Foreword

Having served as Governor of Alaska, the Nation's leading State in value of fishery products landed, I have a special interest in the future of our fisheries.

While it is true that some segments of our commercial fisheries are at present economically distressed, there are other segments which are prospering. Actually, we have many fishing industries, because the factors which affect the salmon industry in the Pacific Northwest, for example, are entirely different from those affecting the menhaden industry along the Atlantic coast.

The Bureau of Commercial Fisheries is working with representatives of States, universities, and industry laying the groundwork for a Joint Master Plan for Commercial Fisheries. The purpose of the Joint Master Plan is to provide a mechanism for considering the views of all agencies and groups working on U.S. fishery problems and to identify areas in which increased efforts are required. We are fully aware that the plan is no panacea, but it can serve as a guide for a coordinated course of action in the future.

There is more at stake than simply our ability to supply our domestic markets. We must think of the vast quantities of underutilized species off our shores that could be harvested and used to supply the growing need for high quality protein throughout the world.

Our commercial fisheries need attention. They are a valuable natural resource which must be maintained and managed to provide the maximum sustainable yield. I believe we are moving in the right direction.

Walter J. Hickel
Secretary of the Interior

U.S. AND POLAND SIGN MID-ATLANTIC FISHERIES AGREEMENT

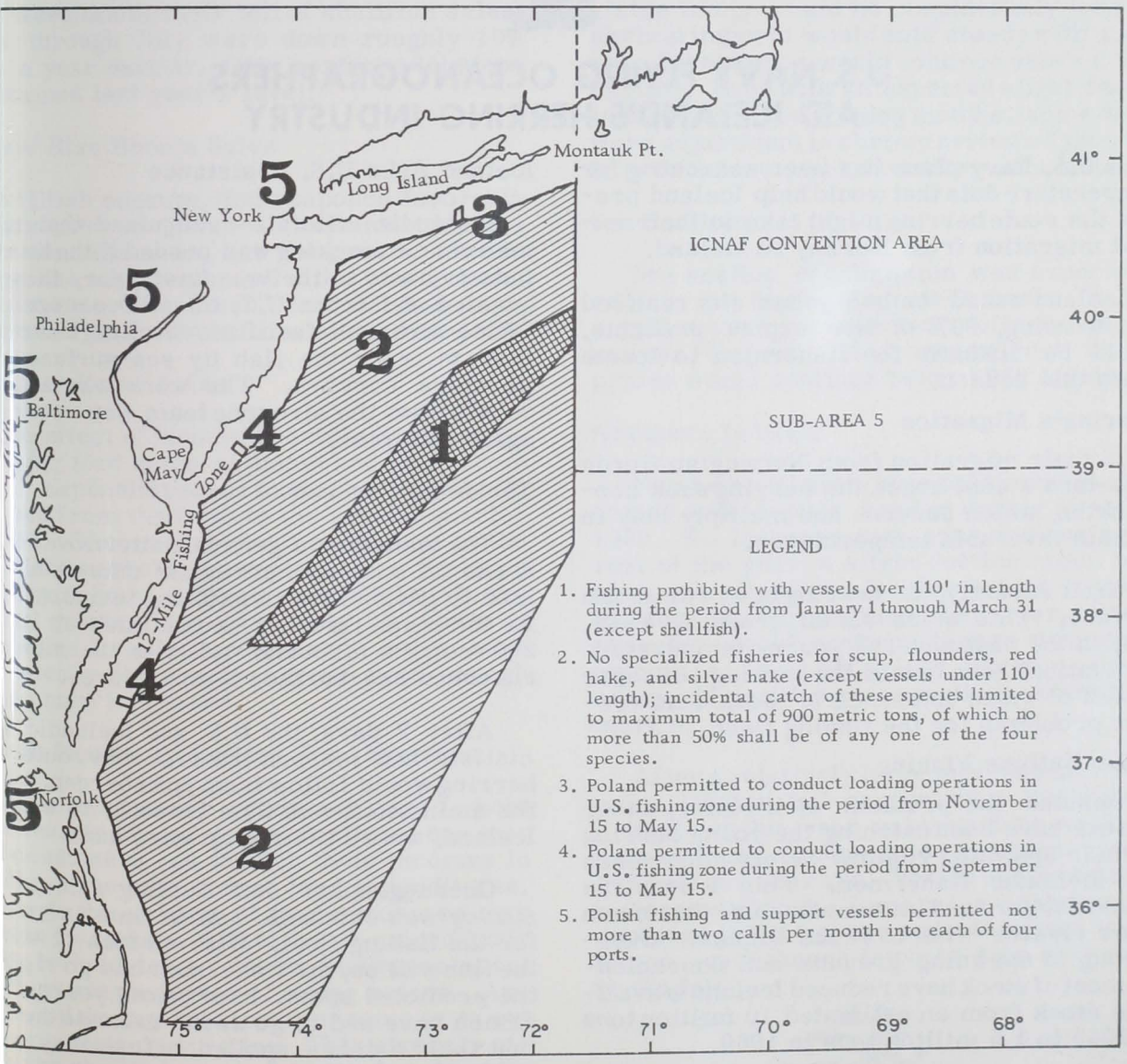
he U.S. and Poland have signed a one- agreement on mid-Atlantic fisheries. ok effect June 12, 1969.

he agreement provides for cooperation in ry research leading to a conservation am for species fished by either country e U.S. mid-Atlantic coast. It also pro- s that Poland take special measures to ct species of special concern to U.S. rmen--and that the U.S. facilitate entry olish fishing and supply ships into 4 U.S. s.

Both countries will conduct joint research on fish of common concern, and exchange scientific and statistical information on the mid-Atlantic fisheries. And, to foster better understanding between Polish and U.S. fishermen, fishery representatives will be exchanged between the fleets on the fishing grounds.

Prohibitions

To conserve red hake, silver hake (whiting), scup, and fluke, Polish fishermen will refrain from fishing in a specific area where



those species concentrate during winter months. Polish fishermen who have been fishing primarily for herring and mackerel will not fish red hake, silver hake, scup, and fluke in the mid-Atlantic. In addition, they will take special precautions to avoid concentrations of groundfish during the entire year.

Loading Zones

In return, Polish fishermen will be allowed to unload and transfer their catches in 3 areas within the U.S. 9-mile contiguous fishing zone. One is off Long Island, adjacent to the Soviet loading zone; the second, off New Jersey, south of Atlantic City; and the third, off ginia, north of Chesapeake Bay. The loa zones may be used only during winter early spring. No Polish vessels will b lowed to fish in the contiguous zone.

Port Entry

Both governments agreed to allow a lim number of fish and supply ships into ports. Use of port facilities at New Philadelphia, Norfolk, and Baltimore limited number of Polish fishing and s vessels was made easier.

U.S. NAVY FLYING OCEANOGRAPHERS AID ICELAND'S HERRING INDUSTRY

A U.S. Navy plane has been searching for temperature data that would help Iceland predict the route herring might take in their annual migration from Norway to Iceland.

Iceland asked for help when she realized that herring, 90% of her export products, would be difficult for fishermen to locate again this season.

Herring's Migration

In their migration from Norwegian fiords to Iceland's east coast, the herring seek zooplankton, which survive and multiply only in certain favorable temperatures.

Until recently, the herring have run at the surface. This made visual tracking easy. But, in the past several years, temperature fluctuations have forced the herring to deeper layers of water in search of food. This created problems for the fishing fleet.

Other Nations Fishing

Besides the problem of tracking, other nations have been catching the young herring in their spawning regions before they reach the Icelandic fishermen. This leaves the older, larger, and more valuable--but much more elusive--fish to reach Iceland. Overfishing in spawning grounds and nonreplenishment of stock have reduced Iceland's available stock from an estimated 10 million tons in 1965 to 1.5 million tons in 1969.

Iceland Asks U.S. Assistance

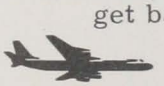
Icelandic officials recognized that m than visual tracking was needed if the her industry was to thrive. Last year, they quested aid from U.S. Naval Oceanogra Office airborne facilities working near land to track the fish by sea-surface perature surveys. The work was so cessful that the airborne team was requ again this year.

The Area Covered

The team flew a general pattern over areas off east and northeast shores of land to get an idea of existing temperat As the plane flew low, sometimes as lo 200 feet, its airborne radiation thermo recorded sea-surface temperatures.

