



Cod-end swinging aboard BCF-chartered vessel during explorations off South Carolina. (Photo: J. B. Rivers)

GROUP APPOINTED TO ADVISE INTERIOR ON MARINE AFFAIRS

A Marine Affairs Action Group has been appointed to advise Interior Department on strengthening its marine programs, Secretary Walter J. Hickel announced on Jan. 20, 1970.

Dr. John C. Calhoun Jr. was named chairman of an 8-man group of leaders in science and industry specializing in marine activities. Dr. Calhoun is vice president for programs and director of the sea grant program, Texas A & M University, and former science adviser to Interior.

Background & Mission

Secretary Hickel explained: "Since I became Secretary, I have given priority attention to this Department's marine programs. Interior's budget for ocean affairs is about 35 percent of the total federal civilian effort in marine activities. Scattered among some 11 bureaus and offices, however, these Departmental programs require greater coordination and integration.

"A start in this direction was made through the establishment of the Office of Marine Resources. It has become apparent, however, that a stronger organizational thrust is needed.

"This need has been given increased urgency by the recent announcement of the Administration's five-point initiative in the field of ocean science and marine resource development. In two of these programs, this Department has been assigned lead agency responsibility, namely, Coastal Zone Management and the establishment of Coastal Zone Laboratories. If we are to meet our increasing responsibilities for developing the ocean's resources and for protecting the nation's marine environment, we must streamline our management structure.

"Accordingly, I have selected a special Marine Affairs Action Group and directed it

to recommend a detailed restructuring of departmental entities engaged in marine related activities toward the specific end of efficiently achieving priority objectives. This task will include:

"(1) A complete review of this Department's marine programs;

"(2) An examination of the recommendations and conclusions of recent ocean policy studies, including the report of the Commission on Marine Science, Engineering and Resources;

"(3) A selection of concrete departmental goals for ocean use and development, in light of new Administration directives; and

"(4) A determination of relative priorities for these goals and time frames for their attainment."

The Group

Secretary Hickel also appointed these members of the Marine Affairs Action group:

Dr. Douglas L. Brooks, Special Assistant to the Director, National Science Foundation;

Dr. John V. Byrne, Chairman, Department of Oceanography, Oregon State University;

Wilbert M. Chapman, Director, Marine Resources, Ralston Purina Company;

Dr. Earl G. Droessler, Vice President for Research, University of New York at Albany;

Dr. Mason L. Hill, former Manager of Exploration, International Division, Atlantic Richfield Company;

Taylor A. Pryor, President, The Oceanic Foundation, Hawaii;

Dr. Lyle St. Amant, Director, Louisiana Wildlife and Fisheries Commission.



HICKEL ENDORSES LAKE SUPERIOR POLLUTION REPORT

Secretary of the Interior Walter J. Hickel endorsed on Jan. 29 the recommendations of a 1969 conference dealing with pollution in Lake Superior. He urged water-pollution-control agencies in Minnesota, Wisconsin, and Michigan to ensure that the recommendations are effectively carried out.

The conference was convened May 13-15, 1969, and reconvened Sept. 30-Oct. 1, 1969, in Duluth, Minn. It sought measures to curb contamination of Lake Superior, the largest, deepest, and cleanest of the Great Lakes. One topic discussed was the daily discharge into the lake of thousands of tons of taconite tailings by the Reserve Mining Co. in Silver Bay, Minn.

Conference Recommendations

The conference recommended the development of guidelines by a specially appointed committee to tighten water-quality standards in Lake Superior. It called for continuing surveillance of Reserve's taconite discharges--and for company efforts to reduce these.

Federal and state agencies were asked to strengthen their surveillance procedures in the Lake Superior Basin to detect more effectively changes in water quality. A minimum of secondary treatment was recommended for all municipalities discharging wastes into the lake and its tributaries.

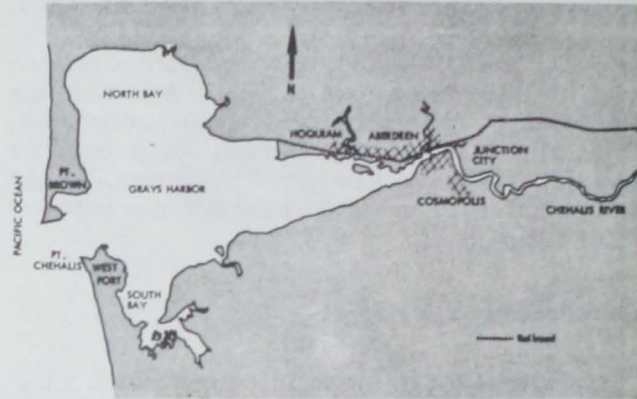
Eliminate Oil

The conference report urged the elimination of visible discharges of oil from any source--and prohibition of the dumping of polluted dredged material into the lake. Also recommended was adoption of uniform state requirements for controlling wastes from water craft.



CONSTRUCTION OF FPC PLANT IN WASHINGTON STATE BEGINS

Groundbreaking ceremonies marking the start of construction of a demonstration plant that will produce Fish Protein Concentrate (FPC) were held Jan. 31 at Aberdeen, Wash.



"The plant will be a major step forward in developing the technology needed to produce FPC in quantity," said Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for Fish and Wildlife, Parks, and Marine Resources.

FPC has been produced under laboratory conditions and in a small model unit by BCF scientists.

Aberdeen Plant's Purpose

The Aberdeen plant will demonstrate the technical and economic feasibility of producing FPC in large quantities. Information resulting from the design, processing, and costs of manufacture will be made available to interested companies--so the technologic advances achieved can be applied to commercial production.

Dr. Glasgow noted that many species of fish rich in protein are now used for industrial purposes, or are not harvested at all. "I see FPC as only the start of a new concept in utilizing these vast aquatic resources and converting them into high quality protein for human benefit."



U. S. TUNA FLEET EXPANDS

On Jan. 1, 1968, the carrying capacity of the U.S. tuna fleet (including bait boats) was about 43,600 tons, reports BCF's Pacific Southwest Region. During 1968, capacity increased by 4,710 tons--to about 48,310 tons.

In 1969, the fleet added 8,000 tons of new capacity and lost about 700 tons through sinkings.

It is estimated that 9,400 tons will be added in 1970. Including 1970 preliminary estimates, the fleet will have increased 49.1% in 3 years.



EASTROPAC OBSERVATIONS MADE AVAILABLE TO TUNA FISHERMEN

Observations during the Eastern Tropical Pacific (EASTROPAC) cruises have been made available to tuna fishermen, discloses BCF's Pacific Southwest Region. The fishermen had expressed much interest in the oceanographic information collected during these cruises. The information may help them locate and catch tuna.

Cruise Reports

One report contains information dealing with seabird, porpoise, whale, and surface tuna school observations. Another report in preparation will contain summaries of "surface temperature, mixed layer depth, water clarity, forage, seabird, porpoise and tuna school sightings for winter and summer months in three areas outside the regions where the U.S. tuna fleet has historically fished."

Oceanographic Information Valuable

BCF Pacific Southwest adds: "Since tuna fishing operations are being extended beyond the traditional fishing regions, oceanographic information which may aid in locating tuna in the new areas is of prime interest to fishermen."



INTERNATIONAL FISHERIES SURVEY CONTINUES OFF CALIFORNIA

The Soviet fishery research vessel 'Ogon' arrived in Port of Los Angeles, Calif., January 26 to join BCF scientists in a survey of Pacific hake populations off California.

The object is to continue the assessment begun last year by U.S. and Soviet fishery scientists. In recent years, these hake stocks have been fished heavily by the Soviet fleet. Data are needed to provide a scientific basis for agreements to protect the species.

Hake are recognized in the U.S. as valuable raw material for producing fish protein concentrate.



U. S. AND JAPANESE TUNA EXPERTS CONFER AT BCF MIAMI LAB

Japanese scientists of the Far Seas Fisheries Research Laboratory, Shimizu, spent the first week of January 1970 as guests of BCF's Tropical Atlantic Biological Laboratory (TABL) in Miami. The scientists, all experts in the biology and ecology of tunas, arrived in Florida Dec. 30, 1969, aboard the 'Shoyo Maru,' research vessel of Japan's Fisheries Agency.

The ship is well known to the world's tuna researchers. She left Tokyo in October 1969 on a 6-month Pacific fishery-oceanography investigation--off Mexico and Panama, then in the Atlantic Ocean. She departed Miami for Tokyo, Jan. 6, 1970, retracing her route.

Led By Dr. Ueyanagi

The Japanese group was led by Dr. Shoji Ueyanagi, renowned tuna researcher. He was accompanied by Yasuo Nishigawa and Yoshio Nonagami, also of the Shimizu laboratory. Joining the vessel at Guayaquil, Ecuador, was Phillipe Serene of the French CNEXO Tuna Program and Dr. Phillip Edmunds, U.S. Bureau of Sport Fisheries and Wildlife, Narragansett, R. I.

Much In Common

The Japanese and U.S. scientists have been leaders in the multinational study of

tropical Atlantic tunas begun 5 years ago. Since its inception in 1965, BCF TABL has researched tropical Atlantic tunas. By mid-1969, TABL had completed 27 cruises to study the ecology and biology of the 7 species of tuna native to Atlantic waters; the 'Shoyo Maru' has completed 4 Atlantic and many Pacific cruises on similar investigations. Both TABL and the Shimuzu laboratory have prepared and circulated volumes of scientific data on the tunas.

Atlantic Tuna Commission

The scientists discussed the newly established Atlantic Tuna Commission scheduled to open headquarters in Madrid, Spain, soon. The Convention that established the Commission was ratified in 1968 after the "Working Party on Tuna Stock Assessment"--set up by FAO--met for 4 days at TABL in August 1968 to discuss a plan of operation. Ten nations are members: Brazil, Canada, France, Ghana, Japan, Morocco, Portugal, South Africa, Spain, and the U.S. The Commission met for the first time at FAO, Rome, Dec. 1-7, 1969. The nations will work closely on a long-term examination of Atlantic tuna populations--toward the goal of conserving, yet exploiting to the fullest, these commercially valuable food fishes.

TABL & BCF Honored

During the Shoyo Maru's visit, Dr. Ueyanagi honored TABL and BCF on behalf of Japan by presenting TABL Director Carl J. Sindermann and Assistant Director Albert C. Jones with two objects of Japanese art--a lacquered serving platter and a figurine of Princess Michiko.

The vessel held open house on January 2 for members of the Miami marine-science complex.



17 U. S. FIRMS PARTICIPATE IN LONDON TRADE SHOW

BCF participated in the Hotelympia International Catering Exhibit, London, England, Jan. 6-15, for the third time. Seventeen U.S. firms displayed and promoted samples.

Sales of fishery products were about \$203,000. These included orders for live and

frozoneels, shrimp, and King crabmeat. Keen interest was shown in frozen crayfish products, King crab, Maine and Alaskan shrimp, fresh and frozen North Atlantic lobsters, canned Gulf shrimp, and tanner crab.



1969 WHALE SEASON YIELDS 108

The only U. S. whaling station, operated by Del Monte Fishing Company, ended its 1969 operation on December 5 because of bad weather and scarcity of whales. The 1969 season, which had opened about May 1, produced a catch of 108 animals. Included were 31 fin, 10 sei, and 67 sperm whales. The total also included 34 undersized or lactating sperm whales taken under a special scientific permit for studies by BCF's Marine Mammal Laboratory.

Gray Whales

Visual counts of gray whales passing Yankee Point, Calif., during the southward migration began in mid-December. Over 1,900 were counted by Jan. 21. Rough weather at peak of the run made counting difficult; counts probably were low. During the first week of January, up to 200 whales a day were counted.



