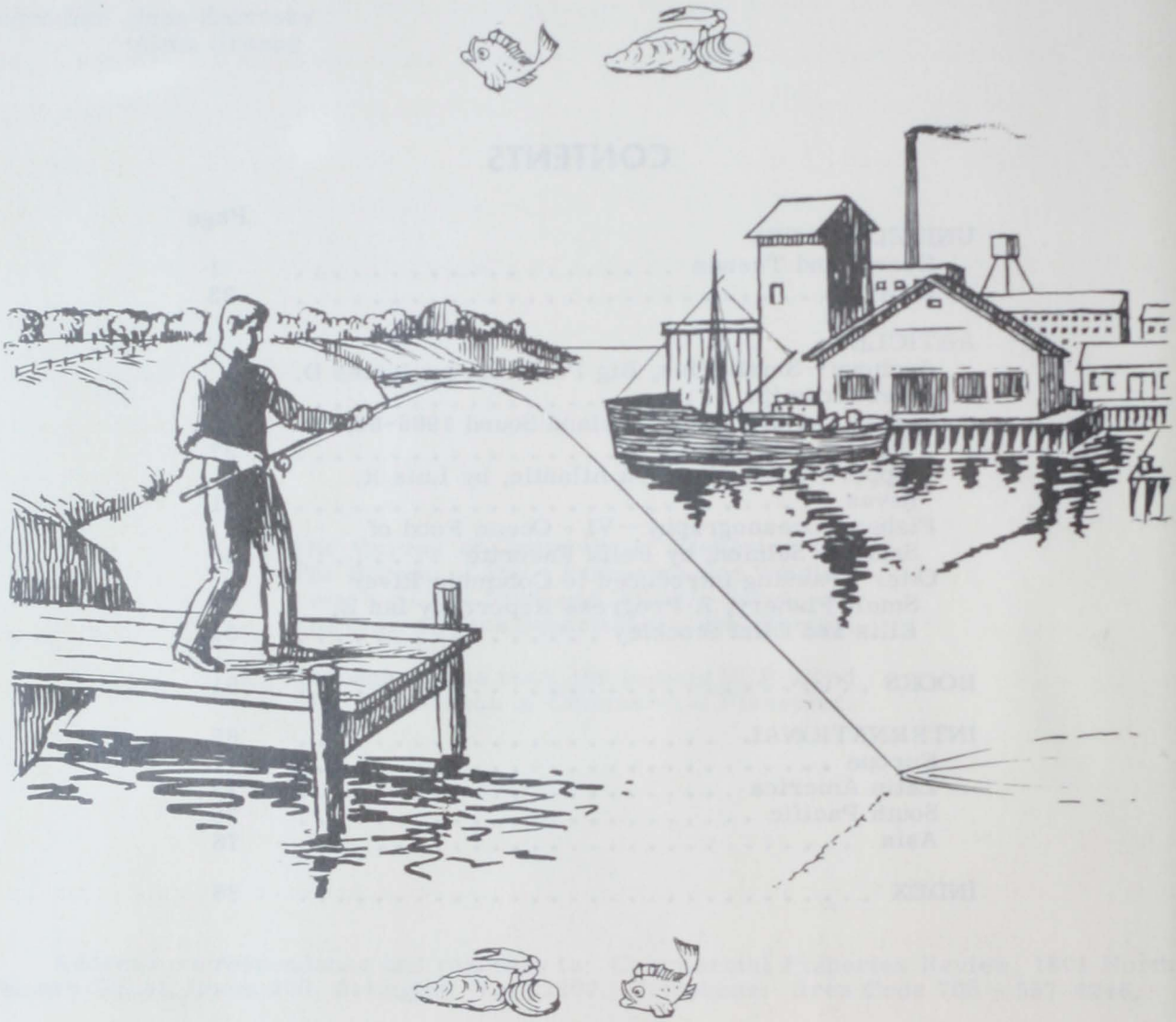


U. S. 1969 CATCH OF FISH & SHELLFISH IS 4.2-4.3 BILLION POUNDS

U.S. fishermen caught between 4.2 and 4.3 billion pounds of fish and shellfish in 1969. The catch brought them a record income exceeding $475 million and approaching $480 million. The previous record year was $472 million. These preliminary data were reported by BCF's Division of Statistics and Market News.

In 1968, 4.1 billion pounds sold for $471.5 million.

The 1969 catch was only slightly larger than the two previous low-volume years and the third smallest domestic catch since 1942. (Record catch--5.4 billion pounds in 1962.)

Some Sharp Declines

Landings declined sharply for haddock, sea herring, whiting, and sea-scallop meats at New England ports. In the Pacific Northwest, the salmon harvest ranked with the smallest of the 20th Century. Fishing for menhaden along the Atlantic Coast generally was poor, but the Gulf of Mexico catch was a record.

Some Good Increases

There were good increases in landings of anchovies, cod, halibut, jack mackerel, and tuna.

Shrimp Slips in Gulf of Mexico

Production of shrimp in the Gulf slipped below 1968 but, for the first time, fishermen received more than $100 million. The catch dropped also in the South Atlantic States, but the developing shrimp fisheries off New England and the Pacific Northwest kept the U.S. shrimp catch at about the 1968 level.

Total Supply Drops

The supply of all fishery products (round weight) was 12.6 to 13 billion pounds--about 25% below 1968's record 17.3 billion pounds. The loss was entirely in nonedible products--resulting from a 40-45% decrease in fishmeal imports. The supply for food was a little higher than 1968's $5\frac{1}{2}$ billion pounds. Of all fishery products, domestic fisheries accounted for 33% (24% in 1968); imports were 67% (76% in 1968).

Per-Capita Use & Consumption

It was predicted that per-capita utilization of all products (round weight) would drop 28%: from 87 pounds in 1968 to 63 pounds in 1969. Per-capita consumption would remain near the high 1968 level of 11 pounds per person.

PHILIP M. ROEDEL NAMED BCF DIRECTOR

Philip M. Roedel, Chief of California's Marine Resources Program, has been named Director of the Bureau of Commercial Fisheries. He succeeds H. E. Crowther, recently appointed Deputy Commissioner of Fish and Wildlife.

Roedel, 56, an internationally known fishery scientist and administrator, has been actively engaged in the fishery world for more than 30 years.

Secretary of the Interior Walter J. Hickel said: "Mr. Roedel is eminently qualified to head the Bureau. We know he will bring to this position the same talent and energy which has earned him such an enviable reputation in the fishing industry as well as in the scientific community."

He Sees Opportunity

Mr. Roedel said it was a great opportunity to join BCF at this time to help strengthen all aspects of the U.S. fishing industry. "Many problems face both government and industry. We must help the industry and, at the same time, make the best use of the resources available to us. We have to take a hard look at what we are doing now--to chart a course that will provide the best service in the future to our Nation and its people. We must select our goals and priorities carefully." He said he looked forward to working at the national level with all segments of the fishing business to achieve the goals selected.

Mr. Roedel, who had close professional associations with BCF for many years, emphasized his great respect for the organization and his pleasure at joining it.

Background

The new director received an AB from Stanford University in 1935. In 1936, he began his professional career as a marine biologist with California's State Fisheries Laboratory.

During World War II, he served in the Army 4 years, first as an enlisted man in the Medical Department, and later as a commissioned officer in the Medical Administrative Corps.

He resumed his professional career in 1946 and earned his master's degree in biological sciences at Stanford in 1952.

State, U.S., World Duties

Roedel held positions of increasing responsibility in California, specializing in marine fisheries. He served on U.S. delegations to international fishery conferences and as consultant to FAO.

He represented California at national fishery meetings and, in 1967 and 1969, on the U.S. State Department Fishing Industry Advisory Council.

He is the author of many scientific papers, a Fellow of American Institute of Fisheries Research Biologists, and a member of fishery societies and other scientific groups.

Director Roedel is married to the former Geraldine Harney. They have two children: David, 20, and Deborah, 18.

BCF SCUBA TEAM STUDIES LOBSTER BEHAVIOR

Studies of lobster behavior by a SCUBA team of BCF's Boothbay Biological Laboratory (Maine) show relative abundance of lobsters in the inshore waters remains constant throughout the year. This suggests that these lobsters do not make extensive seasonal onshore-offshore migrations.

Active At Night

Small-scale movements do occur during stormy weather and strong vertical turbulence in the water. During stormy weather, the divers saw lobsters occupying relatively shallow burrows in 40 feet of water or less move to greater depths. The movements generally involved horizontal distances of 100 yards or less, and an increase in depth of 20 to 30 feet. Lobsters were nocturnally active throughout the year. They left their burrows at about sundown and returned just before sunrise. Lobsters less than 45 mm. were not active at night.

5 GREAT LAKES STATES CONDUCT PESTICIDE MONITORING PROGRAM

The natural resources agencies of Michigan, Indiana, Illinois, Minnesota, and Wisconsin have mobilized a $300,000 pesticide monitoring program in the upper Great Lakes. Their targets: "Tributary streams to pinpoint major sources of pesticide pollution along this big body of water."

The states acted after the U.S. Food and Drug Administration seized more than 30,000 pounds of Lake Michigan coho salmon containing too much DDT.