After 2 days, the U.S. and Icelandic cialists had mapped the probable route herring would follow from Spitzbergen, w the main stock was then located, to eas Iceland, where their migration ends.

Oceanographer Jeff Kerling said: survey was economic both in time and m for the fishing fleet. With an idea of w the fish will be, the fishermen can go rig the predicted spots. In previous years, ermen have had to go so far to locate the that their catches spoiled before they c get back to Iceland."



NITED STATES

LFISH SALES SLUGGISH

nsumer demand for shellfish has been sh for most of this year, report BCF nists. The shellfish industry is not iencing the almost-annual increase in mption that has prevailed throughout the .

cord high prices in summer 1969--10% re above a year earlier--for fresh and n shrimp, northern lobsters, and lobster were taking their toll of shellfish sales. through July were down roughly 10% a year earlier. Only northern lobsters ained last year's level.

me Rise Boosts Sales

ellfish consumption responds favorably creases in income. Consumer income risen this year, but the general rise in s has wiped out most of the income gain. increase in "real" income has been er. This has been true since mid-1968.

g At Home & Out

e effect of income is evident in expendi- for food eaten at home and away from . Expenditures for food at home actually ed from the first to the second quarter 9. Of even greater importance to the sh market are expenditures for food rom home. These rose slightly in the d quarter, but were only 2% above a ago. In effect, restaurant sales have steady for nearly a year even though s have increased.

h Income by Cutting Food Spending

hen inflationary pressures tend to hold nes steady, or force declines, one way consumers can stretch their incomes in hort run is to reduce food expenditures. ugh the volume of food purchased may in the same, a shift to lower-priced foods to hold total food expenditures about y during a period of rising prices. An- quick way to stretch income is to cut on restaurant eating. This strongly af- the shellfish market, which is primarily stitutional market.

Predictions for Coming Months

Consumption of shellfish in late summer and fall 1969 was expected to be a little lower than in 1968. Shellfish prices likely would continue above a year earlier during this period but might drop below end-of-August levels.

Fresh and frozen shrimp consumption was expected to be a little less than in August-October 1968. Shrimp landings in the southern states likely would be considerably less and shrimp imports would hold steady with a year ago. Inventories would continue above a year earlier. Even with an expected slight decline in supplies in the coming months, some downward adjustment in shrimp prices might occur to prevent too much inventory accumulation.

Sea Scallops

Sea scallop consumption was expected to remain low during August-October. Shorter supplies were not expected to offset generally weaker demand. This means that scallop prices would continue below 1968 levels.

Northern Lobster

Northern lobster consumption held about steady with a year earlier during first-half 1969. No increase was expected during the rest of the year; a slight decline might be in prospect. Northern lobster prices in recent months ran higher than last year. Prices probably would continue higher through the autumn, although prices likely would dip seasonally as larger supplies entered the market.

After a relatively large increase last year, spiny lobster tail consumption likely would drift lower this year, unless prices weakened substantially. Consumption was running about 10% behind a year ago. Prices and inventories were record high. Some price weakness was expected in light of the end-of-August inventories--even though imports drop seasonally in the fall.

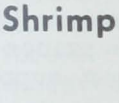
BCF Seattle Scientists Invent Mechanical Scallop Shucker

Except for calico scallops, sea scallops are shucked manually at sea. This is a tedious, time-consuming, and generally unpleasant job. Since 1968, when serious commercial scallop fishing began in Alaska, the BCF Technology Laboratory in Seattle, Wash., has been working on the development of a mechanical shucking device to free the fisherman of this task.

A mechanical shucker must do several things. First, it must open the scallop; it must then remove the meat from the viscera or the viscera from the meat. If the viscera are removed first, the meat must finally be removed from the shell. The act of removing the meat must not damage it. The entire process must be rapid and sanitary, and the equipment should be economical of space and low in cost.

Working Model Developed

Scientists at the Seattle laboratory have developed a working model of a scallop opener and a device that removes the viscera from the meat. The inventors have applied for a patent to be assigned to the Department of the Interior. Persons interested in examining the prototype components from the point of view of manufacturing commercial equipment are invited to contact the laboratory at 2725 Montlake Blvd. East, Seattle, Wash., 98102.



New England Shrimp Fishery Is Growing

There is a growing market for northern shrimp (Pandalus borealis) found in various concentrations in the Gulf of Maine. BCF's Gloucester (Mass.) Exploratory Fishing and Gear Research Base has assisted the industry in developing this resource and finding commercial levels of concentration. The most promising areas are near Stellwagen Bank, Jeffrey's Ledge, and Nauset, Cape Cod.

Up to 50 small and medium-sized boats will work out of Gloucester this year to supply the demand. A new plant is planned for the state-owned Gloucester Fish Pier to handle up to 200,000 pounds of shrimp day. About 100 persons will be employe work in the cooking and freezing plant, 12 to 15 office workers.

A Hopeful Sign

This is a welcome reversal of the d ward trend of recent years in the New land fishing industry. The shrimp boo seen locally as a hopeful sign. The sh are available year round. Most vessel are 2 days and one night. Fisherme Maine have successfully developed a ma for the product cooked aboard vessel.

Maine's fishermen were first to go this species. The shrimp are gaining in ketplace popularity at home and ab Some Gloucester-landed shrimp are b packaged for export to Europe.

Local fishermen are hoping that this resource, along with pollock, may prov alternative to the dwindling haddock resou

Small Tuna Seiners Allowed Larger Incidental Yellowfin Catch

BCF has announced an increase in th cidental catch of yellowfin tuna permitte small purse-seine vessels. It became e tive August 22.

Under an amendment to yellowfi regulations, tuna vessels using purse se and having a capacity of 300 short t less--may now retain a 40% incidental of yellowfin until a total of 4,000 short t taken by such vessels. Previously, the dental yellowfin catch by these vessel restricted to 30%.

Tuna Commission Recommendation

BCF's director said the Inter-Ame Tropical Tuna Commission had recomm that, during the 1969 season, the smal vessels of each nation fishing the reg area should be allowed 4,000 tons aft regular yellowfin season closed.

The 30% incidental catch rate orig set by the U.S. proved too low. So it w justed upward to permit affected U.S. v

se fully the 4,000-ton allotment. When this unt is reached, the small purse seiners revert to the 15% incidental catch rate r which the remainder of the fleet is ating.

Fleet Carrying Capacity ases

s of Sept. 1969, the carrying capacity of J.S. tuna fleet had increased by about tons--to around 54,100 tons. This was rted by BCF's Pacific Southwest Region. 1969 fleet was joined by the 'Pacific winds,' 'Conquest,' 'Neptune,' 'Kerri 'Cheryl Marie,' 'Vivian Ann,' 'Queen ,' 'Mermaid,' 'Lou Jean II,' and 'Gina n.'

e other vessel, 'Kathleen,' is scheduled n the fleet before the end of 1969. This ring the total capacity of the U.S. fleet out 54,600 tons, an increase of over 0 tons, or 20%, in 2 years. The increase nnage during 1969 was considerably er than in 1968. Then, 4,060 tons of ity were added; this brought fleet's ing capacity to 47,660 tons.

en vessels now in the planning stages nsidered, it is estimated that the U.S. could be increased by another 4,000 to tons in 1970.

ic Activity

mid-August, 24 U.S. flag purse seiners shing in, or had departed for, the east- lantic Ocean off west coast of Africa to tuna. Last year, there were 8 U.S. flag s fishing there.

hing has been reported fair to good. -August, catches were being trans- d by refrigerated carrier vessels to Rico and California primarily, al- some shipments reportedly were being o Europe.

Bluefin Tuna Transit Pacific

Transpacific bluefin tuna migration has been reported by H. B. Clemens, California Fish & Game, and G. A. Flittner, BCF. Eight bluefin tuna, tagged and released in the California fishery, migrated westward across the Pacific Ocean. They were recaptured several years later near Japan.

Tagged bluefin, released near Japan and recaptured the following year in the California fishery, have migrated eastward across the Pacific. Clemens and Flittner point out that the bluefin probably undertake a regular migration across the north Pacific. Japanese and U.S. fishermen most likely are harvesting the same bluefin resource.