LIVE CRABS HELD IN SEA-WATER SPRAY SYSTEM

A continuing problem in the Dungeness crab fishery is the cost of live-holding tanks on the boats, reports BCF's Seattle Technological Laboratory. The circulating sea-water tanks, usually constructed of iron, corrode. They must be replaced frequently. The cost of replacement ranges from \$1,000 to \$5,000, depending on boat size.

Laboratory personnel say one possible solution is to eliminate the tank and store the crabs in the hold by "a sea-water spray system that provides the essential moisture, oxygen exchange, and temperature control to maintain the crabs healthy but quiescent." Estimates are that such a spray system could be installed on a 50-foot boat for about \$500.

Lab Experiments

Experiments with sea-water spray for holding live Dungeness crabs aboard vessels were begun in Willapa Harbor, Washington. The large RSW holding tank was installed on the after deck of the M/V 'Ethel May,' a 52-foot crab boat. Hard-shelled crabs were taken from 60 pots to provide about 600 lbs. of crabs. They were loaded immediately into the tank when brought aboard vessel. To limit damage to crabs, the holding tank was flooded prior to loading operation. After all crabs had been loaded, the tank was drained and the spray system put into operation.

Poly-Vinyl Chloride Spray System

The spray system consists of pumping sea water through 3 spray nozzles attached to a 1-inch diameter poly-vinyl chloride pipe frame mounted inside holding tank. Water flows through the system at about 35 gallons per minute. The angle at which the water sprays from each nozzle is about 150°. The spray pattern is wide and flat; it is uniformly distributed over top layer of crabs.

Few Died

After 48 hours under the spray--and a total of about 55 hours out of the ocean--only 4 of over 300 crabs have died. If Dungeness crabs can be held this way for 3 or 4 days with a mortality of less than 5%, the experiment will be considered a success.

The operation, which will continue, is being watched closely by crab fishermen from California to Washington, reports the Seattle Technological Laboratory.



FISH-GUTTING MACHINES DESIGNED FOR FISHING VESSELS

Fish-gutting machines in the past have been too big and costly for any but the largest factory trawlers. Now two types of gutting machines have been developed for medium vessels. Their introduction may enable trawlers to carry smaller crews and handle their catch more quickly and efficiently.

BCF's 'Vacuum Eviscerator'

The 'vacuum eviscerator' was developed by BCF's Technological Laboratory in Gloucester, Mass. It is designed to handle 60 fish per minute, compared to manual rate of 16 fish per minute. The operator holds a fish (head first) against a nozzle and depresses a foot pedal. The gut is removed and the fish washed and flushed by the machine. The prototype system is not fully automatic, but a fully automatic system should evolve. It is estimated that a complete eviscerator will cost about \$5,000.

'Shetland Gutter'

A second gutting machine is the "Shetland gutter," invented by a farmer. It is simple and sturdy. The British White Fish Authority sought to improve the basic design but was able to make only minor changes to components. Already in production, the Shetland gutter is designed for small draggers and handles 45 fish per minute. It costs less than \$3,000 and can take fish up to 17 inches long. Later models will handle larger fish.



BCF EXPLORES PRAWN FISHING OFF SURINAM

In 1969, BCF's research vessel 'Oregon II' discovered commercial concentrations of giant scarlet prawns off Surinam, South America, in 350 to 450 fathoms. More recently, the vessel completed a followup cruise in the same general area for the same species. She fished with large shrimp trawls.

During 13 days of fishing, 23 of 30 sets were considered successful, producing over 1,500 pounds of scarlet prawn tails (7 to 30 count).

These prawns are a desirable commercial commodity. BCF's efforts will assist in development of a fishery.



INTEREST RATE ON FISHERY LOANS IS RAISED

BCF announced on Jan. 30, 1970, that interest charged on Bureau-approved fishery loans has been raised from $7\frac{1}{2}\%$ to 8% .

Philip M. Roedel, Bureau director, said that by law the interest rate is based on the average yield of Government obligations with maturities of 7 years. On Dec. 31, 1969, this yield increased to $7\frac{5}{8}\%$, necessitating a corresponding increase in the interest rate on fishery loans.

How Loans Used

Fishery loans are direct Government loans to owners of fishing vessels. The loans may be used to finance and refinance the purchase, construction, equipping, maintenance, repair, or operation of commercial fishing vessels or gear--when funds are not otherwise available on reasonable terms.



NEARLY \$6 MILLION IN COMMERCIAL FISHERIES AID AVAILABLE TO STATES

Commercial fisheries grants in aid of \$5,950,000 have been made available to the States, Commonwealth of Puerto Rico, Virgin Islands, Guam, and American Samoa. This was announced Jan. 27, 1970, by Assistant Secretary of the Interior Leslie L. Glasgow.

The funds partially reimburse the recipients for completed work on commercial fishery projects. The funds are used on a cost-sharing basis for research, development, construction, and improvement of facilities and vessels designed to benefit the Nation's commercial fisheries. Projects are selected, designed, and carried out by the States, with up to 75% of cost financed by Federal funds.

Nearly \$28 Million Since 1965

Since 1965, nearly \$28 million in Federal funds have been made available for 348 commercial fisheries projects under two Acts: Commercial Fisheries Research and Development Act of 1964 (P.L. 88-309) and Anadromous Fish Act of 1965 (P.L. 89-304).



SHRIMP-FISHERMEN TRAINING SUPPORTED BY LABOR DEPT.

Because there is a shortage of shrimp fishermen in the U.S., the Department of Labor is supporting a program to train shrimpers for the Gulf Coast. This was reported by the Department's magazine 'Manpower' in Dec. 1969.

Under a contract awarded to the Freeport (Texas) Shrimp Assoc., a consortium of boat owners is sponsoring the program. The owners place qualified recruits on board their vessels during the on-the-job phase. Since training began in Feb. 1969, 80 men have taken jobs and gone to sea; 70 more will be trained. The total cost will be more than \$471,000. Training is conducted by Fitzgerald Laboratories, Inc., Annapolis, Md., which has established in Freeport a dockside training center.

The Program

Groups of 10 trainees certified by the Texas Employment Commission begin training at 2-week intervals. The first phase is 8 weeks of on-shore instruction; then 44 weeks of on-the-job training aboard shrimp boats.

The training is divided into 3 parts: 1) Fundamentals: seamanship, oceanography, navigation, communications, engine maintenance, trawls and rigging, net making and repair. 2) Practical experience in workshops at the center and on board a training vessel staffed by instructors. 3) Student signs on a fishing trawler. There he will get his "sea legs" and the experience to make him a competent shrimper.

Trainees Counseled

The program includes job adjustment and counseling to help trainees with discipline, adjustment to the sea, social skills, budgeting. The center uses industrial psychologists and job counselors because many trainees have little schooling or job experience.

Paid During Training & After

Trainees are paid at least \$1.60 an hour during training, and \$5,000 annually afterward.

A typical off-coast vessel with a 3-man crew may be at sea 4 to 20 days.



NEW FISH-LOCATING TECHNIQUES

In some fisheries, as much as 85% of a vessel's operating time is spent locating fish. Reducing searching time as much as possible is very important. Experiments with airborne and/or spaceborne equipment have been promising. A qualified observer can distinguish many species of pelagic fish on the basis of color. These color differences are used by spotter pilots of the commercial fishing industry to locate and identify fish.

The experienced spotter also uses other features: the presence of fish oil films, diving birds, ripples and, sometimes, a churning of surface waters. Airborne and spaceborne sensors, which are better than the human eye in many important respects, may be used to locate and identify surface and near-surface fish stocks.

Measure Color Patterns

The distinctive color of certain species suggests that spectral measurements of the color patterns with analytical equipment may be used to locate and identify fish schools in their natural environment under certain conditions. During September 1968, BCF's Pascagoula Base (Miss.) obtained spectral-reflectance measurements of 15 schooling species in the northern Gulf of Mexico. Measurements were made on single fish, fish in small groups, and fish in schools inside impoundments using a water-color spectrometer. Results of these preliminary measurements indicated the idea has merit; equipment to continue studies in this area is available.

To Study Captive Schools

During the coming months, observations will be made of the color patterns of some commercially important species in their natural environment. These observations will be made on captive schools under a wide range of known (monitored) environmental conditions of sea-state, lighting conditions, and water turbidity. The results will determine the feasibility of an airborne or spaceborne operational system to locate and identify fish schools from observations and automatic analysis of color patterns.

Light Sensors

Another promising approach to locating and identifying pelagic fish is the low-level light sensors, such as image intensifiers. These detect the bioluminescence, or "fire" as fishermen call it, associated with most schools. The Spanish mackerel fishery, which yields an annual catch of 7 to 8 million pounds, illustrates the potential application of this method. In Florida, this fishery is carried on chiefly with gill nets and haul seines at night. The fish are sighted by "fire" in the water. This "fire" results from the movement of fish schools that cause luminescent organisms to glow momentarily. The bodies of rapidly swimming fish are outlined with light; each leaves a trail of fire as it moves. Large schools of mackerel, 5 to 10 tons, are identified by individual flashes within a larger glowing sphere of bioluminescence. The "fire" can be seen best with the naked eye on moonless nights; however, fishing is also done on cloudy nights.

A series of tests has been conducted by BCF Pascagoula from Coast Guard helicopters, fixed-wing aircraft, a stationary oceanographic platform, and surface vessels using a television-image intensifier system. They amplify 40,000 times the ambient light or, in this case, the bioluminescence.

This system has been used to observe fish schools, individual fish, SCUBA divers, and objects towed at subsurface depths in water masses containing both low and high concentrations of luminescing organisms. Off Florida's west coast, imagery was obtained of thread-herring schools at night from altitudes of 500 to 5,000 feet. Test results strongly suggest that low-level light sensors may be used effectively from high altitudes to locate, and possibly identify, pelagic fish stocks over large oceanic area.

The remote sensing system expected to evolve will have daytime and nighttime sensing capabilities. It will scan wide areas at high speeds--and provide real time data on the location, quantity, and species of pelagic fish stocks with much accuracy.



