.

## Computers Shorten Lifetime Work

Data for the atlas were purchased in punched-card form from the U. S. Navy Hydrographic Office and the National Oceanographic Data Center from 1959 to 1964. The data were processed by 3 different computer systems over more than 3 years. The several hundred hours of machine time were equivalent to about 50 man-years of manual data processing. Two to 6 technicians worked a total of about 18 man-months to plot the averaged data on charts. Following this, the author performed all subsequent steps on each chart and graph.

In all, the work that went into producing the atlas took 5 man-years of effort. It would have taken 50-60 man-years if automatic data processing had not been available.

## Foreign Fishing Off U. S. Coasts, April 1967

### IN NORTHWEST ATLANTIC

Soviet: Her fishing and support vessels in the Northwest Atlantic off the U. S. coast nearly doubled during April. Weekly sightings revealed that the fleet increased rapidly, from 75 vessels early in the month to about 140 by month's end. This compares to about 60 vessels sighted during March 1967 and 125 vessels reported during April 1966. The Soviets are increasing their fishing and support vessels faster than in 1966, when the peak (over 150) was reached only by the end of June.

During April, 159 vessels were sighted and identified as 36 large factory stern trawlers, 20 large refrigerated side trawlers ("Pioner" class), 31 medium refrigerated or freezing side trawlers (25 SRTR's, 6 SRTM's), 58 medium side trawlers (SRTs), 5 factory base ships ("Pionersk"), 7 refrigerated fish transports and cargo vessels, 1 tanker, and rescue tug.

The Soviet fishing fleet was divided into large groups dispersed from 75 miles south of Long Island, New York (Hudson and Block Canyons), to 100 miles east of Nantucket Lightship (Lydonia Canyon) off Massachusetts. Fishing extended for 220 miles along the 50- and 100-fathom curves of the Continental Shelf.

Beginning early in the month, the main fleet (75 vessels) was concentrated between Block Canyon and south of Nantucket Lightship. Principal fish caught in moderate quantities appeared to be whiting, red hake, and some herring. By mid-month, that fleet gradually shifted eastward to include the southeast slopes of Georges Bank. Fish seen on deck were whiting, red hake, and herring. Captains of U. S. fishing vessels reported 10 or more Soviet stern factory trawlers catching large quantities of haddock.

By month's end, the Soviets divided the vessels into 2 fleets: one of about 70 vessels, mostly side trawlers and support vessels, was found in a 30-mile area south of Block Island, Rhode Island. Moderate to heavy catches consisted primarily of whiting and red hake.

About 140 miles to the east, the other fleet (also about 70 vessels--stern trawlers, side trawlers, and fish transports) was located in a 20-mile area from Lydonia Canyon extending northward across the southwest part of Georges Bank. The stern trawlers were fishing in deeper waters taking mostly whiting, with some haddock. The side trawlers were working in more shallow depths (35-45 fathoms) and there was some evidence they were taking considerable amounts of haddock and other groundfish, along with whiting and herring. Huge piles of fish were observed in deck storage areas aboard processing vessels in both fleets.

### OFF MID-ATLANTIC COASTS

Soviet: No vessels were reported off mid-Atlantic Bight. The small fleet off the Virginia Capes late in March moved north to Georges Bank. An estimated 50 Soviet vessels fished along the mid-Atlantic coast during April 1966.

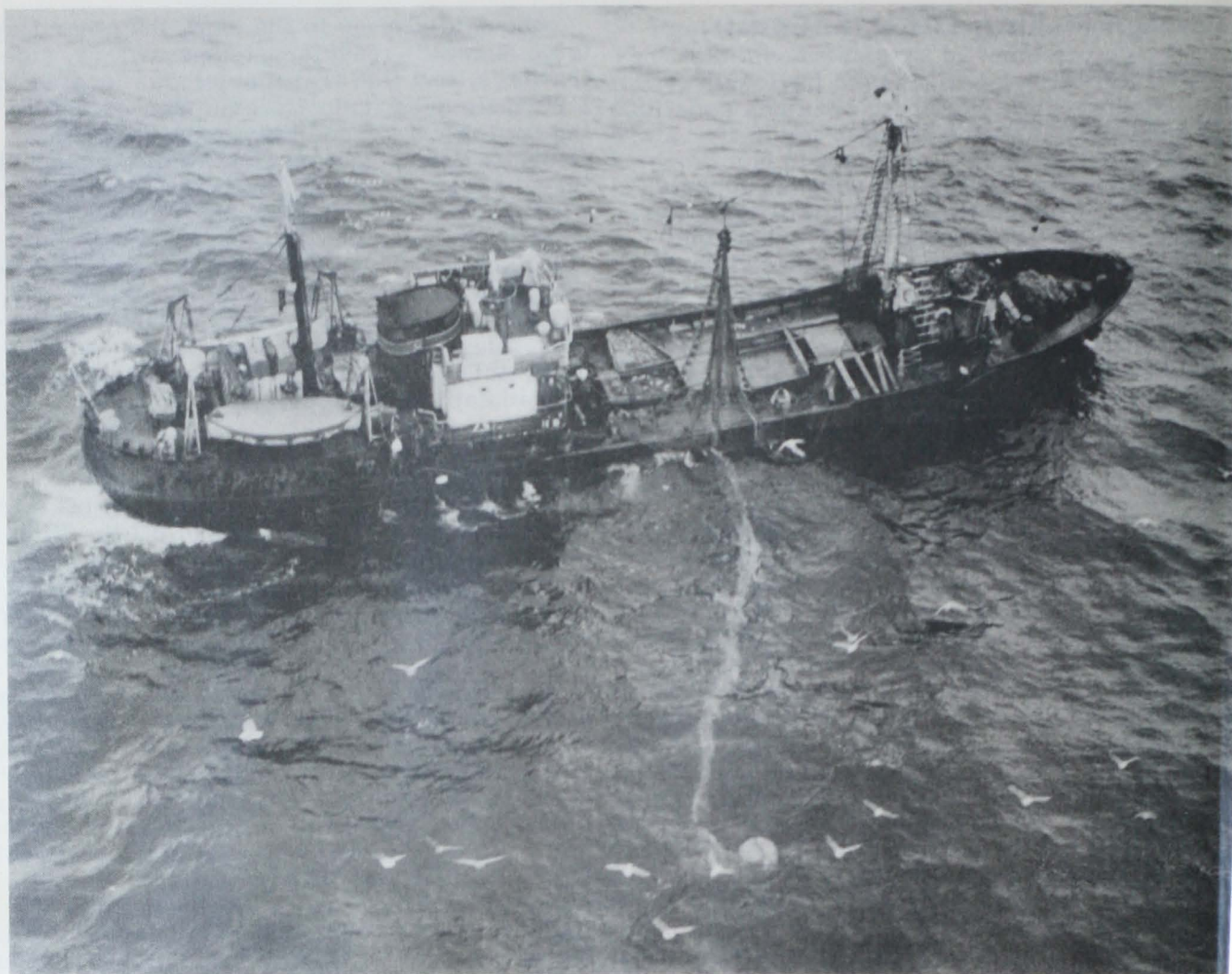
Cuban: On April 25, one Cuban freezer stern trawler (the "Manjuari") was sighted on Georges Bank. The vessel was underway heading probably for cod grounds (Grand Banks off Canada), where Cuban trawlers fished during 1966.

### IN THE GULF OF MEXICO

No foreign fishing vessels were sighted off or near the U. S. Gulf Coast. Elsewhere in the Gulf, Cuban fishing activity was widespread, ranging from Puerto Rico and the Dominican Republic to Campeche Banks off Mexico; the Soviets, however, had only a few vessels in the area, most in transit to the Southwest Atlantic fishing grounds, or being serviced in the new Havana Fishing Port. The Soviet fishery research vessel "Obdorsk" (medium side trawler K-9029) of the Atlantic Institute for Fisheries and Oceanography was conducting fishery studies in the Old Bahama Channel (between Cuba and the Bahamas).

