Unloading the catch. (R. K. Brigham)

THE FISHERY PRODUCTS SITUATION

Donald R. Whitaker
Current Economic Analysis Division, NMFS

Except for a few species, such as sea scallops and king crab, fish and shellfish supplies were generally adequate for trade needs in the first 9 months of 1970. Liberal supplies of some finfish species were available.

Consumption of fishery products will increase again this year on both a total and per-capita basis. Prices have averaged higher than a year ago at all levels. This indicates a strong demand for fishery products in general. Higher prices have attracted considerable imports and, for the rest of 1970, supplies of many frozen products will be heavier than a year ago.

New England Food Fish

Catches of major New England food fish (flounders, cod, haddock, and ocean perch) are running about 10% below last year. This means consumption of fresh fillets of these species is down by a similar percentage. Prices of fresh fillets are up considerably this year and are expected to remain above year-earlier levels through the winter. Supplies of fresh fillets will be seasonally low through the winter.

Frozen Fish Fillets

Supplies of frozen fish fillets have been heavy all year, and consumption of major New England species has increased sharply. First-quarter consumption advanced 17% over a year earlier; second-quarter consumption was up 11%. Leading the increase were frozen cod fillets. Demand for frozen fillets shows little sign of easing, despite mostly firm or rising prices. Wholesale prices of frozen ocean-perch fillets have been averaging 25 to 30% higher than a year ago. Haddock fillets have been 4 to 6% above 1969. Wholesale prices of frozen flounder fillets have weakened in recent months because of abundant supplies.

Inventories of frozen fillets at the start of fourth-quarter 1970 were a fourth higher than last year because of much higher stocks of flounder and ocean perch. Stocks of cod fillets were down considerably from last year. Prices of frozen fillets rise seasonally in the winter. Heavy stocks may offset some of the seasonal increase; however, domestic catches of haddock will be small, so some substitution of other frozen fillets for haddock is expected.

Fish Sticks & Portions

Production of the popular fish sticks and portions was 10% above a year earlier in the first half of 1970. Consumption of fish sticks and portions was about 8% above the first half of 1969. Consumption was up despite higher prices, especially for cod sticks and portions.

Inventories of sticks and portions have been consistently higher than last year because consumption has been running at less than production. At the start of fourth-quarter 1970, inventories were a fifth higher than a year ago. Although supplies of sticks and portions are expected to be ample in the coming months, prices likely will continue higher than a year ago. This is mainly because prices of the raw material for sticks and portions have been rising this year.

Canned Tuna & Salmon

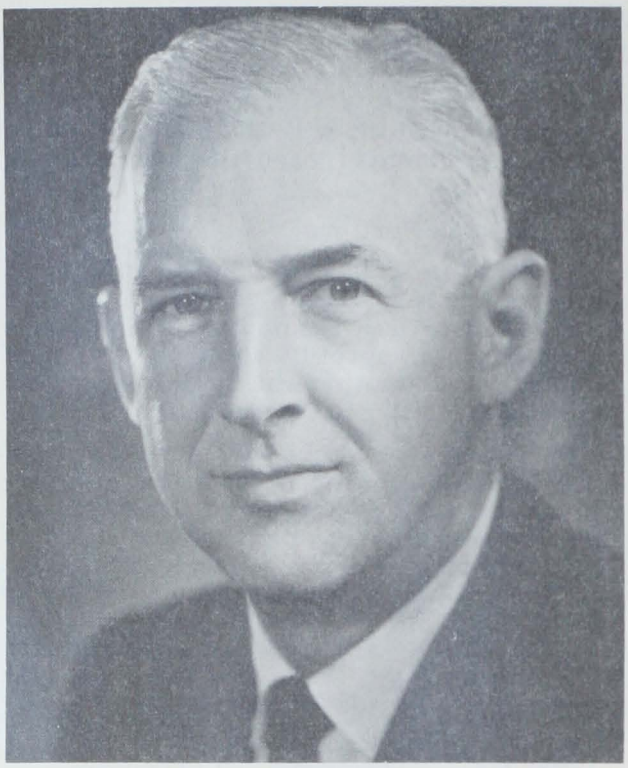
Supplies of canned tuna are running a little heavier than a year ago. Domestic production of canned tuna in oil has been higher, while imports of canned tuna in brine are running less than last year. Retail prices of canned tuna are averaging 11% above last year. Higher prices are the result of rising costs of raw tuna and of strong consumer demand.

Supplies of canned salmon will be greater during this winter than last year. Canned salmon appeared on the October Plentiful Foods list of U.S. Department of Agriculture. Prices of canned salmon are running below a year earlier.

Shrimp & Oysters

Shrimp supplies have been relatively heavy all year and consumption has increased. Shrimp will be abundant for the rest of 1970, and wholesale prices likely will average lower than a year ago. Oysters are also expected to be a little more plentiful than during last winter. Supplies of most other shellfish are lighter than last year, and firm-to-strengthening prices are in prospect for the fourth quarter.

JOHN GOTTSCHALK JOINS NMFS



John S. Gottschalk

John S. Gottschalk has been named assistant to Philip M. Roedel, Director of the National Marine Fisheries Service (NMFS). Mr. Gottschalk was Director of Interior Department's Bureau of Sport Fisheries and Wildlife for the past 6 years; from 1959 to 1964, he directed that Bureau's regional office in Boston, Mass. He joined the U.S. Fish and Wildlife Service in 1945. He worked on river basin studies, Federal aid to States, and was chief of the Division of Fisheries.

His Duties

Mr. Gottschalk will advise Director Roedel on problems of sport fisheries. When the National Oceanic and Atmospheric Administration (NOAA) was established on Oct. 3, 1970, the research programs on marine sport fish formerly conducted by Interior Department were transferred to NMFS. Included were laboratories at Sandy Hook, N.J.; Narragansett, R.I.; Tiburon, Calif.; Panama City, Fla.; and Aransas Pass, Tex.

Mr. Gottschalk also will be liaison with recreational fishing groups in the United States. He will handle special studies: for example, unnecessary disputes between fishing groups.

Rich Experience

Mr. Gottschalk was born in Berne, Ind. He received an AB degree from Earlham College in 1934, and a Master's degree in fisheries biology from Indiana University in 1943. He served as Superintendent of Fisheries, Indiana Department of Conservation, from January 1938 to September 1941.

He is a past vice president of the Wildlife Society. In 1955, he received an American Motors Conservation Award, a national citation for outstanding service in conservation. He is also a past president of the American Fisheries Society.

Director Roedel said: "We are delighted to have a man of Mr. Gottschalk's knowledge, experience, and ability. He is nationally known as a conservationist and fishery scientist. We feel he is the ideal man to head up our marine sport fish program."

FEWER MID-ATLANTIC COAST FISH AND SHELLFISH FORECAST

The abundance of most fish and shellfish that support the Middle Atlantic Coast fisheries will decline in 1971, according to the Virginia Institute of Marine Science (VIMS) at Gloucester Point.

Striped-bass abundance is expected to decline somewhat but fish will be of good size. This species is cyclic: good broods are produced at about 6-year intervals. The hatch of young in 1970 appears to have been good. These fish will not enter the fishery in 1971, but they promise a good year for pan-size stripers in 1972.

Some Decline Inevitable

After the near-record year for spot in 1970, some decline in 1971 seems inevitable, VIMS states. The fish that supported the 1970 fishery were mostly 2-year-olds; a few will still be around in 1971 as 10-inch fish, but small fish will be scarcer than usual. "The result will be only mediocre spot fishing in 1971," notes VIMS.

Croaker and grey sea trout probably will continue to increase at 1970 rate, but the numbers will be far below their peak in the 1940s.

River Herring & Shad

The pound-netters begin their season in early spring, when the river herring and shad come into Chesapeake Bay and swim up rivers to spawn. In 1969, and again in 1970, the foreign trawlers, mostly Soviet, cut deeply into supply of river herring, which are backbone of pound-net fishery. VIMS points out that the success or failure of 1971 season probably will depend largely on extent foreign fishermen harvest this resource.

Shellfish Decline

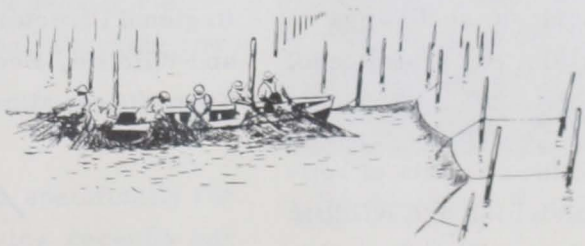
Shellfish abundance also is expected to decline, except for surf clam, expected to increase sharply.

Catches of hard clams will be at about 1969 level because production has declined only slightly since 1963. Production of soft clams has declined sharply since 1965; no production is expected in 1970.

Blue Crabs

The VIMS prediction for blue crabs was for a smaller-than-average year-class available from September 1970 through August 1971. Small crabs hatched in 1970 were present in Virginia waters in late October, however. They are so numerous that scientists are predicting larger-than-average supplies for the 12 months beginning September 1971.

Oyster abundance has trended downward since 1960. Levels in 1970 were expected to be about equal to or slightly below 1969.



SUSQUEHANNA RIVER SHAD WILL BE AIDED BY NEW AGREEMENT

The State-Federal Advisory Committee for Susquehanna River Shad Studies and 5 power companies operating dams on the lower river have agreed to do more to restore American shad to the river above the dams.

The Susquehanna is one of the great rivers of the Atlantic seaboard. It drains a large part of New York State, about half of Pennsylvania, then passes through a small piece of Maryland before emptying into Chesapeake Bay. Before the dams were built, migratory fishes in abundance came up from the sea where they had spent part of their lives. Construction of dams 40 years ago severed the link between river and sea.

Fish Collection Facility

Key feature of the agreement is development and construction of a $500,000 fish-collection facility at Conowingo Dam in Maryland, near river's mouth, by Philadelphia Electric Power Co. and Susquehanna Power Co. It is expected to operate by May 1971, in time for next season of shad run.

50 Million Fertilized Eggs

Pennsylvania Power & Light Co., Safe Harbor Water Power Corp., and Metropolitan Edison Co. will spend an estimated $250,000 over 5 years to acquire and plant at least 50 million fertilized American shad eggs in Susquehanna or tributaries above Conowingo.

U.S. & States in Committee

The advisory committee consists of representatives of Maryland Fish and Wildlife Administration, Pennsylvania Fish Commission, New York Department of Environmental Conservation, and the Interior Department. The committee will monitor results of program to determine if more action, including construction of fishways, is needed.

Federal Power Commission

The agreement is subject to a decision by the Federal Power Commission that the cost to power companies can be classified as operating expenses.