DECADE OF NORTH ATLANTIC FISHING REVIEWED BY BCF

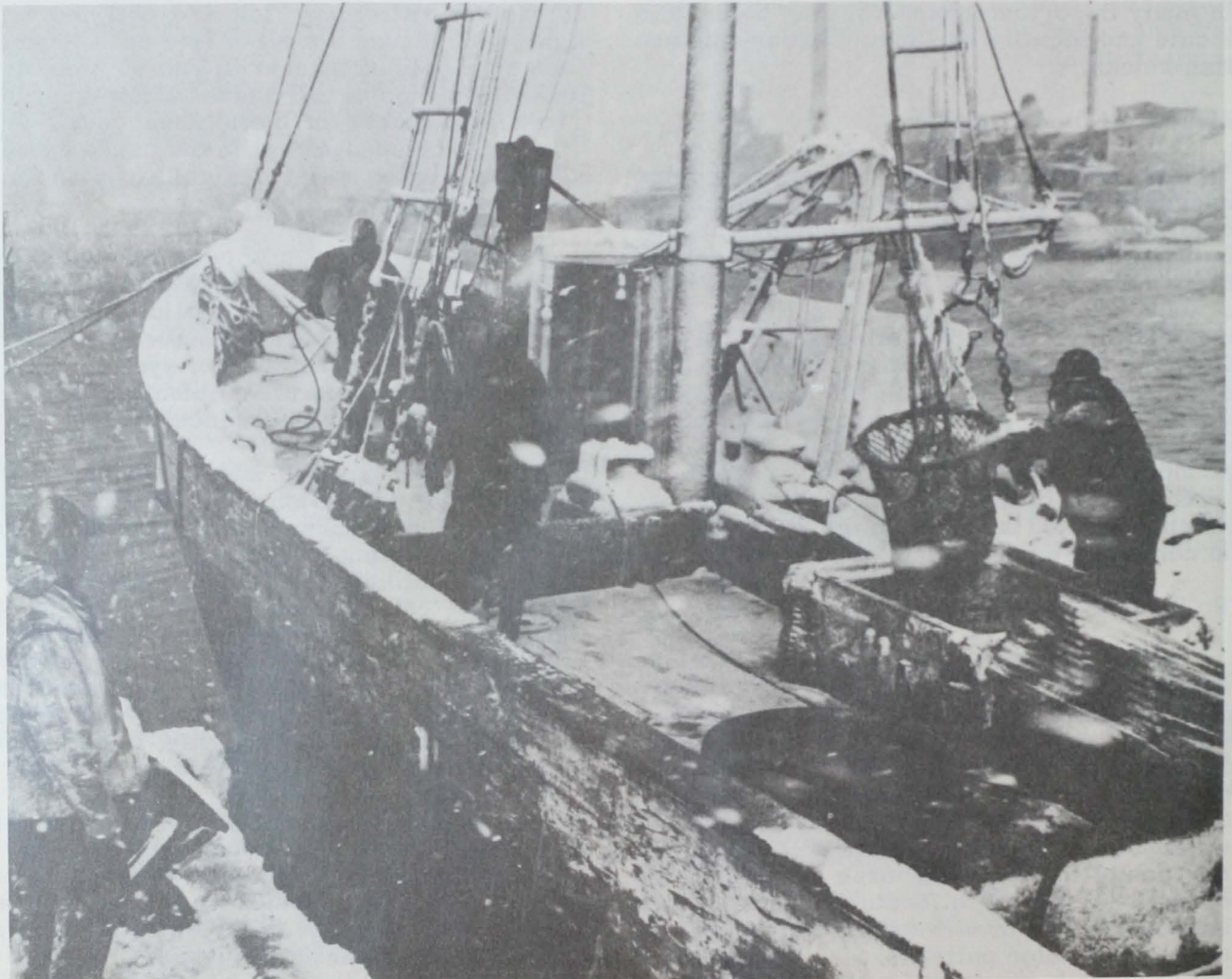
BCF Gloucester (Mass.) provides this review of a decade of fishing in the North Atlantic region:

Generally, the condition of domestic fisheries in the region is not good, but there are some bright spots. There is room for optimism in U.S. international negotiations. We appear to be approaching the day when country quotas will become a reality in the North-west Atlantic. It is imperative that our research efforts be maintained at a level that

will give our international experts the facts they need at the conference table.

Foreign Vessels Appear

Foremost in many minds are the foreign fisheries off U.S. shores. The 1960s began with Soviet exploratory vessels appearing off New England. These were followed by large fleets of several nations. At first, these fleets caught herring. But in 1969 the Soviets began taking substantial quantities of silver hake.



Unloading fish during a snow storm in Gloucester, Mass.

(Photo: Robert K. Brigham)

By 1965 the Soviet catch of silver hake was 7 times the U.S. landing of this major food species.

Haddock Catch Declines

The 1963 year-class of haddock was one of the largest on record. In 1965 and 1966, over 430,000 metric tons of haddock were taken by the Soviets, Canadians, and the U.S. The landings in each of these years were about double the average annual landings by all nations in previous years. Since 1963, there has not been a successful year-class of haddock. In 1969, U.S. landings were down to about 20,000 metric tons. The Soviet and other European fleets are no longer interested in haddock. They are continuing their efforts on silver hake, herring, and other industrial species.

Silver Hake Declines

At the end of the decade, landings of both haddock and silver hake were less than 50% of 1960 landings. In recent years, these species have been the backbone of Boston and Gloucester fisheries. Landings of ocean perch, the leading New England food fish in 1960, are down 60%, and scallop landings even more.

New Bedford Still No. 2

The sea-scallop situation has adversely affected New Bedford, but it has not ousted that port from second position in the Nation in value of fishery landings. Largely responsible for New Bedford's position is the yellowtail fishery. Strong broods have appeared year after year. Landings have held up well with an annual value 3 times greater than 10 years ago. However, this fishery is being exploited at about the maximum it can sustain, and there is always the possibility of foreign competition.

Menhaden Industry Grim

To the south of New England, the situation in the menhaden industry is grim. Some plants are idle; others have been operating at a minimum.

Oyster Industry

Although the oyster industry in Connecticut and on Long Island is encouraged by excellent sets in 1966 and 1968, recovery from

the MSX disaster in Delaware and Chesapeake Bay has been slow. However, there are some signs of improvement.

Alternate Resources

BCF Gloucester hopes that such alternate resources as sea herring and pollock will be utilized more fully by U.S. vessels. The Soviets, Poles, and Germans are still harvesting vast quantities of herring off shore. Recently, East and West German vessels have been taking substantial numbers of pollock which, BCF Gloucester believes, will serve as an excellent substitute for haddock.

Clam Fisheries

The three existing clam fisheries of the North Atlantic region continue to thrive. Surf clam and soft clam production here doubled since the beginning of the decade. The blue crab industry has had its usual fluctuations in supply--but the greatest year-class in history is now entering the fishery in Chesapeake Bay.

New Fisheries

Several new fisheries have considerable potential in the North Atlantic. The offshore lobster trawl fishery has developed largely during the past 10 years. Landings now exceed five million pounds annually. Interest in the offshore pot fishery for lobsters is also increasing. Two latent resources worth watching are the ocean quahog and red crab; the former is already being landed in small quantities.

Shrimp Promising

One of the most encouraging developments of the decade is the northern shrimp fishery. Annual landings have gone from virtually nothing to thirty million pounds during the past 10 years. This fishery started in Maine and is now bolstering the Gloucester economy, which was damaged badly by the drop in landings of ocean perch and silver hake.

BCF Gloucester concludes: "While we cannot look to the seventies without some apprehension, we do believe that if our industry can be assured proper access to the resources off our shores, brighter days lie ahead."



PACIFIC SAURY: LARGE LATENT RESOURCE

The Pacific saury (*Cololabis saira*) is a slender teleost resembling, superficially, a wingless flying fish. It is one of three species of the family Scomberesocidae. Adult saury, 28-32 cm. long, are exceptionally firm-fleshed. The meat is oily,

The saury is highly regarded as a fresh and canned product in Japan and the Soviet Union. Large amounts also are frozen for use as bait in tuna longlining.

3 Stocks

The Pacific Ocean contains three main stocks: The Asian is located off the Soviet Union, Korea, and Japan; the central Pacific stock surrounds the Hawaiian Islands; and the eastern Pacific stock occupies coastal waters from Baja California to northern British Columbia. Although the three stocks generally are considered geographically isolated, some intermixing may occur.

Large Resource Off California

U.S. scientists who have conducted egg and larval studies off California report a very large saury resource. Soviet surveys off the U.S. west coast showed saury in coastal region 50-150 miles wide and 450 miles long between northern California and Washington.

Albacore fishermen off Oregon often observe schools of saury miles wide and up to 20 miles long. During September 1967, BCF's research vessel, 'John N. Cobb,' encountered

a school covering a 3-4-mile area 30 miles offshore near Destruction Island, Washington.

Estimates of Stock

Minimum estimates of the eastern Pacific saury's standing stock range between 450,000 and 800,000 tons. Some researchers feel the figures may be 4-5 times greater. The stock is believed at least as large--and possibly several times as large--as the Pacific hake population.

Japan & USSR Fishery

Both Japan and the Soviet Union fish the Asian Pacific saury on a large commercial scale. Nearly 1,000 vessels support the Japanese saury industry. Although the size of the Soviet saury fleet is unknown, it is believed comparable to the Japanese fleet.

The Japanese catch was 210,000 tons in 1967 and about 150,000 tons in 1968. In recent years, Japanese catches have exceeded 500,000 tons. In 1968, near Tokyo, fishermen sold large saury to fresh-fish market for \$375-958 a short ton. The tuna longline industry was paying up to \$500 a ton (25 cents a pound) for bait saury.

Potential for U.S.

Saury has been sold in the U.S. only in very isolated instances, so its potential price in U.S. is unknown. Assuming comparable prices with average Japanese markets, the

exvessel value of potential annual harvest of eastern Pacific saury is at least \$100 million. The value of saury for Fish Protein Concentrate (FPC) would also be large after procedures for using this species were developed. Possibly, saury exports to Japan would be very profitable because Asian saury catches have been declining in recent years. The export of bait saury to American Samoa for sale to foreign tuna longline vessels might be profitable.

Soviet Interest

Foreign interest in the eastern Pacific saury stock is obvious. The Soviets have conducted at least two extensive surveys off U.S. U.S. fishing vessels have reported a few Soviet vessels fishing saury off U.S., probably exploratory. Soviet publications indicate great interest in this resource and report Soviet intentions for a commercial fishery.

The Japanese realize the potential of this resource, but they have not investigated it as much as the Soviets.

Obstacles to U.S. Fishery

There are problems in developing a U.S. saury fishing industry. The harvesting meth-

ods of Japanese and Soviet vessels differ completely from U.S. methods; they require considerable manpower. Either foreign technology must be modified to U.S. needs--or completely new harvesting methods must be developed. If the former, manpower requirements must be greatly reduced by mechanization to make saury fishing profitable in the U.S. Many U.S. vessels that would be suitable fish other species between August and December, when saury are most available. U.S. markets must be developed, although a large potential export market exists.

Seattle Research

BCF's Seattle Exploratory Fishing and Gear Research Base has conducted preliminary research on saury and plans to expand its program. One exploratory cruise has been completed that provides background for a larger resource-assessment effort.

Much information has been acquired on Japanese and Soviet fishing methods, and plans are being developed to adapt the Japanese technique to U.S. needs and capabilities. Alternate fishing systems, which would be less labor intensive, also are being considered.



CATFISH FARMING IN 1969

BCF Ann Arbor, Mich., and the Bureau of Sport Fisheries & Wildlife laboratories in Stuttgart, Ark., cooperated in reporting the 1969 catfish story. Here are highlights:

The U.S. catfish farming industry received much publicity in 1969, but it is "not all wine and roses. There are trouble spots due to growing pains: Product quality has not always been up to par; market expansion has been limited by inadequate product portion control and high prices; processing plants have not been able to get enough fish to operate efficiently; many producers have yet to show a profit; catfish inventories are building up in ponds; disease incidence is increasing--harvesting and handling techniques are still relatively primitive; and other problems."

Catfish farming acreage continues to expand. Over 40,000 acres across the southern half of the U.S. were under catfish culture in 1969. Around 2,000 of these were devoted to fingerling production.

Close to 1,300 persons and firms are in farm catfish culture in the U.S. (excluding California). The average size of catfish farms (water impoundments) in the South-Central States is about 38 acres, but the majority range between 10 and 30 acres.

Probably not over 20,000 acres were harvested. Possibly 23 to 28 million pounds were produced. These are only estimates--because no reliable data-gathering system exists.

Catfish Use

Local markets (restaurants, retail, live marketing) remained the major market.

Live fish haulers paced prices in spring and early summer. They paid up to 50 cents per pound and took an estimated 2-3 million pounds.

Around 2 million pounds were processed in plants in Arkansas and Mississippi--only 10-15% of capacity. By the time most plants became operable in late spring, competition from live fish haulers drove prices out of their reach and forced them to close over the summer. To resume operations in early fall, processors had to pay 40 cents a pound.

New Outlets

"Fast service restaurants featuring catfish sprang up in several South-Central cities--many with franchise or chain expansion plans. Lack of catfish supplies, inexperience, under-financing, competition, and other factors forced abandonment or postponement of many such plans. The surviving restaurants are prime markets for processed farm catfish and are expected to expand. However, the picture is clouded by special interests of stock promoters of franchise operations."