Japanese Method Tried in Saury Fishing

A chartered 100-foot whale catcher, the 'Dennis Gayle,' was used Aug. 13-19 to determine the suitability of the Japanese 'Boke Ami' (stick-held dip net) method for catching saury off California. The operation was led by Dr. Frank Hester, BCF Fishery-Oceanography Center, La Jolla, Calif.

Fishing was done between Point Reyes and Monterey, 40 to 100 miles off California. To attract and hold fish, three 8-foot light standards were mounted on the port (fish-gathering) side about 10 feet apart. Each standard had three 500-watt incandescent lamps housed in aluminum reflector bases. Half the lamps were equipped with blue filters; the other half were bare. A single 14-foot standard bearing three 500-watt lamp was mounted on the starboard (fishing) side; the outboard lamp was equipped with a red filter. A 2-kw. spotlight mounted on the bridge scanned the water's surface.

The trial dip net was constructed of $\frac{11}{16}$-inch nylon webbing, about 40-ft. wide and 20-ft. deep. Polyvinyl chloride pipe provided buoyancy and support; the bottom was weighted with chains and lead.

The Operation

With the ship underway, all lights were turned on at dusk. The spotlight swept over

the surface to induce saury to jump. When saury were sighted, the main engine was stopped and the starboard lights turned off. When large concentrations gathered under the port lights, the Boke Ami was lowered into the water on the starboard side. The starboard lights were turned on and the port lights extinguished. After the fish had aggregated under the starboard lights, the 2 white lamps were turned off. This left only the red lamp, which caused the fish to rise to the surface. As the fish were being brought aboard, the port lights were turned on again to gather more fish. Saury concentrated quickly under the lights, their numbers increasing with time. Small saury tended to stay on the surface, while larger saury stayed 5 to 10 feet below. Because of rough seas, the Boke Ami was used only at 3 stations, although saury were caught at all stations with a dip net. About 1,000 pounds of saury was caught during the cruise.

Effective But Expensive

It appears that the Boke Ami method is an effective means of catching saury. However, its commercial application in California may not be feasible because a large crew is required.

Flowing Sea Water Gives Best Growth of Oyster Spat

An experiment by BCF's Milford (Conn.) lab on the growth of oyster spat in different environments showed that those in raw, flowing sea water grew much faster than sibling spat in recirculated sea water to which food was added daily.

There was no difference in growth of spat in recirculated sea water fed X or 2 X quantities of food daily.

The growth of spat in the raw, flowing sea water was improved still more when X or 2 X quantities of food were added daily. These spat grew 2-2½ times as fast as those in recirculated sea water with the same amount of food added.

Iced Pacific Hake Tested in Making Kamaboko (Fish Paste

Tests to determine the kamaboko-ma properties of Pacific hake showed that kept on ice 7 days makes a superior kama to that made from fish held on ice for one The tests were conducted by BCF's Se Wash., Technological Laboratory.

When stored as surimi (a pulverized product) for 6 months at 0° F., kama made from 7-day-iced fish retained m its desirable elasticity; kamaboko fro day-iced fish lacked certain essential fa

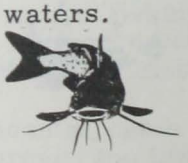
Better Understanding Needed

The researchers report sharp differ among different species of fish in their a to form elastic gels. In some species, fish made better-grade kamaboko than fish. This argues strongly, the researc say, for a need to understand better the c ical and physical properties of actomyo different species--and how these prope change during storage, handling, and p essing.

Restrictions on Walking Catfish Proposed

A proposal to amend regulations to re importation, transportation, or acquisit live fish or viable eggs of the family C idae, after Dec. 31, 1969, was publis the "Federal Register," Aug. 19, 1969, Director, Bureau of Sport Fisheries and life.

Investigations by Interior Departme determined that the walking catfish, C batrachus of the family Clariidae, co with native fish for food and space. C are virtually drought-resistant becau can estivate (spend summer in a torpid hibernate, or migrate overland to find Present fish-management practices failed to control the spread of Clar Florida's fresh waters.



Agency Increases Efforts inst Fish Kills

he Federal Water Pollution Control Adstration (FWPCA) is setting up a new ram to report and investigate intensively ills caused by water pollution, FWPCA missioner David D. Dominick has aned.

said: "The present voluntary program porting fish kills is no longer adequate stepped-up overall campaign against pollution. The old system didn't prfor immediate reporting of fish kill nts and didn't require any counter action e FWPCA."

der the new plan, FWPCA will partici- ctively in investigating fish kills, de- ining causes, and in providing technical o control or prevent such kills.

t Guard Surveys Fishing Vessels

e U.S. Coast Guard has announced that y of safety problems in fishing vessels en underway for months. The study is ng a phase involving a physical survey ampling of vessels in U.S. fisheries.

e Coast Guard's concern arose from tics indicating a consistently lower record for fishing vessels than for ther types of U.S. commercial vessels.

's Purpose

physical survey planned will attempt ce out" safety standards to determine mprovements could be made that would eficial to the industry from a safety ancial viewpoint. The effect on insurates will be included. The Coast Guard ntracted for BCF assistance.

Coast Guard emphasizes that it does ve preconceived ideas of what would be or fishing vessels. It is looking to the ry for help.

U.S. Contributes $\frac{1}{3}$ to $\frac{1}{2}$ of Industrial Pollutants Found in World Oceans

The U.S. alone contributes from $\frac{1}{3}$ to $\frac{1}{2}$ of all industrial pollutants found in ocean waters, a speaker recently told scientists and students at the Virginia Institute of Marine Science, Gloucester Point, Va. The speaker was Dr. Edward D. Goldberg, Professor of Chemical Oceanography at Scripps Institution of Oceanography. Despite contamination of ocean waters by all industrialized nations, however, he is optimistic that the oceans will not become seriously polluted if proper controls are established in time.

Petroleum the Problem

Handling and using petroleum products is the key problem, according to Dr. Goldberg. "Petroleum products not only form the major basis for power and transportation, but they also provide the raw material for the synthetic chemical industries. Ninety-five percent of all organic chemicals originate from petroleum."

Dr. Goldberg pointed out that the introduction of lead tetra-ethyl into fuels has increased enormously the amount of lead byproducts in the air and water. "Although the percentage of lead added to the world ocean is small, we do not know its fate or how it may affect life in these waters. Lead has increased about 20 times that of the natural level in ocean surface waters in the last four decades."

Mercury's Impact

Dr. Goldberg said the real problem in disposing pollutants is to prevent their return to man. He cited mercury as an example. It is used as a catalyst in industrial chemical processes, electrodes in the chemical industry, and in pesticides. Between 5,000 and 10,000 tons of mercury are lost each year by agricultural and industrial users as stack gases and other wastes; much of it finally reaches the oceans.

Mercury's impact on the oceans was felt by the Japanese a few years ago. People in a coastal town were afflicted with "Minamata Bay disease." At first, doctors thought it was a new disease. Persons became seriously ill, palsied, blind, and bald. Fifty died. Later, it was determined that these people had been poisoned by the ingestion of methyl mercury chloride, a waste product from

manufacture of plastics. This had been concentrated by fish and shellfish--and had returned to man. The local government soon regulated the use and disposal of mercury contaminants.

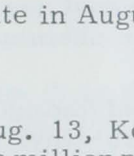
Excellent Salmon Run at Kodiak, Alaska

A late-developing salmon run at Kodiak, Alaska, turned a predicted modest prospect into a 'phenomenal' run of pink salmon, reports BCF Juneau.

By late August 1969, more than 13 million salmon had been caught, perhaps the best odd-year run ever. Over 600,000 cases were produced. An estimate of salmon value was 50 cents per fish. No one could remember so large a catch so late in August.

Million In 1 Day

On Monday, Aug. 13, Kodiak fishermen caught a record one million pounds of salmon; a week later, Aug. 31, they caught 529,000 salmon.



Commercial Quantities of Geoduck Clams Found in Puget Sound, Wash.

Surveys conducted by the Washington State Department of Fisheries show that commercial quantities of geoduck clams exist in Puget Sound. These clams will be harvested by divers with hand-operated hydraulic equipment.

BCF's Seattle Marketing Office has informed local firms of the clams' availability and suggested their use in the firms' minced clam and chowder operations. Samples have been sent to a Seattle seafood company for testing and evaluation.

