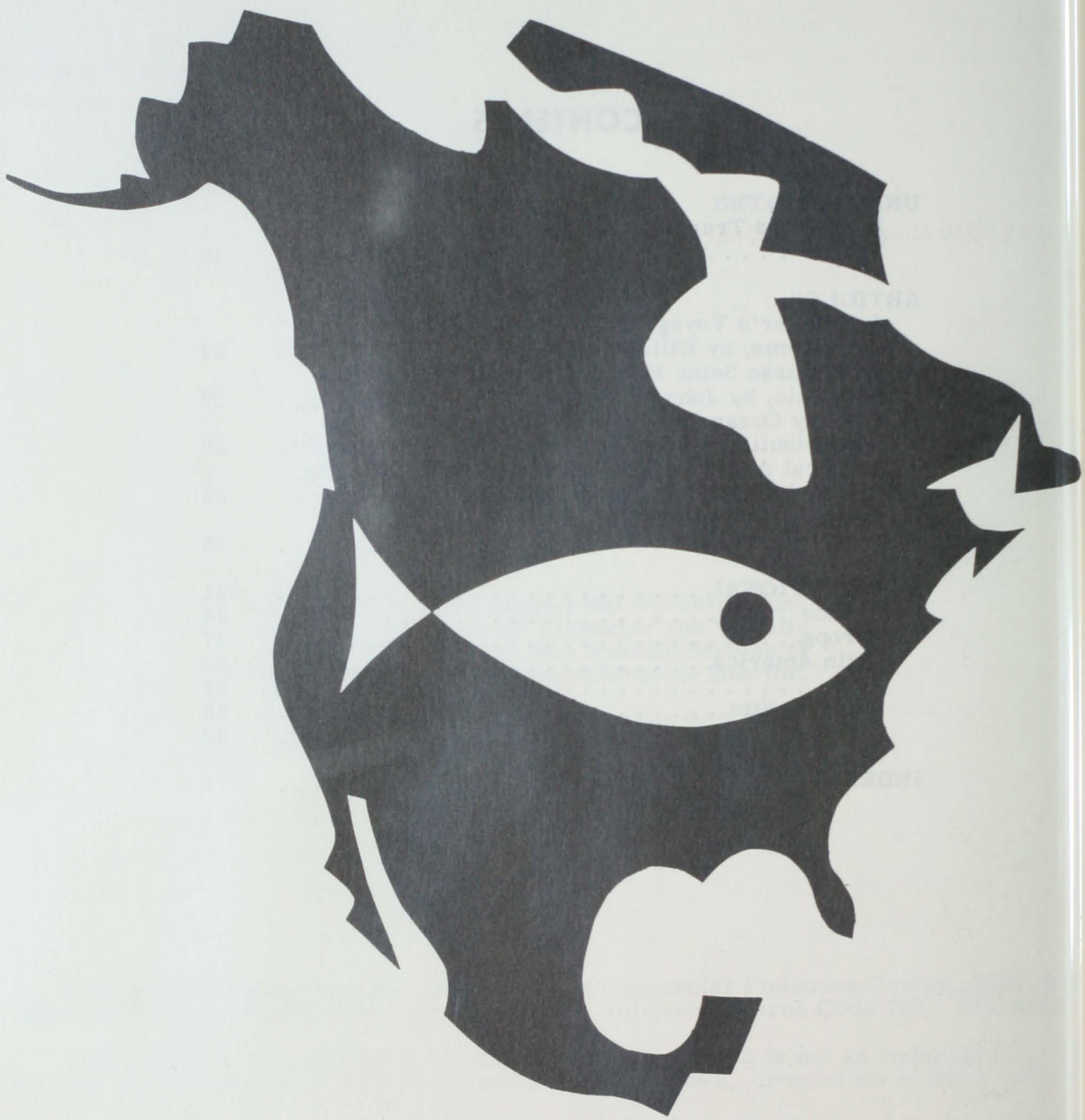


PROGRAM TO STRENGTHEN U.S. MARINE-SCIENCE ACTIVITIES IS ANNOUNCED

A 5-point program to strengthen U.S. marine-science activities was announced on October 19 by Vice President Spiro T. Agnew as Chairman of the National Council on Marine Resources and Engineering Development (NCMRED).

He said the Administration has selected 5 areas "for immediate special emphasis in the next fiscal year" while the Administration and Congress work out a long-term program.

Money will be provided to carry out the 5 programs. Each program will be assigned to an appropriate Federal agency while studies of the organization of U.S. marine-science activities continue.

The 5 priority programs were picked after an intensive Government-wide review of the Nation's urgent needs in marine affairs.

President Nixon requested the study in February after receiving the Report of the Commission on Marine Science, Engineering and Resources--"Our Nation and the Sea." (See CFR, Feb. 1969.)

I. COASTAL ZONE MANAGEMENT

A new U.S. policy will be fashioned "to promote the national development of coastal areas and the Great Lakes." A grant program will aid States to plan and manage coastal activities.

New legislation will help insure that rapid coastal development does not destroy limited land and water resources. All interests in the coastal regions would be assured consideration--"for port development, navigation, commercial fishing, mineral exploitation, recreation, conservation, industrial development, housing, power generation and waste disposal."

The Administration anticipates that grants will be given for these purposes: 1) development by States of planning and regulatory mechanisms; and 2) operation of these State management systems. The latter grants would be made if States demonstrate the capability to prepare plans that provide for:

- "balanced use of the coastal margin, both land and water, that considers viewpoints of all potential users";

- "access to management-oriented research, including coastal ecology studies";

- regulatory authority as needed--zoning, easement, license, or permit arrangements--to insure development consistent with State plans;

- "consideration of the interests of adjacent States";

- land acquisition and power of eminent domain when necessary to implement the plan; and

- review of proposed U.S., U.S.-assisted, State, and local projects to insure consistency with plans.

Mr. Agnew believes that this program should strengthen the capabilities of States to manage coastal resources, lessen the need for Federal intervention, and "facilitate integration of planning, conservation, and development programs among diverse public and private interests."

II. ESTABLISHMENT OF COASTAL LABORATORIES

Coastal laboratories will be set up, supported by the U.S. Government, "to provide information on resource development, water quality, and environmental factors to assist State authorities and others in coastal management."

Existing facilities will be strengthened in order to:

- develop basic understanding and to describe the ecology of the 13,000-mile coastline. Ecology--the interrelationship of organisms with their environment--differs with regions.

- anticipate and assess the impact on a region's ecology of alternative land uses, of pollution, and of changes in the land-water interfaces;

- operate coastal monitoring networks; and

- perform analyses needed for coastal management.

III. PILOT TECHNOLOGICAL STUDY OF LAKE RESTORATION

A pilot study of a lake will be carried o to determine the feasibility of restoring t Great Lakes with technological and regulato mechanisms. Present environmental tec nology and techniques will be tested. The will include "pollution measuring device methods of artificial destratification by aer tion, mixing and thermal upwelling techniqu thermal pollution control and enrichme artificial bottom coating, filtering, harvesti of living plants and animals, and restocki of fishery resources." The program wi reinforce investigations now underwa Specialists from industry, academic institu tions, and Federal laboratories will add the skills to these studies.

IV. INTERNATIONAL DECADE OF OCEAN EXPLORATION

"The United States will propose a range specific programs as its initial contributi to the International Decade of Ocean Explor tion during the 1970s." The U.S. propos the Decade, which was endorsed by the General Assembly in December 1968. Fun will be provided for the U.S. share.

The United States proposes internatio emphasis on these goals:

- Preserve the ocean environment by a celerating scientific observations of t ocean's natural state and its interactions wi the coastal margin. This would be done provide a basis for (a) assessing and predic ing man-induced and natural modifications

the oceans' character; (b) identifying damaging, or irreversible, effects of waste disposal at sea; and (c) understanding the interaction of levels of marine life to prevent depletion or extinction of valuable species as a result of man's activities.

• Improve environmental forecasting to reduce hazards to life and property--and permit more efficient use of marine resources. This would be achieved by improving physical and mathematical models of the ocean and atmosphere to provide basis for "increased accuracy, timeliness, and geographic precision of environmental forecasts."

• Expand seabed-assessment activities to permit better management--domestically and internationally--of ocean mineral exploration and exploitation. Acquisition of needed knowledge of "seabed topography, structure, physical and dynamic properties, and resource potential" would help to achieve these goals.

• Develop an ocean-monitoring system to make it easier to predict oceanographic and atmospheric conditions. The system could be developed through design and deployment of oceanographic data buoys and other remote sensing platforms.

• Improve worldwide data exchange by modernizing and standardizing U.S. and international marine data collection, processing, and distribution.

• Accelerate Decade planning so that there will be more international sharing of the scientific equipment, responsibilities, and costs of ocean exploration.

This U.S. contribution to an expanded program of intergovernmental cooperation reflects 4 recent developments:

(1) Greater population concentration along the coasts of the U.S. and other countries. This could harm the ocean environment and increase demands on coastal margins and marine resources.