Supermarkets More Important

Supermarkets became increasingly important as market outlets for fresh and frozen farm catfish. Retail outlets were a major factor in reducing inventories of frozen catfish products not acceptable to restaurants. "Restaurant markets are highly sensitive to product size and form, whereas retail markets are able to accommodate more variation in the product."

Imports

Imports of catfish increased to around 4 million pounds in 1969; 85% came from Brazil, 14% from Mexico. Imports compete successfully in many restaurants because they are much cheaper. "No adverse consumer reaction has been noted."

California Debuts

California now has about 1,500 acres in production, mostly in small ponds. "Climate, water, markets, and increasing interest point to California as a potential major producing and market area for farm catfish."

SOME MAJOR PROBLEMS

Water Quality: The need for adequate supplies of fresh water has been emphasized repeatedly. During summer 1969, numerous farmers lost fish because they were unable to maintain good water conditions. Losses due to oxygen depletion often could have been prevented had fresh water been available in quantity.

Disease: The incidence of bacterial infections was very high. This reflected the re

relationship of poor water conditions to disease outbreaks.

Agriculture Department's Soil Conservation Service suggested a 13 gpm per acre figure for well capacity. This represents "the absolute minimum a farmer should consider when planning his water system."

Disease control: The incubation period for *Aeromonas liquefaciens* infections in channel catfish is 10-14 days. Farmers should expect outbreaks of bacterial diseases 10-14 days after any stress. "Parasites, handling, or low oxygen stresses may be involved in disease occurrence. Fish should not be handled for at least two weeks if they have undergone low oxygen stress."

Ichthyophthirius or "ich" disease was observed in fingerlings on several catfish farms as of Oct. 1, 1969, about 6 weeks earlier than usual. "Farmers are urged to use preventive measures in ponds where fingerling catfish are being reared."

Harvesting

Harvesting is still "a rather haphazard procedure." Haul seining has vastly improved over the past few years, but it is still a "cumbersome, time consuming, and often expensive harvesting method." Most producers feel they cannot afford their own equipment and must rely on outside harvesting crews and facilities. The latter have been acquired by most large producers and processors.

The development of more efficient holding, handling, and sorting methods is proceeding slowly. In-line weighing scales now are commonly used while fish are being lifted from nets to hauling conveyances. Mechanical grading devices and catch estimators are under development at the Kelso Gear Research facility, Arkansas.

Lack of adequate catfish supplies and the continuity of deliveries were critical to processing. They caused processing costs to increase up to 20 cents a pound--a cost that eliminates profit margins. Some processors are likely to face this problem again in 1970.

Quality

The catfish image as a superior product was hurt in summer 1969 by reports of poor quality. Maintenance of high quality during processing and storage for "wholesomeness, taste, product form and weight is a major problem facing processors." Off flavor occurred in some catfish traceable to pond sources. Freezer burn (dehydration) was noted in catfish products held in cold storage improperly packaged or glazed. Markets rejected these.

Sanitation measures in some processing plants have been inadequate.

Portions and Packaging

Non-conformance with portion control and packaging requirements of certain market outlets, particularly restaurants, produced a frozen inventory buildup of over one-half million pounds by October 1969. This inventory was being reduced primarily by sales to supermarkets.

Lack of knowledge of the size of markets and the requirements of individual markets limits the ability of producers and processors to plan marketing programs and to choose market alternatives.

Resistance by institution buyers to wholesale prices of over 90 cents per pound for frozen farm catfish developed.

Fast service restaurants cannot compete at these wholesale prices. So many turned to imported products.

Wide-scale consumer reaction to retail prices of \$1.29 to \$1.39 per pound retail is largely untested. There are indications of resistance at the higher price.

Production Costs

Current production costs of 28 to 30 cents or more per pound at farm level is too high to permit processing and marketing to large users--restaurant chains and convenience food processors.



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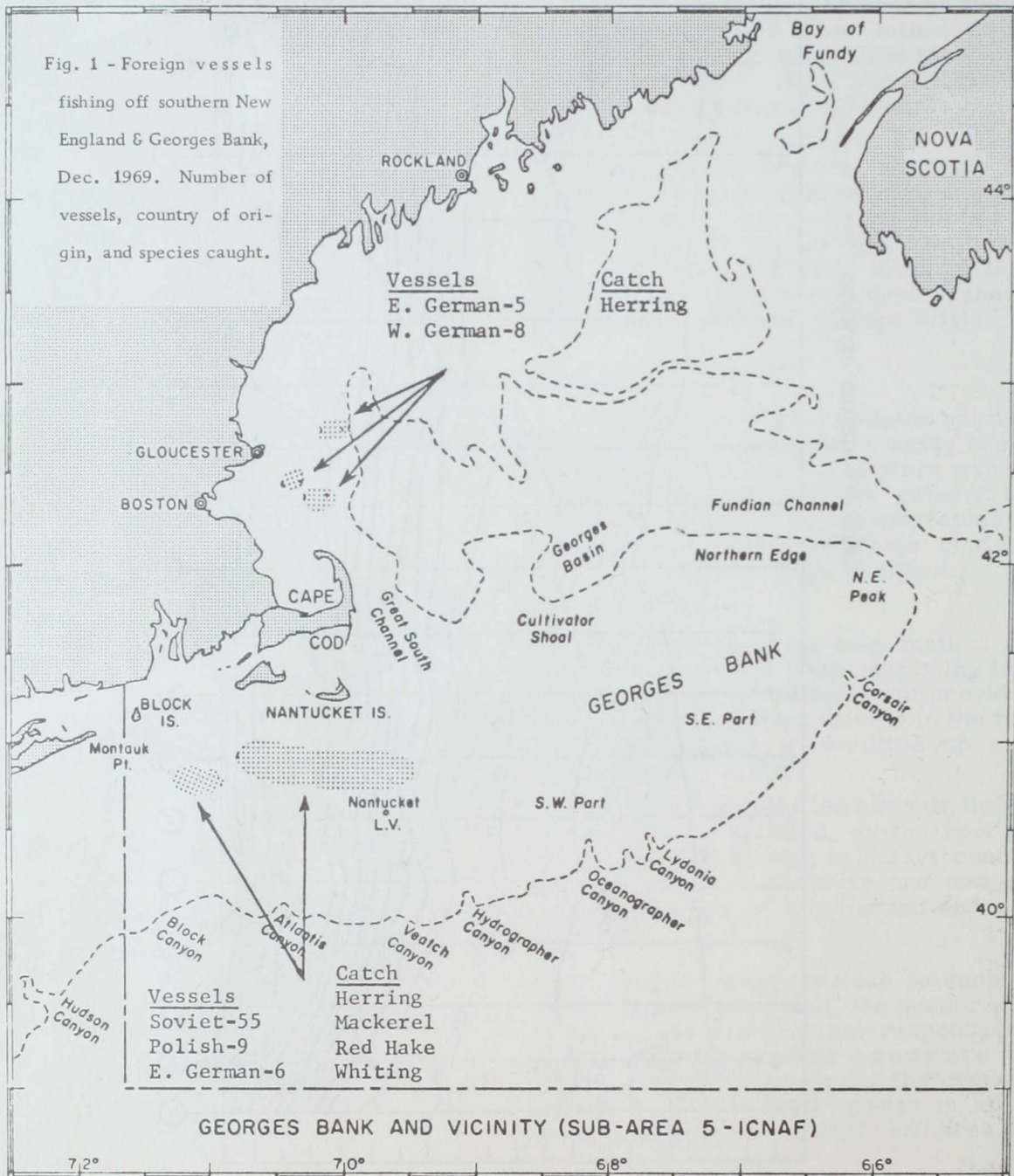
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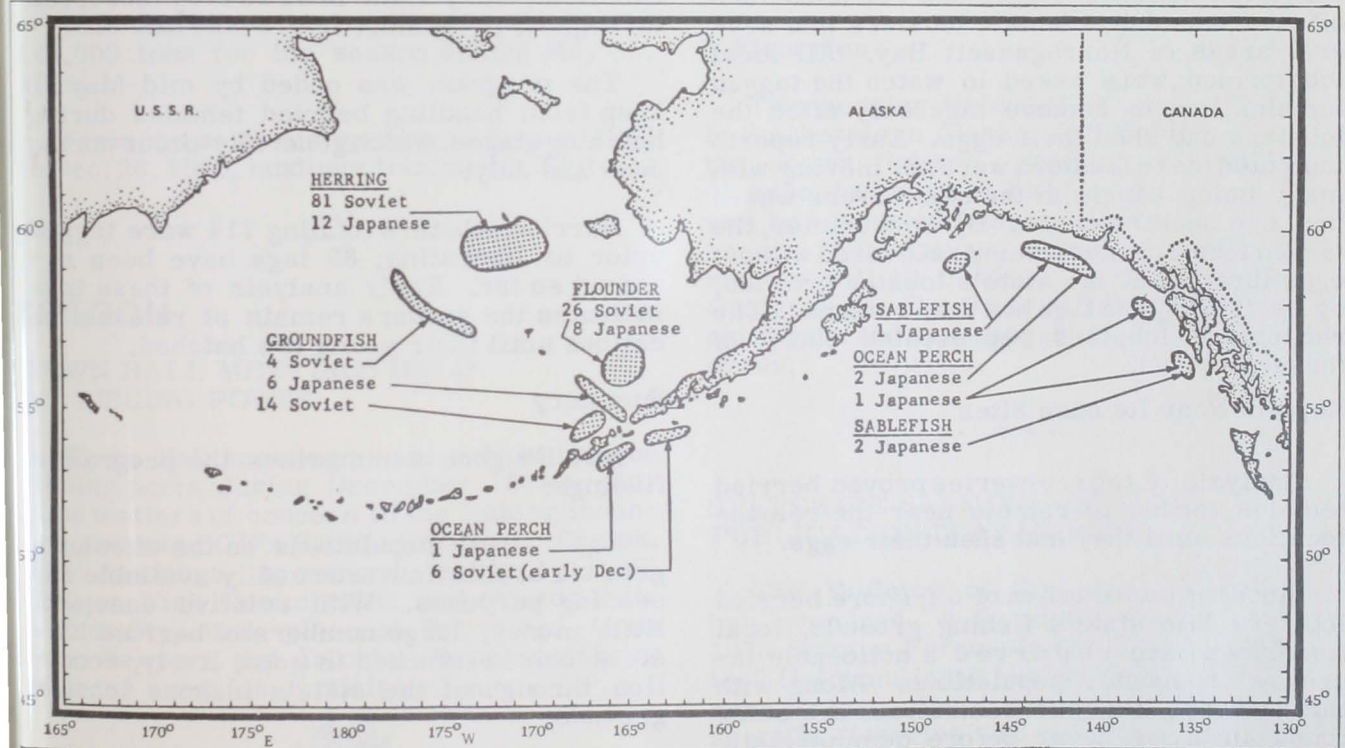


Fig. 2 - Foreign fisheries off Alaska, December 1969.



STATES

RHODE ISLAND

SEED-LOBSTER PROGRAM UNDERWAY

For more than a decade, with Rhode Island's approval, some local trawlers lobstering the offshore regions of the continental shelf have been bringing in egg-bearing female lobsters and releasing them in Rhode Island waters. For identification, the fishermen tie strands of nylon rope to the lobsters before releasing them. Local fishermen reported catching lobsters marked this way and finding the lobsters often had shed their eggs. This information has been collected by Stephen Fougere, Conservation Officer in Rhode Island's Department of Natural Resources.