DR. A. R. LONGHURST HONORED BY LONDON UNIVERSITY

The Senate of the University of London has conferred the Degree of Doctor of Science on Dr. Alan R. Longhurst, Director, Fishery-Oceanography Center, BCF, La Jolla, Calif. The degree honors his work in marine biology. Dr. Longhurst earned his Ph. D. at London.

SAFE-BOATING BILL PROPOSED BY TRANSPORTATION DEPARTMENT

The Secretary of Transportation has sent to Congress a Federal Safe Boating proposal. It would allow the Department to establish minimum safe standards for boats and equipment. The proposal includes a 5-year financial assistance program to encourage States to increase their safe-boating efforts.

INTERIOR ASKS CHANGES IN FISH PROTEIN CONCENTRATE RULES

The Department of the Interior has asked the U.S. Food and Drug Administration to permit the use of fish species besides hake in the making of fish protein concentrate (FPC). The notice was published in the 'Federal Register' Dec. 24, 1969.

Under current regulations, FPC may be manufactured only from "hake or hakelike" fish. Continuing research has shown that a safe and wholesome product also can be made from fatty fish, such as herring and menhaden.

Closer to Commercial Reality

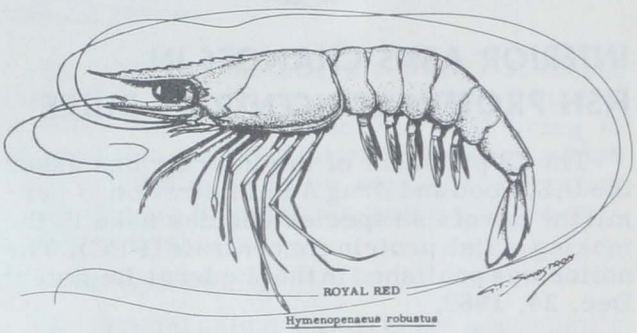
Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for Fish and Wildlife, Parks and Marine Resources, said:

"Permission to use fatty fish, which are found in abundance off our shores, and small, bony, or other unused fish, will put industry into a more favorable position to get into the FPC business.

"We believe the United States must assume leadership in research to increase the world food base. The FPC research of our Department, which has had the benefit of advice from the National Academy of Sciences, is a firm step in the direction of that leadership."

ROYAL-RED SHRIMP CONCENTRATED IN 3 POTENTIAL COMMERCIAL AREAS

The royal-red shrimp (Hymenopenoeus robustus) is an underused species. Although it is a typical penaeid, it differs from commercial penaeids of the genus Penaeus because it prefers deep, cold water. It inhabits the upper Continental Slope from as far north



as Cape Hatteras, North Carolina, to as far south as the coast of the Guianas in South America. But it is abundant in only a few areas. Little is known of its biology, particularly its reproduction and early life history.

3 Potential Commercial Areas

Royal-red shrimp concentrations in the Gulf of Mexico were discovered in 1950. Since then, BCF's Exploratory Fishing and Gear Research Base, Pascagoula, Miss., has made periodic trawling surveys along the Continental Slope from North Carolina to Brazil to evaluate the commercial potential. The results indicate that three grounds off the U.S. coast support commercial quantities of royal-red shrimp: east of St. Augustine, Florida, in the western Atlantic; south-southwest of the Dry Tortugas in the Florida Straits; and southeast of the Mississippi River Delta in the Gulf of Mexico.

How Catch Divided

Preliminary records indicate the 1968 U.S. commercial catch of royal-red shrimp was less than 120,000 pounds (heads-off). Of this total, 53% came from the Mississippi River Delta area, 39% from off St. Augustine, and 8% from Dry Tortugas area.

Soft Bottom, 8^{o}-12^{o} C.

The distribution of royal-red shrimp is restricted to soft-bottom types and to water temperatures of 8^{o} to 12^{o} C. The highest shrimp concentration is in 9^{o} to 10^{o} C. water.

Shrimp densities vary seasonally on all three grounds. Late summer and fall are periods of high density on the St. Augustine and Mississippi Delta grounds; late spring and summer for the Dry Tortugas grounds.

Depth Distribution Varies Seasonally

The depth distribution of shrimp also varies seasonally: the shrimp move offshore in summer and inshore in winter. Shrimp occur at 255 to 550 meters on St. Augustine grounds; 275 to over 550 meters on Dry Tortugas; and at 275 to over 550 meters on Mississippi Delta area. Within each range, seasonal variation in concentration is considerable.

BLUE CRABS ABOUND IN CHESAPEAKE BAY

Blue crabs are more abundant in Chesapeake Bay now than at any time in the past 90 years. Not since commercial fishing started in the 1870s have so many been reported.

This bountiful supply was predicted in October 1968 by W. A. Van Engel of the Virginia Institute of Marine Science, and Robert L. Lippson of Maryland's Chesapeake Biological Laboratory. The 2 scientists predicted a Virginia-Maryland catch--barring trouble from weather, labor, and markets--of over 100 million pounds from September 1969 through August 1970. The previous 12-month high was 97½ million pounds in 1966. They also predicted the catch could remain high through December 1970.

Hatched In 1968

Many of the crabs hatched in 1968 had reached mature size by September 1969; these will support the commercial fishery until early summer 1970. Crabs hatched late in 1968 will reach maturity in early summer 1970, supporting the fishery until the end of the year.

Catch Doubled in Fall 1969

This abundance follows almost 2 years of scarcity--1968 and first two-thirds of 1969--when production fell to less than half former levels, and prices rose to record highs. Through November 1969, crab potters already had doubled their fall 1968 catches. The winter dredge fishing began on December 1, 1969. Virginia vessels should have been able to take the 25 barrels a day per-boat-catch limits in record time.

Hurricane Damage

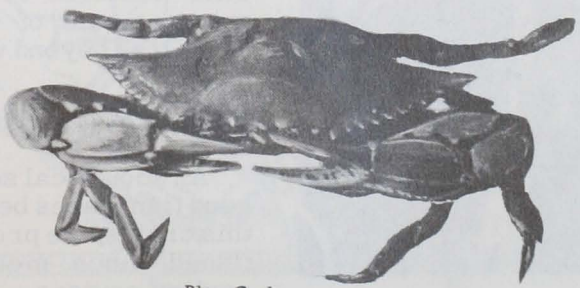
Van Engel warned that the full effect of Hurricane Camille on Virginia stocks may not yet be known. Torrential rains and high runoff caused substantial reductions in river and bay salinities. This resulted in some freshwater kill of crabs on the James and York rivers. Since experimental trawl and dredge surveys have not located as many crabs as expected, the kill might have been even greater than originally thought.

Crab dredge boat.

Poor 1969 Hatch

Van Engel and Lippson are pessimistic about the 1969 hatch, which will provide the fishery from September 1970 through August 1971. Surveys made in fall 1969 failed to locate more than a few small crabs ⅓ to 1½ inches wide, about the same number found in fall 1966 and 1967. The small numbers in those years resulted in the scarcities of 1968 and 1969.

Both states expect to keep a close watch on the new crop during 1970. The prospects, good or poor, for the season starting September 1970 should be discernible in early summer 1970.



Blue Crab

'DELAWARE II' MAKES LARGE BUT NOT PROFITABLE SEA-HERRING CATCHES

The Delaware II of BCF's Exploratory Fishing and Gear Research Base (Gloucester, Mass.) conducted industrial-fish investigations in the western Gulf of Maine between Sept. 30 and Oct. 31, 1969.

Fifty-nine tows caught 0 to 60,000 pounds of herring per tow. Despite large catches, the scientific personnel emphasize: "At current market prices for industrial fish species, the fish caught during this cruise would not have equaled the size of catch needed for profitable commercial operations. However, the demonstrated capabilities of the midwater fishing method should be adequate and suitable for commercial use at times and in areas whenever herring can be found in some abundance. The next scheduled industrial fish cruise is planned to continue evaluation of the suitability of this fishing method in areas of seasonal herring abundance."

Cruise's Primary Purpose

The primary purpose of this cruise was to evaluate the commercial potentials of the midwater trawl fishing method for taking fish species of value for reduction to meal and oil. A closely associated objective was refinement of the midwater trawling technique.

Tows & Catches

The tows varied from 20 minutes to 4 hours; larger catches were made on fairly short tows on good traces of fish.

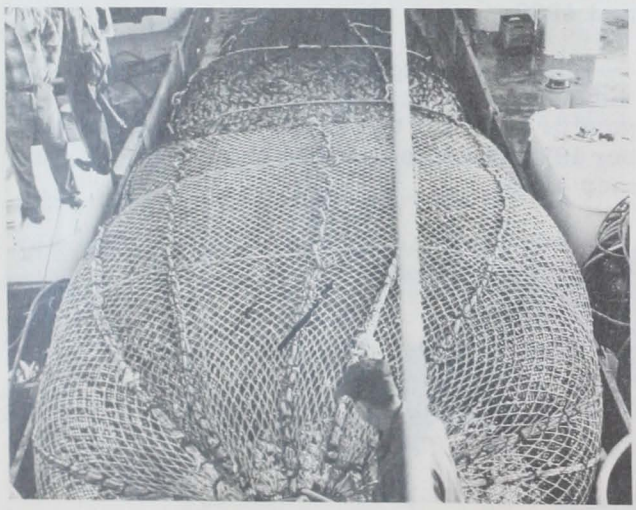


Fig. 1 - A 55,000-pound catch of sea herring.

