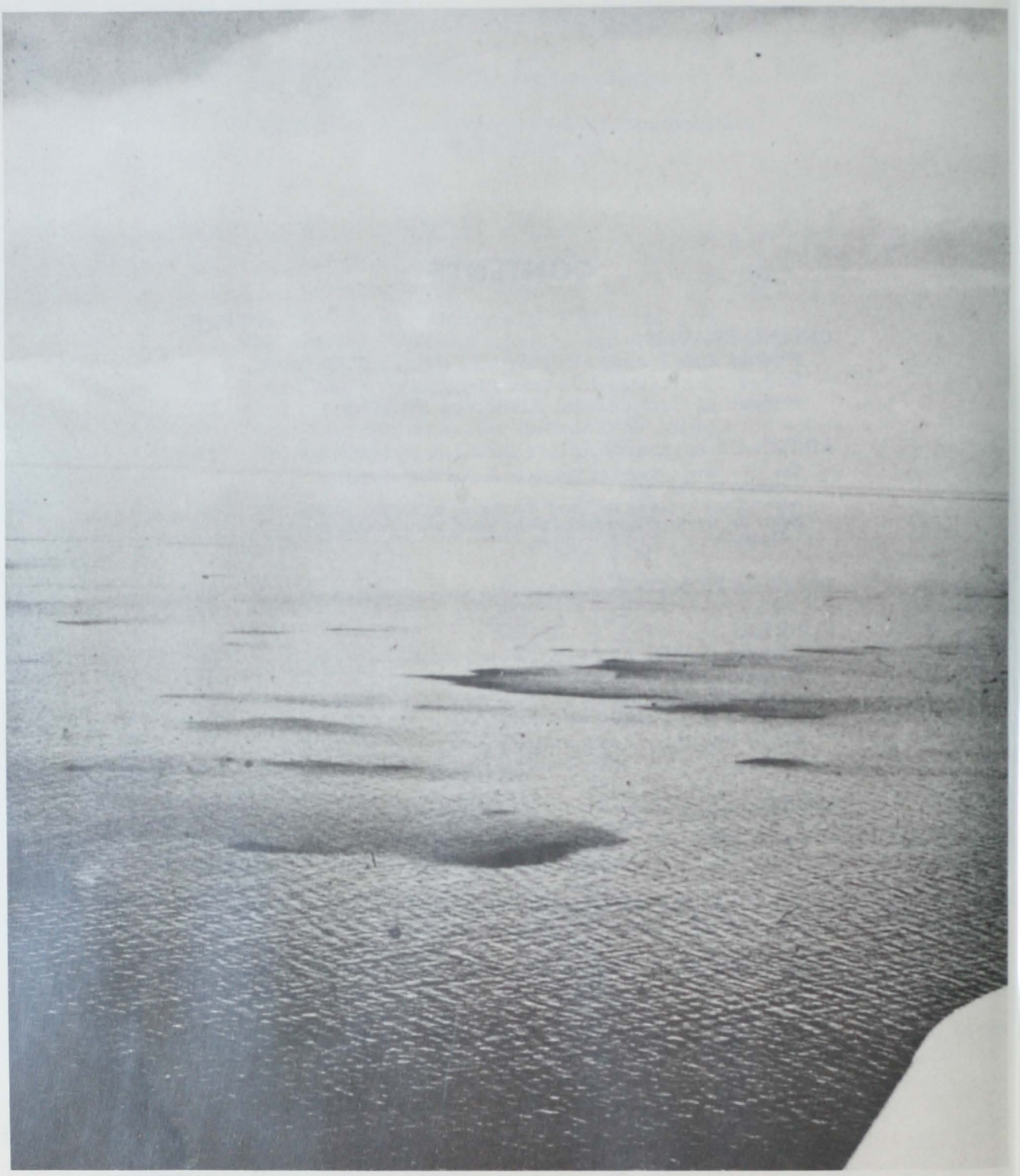


Aircraft photo from 2,500 feet in Jan. 1967 of thread herring schools off West Coast of Florida. Not unusual concentrations for this area. (Photo: Johnny A. Butler.)

WORLD COOPERATION NEEDED TO REALIZE OCEAN'S POTENTIAL, BCF DIRECTOR SAYS

Scientists are developing remarkable technology to understand and exploit the riches of the oceans. But before the full potential of the oceans can be realized to benefit mankind, there must be increased international cooperation and understanding. This was the major theme of the talk by H. E. Crowther, BCF Director, to the Second FAO Technical Conference on Fishery Research Craft, held in Seattle, Washington, May 18-24.

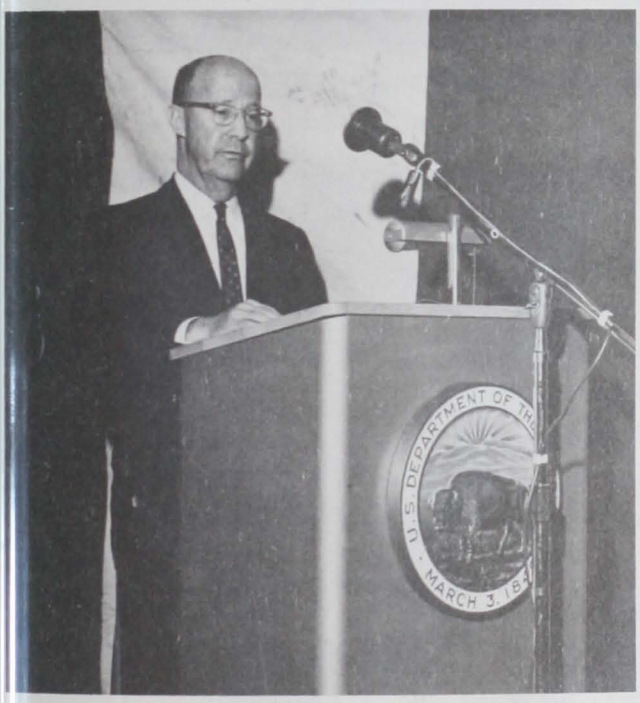


Fig. 1 - H. E. Crowther.

The conference, cosponsored by FAO's Fisheries Division and BCF, was attended by 150 persons from 20 nations. Jan-Olof Traung, Chief of FAO's Fishing Boat section, coordinated the conference.

Crowther recounted the development of research vessels and pointed to other forms of progress becoming visible on the horizon.

The first Food and Agriculture Organization (FAO) Conference on Research Vessels was held in Tokyo in September 1961. Thirty-four delegates from 12 nations exchanged information on design and operation of research vessels--particularly those required for fisheries research. The meeting, Crowther said, "represented the beginning of an unprecedented decade in the history of ocean sciences."

The 7 years since the Tokyo meeting were fat ones. Many nations began to investigate the oceans. More fisheries and oceanographic vessels were designed and built than in any period in history. In 1961, BCF had only one major, new, ocean-going research vessel: the "Albatross IV." Since then, it has added to its fleet the "David Starr Jordan," "Townsend Cromwell," "Miller Freeman," and "Oregon II." Other U.S. agencies have built 30 high-seas oceanographic research and survey vessels that contribute much to fishery development. These vessels can operate anywhere in the world. While the U.S. achievement is impressive--it has been duplicated by many maritime nations.

"Oceanographic Boom"

There has been an "oceanographic boom" in the past 10 years, BCF's Director said, a boom that benefited, at least financially, all sectors of ocean science.

The boom resulted partly from man's curiosity about the unknown and partly from dramatization and popularization of the science

Fig. 2 - David Starr Jordan.

Fig. 4 - Miller Freeman.

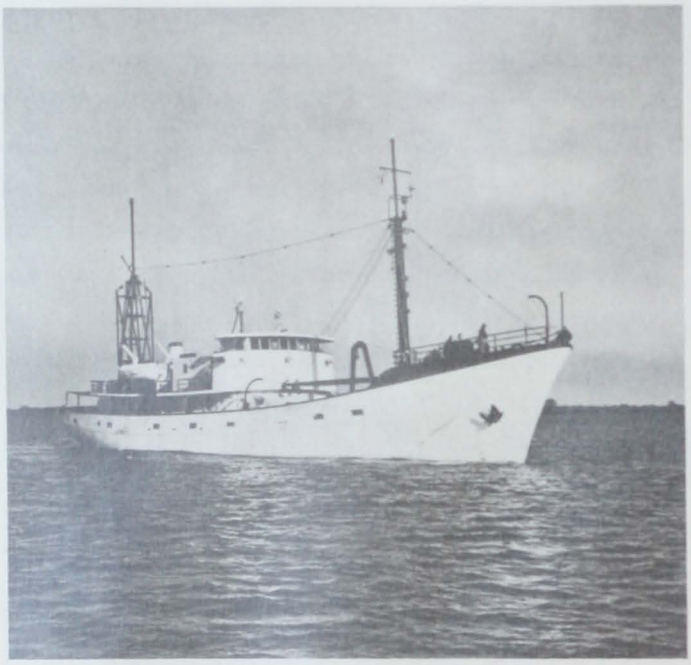


Fig. 3 - Townsend Cromwell.

Fig. 5 - Oregon II.

Newest Major Members of BCF Fleet.

by the news media. But it also resulted from need--the need growing out of "demands for protein to feed a rapidly expanding world population."

Need for Food From the Sea

World fisheries--including "truly high-seas operations"--have grown faster in the past 20 years than in any other period. In 1967, the ocean yielded close to 50 million metric tons of fish and shellfish. Today, fish represent the major source of animal protein for about half the world's population. However, the world population explosion demands ever-greater food production.

Changing Emphasis in Fisheries Research

The questions marine scientists ask today differ from those asked not so long ago, Crowther said. "We are passing from the general descriptive phase of ocean science into a period of specialization." The research requires many new types of platforms. Fishery research vessels must be adaptable to more uses. They must handle complex equipment--operate large nets used by the fishing industry--provide laboratory space and equipment for data storage and analysis--and communication facilities for ship-to-shore transmission of research data.

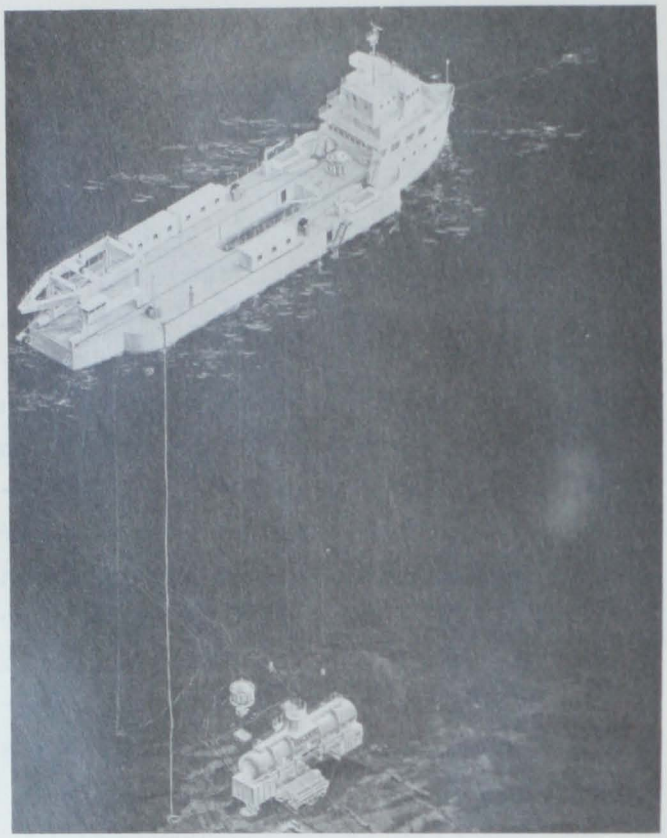
There is a "more applied tone" to marine research today. Scientists are seeking better means to find the ocean's living resources, to determine their numbers, and to extract them efficiently and profitably. They are studying means to predict variations in distribution and abundance of fish in time and space. They are developing procedures to achieve the largest catches in a period of time. They are developing better means of preserving fish and finding new uses for fish.

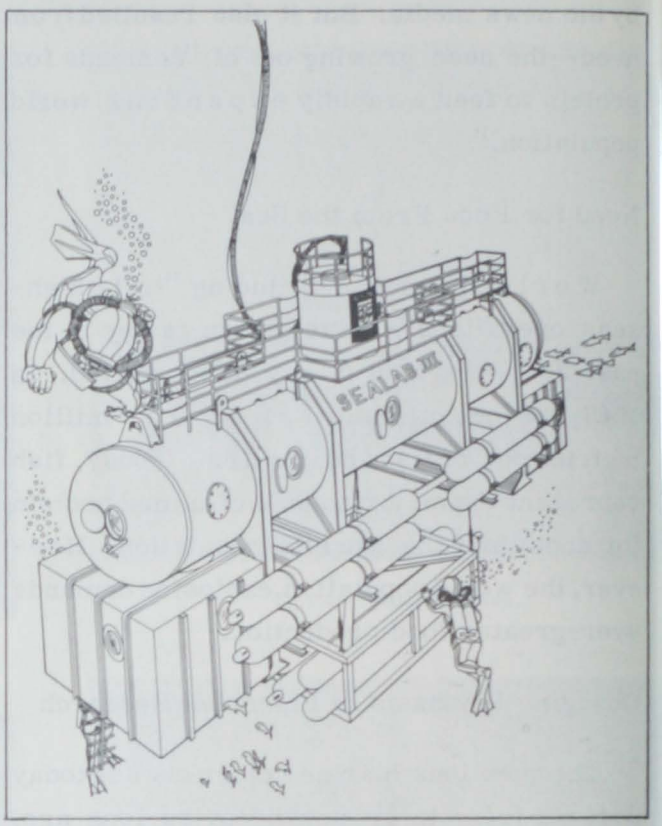
New Research Craft

New research craft have been designed to help the marine scientists. Many are conventional surface vessels for specific missions. But others add a new horizon to observation--the submersibles. Some can operate from surface waters to the greatest depths. In 1961, only a few existed. Now over 20 submersibles belonging to almost every major fishing nation operate in ocean depths between 1,000 and 15,000 feet. They investigate the behavior, distribution, and abundance of sea life--or they investigate the physical, chemical, or geological nature of the ocean and its seabed.

In the future, Crowther added, the research platform will include laboratory facilities built beneath the sea's surface. He outlined the Caribbean project slated for 1969 in which 4 scientists will live and work for 60 consecutive days on the ocean floor while isolated at 50 feet. The site is below the surface of Greater Lameshur Bay in the Virgin Islands National Park. The program involves the U. S. Navy, NASA, Interior Department, and the General Electric Co.

The program has two main purposes: (1) to conduct extensive marine science studies on the sea bottom--emphasizing the behavior and habit of marine animals and how they interact with their environment, and (2) to study the behavior of relatively isolated men under stress in an alien environment. The data can be useful to future underseas missions--and to extended-duration space missions.





Figs. 6 & 7 - Artist's concept of U. S. Navy Sealab III habitat--nonpropelled, seagoing craft with living compartment, diving station, observation room.

Cylindrical habitat is 12 ft. in diameter, 57 ft. long, with 2 rooms, each 8 ft. high and 12 ft. square, attached to bottom of habitat's hull.

Just above habitat is personnel transfer capsule used as pressurized elevator to ferry aquanauts to and from surface and ocean bottom. Both habitat and capsule have helium-oxygen atmosphere pressurized to equal surrounding sea-water pressure.

Starting October 1, 1968, for 60 days, habitat will be underwater base at depth of 430-450 feet off Southern California for 5 teams of 8 aquanauts. Each team will live 12 days under pressure, breathing an artificial atmosphere.

From the Air

Observational platforms have been raised to the skies. Scientists are exploring surface phenomena and near-surface sea life using airplanes and satellites. The achievements of satellites indicate a "possible large payoff in fisheries." Orbiting resource satellites may provide the data scientists need to predict the most promising places for abundant and available resources. Weather satellites are providing data on ocean storms and sea heights needed to route vessels expeditiously to fishing grounds. In the future, part of the job of those concerned with the sea will be done remotely from monitoring or drifting buoys, or remotely controlled subsurface vehicles and facilities.