FISHING ON UPPER MISSISSIPPI R. REFUGE PERMITTED BY SPECIAL RULE

A special regulation of the U.S. Department of the Interior's Bureau of Sport Fisheries and Wildlife permits, under certain conditions, commercial fishing--in addition to sport fishing and to taking of frogs, turtles, crayfish, and clams--in all waters of the Upper Mississippi River Wildlife and Fish Refuge during the open season in 1971.

This special regulation will be effective during Jan. 1-Dec. 31, 1971. The Refuge includes parts of Illinois, Iowa, Minnesota, and Wisconsin.

Maps Available

Maps delineating the 125,000-acre Refuge water areas are available at refuge headquarters, Winona, Minn. 55987; also, from Regional Director, Bureau of Sport Fisheries and Wildlife, Federal Bldg., Fort Snelling, Twin Cities, Minn. 55111.

VAST CALICO SCALLOP BEDS ENCOURAGE NEW FISHERY

Scientists have located extensive calico scallop stocks off North Carolina, Florida's east coast, and eastern Gulf of Mexico. Also, they have found small concentrations off South Carolina and Georgia. There are 1,200 square miles of scallop beds just off north Florida. The Florida area appears potentially best.

Calico scallops are so called because of their mottled shells. They are closely related to the bay scallop.

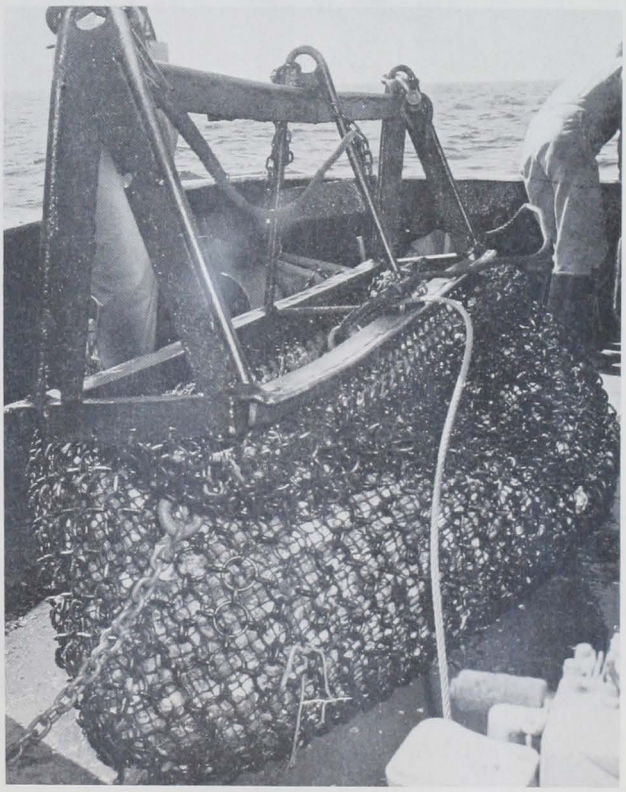
Tom Costello, chief of scallop investigations, NMFS Tropical Atlantic Biological Laboratory, Miami, Florida, says: "Although Florida landings of calico scallops in 1969 were only 160,000 pounds of shucked meats, the landings may be 15 to 20 million pounds by 1975." Most of the catch is now sold directly to restaurants. As landings increase, there will be limited distribution to food markets.

"We've known about these beds since 1960," adds Costello, "but we didn't realize how extensive they were until later when our scientists began making surveys of the beds. Our cruise reports helped stimulate the interest of commercial fishermen but, until recently, two factors prevented rapid development of these resources: One was the changes in location and productivity of the beds from year to year; the other was the lack of mechanical equipment for sorting, shucking and eviscerating the scallops."

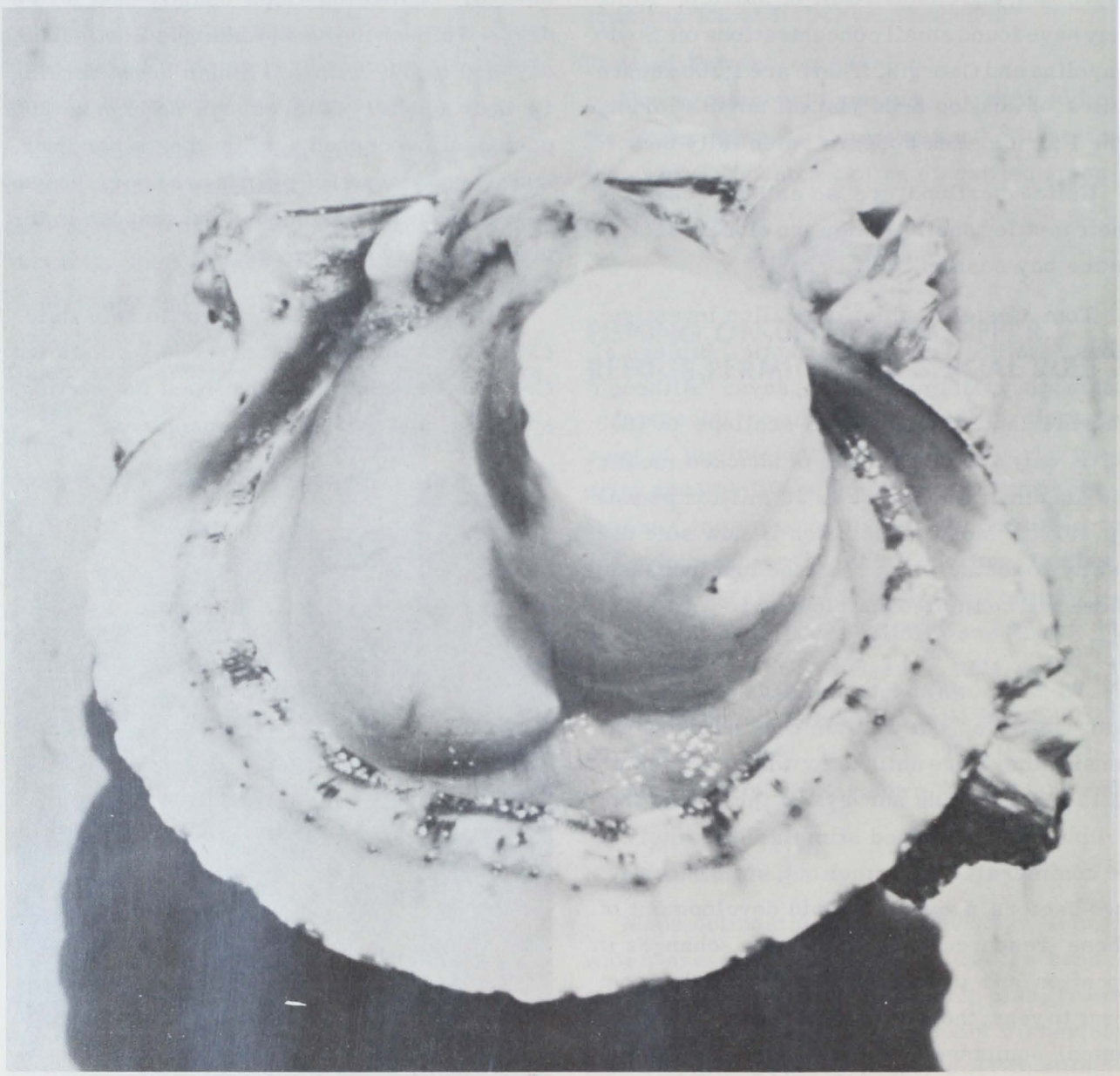
The Fishery

Four vessels designed specifically for scallop fishing and processing recently entered the fishery. They have the necessary equipment to process the catch as it is brought aboard. Scalloping trips usually last 5 to 8 days. While on the beds, fishing is continuous, day and night, with a 14-man crew working 12-hour shifts. Catches run as high as 200 pounds of processed scallop meats per hour, and average about 100 pounds per hour. These vessels have been so successful that the manufacturer may build more.

"Although we've done a lot to help in locating and assessing the beds," points out Costello, "industry has developed the sorting, shucking, and eviscerating machines."



A 40-bushel catch of calico scallops made with an 8' tumbler dredge aboard NMFS research vessel 'Oregon'.
(J. B. Rivers)



Calico scallop on $\frac{1}{2}$ shell. (L. May)

Calico scallops are small. Hand shucking has been economically feasible only where special labor and supply conditions have existed. Although the present machines do the job, industry continues to improve and modify them.

Locating Calico Scallops

Locating commercial concentrations has been one factor limiting industry growth. To help overcome this obstacle, NMFS scientists have developed new techniques to locate and assess the beds. One is RUFAS. (See page 8.) Using RUFAS, beds can be viewed, filmed, and charted quickly and economically.

This monitoring is required to assess annual concentrations of calico scallops soon after they spawn, usually in May and June. As the scientists locate beds, they prepare charts for industry showing commercial concentrations.

RUFAS fishery data are combined with catch information from commercial vessels. These data are used to determine the annual potential of major scallop beds so future predictions will be more precise and quickly available.

Age, Growth, Location Changes

To learn more about the age and growth rates of calico scallops, scientists have marked and released them for later recovery. This information enables researchers to predict when newly discovered beds of young scallops will reach harvestable size.

The scientists also are trying to determine why scallop beds shift from year to year. They have observed that most beds are in a north-south direction along the flow lines of coastal or Gulf currents. Typical beds are 100 to 300 feet wide, and up to 1,500 feet long. The average density is 4 scallops per square foot; sometimes, there are 8 per square foot.

The scientists believe that the location of new beds probably depends on currents and other environmental conditions that influence the free-swimming scallop larvae before they settle and grow. One hypothesis is that the calico scallop resource is an annual crop that will support an extensive harvest each year with only minimum brood stock required to reseed the grounds.

COUNTING SCALLOPS IN 150 FEET OF WATER

Counting scallops on the seabed is no problem to scientists of NMFS' Exploratory Fishing and Gear Research Base in Pascagoula, Miss. They use RUFAS (Remote Underwater Fishery Assessment System), which "flies" just over the scallop beds. Base engineers and the electronics industry developed it.

RUFAS

RUFAS is a towed vehicle with an optical system capable of looking at the seabed, according to engineer Wilber Seidel. It is connected by electrical cable to the vessel, which tows it and also serves as remote control center. The operator, or pilot, can maneuver RUFAS to any position over the seabed from the control center. Electric motors turn maneuvering vanes on the vehicle. Special sensing devices determine its height above seabed and look ahead for uncharted obstructions.

Optical System

The optical system consists of special lights, television, and 35 mm. motion-picture cameras. It is electrically operated from the control center. When RUFAS is looking at the seabed, the TV monitor and video-tape recorder also give scientists a continuous high-quality picture of the terrain. The motion picture camera is turned on when the scientists want to record biological phenomena.