The two largest catches--60,000 and 55,000 pounds--were taken on 40-minute sets; these short sets were terminated to prevent overloading the net.

A total of 322,188 pounds of fish were caught: 307,627 pounds herring; 12,380 pounds mackerel, 1,380 pounds whiting, 134 pounds cod, and 667 pounds other species.

Cruise 69-9 was broken from October 10 to 17 for shipyard installation of a transducer for the scientific sounder and to change scientific personnel.

Fishing Gear Used

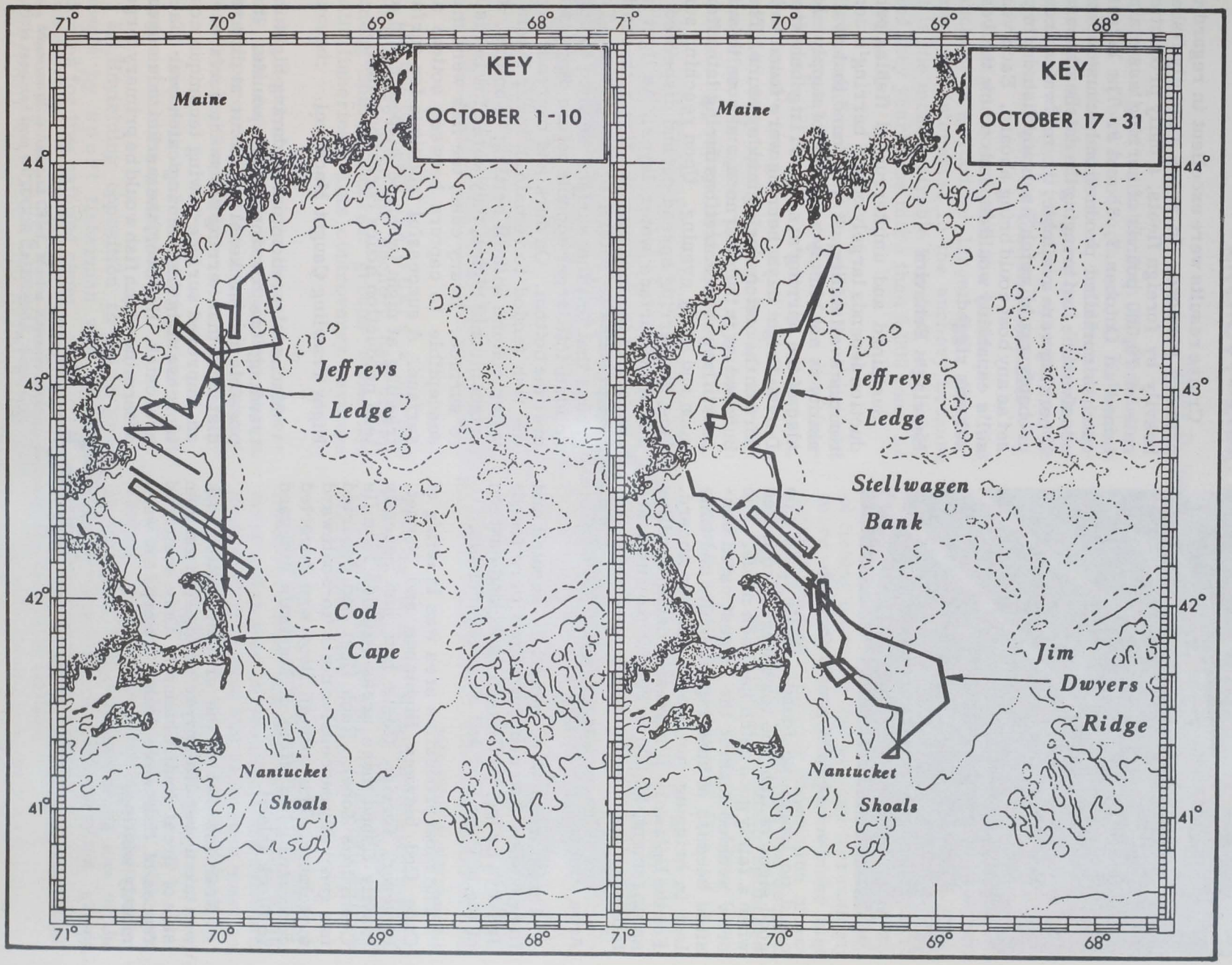
A medium-sized, West German-type midwater trawl was fished exclusively. This 4-seam (Herman Engel) net measures 1,400 meshes around the net at the front of the bellies. Mesh size is 8 inches (stretched mesh) in the wings and forward part of the bellies. The mesh tapers from 8 inches to $1\frac{1}{2}$ inches in the lower part of the bellies, extension, and cod end. The length of the net (from tips of wing ends to extremity of cod end) is about 380 feet.

A set of "beefed-up" 8-foot (height) by 4-foot (width) Suberkrub doors was used to spread this net. Although these doors were very stable while fishing, it is recommended that larger size (10' x 6') doors should be used. The larger doors should give greater horizontal opening to the net.

Improved lifting devices on headrope with heavier chain on footrope should increase net's vertical opening from 7 fathoms generally experienced during cruise to perhaps 10 fathoms. With higher and wider opening, larger catches could be made in less time. This would be feasible only if straining the extra amount of water did not increase the net's drag beyond vessel's towing capabilities.

Fishing Procedure

An acoustical search was conducted to find good fish traces before the net was set. During this cruise, the productive areas located were fished much more intensively than during earlier cruises. Fishing was broken off and scouting begun only when good fish targets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Maine
Jeffreys
Ledge
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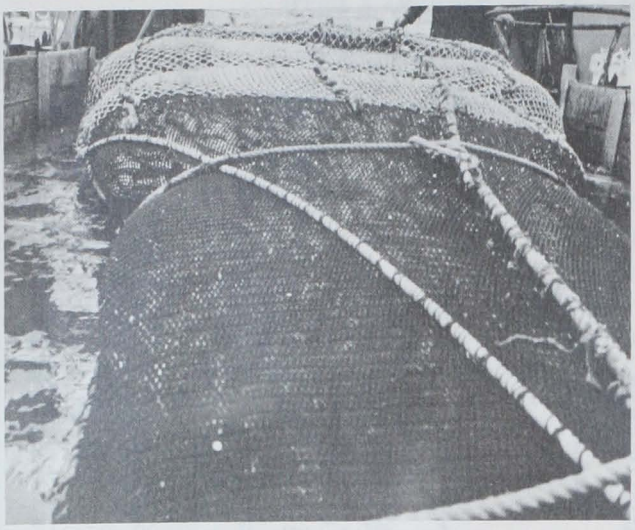


Fig. 3 - A 20,000-pound herring catch.

could no longer be found. While fishing on good signs of fish, the tows were terminated when a fairly good catch had been made. The crew avoided making the largest catch possible because of handling difficulty and time lost in bringing very large catches aboard. For the Delaware II's present catch-handling arrangement, 20,000 to 30,000 pounds are fair-sized catches for ready handling.

Area Fished

Three areas were generally scouted and fished when fish concentrations were found: Jeffreys Ledge, Stellwagen Bank, and eastern offing of Cape Cod and Nantucket Shoals.

The most productive area was in offing of Cape Cod between Highlands and Nauset. However, foreign fleets had just recently heavily fished these areas (outside 12-mile Contiguous Zone). Each fleet had departed in a generally successive north-to-southward movement. The foreign fleet was reported concentrated in offing of Martha's Vineyard to Block Island.

Near the end of the cruise, a quick look was taken over Jim Dwyer's Ridge (on eastern side of Great South Channel). Only scattered traces of fish were found; samples were mostly whiting.

Results and Observations

Cruise results were excellent in regard to primary purpose. In areas recently fished heavily by foreign fleets, a daily production rate of 70,000 pounds of herring was maintained on October 7, 8, and 9. The largest catches curtailed production because of excessive time lost bringing the catches aboard. If herring were available, the midwater trawl probably could catch as many fish during a set as any boat could bring aboard. Each vessel's capability would depend on how the vessel was rigged.

Herring's Behavior

Sustained and uninterrupted fishing production depends largely on the herring's continuous availability. It was found that availability is not simply a matter of supply--but also of the herring's schooling behavior. During bright days, herring were found to be hard on the bottom during midday hours. They bunched up in the afternoon, and rose to surface in large concentrations during late afternoon and early evening. Upon reaching surface, the herring spread out and dispersed in a shallow surface water layer. As light increased in the morning, the fish gathered in small groups to return to the bottom. The groups that left the surface seemed to consolidate into larger schools before dispersing over the bottom. On dark and overcast days, the fish tended to remain in lower levels of water column without settling to bottom. On bright moonlit nights, they were slow in rising to surface. In any case, the fish were most susceptible to capture between bottom and surface. A successful technique for surface trawling at night (when developed) could extend production hours correspondingly.

Night Trawling Caught Mackerel

Mackerel predominated during nighttime trawling; one tow took 6,000 pounds. It is possible that mackerel may occur at different distances than herring below the surface. So an improved surface-towing technique could increase nighttime herring catch over mackerel catch. However, the market value should determine which fish would be primary target.