The Geoduck

The geoduck, Panope generosa, lives deep in the unshifting sand and mud bottoms of sheltered bays from Alaska to Mexico. It is usually found on the mean low water line, or somewhat below. It is the largest clam f in these bays. Individuals more than 8 in long and weighing more than 10 pound not uncommon.

The geoduck lives in a semiperm burrow often 3 or 4 feet below the surfa sends its long siphon (tubular organ) upw Any disturbance in its neighborhood ca the geoduck to partially withdraw its si Further disturbance causes further re tion. But, because the geoduck's shell not large enough, its siphons cannot be drawn completely into the shell.

The geoduck is comparatively safe all enemies--except man. Contrary to p lar belief, it is an extremely poor digge

Maine Seeks Improved Method of Holding Sardines at Sea

The Maine Sardine Council is conduc a major experiment to develop an impr method for holding purse-seined herr (sardines) at sea. The work is being from Port Clyde, Maine, in cooperation the local canning company. The Counci bought new types of equipment being use tensively in Norway.

The Experiment

Freshly caught fish are transferred from purse seine to floating boxlike The nets then are towed 6 to 24 hours to the fish in good shape and improve their dition while awaiting transportation t cannery. This also frees the purse-s catching boat for more fishing. If the are successful, the process could be us the entire sardine industry. It could r in better use of the available supply of along the coast.

Veteran Norwegian fisherman Ca Arne Gronningsaeter is supervising the eration. The canning company is furnis boats and crews.

ECONOMICS OF HAWAII'S SKIPJACK FISHING INDUSTRY IS EXAMINED

A study by Yung Cheng Shang of the University of Hawaii suggests that the slow growth of Hawaii's skipjack fishing industry is not due to overfishing. He indicates that industry profits--by themselves or compared to other industries--have been too low to induce new investment. His study is titled: "The Skipjack Industry in Hawaii: Some Economic Aspects," published by the university's Economic Research Center.

Mr. Shang says that the new state loan programs and higher exvessel prices of the last few years "hold some promise for the future of the industry." If present tuna prices and industry costs continue, "some investment might be forthcoming." However, costs are likely to rise.

Increasing costs could be offset by greater catches. If the increase proves substantial, however, "it will affect the price of tuna." How great an effect would depend on the potential of the several markets for skipjack.

The fresh-fish market in Hawaii has only limited potential. Because of high shipping costs, it is not feasible to ship to U.S. west coast canneries. Possible alternatives are: substitution of Hawaiian catches for the frozen-tuna imports that feed the local canneries--and export of canned tuna to U.S. markets. But even with present higher cannery prices, and the state loan program, "the investment in a fishing vessel is not even marginally profitable. This again points out the crucial role that the productivity increase will play in determining the future of the industry in Hawaii."

THE INDUSTRY

Hawaii's commercial fishing industry accounted for about $\frac{1}{4}$ of 1% of the state's gross product in 1955; in 1967, about 0.12%. This was "not due to an absolute decline in the value of commercial catch but to a very rapid growth in other sectors of the economy."

Skipjack tuna are the largest part of the commercial fish catch: in 1965-67, 75% of the weight and about 48% of the value of marine catch. During the past 20 years, the amount and value of annual skipjack catch "have remained relatively stable": about 10 million pounds and $1.3 million. Between 1948 and 1968, the number of boats and fishermen has declined steadily: from 25 to 16 boats and 260 to 162 fishermen. This indicates some increase in catch per boat and per man.

During 1948-1967, frozen tuna imports into Hawaii "increased significantly." In the U.S., per-capita consumption of canned tuna rose from 0.9 pound in 1948 to 2.4 pounds in 1967. Neither increased productivity nor favorable demand induced investments to replace worn-out and sunken vessels during the past 14 years.

Noting that past research studies of commercial fishing were concerned primarily with biological aspects, Mr. Shang states: "While the solution of certain biological problems is crucial to the industry, it is widely recognized that economic aspects play an increasingly important role."

Fishing Methods

There are 3 techniques of tuna fishing: longline, purse-seine, and pole-and-line. The longline is used for tunas that live hundreds of feet down: albacore, yellowfin, bigeye, and bluefin--and such tunalike species as marlin and swordfish.

The longline is composed of baskets of gear. Each basket has a mainline section supporting branch lines. Each branch line has one hook. The longline itself is supported at the surface by glass or metal floats. Longlining is used in tropical and temperate waters.

Tuna in surface and near-surface tropical waters--skipjack, small yellowfin, and small bigeye--are caught mainly by purse-seining and pole-and-line. Purse-seiners are highly mechanized and have power blocks, nylon seines, and better facilities to carry fish. They can catch thousands of pounds at one time. This technique is used in the eastern tropical Pacific and in Japanese waters.

In Hawaii, the fishing gear is a bamboo pole, a line, and a hook that is part of the lure. The poles are 7.5 to 15 feet long. The shorter one catches fish over 20 pounds; the longer one, smaller fish. Pole-and-line or live-bait fishing is done fairly close to the continental coast and oceanic islands. It is the major Japanese technique for skipjack and albacore fishing.

The Boats

Hawaiian skipjack boats, "which have evolved from the Japanese sampans," are built of wood, 59.3-80.5 feet long, and are 29 to 77 gross tons. Diesel engines range from 135 to 400 horsepower. Sonar and mechanical

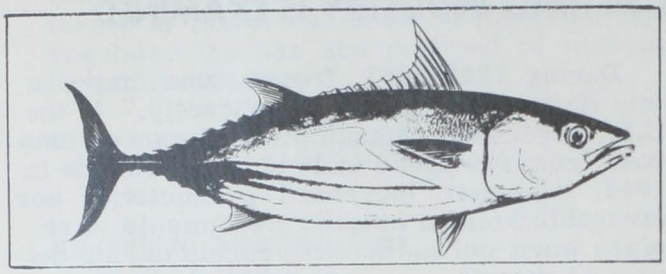


Fig. 1 - Skipjack (Katsuwonus pelamis).

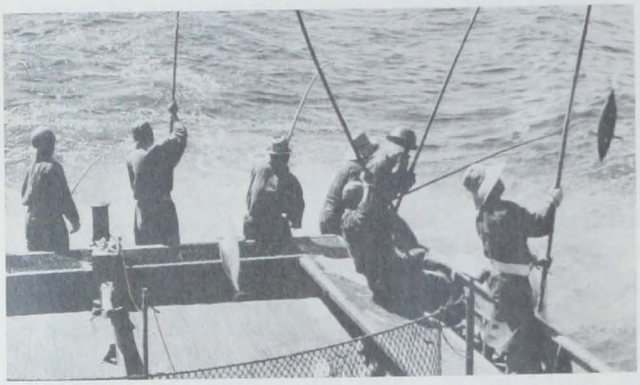


Fig. 2 - This tiny silver fish--the nehu--feeds Hawaiian tuna industry. It is the bait.
(Warren R. Roll, Honolulu Star-Bulletin.)

Fig. 3 - Live-bait fishing for skipjack. Fish are breaking astern in vessel's wake. (H. Mann)

refrigeration are lacking. Each vessel has 6 baitwells, which also store fish. The crew is 6 to 12 men, depending on vessel size.

The Bait: Nehu

Live bait is used exclusively. It is predominantly the nehu, a small anchovy, 92-99% of all skipjack bait. The crew has to accumulate enough bait before scouting for skipjack. Nehu is found in estuarine areas, fairly uncommon in Hawaii. The nearness of certain baiting grounds is one reason why 12 of t 16 full-time skipjack vessels are based Honolulu, Oahu.

The Operation

The vessels leave before dawn and, wi daylight, begin to scout and fish. Bird floc and water movements associated with schools point to the schools. When a scho is located, the vessels try to reach its he and the fishermen "chum" live bait to attra the fish close to the vessels. When fish fo low a vessel's wake, they develop a "feedi frenzy" and attack anything that looks li bait. Standing shoulder to shoulder along th stern, each fisherman uses one pole to cat one fish as rapidly as he can. Only a sma part of the school is caught. The vessels ma run into several schools during the day. Dar ness, or the absence of bait, ends scouting an fishing.