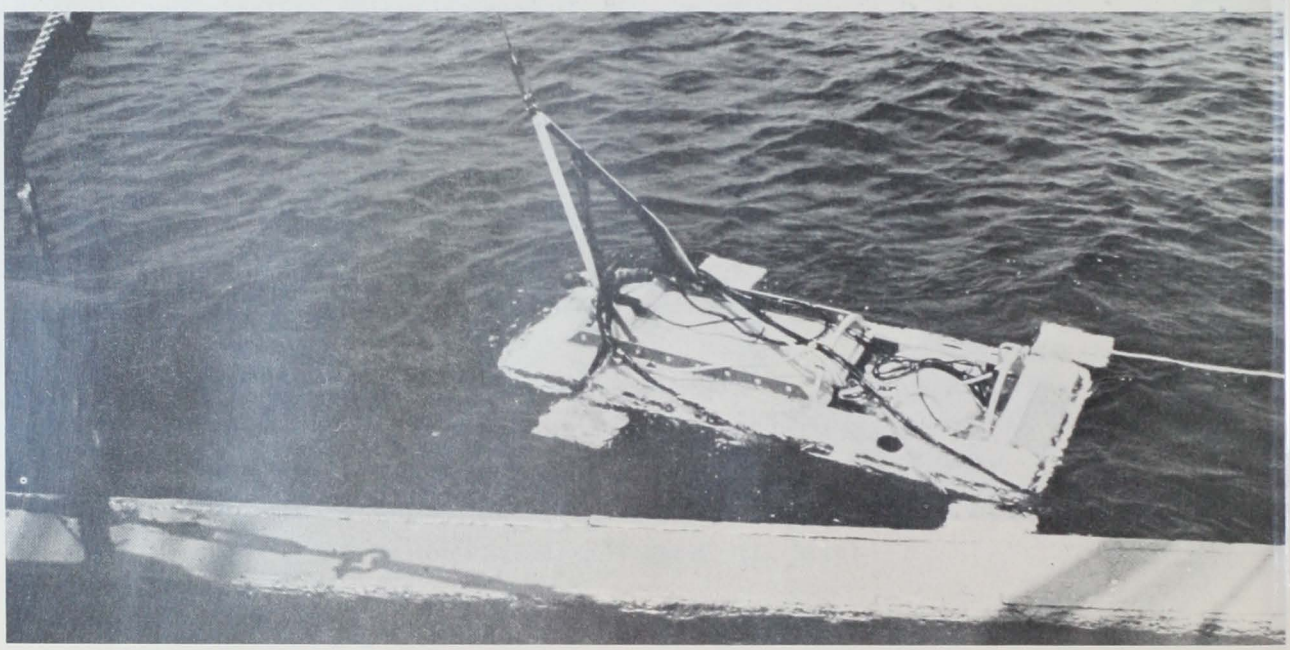
Vast Scallop Beds

The calico scallop beds off the north Florida coast are extensive. NMFS scientists and the fishing industry predict an annual catch of 15-20 million pounds as early as 1975. With wholesale price over $1 per pound, this new fishery would be very valuable.

During a recent RUFAS survey, 120 miles of the scallop beds were viewed, and 4,500 feet of 35 mm. color film were exposed, plus 23 hours of video tape.

RUFAS has provided timely information to commercial fishermen about the location and abundance of calico scallops. It has provided scientists valuable knowledge about growth rates, spawning, and density--all vital to proper management of this developing fishery.

The current RUFAS is not designed for the extreme pressures of deep water, though it has surveyed to 35 fathoms. A more sophisticated model is on the drawing boards. It will have greater depth capability, broader seeing range, and contribute to NMFS' new program to monitor and assess more living marine resources.



RUFAS (remote underwater fisheries assessment system). (Photo: J. B. Rivers)

GULF SCIENTISTS STUDY BENEFITS OF DATA-BUOY NETWORK

A study to determine public and economic benefits from a data buoy network in the Gulf of Mexico is underway within the Gulf Universities Research Corp. (GURC). Scheduled to be completed by April 1971, the study will provide criteria for design and deployment of the network to get the most use out of it. Contract for the study is with the U.S. Coast Guard.

GURC has encouraged initial deployment of the National Data Buoy System in the Gulf as a first priority for scientific and practical reasons, according to Dr. James M. Sharp, GURC president.

He stated: "A better understanding of the climatology and dynamic processes of the waters and air masses in the Gulf of Mexico is an objective of long standing in Gulf coast universities. In addition to the Gulf's being an excellent natural laboratory for oceanographic and meteorological phenomena study, a better means of describing and predicting physical processes in the Gulf can help solve many problems of public and economic interest."

Benefits of Network

Dr. Sharp said improved forecasting of storms and hurricanes would strengthen coastal protection. Improved forecasting of surface conditions and currents for fishing, offshore service, coastal transportation, and pleasure craft would be another benefit.

He emphasized that moisture crossing the Gulf shoreline provides most of the rainfall for the central and eastern U.S. It creates ground fog affecting coastal air traffic.

What Is Needed

To develop climatological understanding--and knowledge of dynamic processes needed for accurate description and prediction of Gulf ocean and atmospheric weather--requires a way to report oceanographic and meteorological measurements from the Gulf.

Dr. Sharp emphasized: "Both air and water traffic in the Gulf are limited so that reports from these sources are meager, especially when weather and sea state conditions are severe.

"Weather satellites and long range radar have improved coastal protection and weather prediction but, as Camille, Celia and unnamed but sudden destructive tropical storms in the Gulf have shown, there is still room for improvement."

Dr. Sharp said this improvement can come only when the Environmental Sciences Services Administration (ESSA) Gulf system and scientists have this information available to develop the understanding of processes that leads to accurate prediction.

Data On Other Oceans Needed

Dr. Sharp stated that there is similar need for data from other oceans. Many Federal and state agencies, and the transportation, fishing, and mineral extraction industries operating in the ocean areas need improved description, as well as prediction, of physical processes.

Coast Guard's Role

The U.S. Coast Guard has conducted studies of "requirements, design and economics of obtaining data from ocean areas by means of instrumented buoys." These studies included comparison of data buoys with other observational means--satellites, aircraft, ships, platforms, etc.

The Coast Guard plans development of prototypes of data buoys for acquiring ocean data. Engineering tests and evaluation buoys are scheduled to be deployed in the Gulf within the next year. Operational buoy network to cover limited ocean areas will be available within a few years.

PACIFIC SAURY: Fishery Studied from Vessel & Plane

I. 'JOHN N. COBB' LOCATES SCHOOLS & EVALUATES HARVESTING SYSTEMS

The John N. Cobb returned to Seattle, Wash., on September 10 after an 18-day cruise in Puget Sound and Washington-Oregon coastal waters to test methods of harvesting Pacific saury (Cololabis saira). The vessel serves the Exploratory Fishing & Gear Research Base of the National Marine Fisheries Service.

The principal cruise objective was to locate concentrations of Pacific saury and to evaluate the commercial potential of three prospective harvesting systems--fish pump, purse seine, and lampara seine--used along with a light-attraction system.

GEAR

Lighting System: The light array consisted of 11 light booms 16 to 30 feet long, each carrying a 2,000-watt bank of incandescent lights. Two booms were 12 feet apart on the stern; the others were at about 15-foot intervals along portside and along starboard-side from bow to after end of house. Two portside booms in the seine-pursing area and the two stern booms in lampara hauling area had a 1,000-watt quartz-iodide light with a red filter. These lights were switched on and off from a low-voltage, remote-control box with a 100-foot cord, usable anywhere on the

Fig. 1 - Saury jumping wildly alongside the Cobb when the white lights are first turned on.

vessel. A 5-kw. searchlight was used to detect surface concentrations of saury and to "draw" them to vessel.

Seining System: The net was $\frac{3}{4}$-inch stretched mesh, 6-thread knotted nylon, 4,500 meshes long by 1,500 meshes deep. The length of corkline was 150 feet, leadline 144 feet, and breastlines 24 feet. One hundred-fathom $\frac{3}{4}$-inch braided towlines were attached to each end of corkline.

There was no chance to test two 150-fathom lampara seines.

Fish Pumping System: The fish-pumping system consisted of a collecting funnel, submersible pump, discharge hose, and fish/water separator. The funnel was canvaslike material supported by 8-foot aluminum frame. It was floated alongside starboard-side. The hydraulic-powered submersible pump was bolted to funnel frame and discharged through a flexible 10-inch hose. The hose passed aft around stern, where it was connected to a steel 10-inch pipe at rail on portside of stern. This pipe discharged into a fish-sorting table with a bed of gradually diverging stainless-steel rods. The water passed through this, fell to the deck and flowed out through scuppers.