(2) Growth of technology that is rapidly opening new ocean frontiers.

(3) Scientific advances that can improve environmental forecasts if better ocean data are available.

(4) 100 coastal nations are showing more interest in benefiting from marine activities.

The Decade will speed the needed understanding of the ocean. It will permit nations individually to plan investments and, collectively, to arrange for preserving the ocean environment and managing ocean resources.

The oceans are global. The scope of work to be done makes international cost sharing and data exchange very attractive. International cooperation in marine affairs may facilitate communication with developing nations, with the Soviet Union, and with others.

The National Council on Marine Resources and Engineering Development says the U.S. proposals are compatible with the ocean exploration program of UNESCO's Intergovernmental Oceanographic Commission. The U.S. contribution to this program will depend on the contribution of other nations.

V. ARCTIC ENVIRONMENTAL RESEARCH

Arctic research activities will be intensified. These will permit fuller utilization of the rapidly developing area. The research will insure that this use does not degrade, through neglect, the Arctic environment. It will accumulate knowledge on the interaction of man with the Arctic environment.

The program will be directed to: (1) the polar icepack to include its impact on transportation and global weather and climate; (2) the polar magnetic field and its effects o communication; (3) geological structure underlying the Arctic lands and polar seas -- as potential mineral sites and as hazards t construction and resource development; (4) balance of the Arctic ecologic system; (5) th presence of permafrost; and (6) slow degradation of liquid and solid wastes under Arcti conditions. Behavior and physiology of ma also will get more attention.

In the beginning, the emphasis will be o strengthening and broadening Arctic researc capabilities. Formulation of an overall polic framework for Arctic-related activities als will be considered.

WENK COMMENTS ON 5-POINT PROGRAM

In a press conference preceding announcement of the 5-point program, Dr. Edward Wenk Jr., executive secretary of the National Council on Marine Resources and Engineering Development, said:

- "The states are pivotal to solving our coastal problem. We need the states to help us manage our ports, our fisheries, our waste disposal, conservation--you name it, they're all part of the same thing."

- The 13,000-mile coastline: "We want to know what's there, and then we want to find out what's happening to it."

- Pilot study of lake pollution: A lake of several hundred square miles would be polluted. Then an attempt would be made to clean it up by chemical, thermal, mechanical and biological means.

"This will be difficult," Dr. Wenk concluded, "but we have to start somewhere. These things can't wait."

• International Decade of Ocean Exploration: Some funds already have been authorized. More would be sought to increase research of the oceans to find out how man is polluting them and how he can reduce that pollution.

• Arctic: Intensify marine research in area where oil, gas, and mining exploration is increasing--and where pollution is special problem because of intense cold.

The National Council

The National Council on Marine Resources and Engineering Development was established by Public Law 89-454 to assist the President in developing and coordinating national marine-science policies and programs. The members are:

Chairman:

Spiro T. Agnew, the Vice President

Members:

William P. Rogers, the Secretary of State

John H. Chafee, the Secretary of the Navy

Walter J. Hickel, the Secretary of the Interior

Maurice H. Stans, the Secretary of Commerce

Robert H. Finch, the Secretary of Health, Education, and Welfare

John A. Volpe, the Secretary of Transportation

Glenn T. Seaborg, Chairman, Atomic Energy Commission

William D. McElroy, Director, National Science Foundation

Observers:

Lee A. DuBridge, Director, Office of Science and Technology

Robert P. Mayo, Director, Bureau of the Budget

Paul W. McCracken, Chairman, Council of Economic Advisors

Thomas O. Paine, Administrator, National Aeronautics and Space Administration

John A. Hannah, Administrator, Agency for International Development

S. Dillon Ripley, Secretary, Smithsonian Institution

Executive Secretary:

Edward Wenk Jr.

UNITED STATES

HICKEL URGES WORLD ACTION TO PROTECT & DEVELOP ARCTIC RESOURCES

A 3-day Polar Plan Conference on Arctic problems ended in Shenandoah National Park, Va., on Oct. 1 with a request by Secretary of the Interior Walter J. Hickel that future Arctic plans be viewed from an international standpoint.

He said: "Knowledge of the world's polar regions will change not only the countries bordering on the Arctic--it will change economic, social and cultural conditions throughout the world. I urge you to think of the Arctic as a single entity, so that all nations can contribute to its conservation and the wise use of its resources.

"The North Country is beginning to undergo the most rapid and profound changes ever seen in any wilderness region in world history. It is unlike any other region in the world in many other ways.

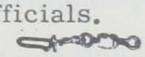
"All of us--throughout the world--who work with the Arctic must find new ways to meet this unprecedented challenge. We need new ideas, new techniques and attitudes, perhaps even new institutions, and we need them in every nation involved in the Arctic."

Involve Alaska's Natives

Secretary Hickel urged that Alaska's native Indians, Eskimos, and Aleuts be given every opportunity to take part in decisions involving the Arctic and the work now being undertaken by industry and government.

Unlike most other workers, he noted, Alaska Natives are accustomed to the land and its climate. Their rate of turnover on the job can be expected to remain low. Their keen personal interest in preserving their environment makes them most likely to respect it and work in harmony with it as much as possible. He emphasized that human values must be given paramount attention. All developmental problems must be considered in terms of their effects on people.

The Conference was attended by 100 representatives of industry, science, conservation, and government to exchange ideas about the North's spectacular boom. Canada and Norway sent high officials.



INTERIOR DEPARTMENT LIMITS FISHERY LOANS TO $40,000

High interest rates charged by commercial lending institutions have led to an unprecedented demand for fishery loans from the Bureau of Commercial Fisheries. This has required BCF to limit such loans to $40,000 per transaction.

Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for Fish and Wildlife, Parks, and Marine Resources, said the action was necessary to prevent depletion of the loan fund during the next few months and to assure better distribution of the money still available. The current rate for fishery loans is $7\frac{1}{2}$ percent; maximum maturity is 10 years.

Purposes of Loans

Dr. Glasgow said loans are made to finance or refinance the purchase, construction, maintenance, repair, equipping, or operation of commercial fishing vessels or gear. Applications in the first two months of fiscal 1970, which began July 1, 1969, more than doubled applications of a year earlier.

The BCF-administered loan program is scheduled to expire in 1970. Interior Department has recommended extension.

EASTERN PACIFIC YELLOWFIN TUNA CATCH RATE IS CHANGED

The incidental catch rate of yellowfin tuna in the eastern Pacific Ocean for seine vessels of 300 short tons capacity or less reverted to 15 percent on October 2, 1969. This applies to vessels that fish any part of a trip within the regulated area.

THE SHRIMP SITUATION

During January-September 1969, 84.3 million pounds of shrimp (heads-off) were landed in the Gulf States, 10% below the 93.9 million pounds of the 1968 period and 23% below 1967 period.

Heavier September landings were recorded in Florida (West Coast), Alabama, Mississippi, and Louisiana; landings declined in Texas. In eastern and central Gulf, greater abundance of white shrimp improved landings somewhat. White shrimp were not prevalent in Texas.

Of considerable significance were the heavier landings in Mississippi, where the August hurricane devastated most processing facilities. However, the fleet was only slightly damaged and fishing resumed as soon as fishermen got their personal affairs in order.

No High Catch Rate

Of some significance was the fact that shrimp fishing always is excellent for a week or ten days following a hurricane. A possible reason is that the storm chills the water and results in premature schooling of shrimp. Surprisingly, no such high rate of catch was recorded following this hurricane. Some possible causes for this: (1) excessive debris deposited on fishing grounds as result of this devastating storm, (2) local fishermen did not fish for a week or more because of the unusually high incidence of personal loss at home, and (3) fishermen from other areas failed to move into the area because they were uncertain of landing conditions; or, more likely, since catches in the area had been running behind a year ago, they did not expect unusual catches.

Prices Begin To Weaken

Prices generally have been holding firm but have begun to weaken. On October 1, cold-storage holdings were 52.9 million pounds--7.7 million pounds above a year earlier. However, most of this increase, about 5 million pounds, is in breaded, peeled, and deveined; holdings of raw headless are up only 2.8 million.

Most holdings of raw headless, shell on, are of larger sizes and very little small shrimp is available. This is substantiated by conversations with industry and by examination of import and catch data.

Imports

For first 8 months of 1969, imports of raw headless shell on, for example, are one million pounds less than a year earlier; peeled and deveined are 13 million pounds greater than a year earlier. Imports of all types are up about 9 million pounds over a year earlier (109 compared with 117).

GULF MENHADEN FISHERY SETS RECORD

The 1969 season total of menhaden landings along the Gulf of Mexico coast through August was 36% ahead of the 1968 period and 7% better than the comparable period in 1962, the record year.

Despite Hurricane Camille, August 1969 landings about equalled August 1968 landings.