### OFF CALIFORNIA

Soviet: The number of vessels sighted off California during April was greater than ever before. It indicated that the USSR has begun to exploit the fishing resources in the area on a large scale. Fishery research and exploratory vessels have been conducting studies of fish populations and concentrations for several



The Soviet medium trawler "Kosmonaut Feoktistov," photographed by the California Department of Fish and Game on March 31, 1967, was about 22 miles west-southwest of Half Moon Bay, San Mateo County (south of San Francisco). It belongs to the Far Eastern Fisheries Administration and previously fished for Pacific ocean perch in the Gulf of Alaska.

years and have obviously located commercially valuable stocks.

Fishing and support vessels sighted fluctuated from about 6 to over 20; most fishing was north and south of San Francisco. Although the number of sighted vessels fluctuated, that of large stern trawlers kept increasing (from none at beginning of April to 11 at the end). This indicated a rapidly growing fishing effort (average catch of large stern trawler is 5-6 times larger than average Soviet medium trawlers).

Early in April, 5 medium trawlers accompanied by a support vessel fished about 22 miles west of Half Moon Bay (south of San Francisco). By mid-April, however, 20

Soviet fishing and support vessels were sighted in about the same location; they were identified as 15 medium side trawlers and 1 large stern trawler, accompanied by 4 (unidentified) support vessels. The vessels were heavily concentrated in a 5-mile radius and, reportedly, were taking good catches of rockfish and Pacific hake at depths of 200-300 meters (650-1,000 feet).

Another large stern trawler, the "Skryplev," which explored off Mexico in March 1967, was sighted 38 miles off San Clemente Island on Tanner Bank (southwest of Los Angeles); she was obviously engaged in exploratory fishing, presumably for Pacific mackerel.

By April 22, a fleet of 2 medium side trawlers and 7 large stern trawlers fished for rockfish outside the 12-mile contiguous fishing zone between Bodega Bay and Gualala River in Mendocino County (north of San Francisco). By month's end, this fleet increased somewhat and divided: 6 large stern trawlers were again fishing off Half Moon Bay, while 7 fishing and support vessels were sighted about 20 miles off the mouth of Russian River, not far from Bodega Bay.

Most observed Soviet catches during April were species of rockfish. The 20 vessels sighted off Half Moon Bay in mid-month were observed fishing for rockfishes and Pacific hake with small-mesh (2-3 inches) cod-ends and taking good catches. No reliable estimates of total Soviet catches off California can yet be made. At least one large stern trawler is known to have landed over 130,000 pounds of fish in a single day in the Bodega Bay area. This is a record catch and the crew worked extremely hard (setting and hauling the trawl 10 times during the day), but it also indicates that greater fishing effort off California was prompted most likely by good fishing.

#### OFF PACIFIC NORTHWEST

Soviet: In the first week of April, 6 Soviet vessels fished off the Oregon coast, taking primarily Pacific hake and true cod. As hake increased and flounder fishing in the eastern Bering Sea ended, more vessels were assigned to the area; by month's end, 17 Soviet fishing, support, and research vessels fished off the Oregon coast, mostly off Newport in the Heceta and Stonewall Banks regions.

The hake season developed slower. During the first 3 weeks of April, the fishing and support vessels off Oregon never exceeded 100. Although 6 more stern trawlers were sighted at month's end, the total number off the Pacific Northwest was about 40. In 1967, it has more than doubled.

Fishing pair trawls in addition to regular bottom trawls were used by some vessels. During surveillance flights, catches varying from water hauls to around 20,000 pounds of hake were observed. On the average, catches were moderate to good and consisted primarily of hake, with possibly a few rockfish mixed in.

The Soviets followed their normal pattern of having exploratory or research vessels work with the fleet to locate fish.

There was no Soviet fishing off the Washington coast, except for vessels on the way to Oregon.

#### OFF ALASKA

Japanese: Her vessels operating off Alaska increased from about 90 to 104 during April. There was Pacific ocean perch fishing in the Gulf of Alaska in 3 areas: Southeastern Alaska, Yakutat grounds, and Albatross Bank. The large side trawler "Tone Maru" fished during early April off Southeastern Alaska and then returned to Japan; the factory trawler "Kirkishima Maru" fished in mid-April and shifted to the Yakutat grounds before returning home. In late April, the factory trawler "Ryuyo Maru" and the smaller trawler "Kitigami Maru" fished perch off Sitka Sound in Southeastern Alaska. The small stern trawler "Hoyo Maru" fished on the Yakutat grounds all month. In mid-April, she was joined by the factory trawlers "Kokuyo Maru" and "Kirishima Maru", which returned to Japan in late April.

The factory trawlers "Daishin Maru No. 12" and "Yutaka Maru" fished for perch on Albatross Bank through April. In late April the factory trawler "Taiyo Maru No. 82" and the smaller trawler "Akitsu Maru" joined the perch fishery on Albatross Bank.

The factory trawlers "Akebono Maru No. 72" and "Aso Maru" fished for perch along the edge of the Continental Shelf south of the Pribilof Islands until midmonth, then returned to Japan.

The Alaska pollock fishery continued north of Fox Islands in the eastern Aleutians at the March tempo. At April's end, the factoryships "Shikishima Maru", "Gyokuei Maru", "Soyo Maru", and "Nisshin Maru No. 2" were active in the pollock fishery. They are accompanied by 60-62 trawlers. Independent trawlers included the factory trawlers "Akebono Maru No. 52", "Zuiyo Maru No. 2", and the smaller trawler "Inase Maru No. 5." The factoryship "Chichibu Maru," licensed to be accompanied by 12 trawlers, ended fishing north of Fox Islands in late April, about the time the Nisshin Maru No. 2 fleet arrived. It is believed the Chichibu Maru fleet has shifted its area of operations.



The king crab factoryships "Keiko Maru" and "Tainichi Maru" accompanied by 9-10 net-setting trawlers operated throughout April on the traditional grounds in outer Bristol Bay.

The long-line vessel "Fukuyoshi Maru No. 15" operated in the western Gulf of Alaska, south of Chirikof Island, during mid-April. At month's end, 2 more long-liners, the "Ryusho Maru No. 2" and "Tenyo Maru No. 10," were off Southeastern Alaska between Cape Ommaney and Sitka Sound. They were taking sablefish. One long-line vessel was fishing just north of the central Aleutians during mid-April.

Soviet: The number of vessels decreased from about 150 in early April to about 40 by month's end. The Gulf of Alaska perch fishery remained relatively stable until late April, when all but nine vessels left, mostly for the Pacific Northwest. In Southeastern Alaska, the perch fleet dwindled from 9 trawlers and 2 reefers in early April to about 3 trawlers and 1 reefer by month's end. During the first week of April, 26 trawlers and 4 support ships were concentrated on the Yakutat grounds; by mid-April, most shifted to Portlock Bank. The Yakutat grounds were completely abandoned by the end of April.

In mid-April, the Portlock Bank area west of Middleton Island supported 23 trawlers, 5 reefers, and 1 tug. By the end of the third and fourth weeks, there were only 4 trawlers and 1 reefer remaining on Portlock Bank.

Perch fishing on Albatross Bank went on for only a week in mid-April when 3 medium freezer trawlers were reported fishing east of Trinity Islands.