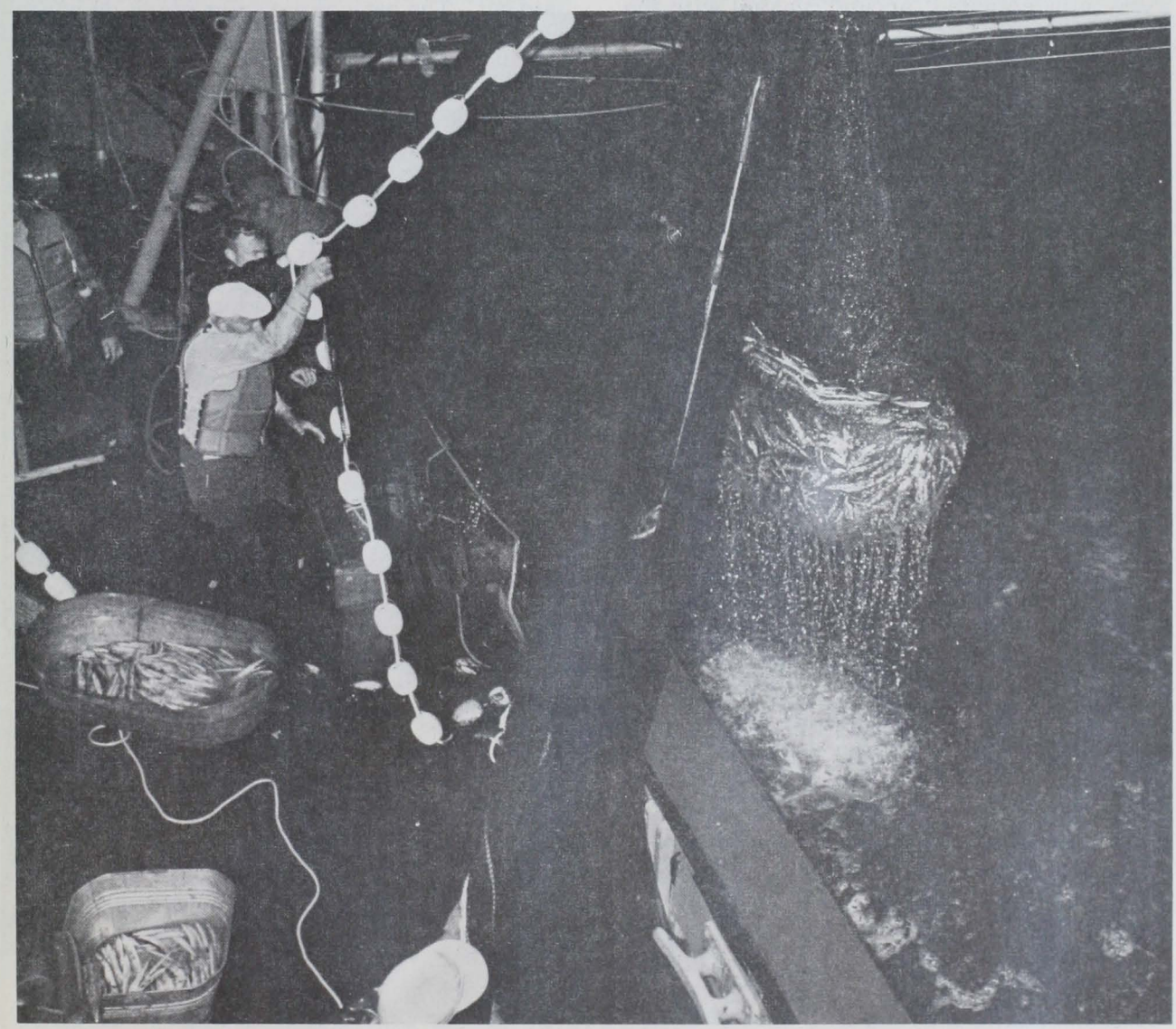


Fig. 2 - 800 lbs. of saury caught in 150-foot seine being strapped aboard Cobb.

METHODS OF OPERATION

During first two cruise days, work was conducted in Puget Sound to develop handling techniques and to make diver measurements on saury seine.

Searching and fishing for saury were conducted off Washington-Oregon during darkness. Search patterns, run in north-south zig-zag fashion, were restricted to waters ranging from 57° to 61.5° F. Saury were detected primarily by scanning spotlight over surface. Several banks of alluring lights were also lighted during scouting. When saury were located, the main engine was stopped. Saury were concentrated around vessel with the banks of alluring lights, and by sweeping spotlight from fish to vessel.

When working the fish-pumping system, fish were concentrated under the bow alluring lights. The pump and funnel were set off the starboardside aft, and the pump was turned on. Then, fish were moved about 60 feet along starboardside to area in which pump was located by turning on and off, in sequence, banks of lights along side of vessel. A 450-watt underwater thalium-iodide light with a red filter was located inside funnel next to pump intake.

The purse-seine-type net was set from Cobb's stern and operated without using a skiff. When a large school was accumulated alongside, the vessel was run in a circle. A buoy was dropped and a 100-fathom towline paid out. The net was set from stern on windward side of circle. The other 100-fathom towline was laid out while returning to

Fig. 3 - Saury caught by Cobb in first offshore set of 150-ft. saury seine.

retrieve the buoy. Then the lines were hauled and the seine dried up and brailed. The corkline was held up and out away from vessel during brailing by 3 cylindrical plastic floats on corkline--and by a line snapped on corkline running out over a block on light boom just ahead of purse davit. All light banks were on while setting and while hauling most towlines. As net neared the vessel, all lights were turned off, except 2 banks near center of net.

RESULTS

Operations in coastal waters were limited to 9 nights; 600 linear nautical miles were surveyed, extending from 44 to 86 miles offshore. Sixty percent of available search time was spent off Washington. Most foul weather was encountered off Oregon; efforts there were limited to northern and central Oregon.

Location, Surface-Water Temperature, and Saury-Catch Data for Stations Occupied During John N. Cobb Cruise No. 70-9

Date	Station	Position		Surface Water Temperature	Time Stations Were Occupied	Estimated Quantity of Saury Observed	Gear Type	Catch	Fork Length cm.	
		Lat. N.	Long. W.		Minutes	Tons		Lbs.	Mean	Range
8/28/70	1	47°12'	126°27'	60°	90	3-5	Pump	1	27	27>
9/01/70	2	45°03'	125°50'	58°	90	7-9	Seine	800	26	19-30
9/02/70	3	44°34'	125°12'	58°	30	2-3	Pump	-	-	-
9/02/70	4	44°33'	125°11'	58°	60	3-5	Seine	400	26	18-30
9/03/70	5	44°30'	125°08'	58°	60	6-8	Seine	300	26	18-30
9/03/70	6	44°34'	125°04'	58°	120*	7-9	Pump	100	27	25-31

*Actual pumping operations were limited to 10 minutes.

Sizable concentrations of saury were located on 3 of 9 operative nights, one night in Washington waters, and two nights in Oregon waters. Results of the 6 fishing attempts (3 pump stations and 3 seine stations) are summarized in table. At stations 1 and 2, saury concentrations were not located until about 0330 P.s.t.; so working time was limited to about 90 minutes before daylight.

Pumping Experiments: The pump was fished at stations 1, 3, and 6. The fish hose was blown off pump at stations 1 and 3, which limited pumping operations to about 2 minutes and 4 to 5 seconds, respectively. In each case, the lengthy repairs required temporary halts. Station 6 was the only time when pump operated without mechanical problems. However, on this occasion, rough weather hampered operation, and the pump funnel could not be oriented at proper distance from vessel. Only a few of the available fish passed into the funnel as they were led along side of vessel. Fish that entered funnel were pumped aboard readily. Lighting techniques used to "run" school along vessel to pumping position were very successful.

Seining Experiments: During first 2 days of work on Puget Sound, the purse seine was rigged and handling techniques developed during 4 test sets. Diver observations during the last 2 sets indicated the net configuration during hauling was satisfactory. However, when set offshore, the net did not always perform as in Puget Sound. About 80% of available fish were encircled by net. Most of the catch was lost around breastline or over corkline at station 2 due to foulups and inadequate rigging. At stations 4 and 5, with a 20- to 25-knot wind blowing, the leadline was so light that the net passed above most fish. Chain was added and tom weights obtained to keep gear down, but lack of fish did not allow gear to be tested again.

The use of lights for seining was successful. As vessel got underway and began paying out towline, the fish initially would stay with boat. Later, they began dropping away until only a few remained with boat by time seine set was two-thirds completed. Most, if not all, of the fish, were regrouped, however, during 10 to 15 minutes required to pull net to vessel's side. As net neared vessel, all fish were relocated to pursing area and successfully held in that position as enclosure was completed.

II. SAURY SCHOOLS SPOTTED FROM AIRCRAFT

Numerous schools of Pacific saury were sighted from a Coast Guard aircraft on September 24. The schools were detected visually at night by their reflected bioluminescence. Identification of the fish as saury was based on a previous overflight, when "sea truth" data were provided by simultaneous catches obtained from the John N. Cobb.

As observed on an earlier flight, the saury schools characteristically were about as large as a house and irregularly shaped. Within the region surveyed from off Cape Flattery, Washington, to the California-Oregon border, the saury were sighted in two areas 30 to 60 miles offshore.

The first area was in an 85-mile band extending from west of Cape Flattery to west of Cape Elizabeth, Washington.

The second area was in an 80-90-mile band between Cape Arago, Oregon, and Crescent City, California. Saury schools were still being sighted off Crescent City when daylight terminated operations.

Where "heavy concentrations" of saury were seen, the schools typically were about 50-100 yards apart, with 25 or more schools within a $1\frac{1}{2}$-mile band of water. Heaviest concentrations were at the survey's northern end (west of Cape Flattery). There, within a 5-mile area, three almost-continuous bands of fish, each about 800 to 1,200 feet long and 600 to 800 feet wide, were observed.

No Japanese saury vessels were sighted. This suggests fleet may be working to the north, off British Columbia.

A.T. Pruter, Seattle Base Director, states: "Aircraft spotting appears to be a very effective way to locate schools of saury and may be necessary if we are to have a U.S. fishery."

Spotting aircraft would aid U.S. fishermen--and be unavailable to foreign fishermen.

For further information contact: A.T. Pruter, Base Director, Exploratory Fishing and Gear Research Base, National Marine Fisheries Service, 2725 Montlake Blvd. East, Seattle, Washington 98102 (Phone: 583-7729).

COMMERCIAL GEODUCK-CLAM FISHERY UNDERWAY IN NORTHWEST

Washington State's newest commercial fishery--for geoduck clams--is underway. Catches of 8,506 pounds were reported by Washington Department of Fisheries, as of Aug. 30, 1970.

Most of the clams are going to restaurants. Some restaurants are featuring a crown steak from the big clam, which they call a "king clam."

ROCKFISH HAVE STRONG HOMING ABILITY

Last year, Richard Carlson and Richard Haight, biologists at the NMFS Auke Bay (Alaska) Biological Laboratory, discovered that yellowtail rockfish, Sebastes flavidus, possess a well-developed homing ability. They tagged and released in Auke Bay 35 fish held in captivity for 3 months at the laboratory. Within days, the fish migrated the 5 miles back to the place where they were captured originally.

SCUBA surveillance of the rockfish population at the home site showed that this shallow-water species descended into deeper water during winter, but returned to the same home site in spring.

Harder Tests for Rockfish

This year, the biologists tested the strength of this homing ability by releasing fish at sites intended to present varying degrees of difficulty: forcing the fish to cross over deep water, placing them in other channels influenced by different water conditions and currents, placing them north and south of their home site, and forcing them to pass through other yellowtail populations.

In each case, the fish returned home, either within days or within a few weeks. So far, the releases have been between 5 and 7 miles distant from the home site. The next step in the experiment will be to see how far these fish will migrate in their effort to return home.

NMFS RESEARCH VESSELS EXPLORE FOR SKIPJACK TUNA

Two research vessels of the U.S. Department of Commerce are exploring an area on the equator, about 2,000 miles south of San Diego, for skipjack tuna.

The EASTROPAC expeditions of 1967 and 1968, sponsored by the National Marine Fisheries Service (NMFS), indicated there is "a likely region for concentrations of skipjack," said Dr. Alan R. Longhurst, Director of the NMFS La Jolla, Calif., laboratory.

The two vessels are the 'David Starr Jordan' operated by the NMFS La Jolla laboratory, the 'Townsend Cromwell' by the NMFS laboratory in Honolulu.

Fig. 1 - David Starr Jordan.