This operation has several problems; th bait problem probably is most serious. Th fisherman spends about 30-40% of his tim fishing for bait. This limits the number trips. Also, the nehu is very delicate an about 30% die before the rest are used at sea The nehu can live a few hours to a few day on the boats. It is one reason why fisherme work within 90 miles of coastline of the mai islands. The need to replenish nehu also con tributes to preventing trips to distant offsho grounds.

Search for Nehu Substitute

Attempts have been made to establish source of bait fish that would be available wit out losing time. Marquesan sardine has bee introduced into island waters, tilapia has bee cultivated, and artificial bait tried (ineffec tive). BCF scientists have found threadf shad comparable to nehu in luring tuna. It i hardy, stays alive for weeks, but it has no spawned in tanks. So there may not be enoug to support a bait fishery.

Markets

Hawaii has 4 markets: a fresh-fish mar ket, where fish are sold to consumer whole o filleted; a bait market for other fisheries cured fish market, where fish is dried o smoked; and a cannery market.

Fishery Statistics Program Is Set Up in Puerto Rico

The first commercial marine fisheries statistics program for Puerto Rico has been established. It was the work of the Division of Fish and Wildlife, Department of Agriculture, Commonwealth of Puerto Rico, assisted by the Institute of Marine and Atmospheric Sciences, University of Miami, Miami, Florida. Bureau of Commercial Fisheries Public Law 88-309 funds were used.

Development of the program began in July 1967 and reliable statistics were being obtained by August 1968. A fish ticket system similar to the one used in developing the Florida fisheries statistics program was recommended by the Institute and is presently in use. The data are processed by the Office of Agricultural Statistics of the Department of Agriculture.

Preliminary Estimates

Preliminary estimates place the minimum annual production near 3 million pounds, valued at nearly 800 thousand dollars to the fishermen. Landings are highest on the island's west coast (42% by weight, 35% by value) and lowest on the north coast (10% by weight, 14% by value). The east coast produces 23% by weight and 25% by value, and the south coast 25% by weight and 26% by value.

Finfish represent 87% of the landings by weight and 72% by value. Snappers, mackerels, and groupers are the most important commercial fish species. Lobsters (mostly spiny lobster, but including some sand lobsters) constitute 9% of the total landings by weight and 22% by value; these have the highest average exvessel price, $0.73 per pound, of all fish and shellfish landed in Puerto Rico. Land crab represents less than 1% of the landings by weight and value, but at $0.67 per pound, it is also a relatively high priced item. The overall average exvessel price for fish and shellfish is $0.28 per pound.

--Charles W. Caillouet Jr.
U. of Miami

Charter sloop sails tradewinds from St. Croix to Buck Island, Virgin Islands. (Photo: M.W. Williams)

House Streamlines Fishing Fleet Improvement Act

To speed renewal and modernization of the aging U.S. commercial fishing fleet, the House of Representatives has passed a bill amending the Fishing Fleet Improvement Act.

The bill, H.R. 4813, would simplify the granting of subsidies for new construction, and provide, for the first time, subsidies for reconstruction of existing vessels.

Amendments in H.R. 4813 would:

1) extend the construction assistance program until July 30, 1971;

2) provide subsidies of not more than 35% for vessel reconditioning, conversion, and rebuilding;

3) increase yearly appropriation authorization from $10 to $20 million;

4) base amount of subsidy, both for remodeling and new construction, on the difference between foreign and domestic costs for class of similar vessels--instead of continuing to require a separate determination for each vessel;

5) eliminate several time-consuming procedures and administrative costs;

6) authorize study of ways to improve effectiveness of the U.S. fishing industry.

Need for Legislation

Urging passage, Rep. Pelly (Wash.) said:

"A modern fishing boat in a U.S. shipyard is a very substantial investment. For example, the cheapest boat constructed. . .since the 1964 amendment, cost over $230,000. Many of them were over $500,000, and several cost in the millions. For the average fishing boat operator, the construction of a vessel of this size and complexity is simply out of the question."

This bill provides subsidies for rebuilding and modernizing existing vessels, Rep. Pelly explained, "so that a vessel operator may improve the efficiency of his fleet without the staggering burden of constructing completely new ships."

Appropriation Increase Limited

It would take an estimated $30 million a year in Federal funds for 7 years to significantly modernize the U.S. fishing fleet. The authorization, however, has been limited to $20 million a year for 1970 and 1971. By 1971, Rep. Pelly believes, "we should be in a position to study the effect of the changes we are now considering. Hopefully, they will prove to have been an effective aid. . .and will justify a further commitment to complete the modernization of this. . .industry."

Simplified Procedures Were Needed

Rep. Pelly considers that previous legislation has been hindered by the "fact that the complicated hearing and administrative procedures of the Maritime Administration were adopted as the guidelines for the granting of subsidy applications." While these may be desirable in the construction of cargo liners costing $15 to $20 million each, he feels "they are an unnecessary burden and expense for small companies in the fishing business."

New Methods Eliminate Uncertainties

The Congressman added:

". . .due to the procedures for determining foreign shipbuilding costs many fishing-boat owners could not find out how much subsidy actually would be paid until after they had committed themselves. The amount of money they would have to raise to cover their share of the cost was always in doubt, pending certification by the Maritime Administration of the cost of building a comparable vessel in a foreign yard.

"No longer will the Maritime Administrator be required to determine the foreign costs of building each vessel for which subsidy is requested. Under this legislation, the Maritime Administrator will only be required to make periodic general surveys of the cost of building representative classes of vessels in foreign yards. These cost determinations will be a matter of public record so that applicants will be able to determine in advance how much assistance they can expect if their application is approved."

Minimum Construction Subsidies

Speaking for H.R. 4813, Rep. Feighan (Ohio) said: "It is anticipated that small

fishing craft operators should benefit substantially. . .from this bill, because of a new guarantee to receive a minimum subsidy of 35% for the construction of new fishing vessels. Heretofore, an applicant for a subsidy could never be certain of the amount he would receive until the 6 month's application period was completed."

Public Hearings No Longer Mandatory

The amendments end the requirement for a mandatory public hearing on each application.

"Every application approved since 1964 has involved a formal hearing before a hearing examiner" explained Rep. Dingell (Mich.). "Except for a few cases, most of the hearings have been quite pro forma, since there was no one to speak in opposition to the application. By providing everyone with an opportunity to request a hearing equal results would be obtained, with a smaller expenditure of time and money."

Trade-In Subsidies Discussed

Although he favored passage, Rep. Van Derlin (Calif.) voiced concern about the continued exclusion of vessel trade-ins from the program. He feels this omission may discriminate against those already in the fishing business who are trying to operate obsolescent boats. He believes they should receive more of the subsidy benefits already available to industry newcomers. The latter do not have to worry about unloading an aging boat to obtain a new one.

He noted that H.R. 4813 has tried to cope with this problem by authorizing a study that will include consideration of vessel trade-i subsidies.

Areas to be Studied

Discussing the proposed study, Rep. Kei (Mass.) said: "We have been trying to he the fishing fleet regain its proper posit ever since I have been a Member of the Co gress, and for many years before that.

"I think, perhaps, the most unique s in our current effort to solve this probl is in this legislation. . .a study under leadership of the Secretary of the Interior consultation with the Maritime Administr tion, other interested Federal agencies, a professional and industrial organizatio knowledgeable about U.S. commercial fishi vessels and their operation.

"The first area is that of insurance. costs about $800 per man for insurance pr miums alone for a fishing vessel to put to s In some nations. . .they do not have any i surance. In other nations--Canada, for e ample--they subsidize the cost of this insu ance, and the net cost per man is around $2 per year."

Rep. Keith described 4 other areas to studied: improvements and innovations vessel and equipment design; trade-ins; i provement of safety and efficiency of exis ing vessels; and possibility of a constructi reserve fund similar to that given the me chant fleet. There, owners are allowed to s aside reserves against vessel depreciati

--Barbara Lun

OCEANOGRAPHY

Microscopic Organisms May Help Clean Up Oil Spills

The use of microscopic organisms to help clean up oil spills is being studied by oceanographers of Florida State University. They plan to collect and study bacteria and other tiny organisms that oxidize and decompose small quantities of oil in polluted harbor waters and shorelines. They have observed that certain bacteria may speed the natural decomposition of oil that often fouls water and beaches.

At St. Marks, Fla., the eastern terminus of the Gulf's Intracoastal Waterway, bacteria have reduced or cleaned minor spills from oil barges and other craft.