The perch fishery south of Fox Islands in the eastern Aleutian Islands remained relatively stable with about 23 trawlers and 3 reefers until late April, when the fleet decreased to 5 trawlers and 1 support ship. The shrimp fishery continued off Afognak Island, with 15 medium freezer trawlers, 1 cannery, and an occasional support ship until mid-April. During last two weeks, 9 or 10

freezer trawlers and 1 factoryship remained. The 5 trawlers fishing for shrimp in Shumagin Islands finished in early April.

The Soviet flounder fishery continued to decrease from first week, when 35 trawlers and 10 reefers were in it; by midmonth, fishing was abandoned completely.

Three canneries accompanied by 9 tangle-net-setting medium trawlers and 33 net pickers fished and processed king crab in the eastern Bering Sea.

#### VIOLATIONS OF U. S. TERRITORIAL WATERS

Violations of U. S. territorial waters by foreign fishing vessels have been increasing in recent years. The 40 violations reported in 1964 increased to 67 in 1966, and led to the recent stiffening of U. S. enforcement measures. Of 145 reported territorial violations, 1964 through March 1967, almost 70 percent (103 vessels) were by Soviet-flag fishing vessels. The Soviet vessels also were the chief offenders in violating the 9-mile contiguous fishery zone.

Table 1 - Reported Violations of U. S. 3-Mile Territorial Waters by Foreign Fishing Vessels, 1964-1967

Year	USSR	Cuba	Japan	Canada	Total
. . . . . (No. of Vessels) . . . . .					
1967 <sup>1</sup> . .	11	-	3	-	14
1966 . .	44	-	4	2	50
1965 . .	31	-	10	-	41
1964 . .	17	4	19	-	40
Total . .	103	4	36	2	145

Table 2 - Reported Violations of the U. S. 9-Mile Exclusive Contiguous Fisheries Zone

Year	USSR	Cuba	Japan	Canada	Total
. . . . . (No. of Vessels) . . . . .					
1967 <sup>1</sup> . .	11	-	3	-	14
1966 <sup>2</sup> . .	16	-	1	-	17
Total . .	27	-	4	-	31

<sup>1</sup>/Data up to March 30, 1967.

<sup>2</sup>/Data since October 15, 1966.

Source: U. S. Coast Guard, Branch of Marine Law Enforcement.

Not all reported violations were substantiated fully by photographic or other evidence and so the U. S. Government took legal action in only 3 recent cases.



## STATES

### Alaska

#### HERRING-ROE-ON-KELP HARVEST IS HELD

The annual herring-roe-on-kelp fishery in Alaska was held at Craig and at Sitka in April, reports BCF Juneau. At Craig, the "season" was open for 20 minutes--and 1,230 pickers harvested 203,000 pounds. At Sitka, the "season" was open for 45 minutes--and 850 pickers harvested 158,000 pounds. Pickers were paid \$1-\$1.25 per pound. The first wholesale value of the product is estimated at \$2 per pound. These prices mean that pickers averaged about \$350 per hour for their effort.

The high market value of herring-roe-on-kelp, its ease of collection, and simple processing requirements have led to significant enforcement problems. The temptation to pick "dollars" off the beach has been great. At least 3 buyers and a larger number of pickers have been caught dealing in illegally taken spawn.

The herring-roe-on-kelp fishery occurs at the time of year when other fishing income is at its lowest. Its participants are largely Alaskans. This means that a significantly larger percentage of the income from the fishery is spent in the villages and small towns of Southeastern Alaska than for any other fishery. The product is exported almost wholly to Japan. These aspects of the fishery make its continuation important--if it can be demonstrated that the harvest does not reduce the herring stocks significantly.



### California

#### 40-45 TONS OF SNIPEFISHES ESCAPE NETS

The April report of the Resources Agency of California contains this item:

During early morning on April 27, two San Pedro purse seiners set their nets on what their skippers believed were schools of mackerel. One had observed with his fathometer an estimated 30-ton school 8 to 10

fathoms beneath the surface in 35 fathoms of water at Pyramid Cove, San Clemente Island. Simultaneously, about a half mile away, the other seiner was surrounding a 10- to 15-ton school that had been noted between 6 fathoms and the bottom in 35 fathoms of water. Most of the "mackerel" they thought they were capturing were small enough to go through the mesh of their anchovy nets. Each seiner ended up with about 100 pounds of gilled slender snipefish (Macroshampus gracilis).

Prior to these captures, slender snipefish were very rare in the eastern Pacific. Fewer than 100 individuals have been caught between Santa Monica Bay and Magdalena Bay. In other world seas (the species was described from the mid-Atlantic), about 100 more individuals have been taken.

The snipefish that were gilled averaged 12 to the ounce (192 per pound). The two San Clemente Island schools would have yielded over 15,000,000 snipefishes to the purse seiners. There is still a ray of hope, although a circuitous one: snipefishes are fed upon by albacore, yellowtail, and rockfish--so the escapees may yet be of some value to local fishermen.



### Massachusetts

#### BOSTON IS BUILDING A PROPER AQUARIUM

The Central Wharf of the storied old seaport called Boston is being reborn. The wharf once was an important stop for coastal ships but, more recently, it became just another part of the rundown waterfront. Rising now on the end of the rebuilt Central Wharf is an aquarium, which is bound to make a big splash in a city that has been without one since 1954.

Bostonians are watching the progress in shaping the concrete shell of a 6-story-high structure that will boast a cylindrical 4-story-high tank. The giant fish tank, heart of the structure, will hold 200,000 gallons of water. A spiral ramp will circle it. A reef environment will be created as home to 40 aquatic species--including groupers, loggerhead turtles, moray eels, leopard sharks, and spotted eagle rays.

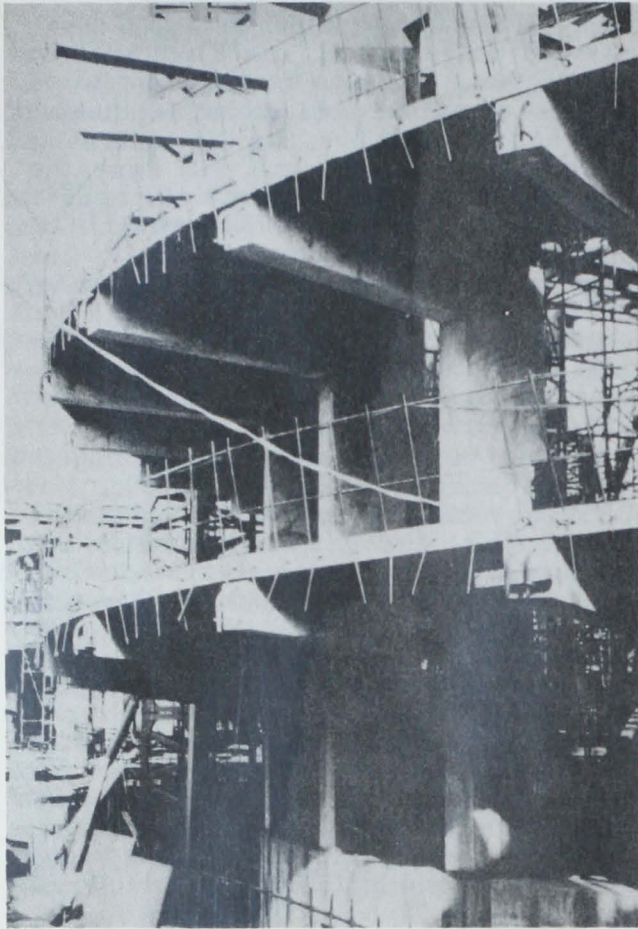


Fig. 1 - Work in progress on interior of the structure.

#### A View from the Top

Standing at the top of the ramp, the visitor will be able to look into the tank, then walk around its 125-foot circumference to the bottom. While walking, he will be able to look through the  $3\frac{1}{2}$ -thick glass.