SQUID RAISED TO ADULT SIZE IN LABORATORY

One of the most important animals used in medical research--the squid--has been reared to maturity in the laboratory for the first time. Edward T. LaRoe, a graduate student at the University of Miami, has succeeded in aquarium-rearing the fast-moving, excitable Sepioteuthis sepioides, a member of the family Loliginidae from egg to adult size.

Useful in Neurological Research

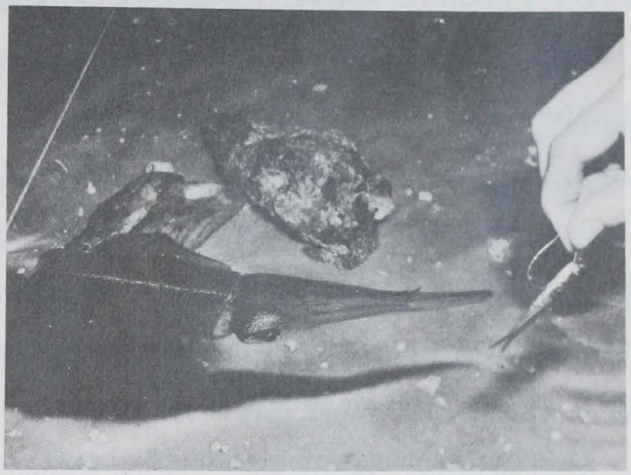
Because squid have the largest nerve fibers of any animal (over 1,000 times thicker than human nerves), they are in great demand for neurological research. But the nerve fibers must be fresh, and the availability of fresh squid is a critical problem.

Seasonal & Easily Damaged

The occurrence of squid in the sea is seasonal. Loliginids are found off the northeast U.S. only in summer. During the winter, entire research teams must go to Chile and Peru for fresh squid. Squid generally undergo a true physiological shock when captured, and often are damaged by the trawls used to catch them. Once in an aquarium, they tend to swim head-on into the glass walls.

Aquaria May Provide Steady Supply

Researchers studying behavior, learning, and memory processes also need aquarium-adapted squid. With its well-developed brain and eyes, the squid has great potential for such studies. In demonstrating that laboratory-reared squid adapt to aquariums, LaRoe may have discovered a way to provide researchers a year-round, healthy supply.



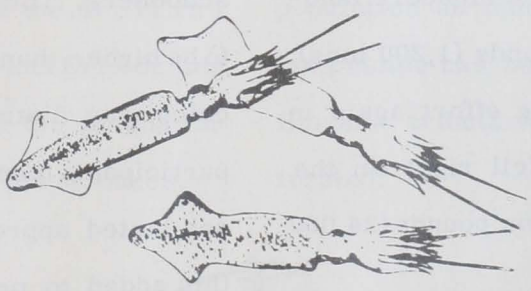
Squid reared from the egg by Edward T. LaRoe. At this age, 125 days, the squid is fed small fishes.

Benefits Commercial Fishery

Squid, valued as food in many parts of the world, is the 5th most valuable fishery product in Japan. LaRoe is gathering data on growth, food preferences, light requirements, and behavior patterns that, ultimately, will benefit the commercial fishery. He already has proved that the tropical loliginid squid grow much faster than previously believed. His squid reached maturity within 5 months after hatching, disproving a long-held theory that it took 3 years.

Laboratory Techniques

LaRoe feels his success has been due largely to his discovery of proper types of food for young squid. He feeds them small shrimp-like animals (mysids). By the time a squid is 5 days old, it will eat 50 mysids a day. Constantly studying the behavior patterns of the hatchlings, he has found certain things they prefer or like. He has adapted his rearing program to the needs of the squid.



Squid

1969 PACIFIC COAST ALBACORE TUNA CATCH IS ABOUT 24,000 TONS

Fall weather in 1969 settled on the U.S. Pacific Coast in October. It terminated virtually all fishing activity in Washington and Oregon waters. But relatively good weather off central California permitted a fleet of about 50 jigboats to continue fishing for albacore into the first week of December.

The 1969 season promises to tally between 48 and 49 million pounds (24,000-24,500 tons), reports Glenn A. Flittner, Leader of the Fishery-Oceanography Group, BCF La Jolla, Calif. Oregon and Washington again led the production race in 1969 with about 34½ million pounds (17,250 tons). California landings pulled up from an extremely poor start of 200,000 pounds (100 tons) in July 1969 to an estimated 11½ to 12 million pounds (5,750-6,000 tons) when December totals were included; nevertheless, the late-season finish failed to equal the 1968 season. The 1969 season was the worst on record in the state since 1942. British Columbia albacore landings totaled 2.4 million pounds (1,200 tons). Thus, despite heavy fishing effort again in 1969, the season's totals fell right on the 1963-68 average of 48 million pounds (24,000 tons).

Production Centers Dislocated

For the third consecutive year, major dislocations in the centers of production were observed. BCF La Jolla estimated that nearly half the entire season's production originated from waters north of Cape Flattery and off Vancouver Island; less than ½ million pounds (250 tons) originated from the district south of San Juan Seamount. The farthest northward penetration of the albacore commercial fishery was recorded in 1969: in the district northwest of Dellwood Hills, near 51°30' N. latitude, off northwest corner of Vancouver Island. A few albacore were even taken inside Hecate Strait in late August 1969.

Larger Fleet

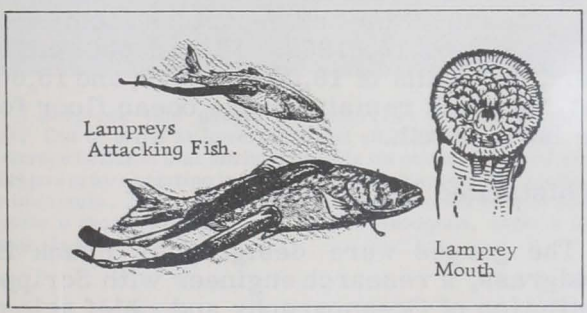
BCF La Jolla estimates the albacore fleet in 1969 was larger than usual. The regular fleet was augmented by an appreciable number of Oregon, Washington, and British Columbia salmon trollers, and a few halibut schooners. Total fishing effort was estimated to be higher than normal. The 1969 middling catch was distributed more unevenly among participants than in 1968. Also, the 1969 season lasted appreciably longer than in 1968; this added to production costs that were not offset by other factors.

SEA LAMPREY PREYS ON LAKE HURON SALMON

Sea lamprey depredation on chinook salmon in Lake Huron is increasing. BCF scientists found 68% of the chinook from a recent catch bore lamprey scars or marks. Michigan Department of Natural Resources biologists report that over 90% are scarred in some areas of the lake. The salmon were planted in 1967.

The Lamprey

The adult sea lamprey, an eel-like parasite with sharp rasping teeth, feeds on the blood of its victims, weakening and often killing them. Entering through the St. Lawrence,



it has preyed on fishes in Lake Ontario for centuries. The deepening of the Welland Canal between Lakes Ontario and Erie during 1913-18 apparently provided the means for lampreys to enter the upper Great Lakes.

Control

Lamprey control, a joint U.S.-Canadian venture, dates from 1965, when a once-prosperous lake trout fishery had been virtually destroyed. While some trout still remained in Lake Superior, commercial catches in Lakes Huron and Michigan had dropped to less than 1% of 1930-1939 levels. About 68 million pounds were taken from the 2 lakes in those years.

Lampricide Treatment

Lamprey hatch in tributaries, where they remain for several years before transforming into the parasitic stage and migrating into the lakes. A chemical lampricide that is highly effective against the young lamprey was discovered in 1958. Properly applied, it is harmless to other fish. Chemical control was extended from Lake Superior to Lake Michigan in the 1960's; it reduced the lamprey population as much as 80-90%. While the lampricide has been used in some of Lake Huron's tributaries, many are still untreated.

OCEANOGRAPHY

NEW FILM IMPROVES UNDERWATER PHOTOS

A new film "that could help make aerial charting the most efficient method of charting shallow water areas" has been created by a technologist of the U.S. Naval Oceanographic Office (NOO). The film is insensitive to all blue light.

Willard E. Vary, the technologist, has been working in NOO experiments photographing coastlines from aircraft to chart coastal areas.

His search for a solution to the blue-light problem began after NOO's first airborne charting test in March 1967. To record ocean-bottom detail at greatest water depths with aerial photography, that test revealed, it would be necessary to filter out all or most blue light.

He Explains Problem

Mr. Vary explained:

"Aerial haze is caused by blue light scatter in the air. In the water, the blue light is the most scattered and least absorbed and this is referred to as underwater haze. These effects of blue light result in non-image-forming densities on the photographs and cause veiling or lowering of contrast in the photographs. Yellow filters on the camera partially eliminate the blue light but also decrease the exposure, often resulting in underexposed photography."

Since increased yellow filtration was not the answer, Vary thought of eliminating the blue-sensitive layer in the color film. "Color films have three layers," he explained. "One layer records the red light, one the green light and the other records the blue light. I thought it would be possible to eliminate the blue layer altogether and, with a yellow filter layer coated over the green and red sensitive layers, blue light would be prevented from affecting those layers."

Film Tested Successfully

The General Aniline Film (GAF) Corporation devised a film to meet his specifications. The new film was first used successfully in February 1968 in the Bahamas to take continuous stereo photographs of the coastal area.