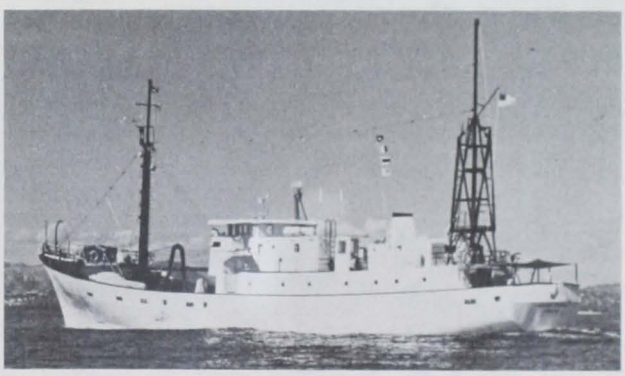


Fig. 2 - Townsend Cromwell.

NMFS is part of the Commerce Department's new National Oceanic and Atmospheric Administration (NOAA).

Cromwell sailed from San Diego Oct. 28 and is slated to return Dec. 1; Jordan left Nov. 2 and will return to San Diego on Dec. 17.

Yellowfin & Skipjack Main Species

Yellowfin and skipjack tunas are the two main species caught by U. S.-flag vessels, many based in San Diego and San Pedro. The tropical yellowfin-tuna fishery is regulated by an annual catch quota. So the Nation's largest high-seas fishing fleet has a serious problem finding alternate tuna resources. Some boats can turn to the late-summer temperate tuna fisheries, some to the eastern tropical Atlantic. But the most important alternative, say fishery biologists, is the stock of oceanic skipjack in the eastern Pacific--unregulated and underfished.

Expedition's Object

The expedition's object, said Dr. Longhurst, is to learn if skipjack tuna are abundant under fishable conditions in this area. Cromwell is making a rapid north-south survey, measuring temperatures, salinity, oxygen, surface chlorophyll, and other oceanographic features. The information is radioed to Jordan. Both ships then proceed to investigate with electronic fish-finding apparatus, mastman, and trolling gear the occurrence of skipjack in likely places.

One scientist watches for birds and porpoises often associated with tuna.

SPACE-AGE TECHNOLOGY USED TO FIND FISH

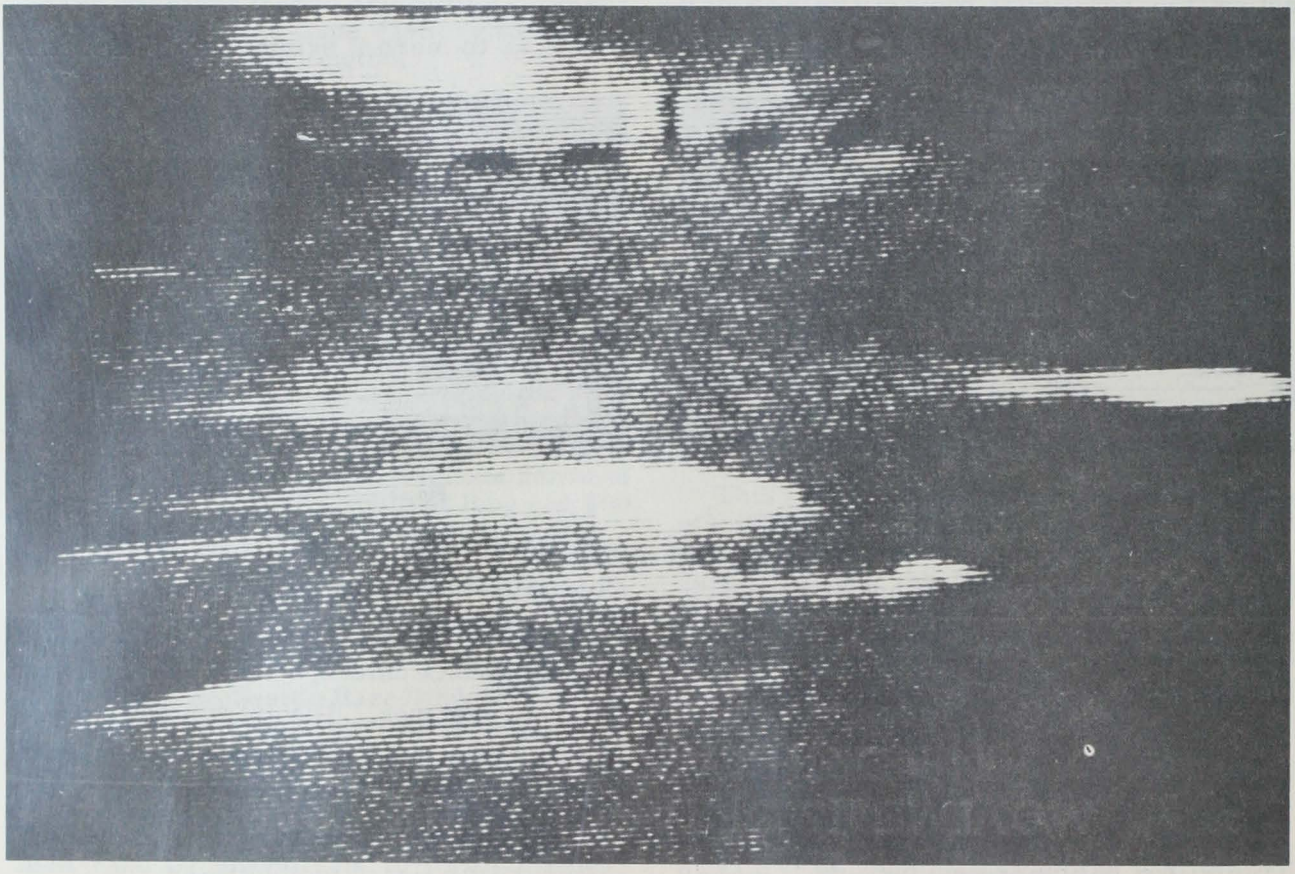
The National Marine Fisheries Service (NMFS) plans to move some personnel to NASA's Mississippi test facility to use its sophisticated technical equipment. This will allow NMFS to expand its Remote Sensor technology program, says William Stevenson, who will be in charge. Historically, locating and assessing fish stocks have taken place from slow-moving ships covering very little ocean surface. In some fisheries, up to 85% of vessel-operating time is spent finding fish. New technology in remote sensing may revolutionize detection, identification, and censusing of open-sea fishery resources.

The Equipment Used

Recent studies at NMFS' Exploratory Fishing and Gear Research Base in Pascagoula, Miss., have shown that airborne sensors can be used to locate and identify surface and near-surface fish schools.

Using aerial photography and special films and cameras, scientists have found that they can locate and identify fish schools. Identification is based on differences in color or spectral reflectance. Observations were made of 15 commercially important species. Measurements were made on single specimens, on groups, and on schools inside impoundments. The results showed different species reflected different color spectrums; these could be used for identification.

With multispectral photographic system and spectroradiometers, NMFS scientists penetrated the water optically, detected the presence of fish schools, and measured the color pattern or spectral reflectance.



Spanish mackerel swimming at night create a "fire" in the water. The "fire" is caused by tiny organisms that glow when disturbed by swimming fish. NMFS scientists use image intensifiers to amplify this light 40,000 times or more. They believe that these devices can be used from aircraft to help fishermen find and identify schools of fish.

Oil Slicks Useful

Preliminary tests indicate that oil slicks from large fish schools, such as menhaden, can be detected and used to locate and identify these schools. Fish-oil slicks also have different temperatures than the surrounding sea surface. So the presence of fish can be detected by monitoring sea-surface temperatures.

Image Intensifiers

The Pascagoula Base has explored another approach to finding and identifying open-sea fish stocks. This uses low-level light sensors, such as image intensifiers, coupled to closed-circuit TV to detect bioluminescence, or "fire" as fishermen call it, associated with schools of fish. Florida fishermen use "fire" to find Spanish mackerel at night. This "fire" results from movement of fish schools, which cause luminescent organisms to glow momentarily. The bodies of rapidly swimming fish are outlined with lights; each leaves a trail of fire as it moves.

The image intensifiers amplify surrounding light 40,000 to 100,000 times. Scientists have been able to observe thread herring schools at night from altitudes of 500 to 5,000 feet.

Preliminary tests suggest that low-level light sensors may be used effectively from high altitudes to locate and possibly identify open-sea fish schools over large areas.

Value to Commercial Fishermen

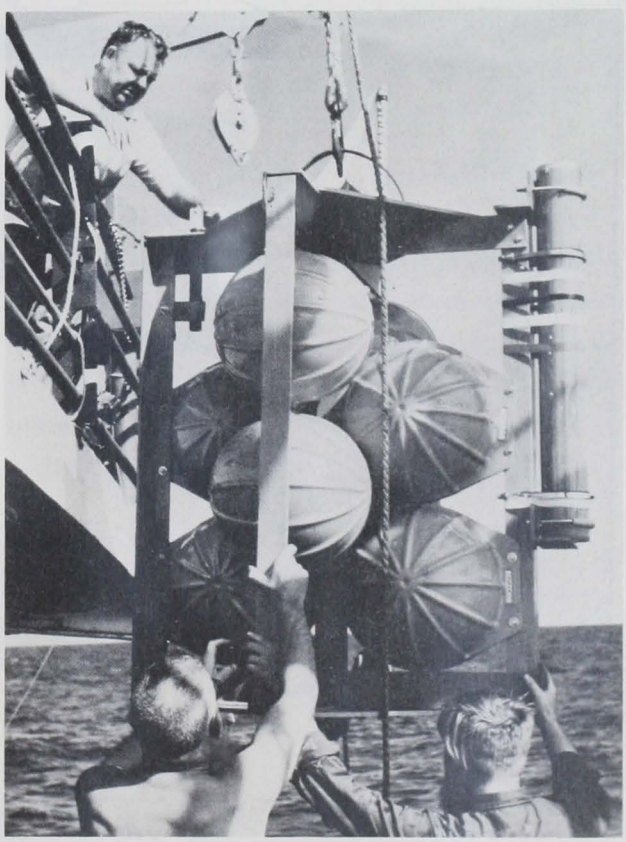
The Pascagoula research may lead to a system that will sharply reduce the time commercial fishermen spend looking for fish. Such information will permit development of underutilized fishery resources, which now cannot be harvested economically because of search time and other factors. Scientists will have tools to tell them quickly whether fishermen can harvest a resource--and how much they can harvest without depleting it.

MODULAR BUOY SYSTEM

Scientists at Woods Hole Oceanographic Institution (Mass.) prepare (below) to lower into the ocean a modular buoy system composed of glass spheres bolted to a fiberglass frame-work. Four such buoys and associated equipment were deployed by Woods Hole to depths of 4,500 meters for 2-month periods in a study of Gulf Stream currents. Each unit stands 67 inches high and provides 340 pounds of buoyancy.