The aquarium also will have 40 smaller tanks of different sizes in 4 gallery areas. And for the children, there will be a special aquarium and dioramas showing other aspects of life in the pond and in the sea.

If the aquarium receives enough contributions, there will be other exhibits. One will contain live penguins in an Antarctic environment. Another will be a tidal pool that will ebb and flow twice in a 24-hour period. It will have starfish, hermit crabs, and other New England coast marine species.

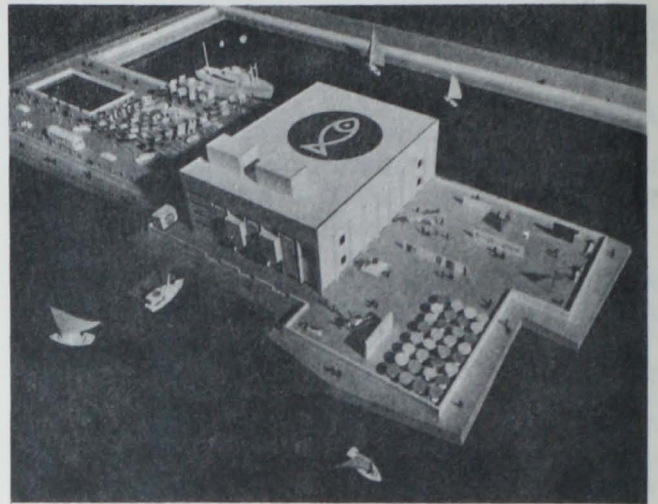


Fig. 2 - Model of the aquarium being built in downtown Boston. The fish on the roof has not been identified.

(Photo: S. F. Rosenthal)

The cost of rebuilding Central Wharf and building the aquarium is expected to be \$14.3 million.



## Virginia

### EDA AIDS OYSTER CULTURE STUDY IN LOWER CHESAPEAKE BAY

A study to determine whether it is practicable to set up commercial oyster hatcheries in the lower Chesapeake Bay area will continue with support from the U. S. Commerce Department's Economic Development Administration (EDA). The sum of \$33,150 was approved for the Windmill Point Oyster Co., Irvington, Va., a producers' cooperative that expects to use the study findings to increase production and sale of seed oysters.

The company itself is investing \$11,050--making a total project cost of \$44,200 for the coming season. BCF initiated the project and invested over \$16,000. In mid-1966, EDA began funding it.

Some significant data already have been developed on the spawning of oysters and the setting of larvae. BCF will continue to monitor the study and give technical aid.



## Washington

### EDA APPROVES MORE FUNDS FOR PACIFIC HAKE PROJECT

The Commerce Department's Economic Development Administration (EDA) has approved a request from the Grays Harbor Regional Planning Commission for \$110,000 more to operate 10 charter vessels for 80 days in studying the feasibility of starting a commercial hake fishery. EDA approved the project in September 1966 and already has provided \$126,000.

Last season, the 4 vessels were practically crowded off the grounds by the huge Soviet fleet that blanketed the areas of high hake concentrations from mid-May to December 1966. As a result, the study objectives were not fully realized. However, conditions are more favorable this season because of the new 12-mile fisheries zones and the signed U.S.-Soviet agreement to keep the Soviet fleet seaward of 60 fathoms between Grays Harbor and the south side of the Columbia River.

BCF personnel met with EDA officials on April 18 to discuss the new request for more money and supplied information to justify it.

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### PUGET SOUND HAKE CATCH ROSE IN 1966

The catch of Pacific hake in Puget Sound's inside waters, primarily from Port Susan and Saratoga Passage, reached 9 million pounds for the winter-spring 1966/67 season. The catch for the 1965/66 season was 6½ million pounds. Five vessels participated in the 1966/67 season of the new fishery, which resulted from BCF exploratory fishing and gear development.

The most active vessels again were the 78-foot "St. Michael" and the 59-foot "St. Janet". They achieved average catch rates of 10,400 lbs./hour and 8,800 lbs./hour of fishing time, respectively, for the entire season.



### BROOK TROUT IS MICHIGAN'S STATE FISH

When Michigan selected the "trout" as the state fish, it left open the question which of four kinds of trout found in Michigan would serve as a model for illustrations. Michigan's Governor Romney referred the matter to his Conservation Department.

Possibilities included brook, brown, rainbow, and lake trout, all common to Michigan. Of those, only the brook and lake trout are native to the State. Brown trout was imported from Germany and rainbow trout from the West Coast. Department personnel felt the chosen species should be a native and thus narrowed the field to two.

The final decision in favor of brook trout rested on these facts: Brook trout (*Salvelinus fontinalis*) are more widely distributed in Michigan waters than lake trout, are more colorful for illustration purposes, are caught by more fishermen, and are therefore perhaps more truly representative of the State. (Michigan's Department of Conservation.)



Brook trout in aquarium.

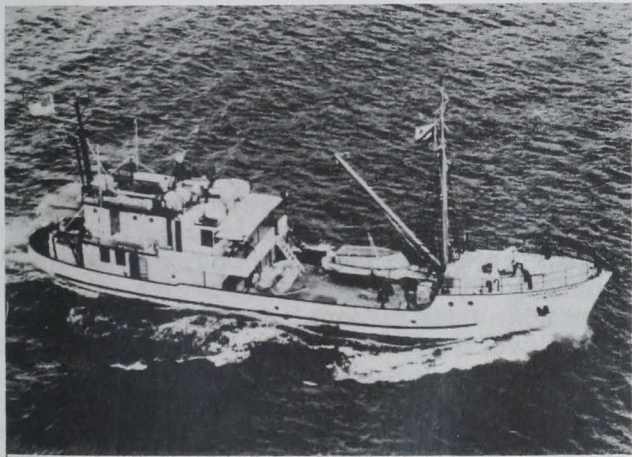


Marlin coming aboard a research vessel of the BCF's Biological Laboratory in Hawaii.

## BUREAU OF COMMERCIAL FISHERIES PROGRAMS

### "Gilbert" Completes 100th Cruise

BCF's Charles H. Gilbert completed her 100th scientific research cruise in the waters of the central Pacific on April 28. The 120-foot vessel, completed in 1952, was designed specially for research in the central Pacific. She carried out her first research mission on the voyage from San Diego to her home port of Honolulu in June 1952. In 100 voyages, she has sailed 325,000 nautical miles, about 13 trips around the globe. Manned by expert fishermen and skippered by Capt. Joe Yoshioka, the Gilbert spends an average of over 200 days a year at sea.



BCF's research vessel Charles H. Gilbert.

In 16 years, Gilbert has made 8 cruises to the Marquesas and Tahiti, 2 to the Mexican coast, 2 to San Francisco, 2 to New Caledonia, 6 to the Line Islands, and 3 to the Leeward Islands. "A whole generation of oceanographers and fishery biologists have received their training in practical research at sea aboard the Charles H. Gilbert," says Richard S. Shomura, Acting Area Director, BCF, Hawaii. He himself served as a technician aboard the ship when he started his career as a scientist. "She has made some real contributions to science. For example, just about everything we know about the behavior of tunas in the sea comes from observations made aboard her."

During Cruise 100, the Gilbert conducted her usual task of catching live tunas to be held at the Laboratory's Kewalo Basin facility for experimental studies in behavior and physiology of fishes; 55 wavyback skipjack and 1 yellowfin tuna were returned live.