Vary reported: "We recorded ocean bottom to a depth of 150 feet. The increased contrast provided by the new non-blue-sensitive film showed various underwater features in more detail."

Major Charting Method

With the new film, NOO believes, "aerial photography may now be on its way to becoming a major method of charting the ocean bottom and measuring water depths."

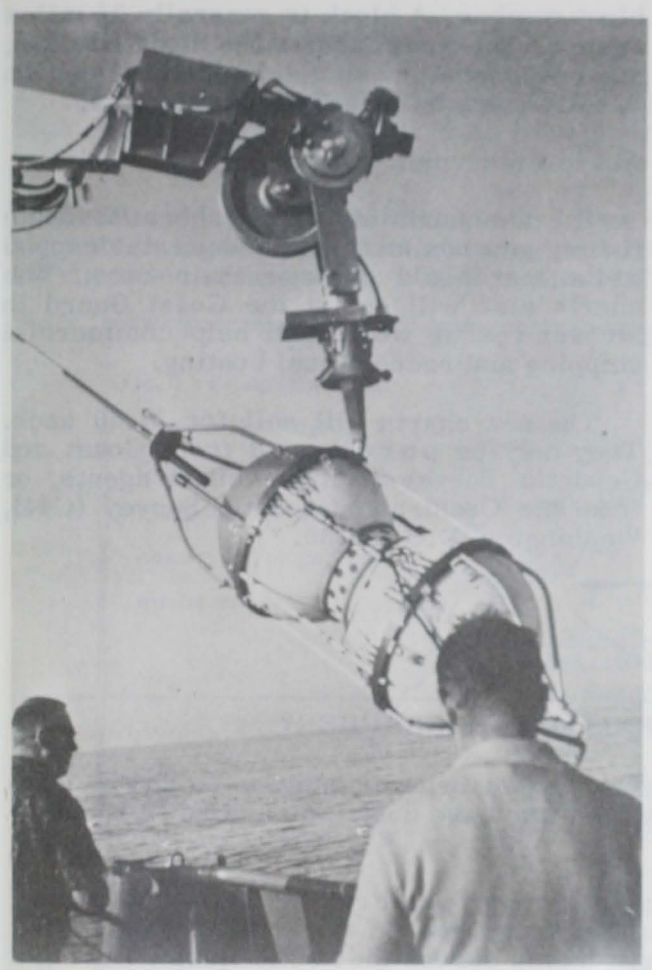
ANTARCTIC TIDES ARE BEING MEASURED

Man's first attempt to measure tides in the deep oceans surrounding Antarctica is being carried out along a 2,000-mile track running south from Australia.

Three free-falling, deep-sea, tide gauges, or capsules, were launched from the RV 'Eltanin' after her departure from Adelaide on Dec. 15, 1969. Placed 600 miles apart, at depths of 18,000, 12,000, and 15,000 feet, they will remain on the ocean floor for one lunar month.

Sophisticated Instrumentation

The gauges were designed by Frank E. Snodgrass, a research engineer with Scripps Institution of Oceanography and chief scientist aboard (Fig.). They are 'free' vehicles, not tethered to the ship. Their capsules, or hulls, are pressure-resistant aluminum spheres. Instruments attached to the capsules are measuring water temperature, current, and pressure. The capsules, which communicate with the 'mother' ship through acoustic signals, describe their operations and condition. Commands from the ship will cause them to surface at the end of the experiment. Data recorded on magnetic tape in the capsules can be computer-analyzed after recovery.



The 3 deep-sea tide gauges are similar to the one shown here. Out of photo at lower right and attached to capsule is set of storage batteries that anchors capsule on ocean floor and provides power for operating instruments and data-recording apparatus in capsule. Battery pack-anchor remains on sea bottom after capsule is recalled to surface. Frank E. Snodgrass, capsule designer, is at left.

Current Meters

Free-falling current meters also will be installed along the Eltanin's track to supplement current measurements made by the tide gauges. Similar metering was done in the Drake Passage (between the tip of South America and the Palmer Peninsula) in January 1969. From data recorded by meters placed $2\frac{1}{2}$ miles down, it was estimated that 270 million gallons of water a second flow through the Drake Passage from the Pacific to the Atlantic.

Studying Flinders Current

Australian scientists aboard the Eltanin are studying the Flinders Current south of Australia. They are installing gauges across the 150-mile-wide continental shelf near Adelaide and making extensive salinity, temperature, and depth measurements.

Mapping Sea Floor

A scientist from the Lamont-Doherty Geological Observatory is taking magnetic, seismic, and gravity readings while the ship is underway. This is part of a continuing program to map the sea floor and the earth's magnetic and gravity fields.

CHARTS LIST OIL-LEASE AREAS IN GULF OF MEXICO

The Coast and Geodetic Survey has announced that it will issue nautical charts before the end of 1970 showing virtually all offshore oil-lease areas in the Gulf of Mexico. The charts will cover an estimated 161,444-square-mile area containing thousands of oil wells and platforms. They will not show oil-lease areas in river estuaries, bays, inlets, etc.

ESSA Coast and Geodetic Survey nautical charts will show location of virtually all Gulf of Mexico offshore oil lease areas.

New overprinted charts, 1115-A and 1117-A, add oil-lease areas to already-existing charts 1115 and 1117.

Chart 1115-A shows the area off Mississippi and Alabama. Publication was scheduled for December 1969.

Chart 1117-A shows the area off Texas. It probably will be published in August 1970.

Chart 1116-A shows the area off Louisiana and northeast Texas. It has been available since 1957. Since an oil-lease area is re-

ferred to as a lease block, 1116-A has come to be known as the "Block Chart."

Heavy Demand

Demand for the Block Chart has increased greatly in recent years. Requests have come from operators of shrimping and fishing craft, tug boats, and other vessels frequenting the area. Originally, the lease blocks were added to help maintenance craft locate a lease area or oil rig for servicing.

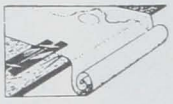
How It Works

There are more than 2,400 platforms in the Gulf of Mexico. Each carries a large sign with the owner's name, the area, and the block number. A block is generally $2\frac{1}{2}$ miles square. The chart carries the block number; any boat operator can determine his position in the square by identifying a platform.

Aid to Fishermen

The new charts will help fishermen locate fishing grounds and avoid underwater capped wells that could damage their nets. The charts also will assist the Coast Guard in air-sea rescue work, and help commercial shipping and recreational boating.

The new charts will sell for $1.50 each. They may be purchased from Coast and Geodetic Survey nautical chart agents, or from the Coast and Geodetic Survey (C44), Washington, D.C. 20235.



WHO IS THE MOST FAMOUS OCEANOGRAPHER?

This is a difficult question. The scientists best known for their exploits on and in the ocean have been explorers and aquanauts. Many men who have contributed most to oceanography are virtually unknown to the public.

One man who was both an explorer and oceanographer was Fridtjof Nansen, a Norwegian who froze his ship, the "Fram," into the Arctic ice off the coast of Siberia to prove the theory that an ocean current would drift a ship across the Arctic Basin. During the 3-year drift he came within 360 miles of the North Pole and then proceeded by sledge to a point 226 miles from the Pole. He is the inventor of the Nansen bottle, which has been the basic oceanographic instrument for decades and is still widely used. A special museum in Oslo houses the Fram and many other Nansen mementos, awards, and expedition materials.

Lt. Matthew Fontaine Maury, USN, often called the father of American oceanography, was the first man to undertake systematic study of the ocean as a full-time occupation and to write an English language textbook on oceanography. The present U.S. Naval Oceanographic Office is an outgrowth of the work he started before the Civil War.

Two other Americans who contributed much to oceanography were William Beebe and Henry Bigelow. Beebe, although best known for his work with the bathysphere in which he reached a depth of 3,028 feet in 1934, also directed a number of shipboard oceanographic surveys.

During his long association with the Woods Hole Oceanographic Institution, Bigelow contributed greatly to the coordination of physical, chemical, and geological studies of the oceans, leading to a more complete understanding of the interrelationships of life in the sea.

Many men who were famous for other reasons have been interested in study of the oceans. Included in the long list are Alexander the Great, Prince Albert of Monaco, Captain James Cook, Benjamin Franklin, and Commander Scott Carpenter. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

FOREIGN FISHING OFF U.S., NOVEMBER 1969

NORTHWEST ATLANTIC (Fig. 1)

105 individual fishing and support vessels sighted (256 in October 1969; 92 in November 1969).

USSR: 51 medium side trawlers, 18 factory stern trawlers, 1 factory base ship, 3 refrigerated transports, 2 tankers (about 107 vessels in October 1969; 50 early in November 1968 to about 10 at month's end). Side trawlers took moderate-to-heavy catches of herring and mackerel south of Long Island to Nantucket. Limited amounts of red hake observed on stern trawlers south of Nantucket.

