Preparing to "trip the bag" with a catch of brown shrimp during a nighttime exploratory drag by BCF's research vessel "Oregon" off F
ida's east coast.
(Photo: J. B. Rive

U. S. SHRIMP LANDINGS MAY SET RECORD

Available data, principally for the first 9 months of 1967, indicate that the U. S. shrimp catch will set a record this year: at least 285 million pounds, heads-on. This will exceed 1954's record landings of 268 million pounds.

Although the monthly catch can, and does, fluctuate widely from season to season, the 1967 estimate assumes that landings at ports of the Gulf and South Atlantic States in October through December will approximate the average volume for these 3 months during the past 10 years--and that landings in other states will be slightly higher than in 1966.

The catch in southern states during January-September totaled 187 million pounds, up 47 million from the same period in 1966. Available information indicates the combined catch from the Pacific and North Atlantic Oceans, landed principally in Alaska and Maine, is above comparable periods in 1966.

Abundant in N. Gulf of Mexico

The upward trend in the catch this year resulted from an abundant supply of shrimp in the northern Gulf of Mexico--in waters off Texas and Louisiana. Landings were heavy in the summer months, height of the brown shrimp season. Compared with 1966, there were significant increases in the catch each month beginning with May and ending with August. September landings also increased. But, in mid-September, Hurricane Beulah paralyzed fishing operations and did extensive damage to many vessels (some were destroyed) and shore establishments. The hurricane reduced the fleet for the remainder of the year. Major damage centered in the Pt. Isabel-Brownsville, Texas, area, an important shrimp production center, but a wide area was affected.

Small Size in May-June

Much of the Gulf coast catch was small in size, particularly during May and June, and canning plants and, to a lesser extent, sun-drying shrimp platforms utilized appreciable quantities. However, the bulk of the catch so far this year was destined for the fresh and frozen trade, primarily as frozen headless shrimp, frozen raw meat, frozen breaded, and frozen cooked meat.

During the period of heavy landings, canning plants operated at full capacity. In January-September, Gulf canning plants received 38 million pounds for processing; nearly 70 percent of this quantity was canned in a $1\frac{1}{2}$-month period ending with June. Most of the remainder was packed and processed during July and August. Plants used about 24 million pounds for canning in January-September 1966 and 30 million in January-September 1965. (BCF Branch of Fishery Statistics.)

COMMERCIAL FISHING HAS WORLD ROLE, SAYS INTERIOR UNDER SECRETARY BLACK

Under Secretary of the Interior David S. Black spoke at the opening dinner of the Commercial Fish Exposition at Suffolk Downs, Boston, Mass., on October 10. Nearly all of his speech follows:

" . . . This is the first time such a group has gathered in the United States, and it is another fitting first for New England. It was here in New England that the first fisheries in this country sprang up. These waters off our 'stern and rockbound coast' are the cradle of the U. S. fishing industry. It was here, too, that freezing and filleting of fish were first tried. The first steam trawler operated out of New England. The oldest fish auction in this country is Boston's own. The first convenience processing and packaging of fish was New England-based, and New England has industriously maintained its leadership in this very important field. In 1966, the first subsidy vessel--the 88-foot 'Victor'--was delivered to a dock in New Bedford . . . .

"Before we look at the commercial fishing picture, it might be well to consider briefly the framework in which it stands. That setting, if we look at it honestly, can have only one name--worldwide hunger. The music of the spheres is being drowned out by the growls of empty bellies all over the earth, and there is a growing appreciation of the need to mobilize against the menace of mass starvation.

"With the land in many underfed countries already producing at levels of near-maximum yield, it is natural that we turn our attention to the sea. As population pressures mount in these countries, they are being backed up against the oceans. We can count ourselves uncommonly blessed that the oceans are so full of food."

World Interest in Food From Sea

"I am happy to report that there is a healthy range to the worldwide interest in food from the sea. The resurgence of U. S. interest in the ocean and its riches comes from the top echelons of government, and from education as well as from industry. Vice President Humphrey is chairman of the National Council on Marine Resources and Engineering Development and in this capacity has visited several of our Bureau of Commercial Fisheries scientific installations. Secretary Udall will be making presentation before the National Council next week of a project to make fish protein concentrate a really significant weapon in the war on world famine.

David S. Black

"Universities everywhere are expanding the teaching of oceanography and the various scientific disciplines it includes, and eager young men and women are responding to this modern version of the age-old challenge of the seas.

"And industry is getting the signals. Manufacturers, large and small, are coming up with more and more effective and sophisticated gear for oceanographic work."

The Seas' Food Potential

"The prospect of the seas has always aroused man's sense of excitement and adventure. Something in the pulsing state of restless change and the limitless nature of ocean has set a mysterious seal of promise on the sea. Today we know a little, and are determined to know more, about what that promise holds and industry is helping us tool up for research. The results hold vast promise of being well worth the effort. Experts vary in their assessments of the food potential of the seas, but we do know that the present world marine catch is approximately 52 million metric tons per year. At the Law of the Sea Institute meetings at the University of Rhode Island in June, experts presented exciting

estimates of potentials ranging from 200 million to 4 billion metric tons, or nearly 100 times the present world catch.

"The lowest of these estimates--or 200 million metric tons--would provide about 20 grams of animal protein per day for 5 billion people. Of the 60 grams of total protein required daily per individual, 10 grams is the minimum that should be animal protein."

"Wild Catch" and Fish Farming

"Obviously, the answer to world hunger lies at least partially in the world's oceans. And when we talk of potential today, we are still talking in terms of 'wild catch.' The richness and ease of harvest offered by the oceans and estuaries today put any consideration of future fish farming into somewhat the same category as desalination. We have the know-how to produce fresh, potable water in quantities and at a cost that makes it a real bargain already in some parts of the world and a reliable cushion for future water-hard times. In much the same way we may view the prospect of fish farming. There is no doubt about the feasibility of producing shellfish and some finfish by marine farming and freshwater pond culture--indeed, some choice species in demand on the high-priced market, such as oysters and catfish, are already being cultivated in just this way. But until we have taken every technological and industrial advantage of the wild water harvest, such methods will not claim top attention or energy in the over-all commercial fishery picture.

"Instead, we look today for new ways of increasing the yield of our commercial fishing fleets. Other countries have been faster than the United States in taking advantage of the vast food potential of the seas. In a way, we Americans are paying today for the victory we achieved in World War II. We came out of that conflict with a comparatively intact fleet of ships. Other nations had to start from scratch and rebuild, and as a result, their floating stock is newer and far superior to ours today.

"But aside from this, the performance of U. S. commercial fisheries still lags far behind the achievement potential that research and development have opened up. In this respect, our ocean 'farmers' could take a page from the book of their landed counterparts. Agricultural technology has been adopted with enthusiasm and vigor by the farming industry, and the results speak for themselves in the statistical language of food production."

Small Fishes Can Make Large Contribution

"There are many ways of approaching the food potential of the oceans, but size is a handy separator, and Dr. W. M. Chapman's breakdown of fish into three size categories is helpful in pointing up some of the avenues of development that beckon today.

"While world hunger is a universal chorus, the tune is not the same everywhere. Rising incomes in some parts of the world are reflected in a demand for higher-priced products and these are generally the products that fall into the upper size category--over 10 inches. The high-income nations demand most of their fish (with the exception of shellfish) in this category, and are willing and able to pay for particular flavor, texture and appearance.

"In the middle size category--5 to 10 inches long--fall the herring-like fishes, and these form the major part of the world catch. The greatest volume of protein in the ocean, however, is in animals less than 5 inches long, and it is in these last two groups that the hope for substantial help for the underfed two-thirds of the world lies.

"The possibilities--like the potential--are unlimited.

"With millions of tons of ocean protein available, and with the technology to produce it at hand, the most obvious avenue open today is development of new ways to get this protein into acceptable forms of food for human consumption."

FPC

"Fish protein concentrate is the most exciting and promising of the new ideas in this field. Eventually, if educational methods are successful in introducing it into the diets of the various cultures most in need of it, this method could utilize as raw material the marine life in any of the size categories in the sea. Its tasteless, odorless, neutral nature lends itself to the 'additive' role, so that it can be introduced inoffensively into the native dishes of almost any prevailing culture without doing violence either to custom or to taste.

"Another method already widely used is to turn fish into some other form of protein before we turn it into human beings. Peru, with its 8 million ton annual catch of ancho-

vettas, is the world's leading example of this particular method. The anchovettas are easily transformed into fish meal, which in turn is fed to poultry. Just as people who prefer their corn in the form of bacon or ham can indulge their taste preferences on cornfed hog products, so those who prefer poultry to anchovies can get their fish protein by chewing on a chicken leg fattened on fish meal."

Fishing's World Role

"Essentially, what I am asking for here tonight is that you who make your living in and around and off the seas, extend your vision in the same manner that conservationists everywhere have been extending theirs--to accommodate a world view. We human beings are asking so much of our world and of each other today. The questions are not arising from idle curiosity but from urgent need. The earth and air and water cry out for care and consideration, and we human beings, although we have needs of our own, have also a role as custodians. We are the movers and the shakers of the natural world and of the world of human affairs. The overlapping of these two worlds is making it increasingly necessary that we look at everything we do in the light of everything that is being or needs to be done.

"Your greatest role, as I see it, is not just making a living from the sea. It is also providing living for fellow human beings. Once you widen your view to take in this second consideration, your goal becomes higher than a mere plus sign on the profit side of the ledger. And the satisfactions of success come less from an additional eked-out penny than from a sense of performing a necessary and worthwhile role in the total world scene.

"I am building up to a sincere pat on the back to the manufacturers of commercial fishing hardware--the ships, the gear, the increasingly various ways of processing and packaging and distributing the bounty of the sea. And I want to make it clear that my congratulations are not merely on the higher profits that these things mean for everyone in your industry. These higher profits are very real and should act as a spur to greater efforts at modernization, but self-interest in your case involves human profits, too. Research and technology have made it possible for you to profit by enlightened self-interest. You can afford to think of the world's hungry people."

North America Lags

"I am speaking now particularly to the North American representatives of the fishing industry. We in this hemisphere have not carried out a vigorous policy toward increasing the use of high seas fishery resources. Where other nations have intensified their efforts, our own fisheries have remained largely static. With the hunger of the world mounting, the methods of processing ocean products multiplying, the means of making the catch widening and improving, we can no longer justify the cautious creaky old ways that worked well enough once upon a time.

"Ocean specialists have done a yeoman service in charting new and profitable paths for commercial fishermen. Their knowledge has too often been unused--the methods and gear ignored. And as a result, it is not uncommon to find our U. S. industry being fished circles around, in waters it once dominated--indeed, even thought of as 'our own.'

"In great measure, this is failure by default. But the race is not over. The competition is by no means closed. On the contrary, the field is opening wider every day, and the prizes--in both economic and human terms--grow daily in importance.

"President Johnson, last April at Punta del Esta, said: We are also prepared to set up in Latin America a demonstration center in the field of fish protein concentrates. We believe that this essential ingredient of a balanced diet can be provided at a much lower cost than has ever been known in our history.

"A team of men from Interior's Bureau of Commercial Fisheries has just returned from Latin America, and is preparing recommendations as to where such a plan could be located at the lowest cost and the highest benefit to the people of Latin America. The President feels that the first such plant outside the United States should be built where there is the greatest likelihood of rapid success in utilizing the ocean potential in feeding the hungry."

Industry on the Move

"What I see and sense here in Boston tonight is an industry on the move. With seven-tenths of the earth's surface given to oceans with the tremendous surge forward in methodology and tooling, and with a heightened awareness of hunger and concern for the hungry, the

eyes of the world are on commercial fisheries. And in this case, the eyes are NOT bigger than the stomach. You will find an eager taker for every edible gram of protein you place on the world's table.

"Yours is no longer just a business. It is a world role, and an increasingly vital one. Government and education are deeply interested in helping you fill it successfully.

"The help given your industry by government and education centers is not proferred entirely in your economic interests. It stems from the larger world stake in commercial fisheries. By taking full advantage of all the knowledge and technology available, you serve not just your own interests, but those of an anxious, needy world.

"I congratulate you on your industrial initiative, as evidenced by the enthusiastic participation in this Exposition. And I urge you, as individuals, to take full advantage of the information and resource pool available to you in stepping up your production. In doing so, you are acting as worthy stewards of a huge and priceless resource."

DO FISH HEAR?

Most fish are deaf to general noise at frequencies higher than 1,500 to 2,000 cycles per second (well within human auditory range). Although minnow, sucker, and catfish can detect noise in the 800- to 1,500-c.p.s. range, most other fish cannot. Sounds in the 300- to 800-c.p.s. range are audible to most marine fishes. Noise in the low-frequency range, below 300 c.p.s., is detected through the lateral line system or skin rather than the ear structure.

Noises which most fish probably cannot hear include those made by air bubbles, water currents, fish feeding sounds, and ultrasonic sounds produced by porpoises and whales for purposes of echo-ranging. Noises which they evidently can detect are those produced by waves, the hydrodynamic shock waves produced by fish movements, and the drumming sounds produced by the swim bladder of other fish.