Tag & Release Berried Females

During March-April 1965, with the cooperation of several off-shore trawlers, conservation officers tagged and released 1258 off-shore berried female lobsters into several areas of Narragansett Bay. All local lobstermen were asked to watch the tagged females and to remove tags only after the lobsters had shed their eggs. Early reports indicated these lobsters were not moving with many being caught in the same areas where they had been released. By midsummer, the tagged lobsters were being recovered without eggs throughout the state's lobster grounds; by April 1966, 495 tags had been returned. The recaptured lobsters represented 39.3% of those released.

Remain Near Release Sites

Analysis of tag recoveries proved berried females tended to remain near the release locations until they had shed their eggs.

Since the introduction of off-shore berried lobsters into state's fishing grounds, local fishermen have reported a noticeable increase in lobster populations. Along with this increase, heavy concentrations are being found in areas never before commercially productive.

Asked by local commercial lobstermen, the 1968 General Assembly appropriated \$10,000 to finance transferral of berried female lobsters from off-shore banks into Rhode Island lobster grounds.

Program In 1969

In January 1969, all Rhode Island trawler captains in the off-shore lobster fishery were contacted about the program. Fourteen asked to participate and agreed to comply with rules on transporting berried lobsters.

The Department of Natural Resources agreed to pay fishermen one dollar for each lobster, regardless of size, provided it was fully berried and delivered in good, lively, condition.

From Jan.-May 15, 1969, 4071 female berried lobsters were delivered from the off-shore canyons and released by conservation officers throughout the state's lobster grounds. These lobsters varied from one pound up to 10 pounds. The overall average weight of the seed lobsters was about 2½ pounds. Condition at time of release was excellent; very light mortality occurred throughout program.

The program was ended by mid-May to keep from handling berried females during hatching stages, which generally occur during June and July.

Berried lobsters totaling 714 were tagged prior to liberating; 89 tags have been returned so far. Early analysis of these tags indicates the seeders remain at release locations until their young are hatched.

Summary

Mr. Fougere summarizes the program's findings:

Egg lobster populations on the off-shore grounds at this time are readily available for seeding purposes. With relative ease and little money, large numbers of berried lobsters can be stocked in good, lively, condition throughout the state's inshore lobster grounds.

The displaced berried lobsters definitely remain near release locations until their young are liberated.

After releasing their young, favorable numbers of stocked lobsters are recovered and sold by commercial lobster fishermen.

This recovers a substantial part of the initial cost of moving the breeders inshore.

An annual program of purchasing and re-leasing 5,000 egg-bearing lobsters into the state's lobster grounds can be conducted without any major state expenditure.

Rhode Island plans to continue the program in 1970.



CALIFORNIA

ANCHOVY CATCH QUOTA RAISED

On Jan. 9, 1970, the California Fish and Game Commission approved a 65,000-ton increase in anchovy catch for use in producing fish meal and oil--32,500 each in inshore and offshore zones of Southern Permit area.

This increases total quota for reduction to 140,000 tons for the season ending May 15, 1970.

From the season's opening in August 1969 to Dec. 28, 1969, landings totaled 48,600 tons.



OREGON

TOWN HALL MEETINGS HELD AT FISHING PORTS

Town Hall meetings were held at Oregon fishing ports during December 1969 to discuss matters of concern to the fishing industry, reports BCF's Pacific Northwest Region. The meetings, sponsored jointly by BCF, Oregon Fish Commission, and Oregon State University, took place at Brookings, Coos Bay, Newport, and Astoria. Representatives of these agencies participated.



ALASKA

NO CLOSED SEASON FOR SCALLOP

Starting Jan. 1, 1970, there would be no closed season on scallops, the Alaska Department of Fish and Game stated Dec. 12, 1969. This action was justified because biologists,

monitoring commercial scallop fishing in the Kodiak management area, found a very low incidental catch of king and tanner crabs.

Scallop landings in Kodiak area reached a record 927,000 pounds during January through November 1969; this compared with 607,000 pounds for all of 1968.

* * *

NEW HERRING RESEARCH PROGRAM IN SOUTHEASTERN ALASKA

A new herring research program in Southeastern Alaska has been designed to answer basic management needs concerned with herring abundance. The program's long-range goals are to: 1) determine separate stocks and their boundaries; 2) enumerate, or index yearly, fluctuations of the stocks; 3) determine causes for yearly fluctuations in abundance; and 4) estimate optimum harvest of these stocks.

2 Fisheries

Two herring fisheries are now operating in Southeastern Alaska: the bait fishery and the spawn fishery. Because Ketchikan is close to the greatest fishing activity, studies will be conducted from there. It offers ready access to fishing and spawning areas. Most studies will be conducted in Ketchikan and Craig areas. But there will be some work on abundance and spawning in other Southeastern areas.

* * *

STATEWIDE SALMON-FORECAST PUBLICATION IS AVAILABLE

The Division of Commercial Fisheries has prepared "A Summary of Preliminary 1970 Salmon Forecasts for Alaskan Fisheries" (Informational Leaflet #136). "Preliminary salmon forecasts are presented for specific fisheries and are also combined to provide projected commercial harvest levels for 1970 for the entire state."

Write for copy to: Mrs. June Grant, Alaska Department of Fish and Game, Subport Bldg., Juneau, Alaska 99801.



GREAT LAKES FACE ENVIRONMENTAL CRISIS

On Sept. 29-30, 1969, the Subcommittee on Energy, Natural Resources, and the Environment of the Senate Committee on Commerce heard testimony on the effects of pesticides on sports and commercial fishermen. William F. Carbine, BCF Regional Director, Ann Arbor, Mich., stressed "the environmental crisis that we face here in the Great Lakes."

Nearly all of Mr. Carbine's testimony follows:

Although the Great Lakes constitute the largest and most valuable fresh water resource of the world, their environmental quality has been deteriorating at an increasingly rapid rate in recent years. The biological and recreational values of the lakes have suffered most from the environmental changes that have taken place. These values may continue to decline even under proposed pollution abatement measures as the lakes will continue to be enriched at a rapid rate. Such enrichment causes the fouling of shallow areas and beaches with the obnoxious algae *Cladophora* and creates conditions that are increasingly unfavorable for the desirable species.

The value of the water of the Great Lakes for municipal and industrial use has not suffered greatly yet, but may be seriously affected if concerted basinwide action is not taken immediately to stem the tide of environmental deterioration which continues to threaten all uses.

The municipal and industrial uses and value of the Great Lakes are enormous, but the total worth of the Great Lakes includes many other uses of major and increasing value and importance to the Nation's economy. The fishery resources of the Great Lakes provides annually over 80 million pounds of food fish for the United States and Canada and more than 50 million pounds of industrial fish. The value of the recreational industry based on the fishery resource has increased tremendously in the past decade and its total worth is incalculable. Other recreational uses of the Great Lakes such as boating, swimming, and related activities are accelerating greatly.

Areas of the Great Lakes that have been influenced most by the increases in the human population and industry have shown marked changes in fish stocks. The confined areas of southern Green Bay on Lake Michigan and Saginaw Bay on Lake Huron, and the Detroit River and western Lake Erie have long received the wastes of growing populations and expanding industry.

The early superficial changes in water quality of these areas provoked pollution surveys that in some instances have brought about improvement in water quality for domestic use, but highly nutrient wastes that continued to enter these areas eventually created an over-enriched environment that destroyed desirable aquatic life. As this occurred, there was an accompanying gradual, almost unnoticed, retreat of highly prized species such as lake trout, whitefish, lake herring, and walleye, from the inner areas of the bays, the Detroit River, and western Lake Erie. These fish were replaced by increasing populations of alewives, carp, smelt, and stunted yellow perch.

The most recent and alarming aspect of the environmental crisis of the Great Lakes has been the appearance of concentrations of pesticides that seriously threaten the value of even the more desirable fish, and may contribute even more to the rampant environmental instability already triggered by enrichment.

Fish and other aquatic organisms have shown a remarkable capability to concentrate chlorinated hydrocarbon insecticides contained in their food and directly from water. Monitoring studies conducted by the Bureau's Great Lakes Fishery Laboratory, Ann Arbor, over the past 3-year period indicates that on the basis of DDT—this also included DDD and DDE—and dieldrin levels in whole fish, the rank of the Great Lakes in order of highest to lowest concentrations of insecticides is: Michigan, Huron, Ontario, Erie, and Superior.

Insecticide levels calculated on the whole fish basis show a marked difference from species to species; generally, a positive correlation appears between fat content and insecticide concentrations. For any given species, DDT and dieldrin levels appear to increase with an increase in the size of fish.

Laboratory investigations have shown that levels of these insecticides in water, in the low parts per billion range, can be toxic to adult fish. Evidence also exists that levels in the low parts per trillion range, although not toxic to adult fish, may affect reproduction.

Pesticides have already caused serious concern about management and production of lake trout and coho salmon—two of the key species in a program to reduce the problems caused by the alewives and enhance fishery values of the Great Lakes. There have been excessive mortalities of coho salmon eggs that have been attributed to pesticide contamination, and high levels of DDT and dieldrin in large coho and lake trout have raised questions by the Food and Drug Administration about the establishment of safe levels for human consumption.

The fish stocks of the Great Lakes have undergone progressive deterioration for more than a century. In the mid-1800's desirable species abounded in all of the Great Lakes, but subsequently all have been reduced greatly or virtually eliminated at various times throughout the Great Lakes. At no time in the history has there been an overall concerted interstate or international effort to reverse these unfavorable trends.

Once the Atlantic salmon, lake trout, whitefish species, and pike perch species comprised 80 to 90 percent of the total production of all of the lakes, but these species that contributed so greatly to the early fishery now usually constitute, where they are still present, less than 5 percent of the fish taken from the lakes.

The history of the Great Lakes shows a sequence of collapses of stocks without subsequent recovery. The Atlantic salmon inhabited only Lake Ontario where it became virtually extinct by 1880 which was attributed by many to the despoilment of its spawning streams. The whitefish all but disappeared from the St. Clair-Detroit River area by 1900 where pollution was intense and unchecked. The lake herring populations collapsed successively in various lakes between the 1920's and present as a result of intensive fishing, enrichment, and competition with the introduced alewife and smelt which have thrived in the richer environments of the lakes.

Blue pike and walleye have declined greatly or disappeared in the past two decades due to enrichment in Lakes Erie and Ontario, and Saginaw and Green Bays, or sea lamprey predation in other areas. The sea lamprey was the major factor in the decline of lake trout and whitefish in the upper lakes—Superior, Michigan, Huron—since the 1940's, but enrichment appears to be the primary factor for the near disappearance of these species in the lower lakes—Erie and Ontario.

As desirable species have been reduced, there have been population explosions of less desirable species at various times throughout the Great Lakes. Perhaps the most obnoxious and destructive of these has been the alewife which was introduced accidentally in Lake Ontario about 1870. Subsequently, it spread throughout the Great Lakes where under favorable conditions, it has undergone population explosions in Lakes Ontario, Huron, and Michigan, and has caused great distress by undergoing massive spring dieoffs, clogging municipal and industrial water intakes, and reducing greatly or eliminating all of the more productive and stable small species that provided food for preferred large predators such as lake trout and coho salmon.

Other low-value new species that have become widely distributed and very abundant are the carp and smelt. Carp were introduced in the late 1800's and during this century have been extremely abundant and have dominated enriched shallower areas of the Great Lakes. Although carp and smelt are not fished intensively, they rank fourth and fifth in pounds of fish taken from the lakes.

Smelt were introduced into a tributary of Lake Michigan in the early 1900's and have subsequently spread to all of the Great Lakes where they become extremely abundant at various times in the richest areas of the Great Lakes such as Green and Saginaw Bays and Lake Erie. Smelt have contributed heavily to catches, but have also been competitive to the detriment of the more stable and desirable exotic species.