Poland: 9 large side trawlers, 7 stern trawlers, 1 factory base ship (44 in October 1969; 46 in November 1968). Vessels scattered east of Cape Cod and Cultivator Shoals, and southeast of Nantucket, during first 2

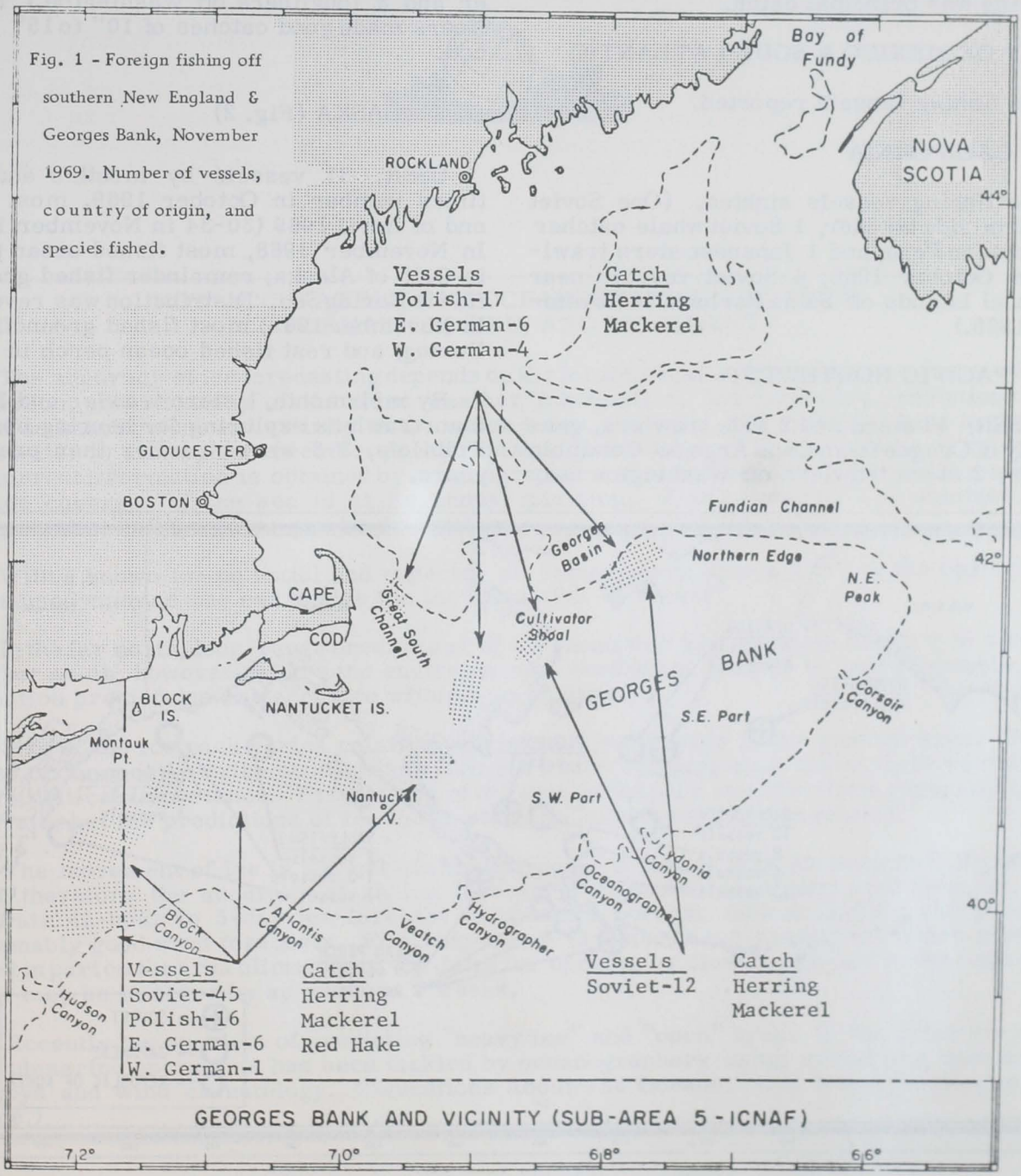


Fig. 1 - Foreign fishing off southern New England & Georges Bank, November 1969. Number of vessels, country of origin, and species fished.

weeks; south of Martha's Vineyard and Nantucket from mid-month. Moderate-to-heavy catches of herring and mackerel.

East Germany: 9 factory and freezer stern trawlers (45 in October 1969; 14 in November 1968). Principal catch probably herring.

West Germany: 4 freezer stern trawlers (28 in October 1969; 7 in November 1968). Herring was principal catch.

GULF OF MEXICO & SOUTH ATLANTIC

No fishing vessels reported.

OFF CALIFORNIA

No fishing vessels sighted. (One Soviet medium side trawler, 1 Soviet whale catcher en route to Peru, and 1 Japanese stern trawler in October 1969; 4 Soviet vessels near Channel Islands off Santa Barbara in November 1968.)

OFF PACIFIC NORTHWEST

USSR: 11 stern and 2 side trawlers, generally of Oregon from Cape Argo to Columbia River; 2 stern trawlers off Washington near Cape Flattery, Grays Harbor, and Cape Disappointment. (In November 1968, 20 vessels, including 14 stern trawlers.) Modest catches of Pacific hake. In mid-month, one catch by stern trawler off Columbia River estimated at 10,000 pounds.

Japan: 4 longliners off Washington; 2 longliners, 4 side trawlers, and 1 support vessel off Oregon. (In November 1968, 1 stern trawler and 3 longliners off Washington.) Longliners made good catches of 10" to 15" black cod.

OFF ALASKA (Fig. 2)

USSR: 31 vessels by month's end, 2.5 times number in October 1969, most since end of April 1969 (30-34 in November 1968). In November 1968, most fished ocean perch in Gulf of Alaska; remainder fished groundfish in Bering Sea. Distribution was reversed in November 1969; most fished groundfish in Bering, and rest fished ocean perch in Gulf.

By mid-month, 1 stern trawler and 3 medium trawlers exploring for herring north of Pribilofs, 2-3 weeks earlier than previous years.

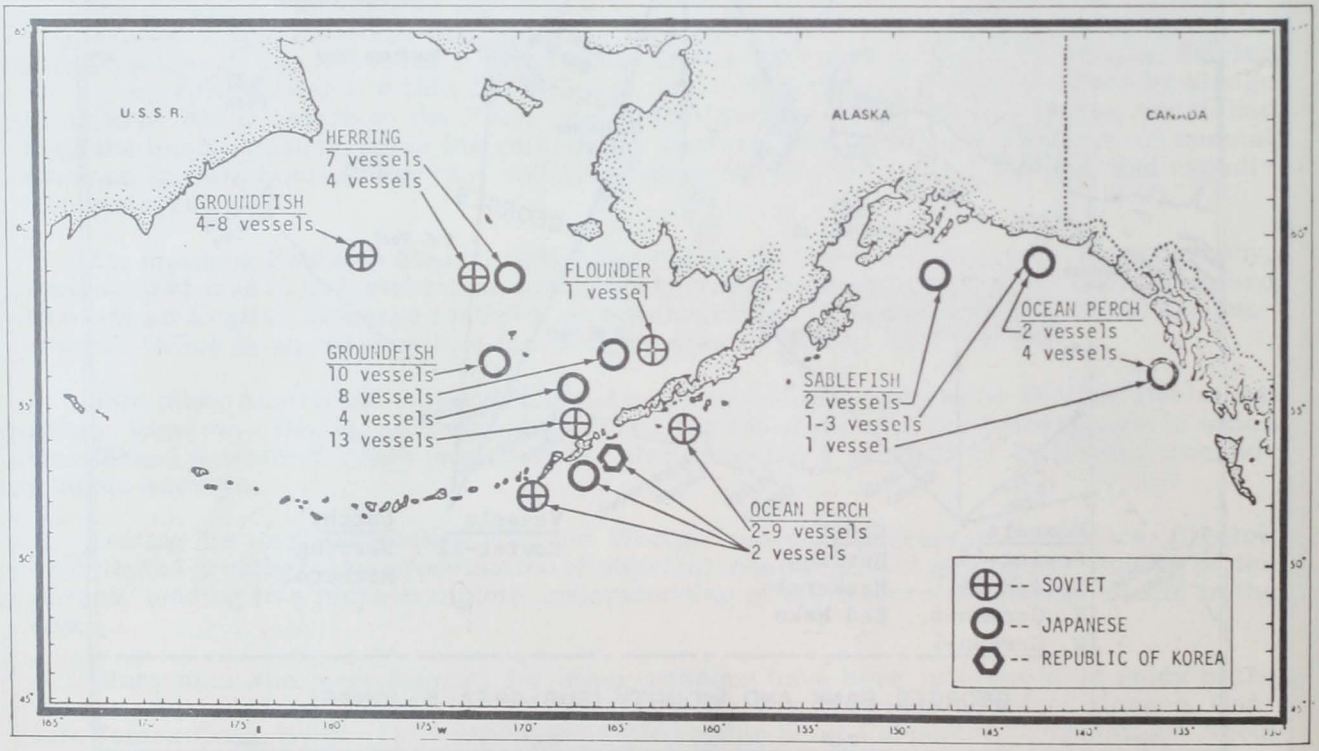


Fig. 2 - Foreign fisheries off Alaska, November 1969.

One medium trawler began flounder explorations in eastern Bering, on Continental Shelf north of Alaska Peninsula, 2-3 weeks earlier than previous years.

Japan: 40-45 vessels, about same as October 1969 (about 40 in November 1968).