### 2 Ride A Sea Sled

Two days were devoted to sea-sled studies. The sea sled is a Stokes basket litter. Scientists at the BCF Exploratory Fishing and Gear Research Base, Seattle, Wash., have fitted it with a tubular frame, windshield, diving planes, and other equipment. It has no power but is towed by the ship. It communicates with the ship by a buzzer system. Two divers ride the sea sled, wearing wet suits, life jackets, and SCUBA equipment. One serves as pilot, the other as photographer. Tested off Waikiki and Waianae recently, the sea sled was towed safely at the surface at 9 knots, and underwater at 2 knots. It went to a depth of 45 feet in the tests. When submerged, the sled was towed as close as 25 feet to the Gilbert's stern in the feasibility tests--and as far away as 150 feet.

Object of the sea-sled studies is to observe and photograph the interaction of baitfish and the tunas, says Robert T. B. Iversen, a scientist at the Honolulu laboratory interested in baitfish studies. In tests off Waianae, the 2-inch-long baitfish nehu were seen swimming as deep as 30 to 40 feet; movies were made of their behavior.

In the Hawaiian aku fishery, the tunas are attracted to the ship by throwing live bait into the water. How the baitfish behave after they hit the water is unknown. By studying their behavior, Laboratory scientists hope to gain clues as to what makes one species of small fish good bait, another poor. The Hawaiian fishery is heavily dependent on the nehu, a slender, short-lived, anchovy seined mostly in Pearl Harbor and Kaneohe Bay. Catching bait takes the aku fleet much time.

During Cruise 100, movies and visual behavioral data were obtained from the sea sled of 2 species of baitfish, nehu and mosquito-fish, after they were chummed into the water. There were no predators present.

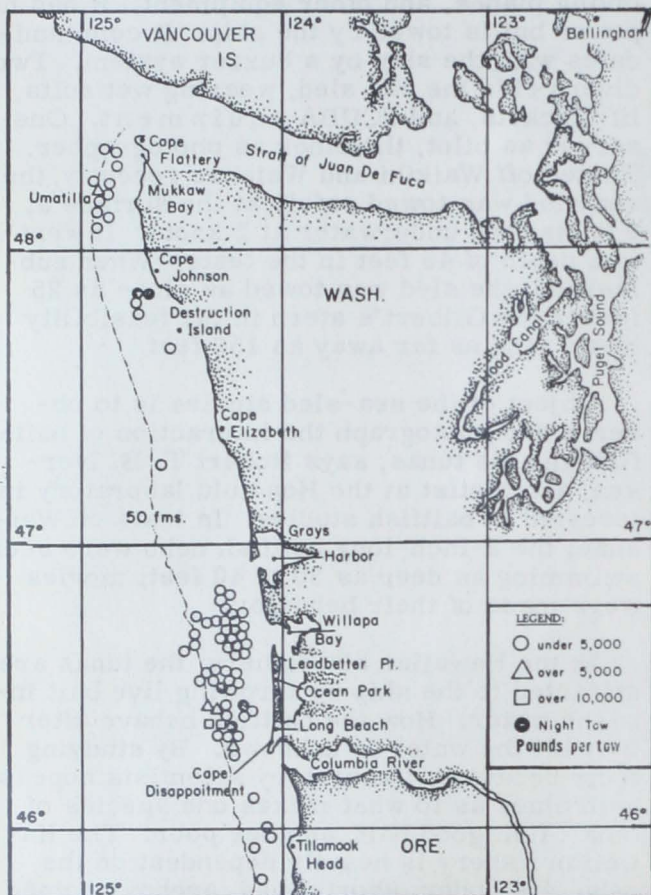


### The "Baron" Finds Anchovy in Many Areas

The BCF-chartered Baron returned to Seattle on April 8 after 127 days of experimental midwater trawling for anchovy along

the Coast of Washington from Cape Flattery to Yaquina Bay, Oregon (Cruise No. 8). Anchovy catches averaged 1,800 pounds per hour of trawling; the largest catch was 12,000 pounds in a single haul.

The primary objective was to test experimental midwater trawl gear and related instrumentation for possible use in capturing anchovy in commercial quantity.



M/V Baron gear research Cruise No. 8.

The experimental anchovy trawls were similar to the "Cobb" pelagic trawl, except  $\frac{3}{4}$ -inch mesh was used throughout. The standard 18 Cobb pelagic trawl was 600 meshes across of 3-inch webbing and was equipped with a  $\frac{1}{2}$ -inch mesh intermediate and full cod-end liner; the  $\frac{2}{3}$ -scale C.P.T. had the same number of meshes but was constructed with 2-inch webbing, resulting in a  $\frac{1}{3}$  reduction in size with a full codend liner of  $\frac{1}{2}$ -inch mesh webbing.

**Vessel and Equipment:** The Baron is a 96-foot seiner-dragger type vessel powered by a 510 hp engine. It operates with a 4-man

crew. Pilot house equipment includes radio telephone, loran, radar, depth sounder and sonar. Deck machinery includes hydraulically operated separate drum trawling winches, trawl net reel, and dual hoists. The hold capacity is about 100 tons.

**Method of Operation:** Onshore-offshore sounding and sonar transects were made between the 20- and 125-fathom depth contours between Cape Flattery and Umatilla, Wash., and from 18 to 65 fathoms south of Umatilla to Yaquina Bay, Oreg. When anchovy schools were located, they were fished to ascertain catch rates with the various nets and catch composition. The geographical size of several anchovy schools was determined by spacing the tows and by sounding transects in the areas of the school. Repetitive tows were made on anchovy schools to determine the cruise objectives.

## RESULTS

Seventy-one drags were made during the cruise--28 with the experimental anchovy trawl No. 1; 22 with the standard 18 Cobb pelagic trawl; 14 with the  $\frac{2}{3}$ -scale C.P.T.; and 7 with the experimental anchovy trawl No. 2. Anchovy was the dominant species taken, followed in order by smelt, rockfish, soles, flounders, dogfish sharks, ling cod, true cod, and only 1 soupfin shark.

**Availability of Anchovy:** They were found in most areas between Cape Flattery, Wash., and Tillamook Rock, Oregon. Juvenile anchovy were found in the North Washington Coast area and adult anchovy were generally found in the southern coastal waters.

**Catch Rates:** The table gives the amount of anchovy caught by each net used, number of drags made with each, total fishing time, and hourly catch rate. The miscellaneous species were mostly juvenile smelt.

**Gear Performance:**

**Trawls--**The light-weight, fine-mesh anchovy trawls required frequent repair caused mostly from dragging the nets on bottom. Anchovy trawl No. 1 was once extensively torn from capturing a large quantity of jellyfish. Other experimental Cobb pelagic trawls performed normally without significant damage from use on the bottom. The Standard 18 Cobb pelagic trawl equipped with an intermediate and full-length codend liner was

Offshore Hourly Catch Rate for Cruise No. 8.

Net	No. of Drags	Time Duration	Anchovy Catch	Anchovy Catch Per Hr.	Total Catch	Catch Per Hr. (all species)
		Hrs.	Lbs.	Lbs.		Lbs.
Anchovy No. 1	28	20	36,286	1,814	47,488	2,374
Anchovy No. 2	7	7 $\frac{1}{3}$	7,090	955	11,225	1,530
600-mesh C.P.T.	22	19 $\frac{1}{6}$	33,285	1,722	40,836	2,130
1/2-scale C.P.T.	14	11 $\frac{5}{6}$	30,310	2,562	60,260	5,091

difficult to control in strong tides. The  $\frac{2}{3}$ -scale Cobb pelagic trawl could be controlled more easily and towed at faster speed than the other trawls.

Load cell indicator--To determine the amount of fish being captured by the trawl, a load cell was mounted on a ribline ahead of the codend. A combination of electrical-mechanical towing cables and electrical ribline was used. The data were displayed on a strip chart recorder mounted in the pilot house. Although some failures occurred with mechanical connectors, the system performed satisfactorily for several tows. Preliminary analysis of the data indicates that load increases as fish are captured.