Today, oceanographers and meteorologists, through the Intergovernmental Oceanographic Commission and the World Meteorological Organization, are planning an Integrated Global Ocean Station System (IGOSS). This system involves the worldwide deployment of ocean buoys and other platforms, such as merchant and fishing vessels, to monitor continuously the ocean surface, subsurface,

and overlying atmosphere. Data will be telemetered automatically to land stations, there to be analyzed and distributed to users, including fishermen. Fishermen may benefit greatly from this system through better weather forecasts and predictions of abundance and distribution of fishery resources.

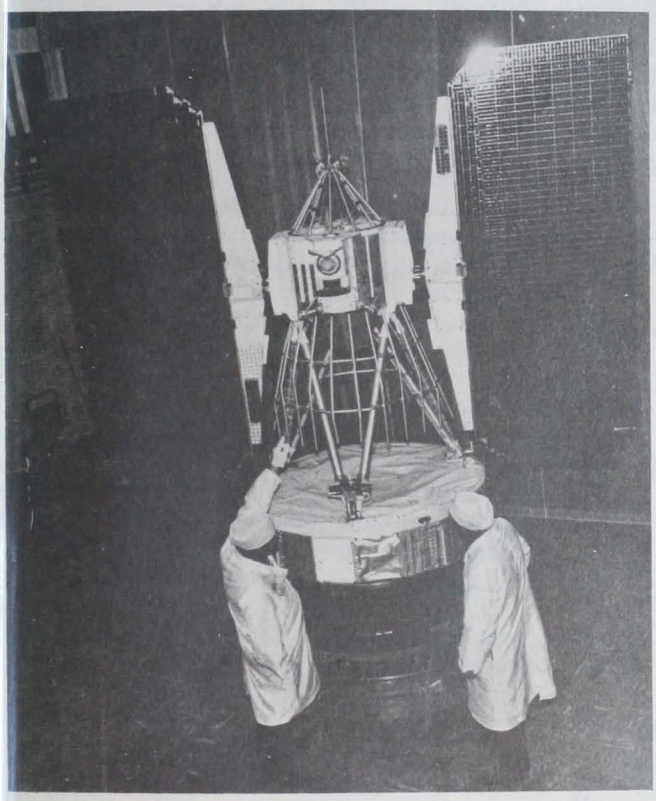


Fig. 8 - Spacecraft technicians check out NASA's 935-pound weather satellite Nimbus II. The large dark panels contain solar-cells that power complex electronic gear.

First NASA satellite to take and transmit directly to ground stations nighttime infrared photos of earth's cloud cover. (Photo: NASA)

The Potential Harvest

The fishery potential of the seas ranges between 200 million and 1,000 million metric tons. These are theoretical potentials based on the ocean's productive capacity. They can be realized only by developing the technology to harvest them--and the understanding of how these resources react to their environment and to man's exploitation. To benefit

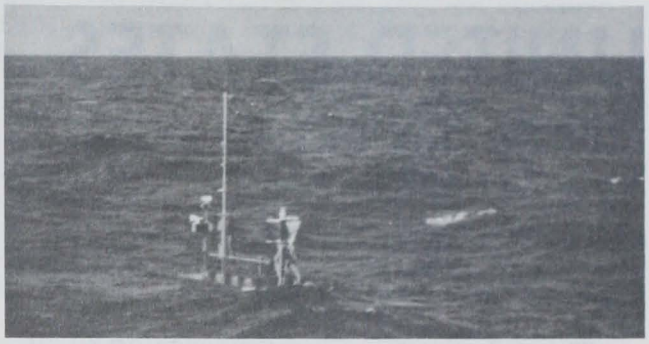


Fig. 9 - NOMAD (Navy Oceanographic Meteorological Automatic Device) buoy transmits data up to 2,000 miles--over standard 100 world-per-minute radioteletype circuits.
(Naval Oceanographic Office)

mankind, the information the scientists gain from the research vessel--and the technology developed to harvest the resources--must be passed on to the producer or processor.

To Benefit Mankind

Crowther stressed the importance of international cooperation to benefit mankind. President Johnson recognized this need, he said, by his proposal to Congress in March 1968 for an International Decade of Ocean Exploration to start in 1970. The full use of new research platforms, harvesting techniques, and the means to manage ocean resources all may be part of the ocean decade.

BCF's Director defined the challenge to the FAO conferees: "History may truly mark the 1970s as the decade in which nations were first able to work and plan together effectively in development and use of ocean resources for the benefit of all mankind. . . . We cannot, however, gauge progress in ocean science solely on the basis of tools we employ. The part or role that they may play in solving world food needs and proper use of the ocean's living resources must be measured in terms of increased ocean yields."

UNITED STATES

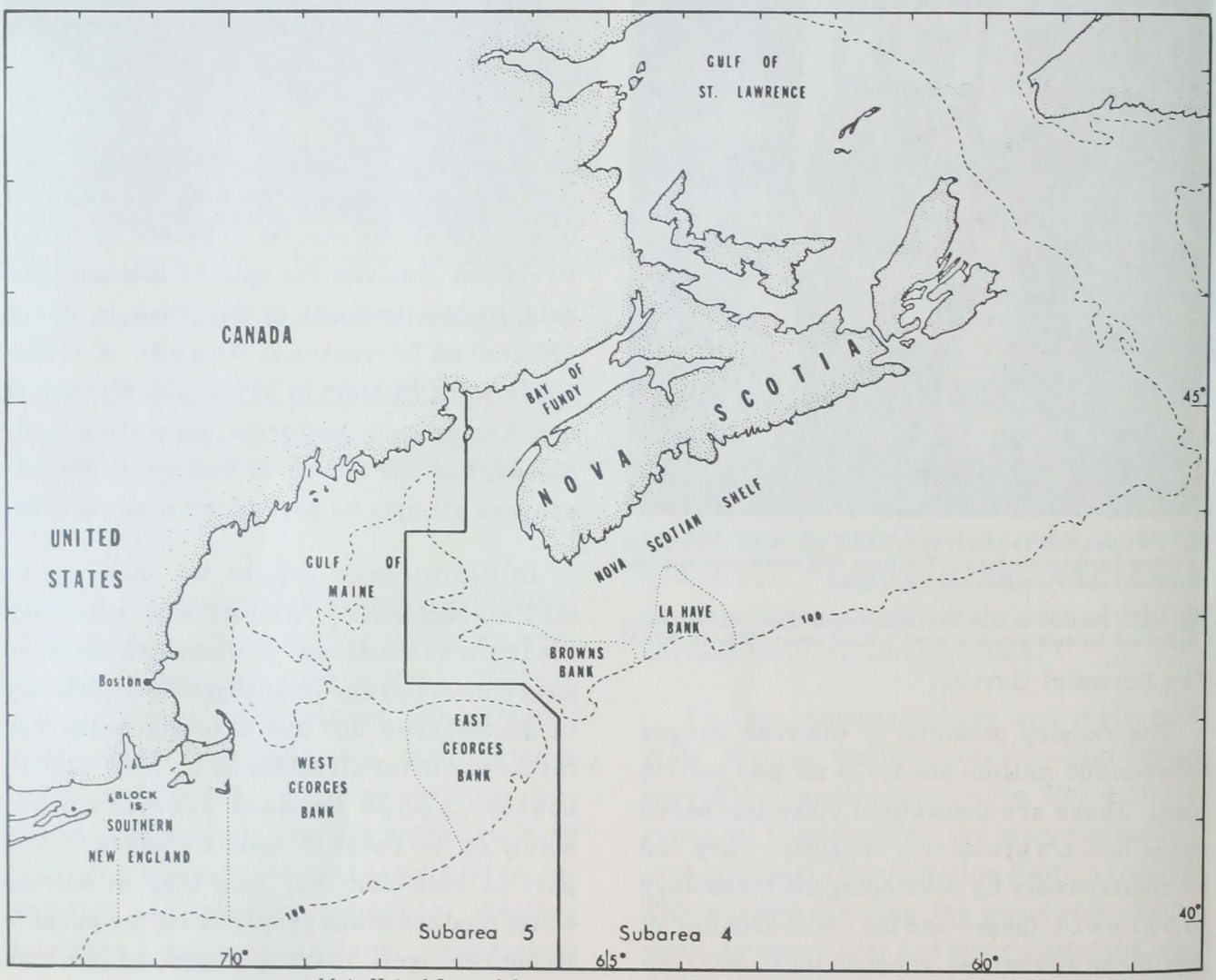
1967 New England Landings Show Ups and Downs

In 1967, New England fleets landed greater amounts of several important species and smaller amounts of others.

This information is contained in "Groundfish and Sea Scallops Fished by New England Fleets," a report by R. L. Schultz and F. A. Dreyer of the BCF Biological Laboratory at Woods Hole, Mass.

HADDOCK

U. S. haddock landings from Georges Bank in 1967 were 76 million pounds, round weight, or roughly 34 percent below the 116 million landed in 1966. Haddock abundance also declined: 8,600 pounds were landed per day fished in 1966 compared to 7,100 pounds in 1967. Lower scrod abundance accounted for this; it decreased from 6,600 pounds per day in 1966 to 4,200 pounds in 1967. Large-haddock abundance increased from 2,100 pounds per day in 1966 to 2,900 pounds in 1967.



Main United States fishing grounds in the Northwest Atlantic.

Age composition of Georges Bank haddock landings shows the shift of age group dominance during 1964-1967. Most noticeable in 1967, relative to other years, was the near-absence of 2- and 3-year-old fish (1964 and 1965 year classes). This was predicted from groundfish surveys in 1964 and 1965. Later surveys found the 1966 and 1967 year classes also very poor. With 4 successive small year classes on Georges Bank, below-average abundance and landings are expected to continue, at least through 1970. The year class failures had a more marked effect on seasonal fluctuations; large haddock were more abundant in the fourth quarter of 1967, but scrod were very low.

Noticeable in fourth-quarter age compositions are the significant numbers of one-year-olds. They were roughly 6 times more abundant than the 10-year average. This contradicts somewhat the research survey prediction of a poor 1966 year class, but faster growth may be responsible. The average length of one-year-olds in the fourth quarter (10-year average) is 36 centimeters. The 1966 year class averaged 39 centimeters in the fourth quarter. This increase in average size apparently is enough to put them into the selection range earlier than normally would occur. However, with the low abundance of scrod, the market demand would be higher. This would create a tendency to land smaller fish and make it more difficult to determine if a real change in growth has taken place.

Browns Bank

U. S. haddock landings from Browns Bank were 3.9 million pounds in 1967 compared to 1.8 million pounds in 1966. This increase resulted from increased scrod abundance. A trend of increasing abundance on Browns should continue until the 1962 and 1963 year classes are fully recruited. No samples were available for age compositions in 1967.

The fourth-quarter 1967 results do not indicate any change in abundance from 1966. The figures are based on less than 100,000 pounds and may not be indicative.

YELLOWTAIL

Yellowtail landings in 1967 were 52 million pounds, almost 18 percent below 1966's 63 million pounds. Yellowtail abundance increased from 4,400 pounds per day in 1966 (Georges Bank) to 5,000 pounds per day in 1967. On Southern New England Grounds (SNE), it increased from 4,500 pounds per day in 1966 to 5,100 pounds in 1967.

Age compositions in 1967 (All Grounds) show the 2- and 3-year-olds in good abundance. This accounted for the increase in overall abundance in 1967. These 2 year classes appear somewhat large relative to other years and should contribute to increasing abundance and landings in 1968.

In fourth-quarter 1967, 2-year-olds were more numerous than usual in Georges Bank landings, but they were less so for Southern New England. This is largely the cause of the quarterly changes in landings-per-day estimates, as fishing effort in 1967 dropped below the levels of 1965 and 1966.

COD

Cod landings by the U. S. from Georges Bank rose from 21.9 million pounds to 23.6 million pounds in 1967. Total U. S. landings increased about one fifth while landings per day dropped slightly.

Quarterly landings per day indicate some degree of increased catch rate in second-half 1967.

REDFISH

Redfish landings by the U. S. from all New England grounds (Gulf of Maine and Georges Bank) were up about 7 million pounds in 1967. Landings per day remained about the same. Redfish landings from the Nova Scotian shelf dropped from 37 million pounds in 1966 to 14 million pounds in 1967. This decline was accompanied by about a 23 percent drop in landings per day. Redfish landings by all countries doubled in 1966 after declining in 1964 and 1965. Redfish landings by the U. S. from the Gulf of St. Lawrence in 1966 were 28 million pounds; in 1967, 34 million pounds. Landings per day increased from 46,000 pounds per day in 1966 to 55,000 in 1967.

SILVER HAKE
(Food Fishery)

The U. S. silver hake food fishery, located principally in the Gulf of Maine and on the cultivator shoals of Georges Bank, declined 28 percent in landings in 1967. Labor disputes and large freezer holdings left over from 1966 were influential. Landings per

day in 1967 for Georges Bank increased slightly. However, abundance in the Gulf of Maine was down about half for the year, and about 80 percent in the fourth quarter.

INDUSTRIAL FISHERY

U. S. industrial landings from New England and Middle Atlantic waters in 1967 were 85 million pounds--about 16 percent below the 102 million landed in 1966. As red and silver hake landings remained about the same in 1966 and 1967, the decline was principally among other species.

Species compositions indicate red and silver hake percentage in the catch was slightly higher in 1967 than in 1966.

The landings-per-day estimate for industrial silver hake (SNE grounds) was 17,000 pounds in fourth-quarter 1967 compared to 8,400 pounds in 1966. This increase in abundance was accompanied by a million-pound increase in landings in fourth-quarter 1967 compared to 1966. Red hake abundance increased from 7,600 pounds per day in 1966 to 21,000 pounds in fourth-quarter 1967; in the latter period, landings of red hake increased 3 million pounds over the 1966 period. Middle Atlantic landings have declined in importance since the Amagansett plant on Long Island was closed.

SEA SCALLOPS

U. S. sea scallop landings for Georges Bank increased 750,000 pounds in 1967, but Middle Atlantic declined by about 50 percent. This lowered total landings by about 5 million pounds. Landings per day on Georges Bank declined slightly for the year--in contrast to the research-vessel index indicating an increase in abundance. Landings per day on the middle Atlantic grounds continue the declining trend evident since 1965.

Contracts to be Awarded for Cleanup of Dead Alewives in L. Michigan

The Department of the Interior will award contracts for leasing 16 fishing boats to net dead alewives in Lake Michigan before they pollute beach waters.

Millions of alewives, small herringlike fish, died in summer 1967.

Plan Of Action

The lake is full of alewives. If the expected die-off occurs, the boats will take the dead fish to docking areas. The fish will be pumped into vehicles supplied by local communities and taken to disposal sites designated by the area authorities.

The alewife program resulted from a Federal-State enforcement conference held in Chicago, Ill., recently to help curb Lake Michigan pollution.

The Department of the Interior has agreed to contribute up to $250,000 for netting the dead fish. The 4 Lake Michigan States--Indiana, Michigan, Illinois and Wisconsin--have been asked to give up to $62,500 each.

Areas Protected

The skimming operation will protect daily 20 miles of shoreline in each State--a total of 80 miles. The areas to be protected include:

Illinois--Chicago area beachfront and waterfront.

Indiana--Gary, Michigan City, and Dunes State Park.

Wisconsin--Milwaukee and Racine-Kenoska areas.

Michigan--Benton Harbor-St. Joseph area and Grand Haven.

A fixed net will be set up off Saugatuck, Mich., as an experiment to determine if this can block dead alewives from being washed ashore.

1967 Great Lakes Production Is Greatest Since 1956

Total commercial fisheries production from the Great Lakes has increased for the third consecutive year. In 1967, U. S. and Canadian fishermen reported 124.8 million pounds, the largest harvest since 1956, and one of the ten highest since 1879, the earliest year of recorded data.