These are the conclusions of a detailed study and review of information on the hearing ability of fishes presented in "Bulletin", volume 126, article 2, of the American Museum of Natural History, New York City. In their study, American Museum biologist William N. Tavolga and Brandeis University (Waltham, Massachusetts) psychologist Jerome Wodinsky employed sophisticated acoustical instruments and training techniques on nine different species of marine fish. The latter included squirrelfish, blue-striped grunt, schoolmaster, red hind, and slender sea robin.

UNITED STATES

Marketing of Edible Fishery Products in 1967

Supplies of edible fishery products in 1967 are expected to total 2.66 billion pounds edible weight, down fractionally from 1966. Landings by U. S. fishermen and imports are down. Per-capita consumption in the U. S., however, still is expected to hold at last year's 10.6 pounds due to the larger-than-usual depletion of year-beginning stocks.

Consumer prices during the fourth quarter of 1967 likely will average a little higher than last year because the reduced supplies of some popular products continue. Supplies of canned salmon, frozen cod fillets, lobster tails, and scallops are down sharply from a year ago. Also, frozen stocks of halibut, swordfish, whiting, and crabs (including crab meat), are below last year's. Frozen holdings of shrimp are ample compared with a year ago. Among other canned products, there are good packs of tuna and shrimp, and a fair pack of Maine sardines.

At the end of 1967, stocks of fishery products are expected to be smaller than at the end of 1966. A reduction of about 3 percent is expected in frozen stocks and of about 22 percent in canned inventories. (BCF Branch of Current Economic Analysis.)

Menhaden Catch Drops in First 9 Months

The catch of menhaden in the U. S. from January through September 1967 was 931.6 million pounds. In the same period of 1966, it had been 1,015.8 million pounds.

States	Jan.-Sept.		Sept.	
	1967	1966	1967	1966
	(Millions of Pounds)			
Middle Atlantic	33.4	17.0	8.8	4.7
Chesapeake	129.6	150.2	16.1	33.3
South Atlantic	75.7	56.7	7.6	11.9
Gulf Coast	692.9	791.9	71.6	113.5
Total	931.6	1,015.8	104.1	163.4

U. S. Fish Meal, Oil, and Solubles Production in September

During September, about 13 million pounds of marine animal oils and 17,164 tons of fish meal were produced in the U. S. Compared with September 1966, this was a decrease of about 7.5 million pounds of marine animal oils and 6,009 tons of fish meal and scrap. Fish solubles production was 6,642 tons--down 3,144 tons from September 1966.

U. S. Production of Fish Meal, Oil, and Solubles, September 1967[1] with Comparisons

Product	Sept.		Jan.-Sept.		Total
	1/ 1967	1966	1/ 1967	1966	1966
	(Short Tons)				
Fish Meal and Scrap:					
Alewives	2/	-	4,508	3,746	3,746
Groundfish	835	360	6,361	5,189	6,311
Herring	1,286	2,067	7,649	10,172	11,850
Menhaden[3]	11,085	17,233	97,229	107,289	134,954
Tuna and mackerel[4]	2,357	2,010	26,773	22,460	29,758
Unclassified	1,601	1,503	8,796	20,608	24,728
Total	17,164	23,173	151,316	169,464	211,347
Shellfish meal and scrap	5/	1,634	5/	9,259	11,773
Grand total meal and scrap	5/	24,807	5/	178,723	223,120
Fish Solubles:					
Menhaden	4,427	8,461	42,253	51,758	60,769
Unclassified	2,215	1,325	17,795	18,394	22,672
Total	6,642	9,786	60,048	70,152	83,441
	(1,000 Pounds)				
Oil, Body:					
Alewives	2/	2/	1,827	2/	2/
Groundfish	105	9	1,143	457	536
Herring	659	1,248	4,142	6,883	7,862
Menhaden[3]	10,058	18,393	76,801	117,542	144,198
Tuna and mackerel[4]	603	276	4,511	3,315	4,884
Unclassified (including whale)	1,559	532	4,284	5,001	6,565
Total oil	12,984	20,458	92,708	133,198	164,045

1/Preliminary data.
2/Included with unclassified.
3/Includes small quantities of other species.
4/Includes anchovies.
5/Not available on current monthly basis.
Source: U. S. Department of the Interior, BCF.

Columbia River Coho Salmon Run Sets Record

The 1967 Columbia River coho salmon run appears to have broken all records. The commercial troll fishery off the coast of Oregon has harvested an estimated 7.3 million pounds,

an all-time record. The sport catch of coho at the mouth of the Columbia River has exceeded 250,000 fish, a record. The commercial gill net catch in the Columbia River was approximately 280,000 fish. This was down somewhat from last year but still a very high harvest.

Returns of adult coho to hatcheries have been outstanding. They are more than sufficient to fill all egg-taking needs. In addition, the run past Bonneville Dam, as of October 12, totaled 95,031 fish. It is the highest ever recorded at Bonneville for that species.

More Aluminum Used in Vessels

Shipments of aluminum for commercial and naval marine uses increased 90 percent in 1966, according to The Aluminum Association. An estimated 55 million pounds were shipped for use in hulls, engines and components for fishing vessels, barges, cargo ships, passenger liners, naval crew and patrol boats, gun boats, hydrofoils, and other craft. Pleasure boats are not included.

A major project is a 226-foot, all-aluminum, trailer ship, the world's largest ocean-going aluminum-hulled vessel, using nearly 800,000 pounds. ("Under Sea Technology," Sept.)

University of Michigan Studies Electronic Fishing

Michigan University reports that it has demonstrated the feasibility of effective, relatively low cost electronic fishing by which fish are attracted to electrodes placed in the water. The system may be useful in the Great Lakes to control alewives. The electronic fishing study is being done under a research contract from Interior Department's BCF.

The university used a small pond and gold fish to demonstrate the system at the National Electronics Conference at Chicago in October. The system will make use of electrode screens operated from boats to sweep or herd fish toward the mouth of a net or the intake of a fish pump.

Lower Power Supply May Be Effective

A university research engineer said the system, which uses power supplies of 5 to 10 kilowatts, may prove as effective in fresh water as previous methods requiring 50-kw. supplies. He said a composite pulse with a 10-percent duty cycle showed, in the laboratory, that it was just as effective as a solid pulse. The low average power of the composite pulse used is expected to produce less fatigue in fish, he said, while allowing longer range, lower operating costs, and lighter equipment.

Because salt water's high conductivity requires 100 times the power needed for fresh water, the composite pulse is even more important in holding average power to reasonable levels. The engineer pointed out: "Previous electrode arrays often created a strong field which stunned the fish before they got where you wanted them to go."

Such equipment, he continued, had an effective range of only 10 to 20 feet, while the equipment under study is effective up to several hundred feet. "Authorities estimate that two or three times as many fish escape as are caught by conventional nets. Proper electronic fishing can increase the catch by 100 to 200 percent. Further economic savings can be made by combining electronic fishing with the use of fish pumps for emptying trap nets."

Electronic Fishing Is Selective

An advantage of electronic fishing is that it can attract selectively fish of a particular size or type, while leaving out those not desired. Thus, third-year alewives could be caught before they die on the beaches, and a supply of smaller fish could be left to maintain the population and provide food for the coho salmon.

The University of Michigan study should end this year with field studies in the Great Lakes and Tennessee Valley Authority lakes. The project also will involve building prototype commercial power units and making tests in towing tanks and model basins to choose the best array of electrodes. After final tests, the university says, prototype designs should be available to commercial manufacturers by spring 1968.

OCEANOGRAPHY

Sub "Alvin" Loses--Then Finds--Its Famous Arm

The submarine Alvin's mechanical arm--which last year lifted the parachute shrouding the H-bomb that had been dropped accidentally off the Spanish coast--fell into the Atlantic in late September this year 100 miles off Woods Hole, Mass., on the continental slope.

The research submarine of the Woods Hole Oceanographic Institution had been engaged in studies of the sea bottom. When the weather became extremely heavy, its mother ship began to recover it. While this was being done, the famous arm--500 pounds and extending to 8 feet--fell to the ocean floor in 4,400 feet of water.

When the arm fell, the sub's catamaran tender and the research vessel "Gosnold" fixed their positions with Loran A. This enabled the tender to return later to take part in the search.

New Recovery Techniques Used

A transponder was placed on the bottom, which provided the sub's pilots with a range and bearing from a fixed point to conduct the search operations. Then beacons or pingers were placed in several locations as reference points for the search pattern. The sonar was used to map the terrain. Once the sonar's effectiveness was learned, individual objects were picked up and a grid pattern laid out for search.

The search area was 2 miles long and one mile wide--"gentle rolling hills with a soft layer of sediment." Accurate and continuous plots of the submarine's location were obtained with the aid of the transponder and

Fig. 1 - The sea on day Alvin lost its arm. (Photos: Woods Hole Oceanographic Institute.)

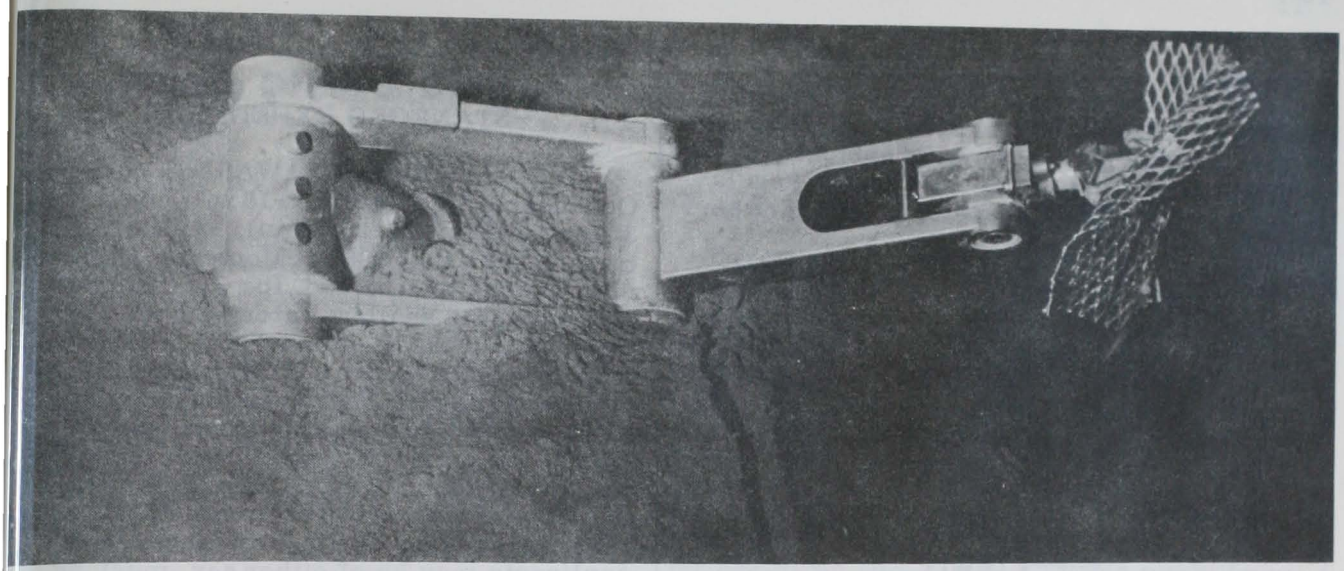


Fig. 2 - The fallen arm at 4,400 feet.

beacons. After the outstanding features of the ocean floor were obtained, the sonar was used to find metal objects for visual identification. Consistent sonar contacts were obtained with objects such as gallon cans and frequent contacts were made with objects the size of half-gallon cans.

On the third dive, the mechanical arm was located and recovered. The recovery was made by inserting a hook, fastened to the sub's bow, through the mechanical arm. The trim and ballast within the sub were then changed to permit it to surface normally with the arm on the hook. When the sub surfaced, swimmers attached lines to the arm and it was lifted aboard the catamaran.

Then, with its arm rejoined, the Alvin again changed the ballast and trim and dove to the bottom to complete its scientific work.

U. S. Tests Sea Bottom's Ability to Support Structures

The U. S. is testing the sea bottom with new instruments designed to determine the sea floor's ability to support structures. The tests are important in a long-range program that may lead to construction of habitations and to engineering activities.

The tests were conducted at 885 feet in the Wilkinson Basin, about 60 miles east of Boston in the Gulf of Maine, by the Environmental Science Services Administration (ESSA) of the U. S. Department of Commerce, and the University of Illinois Department of Geology. ESSA's hydrographic survey ship "Davidson" was used.

Instruments were developed capable of measuring the mass physical properties of ocean sediments directly in the sea floor down to 10 feet below sea bottom.

Inspect Hawaiian Navigational Facilities

The U. S. Coast and Geodetic Survey's (CGS's) new ship "McArthur" is making a complete inspection of navigational facilities and conditions in the Hawaiian Islands. It is the first check of this scope in almost 20 years. Oahu, Hawaii, and Kauai have been covered and the remainder--Maui, Kahoolawe, Lanai, Molokai, and Niihau--is scheduled to be finished by year end. The inspectors consult local Federal agencies, port authorities, pilots, and other marine interests.

The findings for the Hawaiian Islands will be included in a new edition of "United States Coast Pilot 7," with similar information being gathered in California, Oregon, and Washington.