Gulf production was not matched by the Atlantic Coast fishery. There, landings through August 1969 dropped 36% from 1968 and 66% from 1963--the last year of a billion-fish Atlantic fishery.

MANAGEMENT OF MENHADEN FISHERY IS SUGGESTED

Midseason reports show that menhaden, the primary raw material for the Atlantic Coast fish-reduction industry, again have failed to appear in commercial quantities from Delaware to Rhode Island. This was reported in September by the University of Rhode Island (URI) Commercial Fisheries Newsletter. Although some catches were made, the total was less than 10% of the maximum production in previous years.

Fishing on Chesapeake Bay has dropped sharply below 1968. This is strong indication that menhaden will be scarce throughout the middle and north Atlantic grounds during the 1970 season.

The Gulf of Mexico fishery is the one bright spot. The menhaden catch to mid-season was exceptionally heavy. It is possible that the fishery may set a record in 1969.

Gulf Landings Rise

Because of the progressive decline of the Atlantic Coast stocks of menhaden, it is time to pay more attention to the Gulf stocks, the URI newsletter states. Gulf landings have continued to increase. This might be interpreted to mean that the maximum sustainable annual yield has not yet been reached. But continued unrestricted fishing pressure could push this fishery toward extinction.

Management Overdue

Much of the fishing industry is highly independent and opposed to regulation or imposition of quotas. But intelligent management of resources has been beneficial to many fisheries. The application of basic principles of resource management to the menhaden fishery would appear long overdue, the URI newsletter concludes.

ALEWIFE DIE-OFF IN GREAT LAKES IS MINOR

The die-off of alewives in the Great Lakes reached nuisance proportions in only a few areas this year, reports the Great Lakes Commission. Lake Michigan's southern end experienced a "fairly heavy mortality" of the silvery little fish which littered the beaches. In recent years, alewife die-off has been a particular problem in this lake.

In Chicago, park district workers were busy in early July scooping up alewives. Later in July, the die-off was "substantial" along the Indiana shoreline. Around July 21, a sudden rise in temperature of 11-12 degrees in about 48 hours appeared to have triggered the deaths of the temperature-sensitive fish, BCF researchers reported.

Fewer Near Milwaukee

In the Milwaukee, Wisc., area, fewer alewife deaths were reported than in 1968, when the die-off was "moderately light." Vessel and plane surveys found sizable amounts of floating dead fish in the lake's southeastern section in late July. No major concentrations fouled Michigan's lower peninsula shoreline.

Reports from the Lake Ontario area showed that no significant problem had developed this year.

UNDERWATER TUNA SCHOOL TRACKED BY SONAR

For the first time, scientists have tracked a school of tuna underwater using the oceanic equivalent of radar. The feat was accomplished by BCF scientists aboard the Bureau's research vessel 'Townsend Cromwell' in Hawaiian waters in early September. On two occasions, the vessel used sonar to track a skipjack tuna school continuously, for a total of 6 days and 6 nights. Directing the operation was biologist Heeny S. H. Yuen.

The scientists believe they have uncovered some startling aspects of skipjack tuna behavior. Here is their report:

A skipjack tuna school, such as this one, spends the daylight hours near land and comes to the surface layers only infrequently. Toward sunset, the school heads to the open sea, spends the entire night in the surface layers, and travels as far as 60 miles from land. With the coming of dawn, the school returns to the original coastal site, or nearby.

All are facts that carry important implications for biologists and fishermen. They offer clues to the design of new fishing gear and techniques that could open up new fisheries or improve existing ones.

Cromwell's Special Equipment

The Cromwell is equipped with specially designed sonar. Sonar gear detects high-frequency sound waves in water in much the same way that radar detects electromagnetic waves in air. The sonar is a continuous-transmission, frequency-modulated (CTFM) device. It sends out a continuous sonar signal. When the signal is reflected by an object, such as a fish or fish school, the gear can tell the object's distance from the ship, its direction, and depth. This is the sonar's "active" mode.

The sonar also has a "passive," or listening, mode: It listens for acoustic signals emanating underwater. The Cromwell used both modes in tracking the tuna school.

Skipjack Fed Acoustic Tag

Trolling near Kaula Island, a rocky islet about 35 miles southwest of Kauai, Hawaii, the vessel's party caught an 18-inch skipjack tuna. The fish was fed an acoustic tag. This is a cylindrical, battery-actuated, transmitter 3 inches long and less than an inch in diameter. The transmitter produces a short, high-frequency burst of ultrasonic waves at the rate of two a second. These bursts have a frequency of 50 kiloHertz. They cannot be heard by human beings--but are easily detected up to a mile away by the sonar. Earlier experiments in shoreside tanks had shown that a skipjack tuna would accept the tag and continue to swim and eat as usual.

When the tagged skipjack tuna was released, it rejoined the school. This was proved in two ways: First, in the passive mode, the sonar picked up the signal from the transmitter. Switched to the active mode, while trained on the same location, the sonar detected the school of which the tagged fish must have been a member. Second, on one occasion, the fish was lost for a few minutes. Soon observers on deck noticed a school of skipjack tuna feeding at the surface. The sonar was trained on the school and the familiar two-a-second signal of the tagged fish was picked up. Thus, the movements of the tagged fish were taken as representative of the movements of the school.

During Daylight

During daylight hours, the school kept close to the vicinity of Kaula Island, which is surrounded by a narrow shelf about 80 feet deep. About a mile from shore, the shelf breaks into a steep cliff that sweeps down into ocean depths of several thousand feet. It was near this break in slope that the school was first observed; the school returned to it on most mornings. The terrain closely resembles an underwater cliff off Oahu where, in 1966, BCF scientists in a small submarine observed skipjack tuna feeding at 500 feet.

Sundown: Toward Open Sea

Shortly before sundown, the school turned from the bank and swam toward the open sea. The direction of travel varied. One night the school swam southwest, another east, another north. The distance traveled also varied, from 30 miles to about 60. The varied distances mean the school had to adjust its speed to arrive at the Kaula Rock site at dawn. On the 60-mile journey, Heeny Yuen says, the school was swimming at the very

high average speed of 8 knots for more than an hour.

Surface Layer At Night

At night the school kept to the surface layer of the water. It swam steadily in a straight line for an hour or more; often it would pause for as long as an hour. Then it would change direction and swim on.

At the time, the night sky was heavily overcast. To Yuen, it seemed improbable that the fish could be navigating by starlight.

Only on one occasion did the school break its established pattern of movement. Then, instead of returning to the bank at daybreak, it remained 5 miles off the island all day. On the next morning, however, it was back on the bank.

"As she has with many other animals," Yuen says, "Nature has endowed the skipjack tuna with an internal compass and an internal clock."

Tracking the School

The observations of the school's movements were made during two periods. During the first, the vessel tracked it for 2 days and 2 nights, and then had to return to Honolulu for sonar repair. Two days later, it returned to Kaula Island and, within a few hours, again picked up the transmitter signal. The fish was at its accustomed place over the break in slope.

Four more days and nights were then spent tracking the school. The transmitter has a battery life of 200 hours, and the experiment could have lasted at least 2 more days and nights, but Yuen decided that he had learned all he wanted to learn from that school.

Questions About Larger Fish Unanswered

Skipjack tuna form the basis of Hawaii's largest fishery. The catch peaks sharply in summer, when large fish of about 20 pounds are most commonly caught. The fish that was tagged weighed only 3 pounds--so it was far from representative of the bulk of the commercial catch. Since fish schools usually are made up of fish of about the same size, the new information fails to answer questions about the behavior of the larger and older fish.

Some biologists theorize that there is a "resident" population of skipjack tuna around the Hawaiian islands throughout the year, and that the "season" fish are a migrant population. The biologists are eagerly speculating about the results they would get if they succeeded in tagging and following a large tuna.

It is known that the fish, or at least some of them, migrate thousands of miles. But how long these migrations last and the routes taken are matters of speculation. Positive information might help to open the immense central Pacific skipjack tuna fishery to commercial harvest. The yield of the fishery is estimated in the hundreds of thousands of tons; only about 5,000 tons a year now are taken by the Hawaiian fleet.

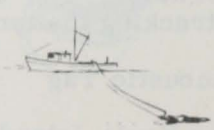
Richard S. Shomura, Acting Area Director, BCF, Honolulu, says plans are being developed to carry out extensive experiments with tagged skipjack tuna, especially the "season" fish, during the 1970 fishing season.

EAST COAST CLAM DREDGE TESTED OFF OREGON

The BCF Exploratory Fishing Base in Seattle, Washington, reports that the Bureau research vessel R/V 'John N. Cobb' recently returned to Seattle after a 19-day clam-gear testing cruise along the Oregon coast between Coos Bay and Newport.

Eighty-five tows were made with an East Coast 36-inch-bar hydraulic clam dredge at depths from 5 to 15 fathoms. The dredge worked efficiently, without mechanical breakdowns. Seattle gear specialists feel the dredge can be adapted successfully to West Coast conditions.