U. S. fishermen took 64.2 percent--80.1 million pounds, 12.3 million pounds over 1966.

The 1967 Canadian catch was 44.7 million pounds, about 3.1 million pounds less than 1966; the bulk of the decline was in Lake Erie. Despite this decline, the total catch was the fifth largest since 1879.

U. S. Alewife Fishery Larger

The increase in U. S. production can be attributed largely to intensification of the alewife fishery in Lake Michigan. The landing of almost 42 million pounds, 12 million pounds above 1966, was the fourth highest of any one species since 1879. Only catches of lake herring in Lake Erie in 1889, 1890, and 1918 were greater.

L. Michigan No. 1

The Lake Michigan catch was almost 57.2 million pounds, 14.4 million over 1966, and a record catch from the lake. Alewives were 73 percent of the catch; chub, 17 percent.

Lake Michigan displaced Lake Erie as the leading producer of fish; its landings exceeded Lake Erie's by about 7.8 million pounds. Excepting one year (1903), Lake Erie had always led the other lakes.

L. Erie Production

Lake Erie catches declined substantially--3.6 million pounds in Canadian waters, and 1.1 million pounds in U. S. waters. Ohio's 1967 catch fell to a record low.

Yellow perch presently accounts for more than half (52 percent) of total landings.

Smelt contributes substantially to the catch in Canadian waters.

The walleye once was a principal species. Average catch by U. S. and Canada from 1945 through 1957 was 5.3 million pounds. The catch has been decreasing steadily; in 1967, it was 1.2 million pounds, nearly 60 percent in Canada.

Lake Superior

In Lake Superior, U. S. fishermen took 454 thousand pounds less than in 1966; Canadian fishermen reported 705 thousand pounds more. Lake herring, formerly very prominent, continues to decline.

Lake Ontario

Both U. S. and Canadian fishermen reported increased catches in Lake Ontario--40 thousand and 179 thousand pounds, respectively. Today, white perch makes up bulk of the catch. It has increased steadily. Whitefish, formerly the dominant species, now is almost nonexistent.

Lake Huron

U. S. and Canadian fishermen in Lake Huron also reported decreased catches--558 thousand and 346 thousand pounds, respectively. The decrease is attributable primarily to smaller landings of chubs.

Catfish Farmers Form Trade Group

Fish farmers of 8 states have formed a trade association: "Catfish Farmers of America." Meeting in Greenville, Miss., April 29-30, the farmers from Arkansas, Alabama, Louisiana, Oklahoma, Mississippi, Texas, Georgia, and Tennessee developed by-laws for the new association and set its goals: 1) to promote the "image" of pond-cultured catfish and to improve opportunities for selling them profitably; 2) give the farmers a common voice in dealing with Federal and state governments to achieve better relations; 3) to set up a trade journal that will provide good communication within the industry. In the beginning, "American Fishes Magazine" will be used.

Each farmer who joins the association will be assessed annually $1 per acre in fish production. The maximum per member is $500, the minimum $25.

Blue Crab Deaths Increase in S. Carolina-Georgia Area

During spring 1966, 1967, and 1968, greater than normal numbers of dead and dying blue crabs were reported from the S. Carolina-Georgia area. Scientists from BCF's biological laboratory at Oxford, Maryland, are working with Robert Lunz, director of Bears Bluff Laboratories in S. Carolina, to determine the cause.

In mid-May, microscopic examinations of crab samples showed an infestation of an amebic parasite thought to be the cause of "grey crab disease."

BCF scientists will continue to work with state scientists on this problem.

1968 Import Quota for Tuna Canned in Brine

The quantity of tuna canned in brine that may be imported into the U. S. during 1968 at the 11-percent rate of duty is limited to 66,985,048 pounds. This is about 3,189,764 standard cases of 48 7-oz. cans. The limit is about 3.6 percent less than the 69,472,200 pounds (about 3,308,200 cases) in 1967; 2 percent over 1966's 65,662,200 pounds (about 3,126,771 cases); 1.4 percent greater than the 66,059,400 pounds (about 3,145,685 cases) in 1965; and 10 percent over the 60,911,870 pounds (about 2,900,565 cases) in 1964.

22% Duty Above Limit

Any imports of tuna canned in brine over the 1968 quota will be dutiable at 22 percent ad valorem under item 112.34, Tariff Schedules of the U. S.

The 1968 quota is based on the U. S. pack of canned tuna during the preceding calendar year (1967), as reported by the U. S. Fish and Wildlife Service.

First Quarter Imports

U. S. imports of tuna canned in brine during Jan. 1-Mar. 30, 1968, were 14,616,675 pounds (about 696,032 standard cases). These are preliminary data of the Bureau of Customs, U. S. Treasury Department.

2nd Boston Fish Expo Set for October

The second American Commercial Fish Exposition will be held in Boston, Mass., October 16-19, noon-6 p.m. The new location is the War Memorial Auditorium at the Prudential Center. Preparations for parking, registration, and hotel accommodations are well advanced.

Larger Affair

The first Expo last year was limited to the trade. It drew over 17,000 registrants. This year's is expected to be an altogether larger show.

Information may be obtained from: Second American Commercial Fish Exposition, Inc., 3 School Street, Boston, Mass. 02108, phone 742-0334.

GULF AND CARIBBEAN FISHERIES INSTITUTE ANNUAL MEETING

The 21st Annual Meeting of the Gulf and Caribbean Fisheries Institute will be held at the Hilton Plaza Hotel, Miami Beach, Fla., Nov. 17-21, 1968.

The Institute has issued a call for papers on the following topics: "industry problems related to labor, sanitation standards and inspection; culture of marine animals; international use of high seas resources; and Caribbean fisheries." Papers with a title and an abstract will be considered for inclusion on the program. These should be sent to the Executive Secretary, Gulf and Caribbean Fisheries Institute, 1 Rickenbacker Causeway, Miami, Fla. 33149. Presentation time for all papers is strictly limited to 20 minutes, followed by a discussion period. Manuscripts will be published in the Institute's annual "Proceedings" and may be longer than the version presented orally.

The Institute is a membership organization; the scientific membership fee is $5 per year, the industrial membership fee $25. Membership may be obtained prior to the meeting, or upon registration. Also, a registration fee of $15 is charged for attendance at the annual meeting.

The International Game Fish Conference will hold its 13th Annual Meeting, Nov. 22 and 23, immediately after the Institute's.

OCEANOGRAPHY

'Uses of the Seas' Is Theme of 'American Assembly'

"In the last third of the 20th century, the sea offers new horizons to government policy and to private business, to the scientist and to the lawyer, to the sailor and to the shore-bound, to the miner and the fisherman, to the strategist and economist, to the old seafaring nations and to the newcomers among the 100-odd states which border the oceans." This statement introduces the final report of the 33rd American Assembly, which met at Arden House, Harriman, New York, May 2-5.

The American Assembly, an affiliate of Columbia University, was established by Dwight D. Eisenhower in 1950. It conducts nonpartisan meetings and publishes books illuminating important issues of U. S. policy.

The 33rd Assembly was attended by 72 persons from the fields of science, engineering, business, government, law, communications, and religion. They reached general agreement on a final report. Most of their recommendations appear below.

Peaceful Uses

In the peaceful uses of the sea during the next 10 years, the "primary interest will be in the harvest of food and in minerals." The Assembly recommends that in planning to exploit the seas high priority be given to living resources.

The yearly harvest of fish and shellfish is over 55 million tons. It can be quadrupled without exhausting fish stocks--if international conservation is practiced. Through fish protein concentrate (FPC) and other food products, the sea could contribute significantly to providing high-quality protein to a world population of 5 billion persons. Aquaculture can expand marine produce--especially shellfish of higher commercial quality.

Minerals

The most valuable minerals will continue to be oil and gas; already, over one sixth comes from offshore wells. The continental shelf and slope probably will provide the largest new reserves. "Within ten years all these reserves will probably be technologically, if not economically, exploitable."

Weather & Oceanic Forecasting

Improved knowledge of the interaction between atmosphere and sea offers the prospect of much better weather and oceanic forecasting. It offers too the possibilities of modifying weather. "Any unilateral action for major climate modification should be subject to international control," the Assembly suggests.

Decade of Ocean Exploration

The Assembly supports President Johnson's call for an International Decade of Ocean Exploration: It believes: "Given the expanding prospects at sea, it is urgent to take measures to accommodate competing uses, to promote conservation, to refine the laws, to negotiate the appropriate international agreements, and to create international machinery to assist in the scientific investigation of the seas and in orderly development of sea resources."

Military and peaceful uses can conflict. Also, civil uses can be incompatible; as, for example, mining and fishing in the same areas. Resolving such conflicts requires more urgent attention on national and international levels. "The ominous problem of pollution must be similarly attacked."

Law of the Seas

It is necessary to redefine the width of the territorial sea and of the continental shelf. A "new and certain law for the deep ocean floor" should be developed to forestall unilateral national action and "undesirable precedents."

The Assembly proposes that:

- The territorial sea should be as narrow as possible. It might be up to 12 miles, provided freedom of passage through all international straits is assured.
- The deep sea bed should not be subject to "national appropriation by claim of sovereignty."
- There should be early international agreement on new management of the deep sea bed to encourage exploration and exploitation.

• The legal concept of the continental shelf in the 1958 Geneva Convention should be redefined. It should eliminate as unworkable the clause giving coastal nations sovereign rights to mineral resources in adjacent areas beyond the 200 meter depth, wherever these resources can be exploited.

• The redefined shelf should be "narrow, not wide, preferably not beyond the 200 meter depth."

• Until revised, the U. S. should announce its intention not to claim permanent exclusive rights to natural resources of the sea bed beyond the 200 meter depth. The U. S. would go on issuing licenses to exploit adjacent areas beyond that depth. But this would be subject to the condition that it would transfer to an international body that might be established for the resources of the deep sea bed any licenses in areas subject to that body. The U. S. should urge other nations to do the same.

The U. S. should support the creation of international body within the United Nations responsible for the exploitation of nonliving resources in the deep sea floor. This body might:

--issue licenses and regulate agreed activities;

--collect an agreed share of revenues for international purposes, including aid to developing nations;

--refer disputes to international arbitration or adjudication;

--encourage research, exploration, and investment.

Living Resources

Concerning the seas' living resources, the Assembly is convinced that stronger regulatory machinery "is urgently required to avoid economic and physical wastes such as occur in current fishing practices." It should include "management of the harvesting and farming of such resources."

Coastal Zones

Concerning fishing in coastal zones, the U. S. should seek a new international agreement on territorial waters to hold the boundary for exclusive fishing rights as close as possible to coast lines. Incentives should be provided for coastal nations to limit their exclusive fishing rights to 12 miles.

Organization of U. S. Marine Policy

The Assembly recognizes several critical factors in U. S. Government organization for marine policy:

• An important first step toward adequate organization was Public Law 89-454. It created an interim National Council on Marine Resources and Engineering Development to implement and improve ocean policy. It set up a Presidential commission to make recommendations for the future.

• There are too many government agencies and their activities are too dispersed.

• Private investment must be encouraged, along with strengthening Government machinery.

• The importance of the international dimension in ocean affairs requires improved formulation of U. S. policy.

Goals Worth Achieving

The Assembly concludes: "The stakes at sea are high and a commensurate investment might be several times higher than the one half billion dollars which the federal oceans program now receives annually from the Congress.

"The Assembly believes that the growth of international cooperation on and in the seas will strengthen the world economy and build the peace. It is convinced that Americans should begin thinking about the oceans as a major concern, somewhere in the scale which includes outer space, urban problems, transportation, public health, foreign aid, and the world population explosion."

Nautical Charts for Texas Intracoastal Waterway

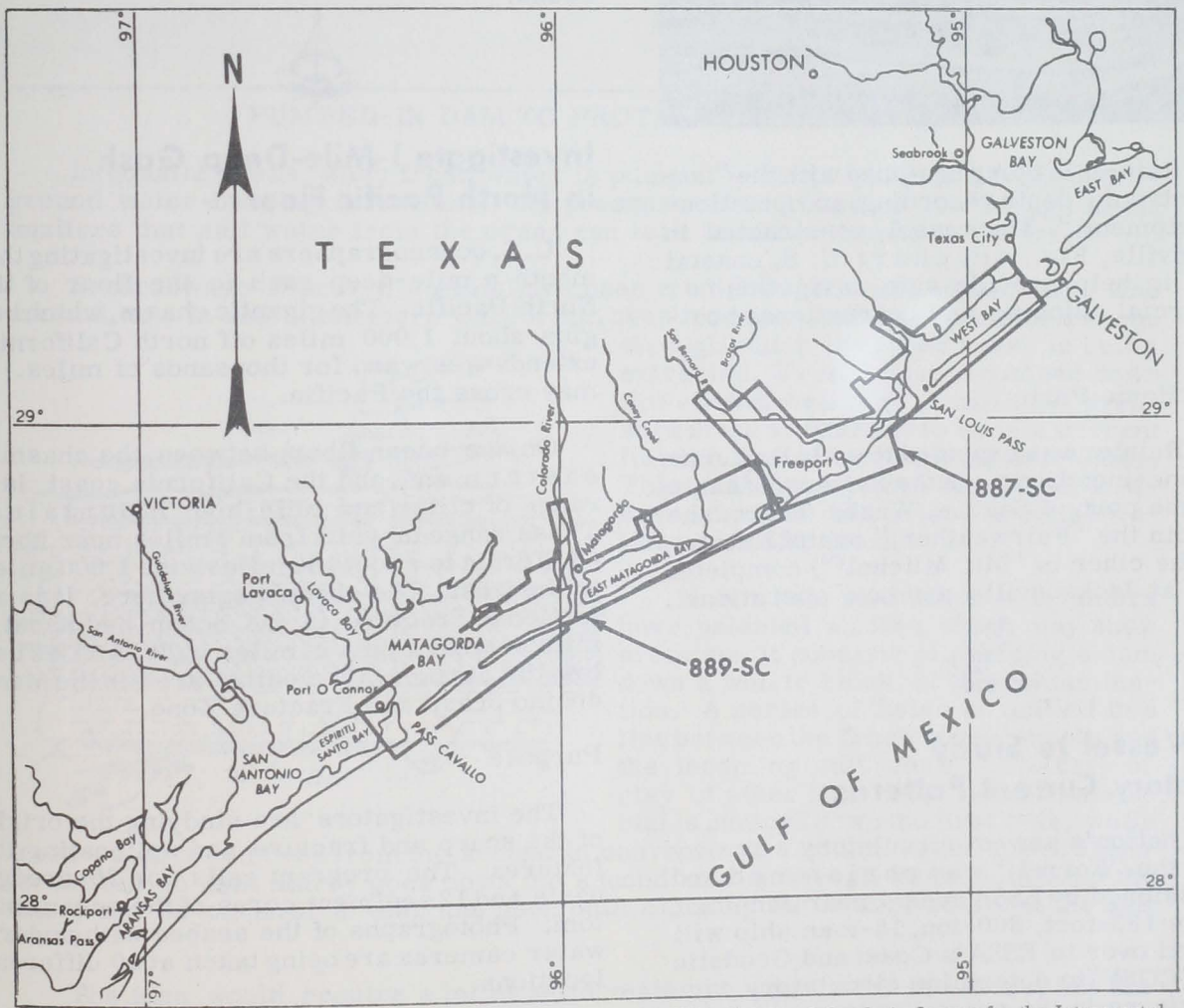
Two new small-craft nautical charts covering key sections of the Gulf Intracoastal Waterway in Texas have been published by the Coast and Geodetic Survey. The accordion-folded charts are part of a series designed to span the giant half-circle of the Gulf Coast. They bridge 2 of the Nation's busiest commercial and recreational boating areas, Galveston and Matagorda bays.

120 Miles Covered

When joined, the charts cover about 120 miles of the Gulf's Intracoastal Waterway for commercial shipping and recreational boating. The waterway was improved to a controlling depth of 12 feet. It carried more than 71½ million tons of commerce by barge and small freighters in 1964. The traffic exceeds original estimates by 500 per cent--and is still expanding. The new charts (887-SC and 889-SC) include topographic features based on 1965 and 1967 aerial photography by the Coast and Geodetic Survey.