The Coast Pilots are a series of nautical books issued by CGS. The books supply

information important to navigators of U. S. coastal and intracoastal waters. "Generally, the books furnish in narrative form information which can not be shown graphically on marine charts, such as navigation regulations, weather, ice, freshets, routes, and port facilities."

A new edition of each Coast Pilot is published at intervals of 4 to 10 years. The new edition of United States Coast Pilot 7 is scheduled for September 1968. The books contain information considered vital for safe navigation. They are consulted regularly by skippers of naval and commercial craft and small-boat operators.

USC Studies California Gulf's Deep Basins

The research vessel "Velero IV" of the University of Southern California (USC) is conducting the first examination since 1889 of benthic (sea bottom) animals in the deep basins of the Gulf of California. The operation will continue into December.

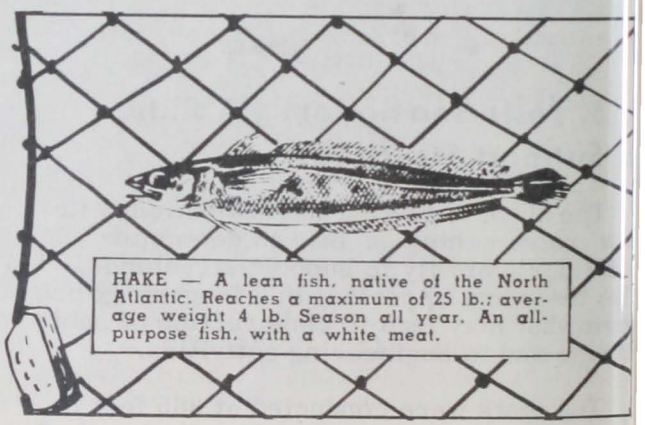
Small samplings were made in the basins 77 years ago by the "Albatross." USC says that nothing significant has been published on the basins' bottom animals since 1919, when the American biologist Chamberlin, who had been aboard the Albatross, published his findings.

USC scientists will use both midwater trawling equipment and a 900-pound "grab" (resembles an excavating shovel) to study 6 basins ranging from 800 to 2,200 fathoms. The deepest, the Tres Marias Basin, is near the upper end of the Central American trench and just inside the Gulf. The others lie north of it; the 800-fathom Sal si Puedes Basin is the northernmost.

The scientists take samplings from depths where there is no light and where temperatures average about two degrees centigrade. They will probe distribution of fish, crustaceans, and polychaeta worms.

STANFORD EXPEDITION

"OCEANOGRAPHIC AWARDS: Stanford Oceanographic Expedition 18 will commence 3 April 1968 from Guayaquil, Ecuador, and terminate 16 June 1968 at Monterey, California. During this period, the RV TE VEGA will study the shallow water benthos along the coast of the Eastern Tropical Pacific from northern Peru to southern Mexico. Intensive ecological and physiological studies will be conducted in selected areas and related to the geographic distribution of particular marine organisms. Applications for this Expedition will be accepted until 1 Jan. 1968, and advance inquires are encouraged. Applicants may be of either sex, must be research-oriented graduate students or 'young professionals' in biology, should be in good academic standing, and in excellent physical and emotional health. The Expedition represents an extensive 15-unit graduate-level course in Biological Oceanography given at sea by a faculty of three (Drs. Donald Abbott, Stanford University; William Evans, University of Alberta; Richard Bovbjerg, University of Iowa). Ten NSF Awards covering subsistence, full tuition, and transportation to and from the vessel are available. Contact Malvern Gilmartin, Hopkins Marine Station, Pacific Grove, Calif. 93950, for further information."



HAKE — A lean fish, native of the North Atlantic. Reaches a maximum of 25 lb.; average weight 4 lb. Season all year. An all-purpose fish, with a white meat.

reign Fishing Off U. S. Coasts September

NORTHWEST ATLANTIC

Soviet: Weekly sightings show that between and 50 Soviet vessels fished on Georges nk throughout September; a year earlier, ut 65.

During the month, 63 individual Soviet ves- were identified: 16 factory stern trawl- , 12 medium refrigerated side trawlers, medium side trawlers, 2 refrigerated fish nsports, 1 factoryship, 1 tanker, and one air tug.

Although scattered, the fleet generally was ncentrated in 2 main groups: (1) Between and 15 vessels (stern trawlers and side wlers) fished along the 50-fathom edge of ltivator Shoals (80 to 90 miles east of Cape d). Moderate catches of fish on deck ap- ared to be primarily whiting and herring. me haddock catches were noted, particularly side trawlers. (2) Between 30 and 35 ves- ls (mostly side trawlers and several sup- rt vessels) were dispersed along northern pes and inner shoals of Georges Bank rking in 25 to 35 fathoms. Large catches herring filled the open storage areas on cks. This area was fished extensively dur- g September and October 1966 and accounted r substantial increase in their herring catch m ICNAF sub-area 5 (117,346 metric tons) er their limited 1965 catch (36,300 tons).

Poland: Ten freezer stern trawlers, 26 ge side trawlers, and two supply vessels re observed fishing among Soviet fleets on orges Bank in September. Tremendous ches of herring were observed on deck and rawl nets. Several trawls hauled more n an estimated 50,000 pounds of fish per l. Open storage areas of large side trawl- were so full of fish that crewmen tempo- ily had trouble handling them. Only 3 to 5 rn trawlers fished herring on Georges nk during September and October 1966.

East Germany: 11 freezer stern trawlers re sighted on Georges Bank among Soviet d Polish vessels with huge catches of her- ng. They fished intermittently during late gust, apparently searching for herring. o stern trawlers operated there during ptember and October 1966.

West Germany: 4 freezer stern trawlers were sighted on Georges Bank with large catches of herring.

IN THE GULF OF MEXICO

Soviet: No fishing vessels were sighted near U. S. coasts in September. Several were passing to and from Cuban ports and South American Atlantic fishing grounds. Periodic fishing off the Bahama Islands was reported.

Cuban: No vessel was sighted in September near U. S. coasts. It appears that a part of the fleet, observed off Louisiana in July and early August 1967, moved south to Campeche Banks and into southwestern Caribbean Sea off Honduras and Panama. Some might have been on their way to tuna fisheries in central eastern Pacific.

OFF CALIFORNIA

Soviet: The number of vessels decreased in September. In mid-month, a group of 5 large stern factory trawlers were sighted in general area off San Francisco. Four were fishing. The 5th was heading north, presumably returning home. During rest of month, only one stern trawler was sighted off California (north of Farrallon Islands) on September 24. No information is available on species breakdown of catches.

OFF PACIFIC NORTHWEST

Japanese: About 7 stern trawlers, accompanied by 1 tanker, were reported during September. They were fishing ocean perch but reportedly not very successfully. By month's end, only 2 remained.

On 3 occasions, vessels were sighted fishing in closed areas under the U. S.-USSR agreement on fishing in the U. S. contiguous zone. The Japanese had indicated they would also respect these zones. It is known that a condition of the license granted the vessels by the Japanese government was that they avoid these areas.

Three trawlers were refueled by a trawler in the straits of Juan de Fuca in early September by permission of the U. S. Coast Guard because of stormy conditions. On the same day, a large freezer trawler entered Seattle for repair. She left after 24 hours.

Soviet Vessels Fishing Off Pacific Northwest in September 1967						
Week Ending	Area	Medium Side Trawlers	Stern Factory Trawlers	Support Vessels	Research Vessels	Total
		(Number)				
Sept. 7	Wash.	7	8	5	2	22
	Oregon	17	-	8	-	25
Total		24	8	13	2	47
Sept. 14	Wash.	5	6	4	3	18
	Oregon	23	5	13	1	42
Total		28	11	17	4	60
Sept. 21	Wash. Oregon	(The coast was fogged but there probably were the same number of vessels as sighted the previous week.)				
Sept. 28	Wash.	-	5	2	1	8
	Oregon	22	15	9	3	49
Total		22	20	11	4	57

Soviet: The number of fishing and support vessels off Washington and Oregon fluctuated from 50 to 60. Early in September, the fleet was about equally divided between the two areas; towards month's end, the concentration off Oregon was much greater (table).

Most fishing vessels were medium side trawler type at beginning of the month but, by month's end, there were about as many large stern factory trawlers as medium trawlers. The stern trawlers (average catch about 6 times the smaller medium trawlers) were moving south throughout the month; in last week, 15 fished off Oregon and only 5 off Washington.

The number of support vessels (refrigerated carriers and processing factoryships) also fluctuated, presumably with number of vessels and quantity of fish. The highest number was seen during week ending September 14. Resource Management Agents of U. S. Bureau of Commercial Fisheries, with U. S. Coast Guard, on a weekly surveillance flight over Soviet fleets observed that in that week Soviet fishing for Pacific hake was excellent. They observed one single haul by 2 Soviet medium trawlers fishing with a pair trawl yield an estimated 100,000 pounds. This was one of the largest hauls ever observed. It indicates that Soviets have mastered pair trawling, which they began using in Northeastern Pacific in 1966.

Soviet catches were not as good throughout month. In first week, as well as in third and fourth, hauls averaging about 10,000 pounds each were observed; on some occasions, blank or water hauls also were made. Fishing was concentrated on Heceta and Stonewall Banks off Oregon.

From 2 to 4 fishery research and explo tory vessels also supported the fleets. The cruised off Pacific Northwest in search of fish concentrations and alerted fleet when they found new ones. The fleet fished until schools dispersed or fishing tapered off, th moved to a new area. But 1 or 2 explorato vessels remained to check for reschooling fish.

There were fewer Soviet fishing vessels off Pacific Northwest in September 1967 tha in September 1966, when all fishing and sup port vessels were medium side trawlers; in September 1967, only about 2 of 3 were med um trawlers. This accords with general growth of Soviet fleets: more and more lar stern factory trawlers are replacing smalle medium side trawlers, especially on distant fishing grounds.

OFF ALASKA

Japanese: The number of vessels de creased from 175 early in September to abo 150 at month's end. This resulted from te mination of king crab fishery in eastern Be ing Sea and a decrease in effort along Aleu tians.

In the Gulf of Alaska Pacific ocean perc fishery, there were about 14 vessels throug the month. Active in the eastern Gulf were factory trawlers off southeastern Alaska a one on Yakutat grounds. The others were i central Gulf. During first-half September, factory trawlers fished on Portlock Bank, on Albatross Bank, and 1 near Chirikof Is land. By month's end, all but one were center on Albatross Bank; the one remained on Por lock Bank.

In early September, about 13 factory trawlers fished for perch along Aleutians. One vessel was located south of eastern Aleutians, 5 south of central Aleutians, and 7 along western Aleutians. As month progressed, number of vessels declined; at month's end, one trawler remained south of Seguam Island in central Aleutians, and 4 trawlers continued fishing along western Aleutians south of Near Islands.

Two trawlers fished for perch along 100-fathom curve in eastern Bering Sea during first week of September and then stopped. Late in month, 3 new 300-gross-ton factory trawlers appeared.

Soviet: Vessels off Alaska decreased from about 43 in early September to about 25 by month's end. The end of whaling off Alaska was principal reason for decrease.

Pacific ocean perch, particularly along Aleutians, was principal species sought.

In Gulf of Alaska, only 1-2 trawlers fished for perch, first on Yakutat grounds and later off southeastern Alaska.

The number of trawlers fishing for perch south of Fox Islands in eastern Aleutians increased from 3 to 8 during month. About mid-month, 5 medium side freezer trawlers began fishing north of Fox Islands. The effort in Seguam and Amukta Islands area in central Aleutians decreased from 4 to 2 trawlers, while 2 trawlers fishing north of Adak Island ended operations about mid-month. Three large stern trawlers and one medium trawler fished for perch along western Aleutians throughout month.

West of Pribilofs, 2 Soviet trawlers fished for perch along 100-fathom curve only in early September.

One whaling fleet was reported along central Aleutians during first-half September. A second fleet also might have operated along Aleutians in early September. By mid-month, the whalers had departed Alaskan area.

SOUND WAVES USED TO MAP OCEAN FLOOR

A side-looking sonar (SLS) can be used to produce quickly detailed and accurate maps of coastal shelves, lake bottoms, harbors, and rivers. It may become as important in charting the ocean floor as aerial photography is for mapping the land.

SLS scans the ocean floor much as a slanted beam of light sidelights the landscape. Pulsed, high-frequency sound waves are sent out by a transmitter housed either in a research vessel or in a "fish" towed behind. The pulses are aimed at the ocean floor a few degrees below the horizontal in a direction perpendicular to the ship's course. As sound hits the bottom, it is reflected in a visual pattern that describes the contours--hills, channels, plateaus--and can be used as a map. Routes for pipelines or shipping channels may be plotted from these data. However, SLS cannot produce three-dimensional images that are mathematically possible but not technically practical at this time. (Reprinted, with permission from Science News, weekly summary of current science, copyrighted 1966 by Science Service, Inc.)

STATES

Alaska

FISHERIES DEVELOPMENT PLANNED

BCF Juneau reports that Gov. Walter J. Hickel of Alaska told foreign newspapermen in Juneau on August 26 that Japanese interests have invested about $125 million in the State since 1958: $60 million in the lumber and pulp industry; $40 million in the petroleum industry, and $25 million in the fishing industry.