Federal Grant

The scientists have received a $105,000 grant from the Federal Water Pollution Control Administration to collect from around the world microorganisms that keep minor oil spillages from fouling the water.

Dr. Carl Oppenheimer, director of Florida State's shore facility, said: "We know that this method by itself could not clear up a spill of say 100,000 barrels, but it could significantly speed up clearing the last portions, which sometimes linger on shorelines for years."

Mechanical methods could be used first to clear away most of the spilled oil. Then the organisms would finish the job.

So far, the oceanographers have observed organisms that attack the oil at the molecular level. They break the oil's hydrocarbon molecules into smaller and smaller units; eventually, they oxidize the oil into carbon dioxide.

U.S. and Florida Are Mapping State's Sea Boundaries

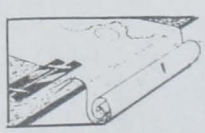
ESSA's Coast and Geodetic Survey (CGS) and the Florida Department of Natural Resources are working together to map the state's seaward boundaries. At stake is ownership of coastal and offshore lands which, at one time or other, are covered by the tide.

The problem involves a determination of federal, state, and private boundaries, ESSA states. In coastal areas, the mean high-water line generally marks the boundary between state and private property--whereas the mean low-water line is the base line, or starting point, for determining the limits between U.S. and state ownership. In Florida, state ownership starts at the mean high-water line and extends offshore 3 miles beyond the mean low-water line along the Atlantic coast--and 9 miles along the gulf coast.

5-Year Program

Costs of the 5-year program will be shared by the U.S. and Florida. Randolph Hodges, executive director, Florida Department of Natural Resources, hailed the program as "a major milestone in the history of our state. Valuable oil, gas and mineral reserves may well exist offshore. Frequently we learn of valuable recoveries of salvage materials from sunken vessels. These, together with the commercial and sport fisheries and marine nursery grounds, constitute a valuable asset."

Hodges said that although Congress has established the intended legal definition of Florida's boundaries along the Atlantic shores--and the Supreme Court for Gulf of Mexico waters--nevertheless controversy may continue until the state's seaward boundaries are determined.



States' Seaward Boundaries Not Accurately Determined

Rear Adm. Don A. Jones, director of ESSA's Coast and Geodetic Survey (CGS), said on Sept. 10 that the seaward boundaries between states have not been accurately determined. He noted the need to define these legal limits because of their increasing economic importance. He spoke at the annual meeting of the American Shore and Beach Preservation Association in Atlantic City, N.J.

Adm. Jones revealed that most states have not laid claim to as much ocean space as Congress has authorized. Although the national domain extends only 3 miles from shore, the Geneva Conventions (adopted in 1958 and ratified by U.S. in 1964) pushed U.S. economic boundaries (and thus the states') as far out to sea as land beneath it could be exploited economically.

New Significance

Adm. Jones declared: "The coastal zone is acquiring a new significance as the nation enters into a new phase of national interest in the sea. Accelerated development and growth of the use of the sea indicates the extent to which it will be exploited to the benefit of commerce, industry, recreation, and settlement."

"Some day," he predicted, "aquaculture may well rival and surpass agriculture in importance as the population growth imposes an increasing dependence upon the marine environment."

The ESSA official said an expanded national effort must be made "if our technology is to be used effectively in making intelligent use of our oceanic frontier. . .Among the basic problems now being encountered is the determination of the extent of offshore waters over which a maritime nation has sovereignty. Ownership of rights to the ocean floor, state-federal jurisdiction, the extent of fishing rights, and other factors are pressing problems."

The Admiral concluded: "Until recent years there seemed to be no need on the part of coastal states to claim ocean space." But rapid developments in the coastal zone and on submerged Continental Shelf now make it "increasingly imperative" that CGS accelerate its traditional shore-and-sea boundary program specifically for boundary purposes.

△△△△△△△△

Alcoa Is Building Deep-Ocean Search & Recovery Vessel

Aluminum Company of America is building the "largest and most advanced deep-ocean search and recovery vessel ever designed." The work is being done by Peterson Builders of Sturgeon Bay, Wisc. The ship, the 'Alcoa Seaprobe,' will be operated by Ocean Search, Inc., a joint venture of Alcoa and Ocean Science and Engineering, Inc.

The 244-foot, all-aluminum craft will be capable of recovering 200-ton payloads from 6,000-foot depths. It is expected to be fitted out and ready for sea trials early in 1971.

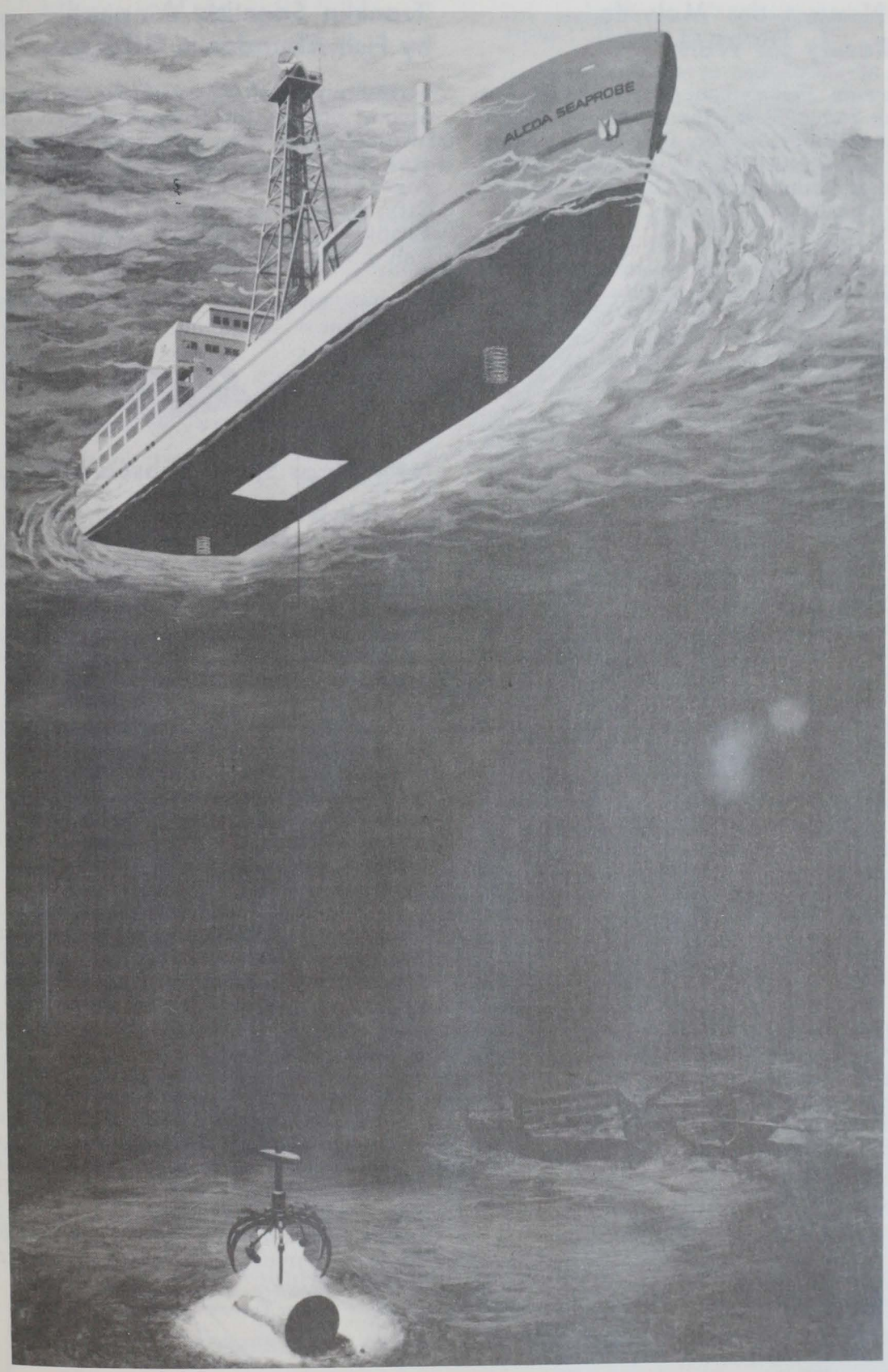
The Vessel

The vessel will have a 50-foot beam, 9-foot draft, and 2,000-ton displacement. Alcoa says: "It will possess the ability to hold its position in rough seas; search, core and sample mineral deposits on the sea floor; locate and retrieve heavy objects more than a mile beneath the surface; and to perform other research and exploratory oceanographic functions. No existing or proposed ship has anything approaching these capabilities."