Observations of Fish Behavior: During daylight hours, anchovy were found on or near the bottom. Anchovy rose toward the surface and were taken from 5 to 16 fathoms below the surface during hours of darkness.

### CONCLUSIONS

1. Large schools of juvenile anchovy were found off the coast of Washington.
2. Catch rates of juvenile anchovy were low due to excessive escapement through  $\frac{3}{4}$ -inch mesh of anchovy trawls and  $\frac{1}{2}$ -inch mesh liners of Cobb pelagic trawls.
3. A winter fishery for anchovy off the coast of Washington would not be feasible with state-of-the-art midwater trawls and present industrial fish prices.



## "Oregon's" Shrimp and Swordfish Catches Are Light

The R/V Oregon returned to St. Simons Island, Ga., on April 28 after a 12-day exploratory fishing cruise off Florida and the northern Bahama Islands (Cruise 117). Primary objectives were to continue seasonal night-time longline coverage for swordfish at pre-selected standard fishing stations, and to continue assessment of offshore stocks of grooved shrimp off Florida's east coast.

Swordfish catches were light--a few small fish were taken. Only scattered brown shrimp were found in Cape Kennedy survey area.

Swordfish: Four 60-basket (600 hooks) longline sets were made between 27° N. and 30° N. Buoy drops on each set varied from 5 to 50 fathoms spaced at 10-basket intervals. Hooks were baited with thread herring (*Opisthonema oglinum*) and mullet (*Mugil* sp.) on alternate baskets.

The longline gear was set at these locations: one set in the axis of the Gulf Stream off Stuart, Florida (390/430 fms.); two sets on the Blake Plateau (Antilles Current) in 650/575 and 465/455 fms.; and one set beyond the 1,000-fm. isobath (2400/2700 fms.).

Only two swordfish were taken: one male (32 lbs.) was taken in the axis of the Gulf Stream on a 30-fm. drop baited with mullet; the second male (38 lbs.) was taken on the Blake Plateau (650/675 fms.) on a 50-fm. drop baited with mullet.

Shrimp: This is the second cruise of a series to determine annual bottom temperatures and brown and pink shrimp (*Penaeus aztecus* and *P. duorarum*) catch-rate relationships between 20 and 40 fms. off New Smyrna Beach, Cape Kennedy, and Melbourne, Florida.



Thirty night-time drags were occupied with a 40-ft. flat trawl on 6-ft. chain doors. Only small amounts of scattered brown and pink shrimp were caught in these offshore areas (20-38 fms.). Catches varied from 0-1½ lbs. of 21/25 count heads-on brown shrimp (*Penaeus aztecus*) and 0-2 lbs. of 21/25 heads-on count pink shrimp (*Penaeus duorarum*) per 1-hour drag.

Rock shrimp (*Sicyonia brevirostris*) were caught in small quantities (less than 1-12 lbs. of 26/30 heads-on count) at all stations in the sampling areas.



## "Kaho" Makes Large Trawl Catches of Alewives in L. Michigan

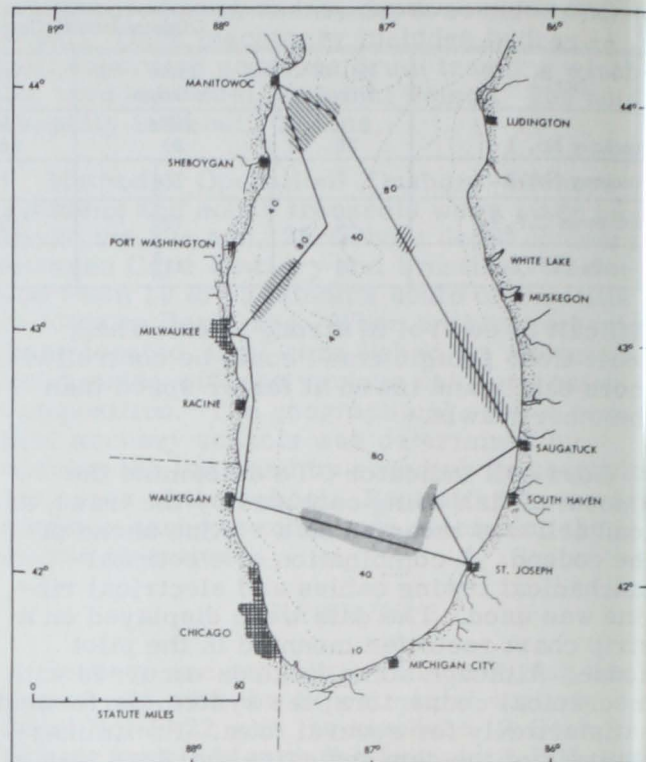
BCF's research vessel Kaho made some good catches of alewives during a 9-day echo-sounding and trawl fishing survey cruise in southern Lake Michigan (Cruise 38, ended April 11).

The cruise's primary purpose was to collect data on the bathymetric distribution of alewives just prior to their annual inshore spawning run--and to collect more information on the timing and strength of the run. A secondary objective was to collect alewives for biological studies.

In previous years, bottom concentrations of alewives have been difficult to locate early in April. This indicated a possibility that schools may break up and leave the bottom. Observations during Cruise 38 support this theory. Heavy bottom concentrations were located only in the southern portion of the lake below 40 fathoms (chart). Elsewhere in the study area, fish were observed to be scattered or in loose schools at midwater. An excessive amount of stormy weather during April may have been responsible for scattering the schools.

Trawling was limited during the cruise. Only 3 exploratory drags were made to confirm the presence or absence of alewives in certain depths or areas:

Location	Date	Depth Fathoms	Minutes Fished	Actual Catch in Pounds			
				Alewife	Chubs	Sculpins	Total
Benton Harbor	April 5	43	20	160	2	-	162
Waukegan	April 5	50	30	750	50	-	800
Port Washington	April 8	60	10	60	50	5	115



Track lines of echo-sounding survey by the R/V Kaho during Exploratory Cruise 38. Shaded area indicates densest bottom concentration of alewives. Hatched areas indicate schools of fish observed at mid-water depths.

The experience of commercial trawlers before, during and after the Kaho cruise helped to compose a fairly clear picture of this year's alewife migration from deep offshore waters to shallow inshore waters in the southern reaches of Lake Michigan. An unusually continuous series of severe storms permitted only intermittent trawling, which served to dramatize the rapid inshore migration. During the last week in March, trawlers made good catches at 54 to 60 fathoms off Saugatuck. Heavy concentrations were found at 40 to 50 fathoms off Benton Harbor the first week in April. On April 12, good catches were made at 6 fathoms off Benton Harbor. On April 15, large trawl catches were taken inside an ore carrier slip in Gary, Indiana.

The change of temperature associated with northerly winds in storms during the third week of April disrupted the alewife migration in the southern end of the lake. For nearly a

week, no alewife concentrations could be found in or near Gary Harbor. Alewife schools appeared again in the area about April 25.

Commercial trawlers on the west shore of Lake Michigan have had fair-to-good alewife fishing from the first week in April off Milwaukee, and from the third week off Two Rivers.



## Pause In A Vessel Loan Program

All funds currently available for payment of fishing vessel construction differential subsidies have now been obligated, and a number of applications have been approved subject to the availability of funds. As a result, BCF is compelled to refuse acceptance and consideration of any more applications for construction differential subsidies until July 1, 1967.