Each mooring included a magnetic tape current meter, an acoustic release holding an 800-pound anchor, and the buoy for returning the package to the surface.

Called Cablemates, the 16-inch glass spheres and cases are manufactured by Corning Glass Works. They are designed for simple attachment to equipment such as the buoy rack. The amount of buoyancy is changed by adding or removing individual Cablemate units.



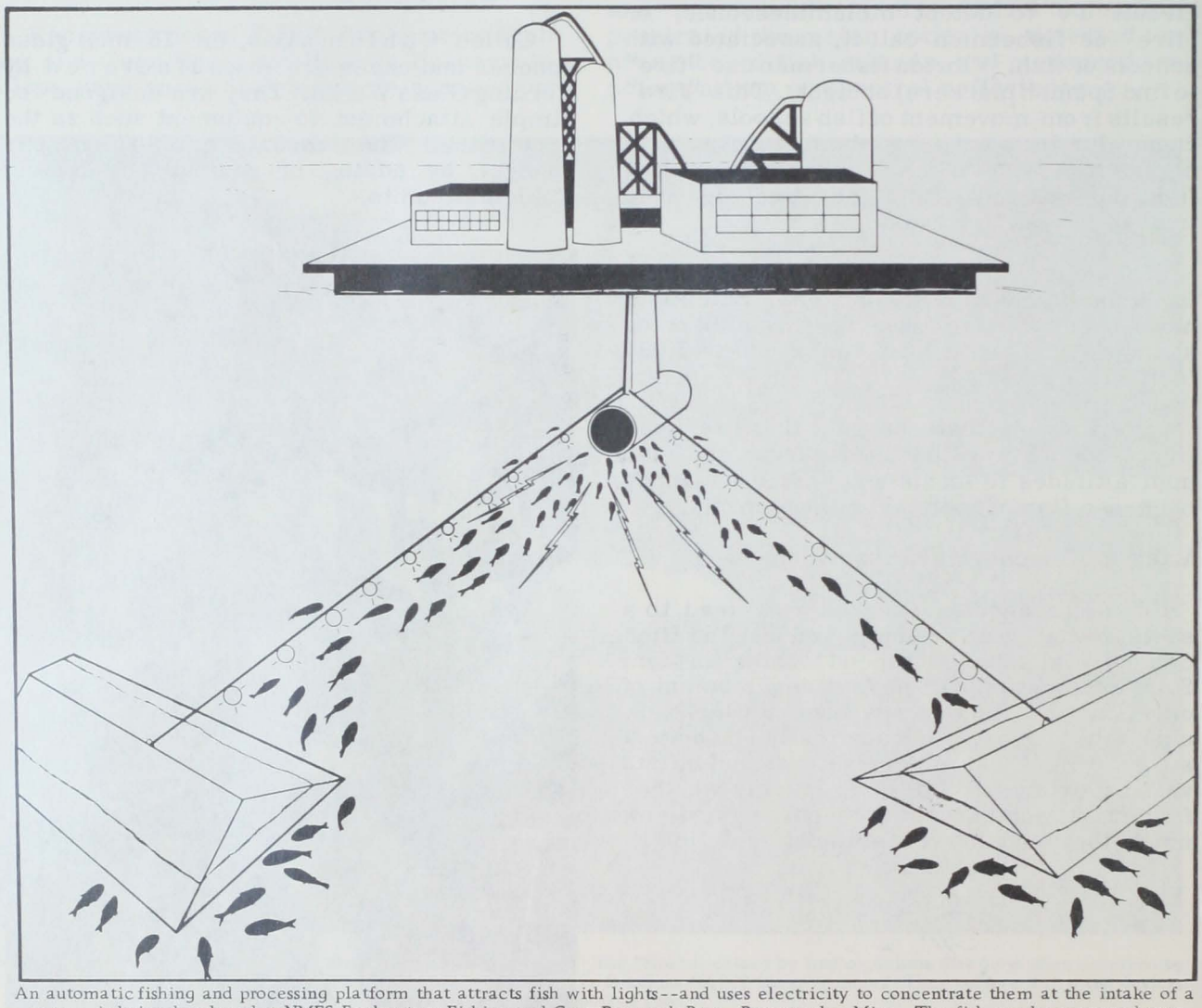
A FISHING PLATFORM MAY SOME DAY REPLACE TODAY'S GEAR

The commercial fisherman is still the hunter of the seas. Despite modern technology, he fishes much the same way his precursors fished--with nets, traps, lines, or similar types of gear.

The NMFS Exploratory Fishing and Gear Research Base in Pascagoula, Miss., is trying to change this ancient approach to fishing. It is developing an automatic fishing platform that may be in operation in 1971. The large latent potential of the Gulf of Mexico is one reason for the development of the platform.

The Fishing Platform

The purpose of the fishing platform is to attract small, loosely schooled fish with submerged rafts and to guide the fish with special lighting to a central point. There they can be concentrated with an electrical field and



An automatic fishing and processing platform that attracts fish with lights--and uses electricity to concentrate them at the intake of a pump--is being developed at NMFS Exploratory Fishing and Gear Research Base, Pascagoula, Miss. The fish can be processed automatically aboard the platform for human or animal food.

pumped aboard a floating platform. The fish could be automatically processed for human and animal food.

The principles behind the platform are not new. SCUBA divers in the northern Gulf of Mexico have observed the small submerged rafts attract and concentrate fish. The rafts, which resemble small tents, attract two types of fish: the "jacks"--amberjack, blue runner, and rainbow runner; the "baitfish" associated more loosely with the structures, and consisting of Spanish sardine, scaled sardine, and round scad. Daily observations showed that over 100,000 baitfish were attracted to each structure. Studies at Pascagoula will determine the best shape and size of the submerged rafts for attracting fish.

Lights to Concentrate Fish

Lights have been used for many years to concentrate fish for commercial fishing. Herrings, anchovies, jacks, squids, and some mackerellike fishes have been concentrated in large quantities around surface and subsurface lights. These fish generally are small and are distributed in small schools along most Gulf and Atlantic coastal areas.

Using underwater mercury vapor lights, the scientists were able to concentrate and catch up to 3 tons per set of these fishes. Commercial purse seining around these lights was economically feasible, but catches were about one-third lower during full-moon periods than during new moon. Studies continue to evaluate the correct type and amount of light for attracting and controlling these fishes.

Early as 1966, submerged lights attached to a fish pump were used to sample open-sea fishes in the Caribbean. Although catch rates sometimes reached 900 to 1,800 fish pumped per minute, the fish were not concentrated sufficiently to make this process commercially feasible. The scientists believe that electricity will concentrate even more fish at the intake.

Electronics Used

Laboratory studies using modern electronics show that specific types of pulsed DC can effectively lead and concentrate fishes. Research will evaluate and determine the best kind and amount of electricity to attract and lead fishes. The results will be used in field tests of the commercial harvesting system utilizing light, electricity, and pumps.

NEW RESEARCH ON FISH-FLESH OIL OXIDATION

Only one method has been completely successful so far in stopping all oxidation of oil in the flesh of fish: keeping all air away by hermetically sealing fish in metal containers. Several series of silver (coho) salmon have been kept frozen in cans for years with no measurable rancidity developing.

In summer 1970, for the first time, pink salmon was frozen in cases to be tested. The oil in pink salmon oxidizes more rapidly than in any other species of fish, but samples examined at the end of August showed no discoloration or rancidity. The fish had been stored frozen for one year.

A New Variable Tried

Now NMFS' Pioneer Research Laboratory in Seattle is trying a new variable in an effort to reduce the cost of processing fish in cans for freezing to a practical level. Samples of sockeye salmon were packed exactly as for canning by being put through a commercial automated salmon-canning line. Then they were withdrawn just before they would have gone to the retort, and were frozen.

This method of packing eliminates hand labor, but it results in two possible disadvantages: Bone is left in the fish. And, because of greater head space in machine-packed fish, there is possibility that small residual amount of air left after vacuum seaming might be sufficient to cause oxidation.

The initial examination of fish packed in this way was favorable. The fish had a pleasing appearance in the can; after thawing and cooking, the color was brighter than that of sockeye from the same batch of fish that had been canned (retorted) in usual way.

PICKLED THREAD HERRING SERVED AS SNACKS

Over last several years, I have been experimenting with new methods of utilizing various fish and shellfish in Puerto Rico which are not presently utilized, or not fully utilized. One of them is thread herring (Opisthonema oglinum). So far, it is used only for fish oil and meal productions in the Atlantic and Gulf coasts, but I found that excellent-quality picked-herring can be made from the thread herring which are over five inches in length. The fish can be chocked and salted or fileted, salted, and pickled exactly the same way as pickling the herrings on the east and west coasts. They can also be salted and smoked. I believe the thread herring in the Pacific Ocean (Opisthonema libertate) which are found in abundance in the Gulf of Panama can also be utilized in the same way.

New Industry Possible

In Puerto Rico, thread herring are caught by beach seines and gill nets as incidental to catch and are not actively sought after. Large schools of them can be sighted throughout the year around the islands, and a large number of them can be captured by $2\frac{1}{2}$-inch mesh gill nets. Thus, it is possible to establish a new industry which processes thread herring for local, states and Caribbean markets.