By mid-month, 6 stern trawlers and 1 refrigerated transport, previously in groundfishery along Shelf edge, began fishing herring on Shelf north of Pribilofs, about a month earlier than in 1968.

Republic of Korea (South Korea): Late in month, 2 stern trawlers in Gulf, south of Unimak Pass. Catches presumably ocean perch, Alaska pollock, and other bottomfish. (South Korea's first fishing in Gulf since 1967.)

HOW ACCURATELY CAN OCEANOGRAPHERS PREDICT ICE FORMATION, SIZE, AND MOVEMENT?

The accuracy of ice forecasting depends on the locale, details required, time range of the prediction, and accuracy of the input weather information. Ice formation predictions are based on heat content and salinity of the water mass, currents, and expected heat exchange from water to atmosphere (weather prediction and climatology). The required heat, salinity, and current information is obtained by oceanographers aboard icebreaker survey ships when the ice coverage of the sea is at its annual minimum. From ocean data so obtained, the "ice potential" of the water can be determined.

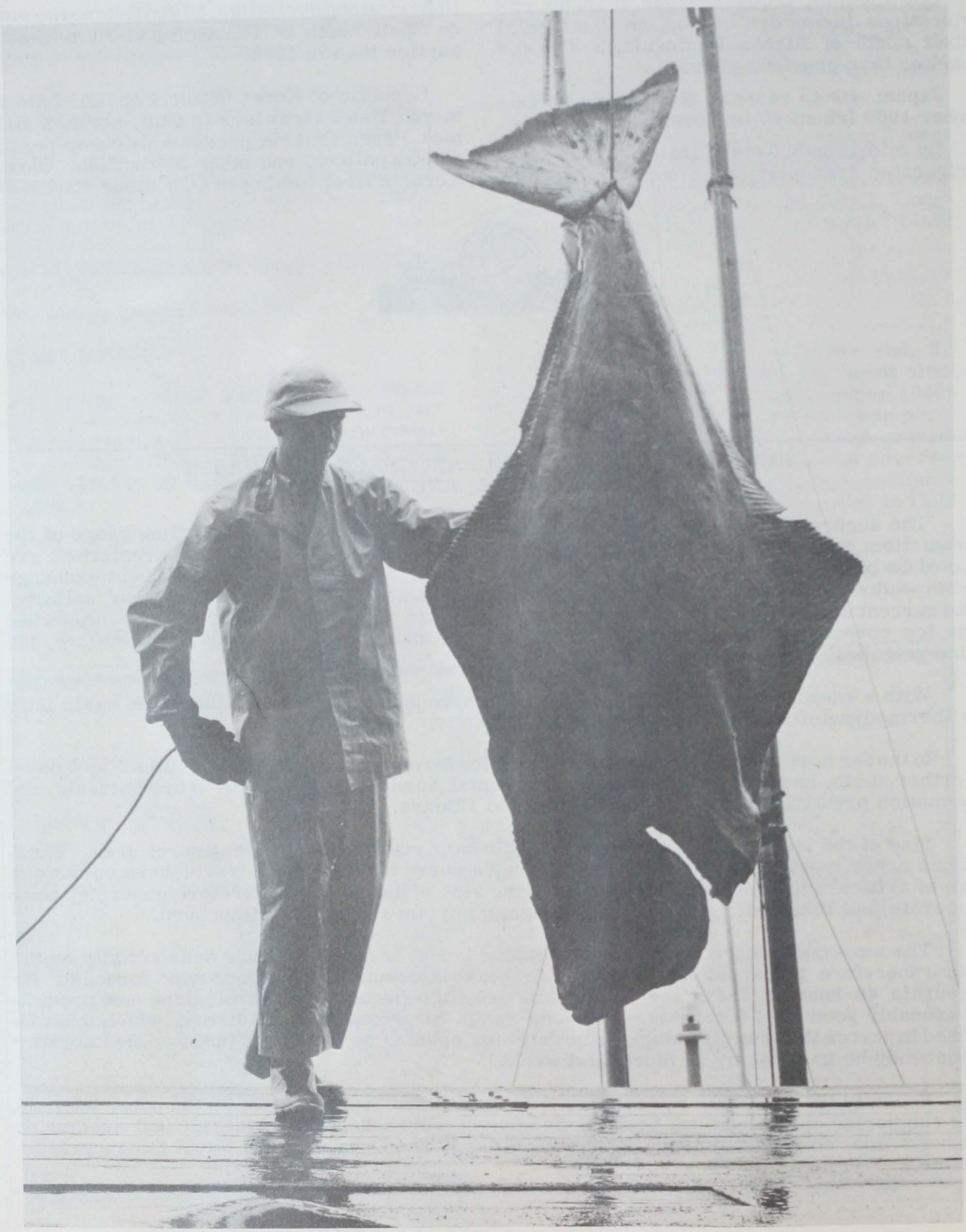
With a known ice potential and expected air temperature data applied to the basic laws of thermodynamics one can derive the ice formation "forecast".

In the far north, long-range predictions of ice formation are accurate within 2 to 4 days. Farther south, however, where the environmental conditions tend to be more variable, the formation predictions are accurate within 8 to 12 days.

Size of the ice pack varies relatively little from year to year in the general area. Variations occur mostly on the southernmost fringes where shipping must travel; here variations are of critical importance. Predictions of the size of the pack are therefore generally quite accurate, but the predictions of ice in the shipping lanes need to be improved.

The movement of ice in and out of shipping lanes, or leads, depends substantially on the wind; therefore the accuracy of an ice forecast is dependent on a good wind forecast. An accurate 48-hour to 5-day ice forecast is possible because meteorologists can produce reasonably good wind forecasts. For long-range (seasonal) ice prediction, which must be based in part on the area climatology, the dates for opening or closing of leads on the Labrador coast may be in error by as much as 6 weeks.

Recently the problem of predicting "heavy ice" and "open" areas in the polar ice pack for submarine operations has been tackled by oceanographers using aerial and submarine surveys and wind climatology. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)



Man-size halibut are common in Alaska. (BCF-Alaska photo: J. M. Olson)

STATES

ALASKA

1970 KODIAK PINK SALMON RECORD RUN PREDICTED

"The Kodiak pink salmon forecast for 1970 is unique because it projects a record return for the even-year cycle," reports the Alaska Department of Fish and Game. Of further significance, the Department notes, the 1969 return has the highest odd-year run since 1939, although the parent year (1967) return was the poorest.

If 1970 forecast is substantially correct, Kodiak catch should approach 15 million. Also, a catch of 563,000 is projected for the Mainland District. This would mark first time since 1945 and 1946 that catches of successive years exceeded 10 million pinks. These catches are the estimates of the harvestable portion of a predicted run of 20.2 million fish.

Pre-Emergent Fry Densities

Forecasting would not be possible without a backlog of pre-emergent fry sampling data. The Department says a relationship exists between pre-emergent fry densities and later total returns. Hydraulic sampling of 31 major pink-salmon-producing streams in 1969 yielded the highest fry density in the 6 years of data collecting. "A ratio of the parent year pre-emergent fry density with the 1970 index for 29 comparable streams indicates the 1970 return at 20,200,000 pink salmon."

The Kodiak-Afognak Island 1970 forecasts of returns for the major districts are:

1. Afognak-Kizhuvak: The excellent fry densities in the streams indicate a 1970 return of 1.9 million pinks. Malina River should be primary producer.

2. Westside: The area from Outlet Cape to Rocky Point, including Terror, Uganik, and Uyak Bays, should contribute 3.5 million pinks.

3. Karluk-Red River: An exceptionally high fry density in Red River indicates near-record return of 6.3 million fish.

4. Alitak Bay: Fry densities were above parent-year index in all streams except Humpy River. Return is projected at 3.3 million pinks.

5. Eastside-Chiniak: Area from Monaska Bay to Cape Trinity should produce 5.2 million fish. Chiniak Bay should produce exceptionally strong return.

Chignik Area

The Eastern District, Chignik area (Kelokak Rocks to Kupreanof Point) is the primary pink-salmon-producing area in this cycle year. Parent escapements in Eastern District were good, and fry survival probably was normal. Good fry densities also were obtained in Western and Perryville Districts. Therefore, 1970 return is forecast above even-year average of 1.7 million.

* * *

SOUTHEASTERN PINK SALMON FORECAST FOR 1970

Of the 85 salmon streams sampled in Southeastern Alaska in 1969, 39 were in Southern half and 46 in Northern.

27.7 Million Pinks

In 1970, a run of 18.7 million pink salmon is expected to return to Southern Southeastern and 9 million to Northern Southeastern. Escapement indices for Southern area for 1964 and 1966 of about 5 million pinks produced returns of slightly over 20 million in 1966 and 1968. Escapement indices for northern area of 2 to 3 million in 1964 through 1967 produced highly variable returns of 5 to 12 million for return years 1966 through 1969. From this information, it is assumed that in 1970 about 5.5 million pinks will be allowed to escape to Southern Southeastern streams and 3.5 million to Northern streams. This would leave balance of 13.2 million in Southern and 5.5 million in Northern Southeastern available for harvest--a total Southeastern catch of 18.7 million pinks.

The Alaska Department of Fish and Game points out that this 1970 forecast is based on cumulative knowledge of the past 6 years' pre-emergent work in Southeastern Alaska.