New information benefits the more than 223,000 recreational boaters registered by the state in 1967.

The charts were produced at the scale of 1:40,000. They may be purchased for $1.50 each from Coast and Geodetic Survey nautical chart agents, or from the Coast and Geodetic Survey (C44), Rockville, Md. 20852.



Area covered by two new small-craft nautical charts issued by the ESSA Coast and Geodetic Survey for the Intracoastal Waterway in Texas.

'Rainier' Is 14th Vessel in Coast & Geodetic Fleet

A 231-foot, 1,627-ton vessel--the "Rainier"--has become the 14th hydrographic and oceanographic survey vessel operated by the Coast and Geodetic Survey (CGS). GCS is part of the Environmental Science Services Administration (ESSA) of the U. S. Department of Commerce.

The Rainier is being equipped with the "latest electronic, depth recording, and positioning equipment." The vessel, constructed in Jacksonville, Fla., will chart U. S. coastal waters to help provide safe navigation for commercial shipping and recreational boating.

Seattle Home Port

The Rainier was expected to sail about June 4 on a one-month trip via the Panama Canal to her home port of Seattle, Wash. There she would join the "Fairweather," one of 2 sister ships (the other is "Mt. Mitchell") completed earlier at Jacksonville and now operational.

ESSA Vessel to Study Circulatory Current Patterns

The nation's newest circulatory survey vessel, the "Ferrel," was christened and commissioned by ESSA June 4 near Jennings, La. The 133-foot, 300-ton, 16-man ship will be turned over to ESSA's Coast and Geodetic Survey (CGS) "to determine circulatory current patterns in the coastal and estuarial waters of the east and gulf coasts." She is the first vessel built in U. S. specifically for such work. She will operate with a 59-foot auxiliary buoy tender. Home port for Ferrel and tender is Norfolk, Va.

The Ferrel will be base ship for the TICUS (tidal and current survey) system developed by CGS. She will receive telemetered information from TICUS buoys, tend buoy systems, and transport equipment from site to site.

The Ferrel was named after Professor William Ferrel, a 19th century pioneer scientist. He contributed much to the knowledge of tidal phenomena.

The Ferrel cost $690,000. She will carry 15 buoys and 48 sensors. Her first assignment will be in Louisiana waters near New Orleans. She will continue an earlier survey to determine the circulatory pattern of currents in the Mississippi River-Gulf Outlet Canal, Chandeleur Sound, and Breton Sound.

Investigate 1-Mile-Deep Gash in North Pacific Floor

U. S. oceanographers are investigating this month a mile-deep gash in the floor of the North Pacific. The gigantic chasm, which begins about 1,000 miles off north California, extends westward for thousands of miles. It may cross the Pacific.

On the ocean floor, between the chasm's eastern end and the California coast, is a range of cliffs and mile-high mountains. These range in width from 4 miles near north California to about 100 miles wide 1,000 miles to the west. The chasm begins here. It is an immense fracture in the ocean bed about 1 mile deep and tens of miles wide, 3 miles below the surface. The entire area is the Mendocino Scarp and Fracture Zone.

Purpose

The investigators are studying the origin of the scarp and fracture and delineating its features. The program calls for 20 dredge hauls and 12 sediment cores of the ocean bottom. Photographs of the seabed with underwater cameras are being taken at 20 different locations.

The investigation is being conducted from ESSA's USC&GSS "Oceanographer," a Seattle-based electronically equipped oceanographic survey vessel.

Book Answers 100 Questions About the Oceans

A 120-page, $5\frac{1}{2}$x$8\frac{1}{2}$-inch book that answers 100 "Questions About the Oceans" has been issued by the National Oceanographic Data Center (NODC), which is managed by the Naval Oceanographic Office.

The questions include: "What is green scum?" "Why is the ocean salty?" "What is the hydrologic cycle?" "What causes the hydrogen sulfide concentration at the bottom of the Black Sea?" "What universities and colleges have oceanographic courses?" "Who hires oceanographers?" Many questions are illustrated, some humorously. Each answer contains a guide to further reading.

Brief & Clear Answers

The publication was written by Harold W. Dubach, NODC Deputy Director, and Robert W. Taber, (Acting) Director of NODC's Quality Control Division. They selected the questions from thousands about oceanography and answered each briefly and in language secondary school students can understand.

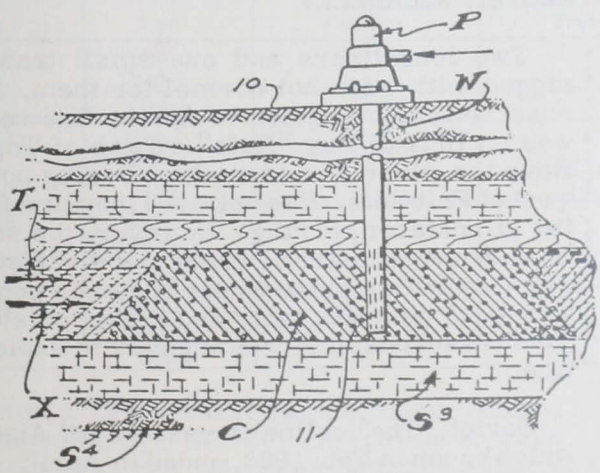
A paperback copy of "Questions About the Oceans" is available for $.55 from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Correction: In May CFR, p. 9, caption under U. S. Navy's vessel "Kane" should have read: "USNS" not "USGS".

PUMPED-IN DAM TO PROTECT FRESH WATER

In coastal areas, when fresh water is pumped in large quantities from underground water-bearing formations, the pressure often becomes low enough in the aquifers that salt water from the ocean can leak in and contaminate the fresh.

Several ways of preventing this have been tried, but with limited success. One method, now in use in southern California, uses a second well in addition to the one through which the fresh water is being extracted. Fresh water is pumped down this second well both to maintain pressure in the aquifer and to keep a current flowing against the incoming salt water. This is obviously less than ideal, however, since the whole idea is conservation of limited fresh water.



Now a pair of California inventors have patented an idea which may show promise: It consists of pumping a dam down a well to block off the contamination. A series of holes is drilled in a line between the fresh water supply and the incoming salt water. A slurry of clay of other non-water-soluble material is pumped down the first hole, while fresh water is removed from the second in conventional fashion. Then the process is shifted so that slurry goes down the second hole and fresh water comes up the third, and so on until a wall has been built blocking the aquifer off from the salt water.

The idea would require a lot of solid material, admits the inventors, but the drilling mud used in oil wells provides an obvious source. Its use would also relieve the oilmen of the cost of disposing of it. (Reprinted, with permission from "Science News," weekly summary of current science, copyright 1966 by Science Service, Inc.)

Foreign Fishing Off U. S. in April

OFF ALASKA

Japanese: Between 130 and 135 Japanese vessels fished off Alaska through April--20-25 more than in late March. The increase was due to arrival of another factoryship in eastern Bering Sea, more reefers and cargo vessels, and a slight increase in independent trawlers.

The factory trawlers in Pacific ocean perch fishery in Gulf of Alaska increased from 6 to 7 in early April and remained at 7 through month. During first-half April, the 7 were scattered off southeast Alaska, on Fairweather Ground, and on Yakutat grounds in eastern Gulf. About mid-month, 5 vessels shifted to Middleton Island grounds in Central Gulf; in late April, the same 5 shifted farther west in central Gulf to Albatross Bank and Chirikof Island area. Between 7 and 10 independent factory trawlers (500 to 3,500 gross tons) fished for perch along 100-fathom curve in eastern and central Bering Sea through April. The primary area was along curve from just south to just northwest of Pribilofs. The factoryship "Chichibu Maru" replaced the factoryship "Meisei Maru No. 2" in central Bering Sea in early April and assumed the latter's 7 trawlers. This fleet fished along 100-fathom curve northwest of Pribilofs through April, presumably for ocean perch.

The factoryship fleets engaged in minced fish meat and fish meal production in eastern Bering increased from 3 to 4 in early April when the fourth, with 16 trawlers, arrived. All 4 fleets concentrated on Alaska pollock grounds north of Fox Islands in eastern Aleutians during most of April; but at month's end, 3 fleets had moved to Continental Shelf north of Unimak Island in eastern Bering.

The two crab factoryships, accompanied by 16 vessels, remained on Continental Shelf north of Alaska Peninsula in eastern Bering. In late April, however, 4 tangle-net setters were reported near Pribilofs. In 1965 and 1966, one fleet and, in 1967, both fleets shifted to Pribilofs in late May and early June. The 4 net-setters in Pribilof area in April meant fishery again will be shifted there--but earlier than previously. This early movement presumably is due to fact that Japanese crab fleets, like Soviet, are catching predominately tanner rather than king crab on Continental Shelf north of Alaska Peninsula. Unlike Soviet, however, the Japanese fleets, besides fishing tangle-net gear, also are fishing pots, which are more selective for tanner crab. One fleet reportedly was using 4,000 tanner crab pots, 400 larger pots designed for king crab, and 600 medium dual-purpose pots--and carrying a full complement of tangle-net gear. The other fleet was using principally tangle-net gear, but it also was working 500 tanner crab pots and 200 larger pots for king crab. In early April, the first fleet's average daily catch was reported between 20 and 60 metric tons, 90 percent tanner. The other's production in early April was 3,900 cases of king and 1,500 cases of tanner. Although only 28 percent of cases packed by this fleet consists of tanner crab meat, about an equal number of king and tanner crab was caught. Because tanner are smaller, more are needed to produce a case.

During April, at least 10 long-liners fishing for sablefish were active off Alaska--all in eastern Gulf of Alaska. The number varied from 3 to 6. Observations of one long-liner indicated it may be using diver gill nets, fished just off ocean floor, rather than long-line gear. This gear was used by Japanese in Gulf of Alaska in 1963; the catches were almost entirely sablefish.

Two long-liners and one small trawler, rigged with gear not normal for them, were observed in Bering Sea in April. One vessel was on Bristol Bay "flats" south of Togiak Bay; the other two in central Bering northwest of Pribilofs. It is believed they are fishing gill nets for herring. However, the small trawler in the central Bering had a variety of gear, including glass floats and crab pots; it was equipped with table and roller on stern. This vessel possibly was engaged in exploration.

Soviet: The decline in vessels off Alaska, which began in Feb. 1968, ended in April. The number remained over 70 through month, with considerable weekly fluctuations.

The Pacific ocean perch fishery (6 vessels) was confined to Aleutians through April. By mid-April, when flounder fishery in eastern Bering had disbanded, this fleet increased to about 12 medium trawlers supported by 2 refrigerated carriers. It continued at that level through month.

The shrimp fishery on Portlock Bank just east of Afognak Island in central Gulf of Alaska continued at increased level through April. The two "Zakharov"-class canning factoryships remained, as in March 1968; but in early April, medium freezer trawlers increased from 15 to about 20.

Flounder fishing in eastern Bering, which began to decline in March, was discontinued in mid-April.

In early April, trawlers north of eastern Aleutians switched emphasis from deep-water trawling for sablefish and turbot to trawling along Continental Shelf edge for groundfish; these consisted mostly of pollock, flounders, perch, gray cod, and sablefish. By mid-month, fishery was extended along Continental Shelf edge into central Bering; and, operating between Unimak Pass to well northwest of Pribilofs, were over 20 trawlers and 1 to 3 refrigerators. By end of April, fleet was concentrated in 2 areas: north of eastern Aleutians near Unimak Pass (5 vessels) and along 100-fathom curve in central Bering northwest of Pribilofs.

erated off U. S. Pacific Northwest during April. The stern-trawler concentrated on ocean perch and appeared doing well. A single haul off Oregon appeared to be about 14,000 pounds of ocean perch, the largest single haul seen taken by this vessel.

Soviet: 54 different fishing and support vessels were sighted. In March 1968, only about 20 such vessels were sighted off Washington and Oregon. The number increased rapidly each week during April until it reached peak of 39 in fourth week (see table). This indicated beginning of Pacific hake season.

By type, the 54 were: 12 stern factory and freezer trawlers; 29 medium trawlers; 10 processing and support vessels; and 3 research vessels. The mix is similar to previous years with one exception: a few more stern trawlers in 1968.

Most fishing was off Washington until about mid-April, when entire fleet concentrated off Oregon (see table).

Catches in first part of April off Oregon and Washington appeared mostly Pacific

Soviet Fishing Vessels Sighted Off U. S. Pacific Northwest in April 1968

Week Ending	Area	Type of Vessel					
		Medium Side Trawlers	Stern Factory Trawlers	Support Vessels	Research Vessels	Tugs	Total
Apr. 4	Wash.	10	-	3	-	1	14
	Oregon	2	3	-	-	-	5
	Total	12	3	3	-	1	19
Apr. 11	Wash.	7	1	6	1	1	16
	Oregon	5	4	0	0	0	9
	Total	12	5	6	1	1	25
Apr. 18	Wash.	-	-	-	-	-	-
	Oregon	18	8	5	2	1	34
	Total	18	8	5	2	1	34
Apr. 25	Wash.	-	-	-	-	-	-
	Oregon	18	10	8	1	2	39
	Total	18	10	8	1	2	39

Two Zakharov-class canning factoryships, accompanied by 7 net-setting trawlers, were active in king crab fishery on Continental Shelf in eastern Bering through April. As previously, the fishermen were using only tangle nets; however, this year their catches consist also of tanner crab. King crab catches prevailed in previous years; this year, the proportion of tanner was at times as high as 90-95 percent of total crab catch.

OFF PACIFIC NORTHWEST

Japanese: Two vessels, one a stern-trawler and the other a support vessel, operated off U. S. Pacific Northwest during April. The stern-trawler concentrated on ocean perch and other rockfish. During latter part, when hake began running off Oregon, catches up to 10,000 pounds per drag were observed.

Research vessels of Pacific Institute for Fisheries and Oceanography (3 medium trawlers) were sighted. At least 2 probably were searching for fish concentrations to aid the fleets.

OFF CALIFORNIA

Soviet: During 2 surveillance flights, 6 vessels were sighted on April 3, about 16

miles off Farralon Islands; 13 vessels on April 19 off northern California. Estimated number of vessels off California during April was about one dozen. Most were stern factory trawlers.

Research Vessel Takes Supplies At Los Angeles: On April 18, the research vessel "Druzhnii" of Soviet Pacific Institute for Fisheries and Oceanography received permission to enter Los Angeles harbor (see fig. 1) to obtain 100 tons of drinking water and 140 tons of diesel oil. The vessel had departed Vladivostok on Feb. 25 and was headed for Central Equatorial Pacific to conduct oceanographic research.

IN GULF OF MEXICO AND OFF SOUTH ATLANTIC

No foreign vessels were sighted fishing off U. S. Atlantic coast south of Cape Hatteras (including off Florida) or off U. S. Gulf of Mexico coast.

IN NORTH ATLANTIC

An estimated 240 vessels--Soviet, Polish, East German, and Japanese--were sighted in North Atlantic off U. S. coast. This was 70 over the March 1968 number. Soviet vessels were most numerous; judging from weekly surveillance, Soviet fleet averaged an estimated 120.

Fig. 1 - On April 18, 1968, Soviet research vessel "Druzhnii" ("The Friendly One") enters Port of Los Angeles (San Pedro Bay) for fuel and provisions. (Photo: Putnam, Calif. State Fish and Game Commission.)

Aid to Soviet Fishermen: On April 26, 2 stern factory trawlers were granted permission to enter Drakes Bay. The "Revolutsioner" reported to U. S. Coast Guard that 2 crew members were injured and asked permission to enter U. S. territorial waters to rendezvous with "Tikhvin", which had a physician aboard. Later in day, the emergency medical evacuation of a seaman was requested. Diagnosis: compound fracture of nose.

In all, 188 individual Soviet vessels were sighted and identified; this compares with 125 in March 1968.

Thirty-seven Polish vessels, 5 East German side trawlers, and 2 Japanese stern trawlers also were sighted.