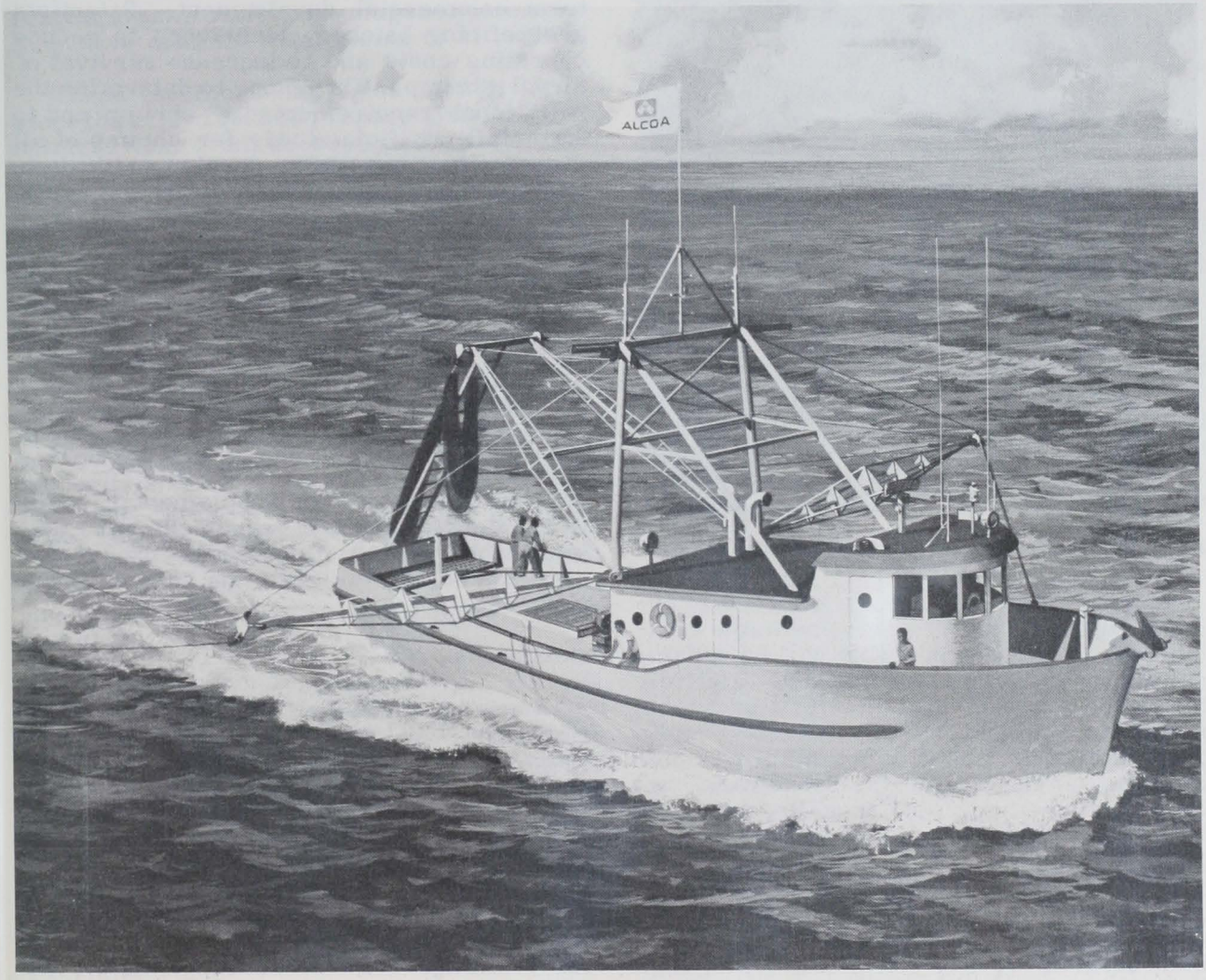
Little Snacks

--Robert Y. Ting
Associate Professor
University of Puerto Rico

NEW ALUMINUM SHRIMP TRAWLER

A new shrimp-trawler design is available from Alcoa. The 76-foot design specifies aluminum for major components, including hull, deckhouse, rigging, and fish hold liner and shrimp stowage system. The beam is $23\frac{1}{2}$ feet and draft 9 feet.

Among aluminum innovations are new welding specifications, improved alloys, and a penboard and stanchion system for storing just-caught shrimp. Drawings and bill of materials are available from Alcoa, 1501 Alcoa Building, Pittsburgh, Pa. 15219.



New aluminum shrimp trawler.

SHRIMP FARMING MAY HELP MEET GROWING CONSUMER DEMAND

Scientists at the NMFS Biological Laboratory in Galveston, Texas, believe that shrimp farming (mariculture) may be the answer to the growing demand for shrimp. At present, Americans eat about one million pounds a day--about one-third world production.

The Galveston scientists collect live female shrimp in spawning condition, spawn them in the laboratory, hatch the eggs, and rear the larvae.

Female shrimp are collected in the Gulf of Mexico and transported to the laboratory. Each female carries 500,000 to 1,000,000 eggs. The eggs hatch in about 12 hours--provided conditions are suitable. The small shrimp, called larvae, are fed small algae (diatoms) and brine shrimp.

After two weeks, the young shrimp are transferred to brackish-water ponds. There they will grow to about 4 inches with natural foods. Growth can be spurred by adding fertilizers or feed to the ponds. However, growth diminishes as shrimp approach size ($3\frac{1}{2}$-$4\frac{1}{2}$ inches) at which they normally leave estuaries and move offshore.

Live Bait Market

Cornelius Mock, in charge of hatchery engineering, believes the first profitable commercial operations probably will be shrimp culture for live bait markets. The relatively high price paid for bait will permit profitable production of small shrimp in ponds despite the unavailability of efficient culture techniques. Under normal weather conditions, two crops could be harvested annually.

The Problems

Several problems have prevented development of shrimp farming for food market, says Mock: (1) the high cost of obtaining young shrimp for stocking (2) no efficient foods are available, and (3) the low price per pound for shrimp of small sizes that can be raised in ponds.

Despite these problems, several private companies have built hatcheries for growing and selling young shrimp. Many companies and universities are researching shrimp culture.

Galveston Research

The Galveston research will aid long-term commercial development. Scientists are refining hatchery techniques to reduce operating costs and to increase survival of larval shrimp. They hope to determine the nutritional requirements of shrimp and to formulate artificial foods for shrimp of all sizes. They must also develop methods to hold shrimp throughout their entire life cycle. Once these methods are developed, selective breeding will begin.

Recently, the researchers freeze-dried the diatoms used to raise larval shrimp. Later, the diatoms were mixed with sea water and fed to larval shrimp. The results were good. This technique may permit the storage of food. It also may make raising young shrimp more flexible and less dependent on the timely success of diatom cultures.

They also have tried supplemental feeding to accelerate growth of larger shrimp. Pelleted rabbit and trout foods and corn meal have been tested; so far, little or no growth has occurred.

Next Steps

Because of recent developments at the Galveston Laboratory, scientists may soon attempt to increase local shrimp stocks by seeding natural populations. Stocking artificially reared shrimp in natural waters may be desirable where production is poor because of adverse environmental conditions. Techniques have been developed to rear large numbers of shrimp from eggs deposited in the laboratory to about $\frac{1}{2}$-inch long, a suitable size for stocking. With present facilities, about one million shrimp can be produced each year. Expansion of hatchery facilities will permit production of more small shrimp. It will enable scientists to determine feasibility of supplementing wild populations by seeding.

GETTING MORE MEAT FROM FISH

Doubling the yield from fishery resources--without catching more--may sound like a dream, but NMFS scientists are working to make it a reality. They are using special processing machines to recover almost twice as much meat from fish as present techniques produce. Many species--rockfish, flounders, haddock, cod, and others--are filleted. The normal yield of meat from each fish ranges from 25 to 30%.

At the NMFS Technology Laboratory in Seattle, Wash., scientists using the new machines have obtained meat yields of 37 to 60%.

These machines have been used in Japan since the early 1950s to prepare boneless and skinless flesh from dressed fish, fillets, and chunks of flesh from large fish. The Seattle scientists learned of the machines in 1968 during the visit of a Japanese scientist. The NMFS Technology Laboratory in Gloucester, Mass., also obtained a similar machine to study Atlantic Coast species.

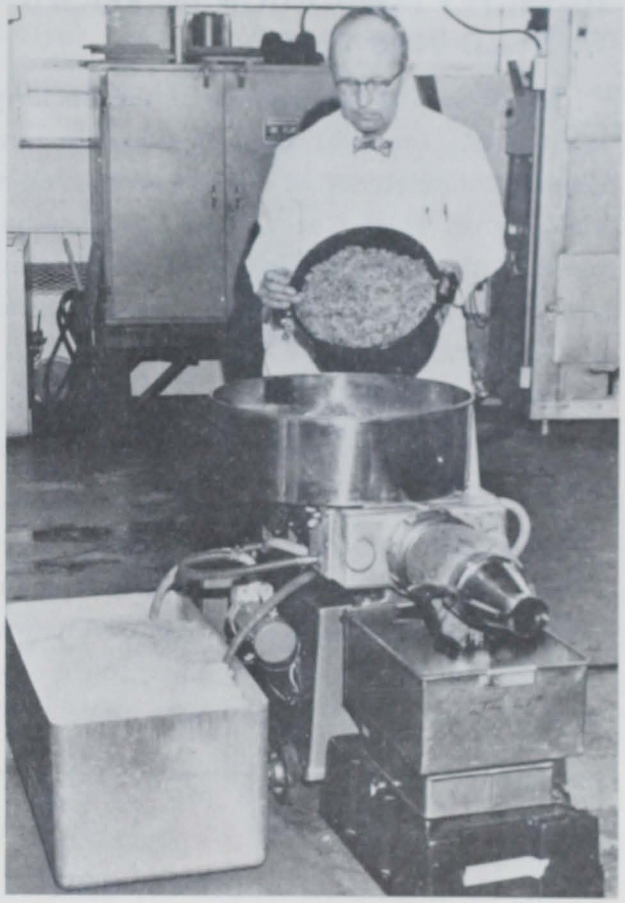
The Machine

Headed and eviscerated fish are fed into the machine and pass between a belt and a perforated drum. The pressure applied by the belt on the fish forces the flesh through the drum perforations, while the skin and bones pass to the waste discharge chute. The fish flesh can be passed through a meat strainer to remove any traces of bone. The final product is minced fish, free of bones and skin.

The Seattle scientists have used the minced fish to develop foods that no longer resemble fish. These foods can be flavored and modified to taste like cheese, spiced meats, or other items. The Gloucester scientists are using the minced fish in new products: fish cakes, canned fish, and fish frankfurts. They used the minced fish as a starting material in fresh fish sausage, croquettes, casseroles, fish loaf, and jellied roll.

Potential Value

The potential value to the New England fishing industry was shown by Gloucester scientists. In 1967, 312 million pounds of New England fish were filleted. They estimated that about 126 million pounds of meat were recovered. Had the wastes been run through the Japanese flesh separator, another 57 million pounds might have been recovered. At 10¢ a pound, this would have been worth $5.7 million.



A final process in preparing minced fish is to pass it through a meat strainer to remove any remaining bones. This machine helps NMFS technologists recover large amounts of fish flesh that previously were discarded. Minced fish has been used by NMFS technologists on both coasts to develop new foods--such as fish cakes, fish frankfurts, and canned minced fish. These new methods will increase the use of fishery resources and help develop new markets.

This new technology could help U.S. fishing industry produce the fast-growing, processed, high-protein snack-type and convenience foods using the long-neglected species as protein source. Successful introduction of fish protein into only one or two of these high-volume food products could create a new demand for exploiting the underutilized fishery resources.

ANCHOVY POPULATION INCREASED FIVEFOLD IN 16 YEARS

An extensive reanalysis of the anchovy larvae data for 1951 through 1966 has confirmed the existence of a large population of anchovy off West Coast. The increase has been on the order of fivefold (figure). This was reported by NMFS' Fishery-Oceanography Center, La Jolla, Calif.