There are at least 5 joint Japanese-American fishery operations in Alaska, 4 of them major:

1. The Orca Cannery in Prince William Sound and all Alaska properties of Pacific Alaska Fisheries purchased jointly by Mitsubishi Shoji, the largest corporate complex in Japan; Nichiro Gyogyo, the world's largest salmon canning company; and New England Fish Company.

2. The Sand Point Packing Co., of Sand Point, formed by the same 3 companies.

3. B. & B. Fisheries Inc., Kodiak Island, jointly formed on a 50-50 basis by Taiyo Fishing Co. of Japan, one of the world's largest fishing companies, and Bix Bonney.

4. Seward Fish Freezing Co., 49 percent Japanese owned, bought jointly by Hoko Suisan, a fishery firm; Marubeni Iida, a trading firm; and the U. S. firm TAD Fishing Co.

Governor Visits Japan

Returning from a 10-day visit to Japan in September, Hickel reported concluding an informal agreement with Taiyo Fisheries for participation of the Japanese Fisheries Association on a 50-50 basis with Alaska to establish and operate a fisheries research center at Kodiak. A research center and a research vessel are needed first. Hickel stressed that all information developed by the center must be made public.

Hickel added that in his talks with Japanese industrialists he had assured them that no restrictions would be placed on the size of foreign investment in Alaska industry.

Fisheries Complex Planned

The Governor recently announced his three-part program to create a complex of marine research and educational facilities at Kodiak. This is conceived as a Federal-state effort with local government and private enterprise.

The first part of this program is the Alaska Institute of Fisheries Development. The other two are the Alaska Maritime Academy and the Alaska Marine College, a Sea Grant institution.

* * *

PLAN SHIPYARD IN SEWARD

A $2.5 million shipyard with a 1,000-ton capacity and drydocking facilities for eight 150-foot vessels and five 250-foot vessels is going to be built in Seward. It is being funded privately and is expected to be operational by June 1968.

The Resurrection Bay Shipyard, as it will be called, will employ the new Syncrolift method of drydocking. The heart of the system is a platform lowered and raised by paired electric hoists, all interconnected and controlled centrally. The platform has 3 pairs of railway tracks to permit placing the railway truck cradles in whatever position is necessary to fit the hull of the vessel being drydocked.

* * *

KING CRAB VESSELS MUST PASS STABILITY TESTS

Because of king crab vessel losses in Alaska, the underwriters now require each vessel fishing out of Kodiak to have a stability test before renewing its insurance. This is disturbing the industry because no one in Alaska is qualified to make these tests.

The Kodiak fishermen affected are being encouraged to join in a group project to bring in a qualified marine architect.

Oregon

TUNA LANDINGS HIGH

Tuna landings at Oregon ports this season have been the heaviest in the 30-year history of the state's highly important albacore fishery, reported the Oregon Fish Commission on October 24. Biologist Larry Hreha of the agency's Astoria research laboratory said preliminary figures showed 25.5 million pounds of albacore reported. This is 350 percent above the past 30-year average. Although tuna fishing season was practically ended, late reports could push the 1967 total to 28 million pounds.

The highest previous catch was 1944's 22.5 million pounds. In the 30-year period, 1937 to 1966, the average of albacore landings at Oregon ports was 7.3 million pounds.

Season Started Normally

Hreha said this season started normally in mid-July off the southern Oregon coast. Catches were good from the start. By the third week of August, the center of fishing activity had moved up off Newport. Still later, the fish were centered off the Columbia River's mouth and northward off the southern Washington coast.

Seven of the 223 albacore tagged during a Fish Commission tuna investigation cruise in late July were caught in the commercial fishery during September. Recoveries reported were all from live-bait boats and made 35 to 135 miles north of the point of tagging.

Contributing to this year's good landings were the relatively warm water currents off the coast preferred by albacore; the currents persisted all summer. This and exceptionally good weather permitted more intensive fishing throughout the season.

Tuna 60-100 Miles Offshore

The fish were found at their usual distance from shore: 60 to 100 miles. The smaller boats troll with jigs (feathered or plastic lures). In recent years, the larger tuna clippers have been fishing Oregon waters. They use live forage fish as bait and as chum to attract tuna schools. Some local larger boats also have been equipped with live bait tanks. During the season's height, one clipper reportedly caught 119 tons of albacore in one day off southern Washington.

While Oregon waters were active, normally productive southern California fishing grounds were quiet. At one period, California biologists reported that about 90 percent of the California albacore fleet was off Oregon.

Landings Up For Coast States

From 1937 to 1966, average landings at Oregon, California, and Washington ports were 36.7 million pounds. Preliminary estimates are for landings in these 3 states of 46 million pounds this year.

* * *

1967 SHRIMP CATCH SETS RECORD

Oregon's 1967 shrimp catch of 10.2 million pounds topped previous records by a substantial margin. Landings for October, the season's final month, should add another 200,000 pounds, according to a biologist of the Oregon Fish Commission's Astoria laboratory. Average annual landings from Oregon waters during the past 10 years have been 2.5 million pounds.

The previous record landings for Oregon, Washington, and California combined were 9.8 million pounds in 1958. The average total catch for the three states has been 6 million pounds a year since 1957.

Excellent demand for shrimp, coupled with a poor market for bottomfish, attracted more trawlers to the shrimp beds this year. Up to 40 vessels were fishing shrimp off the Oregon coast at one time, compared with 15 to 25 boats during other seasons. Exceptionally good weather and more fishing days also contributed to the record catch.

Vessels and Gear

Most shrimp vessels working Oregon waters are 50-55 feet long. A few 80-footers, which last season fished Washington hake, were on the Oregon shrimp beds this year.

Shrimp are taken in otter trawl nets towed along green mud bottoms 360 to 600 feet deep and 4 to 20 miles off the coast. Productive beds are located offshore near Brookings, Port Orford, Coos Bay, Newport, and Tillamook Head. The Newport bed was located during an Oregon Fish Commission shrimp survey in spring 1966. Landings of about a half million pounds were made from that bed last season. This year the bed produced about

1.4 million pounds. The shrimp reaching the market from Oregon beds average about 3 inches long, the so-called cocktail size, and are mainly 2- and 3-year-olds.

The outlook for next season is promising on the basis of the presence of large numbers of 1966 year-class shrimp, which will be of marketable size by next season. This is especially true on Coos Bay, Port Orford, and Brookings beds, where shrimp of the 1966 year-class predominated in the 1967 catch. (Oregon Fish Commission, Oct. 31, 1967.)

* * *

KOREANS TRAIN AT
FISH COMMISSION HATCHERY

Two South Korean fish culturists are learning modern salmon hatchery practices at the Oregon Fish Commission's Sandy River station. After additional on-the-job experience at other northwest fish culture locations, they will return to Korea in January 1968 to manage a salmon hatchery now being designed with U. S. aid. Their agenda includes visits to state fish culture stations.

Chum salmon are present in some Korean streams. Korea's new fish cultural program will be devoted initially to this species. On this side of the Pacific, the species is found from northern California to the Bering Sea, but it is more common in the northern portion of its range. In Oregon, chums (or dog salmon) run relatively late in the fall compared with other salmonids. The young go to sea in the first spring and reach maturity in the 3rd or 4th year. The weight of mature fish ranges from about 8 to 18 pounds.

U. S. Team Visited S. Korea

In June, Ernest R. Jeffries, director of the Fish Commission's fish culture division, toured South Korea as a member of a 3-man team that selected potential hatchery sites. His colleagues were Richard T. Pressey, BCF, and Clinton Atkinson, U. S. Fisheries Attaché in Tokyo.

California

PELAGIC FISH CATCH

The September report of the Resources Agency of California contains these data on the catch of pelagic fish:

Species	September		January 1 - September 30		
	1/1967	1966	1/1967	1966	10-yr. Mean 1956-1965
	(Landings in Tons)				
Anchovy	10	225	28,101	19,023	6,022
Mackerel, jack	310	840	14,729	16,997	21,991
Mackerel, Pacific	35	158	198	1,183	10,656
Sardines	2	67	62	382	9,723
Squid	2	722	8,071	7,223	5,372
Total	359	2,012	51,161	44,808	53,764

1/Estimated. Accumulated landings are revised monthly.

New Jersey

STATE ADOPTS PLAN TO
FIGHT WATER POLLUTION

Interior Department's Federal Water Pollution Control Administration (FWPCA) and New Jersey officials agreed at a November 1 conference on a program to control water pollution along 100 miles of the state's coastal waters. FWPCA endorsed a state plan to build a string of regional sewage treatment plants along the coast to pump effluents through pipes extending up to a mile into the ocean. The plants would cost nearly $100 million. The cost of the state's overall pollution abatement program is put at $500 million.

State Health Commissioner Roscoe P. Kandle said: "We are convinced that it is not possible for the bay waters to continue to receive increasing amounts of treated waste water and remain acceptable for shellfish harvesting and recreation uses."

Shellfish Infected

Murray Stein, FWPCA's chief enforcement officer, said the Government had come into the situation because dirty water had infected a large part of New Jersey's shellfish, which are sold interstate. "Clams have truly become an amenity of American life," he said, and should be protected.

Stein said the conference's recommendations would be sent to Interior Secretary Stewart L. Udall for final approval.

State's Program

Richard J. Sullivan, director of the state's Division of Clean Air and Water, said the program would cover about 100 miles of tidal bays and inlets lying behind barrier beaches from Shark River Inlet south to Cape May.

The regional treatment plants would be ready by November 1970. The cost would be met by matching Federal, state, and local funds.

Sullivan said the treated waste would be dumped so far in the ocean that it would not affect the shoreline.

Large Area Can Be Restored

The abatement program can restore about 36,000 acres of New Jersey's 163,000 acres of Atlantic shellfish beds. If this is achieved, New Jersey would replace New York as the leading producer of shellfish.

Virginia and Maryland

VIRGINIA AND MARYLAND SCIENTISTS PLAN CHESAPEAKE BAY STUDY

Scientists of the Virginia Institute of Marine Science (VIMS) Gloucester Point, Va., Maryland's Chesapeake Biological Laboratory (CBL), and the Johns Hopkins University's Chesapeake Bay Institute (CBI) met last month at Gloucester Point to discuss their possible involvement in providing data to the U. S. Army Corps of Engineers to construct a model of Chesapeake Bay.

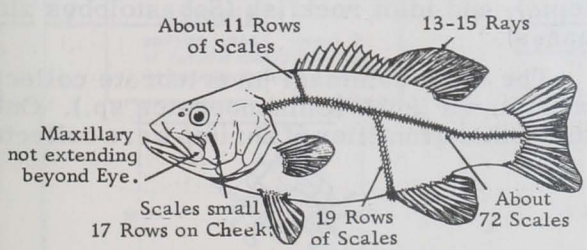
Records of currents and velocities, salinities, and temperatures would have to be made in relatively short periods over a year or more to supply the necessary information. The scientists agreed tentatively that CBI would work in the upper bay, CBL in the middle bay, and VIMS in the lower bay and ocean. All 3 would cooperate in measurements involving the bay's entire length during a single tidal cycle.

The Chesapeake Bay Model would cover about 11 acres in Maryland and provide useful information to those using its marine waters. It would be like the James River Model now being operated by VIMS.

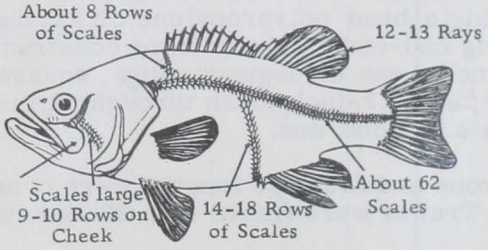
James River Model Used Constantly

Dr. Morris Brehmer, Assistant Director VIMS, noted that the James River Model has been used constantly since it was employed primarily to determine the effect of proposed channel dredging on the seed oyster beds. Four recent studies involved the best design for a land-fill in Hampton Roads to provide additional docking facilities; location of sewage outfalls to lessen damage to other interests; estimate of changes in water temperature resulting from the river's use as a coolant. At present, the Federal Water Pollution Control Board is using the model for pollution studies.

IDENTIFICATION OF BLACK BASS



Smallmouth Black Bass



Largemouth Black Bass

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

"Manning" Surveys Bottomfish in Gulf of Alaska

BCF's John R. Manning returned to Juneau, Alaska, on August 31 after an 8-week exploratory bottom fish survey in the northwestern Gulf of Alaska (Cruise 67-3, July 10-Aug. 31). Operations were conducted in inshore and offshore waters between and due south of Point Elrington and Nuka Bay (see figures 2-3).

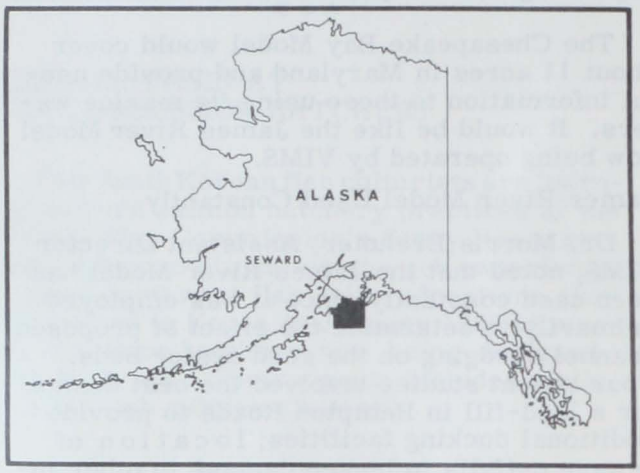


Fig. 1 - General Area of Operation, Cruise 67-3.