Widespread and frequent shifting of foreign fleets between Georges Bank and off U. S. mid-Atlantic necessitated coordination of

flights with First, Third, and Fifth Coast Guard Districts.

IN NORTHWEST ATLANTIC

Soviet: Early in April, about 30 Soviet vessels were dispersed along Continental Shelf from Block Island (R. I.) to Nantucket Island (Mass.). By mid-month, number declined briefly when fishing shifted to waters off New York and New Jersey. Later, about 70 returned and fished south of Nantucket and on south-west slopes of Georges Bank. The limited catches visible on deck appeared mostly herring, with some whiting and red hake.

OFF MID-ATLANTIC

Soviet: Through April, 100 or more vessels (mostly medium trawlers and support ships) fished primarily off New York and New Jersey and intermittently off Virginia Capes.

Early in month, about 75 vessels were 40-50 miles south of Moriches Inlet, L. I. Heavy-to-moderate catches observed were herring. By mid-month, an estimated 100 vessels were concentrated about 60 miles south of the Inlet. (See fig. 2.) Limited catches were primarily herring, but several stern trawlers appeared taking red hake. During first-half April, 25 to 30 vessels were off Virginia.

In last 10 days of April, frequent reports from U. S. fishermen at New York and New Bedford, Mass., indicated 50 to 60 vessels taking scup near Hudson Canyon south of Long Island. U. S. fishermen also reported taking in their trawl nets large amounts of scup and herring heads discarded by Soviet vessels processing the fish.

Polish: Early in April, about 20 vessels were 35 miles east of Barnegat Lightship off New Jersey. By mid-month, 30 vessels fished south of Long Island. Moderate catches of herring were seen.

East German: Four vessels arrived off southern New England and New York during second half of April. They were fishing for herring 17 to 23 miles south of Shinnecock Inlet (L. I.) and off Block Island (R. I.).

Japanese: Late in April, 2 stern trawlers were sighted near Hudson Canyon. The area has good whiting and red hake resources. Japanese sources report one trawler has taken about 200 tons, primarily butterfish, mixed with squid and other species. On April 30, one vessel was sighted 70 miles south of Block Island (R. I.). No catches were observed.

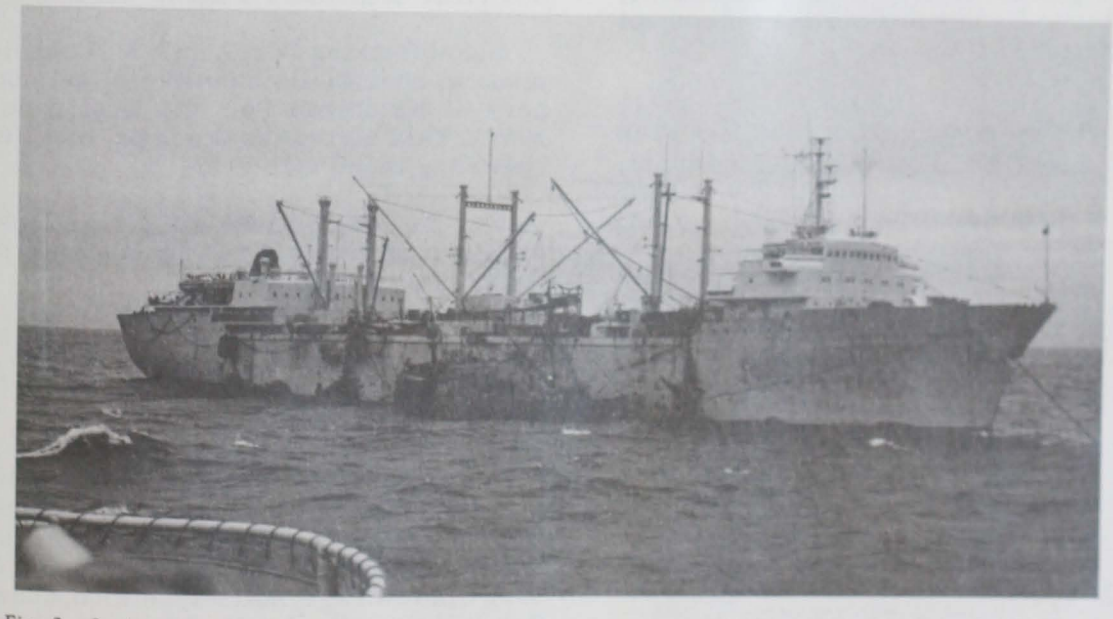


Fig. 2 - Soviet processing factoryship "Chernomorskaia Slava," built in W. Germany, receives catches from medium side trawler (SRT class) in Moriches Inlet loading and unloading zone. This is off Long Island, N.Y., and was established by 1967 U.S.-USSR Mid-Atlantic Fisheries Agreement. (Photo: USCG cutter "Tamaroa")

STATES

California

FIRST BASKING SHARK LIVER SENT TO JAPAN

The Japanese vessel "Montana Maru" carried the first shipment of basking shark liver from California to Japan for processing, reported BCF La Jolla in April.

The shipment consisted of 139 drums totaling 57,465 pounds of liver taken from about 60 sharks. Most sharks were taken near Santa Barbara by 5 vessels in 3 days. Two more vessels have entered the fishery; several more have shown interest.

The fleet was expected to move north to Monterey, where 1,000-1,500 sharks were seen repeatedly by an airplane pilot.

* * *

EDA HELPS CREATE FISHERY FACILITIES AT CRESCENT CITY

Two grants totaling $385,000 to help develop a waterfront industrial park--and create 345 jobs--at Crescent City, Calif., were approved by the Economic Development Administration (EDA).

The Crescent City Harbor District will develop a 4-acre park costing $594,000. The project includes building wharves, ice plant, and 2 seafood processing plants. The Harbor District is matching EDA's $297,000 grant.

A. Paladini, Inc., Del Norte Ice & Cold Storage Co., and Eureka Fisheries, Inc., will operate the plants under long-term leases. Paladini will provide 133 new jobs, Eureka 208, and Del Norte 4.

Sewer System

EDA also is granting $88,000 to Crescent City, which will match it, to help expand its sewer system to serve the industrial park. The system will serve the harbor area and adjacent parts of Del Norte County.

Development of the waterfront industrial park is part of city and county long-range efforts to strengthen the fishing industry and replace jobs lost by the closing of 2 lumber plants.

Alaska

STATE POLLUTION LAWS STRENGTHENED

BCF Juneau reports that Gov. Walter J. Hickel of Alaska signed legislation in April prohibiting pollution of State waters by petroleum, acid, coal, or oil tar, lamp black, analine, and bitumine.

The Act provides, on conviction, fines of $500 to $2,500 and imprisonment of 30 days to 1 year. Violators also may be held liable for civil damages of $5,000 to $100,000. If a vessel is involved, it can be seized without warrant and held as security for payment of civil damages.

* * *

SALMON CANNERY PLANS TO REOPEN

Nakat Packing Corp., an A & P subsidiary, plans to operate its Sunny Point salmon cannery at Ketchikan for the first time since 1952. This will make 3 major canneries operating there this year.

The decision reflects predictions of an excellent salmon year in the southern part of Southeastern Alaska.

* * *

FERRIES TO SERVE PRIME FRESH SEAFOODS

Alaska's finest seafoods will be delivered fresh to each ferry arriving at Petersburg. The suppliers will be: Alaska Glacier, shrimp and Dungeness crab; PFI, king crab; Petersburg Cold Storage, halibut, salmon, and sablefish (black cod). In all, 2,000 pounds will be provided to the Southeastern Alaska ferries each week.

This will be the first constant supply to the ferries. The fresh seafoods will be in insulated containers.

* * *

KODIAK WATER SHORTAGE EXPECTED

The recent expansion of shrimp production has made Kodiak officials uneasy about the municipal water supply. If present plans are fulfilled, there will be 20 to 24 shrimp peeling machines in operation by the end of 1968. This is more than a 100 percent increase in machines that use much water.

Water Needs Increasing

During the past year, Kodiak tripled its water supply. At present, it is enlarging its reservoir capacity. It was hoped the completed projects and those being built would meet industry needs for the next 3-5 years. However, fishery developments, especially in the shrimp industry, have created new water demands that must be met this year. At peak processing periods, Kodiak uses as much water as metropolitan Anchorage, a city 10 times larger.

Hawaii

SEEKS AIR LINK WITH ALASKA

The Hawaiian Legislature has approved a resolution asking for direct air service between Anchorage, Alaska, and Honolulu. The resolution was directed to the Civil Aeronautics Board in Washington, D. C.

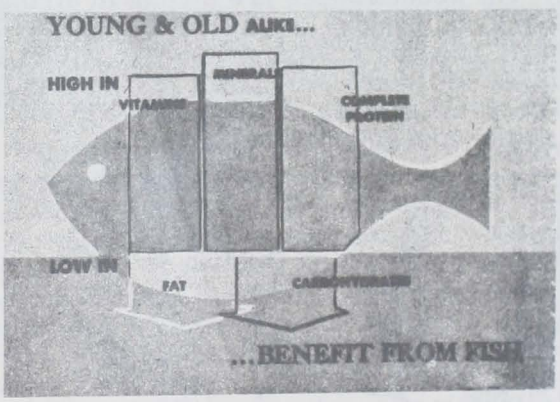
The legislature said Hawaii produces cattle and other commodities that are shipped to Alaska in large quantities. Alaska has large quantities of seafood that can be shipped to Hawaii. Also, the route would be a potential stimulant to the movement of commerce and people.

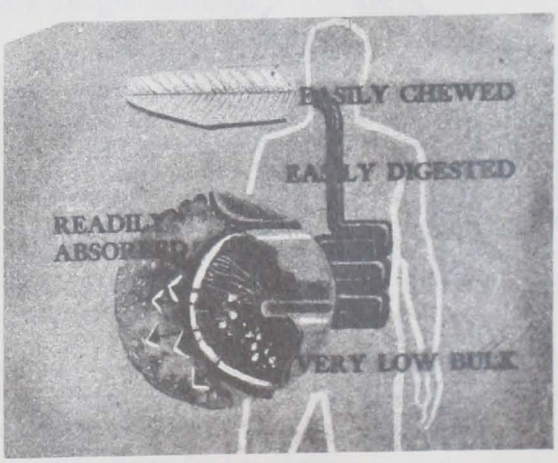
Florida

BANS SALES OF
CERTAIN PUBLIC LANDS

Florida has banned any more sales of public land in Boca Ciega Bay, Apalachicola Bay, Charlotte Harbor, Featherbed Bank, and Banana River. It has ordered a master plan for the "preservation and utilization of state submerged lands." An interagency committee was set up to develop a plan that would designate areas in a natural state to be set aside in perpetuity.

Research by BCF's Biological Laboratory in St. Petersburg Beach brought to public attention the effect of dredging and filling on the rich marine life of these areas.





BUREAU OF COMMERCIAL FISHERIES PROGRAMS

BCF's New Lobster Trap May Open Offshore Fishery

A new steel pot (trap) that can be used in offshore, deep-water, lobstering may lead to a new fishery for Gloucester, Mass., and other coastal fishing centers. It was developed by BCF's Exploratory Fishing and Gear Research Base in Gloucester. The new pot has excited fishermen.

At present, lobsters are caught inshore using wooden slat boxes with net openings--and offshore with trawls. A wooden box cannot be used in deep water because it floats. And the trawl often injures lobsters when catching them and again when it is raised to a vessel's deck. Massachusetts law forbids landing dead lobsters.

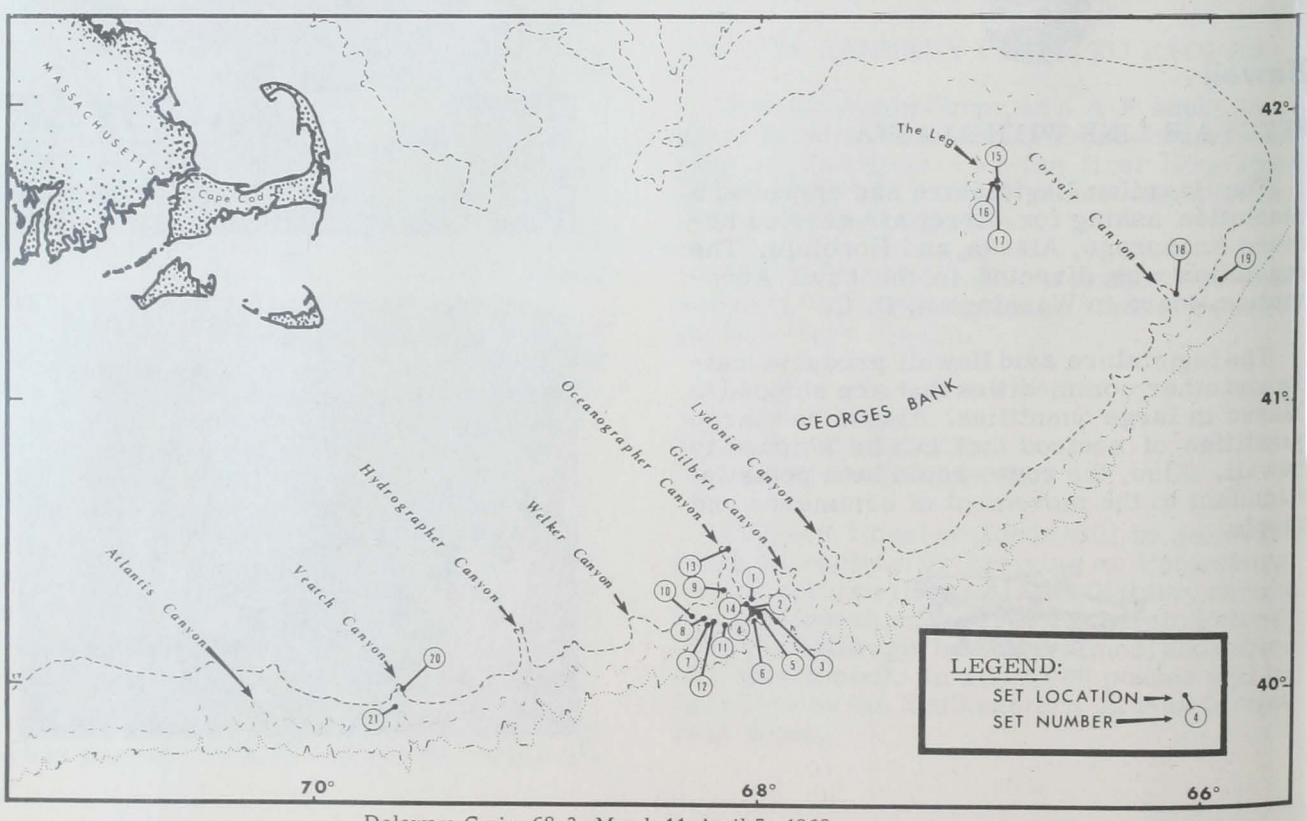
The wooden boxes are strung in strings of 4 to 6 on the sea bottom with a buoyed line. Most inshore lobstermen fish within 1-1½ miles off shore with lines 75-120 feet long. The average take is one pound per pot during the season's height.

The new plastic-covered steel pot, approximate inside dimensions 5x4x2 feet, weighs 138 pounds. It is more than twice as large as the inshore wooden box. Now the offshore pot fisherman will be able to string 30 to 100 steel pots per line 1,200 fathoms long. Pulled every 24 hours, the catch can be 20 pounds per pot. It is estimated that an average catch per pot of 10 pounds could make a profitable industry.

The Past 10 Years

During the past 10 years, an increasing number of vessels converted from fish dragging to lobster dragging because lobster was extremely valuable. In 1966, 25.6 million pounds of lobster were taken by inshore pots--and 3.9 million pounds by offshore dragging. Most of the catch was taken in New England waters. Preliminary 1967 figures indicated 5 million pounds taken by trawl, while the pot take fell below the 1966 figure. The catch value increased.