Only small quantities of razor clams and cockles were collected during the cruise. Very large catches of sand dollars, up to 4 tons per 15-minute tow, necessitated making shorter tows.



DESTROYER'S SONAR TRACKS WHALE

Two marine biologists working for the U.S. Naval Oceanographic Office aboard a destroyer in the Atlantic visually identified sonar "echoes" as a whale.

Biologist William T. Leapley reported: "This was one of those rare incidents--the first time we have been able to verify a sonarman's classification of an 'echo' as a whale sonar target by first actually tracking the source of the contact and then by visually identifying it as a whale--in this instance, a group of five finback whales."

Leapley and his associate, Coleman Levenson, had just completed an investigation into biological sonar targets when sound signals indicating possible whales were received.

Leapley recalled: "At that time, we were off Cape May, steaming toward Newport, Rhode Island. . . .Prior to this, the sonarmen aboard the ship had reported what they thought were the 'echoes' of sound signals bouncing off the bodies of whales, but we had yet to confirm any of these reports through visual identifications of the 'echo' sources.

"So when a sailor awakened me just before dawn on a summer morning to report a whale off the ship's starboard side, I thought that this might be the sighting we had been hoping for. After dashing up to the bridge to have a look, I learned that the 'sighting' was just another sonar contact classified 'probable whale' by the senior sonarman.

"I was about to write it off as a frustrating near miss when Cole (Levenson) arrived on the scene with the suggestion that we try to track down this target and really get some proof of its identity."

Whale Hunt

They received permission to hunt for the whale. As the ship headed at 28 knots back to where the sonarman first picked up the whale contact, they scanned the predawn horizon. Then, dead-ahead, the marine biologists saw "this great long form stretching out in the path of the ship. We would have cut it in half, if we hadn't taken right rudder evasive action. And there lying near our ship were two huge finback whales, 65- to 75-foot specimens that had just surfaced."

The finbacks rank second in size to the blue whales, which reach a maximum of 100 feet. "But the blue whales," Leapley notes, "are becoming very rare, almost extinct due to over-whaling." Finbacks feed on small planktonic organisms through a unique baleen mouth apparatus that works like a sieve.

Maneuvering Around Them

Almost as soon as the marine biologists spotted the two adult finbacks, the destroyer's skipper began to maneuver the vessel in a tight circle around them. Leapley recalls: "About half-way around, the whales dove. Then, about five minutes later, they surfaced again. At about the same time, we noticed that two more adults and a juvenile had also surfaced approximately 100 yards away. By this time, Cole was snapping pictures of the whales."

The skipper was able to maneuver the destroyer to a point 20 yards away from two adult and one juvenile whale--and the biologists got a very good view.

Echoes Tape Recorded

During the 45 minutes the scientists maintained visual contact with the 5 whales, the ship's sonarmen tape-recorded echoes bounced off the mammals' bodies on equipment connected to the ship's sonar.

Leapley concluded: "The tape containing the sounds now definitely determined to be whale echoes will be analyzed further to learn what a whale looks like on sonar equipment. Results of this analysis will eventually help the Navy to classify the mammals."

UNIVERSITY CURRICULA IN MARINE SCIENCES PUBLISHED

The National Council on Marine Resources and Engineering Development has published a compilation of institutions offering courses and degrees in marine sciences during the 1969-70 and 1970-71 academic years. It is entitled "University Curricula in the Marine Sciences and Related Fields."

The publication will help prospective students, research workers, and instructors

identify career opportunities and it will foster full use of educational facilities. In the foreword, Edward Wenk Jr., Executive Secretary of the Marine Sciences Council, emphasizes that skilled manpower is central to achievement of long-range national goals in marine sciences. It is the individual talents that pace our progress, he emphasizes.

What Report Contains

The report is based on information provided by the institutions in response to a questionnaire. Institutions are listed under 5 major categories: Marine Science, Ocean Engineering, Maritime Officers, Fisheries, and Marine Technicians. Each program is described in terms of teaching and research facilities--laboratories, classrooms, ships, computers--and academic programs and staff. Degrees offered and degree requirements are described.

It is available for $2 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

U. S. AIDS GULF OF MEXICO OYSTER INDUSTRY

BCF made available $281,388 in October for the hurricane-damaged oyster industries in Louisiana, Alabama, and Mississippi. The Bureau had determined that a resource disaster occurred when Hurricane Camille ravaged the 3 coastal areas in August 1969.

The money will be used to restore seed oyster grounds under State jurisdiction; $176,388 was allocated to Louisiana, $85,000 to Mississippi, and $20,000 to Alabama. The projects are financed 100% with Federal funds.

BCF acted quickly to provide the funds because the timing of restoration is important: oyster larvae begin arriving in these Gulf Coast waters during October and must have clean shells to which they can attach during their early life.

SENSOR STUDIES TEMPERATURE-FISH MIGRATION RELATIONSHIP

Coast Guard planes flying monthly missions at 130 knots, from 200 to 600 feet abov Atlantic and Pacific coastal waters, are becoming valuable parts of the fisherman's gear. Some of the information obtained o these flights is used by the Bureau of Spo Fisheries and Wildlife to "determine the relationship between surface temperatures an the distribution of migratory game fish." The findings also are useful to commercia fishermen; the data may help in predictin the movements of fish from the temperature the fish are known to tolerate.

The temperatures are detected ("read" with a Barnes infrared thermometer sensor which transmits them to a strip-chart recorder. The sensor is aimed through a smal hatch in a rear window of the plane. Also scientists note on the chart what they se below.

The Sensor

The sensor exploits the principle that fo certain wavelengths the amount of infrare radiation given off by an object is proportiona to the surface temperature of that object.

The sensor can be used at virtually an distance--so long as the target fills the fiel of view. It responds in a fraction of a second it is ideal for measuring sea-surface temperatures from a plane. The sensor mad practical the rapid preparation of temperature maps.

Areas Covered

On July 1, 1969, the East Coast program of obtaining monthly sea-surface temperatures was transferred from the Marine Laboratory of the Bureau of Sport Fisheries and Wildlife (BSFW) at Sandy Hook, N. J., to the Coast Guard's Oceanographic Unit in Washington, D. C.

On the West Coast, similar flights are made from BSFW's laboratory in Tiburon, Calif.

Monthly flights along the East Coast are made between Cape Cod, Mass., and Miami, Fla.; along the West Coast, between Vancouver Islands, B.C., and Northern Baja California, Mexico.

Charts are issued after each series of flights and depict the flight paths and contours of surface isotherms. The data are used in ecologic studies to help explain temperature's

Fig. 1 - Looking through hatch for marine animals. Infrared Thermometer Sensor is to right.

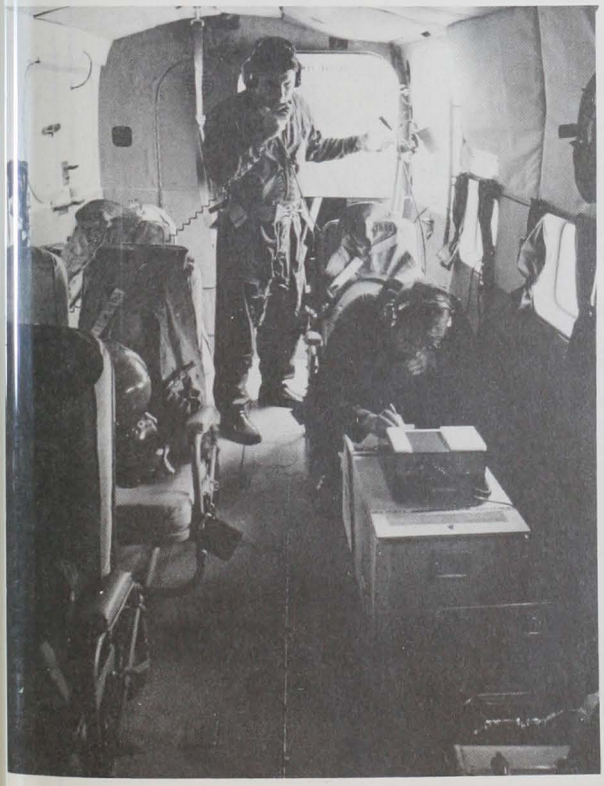


Fig. 2 - Coast Guard team at work.