Not all unfavorable population explosions as desirable species declined have involved exotic species. In Lake Erie the gizzard shad increased sharply when accelerated enrichment was first noted in the 1950's, and caused distressing problems and dieoffs. Then, the sheepshead increased to dominate the lake in the 1960's and now holds a competitive advantage that makes difficult the establishment of more desirable species.

The greatest current fishery problems are the great abundance of undesirable species and the extreme instability of the fish stocks due to natural vacillations accompanying population explosions and the continuing accelerated enrichment.

Safeguarding and perpetuating the Great Lakes fishery resource is a major responsibility of the U.S. Department of the Interior's Bureau of Commercial Fisheries. Any practice or series of events which threatens the abundance of fish or a useful and productive balance of fish species is of primary concern to us.

Scientists of the Bureau of Commercial Fisheries have been working with the fisheries of the Great Lakes and their environment over

a period of almost 50 years. The Bureau has been in a particularly advantageous position to observe the process of change that has been taking place in this—the largest complex of freshwater resources in the world. We were the first to direct public attention to the now well-publicized deterioration of Lake Erie.

Bureau scientists have found that water quality is detrimental to fish long before the more obvious issues of human safety and welfare are threatened. Before the public is aroused valuable fisheries and the waters that produce them are lost or so deteriorated that trends cannot be reversed or great effort and expense are necessary for rehabilitation.

We urge, therefore, a broad concept of environmental quality and pollution; a definition, not necessarily restricted to bacterial counts, excesses of dissolved solids, gross deficiencies in dissolved oxygen or easily detectable changes in bottom fauna composition. We urge the establishment of environmental quality standards that have prevention of pollution as a goal; not a set of limits that will define the degree of deterioration to be tolerated before action is taken to avert a national disgrace.

Experience has taught us that, frequently, troubles within one portion of this vast drainage have their origins in other, often remote, portions. We must become aware and remain cognizant of the occurrences in the Great Lakes that may threaten any portion of fish and wildlife. We must also strive to develop means of restoring fishes that already have become victims of situations created by the carelessness, greed, and shortsighted planning of parts of our society.

There should be close surveillance of any actions that might aggravate the already deplorable situation that has been developing in the Great Lakes drainage. Unless the practices which have induced

these conditions are stopped and the trends toward further deterioration are reversed, the Great Lakes eventually will become the world's largest, but least valuable freshwater resource.

This concludes my formal statement as such. I would, however, like to make a few additional comments relative to the pesticide problem. Although the announced purpose of these field hearings is to consider the effects of pesticides on sport and commercial fisheries, we felt it appropriate that your subcommittee be provided a general review of the environmental deterioration that is taking place in the Great Lakes basin. Pesticide pollution is just one of the many complex influences which are threatening the usefulness of the Great Lakes. It is imperative that we attack these environmental problems on a broad front in a coordinated fashion.

More specifically as regards pesticide pollution, as a fisheries research agency, our most pressing concern is that the levels of hard pesticides in the Great Lakes may already be at a point where they may affect reproduction in certain important species and ultimately negate the rehabilitation efforts undertaken to date. This environmental concern, however, should not be confused with the human health aspects of the pesticide problem. These aspects must be considered separately.

It is not possible for a regulatory agency such as the FDA to set some tolerance level which will automatically take care of both the environmental and the human health concerns. FDA must concern itself solely with the possible threat to human health, whereas fisheries scientists must concern themselves with the environmental aspects.

We have joined with the Michigan Department of Natural Resources in taking a firm stand against any further use of DDT and other hard pesticides. We have been monitoring pesticides in the Great Lakes for 5 years and have extensive data on the subject.



OYSTER INSTITUTE HONORS BUREAU OF COMMERCIAL FISHERIES

The Oyster Institute of North America (OINA) recently awarded identical plaques to the Bureau of Commercial Fisheries (BCF) and to the Bureau's Division of Statistics and Market News.

In a ceremony in Washington, D. C., Cranston Morgan, President of OINA, made the

presentations, thanking BCF for its services to the Institute over the years.

Brief acceptance remarks were made by Charles H. Meacham, Commissioner for Fish and Wildlife; Philip M. Roedel, BCF Director; and Frank Riley, Acting Chief, Division of Statistics and Market News.



Left to Right: Cranston Morgan, President, OINA, Weems, Va.; William R. Woodfield (Former President), Galesville, Md.; Frank McGinnes, Vice President, OINA, Irvington, Va.; John L. Plock, Greenport, L. I., New York; Charles H. Meacham, Commissioner of Fish and Wildlife Service, U.S. Dept. of the Interior; Elizabeth M. Wallace (Mrs. David H. Wallace), Executive Director, OINA, Sayville, L. I., New York; Robert L. Doxsee, Point Lookout, L. I., N. Y.; Frank Riley, Bureau of Commercial Fisheries; Edward Gruble (Immediate Past President), Seattle, Wash.; Clifford V. Varin, West Sayville, L. I., N. Y.; Nelson Slager, Bay Shore, L. I., N. Y.; Richard H. Loring, Dennis, Mass.; Philip M. Roedel, Director, Bureau of Commercial Fisheries. Joseph O. Saunders, Newport News, Va., Chairman of OINA's Education, Promotion, and Marketing Committee was not present when the photograph was taken.

(Photo: Bob Williams)



OCEANOGRAPHY

AUTOMATED WEATHER BUOY AT WORK OFF VIRGINIA

On Jan. 31, the U.S. Coast Guard anchored a 100-ton automated weather buoy approximately 125 miles east of Norfolk, Va. (latitude 36°30' N., longitude 73°30' W.) on northern edge of main Gulf Stream; later, 200 miles to northeast, the Coast Guard cutter 'Gresham' began to man Ocean Weather Station 'Hotel,' the second part of a floating weather station team. The buoy began flashing weather observations across the U.S. to a computer at the Scripps Institution of Oceanography in La Jolla, Calif.

The Coast Guard states that data gathered by these floating weather stations will be transmitted to the main U.S. weather teletype network for use in forecasting. ESSA's

Weather Bureau has discovered that severe weather conditions formed in this area can migrate northward along the Atlantic Coast undetected by shore-based facilities.

It is hoped the weather buoy and the Gresham will help to improve Weather Bureau forecasting for the East Coast.

The Data Gathered

The 100-ton buoy is 40 feet in diameter and has a 45-foot mast. It gathers hourly data on "air and water temperatures, barometric pressure, winds, dew point, solar radiation, precipitation and surface water currents." The data are stored in a computer inside the buoy. Every 6 hours, the shore-based computer in California interrogates the computer and receives and interprets its radio transmission.

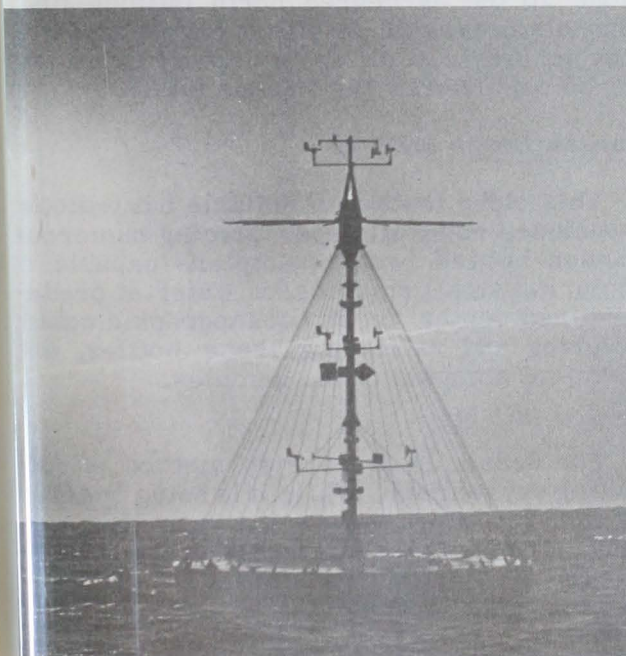
Weather Buoy

The buoy is held on station by a 3-inch plaited nylon line attached to a 3-ton anchor weighted by 18,000 pounds of chain. The 2-mile mooring line allows the buoy to swing in a circle about 1½ miles in diameter. It warns off passing ships with a flashing xenon light, similar to the strobe unit of a flash camera.

National Project

The experimental buoy is part of the Coast Guard-managed National Data Buoy Development Project that began in late 1967. If the project continues to appear feasible, a network of similar buoys may some day be placed to provide oceanographic as well as meteorological data.

The weather buoy is scheduled to remain on station until July 1970, when it will be brought in for overhaul. It will be restationed in August for a year's service.



Automated weather buoy off Virginia.
(Photo: R. E. Tilley, 5th Coast Guard Dist.)



SEARCH BEGINS IN GULF FOR DANGERS TO SHIPPING

A wide search for dangerous obstructions to shipping in the Gulf of Mexico was launched February by the Coast and Geodetic Survey (CGS). It will be carried out primarily in fairways leading into ports in Texas, Louisiana, Mississippi, Alabama, and Florida.

The only wire drag vessels in the U.S., the 'Rude' and 'Heck', left Norfolk, Va., their home port, for Corpus Christi, Texas, their base this year.

First Charted in 1966

The fairways were first charted in 1966 to guide coastal and ocean-going vessels safely between the numerous oil well platforms rising above Gulf surface as far out as 60 miles. No drilling structures are allowed in the fairways.

The ships' mission will be to search the fairways for partially removed oil platforms, sunken vessels, or other submerged hazards to vessels.

Eastward From Texas

The ships begin off Texas and will work eastward towing a submerged wire between them as they sweep the assigned areas. Shipping will be advised immediately through "Notice to Mariners" of hazardous obstructions. CGS charts will be corrected. The wire, towed at various depths down to 60 feet, will be kept close to bottom in fairways and in shallow areas.

Search for Sunken Wrecks

The sunken wrecks to be searched for include commercial and pleasure ships now noted approximately on nautical charts.



FAST-RESPONSE OXYGEN SENSOR TESTED

A newly developed sensor designed to give accurate, on-the-spot measurements of the water's oxygen content may soon replace present methods of recording oxygen levels.

This is the prediction of Quick Carlson, a civilian oceanographer at the U.S. Naval Oceanographic Office (NOO).

Carlson and his scientific team tested the new sensor to depths of one mile at 23 different Pacific locations while their oceanographic research ship, the USNS 'Davis' steamed from Yokosuka, Japan, to San Francisco.

Oxygen measurements returned by the sensor verified the general oxygen structure of the Pacific Ocean along the ship's route--close to the 34-degree north latitude line. They also revealed details of oxygen layering (oxygen levels at different depths) that could not be captured by the Nansen bottle.

Nansen Bottle Method

This older method is reliable but tedious. It includes several steps: placing numerous Nansen bottles (water samplers capable of capturing small amounts of water at predetermined depths) on an oceanographic cable, lowering and retrieving these bottles, and chemical analysis of the samples.

Sensor Is 1 Step

The sensor is a one-step method of collecting oxygen data. While it is being lowered through the ocean depths, it can provide continuous oxygen measurements in the form of electrical signals transmitted up a long oceanographic cable.

Carlson predicted: "As a result, the sensor should give us detailed, on-the-spot oxygen levels from all depths, in direct contrast to the spot-check readings we are now getting through the use of the Nansen and similar methods."

If further tests continue to support his view, Carlson predicted, the sensor will become an "easy-to-use, fast-response tool for oceanographers needing accurate oxygen measurements to determine the overall distribution of dissolved oxygen in all ocean waters, regardless of depth and area."