Following is the cruise report of BCF's exploratory vessel "Delaware," which tried the new pot. (Cruise 68-3, March 11-April 5, 1968.)



Delaware Cruise 68-3, March 11-April 5, 1968.

LOBSTER EXPLORATIONS ON THE CONTINENTAL SLOPE AND SHELF WITH POT (TRAP) FISHING GEAR

BCF's research vessel Delaware completed the first in a series of scheduled cruises to investigate pot (trap) fishing for lobsters on the Continental Shelf and Slope.

The cruises are to be conducted by BCF's Exploratory Fishing and Gear Research Base at Gloucester, Mass. They are part of the continuing program to aid the trawler fleet of the North Atlantic Region.

The pot fishing method, generally used only in near-shore depths, may provide members of the groundfishing and scalloping fleets with the possible means to profitably diversify their fishing effort. The development of an offshore pot fishery to harvest lobster populations from areas of rough, untrawlable bottom would benefit the industry. It would reduce the competition for--and the fishing pressure on--the currently producing fish stocks. Further, an increase in lobster production should stimulate an expansion in marketing to make better use of the potential U. S. market for live lobsters.

During Delaware's Cruise 68-3, exploratory activities were largely limited by the prior necessity to solve shipboard gear-handling problems and to work out practical techniques for fishing at considerable depths with offshore traps. However, limited explorations were accomplished. Twenty-one (21) sets of 11- to 19-pot strings of lobster pots were made. Of this number, 11 caught lobsters; one caught only red crabs; two caught only rock (sand) crabs; and four were without catch of commercial value. The gear was lost on three sets because of weather and the failure of a component of the running gear.

Fishing Results

The largest lobster catch weighed 150.5 pounds. This catch was taken on a 14-pot string that fished for 77 hours; weather conditions had not allowed the set to be hauled sooner. Excepting one $2\frac{1}{2}$-pound lobster, all were large. It seems significant that all lobsters were in the "parlor" (holding) section of the pots on this set. Because the bait was almost gone and the few remaining scraps were watersoaked, it was obvious that the pots had ceased to fish before the pots were hauled. Based on this very limited experience, it is anticipated that a fishing period of about 48 hours may produce the best results. This would depend on the concentration of lobsters available, water temperature with its consequent effect on keeping qualities of bait and the metabolic rate and rate of activity for lobsters, and the feeding behavior of the lobsters at the time.

Ninety-four (94) lobsters weighing about 389 pounds were taken during the cruise: 78 were legal size totalling about 380 pounds. The average weight was nearly 5 pounds. All except 2 of the 16 short lobsters were taken on one 11-pot string of gear set in Veatch Canyon in 140 to 150 fathoms.

Except for 4 males, the entire catch was either tagged and released near their point of capture, or were preserved for later biological study. The 4 males are being used initially in time-lapse motion picture studies of lobster behavior in relation to lobster pots. The same lobsters are destined for transfer to the State Lobster Hatchery at Martha's Vineyard, Mass., where they will be used in breeding experiments.

During 3 daytime sets--when pots were set and hauled during the day without an intervening period for nighttime lobster activity--only one lobster was caught. However, $1\frac{1}{2}$ bushels of rock crabs were taken in the second daytime set. Of 15 overnight sets, 10 produced lobsters; one produced a heavy catch of red crabs (800 pounds); one produced rock crabs and hake; and one caught cusk and codfish. The two remaining night sets caught nothing.

Two incidental catches of red crabs were made while exploring for lobsters. One (paragraph above) totaled 25 bushels of crabs from 13 pots weighing 800 pounds. The other was $6\frac{1}{2}$ bushels for 208 pounds from 11 pots; this string also caught one 3-pound lobster. It seems this species of crab can be readily taken by pot gear in depths and areas it occurs. It may prove to be a profitable adjunct to lobster pot-fishing.

The cruise was divided into two parts. Two different sets of running gear as well as lobster pots were used:

Running Gear in 1st Part

The running gear used during the first part was made of 7x19, $\frac{5}{16}$-inch diameter, double

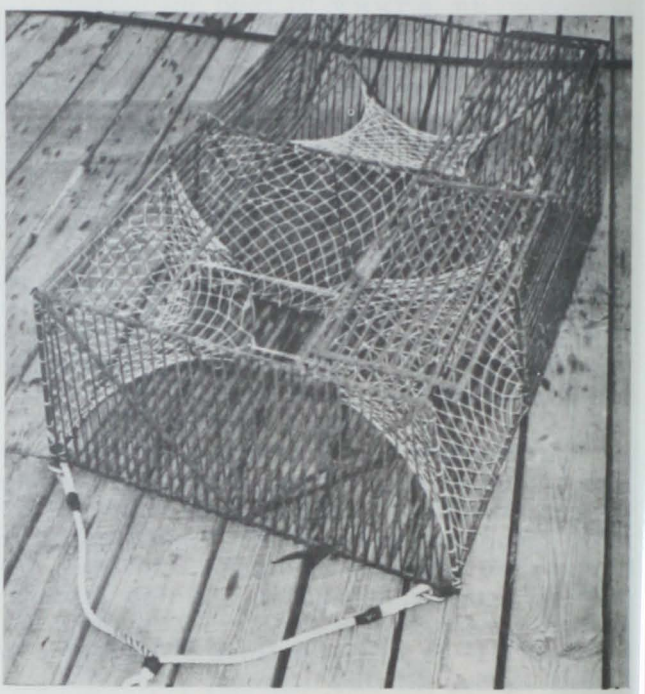
galvanized, aircraft-type wire rope. Its approximate (manufacturer's estimate) breaking strength was 9,800 pounds. This wire was used both for the buoy lines and the mainline to which the pots were attached. For ease in shortening or lengthening the buoy lines (according to length required for depths fished), the buoy lines were cut into 100-fathom sections. The mainline, between points of attachment for the pots, was assembled in 10-fathom lengths; this allowed mainline's length to be easily adjusted to accommodate number of pots desired on a string. All ends of the $\frac{5}{16}$-inch wire were swage-spliced with thimples included. Sections were joined with split-links, swivels, and "figure 8" links--the latter for quick disconnect or connection. In addition, linkage for connection of mainline sections also included another type of quick disconnect coupling for attachment of the pot gangions. For this purpose, a recessed link and "G" hook were used (similar to Vigneron-Dahl or "dandyline" otter-trawl gear). During preliminary test fishing, the recessed link was included in the mainline and the "G" hook was attached to the pot gangion. At the beginning of the cruise's first part, this order was reversed and the "G" hook was included in the mainline, while the recessed link was attached to the gangion. The change was made to help eliminate loss of pots due to accidental disconnection while fishing. Air-filled, plastic, balloon-type floats, of approximately 120 pounds of static lift each, were used to float the buoy lines; the number of floats used during each set was adjusted to the length and weight of the buoy line used for the varying depths fished.

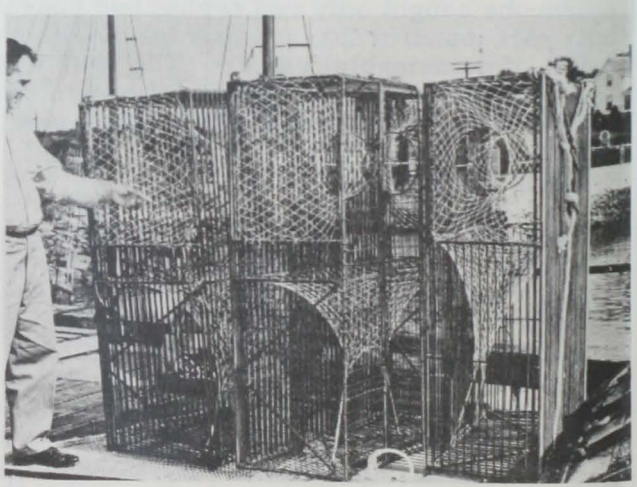
Running Gear During 2nd Part

During the second part, $\frac{1}{2}$-inch diameter, 6x19, galvanized wire rope with an approximate breaking strength of 23,000 pounds was used to replace the buoy lines fished during the first part. This $\frac{1}{2}$-inch buoy line was connected to $\frac{3}{4}$-inch diameter wire used for the mainline; the $\frac{3}{4}$-inch wire had an approximate breaking strength of 42,000 pounds. At one end of each mainline, an extra 300 fathoms of $\frac{3}{4}$-inch wire was included; this provided sufficient length to start wrapping the heavy wire on the winch before the pots were lifted from the bottom. Hardware in both the buoy line and the mainline was reduced to a few swivels attached with split-links and shackles to mechanically spliced eyes in the ends of the wire sections. The pots were attached to the mainline by means of 2 links of chain and shackles. One chain link was fixed to the $\frac{3}{4}$-inch mainline by means of a wire clamp, the other link was shackled to the eye in the end of the pot gangion. No pots attached in this fashion were lost. Each buoy line (made from the $\frac{1}{2}$-inch wire) was buoyed by a cluster of four 55-gallon drums filled with polyurethane foam. The statis lift of each cluster of drums was 1,600 pounds.

Pot Gear in First Part

Pot gear of a variety of designs was fished during the first part of the cruise. A total of 63 pots included 7 BCF-designed experimen-





Deepwater lobster pots (traps) fished during first part of Delaware Cruise 68-3.

tal pots, 31 BCF-built pots modeled after one of 11 original prototype pots of experimental design, and 25 plastic-coated pots built by a cooperating manufacturer but modeled after one of the larger BCF experimental designs. One string of 15 pots was lost when carried downslope during an extended period of bad weather, 8 single pots were lost while perfecting fishing and gear-handling techniques, and 33 were lost when the swage splices weakened during use and parted. To date, grappling operations have been unsuccessful in retrieving the lost gear, but continued efforts are planned for later in the year.

Pot Gear in Second Part

Fewer pots were fished during the second part of the cruise. Twenty-five (25) steel-framed, plastic-coated pots were available aboard ship; these included (1) five of 40x60x18-inch dimensions, and (2) twenty of 36x48x18-inch dimensions. Of the latter, 6 were equipped with plastic-coated wire "kitchen heads" (entrance tunnels); all other pots had twine-knitted kitchen heads. All pots had twine parlor heads. Three uncoated steel pots of varying dimensions were also available; however, only 2 strings of 11 plastic-coated pots each were fished during the 13 sets made on this part of the cruise. No gear loss or damage was sustained.

Shipboard Gear Handling

The system for handling the lobster pot gear aboard ship has passed through successive steps leading toward the best method; this process continues. The primary requirement is that it should be rugged yet rapid, safe, and easy to operate; further, it should be relatively simple and inexpensive to instal. Obviously, the method should contribute to damage-free handling of the pots. A problem that sounds simple--but is difficult to solve--is that the pots frequently come up between the vessel hull and the mainline during haulback. When the pots are lifted to rail height, they become jammed between mainline and ship and tend to be crushed by the pressure exerted. To eliminate this requires major modification of an otherwise straightforward system. Besides reducing time and manpower requirements for handling gear, it is hoped existing deck or gear machinery can be used, or modified, to curtail conversion costs.

Taking lobster pot aboard ship during haulback operation.

The Delaware's system is considered far from ideal. However, it represents one practical solution; although relatively slow and primitive, it is nevertheless quite safe, does not incur damage to or loss of pot gear, uses existing deck machinery, is inexpensive to instal, and is fairly easy to operate. The trawl winches are used to take up and store the buoy lines and mainlines. The lines are hauled over existing deck-mounted sheaves with their fairlead to (and from) the forward starboard gallows and the hanging sheave for that gallows. The gear is both hauled and set in this manner.

During hauling, the buoy line flotation is brought aboard, and the end of the buoy line is shackled to a pennant reaching to the winch drum. The buoy line is taken in by the winch. When the mainline is reached, the first pot is lifted (by the gangion attached to the mainline) from the water. The gilson hook is used to catch the bridle, which attaches the gangion to the pot; after the gangion is unshackled from the mainline, the pot is lifted over the rail with the gilson and dropped upon a table set on the deck. From the table, the pot is slid along a skid (made of pipe) to a rack installed along the starboard rail. The pots remain in this rack where they are emptied, rebaited, and stored until the next set is made.

When the gear is set out, the buoy is put overboard, and the buoy line is payed out as the vessel proceeds at slow speed. When mainline is reached, the gangion of the forward pot (in rack along rail) is shackled to mainline, and the pot is pushed overboard. The next pot in the rack is pushed forward to a point where the pot gangion will reach to the mainline paying out through the hanging sheave in the gallows. This process is repeated until all pots are overboard. The end buoy line is payed out and the buoys are set. All gear is set "on the fly" because otherwise the pots tend to fall to the bottom in a heap--and an appalling snarl results.

More offshore lobster-trapping trials and exploratory fishing are scheduled for June 1968.

Search for Hake

1. THE 'BARON' FINDS FEW HAKE

The BCF-chartered M/V Baron returned to Seattle, Wash., on April 24 after 75 days of experimental gear research (Cruise No. 10). The research concerns development of commercial harvest systems for Pacific hake (Merluccius productus). The areas of operation were off northern Mexico, California, and Oregon. The Baron was assisted by BCF's "John N. Cobb" and "Miller Freeman" in the first 2 areas. She found insufficient hake to warrant a commercial fishery during late winter-early spring. Some immature hake (5 to 13 inches) were found in Santa Barbara Channel and near Point Conception.

Objectives

The major objective was to sample schools of spawning hake to determine the best method and time to make good catches. Other objectives were to: (1) delineate the geographic and bathymetric distribution of hake schools; (2) survey hake schools to determine diel changes and their position in the water column and daily direction of movement, (3) fish at various levels through hake schools during daylight and darkness to establish catch rates and obtain data on school composition; (4) conduct behavior and stratification studies utilizing a remote-controlled underwater strobe camera; (5) provide samples of hake for tests by interested processors in the California area.

Methods of Operation

The cruise schedule was phased in the order of objectives. Sonar and depth sounders were used while attempting to locate schools. Tracklines generally extended 15 to 60 miles off shore, and occasionally to 100 miles.

Vessel and Equipment

The Baron is a 4-man, 96-foot, seiner-dragger-type vessel, powered by a 510 hp diesel. Pilothouse equipment includes 2 lorans, 2 radars, depth sounder, sonar, and ship-to-shore radio. Deck machinery includes hydraulically operated separate drum trawl winches, net reel, and dual hoists. The Baron can carry about 100 tons of hake.

Gear

The Baron carried "Cobb" pelagic trawls, Universal trawls and aluminum hydrofoil-type otter doors, dual electrical core towing cables.