The cruise's primary objectives were to obtain data on commercial concentrations of bottomfish and locate and log trawlable fishing grounds. Its secondary objectives: to gain more information on bathymetric and geographic distribution of benthic (sea bottom) organisms common to Alaskan waters, and to log sightings of foreign fishing vessels and give this information to Branch of Enforcement and Surveillance.

The Gear

Sampling gear consisted of conventional 400-mesh eastern otter trawls equipped with $\frac{3}{8}$-inch single-brad polypropylene chafing gear along cod-end. Trawls were constructed of 4-inch mesh throughout wings, square and belly; and 3.5-inch mesh throughout intermediate and cod-end.

Headrope and footrope lengths were 71 and 94 feet. Trawls were fished with 22-fathom split "V" dandylines (10-fathom single to main warp with 12-fathom "V" to wings), and a pair of 4.5 x 7-foot Astoria V-doors (800 pounds each). Optional equipment included: (1) 30-fathom $\frac{1}{4}$-inch snag cable, (2) 92-foot $\frac{1}{4}$-inch tickler chain, and (3) roller gear--four 9-inch rubber wing bobbins; two 16-inch round steel bobbins; thirty-eight 6-inch rubber spacers; and five 18-inch, six 14-inch, and six 12-inch rubber rollers.

The Operation

Echo-sounding transects were made to locate trawlable fishing grounds. All soft-bottom areas that appeared reasonably level and sufficiently long were sampled. Hard-bottom trawling was limited to 14 tows--because the entire roller gear assembly was lost off Pye Reef during tow 33. Towing time was generally held to one hour. A 3:1 main-warp scope ratio was used for all drags. Towing speed averaged 3 knots.

Sixty-six of the 79 drags attempted during survey were successful--no solid hang-up or trawl damage occurred. The bathymetric interval for all drags ranged between the 43- and 158-fathom isobaths; most sampling effort was between 80 and 125 fathoms. Total weights recorded from 6 hauls were over 3,000 pounds.

The Catch

The following species, listed in order of decreasing abundance, were collected in quantities of 100 or more pounds for any single tow: turbot (Atheresthes stomias), Alaska pollock (Theragra chalcogrammus), Pacific cod (Gadus macrocephalus), flathead sole (Hippoglossoides elassodon), Pacific ocean perch (Sebastodes alutus), blackcod (Anoplopoma fimbria), rex sole (Glyptocephalus zachirus), dover sole (Microstomus pacificus), Pacific halibut (Hippoglossus stenolepis), and idiot rockfish (Sebastolobus alascanus).

The most dominant invertebrate collected was tanner crab (Chinonoecetes sp.). Only incidental quantities of shrimp were collected.

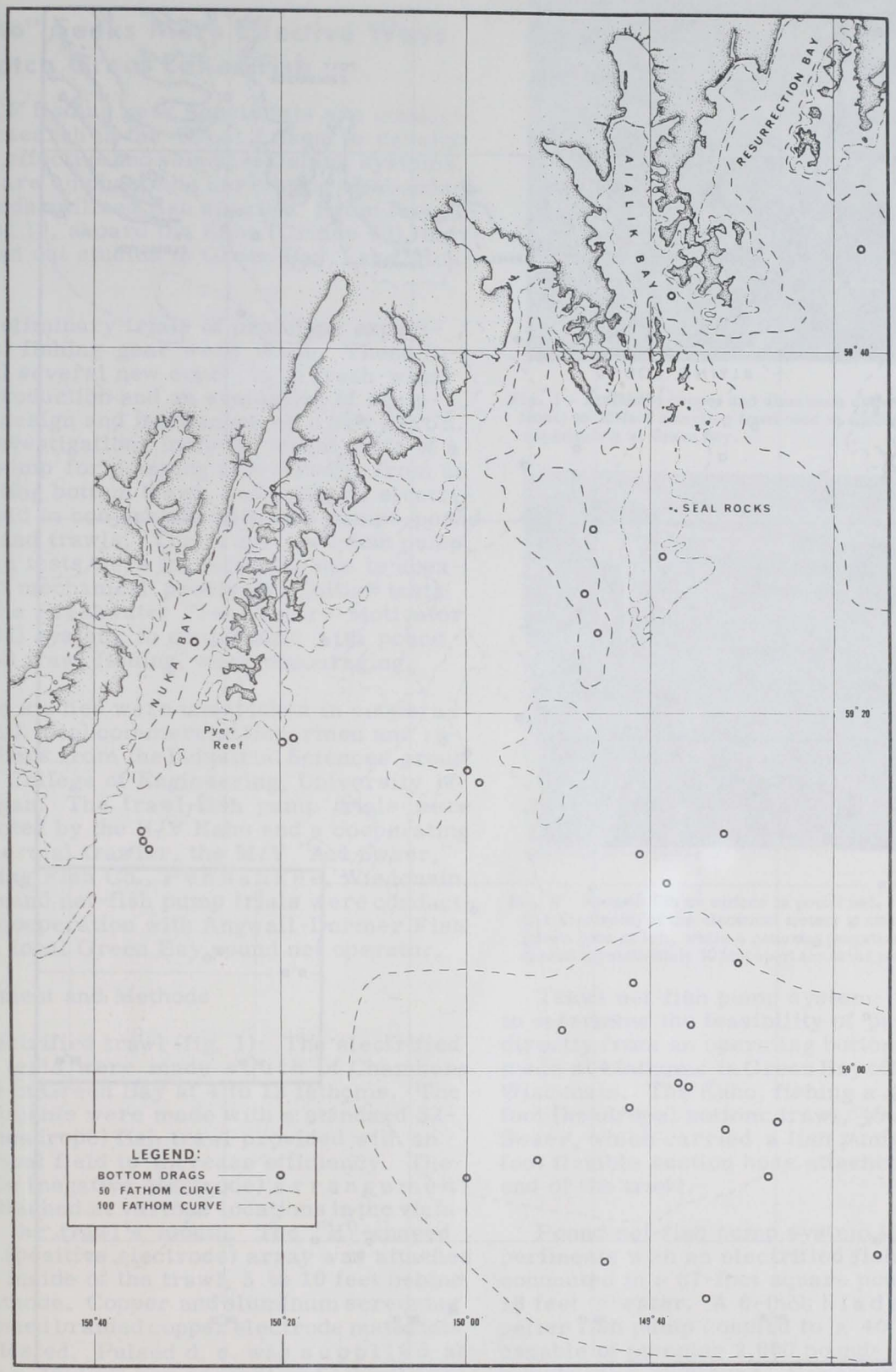


Fig. 2 - Western Area of Operation, Cruise 67-3

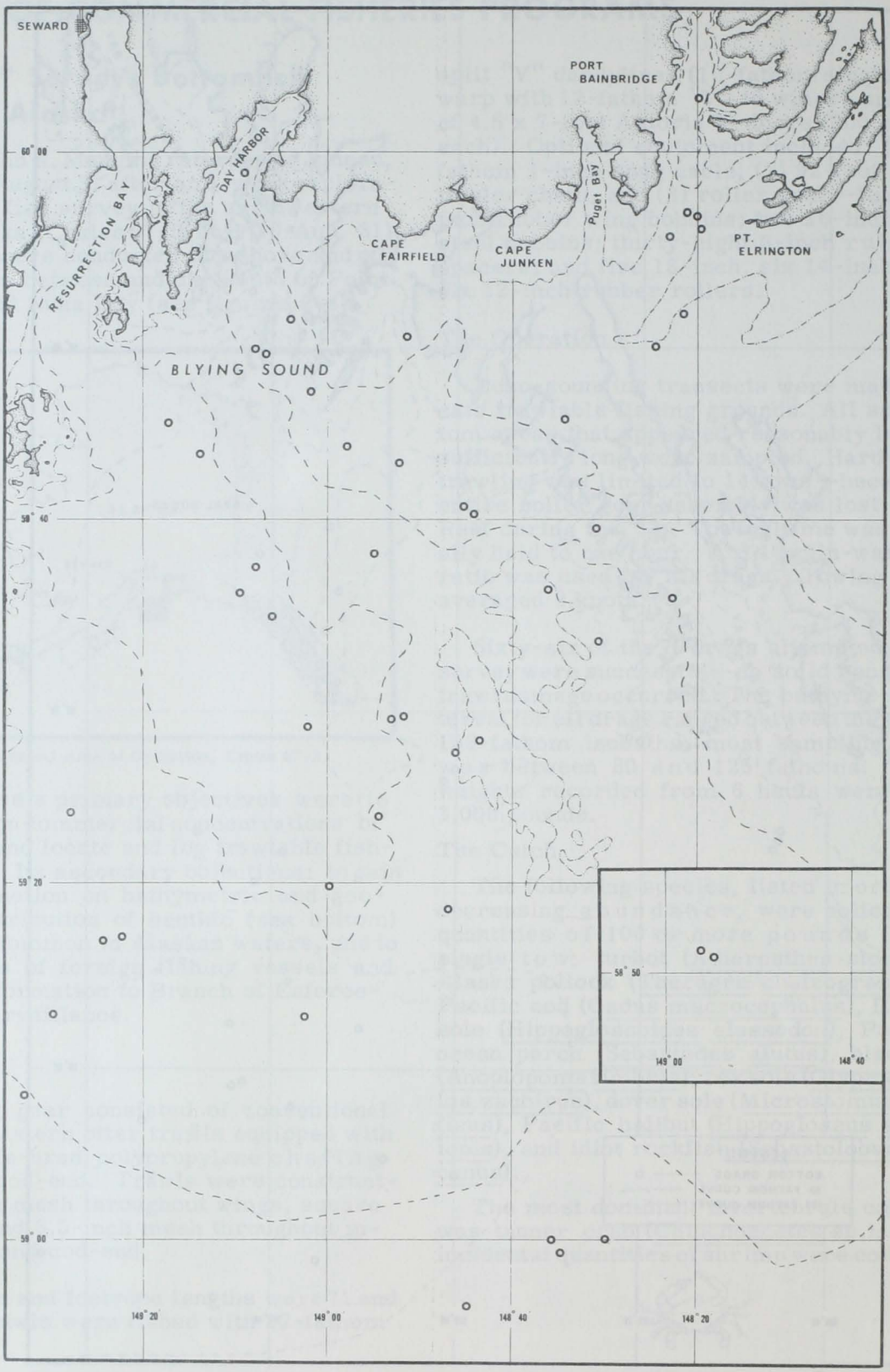


Fig. 3 - Eastern Area of Operation, Cruise 67-3.

"Kaho" Seeks More Effective Ways to Catch Great Lakes Fish

BCF fishing gear specialists are conducting research in the Great Lakes to develop more effective and selective fishing systems. They are emphasizing harvesting of abundant and underutilized fish species. From July 11-August 19, aboard the Kaho (Cruise 43), they carried out studies in Green Bay, Lake Michigan.

Preliminary trials of prototype experimental fishing gear were made. These involved several new concepts in fresh-water fish production and an evaluation of equipment design and mechanics of operation. The investigations included initial tests of a fish pump for pumping fish directly from an operating bottom trawl, and using an electrical field in conjunction with fish pumps, pound nets, and trawls. The trawl net-fish pump system tests were inconclusive due to unexpected mechanical problems. Initial tests with the Freshwater Fish Electro-Motivator (FFEM) system, in conjunction with pound net and trawl fishing, were encouraging.

The studies were undertaken in cooperation with local commercial fishermen and researchers from the Industrial Sciences group of the College of Engineering, University of Michigan. The trawl-fish pump trials were conducted by the R/V Kaho and a cooperating commercial trawler, the M/V "Art Swaer," Schilling Fish Co., Pensaukee, Wisconsin. The pound net-fish pump trials were conducted in cooperation with Angwall-Dormer Fisheries, local Green Bay pound net operator.

Equipment and Methods

Electrified trawl (fig. 1): The electrified trawl tests were made south of Chambers Island in Green Bay at 4 to 12 fathoms. The experiments were made with a standard 52-foot (headrope) fish trawl provided with an electrical field to increase efficiency. The cathode (negative electrode) arrangement was attached at various locations in the vicinity of the trawl's mouth. The "H"-shaped anode (positive electrode) array was attached to the inside of the trawl, 5 to 10 feet behind the cathode. Copper and aluminum screening and tinned braided copper electrode materials were tested. Pulsed d. c. was supplied at 13 p.p.s. (pulses per second) and 10 milliseconds in duration.

Fig. 1 - Attaching copper and aluminum cathode (negative electrode) to 52-foot sampling trawl used in electrified fishing gear experiments in Green Bay.