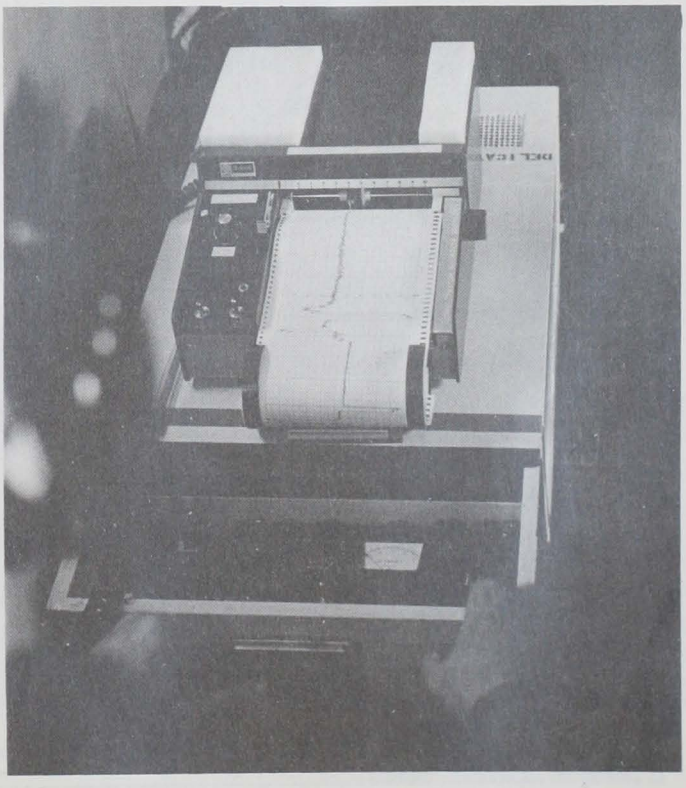
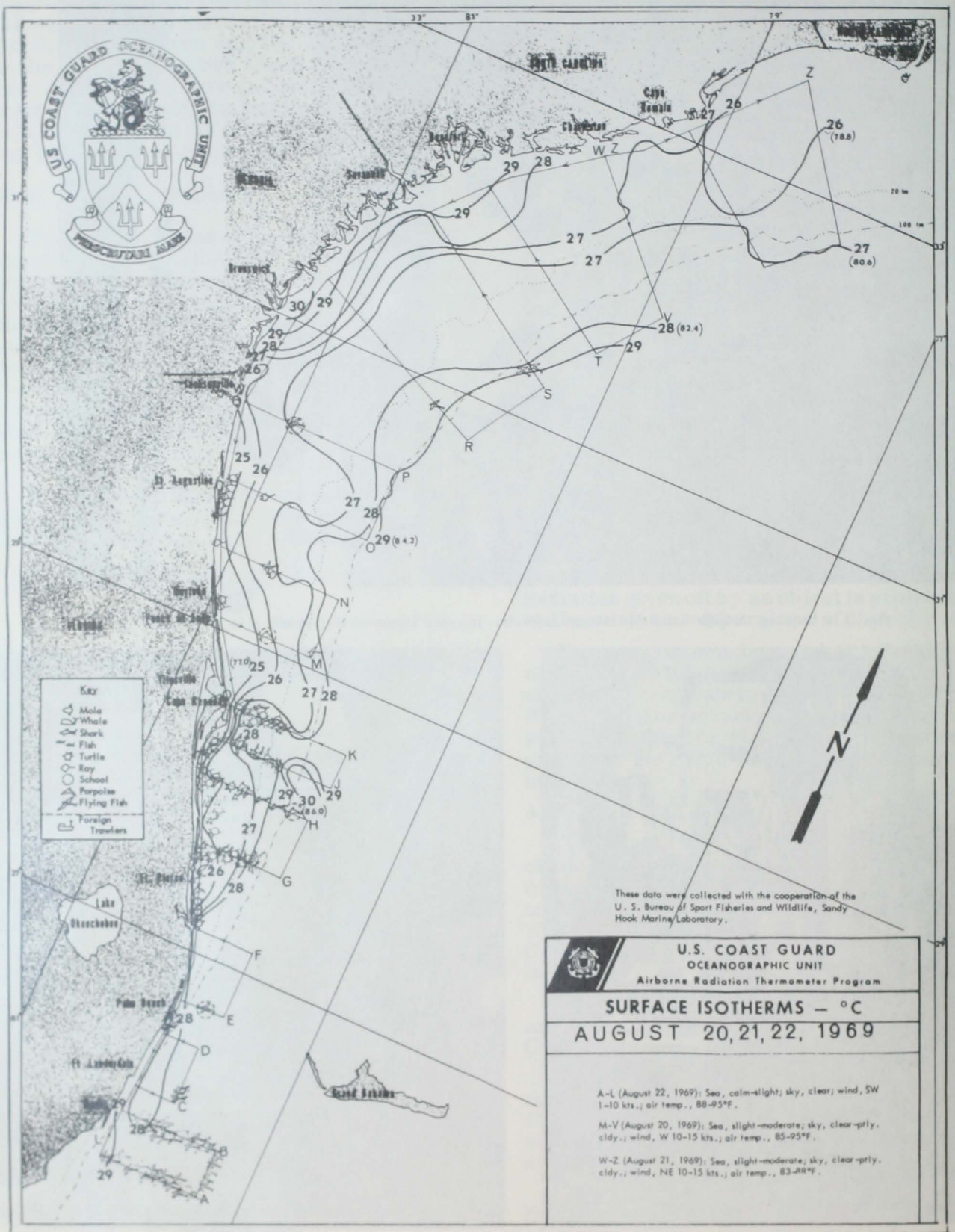


Fig. 3 - Strip Chart Recorder for Infrared Thermometer Readout.
(All Photos: Coast Guard)


U.S. COAST GUARD OCEANOGRAPHIC UNIT
PRESCRUTARI AUDE
Key
Mola
Whale
Shark
Fish
Turtle
Ray
School
Porpoise
Flying Fish
Foreign Trawlers
Cape Romain
Charleston
Savannah
Brunswick
Jacksonville
St. Augustine
Daytona
Cape Kennedy
Palm Beach
Lake Okeechobee
Grand Bahama
N
These data were collected with the cooperation of the U. S. Bureau of Sport Fisheries and Wildlife, Sandy Hook Marine Laboratory.
U.S. COAST GUARD
OCEANOGRAPHIC UNIT
Airborne Radiation Thermometer Program
SURFACE ISOTHERMS — °C
AUGUST 20, 21, 22, 1969
A-L (August 22, 1969): Sea, calm-slight; sky, clear; wind, SW 1-10 kts.; air temp., 88-95°F.
M-V (August 20, 1969): Sea, slight-moderate; sky, clear-ptly. cldy.; wind, W 10-15 kts.; air temp., 85-95°F.
W-Z (August 21, 1969): Sea, slight-moderate; sky, clear-ptly. cldy.; wind, NE 10-15 kts.; air temp., 83-88°F.

influence on distribution of migratory fishes--and on seasonal cycles of ocean productivity.

The charts are sent to hundreds of private and government institutions, newspapers, and commercial and sport fishermen.

Sightings of Marine Life

During East Coast flights, the crew reports and photographs sharks, turtles, porpoises, whales, and foreign fishing vessels. These are shown on the charts. Occasionally, scientists who are expert in recognizing marine life from the air are aboard. They increase the biological information obtained.

SOVIET RESEARCH VESSEL ARRIVES AT WOODS HOLE

The Soviet research vessel 'Ekliptika' arrived at Woods Hole, Mass., September 28, 1969. Research this year includes a study of herring spawning.

Chief Scientist is Vladimir Sauskan, expert on the life history of Atlantic hake. He has studied various species of Merluccius throughout North and South Atlantic.

The first cruise has been successfully completed. It was a 3-vessel operation; the Soviet 'Aliot' joined in the work at Sauskan's request. The survey cruises were scheduled to end in November.

Atlantniro's 'Ekliptika' leaving Woods Hole (Mass.) Coast Guard Base to join BCF's 'Albatross IV' for a joint survey (September 1969). (Photo: Robert K. Brigham)

FOREIGN FISHING OFF U.S., SEPTEMBER 1969

Generally good weather permitted excellent coverage of the northwest Atlantic off New England; 340 foreign fishing and support vessels were sighted (325 sighted in August). (Fig. 1.)

SOUTHERN NEW ENGLAND & GEORGES BANK

USSR: 75 vessels--34 factory stern trawlers, 126 medium side trawlers, 6 factory base ships, 8 refrigerated transports, and 1 tanker (102 vessels in September 1968). Catches, moderate to heavy, were primarily herring and mackerel.