Weather

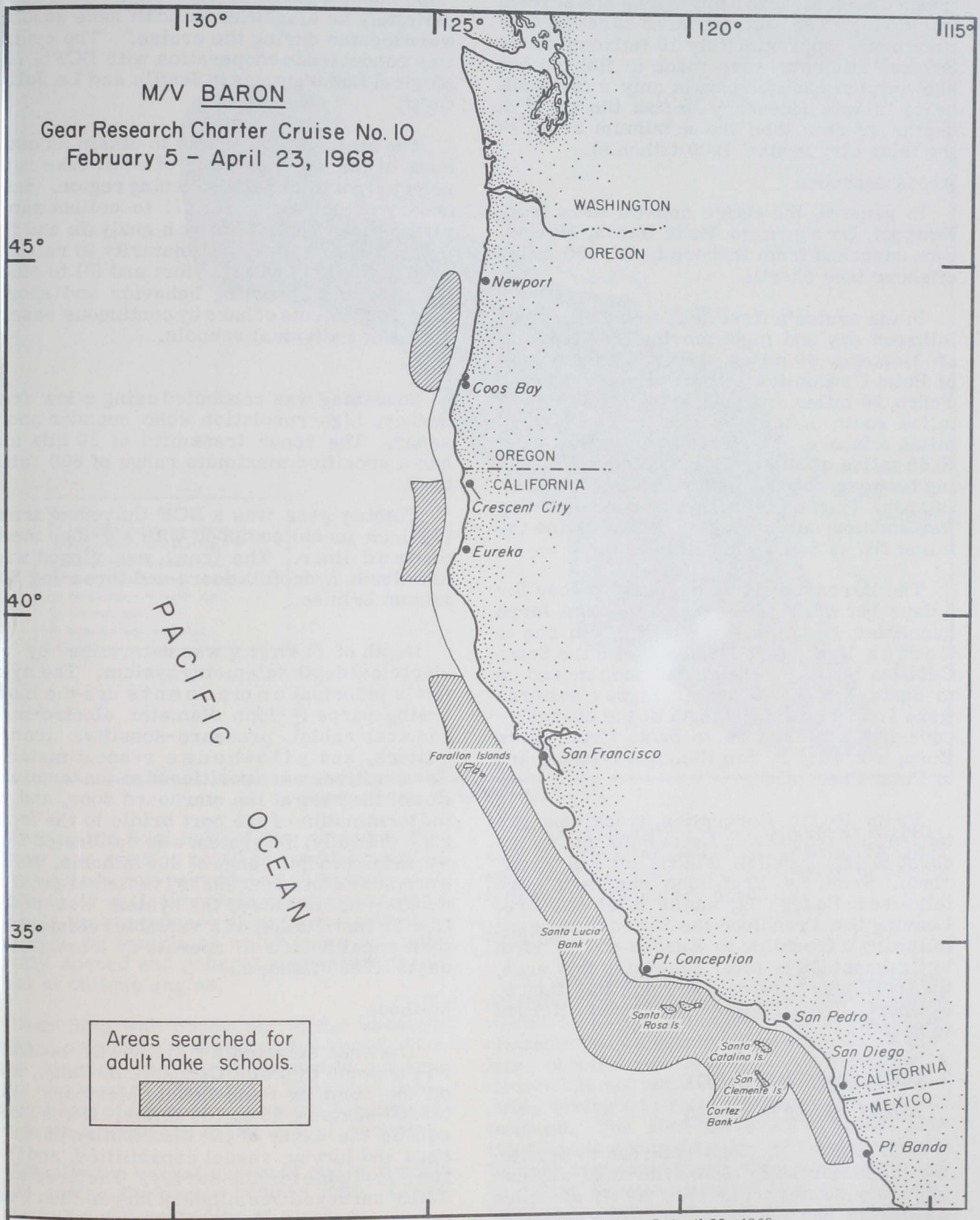
The weather was excellent during the first half; during much of the second half, strong northwesterly winds and rough seas caused some difficulty in searching for schools.

RESULTS

The Baron was unable to locate schools of fish.

On previous cruises adjacent to northern Mexico and southern California, schools of spawning hake had been found. However, no studies had been conducted to determine the feasibility of a commercial fishery in that area. During the Baron's Cruise No. 10, the John N. Cobb and the Miller Freeman were conducting resource assessment and biological studies of hake. They helped the Baron search for adult hake schools.

Although no sizable schools of spawning hake were located, echo-sound tracings showed one promising sign in 225 fathoms 25 miles northwest of San Clemente Island. The traces had the characteristics generally associated with hake schools; they were



M/V Baron Gear Research Charter Cruise No. 10, February 5-April 23, 1968.

tracked over an area 6 miles long and several miles wide. The sign appeared as rather distinct bands approximately 10 fathoms thick. Several attempts were made to fish on the showing, but each tow caught only a few adult hake. It was necessary to fish the trawl at depths greater than the maximum range of the telemetry system (200 fathoms).

Areas Searched

In general, the entire coastal area from Newport, Oregon, to Point Banda, Mexico, was searched from inshore to 60-100 miles offshore (see chart).

In the cruise's first half, tracklines were followed day and night moving southward to off Monterey 60 miles, then south from west of Point Conception to San Pedro. From San Pedro, 20 miles offshore, southeasterly to 75 miles south of the Mexican border and 40 miles offshore. The Baron then turned west to 65 miles offshore, then on a course heading between San Clemente and San Nicholas Islands. The single promising echo sounding was located on this leg of the trackline (25 miles NW of San Clemente Island).

The Baron fished on the heavy traces for 3 days but was unable to take hake in large quantities. Tracklines were then run to Cortez Bank, San Clemente, and the Santa Catalina Islands. The vessel then moved up to Santa Barbara Channel. Zigzag patterns were followed the length of the channel--covering from inshore to Santa Cruz, Santa Rosa, San Miguel, San Nicholas Islands, and to Point Conception.

From Point Conception, tracklines extended out beyond Santa Lucia Bank and up the coast to the Farallon Islands off San Francisco. From San Francisco tracklines were followed to Bodega Bay and 80 miles offshore. Leaving San Francisco the Baron then began following a trackline to Eureka and on north to Crescent City. After searching this area, the tracklines continued to Coos Bay then to Newport. From Newport the Baron returned to Seattle.

2. 'COBB' FINDS NO LARGE ADULT HAKE SCHOOLS

BCF's John N. Cobb returned to Seattle, Wash., on March 22, 1968, after a 40-day exploratory fishing cruise (No. 93) off southern California and the Baja Peninsula, Mexico. "No concentrations of fish sign that could definitely be classified as adult hake schools were located during the cruise." The cruise was conducted in cooperation with BCF's Biological Laboratories in Seattle and La Jolla, Calif.

The basic objective was to obtain an estimate of the standing stock of adult hake in a selected portion of the spawning region. Secondary objectives were: (1) to collect samples of hake for stomach analysis and for studies of size, sex, and maturity in relation to distribution and behavior; and (2) to study the diel and schooling behavior and short-term movements of hake by continuous observation of individual schools.

Gear

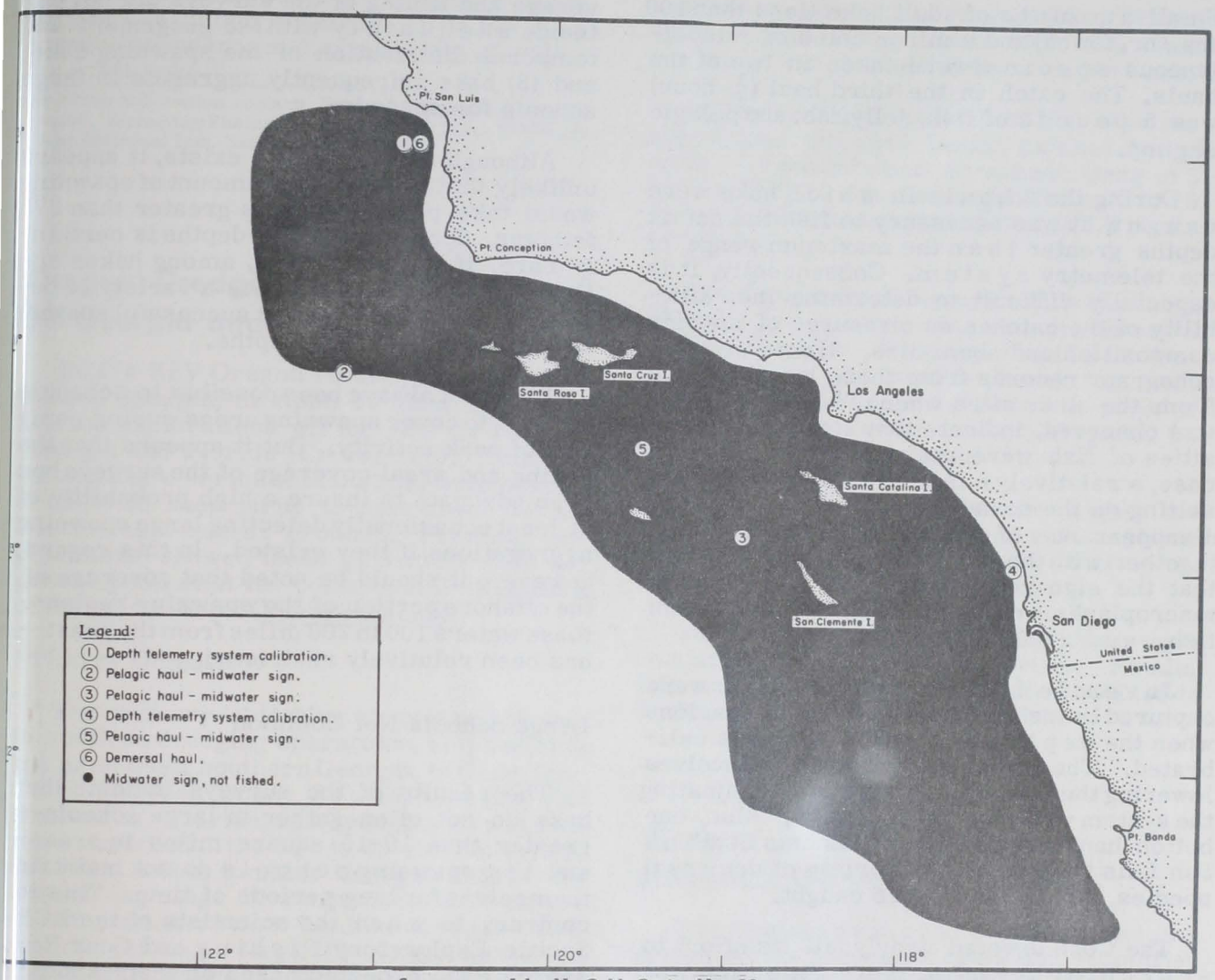
Searching was conducted using a low-frequency, high-resolution echo sounder and a sonar. The sonar transmits at 30 kHz and has a specified maximum range of 800 fathoms.

Fishing gear was a BCF Universal trawl ($2\frac{1}{2}$-inch mesh) equipped with a $\frac{1}{2}$-inch mesh codend liner. The trawl was rigged with aluminum hydrofoil doors and three-leg 30-fathom bridles.

Depth of fishing was determined by an electrical depth telemetry system. The system's principal components are the main towing warps ($\frac{5}{8}$-inch diameter electro-mechanical cable), pressure-sensitive transmitters, and pilothouse readout meters. Transmitters were positioned at the termination of the warp at the starboard door, and at the termination of the port bridle to the footrope Initially, the system was calibrated for a maximum depth range of 200 fathoms. However, it was found necessary to fish at greater depths--so one side of the system was modified by installation of a variable resistor and than recalibrated to operate at a maximum depth of 300 fathoms.

Methods

The area selected for study was bounded on the north by Point Conception, Calif., and on the south by Point Banda, Mexico; it extended seaward 60 to 100 miles. It was chosen on the basis of the distribution of hake eggs and larvae, vessel capabilities, and the time available for the survey. The area actually surveyed was slightly larger than that originally selected.



Survey area John N. Cobb Cruise No. 93.

During the first half of the cruise, the survey was run in a north-to-south direction on tracklines run perpendicular to the coast at 20- to 25-mile intervals. During the second half, the survey took place in the opposite direction on tracklines which were not uniformly spaced and generally intersected the coast at oblique angles.

Searching was conducted at the vessel's normal cruising speed of 9.3 knots. The echo sounder was set to record to a maximum depth of 275 fathoms. The tilted (wide angle) beam of the sonar was used because of the depth limitations of horizontal scanning.

Usually the vessel operated on the tracklines during the period 0600 to 2000. Little time was spent searching at night.

Trawl hauls were made whenever significant fish sign was detected. Specimens from each haul were either processed at sea or frozen for laboratory analysis.

Results

No concentrations of fish sign that could definitely be classified as adult hake schools were located. Midwater sign having some characteristics generally associated with hake schools was observed at 4 locations in Channel Island area. All of the sign was located during daylight between 195 and 250 fathoms. The sign appeared as rather distinct bands approximately 10 fathoms thick. In each instance, the main body of sign was less than 4 square miles in area. A trawl haul could be made at only 3 of the locations.

Small amounts of adult hake (less than 100 lbs./hr. towed) and a minor catch of miscellaneous species were taken in two of the hauls. The catch in the third haul ($\frac{1}{2}$ hour) was 5 pounds of fish, jellyfish, and pelagic shrimp.

During the 2 hauls in which hake were caught, it was necessary to fish the net at depths greater than the maximum range of the telemetry system. Consequently, it is especially difficult to determine the reliability of the catches as measures of species composition and abundance. However, the echogram records from these locations, and from the other sites where "hake-like" sign was observed, indicate that significant densities of fish were not observed. In each case, a relatively minor reduction in volume setting on the sounder resulted in complete disappearance of the sign. The echograms, together with the results of trawling, suggest that the sign represented an assemblage of macroplankton mixed with small quantities of fish.

Juvenile hake ($\leq$ 3 years of age) were captured in inshore areas during 2 occasions when the depth telemetry system was calibrated. The calibration procedure involves lowering the trawl to the bottom and adjusting the system while the vessel drifts. Also, one bottom haul was made at 52 fathoms depth off San Luis Obispo Bay; a variety of demersal species, but no hake, were caught.

The Cobb devoted nearly all its effort to searching for hake. Very little time was spent observing the behavior of the concentrations of sign observed. This was carried out by BCF's "Miller Freeman" and the BCF-chartered "Baron."

Meaning of Cruise Results

The results of this survey parallel those of similar surveys in 1963, 1964, 1965, and 1966. Again, despite relatively widespread occurrence of hake eggs and larvae in the area of operation, which is indicative of a large spawning population, significant quantities of adult fish could not be located. To date, only one large concentration of hake has been observed. The following might be a few possible reasons for the observed results: (1) in all years, searching was restricted to a maximum depth of 275 fathoms, (2) the coverage and timing of the surveys did not coincide adequately with the geographic and temporal distribution of the spawning hake, and (3) hake infrequently aggregate in large schools for spawning.

Although the possibility exists, it appears unlikely that a significant amount of spawning would take place at depths greater than 275 fathoms. Spawning at these depths is certainly rare, if not unknown, among hakes and Gadoid fishes. Also, there is a variety of biological arguments against successful spawning occurring at these depths.

It has not always been possible to schedule surveys to cover spawning areas during periods of peak activity. But it appears that the timing and areal coverage of the surveys has been adequate to insure a high probability of at least occasionally detecting large spawning aggregations if they existed. In this regard, however, it should be noted that coverage of the offshore portion of the spawning region--those waters 100 to 200 miles from the coast--has been relatively restricted.

Large Schools Not Common

The results of the surveys indicate that hake do not often gather in large schools--greater than 10-15 square miles in area--and that spawning schools do not maintain themselves for long periods of time. This is contrary to what the scientists of the BCF Seattle Exploratory Fishing and Gear Research Base expected based on their knowledge of hake spawning in Puget Sound. The one spawning population observed there is densely massed in a 12- to 15-square mile area; spawning takes place over several months. School size apparently is maintained by more or less continuous emigration and recruitment. If, when spawning, the ocean hake population segregates into small scattered schools which are maintained for relatively brief periods, survey observations are more explicable than if it is assumed spawning behavior is such that large, dense concentrations are formed. However, regardless of the hake's spawning distribution and behavior, it is difficult to account for the results of the 1968 survey. During this survey, 3 vessels searched intensively a significant portion of the spawning region without success. The scientists conclude: "It is apparent that a de-

tailed review of all past survey data is necessary before further attempts are made to assess the abundance and availability of spawning adult hake."

For further information contact: Dayton L. Alverson, Base Director, Exploratory Fishing and Gear Research Base, 2725 Montlake Boulevard East, Seattle, Wash. 98102.

'Oregon' Dredges Callico Scallops Off Georgia and Florida

BCF's R/V Oregon returned to St. Simons Island, Georgia, on April 27 after 16 days of scallop explorations off the east coasts of Georgia and Florida (Cruise 128). This was the sixth in a series of industrial development cruises to keep an up-to-date check on the Florida east coast grounds. Previous explorations showed these grounds hold the greatest potential for commercial utilization of calico scallops (Pecten gibbus).

Primary Objective

The primary objective of cruise 128 was to continue dredging operations, emphasizing the area from southern Georgia to Cape Kennedy. Between Doboy Sound, Georgia, and Melbourne, Florida, 210 dredging stations were occupied in the 5½- to 40-fathom range. Of these, 8-foot tumbler dredges fitted with 2-inch bag rings 20-rings deep were fished at 178 stations; 6-foot tumbler dredges fitted with 2-inch bag rings 13-rings deep were fished at 31 stations. All dredges were fitted with 2½-inch stretched mesh nylon liners.