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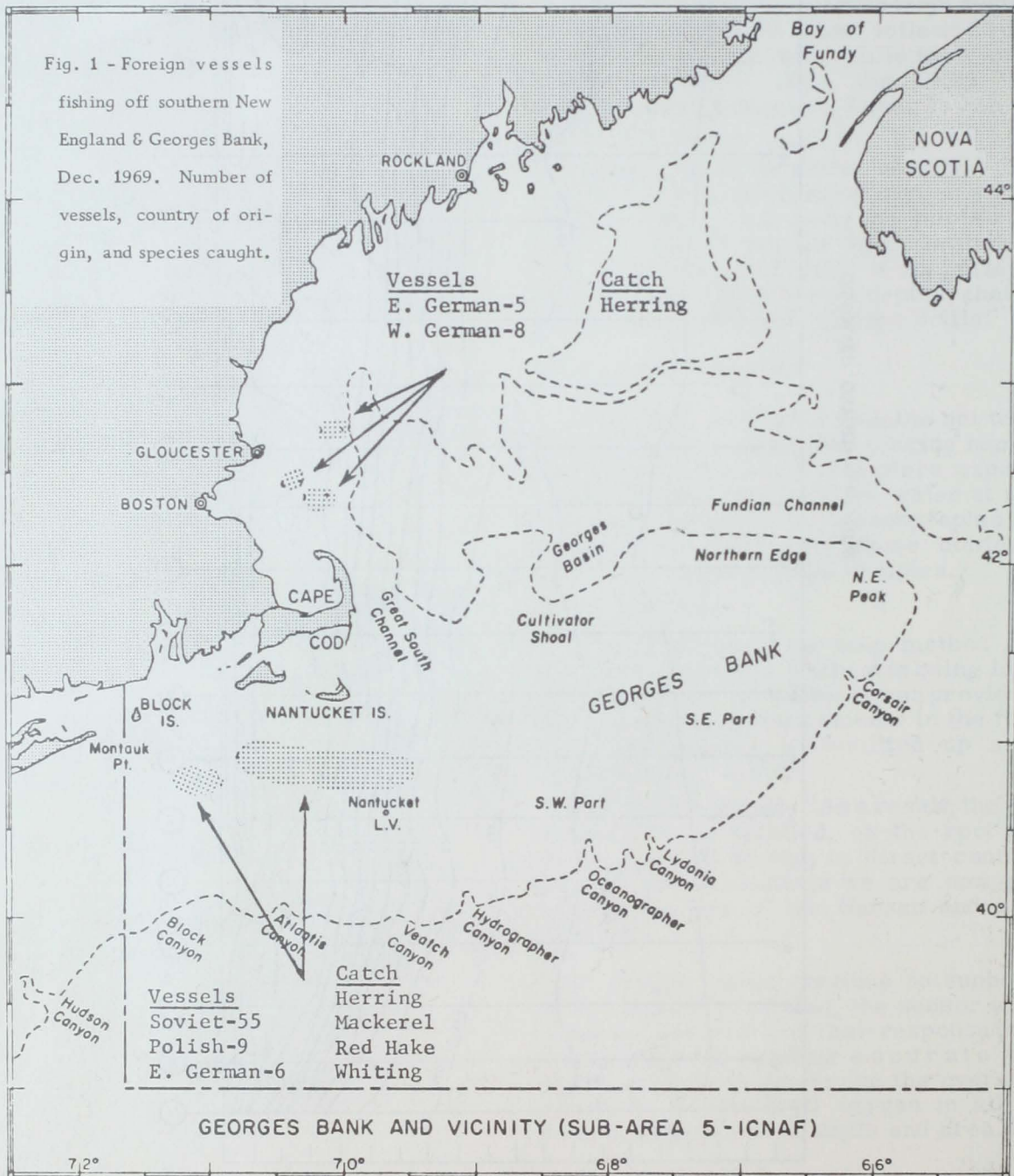
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Sablefish: 4 longliners--3 in eastern and 1 in central Gulf.

Herring: 10 stern trawlers, 2 reefers.

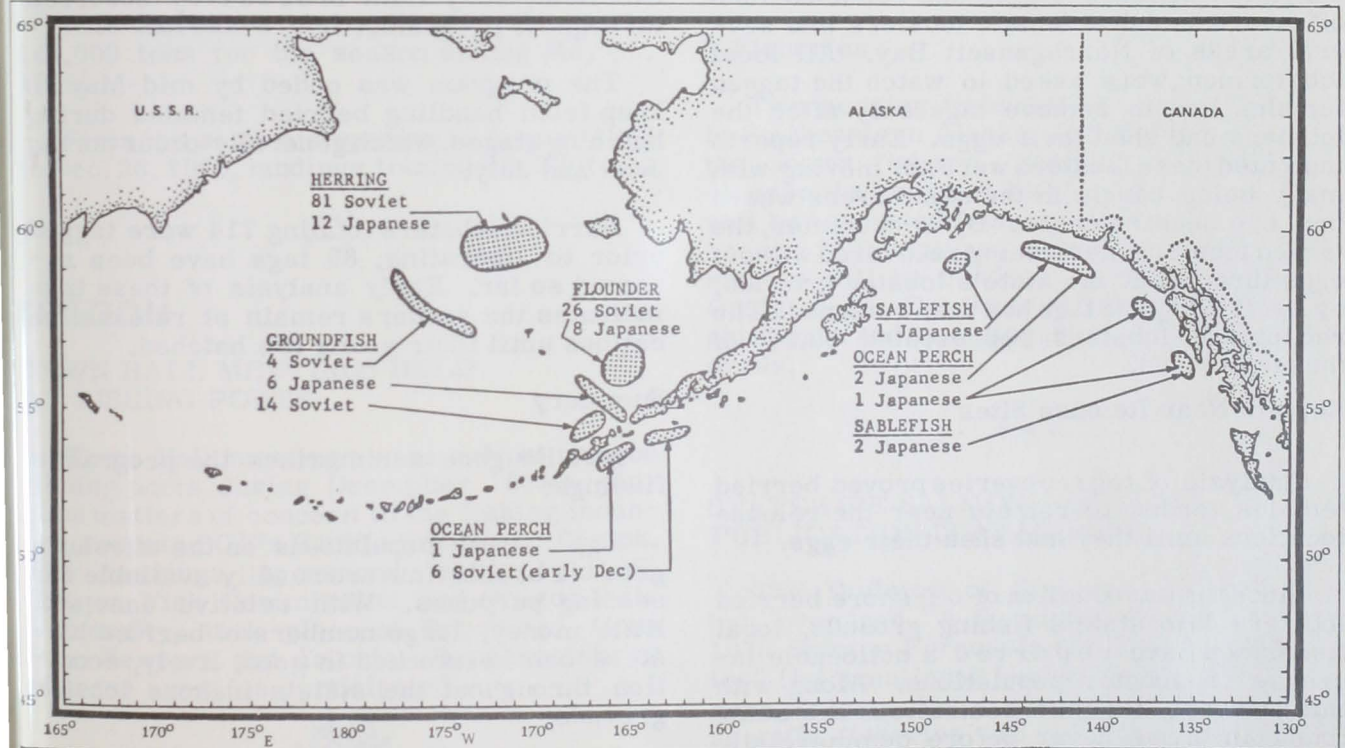


Fig. 2 - Foreign fisheries off Alaska, December 1969.



STATES

RHODE ISLAND

SEED-LOBSTER PROGRAM UNDERWAY

For more than a decade, with Rhode Island's approval, some local trawlers lobstering the offshore regions of the continental shelf have been bringing in egg-bearing female lobsters and releasing them in Rhode Island waters. For identification, the fishermen tie strands of nylon rope to the lobsters before releasing them. Local fishermen reported catching lobsters marked this way and finding the lobsters often had shed their eggs. This information has been collected by Stephen Fougere, Conservation Officer in Rhode Island's Department of Natural Resources.

Tag & Release Berried Females

During March-April 1965, with the cooperation of several off-shore trawlers, conservation officers tagged and released 1258 off-shore berried female lobsters into several areas of Narragansett Bay. All local lobstermen were asked to watch the tagged females and to remove tags only after the lobsters had shed their eggs. Early reports indicated these lobsters were not moving with many being caught in the same areas where they had been released. By midsummer, the tagged lobsters were being recovered without eggs throughout the state's lobster grounds; by April 1966, 495 tags had been returned. The recaptured lobsters represented 39.3% of those released.

Remain Near Release Sites

Analysis of tag recoveries proved berried females tended to remain near the release locations until they had shed their eggs.

Since the introduction of off-shore berried lobsters into state's fishing grounds, local fishermen have reported a noticeable increase in lobster populations. Along with this increase, heavy concentrations are being found in areas never before commercially productive.

Asked by local commercial lobstermen, the 1968 General Assembly appropriated \$10,000 to finance transferral of berried female lobsters from off-shore banks into Rhode Island lobster grounds.

Program In 1969

In January 1969, all Rhode Island trawler captains in the off-shore lobster fishery were contacted about the program. Fourteen asked to participate and agreed to comply with rules on transporting berried lobsters.

The Department of Natural Resources agreed to pay fishermen one dollar for each lobster, regardless of size, provided it was fully berried and delivered in good, lively, condition.

From Jan.-May 15, 1969, 4071 female berried lobsters were delivered from the off-shore canyons and released by conservation officers throughout the state's lobster grounds. These lobsters varied from one pound up to 10 pounds. The overall average weight of the seed lobsters was about 2½ pounds. Condition at time of release was excellent; very light mortality occurred throughout program.

The program was ended by mid-May to keep from handling berried females during hatching stages, which generally occur during June and July.

Berried lobsters totaling 714 were tagged prior to liberating; 89 tags have been returned so far. Early analysis of these tags indicates the seeders remain at release locations until their young are hatched.

Summary

Mr. Fougere summarizes the program's findings:

Egg lobster populations on the off-shore grounds at this time are readily available for seeding purposes. With relative ease and little money, large numbers of berried lobsters can be stocked in good, lively, condition throughout the state's inshore lobster grounds.

The displaced berried lobsters definitely remain near release locations until their young are liberated.

After releasing their young, favorable numbers of stocked lobsters are recovered and sold by commercial lobster fishermen.

This recovers a substantial part of the initial cost of moving the breeders inshore.

An annual program of purchasing and re-leasing 5,000 egg-bearing lobsters into the state's lobster grounds can be conducted without any major state expenditure.

Rhode Island plans to continue the program in 1970.



CALIFORNIA

ANCHOVY CATCH QUOTA RAISED

On Jan. 9, 1970, the California Fish and Game Commission approved a 65,000-ton increase in anchovy catch for use in producing fish meal and oil--32,500 each in inshore and offshore zones of Southern Permit area.

This increases total quota for reduction to 140,000 tons for the season ending May 15, 1970.

From the season's opening in August 1969 to Dec. 28, 1969, landings totaled 48,600 tons.



OREGON

TOWN HALL MEETINGS HELD AT FISHING PORTS

Town Hall meetings were held at Oregon fishing ports during December 1969 to discuss matters of concern to the fishing industry, reports BCF's Pacific Northwest Region. The meetings, sponsored jointly by BCF, Oregon Fish Commission, and Oregon State University, took place at Brookings, Coos Bay, Newport, and Astoria. Representatives of these agencies participated.



ALASKA

NO CLOSED SEASON FOR SCALLOP

Starting Jan. 1, 1970, there would be no closed season on scallops, the Alaska Department of Fish and Game stated Dec. 12, 1969. This action was justified because biologists,

monitoring commercial scallop fishing in the Kodiak management area, found a very low incidental catch of king and tanner crabs.

Scallop landings in Kodiak area reached a record 927,000 pounds during January through November 1969; this compared with 607,000 pounds for all of 1968.