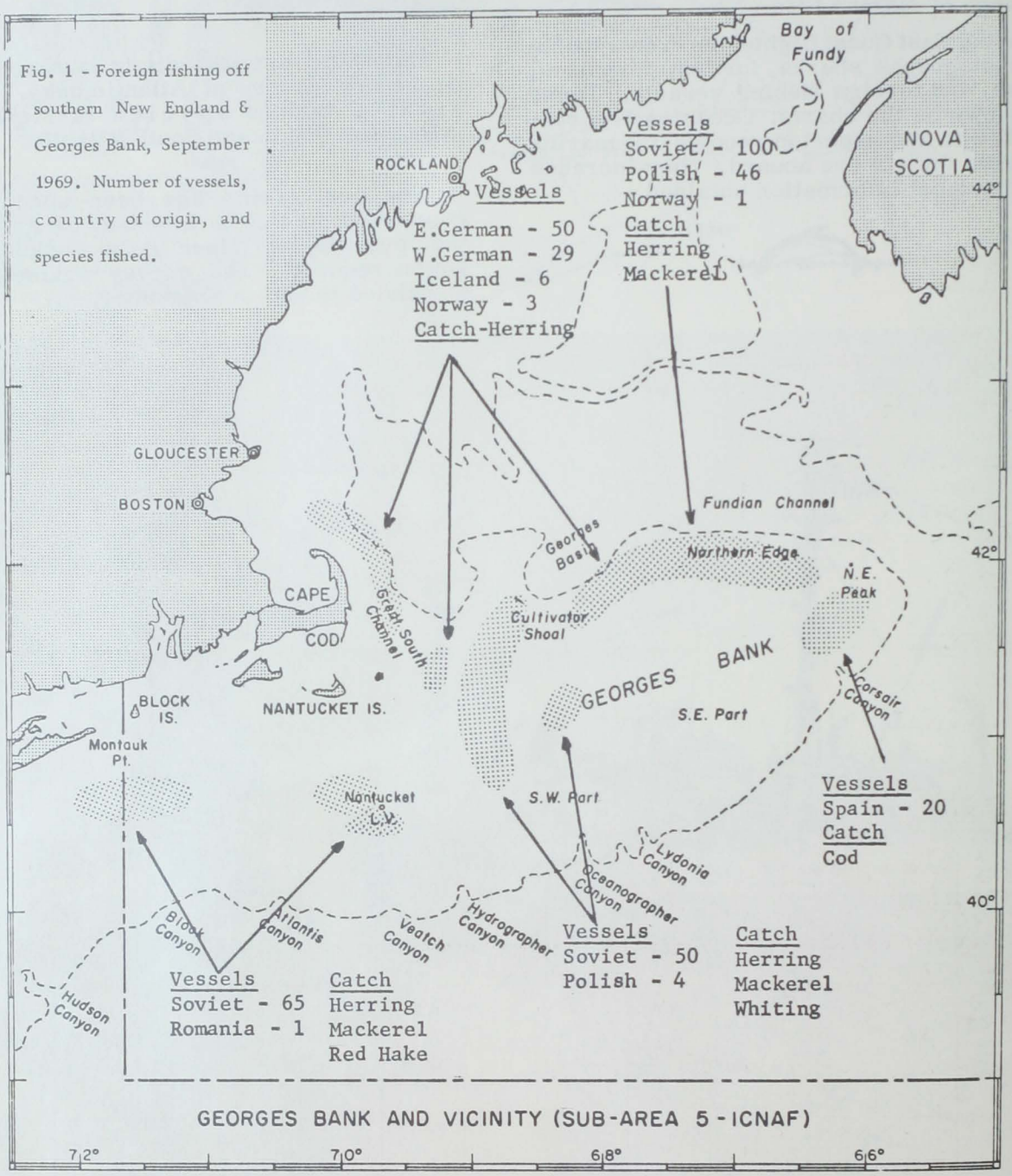


Fig. 1 - Foreign fishing off southern New England & Georges Bank, September 1969. Number of vessels, country of origin, and species fished.

Poland: 50 vessels--13 stern trawlers, 32 large side trawlers, 2 factory base ships, 3 carriers (25 in Sept. 1968). Catches, moderate: herring and mackerel.

East Germany: 50 vessels--29 factory and freezer stern trawlers, 19 side trawlers, 2 factory base ships (20 in 1968). Catches, moderate to heavy, probably herring.

Floating cod-end and pickup techniques were used: A BCF Agent saw 3 floating cod-end sections buoyed together and containing over 100,000 pounds. Retrieval through stern opening of factory base ship took about 15 minutes.

West Germany: 28 freezer stern trawlers, 1 fisheries protection vessel (21). Catch was mainly herring.

Spain: 15-20 stern and side trawlers were pair trawling. Catches were excellent (probably cod).

Iceland: 6 herring purse seiners continued at-sea transfers to U.S. carriers for delivery to reduction plants at Gloucester, Mass., and Amagansett, L.I.

Norway: 1 stern trawler, 3 herring purse seiners.

Romania: 1 stern trawler. Catch was presumably herring and mackerel. (Same trawler, 'Galati,' sighted in September 1968.)

Japan: 1 stern trawler.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels reported.

WEST COAST

USSR: 3 stern trawlers, 6 support vessels, 2 research vessels off Washington and Oregon, and adjacent to Canadian coast off Vancouver Island (33 in September 1968). Catch: Pacific hake. Several hauls estimated at 10,000-35,000 pounds were observed off Washington.

Japan: Early in month, 1 longliner off Washington, and 1 stern trawler off Oregon. Late in month, 2 longliners, 1 stern and 1 side trawler (1 longliner in 1968). Longliners believed fishing black cod.

OFF ALASKA

USSR: 17 vessels (5 more than in each of 2 preceding months, half number sighted in September 1968). (Fig. 2.)

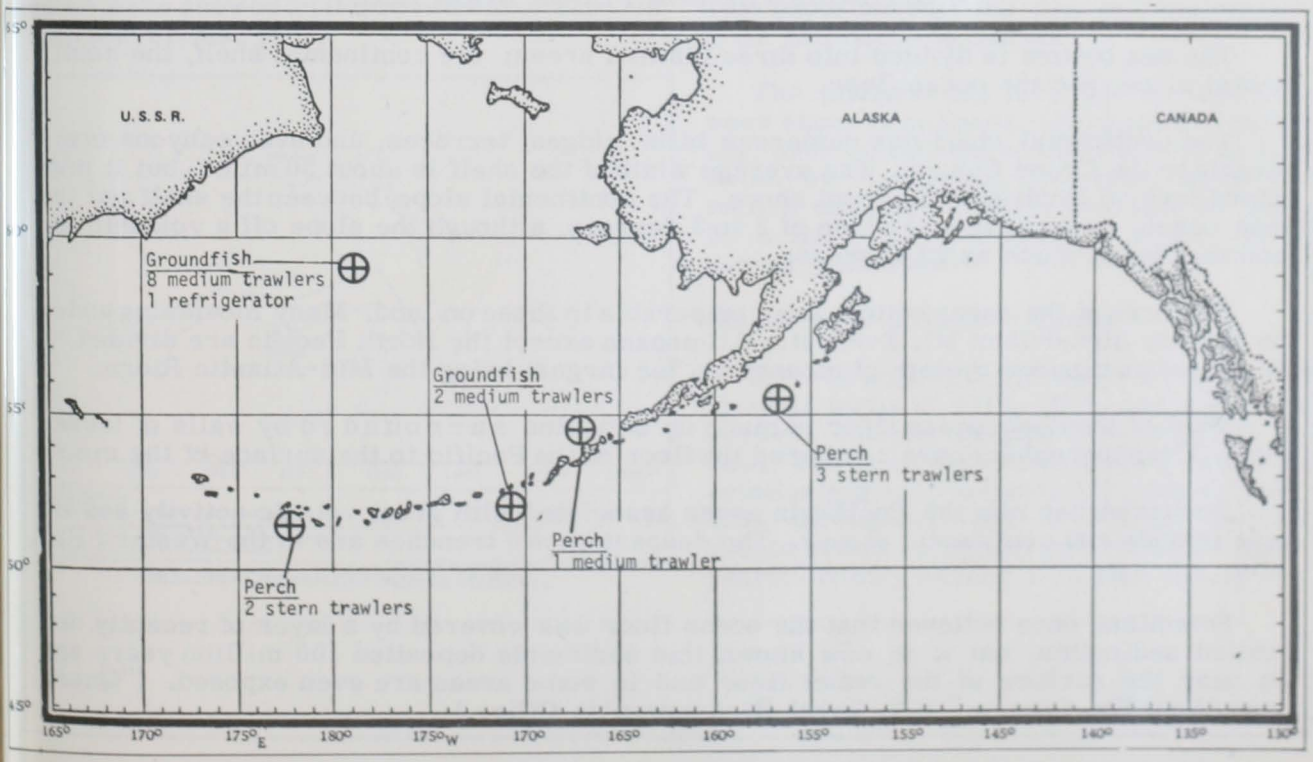


Fig. 2 - Soviet fishing activities off Alaska, September 1969.

Japan: 110 vessels at end of September (190 in August).

Ocean perch: In Gulf of Alaska, about 15 stern trawlers till mid-month; at month's end, 6 were between eastern and central Gulf. Off Aleutians, stern trawlers decreased from 6 to 5--3 south of eastern Aleutians, 2 along western.

Groundfish: Early in month, 12 stern trawlers along Continental Shelf edge in Bering Sea; end of month, 6: 3 in eastern Bering, northwest of Unimak Pass, 3 in central Bering, northwest of Pribilofs.