Four standard assessment transects were conducted from 10 to 40 fathoms in areas established during September 1967 (Cruise 121) and occupied during each cruise in the series.

East of New Smyrna Beach, in 23 to 28 fathoms, maximum catches ranged up to 20 bushels of scallops per 30-minute drag. Counts ranged from 92 to 133 meats per pound and yielded 3 to 3.6 pounds per bushel.

Catch Rates Significant

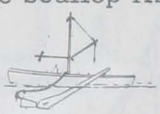
Northeast of Cape Kennedy, between latitudes 28°30' N. and 29°00' N., where commercial concentrations were located during February 1968, catch rates remained commercially significant. They ranged up to 18.9 bushels per 30-minute drag in 24 to 26 fathoms. Counts ranged from 93 to 101 meats per pound and yielded 3 to 4 pounds per bushel.

In the southern portion of the area surveyed, east of Cocoa Beach, catches ranged up to 14.7 bushels per 30-minute drag in 21 to 26 fathoms. Counts ranged from 97 to 151 meats per pound and yielded 2.2 to 3.8 pounds per bushel.

Subcommercial-size scallops were caught on the northernmost transect (southeast of Flagler Beach). Although scallops were smaller than those further south, the meats were firm and yielded 5.3 pounds per bushel. Counts ranged from 116 to 130 meats per pound. (See page 32 for chart.)

In general, meat counts were higher and meat yields lower, although commercially acceptable, than at other times during the current series.

Two days of dredging demonstrations were conducted for industry observers. Fishing information and assistance were provided to 3 vessels in the scallop fishery.



'Oregon' Surveys Midwater Schoolfish Off East Coast

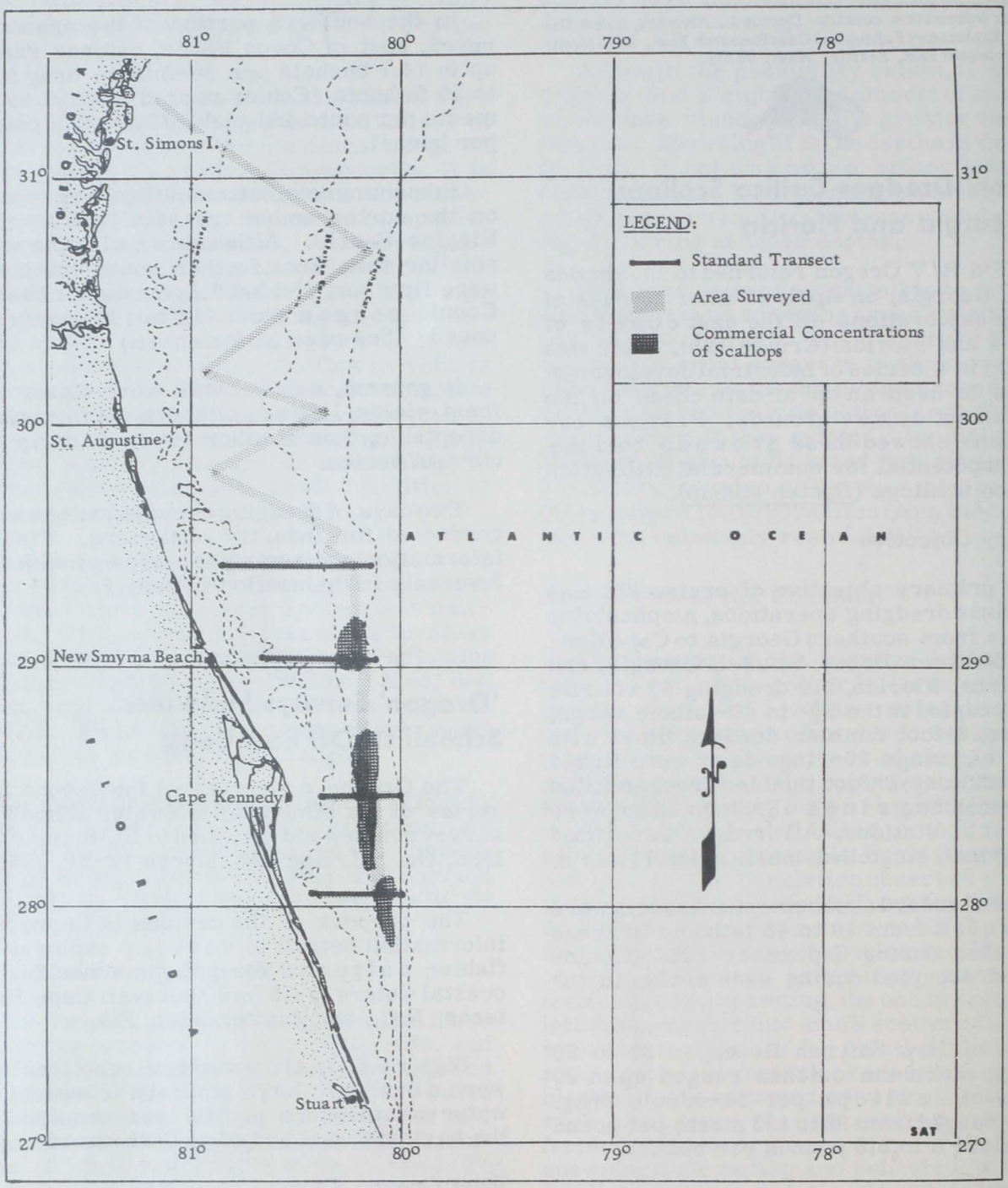
The Oregon completed the second in a series of six bimonthly midwater schoolfish survey cruises and returned to St. Simons Island, Ga. (Cruise 127, March 12-21, 1968.)

The purpose of the cruises is to provide information needed to develop exploratory fishing patterns for pelagic schoolfish in coastal waters (5-20 fms.) between Cape Hatteras, N.C., and Jupiter Inlet, Fla.

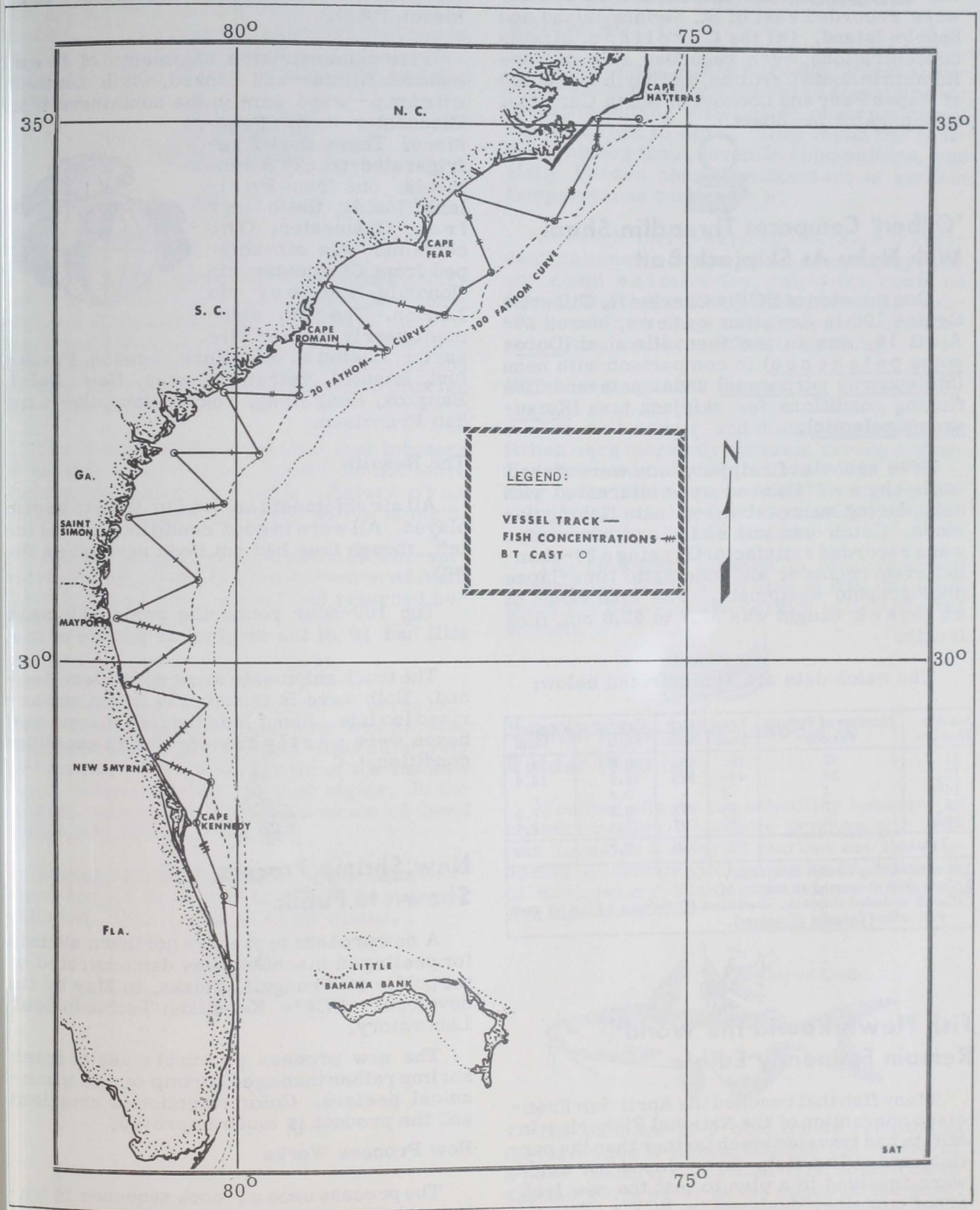
High resolution vertical echo tracings were obtained on 26 standard transects. A water-temperature profile was acquired at the beginning and end of each transect.

What Oregon Found

Preliminary examination of echo-tracing data shows that extensive concentrations of bottom and midwater fish schools again were present off Florida (north and south of New Smyrna Beach and southeast of Mayport).



Oregon Cruise 128, April 12-27, 1968.



R/V Oregon Cruise 127, March 12-21, 1968.

Off Georgia, limited midwater fish schools were recorded east of St. Simons Island and Sapelo Island. Off the Carolinas, sizable concentrations were recorded east of Cape Romain in South Carolina, and north and south of Capes Fear and Lookout in North Carolina. (See page 33 for chart.)

'Gilbert' Compares Threadfin Shad With Nehu As Skipjack Bait

One mission of BCF's Charles H. Gilbert's Cruise 108 in Hawaiian waters, March 20-April 18, was to test threadfin shad (Dorosoma petenense) in comparison with nehu (Stolephorus purpureus) under pole-and-line fishing conditions for skipjack tuna (Katsuwonus pelamis).

Five schools of skipjack tuna were fished while threadfin shad were alternated with nehu during successive 3-minute fishing periods. Catch data and skipjack abundance were recorded satisfactorily using a 20-channel event recorder and automatic time-lapse photographic equipment. The size range of skipjack caught was 37.7 to 62.6 cm. fork length.

The catch data are summarized below:

Station Number	Number of Fishing Periods	Total Catch		Catch Per Minute[1]	
		Shad	Nehu	Shad	Nehu
11	12	191	168	10.8	9.3
12	18	435	383	16.6	14.4
14[2]	1	2	-	0.6	-
15	7	31	92	3.5	7.5
20[3]	8	78	97	7.1	8.1
Totals		737	740	7.7	9.8

1/4 men fishing almost constantly.
2/Only shad chummed at station 14.
3/Catch included skipjack, kawakawa (Euthynnus affinis) and yellowfin (Thunnus albacares).

Fish Flown Round the World Remain Eminently Edible

Many fish that reached the April San Francisco convention of the National Fisheries Institute had traveled much farther than the participants. The fish, flown round the world, were involved in a plan to test the new leakproof container designed by BCF's Gloucester (Mass.) Technological Laboratory (CFR March 1968).

Five demonstration shipments of fresh haddock fillets--and cooked, whole northern shrimp--were sent in the containers from Gloucester to San Francisco. There were 2 refrigerated-truck shipments: one from Portland, Maine, the other from Gloucester. One container was air-shipped from Gloucester via Honolulu, another via London. The fifth shipment nearly circled the earth: Boston to New York, London, Frankfurt, Istanbul, Beirut, Teheran, New Delhi, Bangkok, Hong Kong, Tokyo, Honolulu--and San Francisco.

The Results

All air shipments arrived in time to be displayed. All were in good condition and had ice left, though they had not been re-iced on the way.

The 100-hour round-the world shipment still had 10 of the original 39 pounds of ice.

The truck shipments were not a close second. Both were in transit 150 hours and arrived too late. About half the fish in insulated boxes were partly frozen--but in excellent condition.

New Shrimp Process Shown to Public

A new process to prepare northern shrimp for peeling on machines was demonstrated to the public at Wrangell, Alaska, in May by its developer--BCF's Ketchikan Technological Laboratory.

The new process permits use of fresh shrimp rather than aged shrimp on the mechanical peelers. Color retention is excellent and the product is much improved.

How Process Works

The process uses a 2-cook sequence in water: 1) The shrimp are cooked for a short

time at a high temperature. This stabilizes the orange-red surface color and preserves quality. 2) The high-temperature treatment is followed by a longer cook at a lower temperature. This makes it easier to peel the shrimp.

Larger Lobsters Are Active at Night, Study Shows

The SCUBA team of BCF's Boothbay Harbor (Maine) Biological Laboratory has completed a study of the night behavior of the lobster during the summer and winter. The divers observed and counted lobsters inside and outside their burros from sunset to sunrise and down to 70 feet.

The observations indicated that lobsters of about 2-inch carapace length did not leave their burrows at night--while lobsters over 2-inch carapace length were active at night.

Of these larger lobsters, about 80% in summer--and about 40% in winter--ventured from their burrows after sunset and returned before sunrise.

Predators Also Active At Night

Finfish that are known predators of the lobster--longhorn sculpin, cunners, sea ravens, cod, goosefish, and wolffish--are relatively common and active inhabitants of the inshore ocean bottom during summer nights. In the winter, only a few inactive species of these finfish are seen.

During the study, bottom water temperatures ranged from 14° to 16° C. in summer and from 1° to minus 1° C. in winter.

Some Alaskan Fish Semidormant Below 40° F.

Biologists of BCF's Auke Bay (Alaska) Biological Laboratory discovered something interesting during underwater observations of Sashin Creek in April. They found the resident rainbow trout, juvenile coho salmon, and Dolly Varden char semidormant at stream temperatures below 40° F.

Although there were 20,000-25,000 resident salmonids in the creek, excluding pink and chum salmon fry, only a few could be found. The fishes found beneath large rubble in pools or deep stream areas were torpid. They made no effort to escape.

Different from 1967 Survey

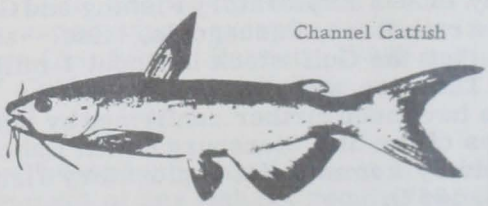
The behavior and distribution of these fishes were markedly different during a similar underwater survey in June 1967. Then, they were distributed widely throughout Sashin Creek and segregated according to ecologic conditions in the stream.

The biologists planned to make frequent underwater surveys in May to find out when these fishes resume normal activity in the stream.

Catfish Form Tight Schools in Colder Weather

Weather affects the schooling behavior of channel catfish (Ictalurus punctatus). This was found in a study of marked catfish conducted in experimental ponds by BCF Branch of Exploratory Fishing personnel at Kelso, Arkansas.

Channel Catfish



The passage of 2 cold fronts resulted in the formation of tight schools in the center of a pond. Before, the catfish were scattered in shallow warm water at the edges of the pond.