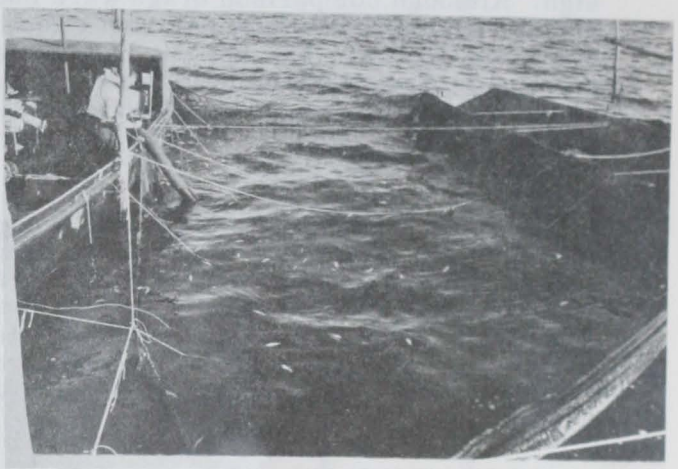


Fig. 2 - Stunned fish on surface in pound net. The anode (positive electrode) of the electrical system is attached to the pump intake hose at left, while 4 cathodes (negative electrodes) are spaced approximately 10 feet apart across the pot of the pound net.

Trawl net-fish pump system: Experiments to determine the feasibility of pumping fish directly from an operating bottom trawl were made at 4 fathoms in Green Bay off Pensaukee, Wisconsin. The Kaho, fishing a standard 52-foot (headrope) bottom trawl, towed the Art Swaer, which carried a fish pump with a 30-foot flexible suction hose attached to the cod-end of the trawl.

Pound net-fish pump system (fig. 2): Experiments with an electrified fish pump were conducted in a 37-foot square pound net set in 18 feet of water. A 6-inch bladeless impeller fish pump coupled to a 40 hp. engine capable of pumping 2,000 pounds of fish per minute was employed. Power for electromotivation was supplied by a 10 kw. single

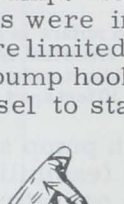
phase a.c. generator coupled to a solid state pulse-forming unit which supplied pulsed d.c. voltage from 0 to 250 volts d.c. The pulse frequency was variable from 5.3 to 50 p.p.s. and from 10 to 55 milliseconds in duration. The cathode assembly was a series of four 10-foot lengths of $\frac{5}{8}$-inch conduit pipe, each fitted with ten 15-foot lengths of sash chain, spaced 10-feet apart across the pot of the pound net. The anode arrangement was six 20-inch lengths of 1-inch flat steel stock, shaped in the form of a funnel, attached to the mouth of the fish pump suction hose.

Results

FFEM-trawl: Efforts were concentrated on selection of electrode materials and design. Although comparison drags were made during development trials, the most effective electrode system has not yet been tested thoroughly enough to draw definite conclusions. Of the 14 species caught, the electric field appeared to affect alewife, smelt, and white suckers most significantly.

Pound net-FFEM-fish pump: Tests involving the use of electricity to guide fish into a fish pump were partially successful. It was found possible to move alewife only 10 feet. Sequential switching through a series of electrodes will be necessary to remove fish from a normal sized pound net effectively and efficiently.

Trawl net-fish pump: Results of the trawl net-fish pump trials were inconclusive because the tests were limited by the mechanics of the trawl--fish pump hook up and inability of towed pump vessel to stay directly over the trawl.



"Oregon" Dredges Scallop Off Florida

The R/V Oregon returned to St. Simons Island, Georgia, on September 22, after 25 days of scallop-dredging explorations off Florida's east coast. The cruise objective was to provide an up-to-date assessment of grounds that previous explorations have shown to hold the greatest potential for commercial exploitation of calico scallops (Pecten gibbus). This was the first in a series of industrial development cruises scheduled to make a intensive systematic resurvey of the Cap Kennedy scallop beds. 285 fishing station were occupied between 10 and 40 fathoms.

Largest Calico Scallops

From St. Augustine to Ft. Pierce, comm cial concentrations were located over a br area--from the offings of New Smyrna Bea to Bethel Shoal in 19 to 27 fathoms. The ca ico scallops found here were the largest in the surveys and provided the largest me yield to date.

The gear used was 8-foot tumbler dredg with 2-inch bag rings fished with and witho liners on bags 13 and 20 rings deep and a 3 foot North Carolina type scallop trawl.

The Catch

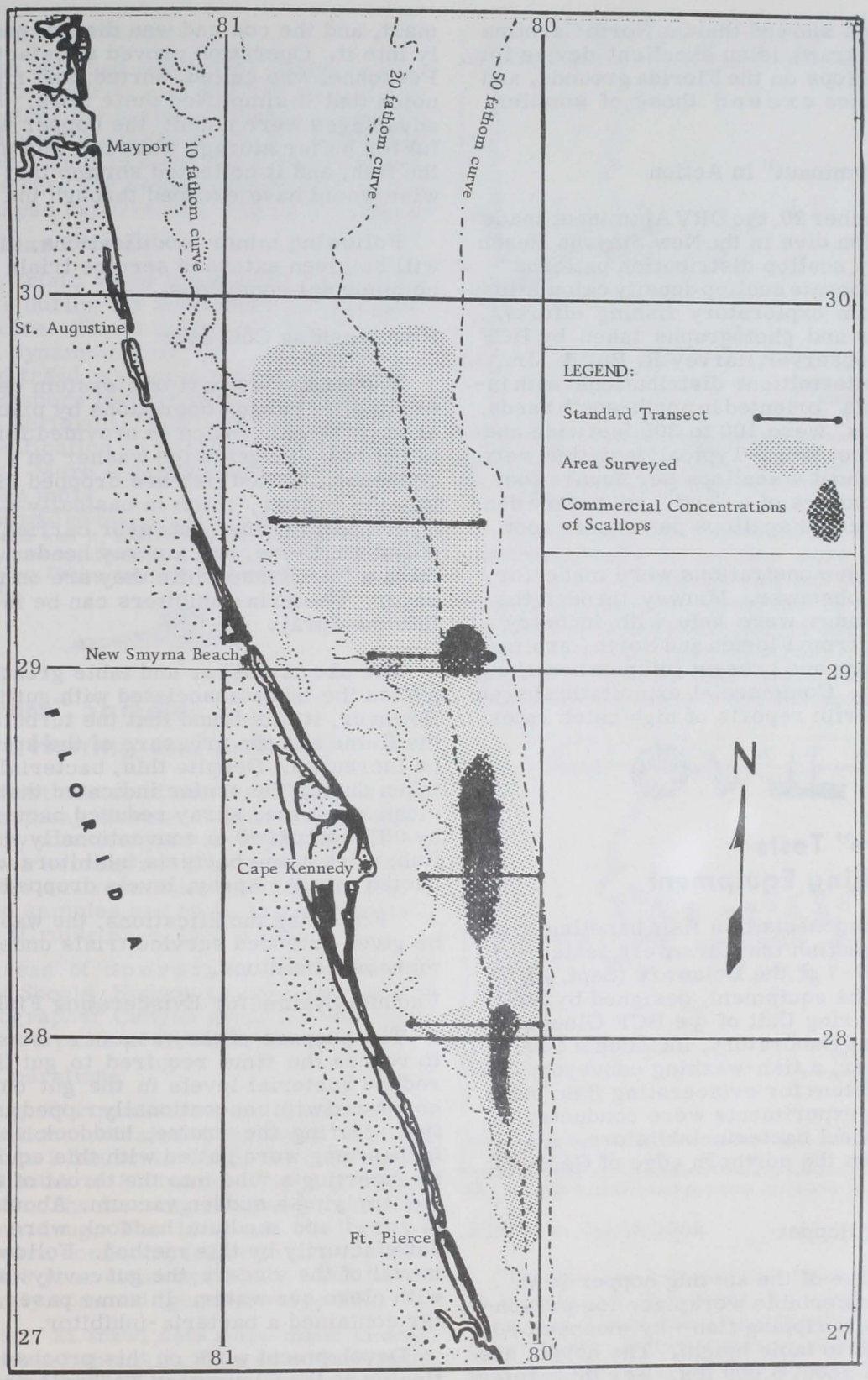
East of New Smyrna Beach, in 25 to 2 fathoms, maximum catches of up to 21 bushe per 15-minute drag (84 bushels per hour were obtained with a single 35-foot scallo trawl, and 19 bushels per 15-minute drag (bushels per hour) with a single 20-ring ba 8-foot tumbler dredge. The best count averaged 50 to 66 meats per pound, and yiel averaged 6 to $7\frac{1}{4}$ pounds of meat per bush (65 to 70 pounds in the shell. Maximum production rate in this area was 570 pound of scallop meats per hour per 8-foot dredg

From Hetzel Shoal to Melbourne, in 21 23 fathoms, catches of up to 16 bushels pe 15-minute drag were made with a 13-ring bag 8-foot tumbler dredge. Meat counts averaged 68 to 76 per pound, and meat yie averaged 5.3 to 7 pounds per bushel.

Northeast of Bethel Shoal, in 19 to 21 fa oms, catches of up to 16 bushels per 30-m ute drag were made with a 13-ring bag 8-fo tumbler dredge. Meat counts averaged 88 115 per pound and meat yields averaged 4 5 pounds per bushel. The scallops in thi area were generally smaller in size and co stitute a stock, which should attain comme cial size in the near future.

Small "seed" scallops were found throu out the area surveyed.

On September 19, a 100-bushel sample shell stock was landed for experimental pr essing by industry.



R/V Oregon Cruise 121.

Gear trials showed that the North Carolina type scallop trawl is an excellent device for catching scallops on the Florida grounds, and that catch rates exceed those of smaller dredges.

The Sub "Aluminaut" in Action

On September 20, the DRV Aluminaut made an observation dive in the New Smyrna Beach area to study scallop distribution patterns and to corroborate scallop density calculations resulting from exploratory fishing efforts. Observations and photographs taken by BCF Pascagoula observer, Harvey R. Bullis, Jr., confirmed intermittent distributions with individual "beds" oriented in north-south bands. Typical "beds" were 100 to 300 feet wide and up to 1,500 feet long. Typical densities were found to be about 4 scallops per square foot within the confines of a "bed", with some densities exceeding 8 scallops per square foot.

Dredging demonstrations were made for an industry observer. Midway through the cruise, meetings were held with industry participants from Florida and North Carolina to provide past and present information about the resource. Commercial exploitation began on October 4 with reports of high catch rates.

"Delaware" Tests Fish-Handling Equipment

Three components of a fish-handling system for groundfish trawlers were tested during Cruise 67-7 of the Delaware (Sept. 20-21, Oct. 1-4). The equipment, designed by the Food Engineering Unit of the BCF Gloucester Technological Laboratory, included a fish-sorting hopper, a fish-washing conveyor, and a vacuum system for eviscerating fish. Also, fish washing experiments were conducted to evaluate several bacteria-inhibitors. All fishing was on the northern edge of Georges Bank.

Fish Sorting Hopper

The purpose of the sorting hopper is to provide a comfortable workplace for personnel sorting and ripping fish--by mechanically elevating fish to table height. The hopper has a capacity of about 5,000 lbs. For this cruise, it was located on the portside just abaft the mast, and the cod end was discharged directly into it. Operation proved satisfactory. Personnel who culled, sorted, and ripped fish noted that it simplified their work. Two other advantages were noted: the hopper was useful for buffer storage when ice was applied to the fish, and it collected shrimp that otherwise would have escaped through the scuppers.

Following minor modifications, the hopper will be given extended service trials under commercial conditions.

Fish Washing Conveyor

The washer is part of a system designed to simplify gutting operations by placing fish at table height. Space is provided for 4 men to gut fish alongside the washer on a table or conveyor. Gutted fish are dropped directly into the washer, which is basically a turbulent flume. An inclined conveyor carries the fish out of the flume, and a spray header gives them a final rinse while they are on the conveyor. Bacteria-inhibitors can be inducted into the spray.

The use of washer and table greatly simplified the labor associated with gutting fish. However, it was found that the turbulence in the flume and the pressure of the spray should be increased. Despite this, bacterial counts taken during the cruise indicated that the clean sea-water spray reduced bacteria levels by 90% compared to conventionally washed fish; when some bacteria inhibitors were inducted into the spray, levels dropped 99%.

Following modifications, the washer will be given extended service trials under commercial conditions.

Vacuum System for Eviscerating Fish

The purpose of the vacuum eviscerator is to reduce the time required to gut fish and reduce bacterial levels in the gut cavity--compared with conventionally ripped and gutted fish. During the cruise, haddock up to 18 inches long were gutted with this equipment by inserting a tube into the throat of the fish and applying a sudden vacuum. About 500 lbs. of scrod and medium haddock were gutted satisfactorily by this method. Following removal of the viscera, the gut cavity was rinsed with clean sea water. In some cases, the water contained a bacteria-inhibitor.

Development work on this process is continuing at the Gloucester Technological Laboratory.

Quality and Shelf Studies

All fish obtained during the cruise were stored in boxes with ice, and returned to the Technological Laboratory. Bacteria levels and organoleptic quality of the fish are being monitored. Shelf life and fillet yield determinations also are being conducted. The results of these experiments will be published.