Minced fish-meat, meal and oil: 5 factory-ship fleets fishing Alaska pollock and flatfish, decreased to 3: 2 in central Bering, north of Pribilofs, 1 in eastern Bering, north of Unimak Pass.

The 2 crab fishing fleets departed the eastern Bering Sea after mid-month.

Sablefish: 8 longliners in August; 9 in September--6 in eastern and 3 in central Gulf.

South Korea: Shin Hung's trawling fleet--1 factoryship, 1 carrier, 7 trawlers--left by September 1. One large and 2 small stern trawlers in eastern Bering Sea also believed to have left. Late in month, a new stern trawler appeared in eastern Bering and began trawling groundfish, primarily Alaska pollock.

WHAT DOES THE SEA FLOOR LOOK LIKE?

The sea bottom is divided into three distinct areas: the continental shelf, the continental slope, and the ocean floor.

The continental shelf has numerous hills, ridges, terraces, and even canyons comparable to the Grand Canyon. The average width of the shelf is about 30 miles, but it may extend several hundred miles from shore. The continental slope, between the shelf and the deep ocean, has an average slope of 2 to 3 degrees, although the slope off a volcanic island may be as much as 50 degrees.

Features of the ocean bottom are comparable to those on land. Many mountains under the sea are higher than Mt. Everest. All oceans except the North Pacific are divided by an almost continuous system of mountains, the largest being the Mid-Atlantic Ridge.

Most of the deep-ocean floor is made up of basins surrounded by walls of lesser depth. Oceanographers have compared the floor of the Pacific to the surface of the moon.

Deep trenches rim the Pacific in areas associated with great volanic activity and lie near islands and continental slopes. The deepest known trenches are in the Western Pacific.

Scientists once believed that the ocean floor was covered by a layer of recently deposited sediments, but it is now known that sediments deposited 100 million years ago lie near the surface of the ocean floor and in some areas are even exposed. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

STATES

ALASKA

1969 SALMON PACK IS NEARLY MILLION CASES BELOW 1968's

The Alaska Department of Fish and Game reported in September:

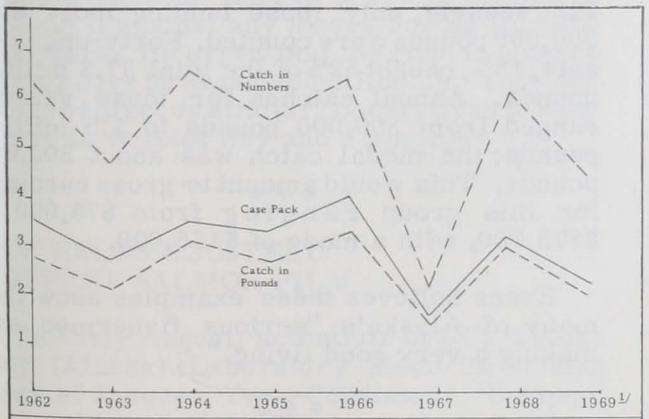
"The 1969 salmon season is basically over now. The preliminary final case pack for this year by region in number of cases is as follows:

	Kings	Reds	Cohoes	Pinks	Chums	Total
Southeastern	302	35,497	8,824	231,105	32,705	308,433
Central	6,106	311,605	13,723	992,286	123,146	1,446,866
Western	28,584	440,276	1,793	33	26,037	496,723
Total	34,992	787,378	24,340	1,223,424	181,388	2,252,022

"This year's salmon pack was nearly a million cases below that of the 1968 season. A total of 2.2 million 48-pound cases was packed in 1969 compared to 3.1 million cases in 1968. As shown by the graph the pack in 1967 was 1.5 million cases.

"The extremely poor season in Southeastern accounted for practically all of the deficit. The Panhandle catch produced 308,433 cases compared to 1.4 million in 1968.

"Central Alaska's catch produced 1.4 million cases in both 1968 and 1969 while Western Alaska showed an improvement of 138,000 cases over last year.



1962-1969 Comparative Salmon Statistics.

"The Department each year publishes a weekly Salmon Case Pack by geographical area. Just what does this weekly case pack represent? For one thing over a seven year average the pounds of salmon producing the case pack represented 78% of the total production poundage.

"The graph shows the number of cases of salmon packed, the total catch in numbers of salmon and the total pounds over the years 1962 to 1969. By using this information and knowing what the weekly case pack is at any time during the fishing season, a person can quite easily estimate salmon caught to date either in number or pounds. Sometimes a picture is truly worth 10,000 words."

* * *

LARGEST BRISTOL BAY RUN PREDICTED FOR 1970

The largest salmon catch in the history of the Bristol Bay fishery is in prospect for 1970. This was the preliminary forecast in late September by the Alaska Department of Fish and Game in Juneau.

The inshore run forecast in Bristol Bay sees about 64 million sockeye salmon returning; over 40 million of these should be harvested by fishermen. However, some indicators estimate inshore returns as low as 50 million--a yield similar in size to the parent year 1965.

Maybe Over 5,000,000 Cases

A 40-50 million catch would far exceed the historic highs of 1917, 1938, and 1965, when sockeye catches ranged from 24 to 25 million. The case pack from such a catch, plus relatively good prospects for pink salmon in 1970 throughout Gulf of Alaska districts, should result in highest pack in more than 20 years. It may exceed 5 million cases.

Processing Problems Foreseen

Although more than enough fishermen live and work in Alaska to harvest the expected 1970 bonanza in Bristol Bay, processors may have problems handling the catch, Governor Miller emphasized. This is because the run in the Bay is short and the industry physically limited.

1 River System

The huge size of the expected Bristol Bay run is almost solely attributable to a single river system: the Kvichak River-Lake Iliamna-Lake Clark. Over 52 million sockeye of the 64 million run will return to this watershed, most of these from a single age class of 5-year-olds produced from high-cycle-year spawning in 1965; then, about 25 million escaped the fishery and ascended the river.

High Levels Confirmed

Preliminary indications from high-seas fishing at Adak in 1969 on immature salmon that will make up 1970 run generally confirmed very high levels of abundance. Improved growth rates had occurred compared to parent cycle. The fishing was done by the University of Washington working under U.S. contract.

The 1970 run should require about 14 fish to make a 48-pound case of salmon; in 1965, 17 fish were required.

Other Good Runs

The preliminary forecast for Bristol Bay indicates the Naknek, Egegik, and Ugashik Rivers also will have relatively good runs in 1970. The resident fishermen, especially of Ugashik, recently suffered a series of very poor runs.

* * *

FISHERY ECONOMICS HAS SOME BRIGHT SPOTS

Several reports have indicated the plight of the Alaska fishermen: a low average annual income that would reduce them to a poverty level if total catch value were distributed evenly among all. In 1967, the value of Alaska's catch, $48.8 million, divided among 18,172 fishermen would give an average annual gross income of $2,685. After depreciation, expenses, and taxes, most would have lost money.

Recently, Bill Evans, Statistician of BC Juneau, drew "an altogether different pictur for those who are truly fishermen in Alaska.

SE Alaska Troll Fishery

In the Southeast Alaska troll fishery, 22 of the 1,792 so-called trollers caught 76.4 of the fish. Evans arrived at these figures b going through the list of annual total vesse landings by vessel number. He recorded onl trollers catching 1,000 fish or more.

The highliner took 7,000 fish, and the mos common (modal) catch for the group was abou 2,500 fish. Based on catches of about 25 kings and 75% cohos, the vessel landing 1,00 fish would have grossed about $6,450. Th modal annual catch of 2,500 fish would hav grossed the fishermen about $16,000; th highliner with 7,000 fish would have grosse about $45,000. Most of these vessels probabl fish for halibut also, and perhaps for som other species; so these would have highe annual earnings than indicated from the fig ures that could easily be obtained.

Central Alaska King Crab

In the Central Alaska king-crab fishery o 222 vessels, only those landing more tha 300,000 pounds were counted. Forty-one ves sels, 18%, caught 52% of the total 37.3 millio pounds. Annual catches for these vessel ranged from 300,000 pounds to 1.5 millio pounds; the modal catch was about 500,00 pounds. This would amount to gross earning for this group ranging from $75,000 t $375,000, with a mode of $125,000.

Evans believes these examples show tha many of Alaska's "serious fishermen ar making a very good living."

* * *

STATE INSURANCE DIRECTOR URGES FISHERMEN'S CO-OP

Alaska's State Insurance Director, W. W Fritz, testifying in September before a Con gressional Committee in Kodiak, urged Con gress to make available a back-up fund of $

illion to form a fishermen's insurance co-erative in Kodiak. This was reported in the odiak 'Mirror'.

Fritz said that the insurance industry has rtually no interest in providing marine in-rance to North Pacific fishing vessels be-use of the high rate of boat disasters and sulting heavy losses to insurance firms.