## Gloucester Puts Together Trawl Instrument Package

A "packaged unit" trawl instrumentation system has been assembled by BCF's Gloucester Exploratory Fishing and Gear Research Base and is ready for use on commercial trawlers. It is based on the sonic transducer system that was developed to measure experimental trawls. The new unit records on a 7-inch-wide strip chart the vertical and horizontal opening and bottom contact of the trawl while it operates on the ocean bottom.

The unit will be used for the first time aboard the 83-foot Gloucester trawler "Annette G." on its next trip.



## Takes Part in Sanitation Workshops

During the first half of May, BCF participated with the Food and Drug Administration (FDA) in 3 FDA/BCF workshops on the sanitary processing of breaded shrimp and smoked fish--in Los Angeles, Calif.; Brownsville, Tex.; and New York City. The recent

increase in the inspection of seafood products for bacteria has heightened industry interest in the sanitation aspects of fishery products.

These 3 workshops demonstrated an effective technique to help the industry improve its sanitation. BCF will continue to take a major role in future meetings. FDA is considering a workshop for the Atlanta, Ga., area.



## La Jolla Develops New Fast-Sinking Purse Seine

A working model of a new, fast-sinking, tuna purse seine has been developed and tested successfully by scientists of the BCF Tuna Resources Laboratory, La Jolla, Calif. The net sinks almost 3 times faster than conventional purse seines. This important feature increases the speed of net setting and reduces the chance of escape of an entrapped school of tuna.

The net experiments were carried out by Roger E. Green, BCF, and M'nakhem Ben-Yami, a gear technologist from Israel. They used testing facilities of the U. S. Navy and the San Diego Department of Utilities.



## Monhegan's Lobsters Stay Close to Home

The lobster population tagged by BCF's Boothbay Harbor Biological Laboratory at Maine's Monhegan Island in November 1965 and July 1966 has not strayed from the island area. Of 1,116 lobsters released in November 1965, 905 (81 percent) have been recovered at least once. Of 600 released in July 1966, 40 (7 percent) have been recovered during 9 weeks of fishing at Monhegan. None of the 1966 releases has been recovered outside the Monhegan area.

Long-term tag retention rates remain at about 45 percent for lobsters retaining at least one elbow tag, 90 percent for back tags, and 48 percent for brands. Tag retention rates for individuals having shed are similar. About 55 percent of the January, February, and March returns had shed the previous

year. All recoveries retained the amputated scute and spine marks, thus distinguishing their tag type and time of release.



## Export Promotion Program Gains Overseas Markets

Fishing industry members report that the work of BCF's Office of International Trade Promotion has enabled them to establish overseas markets for fishery products processed from underutilized species. Fish franks made from carp have been sold in Germany. Fish pepperoni, manufactured from shad and rockfish, created much interest in Frankfurt and, when produced commercially, will have a market in Western Europe.

Calico scallops, with roe, were promoted in France, England, and Germany and resulted in an initial sale of 30,000 pounds for export.

BCF looks forward to introducing more new processed products this fall, including a breakfast sausage made from shad and other underutilized species.



## Take Fish on Your Picnic--Or Into Your Backyard

On those warm days when the family chef moves outdoors--into the backyard or to a picnic area--she and her family will be rewarded if she cooks fish. There are endless delicious possibilities, suggests a new BCF promotion program, that will reach its peak in the summer. Industry is being encouraged to participate fully.

The program is designed to make the public more aware of fish--and to reduce industry's heavy inventories. (However, BCF will continue to be friendly to the Tom Sawyers who cook non-store-bought fish.)

BCF information leaflets and photographs are being readied for distribution to the food editors of major newspapers throughout the U. S. Also, special promotion pieces are being prepared for retail outlets encouraging

their advertising and merchandising support. Some industry members already have agreed to emphasize "Outdoor Fish Cookery" during this period.



## La Jolla Issues 1967 Temperate Tuna Forecast

BCF's Tuna Resources Laboratory at La Jolla, Calif., has issued its seventh consecutive annual prediction for the seasonal summer albacore and bluefin tuna fisheries off the Pacific Coast.

For albacore tuna, the Tuna Forecasting Program staff's "best guess" region is based solely this year on its knowledge of the April-July changes in thermal conditions off Southern California-Baja California (Figure 1). Coastal upwelling appears to have intensified in the region from Point Conception to Punta Banda in April; if these conditions prevail through May and into June, sea temperatures offshore should be as much as 2° F. colder than July 1966.

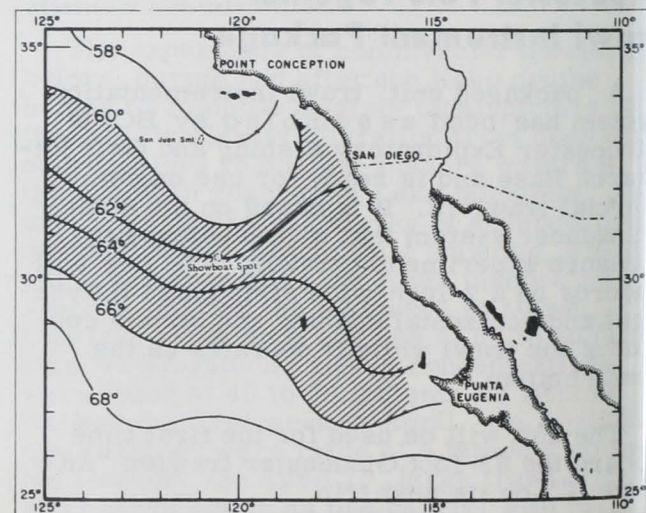


Fig. 1 - Forecast sea surface temperature field for July 1-15, 1967. Waters within the shaded zone are expected to yield most of the albacore tuna to be taken during this period.

The open ocean in the region encompassing the general migratory route of albacore (east of longitude 140° W.) appears to be warming slightly less than average. This indicates that the shoreward migrants probably will be later than last season and appear in the first or second week of July. Waters off Cape Mendocino and Cape Blanco are warming less

apidly than last year. If this trend continues unabated, it suggests that the Oregon fishery probably will commence in the third or fourth week of July, about 3 weeks later than 1966.

July landings in Southern California probably will be below the 1945-66 average of 582,366 pounds (3,791 tons). Total season landings from Southern California-Baja California should improve substantially from 1966 (the poorest since 1947), reflecting a southward trend in distribution of fish this year. Oregon production probably will fall off from last year's record, reflecting a return to cooler, more normal oceanographic conditions. Fragmentary data on year-class representation suggests that fish abundance may be average for all size groups entering the fishery; thus, total U. S. West Coast landings are expected to be near the 1944-65 average of 42,000,000 pounds (21,000 tons).

### Bluefin Tuna

In previous years, the staff restricted its forecasts for bluefin tuna solely to the Southern California offshore region. This year, however, it is attempting to provide the same kind of statements as for albacore.

The high-seas purse seine fleet already has begun to assemble in the Cape San Lucas-Cape San Lazaro, Baja California offshore region. At present, the boats are reported to be working in warm water on yellowfin and skipjack, but unconfirmed rumors report bluefin schools appearing in the 65°-67° F. water off Point Tosco (see Figure 2). For the past 4 years, oceanographic conditions in this region have created a zone of 65°-67° F. water extending from the northwest, approaching the coast between Cape San Lazaro and Cape San Lucas. This region is expected to produce bluefin again this season, and the first commercial action should be well underway by Memorial Day, winds and seas permitting. Coastal upwelling has been accelerated substantially during the last 4-6 weeks in this area, due largely to stronger northwesterly winds than a year earlier.

Bluefin tag return data indicate that the open ocean off Baja California from 50-300 miles out appears to embrace the northward migratory route as the summer season advances. Once the season commences off Cape San Lazaro-Point Tosco, the La Jolla staff expects again to see the bulk of the 1967 production originating from the region south of

the International Border. Bluefin are expected to appear in the Southern California offshore area by the third week of August; however, production from this area is expected to comprise a relatively small percentage of the total catch.