Fishing Gear Trials

Initial trials were made with 3 fishing gear units during the September 20-21 part of the cruise. These units are: trawl warp load-cell dynamometers, polyurethane impregnated trawl ground cable, and steel framed offshore lobster pots. Data were obtained on performance of these devices to guide modification as necessary and additional testing. More extensive sea trials will be given these units.

Note: For additional information concerning this cruise and program work associated with it, contact: John A. Holston, BCF Technological Laboratory, Gloucester, Mass., or Keith A. Smith, BCF Exploratory Fishing and Gear Research Base, Gloucester, Mass. 01930.

"Delaware" Samples Offshore Herring and Lobsters

The latest cruise of the M/V Delaware of BCF's Boothbay Harbor (Maine) Biological Laboratory was designed to sample populations of sea herring and lobsters and to obtain related environmental data, obtain lobster blood samples, and to sample for larval herring. (Cruise 67-8, Oct. 9-18.)

The areas of operation were eastern Nantucket Shoals, Hudson Canyon eastward to Oceanographer Canyon area, the southwest and northern parts of Georges Bank.

Fishing Operations

Herring: Six trawl sets were made for herring at stations indicated on the chart. The sets lasted up to 2 hours in 30 to 90 fathoms and yielded a total of 35 bushels (approximately 2,400 lbs.). The herring obtained were 22.1 to 35.7 cm. long. The 1960 and 1961 year classes were dominant, followed in percentage by 1959 year class and older. The fish had recently spawned (gonadal stage VII).

Lobster: 21 trawl sets were made at stations indicated on chart. The sets, in 50 to 80 fathoms, yielded 763 lobsters (59% females and 41% males) and ranged from $\frac{1}{8}$ pound to 15 pounds; the mean was 1.3 pounds.

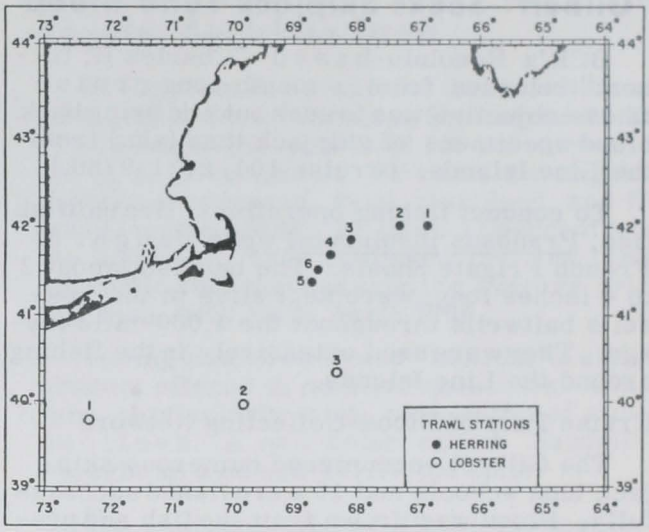


Fig. 1 - Herring and lobster trawl operations during Cruise 67-8 by M/V Delaware.

Other species: Other animal species of consequence in the catches were butterfish ($\frac{1}{4}$ bushel), cod (8 bushels), dab (2 bushels), dogfish (5 bushels), goosefish (8 bushels), haddock (9 bushels), squirrel hake (4 bushels), shad ($\frac{1}{2}$ bushel), skate (1 bushel), squid ($1\frac{1}{2}$ bushels), northern shrimp (12 bushels in herring trawl 3), and whiting (29 bushels).

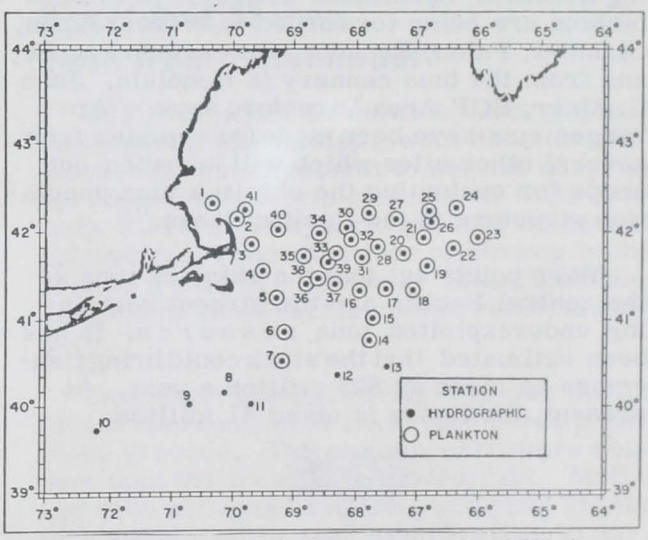


Fig. 2 - Hydrographic and plankton operations by M/V Delaware.

Plankton Operations

Thirty-five 1-meter net tows of 15 minutes (5 minutes at 20 meters, 5 minutes at 10 meters, and 5 minutes at surface) were made (see chart). Herring larvae obtained from 21 stations ranged from 5 to 30 mm.; the mean (total length) was 12 mm.

"Gilbert" Seeks Skipjack Tuna Blood

BCF's Honolulu-based "Charles H. Gilbert" returned from a month-long cruise whose objective was to seek out and bring back blood specimens of skipjack tuna (aku) from the Line Islands. (Cruise 104, 8/31-9/30.)

To conduct fishing operations, live baitfish (iao, Pranesus insularum) were caught at French Frigate Shoals. The baitfish, about 2 to 4 inches long, were kept alive in the vessel's baitwells throughout the 1,000-mile voyage. They were used extensively in the fishing around the Line Islands.

Cruise Part of Blood-Collecting Network

The Gilbert encountered numerous skipjack tuna schools and 10 were fished successfully. Blood was drawn from the fish and preserved by freezing in a glycerine solution. The blood specimens, collected by biological technicians Tagay Kang and Lloyd T. Watarai, were brought back to the BCF Laboratory, where serological analyses will be conducted. The data will aid the Laboratory's evaluation of the Pacific-wide distribution of skipjack tuna.

The cruise represents only one phase of the Laboratory's skipjack tuna blood-collecting network. Specimens collected in similar fashion are being forwarded to it from Japan, Okinawa, Palau, Ecuador, the eastern Pacific, and from the tuna cannery in Honolulu. John C. Marr, BCF Area Director, says: "Arrangements have been made for samples from several other sites which will broaden our scope for evaluating the skipjack tuna population structure in the Pacific Ocean."

Marr points out that the skipjack tuna of the central Pacific are the largest remaining underexploited tuna resource. It has been estimated that the stock could bring fishermen as much as $25 million a year. At present, the figure is about $1 million.

"Miss Behavior" Studies Albacore With Sonar

Miss Behavior of BCF's La Jolla, Calif., Fishery-Oceanography Center cruised the albacore fishing grounds off northern California and Oregon August 28-September 15 to obtain target signatures from albacore tuna using continuous transmission frequency modulated (CTFM)--Doppler sonar. The sonar worked well but there were problems. The fish, moving always at 5-6 knots, changed course repeatedly; whenever their body orientation changed, their targets would fade out.

It is becoming increasingly evident to the researchers that near-surface tuna schools are tricky sonar targets. CTFM sonar scans fast enough to track tunas, but their spacing and orientation within the school make it virtually impossible to maintain contact beyond about 100 meters. Even these short ranges might work well in a seining operation if the vessel's speed and course changes can keep pace with the fish school's.

BCF Honolulu Attempts Bottom Trawling in Hawaiian Area

BCF's research vessel "Townsend Cromwell" sailed from Kewalo Basin on October 25 for a 3-week research cruise to determine whether commercial stocks of bottom fishes and invertebrates can be found off the Hawaiian Islands. The vessel concentrated on the Maui-Molokai area. The University of Hawaii was cooperating in the cruise.

The Cromwell was using commercial-type bottom trawls provided by BCF's Exploratory Fishing and Gear Research Base, Seattle, Wash. Heater Heyamoto and Robert P. Larson of the Seattle base were aboard for the first days of trawling.

Little Known About Fishery Resources

The grounds trawled lie at depths of 600 to 2,400 feet off the islands. John C. Marr, BCF Area Director, said: "Almost nothing is known about the resources of the sea floor around the islands. Much of our scanty information comes from the voyage of the Government research vessel, "Albatross," about 70 years ago. Since that time, there have been a few sporadic attempts at commercial bottom or near-bottom trawling but none was successful."

Modern trawling depends heavily on echo-sounding equipment, which locates areas where the ocean floor is smooth and allows the ship to avoid rocky areas that tear the trawls. The Townsend Cromwell is equipped with echo-sounders and sensitive sonar.

Marr added: "Around the main islands in the Hawaiian chain, there are 4,330 square nautical miles of grounds we believe may be trawlable. There are about 6,200 square nautical miles of potentially trawlable grounds around the Leeward Islands. If the yield of all these grounds were about 1½ tons a year then Hawaii might be able to establish an industry providing more than 15,000 tons of valuable marine products a year, or more than twice as much as all the current Hawaiian fisheries provide.

"What we hope to find, among other things, is shrimp. There is some evidence that there may be stocks of shrimps on the bottom off Hawaii. Deep-sea fishes sometimes have stomachs full of shrimp. In the Gulf Coast States, shrimp commands a price of about $900 a ton to the fishermen. In addition to shrimp, there may be stocks of valuable bottom fishes."

The bottom trawling was directed by Richard S. Shomura, Chief of the Fishery Development Program at BCF's Honolulu Laboratory. Shomura says it will take several voyages to assess the true potential of the Hawaiian area.

Typhoon Cuts Fish Kill by Grounded Tanker's Oil

Scientists of BCF's Honolulu Biological Laboratory recently assessed damages to fish fauna and invertebrates caused by the grounding of the tanker "R. C. Stover" at Wake Island. The damage was slight, probably because tanker carried mostly jet fuel, aviation gas, and diesel fuel rather than bunker oil. The kill of marine life was about 2 tons--mostly fishes from the shallow reef flats. The scientists detected no harm to the thousands of sea birds that nest on the island.

Another factor that kept fish kill low was typhoon Sarah, which struck shortly after the Stover was grounded. She blew away the oil and partially scoured the oil-fouled parts of the island.

Auction Prices for Regular Sealskins Drop

At the semiannual fur seal auction at Greenville, South Carolina, September 28-29, 21,622 sealskins were sold for the account of the U. S. Government. Prices for regular sealskins--dressed, dyed, machined, and finished--averaged $80.22, down 11 percent from the last sale. This continued the decline started in 1966 that has seen the average price fall from $127.99 in April 1966.

Faring much better was "Lakoda," a sheared product offered in smaller quantities. Other furs, particularly mink, have suffered similar declines. A new color called "Sandrift" brought an average $91.77 per skin.

The auction produced $1,153,000 for the U. S. Government. If prices are not higher at the spring 1968 sale, income for fiscal 1968 will be less than expenditures. If that happens, no payment will be made to Alaska in fiscal 1969 under provisions of the Alaska Statehood Act.

Royal-Red Shrimp Seen from "Aluminaut"

BCF staff from Brunswick, Georgia, and Pascagoula, Mississippi, went down in the chartered sub Aluminaut to see the deepwater royal-red shrimp grounds off Cape Kennedy, Florida. Ten years ago, BCF discovered commercial concentrations of shrimp in this area at 175 to 210 fathoms. Since then there has been a small-scale commercial fishery here.

This experimental diving trip was the first direct observation of royal-red shrimp on these grounds. The shrimp were more abundant than the trawl catches indicate. Motion and still pictures are being analyzed for clues that would lead to gear modification to increase its efficiency.

Also, dives were made out of Miami, at the edge of the Gulf Stream, to 1,600 feet to observe plankton and other midwater forms, and on calico scallop grounds off north Florida.

Ketchikan Studies Shrimp Flavor Retention

BCF's Ketchikan Technological Laboratory (Alaska) has extended its nucleotide studies to include commercial species of Alaskan shrimp during ice holding. Certain nucleotides have flavor-enhancement properties. By studying their degradation during handling and processing, the researchers hope to be able to specify conditions that will retain as much flavor as possible.

Dr. Roy Porter traveled to Wrangell to collect pink shrimp and side stripe shrimp aboard the trawler "Thomas E." Time zero samples were peeled directly from the net and frozen immediately in powdered dry ice. About 50 pounds of each species were placed in ice and transported to Ketchikan for periodic sampling during ice storage. These samples will be compared with similar samples of spot shrimp collected earlier at Ketchikan.

Expands Markets by Air Shipping Fresh Fish

BCF marketing personnel have been working for several months with airline freight companies and midwestern food chains to expand markets for fresh domestic fishery products. Fresh fish from the east and west coasts have been flown to stores in Chicago, Milwaukee and Madison. The early results have been encouraging. Other supermarket chains in the midwest are watching the fresh fish market closely.

U. S. Overseas Trade Shows Will Display Fishery Products

BCF's Office of International Trade Promotion, Branch of Marketing, will take part in two overseas trade fairs displaying fish for use in institutions: catering services, restaurants, hospitals, government agencies, homes for the aged, etc.

The shows will be held at Hotelympia, London, Jan. 9-18, and at the U. S. Trade Center, Milan, Italy, Jan. 20-27.