The fishermen of the North Pacific, for the ost part, cannot afford the high and increas-g rates of marine insurance coverage. One ternational requirement for getting marine surance involves hull stability tests. The tability tests are expensive.

wn Co-Op Needed

Fritz envisions the area's fishermen set-ng up their own insurance pool through n insurance cooperative and a Board they elect. The Board, made up of fishermen, ould decide which vessels could belong to he cooperative. He said the fishermen know hich are the good and the bad risks. Fisher-nen rejected by the Board would have to pay he commercial rate to be insured by the co-perative.

Insurance pool cooperatives already have en operating for years in Seattle, Wash.

Fritz said the cooperative would need ini-lally a back-up fund of about $2 million to stain it against any losses during its first w years. He urged that the first insurance operative be organized in Kodiak. This one ould help set up similar cooperatives in such eas as Bristol Bay and Cook Inlet.

* * *

CF HELPS COUSTEAU REPARE SALMON FILM

In early August, scientists of BCF's Auke ay (Alaska) Laboratory aided the 6-man rew of Jacques Yves-Cousteau's 'Calypso' n production of a film on sockeye salmon. wo Kodiak Island bases were used: the CF station at Karluk Lake, and the Fraser ake station of the Alaska Department of Fish nd Game. A small part was made in a almon cannery at Alitak Bay.

Part of Life Cycle

The film covers that part of the salmon's life cycle dealing with the adult's return to the spawning grounds. It includes the fishery, morphological changes in adult fish prior to and after spawning, the spawning act, behavior, and death.

It is expected that the film will be ready for distribution to theaters and ABC and BBC TV in about a year.

CALIFORNIA

TO BUILD FIRST STATE-OWNED CHANNEL CATFISH HATCHERY

California's Wildlife Conservation Board is financing construction of California's first state-owned hatchery for channel catfish. Building of the $1.2-million Imperial Valley Warmwater Hatchery will begin about Jan. 1, 1970, and take a year.

The Hatchery

The hatchery will be on state property 6 miles north of Niland, on east side of Salton Sea, in Imperial County. It will consist of 17 rearing ponds, each 6 feet deep, covering nearly 100 acres; 3 residences, and an administration building including shop, warehouse, office, and ice-storage facilities.

The Department of Fish and Game will take over operation when the hatchery is completed. The Department recommended construction after nearly 4 years of on-site testing.

500,000 A Year

About 500,000 one-half-pound channel catfish will be reared annually. These will be stocked in many suitable Southern California reservoirs and units of the State Water Project. The channel catfish growth rate is exceptionally fast, and the growing season lasts all year.

* * *

TAGGED STURGEON MIGRATE FAR

A green sturgeon tagged in 1967 in San Pablo Bay, Calif., by the California Department of Fish and Game, has been caught by a commercial fisherman in Grays Harbor, Washington. It was one of 25 tagged that year. Two other tags were returned from the same group, one from Santa Cruz, Calif., the other from Astoria, Oregon.

3 from 1954 Tagging

Three tags from a 1954 California tagging program also were recovered far away: one from Astoria, at liberty more than three years; another from the same area after 431 days; the third after 1,067 days in Winchester Bay, Oregon.

This indicates that green sturgeon migrate along the Pacific coast for considerable distances. They are likely to mix with other populations.

NEW YORK

LONG ISLAND SOUND POLLUTION DOUBLES IN DECADE

Two New York Congressmen warned on October 24 that Long Island Sound was becoming more polluted--and that efforts to improve its water quality were becoming less effective. This was reported the next day by Nancy Moran in 'The New York Times'.

Rep. Ogden R. Reid, Westchester County Republican, said: "Long Island Sound is in danger of becoming another Lake Erie. The water is twice as dirty as it was 10 years ago and the pollution is spreading out from the shoreline."

Rep. Lester L. Wolff, Nassau County Democrat, said Congress should create an intergovernmental commission "to stop the piecemeal destruction that is going on now."

Pollution Increases Sharply

The Congressmen had seen the results of a survey released that week by Interior Department's Federal Water Pollution Control Administration (FWPCA). The report showed that the bacteriologic count in L.I. Sound had risen sharply along shorelines.

Russell E. Train, Interior Department's Under Secretary, commented on the survey: "There is clear evidence of deterioration a the western end of the sound. The bad spots are danger signals that give us a chance t save the sound as a whole."

The survey was made in October b Interior Department's 64-foot, laboratory- equipped 'Clean Waters'. Water was sampled at 100 places throughout the sound.

Sewage Treatment Lags

Most pollution, the survey found, came from the discharges of 179 municipal sewage facilities into the sound--and from commercial navigation, pleasure boats, and dredging. There are 10 times more pleasure boats than 10 years ago.

Less than half the municipal sewage facilities provide secondary disinfecting treatment. Under U.S. regulations, all municipal facilities are slated to have secondary treatment by 1972. Some are behind schedule.

Nuclear Plants Planned

Water quality may be affected significantly by planned construction in the 1970s of nuclear-fueled power plants in the area. The plants would use billions of gallons of wate a day for cooling. The hot water discharged into L.I. Sound would cause an almost immediate change in water temperature.

Conservationists oppose the plants becaus warming of water disrupts fish life. It also fosters growth of algae--from mild green fuz to huge seaweed-like plants that now ar harming Lake Erie.

Effect on Shellfish

The Clean Waters cruised up and back 30 miles, from Port Chester to Flushing Harbor, through murky water. Most of this water has been closed to shellfish harvesting in recent years because of high bacterial counts.

Daniel Marchishin, a sanitary engineer who had gathered water samples, reported many people shellfishing. He said: "We're not policemen, so we let them alone, but I sure wouldn't want to eat those clams."

He and 2 assistants sampled for coliform rod-shaped bacteria found in the intestines

of warm-blooded animals. At Whitestone Bridge, coliform count was 27,000 per 100 milliliters; at Port Chester Harbor, 14,000 per 100 milliliters. In shellfish areas, 70 per 100 milliliters is standard count.

Coliform counts midstream in the sound and east of Port Jefferson generally were much lower; the water was of "generally good quality."

FWPCA Survey in 1972

The Federal Water Pollution Control Administration plans a comprehensive survey of L.I. Sound in 1972. But, Cong. Reid said, "the pollution problem is growing every day" and the FWPCA survey should begin immediately.

WASHINGTON

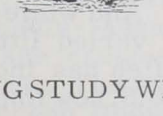
HAKE LANDINGS IN PUGET SOUND REACH 9 MILLION POUNDS

Hake landings in Puget Sound during the past season were about 9 million pounds. Chances for a record disappeared when 2 major buyers of hake restricted landings or stopped buying.

A new, floating, fish-meal plant at Neah Bay, Wash., suffered mechanical problems from the time it opened in Nov. 1968. It was forced to limit landings until late March 1969, when it closed for major repairs.

Million-Pound Vessels

Five of the 6 vessels in the 1968-1969 fishery landed over 1,000,000 pounds each; 2 exceeded 2,000,000 pounds. Catch rates for the 6 were higher than in 1967-1968--but the significance of this is uncertain because trawler efficiency differed.



FLORIDA

SHRIMP FARMING STUDY WINS EDA FUNDS

The Economic Development Administration (EDA) has granted $180,759 to a firm to help determine the feasibility of raising fresh-water shrimp on Florida Indian reservations and other underdeveloped lands. The shrimp is the Macrobrachium species indigenous to Florida.

The funds will help pay for a 2-year project of growing fresh-water shrimp in a controlled environment--and demonstrating shrimp cultivation on a semicommercial scale. The study will be conducted on the Big Cypress Reservation in Broward and Hendry counties, about 65 miles northwest of Miami. The Seminole Indian Tribe is leasing the land.

Could Help Indians

The firm says that if fresh-water shrimp farming proves feasible, there would be jobs for Indians on whose reservations the shrimp would be raised. Techniques developed would be adaptable to other parts of the U.S.

Facilities and technical help will be provided by the Bureau of Indian Affairs and Bureau of Commercial Fisheries, Interior Department, Florida Soil Conservation Service of the U.S. Department of Agriculture, and by the Florida Game and Fresh Water Fish Commission. Total cost is $334,290.

EDA

EDA was established under the Public Works and Economic Development Act. It is authorized to conduct the research that will help to create new jobs and boost incomes in areas with employment problems.

COMMONWEALTH OF PUERTO RICO

'STAHL' FINDS SNAPPERS & GROUPERS IN UNEXPLOITED AREA OFF PUERTO RICO

Large red snapper, lane snapper, and grouper are available in an area not generally exploited by local fishermen. The area is Vega Baja to Cerro Gordo. This was discovered in September during exploration and test fishing by the M/V 'Agustin Stahl' of Puerto Rico's Department of Agriculture.

Fishing Tests

The Stahl conducted fishing tests in various depths up to 110 fathoms with fish pots. The results were lane snapper, red snapper (up to 10 pounds each), and grouper.

Local fishermen normally do not use fish pots in this area. The test results may encourage their use. Stahl personnel are helping fishermen build and operate the pots.