* * *

NEW HERRING RESEARCH PROGRAM IN SOUTHEASTERN ALASKA

A new herring research program in Southeastern Alaska has been designed to answer basic management needs concerned with herring abundance. The program's long-range goals are to: 1) determine separate stocks and their boundaries; 2) enumerate, or index yearly, fluctuations of the stocks; 3) determine causes for yearly fluctuations in abundance; and 4) estimate optimum harvest of these stocks.

2 Fisheries

Two herring fisheries are now operating in Southeastern Alaska: the bait fishery and the spawn fishery. Because Ketchikan is close to the greatest fishing activity, studies will be conducted from there. It offers ready access to fishing and spawning areas. Most studies will be conducted in Ketchikan and Craig areas. But there will be some work on abundance and spawning in other Southeastern areas.

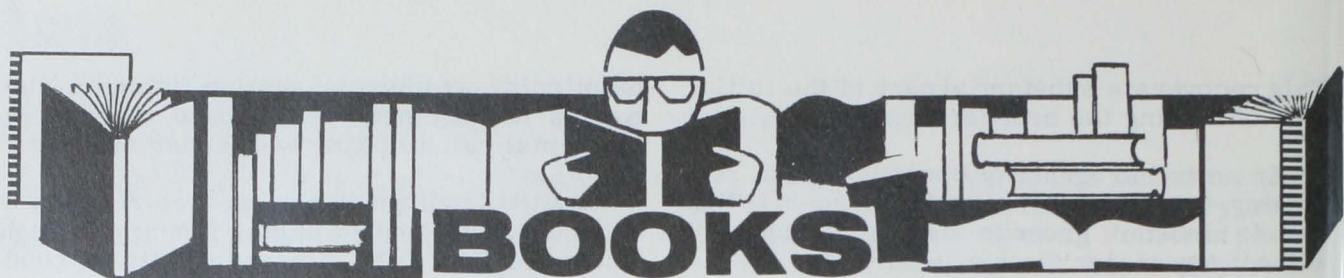
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STATEWIDE SALMON-FORECAST PUBLICATION IS AVAILABLE

The Division of Commercial Fisheries has prepared "A Summary of Preliminary 1970 Salmon Forecasts for Alaskan Fisheries" (Informational Leaflet #136). "Preliminary salmon forecasts are presented for specific fisheries and are also combined to provide projected commercial harvest levels for 1970 for the entire state."

Write for copy to: Mrs. June Grant, Alaska Department of Fish and Game, Subport Bldg., Juneau, Alaska 99801.





ATLANTIC COASTAL ZONE

"The Wildlife Wetlands and Shellfish Areas of the Atlantic Coastal Zone," by George P. Spinner, Folio 18, Serial Atlas of the Marine Environment, 4 pages of text and 12 color plates, \$12. "A Plan for the Marine Resources of the Atlantic Coastal Zone," \$4. Order from the American Geographical Society, Broadway at 156th Street, New York, N. Y. 10032.

The folio summarizes a 3-year study of the marine resources of the Atlantic coast. Data on finfish, shellfish, and wildlife were collected from all available sources. All land-use planning reports and recreation and water-resource development plans on all levels of government were examined to ascertain their probable effects on marine resources.

The 12 maps show the two most reliable indicators of value uncovered: the ownership, or proposed acquisition, of coastal salt marshes by government conservation agencies, and the location of important shellfish beds. Salt marshes believed to be of value for fish and wildlife conservation purposes, but still vulnerable to destruction, also are shown. The maps depict a proposed zoning of the coastal zone from the standpoint of conservation of marine resources.

The book, in conjunction with the folio, gives the opinions of Mr. Spinner and members of his marine resources committee on preserving the remaining wetlands of the Atlantic coastal zone. It includes descriptions of present and proposed preservation programs, examines the economic value, legal aspects, and competing uses of the coastal area, and outlines program goals. It is a plea both for prompt action and for meaningful and effective cooperation by all who share responsibility for the wetlands. This book should generate much discussion, a major purpose of its publication.

BIOLOGY

"Development of Fishes of the Chesapeake Bay Region: An Atlas of Egg, Larval, and Juvenile States: Part I," by Alice J. Mansueti and Jerry D. Hardy Jr., edited by Earl E. Deubler Jr., University of Maryland, Natural Resources Institute, 1967, 202 pp., illus.

Knowledge of early developmental stages of fishes is fundamental to proper understanding of many aspects of fishery biology and ichthyology. However, the eggs, larvae, and juveniles of many species are unknown and undescribed. This book is intended to be an illustrated work manual for biologists in identifying early developmental stages.

It summarizes information on early stages of 45 species from 14 families--sturgeon, gar, bowfin, tarpon, bonefish, herrings, anchovies, mud-minnow, pikes, lizardfishes, minnows, suckers, sea catfishes and catfishes. Although morphological descriptions of early developmental stages are emphasized, descriptions of adults and comments on distribution, ecology and spawning have been included.

EELS

"The Eel Fisheries of Eastern Canada," by J. G. Eales, Bulletin No. 166, Fisheries Research Board of Canada, 1969, 79 pp., illus., \$1.75. Order from Queen's Printer, Ottawa, Canada, Cat. No. Fs 94-166.

This bulletin gives the results of a survey of eel fishing in Canada made in summers of 1965 and 1966. The survey was made to describe various methods of capture and to assess the exploitation of eels. Mr. Eales includes a general description of the biology, distribution, and life history of the American eel, *Anguilla restrata*, fishing techniques, optimum times of fishing, and methods for holding, transporting, and processing.

COMMERCIAL SHRIMP FISHING

"Opportunities in the Shrimp Fishing Industry in the Southeastern United States," Sea Grant Information Bulletin No. 3, University of Miami, 1970, 28 pp. Available from Sea Grant Advisory Services, Rosenstiel School of Marine and Atmospheric Sciences, 10 Rickenbacker Causeway, Miami, Florida 33149.

This publication answers the principal questions asked by those interested in participating in the shrimp industry--the amount of initial investment required, the economic return that can be expected, the reasons for fishing regulations, and the location and availability of shrimp at various fishing grounds. Sections on innovations in gear and boat construction, and the list of sources for financing the purchase, reconstruction or reconditioning of a shrimp trawler will be of interest to present shrimp fishermen.

The Sea Grant Bulletins are a new series aimed at transmitting information from the scientific community to the public. Future bulletins will discuss the role of marshes in commercial and sport fish production; lobster and shrimp culture; sanitary problems and standards on fishing vessels; various aspects of ocean law; Sea Grant and the community; and other subjects dealing with the practical problems involved in the development of the oceans. The University would welcome suggestions for other types of information that the public would like to receive under this program.

FISH BEHAVIOR

"The Central Nervous System and Fish Behavior," edited by David Ingle, University of Chicago Press, 1968, 272 pp., illus.

This book is made up of 20 papers presented at a meeting intended to promote an interdisciplinary attack on brain function, and to give impetus to the study of teleost fishes. The 4 major sections are: Anatomy and Function of the Fish Visual System; Anatomy and Function of Fish Forebrain; Physiological Aspects of Fish Behavior; and Behavioral Processes in Fish.

MICROBIOLOGY

"Microbiology of Oceans and Estuaries," by E. J. Ferguson Wood, Elsevier Publishing Co., New York, 1967, 319 pp., illus. Excluding the seaweeds around the coasts, the major part of plant life in the water is microbial. Even in sea-grass beds, the microbial epiphytes represent a biomass of the same order as the accompanying sea-grasses and larger seaweeds. Interest in marine microbiology has grown so great in recent years that all other branches of oceanography and marine biology look increasingly to the microbiologist for help and information.

This book is intended primarily to introduce students to the discipline of the microbiology of oceans and estuaries. It also will aid the researcher desiring a resumé of this microbial world, and brief him in the modern trends of thought about the activities of microorganisms in physical and chemical phenomena in the seas.

PLANKTON

"Marine Plankton: A Practical Guide," by G. E. and R. C. Newell, Hutchinson Educational Ltd., Great Portland St., London, W1, England, revised 1967, 221 pp., illus.

This manual attempts to give zoology students a concise account of the kind of practical study of plankton they might make at sea, or in the lab. Although mainly concerned with species found around the British Isles and adjacent seas, it should be valuable to students everywhere for its examination of methods of plankton collection, sorting, and quantitative estimation.

POND FISH CULTURE

"Proceedings of the World Symposium on Warm-Water Pond Fish Culture," FAO Fisheries Report No. 44, Vol. 4, edited by T.V.R. Pillay, Rome, January 1968, 492 pp.

This is the fourth volume of the symposium proceedings. It contains review, experience, and working papers dealing with breeding and selection, biological and other methods of increasing production, and standardization of research techniques.

PROCESSING

"Use of Sodium Nitrite in Smoked Great Lakes Chub," by K. G. Weckel and Susan Chien. Research Report No. 51, 4 pp., Sept. 1969, University of Wisconsin.

In the past few years, several outbreaks of botulism have resulted from consumption of improperly handled or processed smoked Great Lakes chub. Since sodium nitrite (NaNO₂) can inhibit the growth of microorganisms, the use of 100 to 200 p.p.m. in smoked chub has been proposed. This report describes the procedures and results of studies made to determine the rates of uptake and retention of NaNO₂ in smoked chub.

RED SALMON

"Further Studies of Alaska Sockeye Salmon," edited by Robert L. Burgner, Publications in Fisheries, New Series, Vol. III, University of Washington, Seattle, 1968, 267 pp., illus., \$3.60.

The lake systems of southwestern Alaska produce nearly half the North American pack of sockeye, or red, salmon (*Oncorhynchus nerka*). Studies of this valuable resource by the University of Washington were initiated in 1946 at the request of the Bristol Bay salmon packers.

The first volume of the series, "Studies of Alaska Red Salmon," reported on research conducted on sockeye runs of Bristol Bay and Kodiak Island. Volume II dealt with salmon gear limitation in northern Washington waters and management of the high-seas fisheries of the northeastern Pacific. This volume, the third, contains 6 articles on sockeye salmon research--5 on Bristol Bay and one on the Chignik lake system. They include a comparison of salmon fry food, distribution and growth of sockeye fry, identification of adult sockeye groups, age determination by otolith, egg development, and surveys of spawning populations. All contribute toward an understanding of the complex factors controlling sockeye population levels in the lake systems, and of the number of spawning salmon needed to produce the highest sustained yield.

WATER POLLUTION

"Trace Metals in Waters of the United States: A Five Year Summary of Trace Metals in Rivers and Lakes of the United States (Oct. 1, 1962-Sept. 30, 1967)," by John F. Kopp and Robert C. Kroner, Department of the Interior, Federal Water Pollution Control Administration, 1969. Copies available from Analytical Quality Control Laboratory, Division of Water Quality Research, 1014 Broadway, Cincinnati, Ohio 45202.

Water for fish propagation must be substantially free from domestic and industrial pollution, and must be able to sustain the flora on which fish feed.

In determining water-quality requirements for aquatic life, it is essential to recognize that there are not only acute and chronic toxic levels, but also tolerable, favorable, and essential levels of dissolved materials. Different species, and different developmental stages of the same or different species, may differ widely in their sensitivity or tolerance to different materials. Also, substances in suspension, as well as in solution, affect aquatic organisms both directly and indirectly.

Adequate water-quality surveillance is essential to identify compliance with water-quality standards--in order to document violations for corrective actions, and to identify new pollution trends, sources, and types before problems develop.

This report provides detailed summaries of data on 19 trace metals detected at over 100 water-quality surveillance stations in the 16 major river basins of the U.S. Numerous tables include percent frequency of detection, observed mean values, highest recorded concentrations, number of violations of quality criteria, and comparisons of suspended and dissolved trace metals in surface water.

--Barbara Lundy