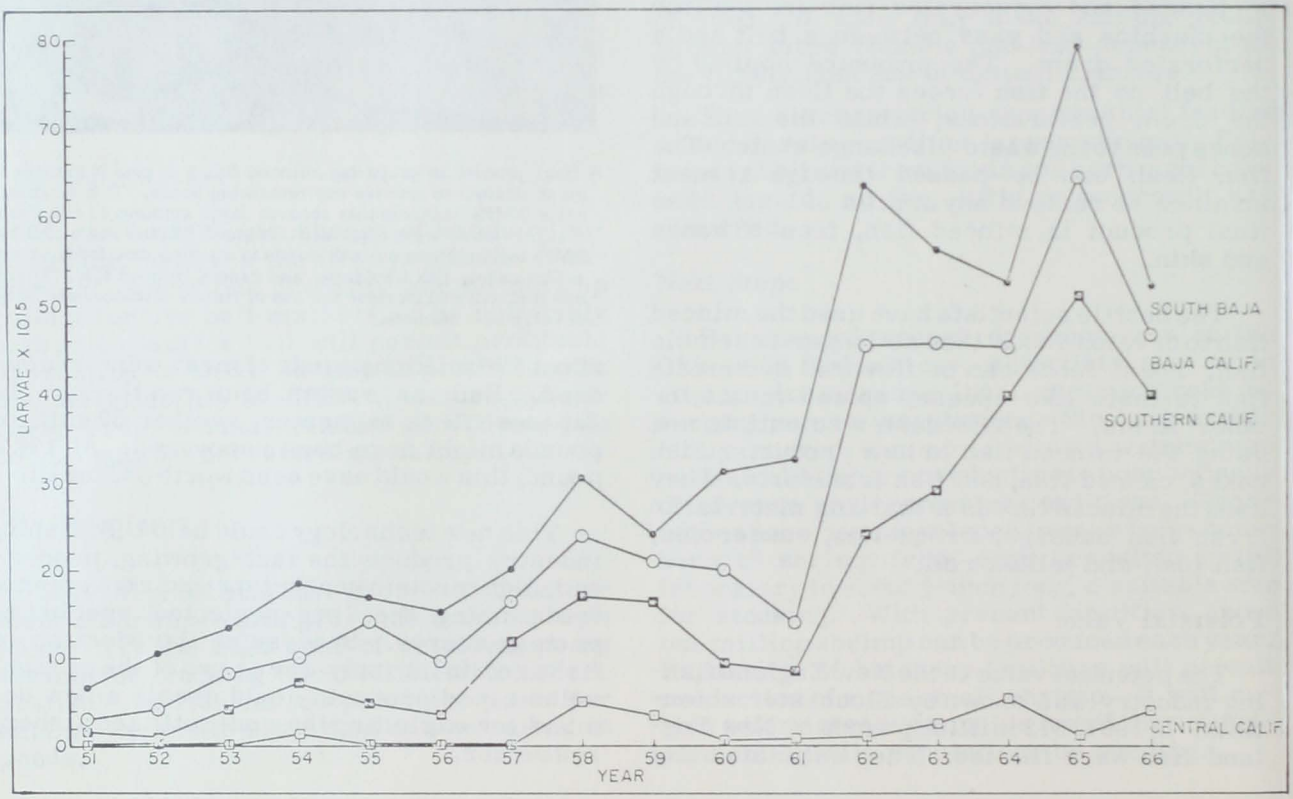
Most of the increase was noted off southern California, especially 80 to 280 miles off coast.

Work is now in progress to define more closely the estimates of spawning biomass through direct estimation of anchovy spawning biomass from anchovy eggs; these eggs have been collected with new nets since 1966.

STAMINA OF HATCHERY-REARED FISH TESTED

A see-through plexiglass tunnel--a "stamina tunnel"--is being used in fish hatcheries of the U.S. Department of Interior's Bureau of Sport Fisheries and Wildlife to test the stamina of fish. The tunnel will help determine their ability to survive after being planted in natural waters.

The tunnel carries a stream of water of controllable velocity. It is being used to see if fish are able to maintain their normal position against a natural flow of water.



Numbers of anchovy larvae off the Pacific West Coast, 1951-66.

OYSTERS CAN BE GROWN SUCCESSFULLY IN MSX-INFESTED AREAS

Oysters can be grown successfully in areas infested with the microscopic parasite MSX, reports Dr. Jay D. Andrews, Virginia Institute of Marine Science (VIMS). The problem is getting commercial quantities of resistant seed oysters. A VIMS unit is conducting research aimed at rearing disease-resistant oysters to rehabilitate abandoned oyster grounds in lower Chesapeake Bay.

Native and selected laboratory-bred offspring have been reared from spatfall to market size without intolerable losses, Dr. Andrews said. Predation, winter smothering, and storm damage remain important causes of mortality.

Resistance to MSX

Offspring of oysters native to lower Chesapeake Bay have exhibited resistance to prevailing levels of MSX activity in 7 consecutive year-classes from 1964 through 1970, Dr. Andrews reported. Fewer than 20% per year of these year-classes have died. This excludes losses from smothering and predation.

Resistant Seed Oysters

Use of areas where MSX is active requires resistant seed oysters. These may be obtained in two ways: 1) Brood oysters heavily selected by MSX for several years may be bred in hatcheries--and thus produce genetically resistant seed. The hatchery method has not yet been proved economically feasible, and the quantity of seed needed is too large for hatcheries. 2) "Obtain seed with acquired resistance gained by exposure to MSX from egg and larval stages to seed size. The parents of these natural sets in seed areas are upriver; they are not exposed or selected and do not exhibit resistance."

Native-Set Oysters Hardy

MSX-active areas usually have predators that prevent tiny seed oysters from surviving. Certain marginal areas, such as Piankatank River, have produced resistant seed, but growth and spatfalls have been inadequate. These seed areas must be monitored with susceptible imported oysters to determine level of MSX activity, and to insure that seed oysters have acquired necessary resistance. Few native-set oysters die or are infected with MSX.

SAN PEDRO AGAIN NO. 1 COMMERCIAL FISHING PORT

The fleet of San Pedro-Terminal Island, Calif., caught $40.5 million worth of fish in 1969, the largest ever for any U.S. port. It was the 21st consecutive year that San Pedro led all U.S. ports in value of catch. For the 4th successive year, it led all ports in volume of catch--406.9 million pounds.

MEETING

WORLD MARICULTURE SOCIETY MEETS IN TEXAS, JAN. 28-29, 1971

The second annual workship of the World Mariculture Society (WMS) will be held at the Galvez Hotel in Galveston, Texas, Jan. 28 & 29, 1971.

WMS promotes the study of mariculture and marine science and disseminates information in these fields. It is based at Louisiana State University, Baton Rouge, La. 70803. Secretary-Treasurer is James W. Avault.

Hundreds of gillnetters fish Kvichak Bay (adjoining Bristol Bay, southern Alaska). Note 2 lines of boats waiting to sell catches to buying scows.
(NMFS-Alaska Photo: L. M. Olson)

FISHING JURISDICTION--
ALASKA'S POSITION

C. A. Weberg
Director of International Fisheries
State of Alaska

Fishermen on both coasts of the United States and Canada, particularly on the West Coast and Alaska, are working hard to obtain extended fisheries jurisdiction.

Why all this interest in recent months and years?

Until 1966, United States jurisdiction extended three miles or to the territorial waters limit. With the rapid increase of foreign fishing vessels, plus new technologies and ability to harvest tremendous quantities of fish on a year-round basis right at our front door, the U.S. Congress passed legislation in 1966 which extended the fishery jurisdiction from three to twelve miles.

This law provides that no foreign fishing vessel can take fish in the area from the coast to a line 12 miles seaward unless an agreement has been reached between the United States and the foreign country allowing special concession to this provision. Our offshore islands also fall under the cover of this statue.

A number of other nations, including Canada, also adopted a similar law providing the coastal states with exclusive fishery jurisdiction out to 12 miles.

Other countries, particularly several in South America, have unilaterally claimed up to 200 miles as within their exclusive jurisdiction and are actively enforcing their claims.

At the time of the passage of Public Law 89-658, which established the U.S. Contiguous Fishery Zone, many persons connected with the fishing industry believed that the new law was inadequate for the protection they sought, and they advocated distances out to the Continental Shelf or 200 miles, whichever was the greatest. However, they recognized the problems associated with obtaining greater jurisdiction and more or less agreed to 12 miles as the best that could be obtained at that time.

Some U.S. fishing interests are opposed to extended jurisdiction for coastal states because they conduct some of their fisheries near the coasts of other nations.

A measure of resource protection was provided in 1958 when the Law of the Sea Conference adopted a convention concerning the Continental Shelf, giving the coastal state authority over shelf organisms which, at the harvestable stage, are either immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil. Several species of crab have been found to qualify as creatures of the Continental Shelf and have been afforded special consideration.

Reprinted from 'Alaska Fish & Game', Sept.-Oct. 1970.

In the past few years, foreign fishing fleets have taken increasingly larger amounts of the renewable resources off the coast of Alaska.

In 1969, the fleets operating mainly on Alaska's Continental Shelf harvested approximately three billion pounds of fish, including shellfish and a small number of whales. These fisheries are conducted with little or no control by the United States with the exception of several bi-lateral agreements and conventions. The consequence of lack of complete control is that several species of fish may be dangerously near the point of over-exploitation.

While it is true that the United States fishermen do not presently utilize many of the stocks being harvested by these foreign fleets, we expect to in the near future and must insist that a viable resource be available when we are ready.

Additional problems caused by the lack of adequate jurisdiction are connected with the "incidental" catch of species. Foreign vessels trawling for pollock and other species are taking large quantities of immature halibut. This species has been subject to strict conservation regulations imposed under a convention between the United States and Canada. Subsequently, our fishermen are catching fewer mature halibut because of lack of control over this situation.

Emergence of previously undeveloped nations into the marine fisheries arena further complicates the problem. Entry of South Korea into the high seas fishery for Bristol Bay salmon has caused serious concern for this particular stock which has been nurtured and conserved by Alaska and is the object of considerable research by the International North Pacific Fisheries Commission and the federal and state governments.

It appears, therefore, that the best solution to the problem lies in extending the coastal states' fishery jurisdiction to include the Continental Shelf or a set distance of 200 miles, whichever is the greatest distance, and to provide special consideration for migratory species, such as salmon, which go beyond these limits. Perhaps abstention from fishing salmon anywhere but in the coastal zone is a possibility.

Foreign nations could continue to fish stocks of interest to them but only under regulation of the coastal state. By using this means, the coastal state having a vested and special interest in the resource could retain a viable resource for the benefit of its citizens.