The vessel's hull and superstructure will be of Alcoa-developed aluminum marine alloys. It will be powered by diesel electric generators giving it a 10,000-mile, 45-day cruising range. It will be equipped with "the most advanced communication navigation and search equipment available."

Its Missions

The kinds of missions the vessel will be given have not yet been determined. However these are expected to include "deep-sea recovery work, deep-ocean archeological projects, and proprietary undersea geological explorations. . . ." The ship also will be available to assist in searching and recovering missing submarines or other objects.


ALCOA SEAPROBE

Scripps' Newest, the 'Melville,' Nearly Ready for Work

The newest U.S. oceanographic research vessel, the 245-foot, 2,075-ton Melville left Defoe Shipbuilding Co., Bay City, Mich., Sept. 2 for San Diego, Calif., and use by Scripps Institution of Oceanography. She was scheduled to arrive in late October.

The Melville paid a 2-day courtesy call on Woods Hole (Mass.) Oceanographic Institution (WHOI). A sister ship of the Melville, the 'Knorr,' is being built by Defoe for WHOI. She is scheduled for delivery later this year.

The Melville then proceeded to the Bahama Islands area for 2 weeks of intensive sea tests and trials.

Bahama Tests

The Bahama trials will provide extensive testing of the ship's machinery, especially winches and other deep-sea gear. Tested too will be her maneuverability with a new type of propulsion that enables her to move forward, backward, or sideways, or remain stationary over a fixed point in 35-knot winds and heavy seas.

This propulsion system uses vertically mounted, multibladed, cycloidal propellers, one at the bow and one at the stern. Although this system was U.S.-designed, its use is relatively new here. It has been used in Europe for more than 30 years.

The Melville

The Melville was built at an estimated cost of $7 million, including equipment. She has a maximum capacity of 62 scientists, technicians, and crew members. She and the Knorr were constructed under an $11.8 million, 2-ship, contract, excluding equipment.

'Franklin' Scientists 'Amazed' by Fish Abundance Off New Jersey

During the 30-day Gulf Stream Drift Mi sion of the 146-ton 'Ben Franklin' that end in August, the crew saw relatively little m rine life. But in September, during a 24-ho research dive 81 miles southeast of Atlan City, New Jersey, scientists aboard t Franklin were "amazed" by the abundance fish surrounding the submerged vehicle.

Also, the crew reported, findings 'hi that a new seamount exists off the Jers coast.

New Maps Show Subsea Mineral Are

Four new maps showing the world distr bution of known and potential subsea miner resources have been published by the U. Geological Survey, Department of the Interio The maps are supplemented by a 17-pa pamphlet that describes subsea geolog features and reviews the magnitude and p tential usefulness of seabed resources.

The maps were prepared at the request the National Council on Marine Resources a Engineering Development. They are part the U.S. government's effort to assem basic information helpful to U.S. and fore officials concerned with seabed explorat and development.

Dr. Vincent E. McKelvey and Dr. Frank F Wang, authors of the maps and report, n that subsea petroleum (oil and gas), produc offshore by 25 countries, contributes 17% world's output. It makes up nearly 90% total value of current subsea mineral pr duction.

The maps and pamphlet, "World Subs Mineral Resources," are published as Mi cellaneous Geologic Investigations Map I-6 They are available for $2.75 the set (maps sold separately) from Distribution Bran U.S. Geological Survey, 1200 South Ea Street, Arlington, Virginia, 22202; the Fede Center, Denver, Colorado; and Fairban Alaska, 99701.

oreign Fishing Off U.S.
July-August

F NEW ENGLAND & ON GEORGES BANK

Fog and haze restricted surveillance in ly, but good weather in August permitted cellent coverage.

In July, about 175 vessels (150 in June); August, 325 from 10 countries, perhaps the st in 1 month since summer 1963, when a far-less-modern, 300-400-vessel Soviet fleet fished off New England.

Soviet: Fleet in same general areas, June, July, and August. In August, 212 vessels--39 factory stern trawlers, 152 medium side trawlers, 8 factory base ships, 12 refrigerated transports and cargo vessels, and 1 tanker (118 in August 1968).

Polish: In June, 3 vessels; July, 18; August, 37--28 side and 4 stern trawlers, 4 carriers, and 1 factory base ship.

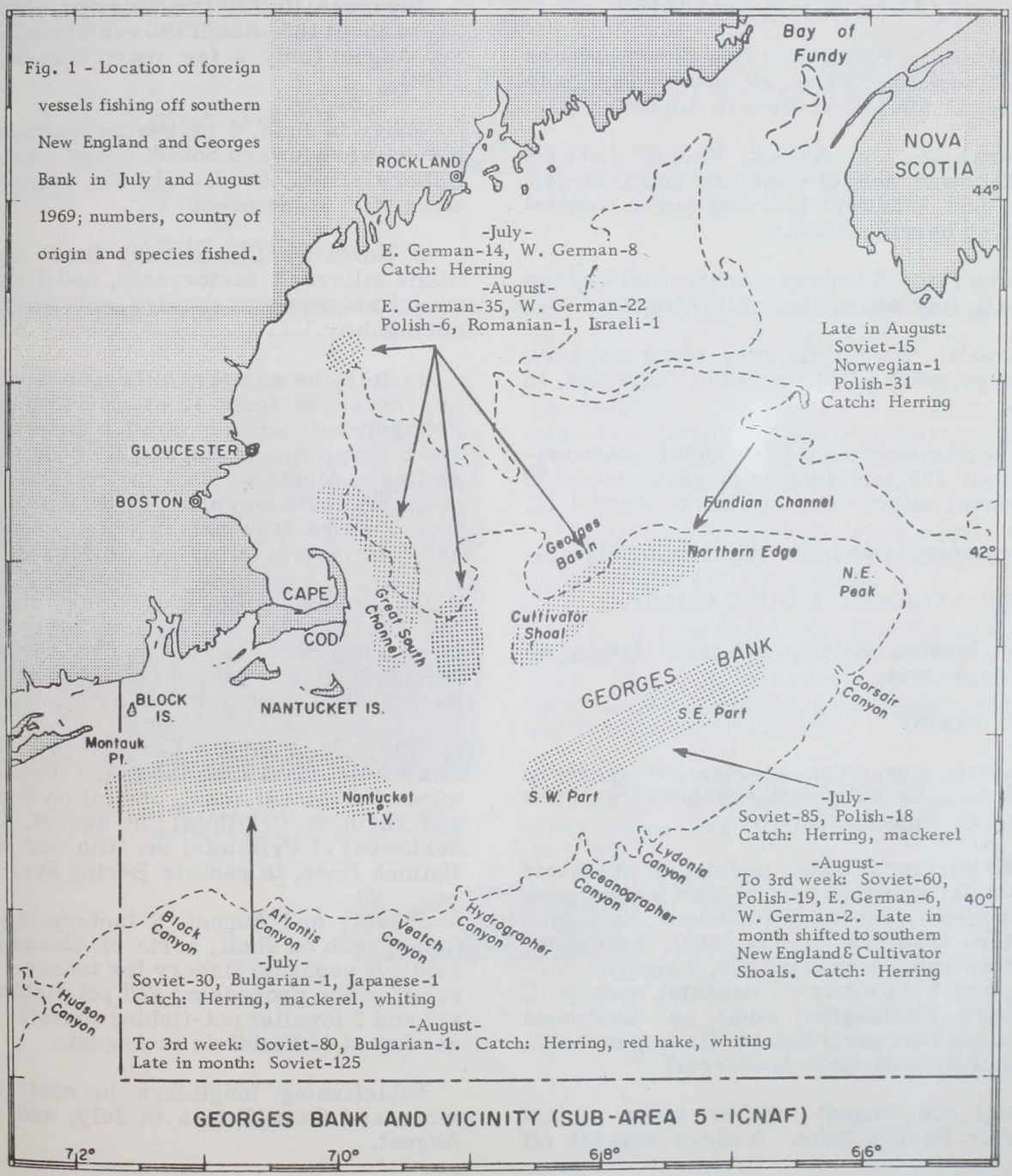


Fig. 1 - Location of foreign vessels fishing off southern New England and Georges Bank in July and August 1969; numbers, country of origin and species fished.