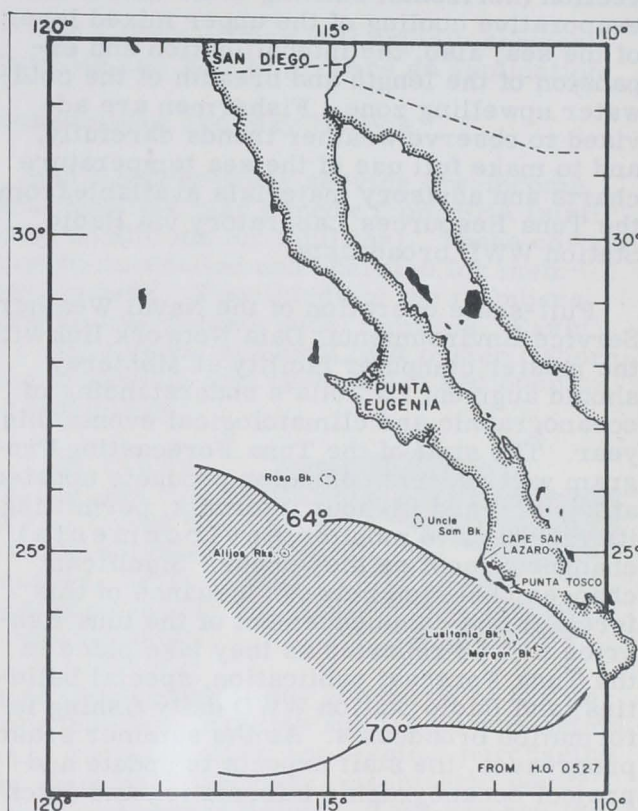


Fig. 2 - Shaded zone delimits the region expected to produce bluefin tuna during the June 1-15, 1967 interval.

Last year, an all-time high of 34,820,406 pounds (17,410 tons) of bluefin tuna were taken by the purse seine fleet. Although this production record may not be duplicated again this year, the staff has reason to expect production to be above the 1961-66 average of 26,060,312 pounds (13,030 tons). This estimate is based on the expected return of last season's strong incoming year-class (which produced a large percentage of the total tonnage landed), and also on a very high amount of fishing effort by a modern, efficient, purse seine fleet this year. Effort could increase further if the yellowfin tuna season is closed in midsummer.

As for climate, the U. S. West Coast should experience a return to more normal weather conditions this year. The mean sea level pressure pattern trends currently being observed suggest that pressure gradients will be intensified this summer, northwesterly

wind flow will be enhanced, and midsummer coastal upwelling will be more evident than last year, especially from Point Conception to Cape Mendocino. These conditions foretell increased turbulence, mixing, cold advection (horizontal shifting of air mass) and evaporative cooling of the upper mixed layer of the sea; also, the intensification and expansion of the length and breadth of the cold-water upwelling zone. Fishermen are advised to observe weather trends carefully, and to make full use of the sea temperature charts and advisory materials available from the Tuna Resources Laboratory via Radio Station WWD broadcasts.

Full-scale operation of the Naval Weather Service Environmental Data Network link with the master computer facility at Monterey should augment La Jolla's understanding of oceanographic and climatological events this year. The staff of the Tuna Forecasting Program will receive computer products updated at 3-, 12-, and 24-hour intervals, permitting its members to monitor environmental changes almost as they occur. Significant changes observed between issuance of this forecast and commencement of the tuna fisheries will be reported as they take place in the Tuna Forecast publication, special bulletins, and Radio Station WWD daily fishing information broadcasts. As the summer season progresses, the staff expects to update and project oceanographic information and catch reports so fishermen at sea can make maximum use of available data.



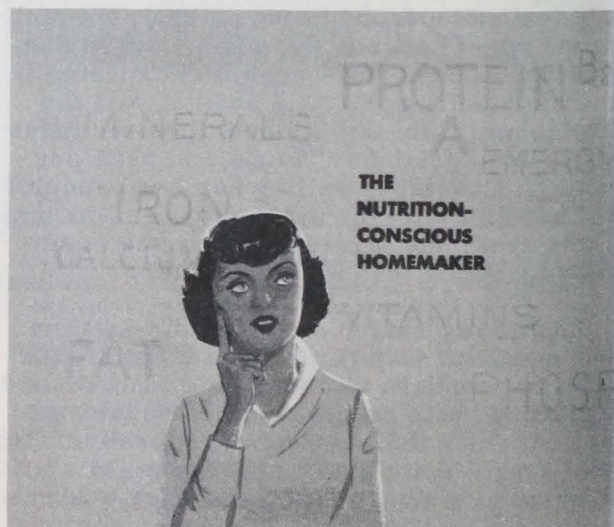
## "Geronimo" Sails Entire Gulf

The R/V Geronimo returned to Galveston, Texas, on March 31 after a 42-day cruise in the Gulf of Mexico. The ship sailed 6,032 nautical miles and occupied 115 oceanographic stations, none more than 40 miles apart. A number of stations included deep hauls for water at depths exceeding 3,000 meters.

This is only the second time in the history of the Gulf of Mexico that a vessel has covered it during one cruise. The first was the old "R/V Hidalgo" of Texas A&M University in February-March 1962.



The Geronimo cruise provides an excellent opportunity to begin determinations of the variability of the Gulf waters. It was never possible before.



## FEDERAL ACTIONS

### Rural Loan Program Includes Fisheries

The Economic Opportunity Act of 1964 authorizes the Farmers Home Administration (FHA), U. S. Department of Agriculture, to make loans to low-income farm and non-farm rural families who need small amounts to improve their earnings. These must be families living in the country, or in small towns of not over 5,500 population, with limited resources and incomes too low to cover basic needs; unable to get a loan from other sources at reasonable terms and rates; and, in nonfarm cases, furnish evidence that the service or product is not being adequately supplied by others in the community.

The loan to any one family may not exceed \$3,500--and is limited to need of family and reasonable ability to repay. Schedule of repayment is based on use made of loan and ability to repay. The loans can extend up to 15 years under certain conditions. They are usually secured by a promissory note and a loan agreement. The interest rate is 4 percent a year on unpaid balance.

Fishermen on Florida's west coast have obtained loans for small boats (20 foot) and aboard motors, nets, supplies, and many things connected with increasing their income from fishing. Loans will be accompanied by management assistance to help borrowers make a profitable use of their resources--including assistance in planning

farm or nonfarm enterprise, budgeting, and solving other management problems.

FHA county offices will explain services available and way to prepare an application.

#### Cooperatives Too May Borrow

Small cooperatives serving low-income rural families may borrow from FHA (similar to conditions for families). These co-ops must be controlled and operated for members' benefit. Two-thirds of the members must be low-income rural families. Early in 1966, a group of East Coast oyster fishermen obtained a loan to organize and operate a cooperative.

Loan funds may be used by a rural co-op to provide services, supplies, or facilities not otherwise available--and which will raise income and living standards of low-income families. Eligible applicants may obtain loans for production, processing, purchasing and marketing facilities, machinery, equipment, land, and buildings. They can pay the costs of organizing a co-op and such related cost as legal, technical management, and other professional services that cannot be provided from other sources. The loans cannot exceed 30 years; interest rate is  $4\frac{1}{8}$  percent. Loans are usually secured by a lien on co-op's real and personal property, including present and future inventories and assignment of co-op income.

FHA also will help community leaders and groups organize co-ops by determining feasibility, economic soundness, and cost. Organization financing and management advisory services are provided on a continuous basis to assure efficient operation and successful management of the borrower co-op.