* * *

EFFICIENCY OF SHRIMP POTS STUDIED

Fishermen in Southeastern Alaska have used shrimp pots (traps) for many years. In the past, the efficiency of shrimp pots was evaluated by catch analysis. This was indispensable for evaluation of fishing gear. However, direct observations answer some questions not apparent from other methods of analysis.

Aims of Study

The staff of BCF's Exploratory Fishing Gear Research Base at Juneau, Alaska, made the first use of the observational technique in studies of shrimp-pot efficiency. Shrimp pots were studied under controlled conditions in a large test tank at Little Port Walter, Alaska. One primary goal was to determine how shrimp escape from the pots. Another was to measure relative efficiency in terms of number of shrimp entering and escaping pots with different types of entrances.

5 Types of Pots

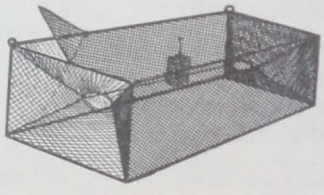
Shrimp pots with 5 types of entrances were used: short tunnel, long tunnel, top loader, ramp, and plastic pipe.

The long-tunneled pot was found most efficient type because fewer shrimp escaped from it than from all the others. Also, more shrimp entered it than either the ramp or top-loading pot. The ramp pot was least efficient: more shrimp escaped and fewer shrimp entered than pots with conical tunnels.

Details of these studies are in "Test-Tank Studies of Shrimp Pot Efficiency," by Doyne W. Kessler. The report is available from BCF Division of Publications, Bldg. 67, U.S. Naval Air Station, Seattle, Wash. 98115.

Fig. 1 - A husband and wife crew unloading day's catch of shrimp at a Wrangell, Alaska, processing plant.

Fig. 2 - Shrimp from a peeler passes this team before being canned at a Wrangell, Alaska, processing plant.
(BCF-Alaska photos: J. M. Olson)



1969 SHRIMP & TANNER CRAB LANDINGS AT KODIAK SET RECORDS

The 1969 shrimp landings at Kodiak, Alaska, through November were 38.7 million pounds, a new annual record. It was an increase of 6.1 million pounds, or 19%, over 1968's record 32.6 million pounds.

The 1969 landings were made in 854 trips, or 40 trips fewer than comparable 1968 trips. Average catch per trip of 45,350 pounds in 1969 was 8,793 pounds more than 1968 average.

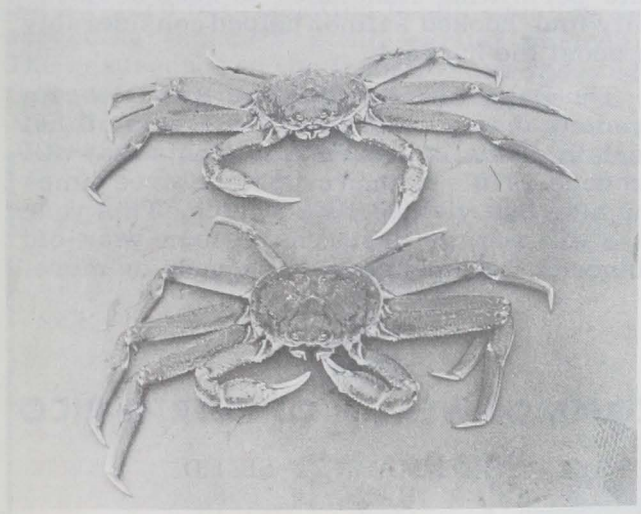


Fig. 1 - Male and female tanner crab.

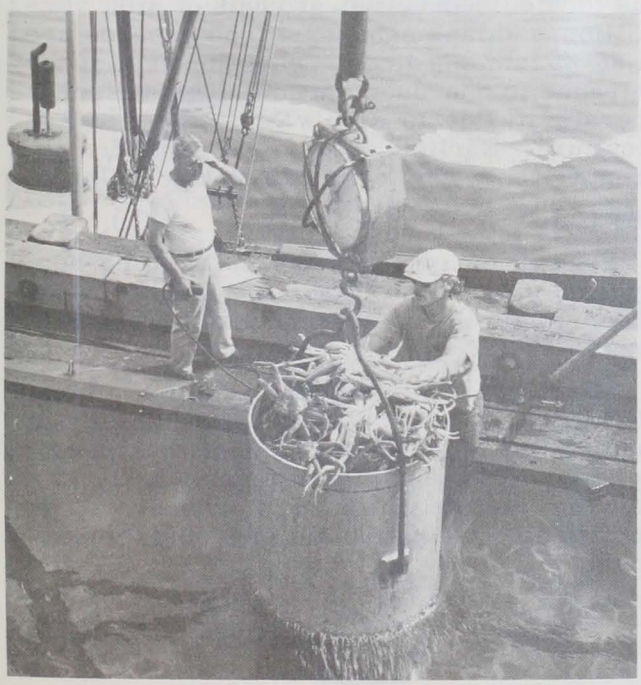


Fig. 2 - A bucket load of tanner crab about to be placed in holding tank at a Kodiak, Alaska, processing plant.

Tanner Crab Landings

Most Alaska Tanner crab landings are made in the Kodiak area. Through Nov. 1969, landings there were 6.7 million pounds--a rise of 4.2 million pounds, or 168%, over comparable 1968 landings.

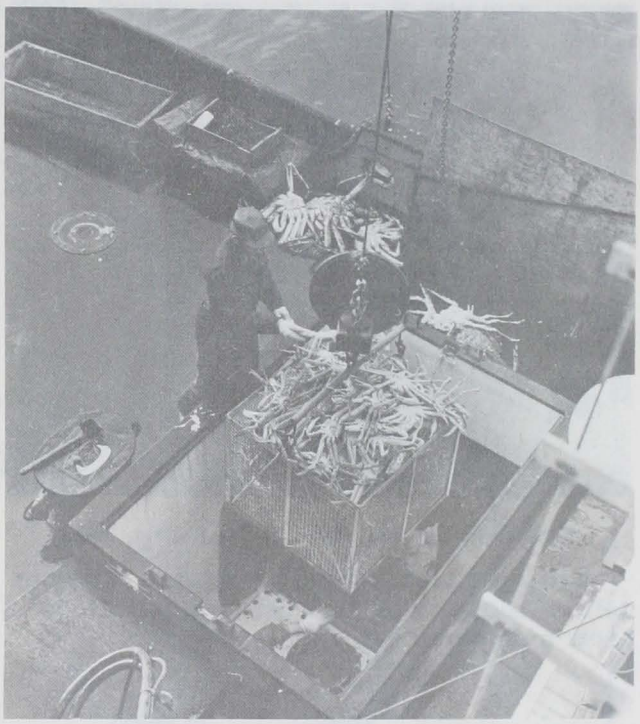


Fig. 3 - A bucket load of tanner crab being unloaded at a Cordova, Alaska, processing plant. Note larger king crab lying on deck.

Fig. 4 - Tanner crab wait processing at a Cordova, Alaska, processing plant. (BCF-Alaska photos: J. M. Olson)

MASSACHUSETTS

APPRENTICE FISHERMEN WILL BE TRAINED BY BOSTON FLEET

The Boston fleet is setting up an apprenticeship training program. Men will be trained aboard large otter trawlers during 3 trips. The trawler owners will pay them $15 for an 8-hour day.

Fishermen's training program at New Bedford, Mass.

When the training is completed, the men will be ready to be signed on as full-fledged crew members.

MICHIGAN

RECORD SALMON CATCH IN 1969

Lake Michigan salmon fishermen set a record in 1969 by catching 175,000 cohos and chinooks weighing an estimated 2 million pounds. This was reported by the Department of Natural Resources. The catch was 75% above 1968's 100,000 fish. The Department says the increase reflects several plus factors:

(1) Bigger plants of cohos.

(2) The first substantial returns of adult chinooks: 43,000 of the total catch.

(3) More liberal regulations, including relaxed rule on foul-hooking.

(4) More "salmon savvy" by fishermen. Each year they come up with new and better techniques and tackle.

How Catch Divided

The total catch was about evenly divided between the open waters of Lake Michigan and tributary streams. In the streams, the rule permitting fishermen to keep accidentally foul-hooked salmon helped considerably to boost the harvest.

The Department of Natural Resources predicts that a record in 1970 seems all but certain. This is because the plants that will produce 1970's salmon crop were three times the size that yielded 1969's catch. This year also will see the first runs of four-year-old chinooks that may reach 40 pounds or more.

COMMONWEALTH OF PUERTO RICO

'STAHL' FINDS MARKET-SIZED FISH OFF SAN JUAN

Experimental fishing by the 'Agustin Stahl' has located productive grounds of silk, vermillion, and lane snappers. The grounds are in 35-45 fathoms directly east and west of the entrance to San Juan harbor. The vessel is operated by Puerto Rico's Department of Agriculture. Earlier, she found snappers and groupers between Vega Baja and Cerro Gordo.

The Catch

Production per pot was 10 to 40 pounds. Average size for the 3 species was $1\frac{1}{2}$ to 2 per pound. This is considered excellent market size for pan-fry fish.

The Department of Agriculture states: "Considering these results, it is apparent that many areas from Arecibo (north coast) eastward could be exploited commercially to a much greater degree than is presently done, specifically during the calmer summer season."