East German: In July, the base ship 'Junge Garde' and 14 vessels; in August, 40--27 factory and freezer stern trawlers, 11 side trawlers, and 2 factory base ships (31 in August 1968).

West German: In July, the fisheries enforcement vessel 'Frithjof' and over 10 trawlers; in August, 22 freezer stern trawlers and 2 fishery protection vessels. The latter provide medical aid, technical assistance, towing and salvage, and meteorological services. (About 29 in August 1968.)

Icelandic: Five herring purse seiners used Gloucester, Mass., as an operation base in July. A 6th joined them in August.

Norwegian: In August, 'Gadus' (stern trawler) was east of Cape Cod and Georges Bank, and 'Kloster' (herring purse seiner) explored herring fishery.

Bulgarian: A factory stern trawler sighted in early July and again in mid-August.

Israeli: 'Hiram' (factory stern trawler), 20 miles north of Race Point, Cape Cod, in July.

Spanish: 'Sobroso,' VI-5-8380 (side trawler about 165 feet long, 425 gross tons, 26 crewmen) entered Boston Harbor August 21.

Japanese: One stern trawler in July.

SOUTH ATLANTIC & GULF COASTS

No foreign vessels reported fishing in July or August.

WEST COAST

Soviet: One stern trawler off northern California in July. (One fishery research vessel in August 1968.)

Off Northwest coast, in July, 38 stern and 9 medium trawlers, 12 support vessels and 4 research vessels (54 vessels, including 37 stern trawlers, in July 1968). In August, 37 stern and 7 side trawlers, 9 support vessels, and 2 research vessels, mostly off northern Washington; some on LaPerous Banks off Vancouver Island. (In August 1968, 49, including 34 stern trawlers.)

July and August catches were almost entirely Pacific hake. A stern trawler off Vancouver Island and Cape Flattery caugh almost 30,000 pounds in a single haul.

Japanese: In late July, 1 longliner o Washington; in August, 2 longliners and stern trawler. One longliner caught abou 5,000 pounds of ocean perch. Early in Augus a longliner was taking black cod on almos every hook. (Two longliners in August 1968

ALASKAN COASTS

Japanese: In July, vessels decreased fro 390 to about 185. About 190 remained through out August (only a few more than in Augus 1968).

Early in June, 6 high-seas salmon fleet moved west toward Soviet coast. Just befor fishery ended, about July 22, only 3 fleet were still in the area.

A North Pacific whaling fleet--about 1 whale killers, 1 factoryship, and 2 refriger ated carriers--was south of eastern Aleutian during July.

In July, the eastern Gulf ocean perch fish ery increased from 12 stern trawlers and refrigerated carrier to 20 trawlers and stern trawlers. In August, 3 of the trawler shifted to Albatross Bank in central Gulf. Th ocean perch fishery along Aleutians increase from 2 stern trawlers in July to 6 trawler and 1 refrigerated carrier in August.

As the Gulf ocean perch fishery increase the groundfishery along Shelf edge in th Bering Sea decreased from 20 vessels to 1 In August, these 12 and a refrigerated carrie were south to northwest of Pribilofs.

Throughout July, 5 factoryship fleet trawled Alaska pollock and flatfish fo minced-fishmeat, meal, and oil on Shelf eas and north of Pribilofs. In August, 4 wer northwest of Pribilofs; the fifth was north Unimak Pass, in eastern Bering Sea.

In July and August, 2 factoryship fleet fished crab on Shelf, north of Alaska Penin sula. A separate fishery for tanner crab-- combination processing and pot-fishing ves sel and 3 smaller pot-fishing vessels--bega northwest of Pribilofs in August.

Sablefishing longliners in eastern Gu increased from 2 to 5 in July, and to 8 i August.

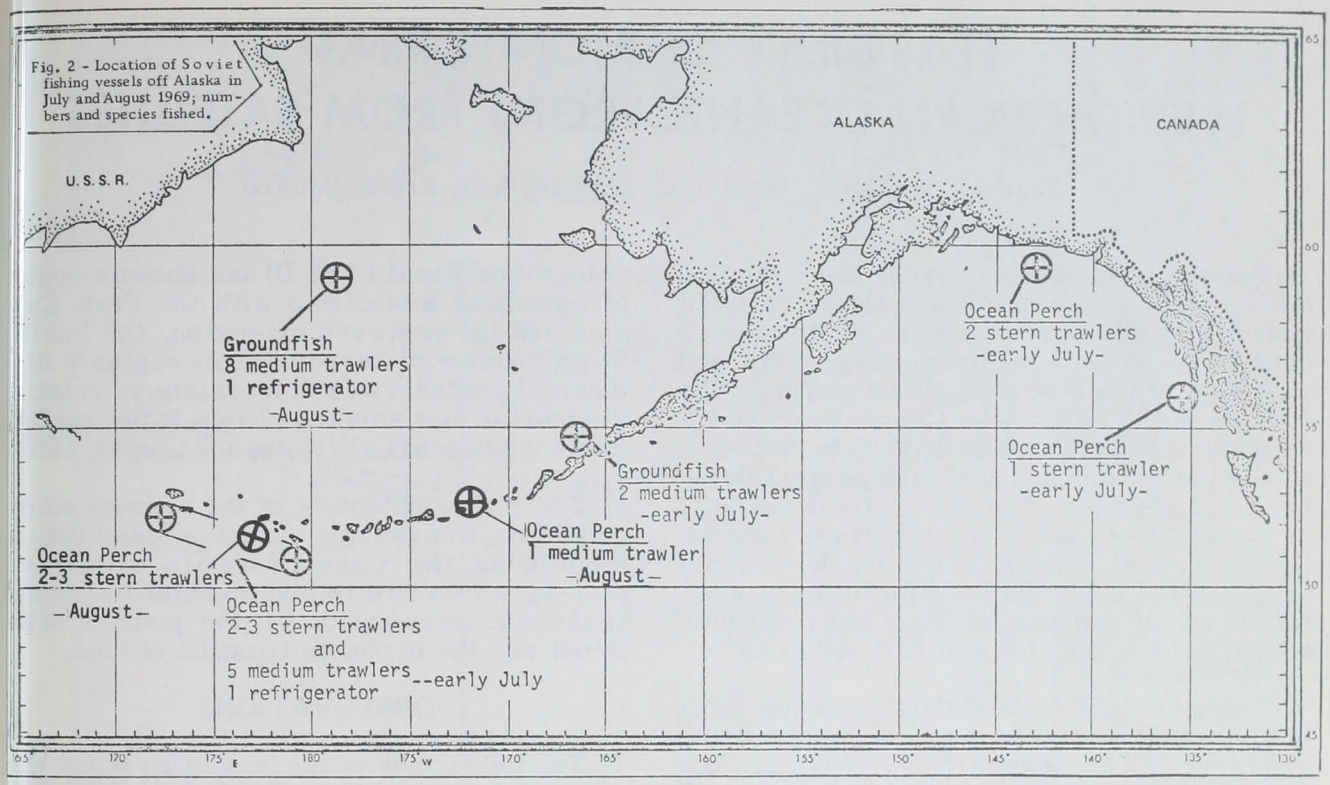


Fig. 2 - Location of Soviet fishing vessels off Alaska in July and August 1969; numbers and species fished.

Fig. 3 - Korean stern trawler 'Keo Mun #501' fishing in the Bering Sea. Built in France in 1966, she is 106 feet long and 223 gross tons.

Republic of Korea (South Korea): One factoryship, 1 refrigerated carrier, and 7 trawlers fished Alaska pollock northeast of Pribilofs through July until late August, when they prepared to return home.

One independent stern trawler and 2 small stern trawlers also fished Alaska pollock in July, southwest of Pribilofs.

The 5 gillnetters that had fished salmon in late June were not seen after first week of July. Their refrigerated carrier sailed for home in late July and, presumably, the gillnetters accompanied her.

Soviet: Vessels decreased from 20 to about 12 in July and August, the fewest since Soviets began year-round fisheries off Alaska in 1963.