All processors of fish for institutional use are invited to display their products. Floor space and adequate freezing space will be free. Fishery items must be produced or processed in the U. S.

Dr. Longhurst Named Head of BCF La Jolla Center

Dr. Alan R. Longhurst is the new director of BCF's Fishery-Oceanography Center in La Jolla, Calif. He succeeds Dr. Elbert H. Ahlstrom, who takes up his research on larval fishes at the center.

Fig. 1 - Dr. Elbert H. Ahlstrom (standing) congratulates his successor, Dr. Alan R. Longhurst, as director of BCF's Fishery-Oceanography Center in La Jolla, Calif. (Photo: "San Diego Union")

Dr. Longhurst was associated with the University of California's Scripps Institution of Oceanography since 1963. He served recently as coordinator for EASTROPAC, the oceanographic study of the eastern tropical Pacific conducted by several agencies.

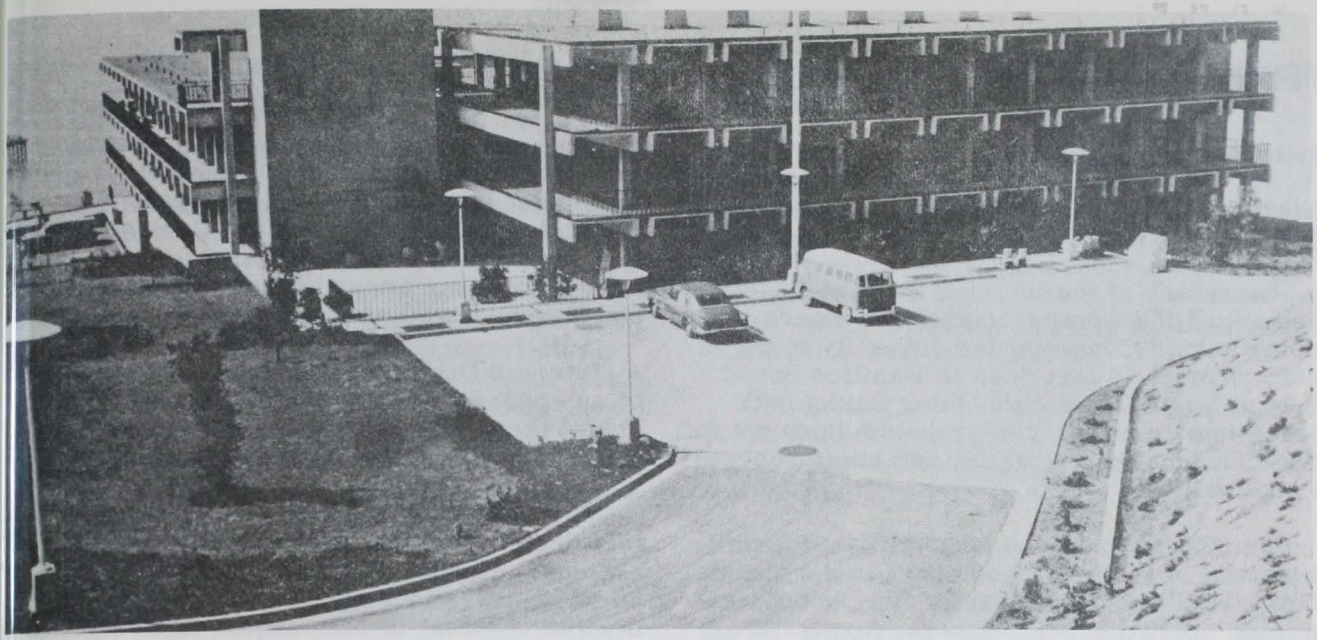


Fig. 2 - Fishery-Oceanography Center in La Jolla, Calif.

La Jolla Is Important Research Center

The Fishery-Oceanography Center is a center for West Coast fishery and oceanographic research. It studies the tunas of the eastern Pacific, and the anchovy, sardine, and jack mackerel resources of the California Current.

Dr. Longhurst, a native of England, received his doctorate in 1954 from the University of London's Bedford College. Before joining Scripps, he did fishery research and held administrative posts in Africa and New Zealand. He has written 40 papers on fisheries and oceanography.

Dr. Ahlstrom Honored

About a year ago, Dr. Ahlstrom was promoted to Senior Scientist, one of six in BCF, but remained as director of La Jolla until Dr. Longhurst was named his successor.

BCF originated the position of Senior Scientist a decade ago and has appointed men of excellent scientific achievement. The appointees are relieved of administrative duties and permitted to devote themselves to their special fields.

Dr. Ahlstrom's Achievements

In 1959, BCF picked one of Dr. Ahlstrom's papers as the Bureau's outstanding scientific publication. In 1965, Interior Department gave him its highest award--the Distinguished Service Award. He is an internationally recognized authority on the egg and larvae stages of marine fishes and has represented the U.S. in this field at scientific meetings around the world. He discovered the distribution and abundance of young Pacific hake, which led to the start of a new fishery in the Northwest. His research pointed the way to the discovery that the Pacific anchovy has replaced--and may be more numerous than--the sardine off California.

Dr. Ahlstrom will publish the findings of his long and extensive study of the young stages of marine fishes. The publications will mirror the fishery resources of the California Current System. Because many major groups of fishes in the world have their equivalents in the California Current, Dr. Ahlstrom's work will contribute a great deal to tomorrow's oceanographers.

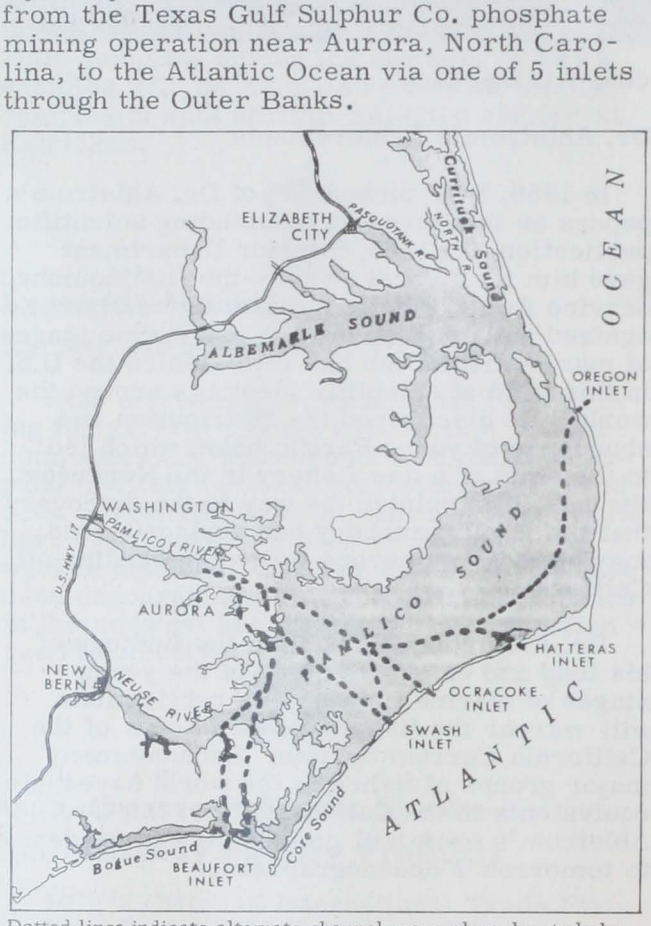
FEDERAL ACTIONS

Interior Department

UDALL OPPOSES PAMLICO
SOUND CHANNEL PROPOSAL

Secretary of the Interior Stewart L. Udall has urged the Army Corps of Engineers to delay asking Congress for authority to dig a ship channel 40 feet deep in Pamlico Sound behind North Carolina's Outer Banks until scientists can study the probable damages to the abundant fish, wildlife, and other recreational values.

The Corps has been conducting a feasibility study of 7 alternate routes for the channel from the Texas Gulf Sulphur Co. phosphate mining operation near Aurora, North Carolina, to the Atlantic Ocean via one of 5 inlets through the Outer Banks.



Dotted lines indicate alternate channel proposals under study by Corps of Engineers.

Secretary Udall said his Department understands the Corps now plans to ask Congress to authorize construction before the impact on the natural resources has been adequately evaluated. He added:

"We are compelled to take a position in opposition to the proposed channel project until adequate studies and analyses can be conducted which will conclusively demonstrate that the project can be constructed and operated in such a manner that natural resources can be preserved and protected."

Interior Department, recognizing the scope of an appraisal of the effects, has offered to assist the Corps of Engineers in organizing and conducting the necessary studies.

Open waters in Pamlico Sound reach 20-foot depths, less than half needed for proposed channel. The 7 alternate routes range from 50 to 97 miles in length. Construction would involve removal of 120 million to 233 million cubic yards of spoil materials from channel areas of 3,800 to 7,300 acres. Spoil disposal easement sites would range from 19,800 acres to 35,300 acres. A variety of jetties and breakwater structures would be needed to stabilize the inlets and reduce channel shoaling. Project construction would require about 4 years and annual maintenance dredging. The 5 inlets under consideration for the channel's ocean end are Oregon, Hatteras, Ocracoke, Swash, and Beaufort. Except for Beaufort Inlet, all are through Cape Hatteras National Seashore or Cape Lookout National Seashore, both administered by Interior's National Park Service.

Secretary Udall said the Bureau of Sport Fisheries and Wildlife advised him:

"Evaluation of the probable effects of the seven proposed channel routes on fish and wildlife resources is impractical owing to the limited amount of available engineering, hydrological, and biological data. However, it is obvious from the magnitude of the proposed project that sizable damages could occur."

Secretary Udall said the Bureau's preliminary estimates show initial channel construction will destroy fish and wildlife habitat and sessile (attached by base) organisms in areas of channelization and spoil deposition. These damaged areas will range from 22,000 to 42,600 acres, depending on route selected. Potentially greater damages can result from alteration of existing salinities, currents, and turbidity levels. These factors pla

sizable roles in governing the ecology of the Pamlico Sound estuarine complex. (Ecology is biology dealing with the mutual relations between organisms and their environment.)

In offering to help the Corps, Interior Department said:

"The ecology of this area is governed to a large degree by the fresh-water inflow from four major river systems mixing with salt water encroaching through the several inlets. To this are added a variety of bottom types, tidal and wind currents, nutrients from the upland, and many other elements. These basic ingredients contribute to the immense biological productivity of the area.

"The Pamlico-Albemarle Sound complex contains over 1.6 million acres, which represents about 90 percent of the total estuarine area in North Carolina. Many fishes, such as fluke (summer flounder), croaker, and weakfish (spotted sea trout) utilize the area as a nursery and migrate to other areas as distant as Massachusetts.

"A variety of wildlife species also contribute to the total fauna. The most evident of these are the flocks of migratory waterfowl that over-winter here. Multitudes of shore and marsh birds add to the variety and abundance. The plentiful food supply, diversity of habitats, and relative remoteness of the area combine to make it of outstanding value to aquatic birds and animals. Further importance is reflected by the fact that three State wildlife management area and four National wildlife refuges have been established in the area.

"Commercial and sport fishing and hunting do not represent the total natural value of these North Carolina estuaries and Outer Banks. Of possibly even greater value are the enormous recreational uses from boaters, campers, nature enthusiasts, swimmers, and others. The focal points for many of these activities are the Outer Banks areas of the existing Cape Hatteras National Seashore Area and the newly authorized Cape Lookout National Seashore Area. These areas possess outstanding scenic, historic and recreational values. Cape Hatteras National Seashore Area had 1,133,000 visitors in 1966 and comparable use is expected at Cape Lookout National Seashore Area when it is developed."

* * *

PROTECT MARINE LIFE ON CONTINENTAL SHELF

Three agencies in the Department of the Interior--Geological Survey (GS), Bureau of Land Management (BLM), and Fish and Wildlife Service (FWS)--have signed a memorandum of understanding to cooperate in minimizing possible damage to marine resources on the Outer Continental Shelf during mineral exploration and development.

The Outer Continental Shelf covers at least 850,000 square miles. Portions of it are exceptionally rich in petroleum, natural gas, and sulphur.

"As these resources are developed more fully, it becomes increasingly important for Interior to exercise its legal responsibility for safeguarding aquatic resources," Interior Secretary Udall said. "Experts from each agency will work together in the field and in Washington to see that the delicate ecological system that prevails on the Outer Continental Shelf is not harmed."

Under international convention, the Outer Continental Shelf extends at least to a depth of 656 feet (200 meters), or further if exploitation of the sea bed is possible.

Responsibilities of Agencies

The Geological Survey issues mineral exploration permits and supervises development and production of mineral resources on the Outer Continental Shelf. The Bureau of Land Management issues and administers leases on the Shelf. The Fish and Wildlife Service is responsible for the conservation and management of the commercial and sport fishery resources. It provides advice and assistance on aquatic resources to Survey and BLM.

Survey and BLM will provide FWS with information on marine geophysical explorations supervised by Survey and will give FWS a chance to recommend restrictions in such permits and leases for mineral development.

FWS also may observe geophysical explorations and recommend corrective action if it appears that undue damage to living resources may result.

FWS also will assist Survey and BLM by providing results of periodic studies on

problems of the impact of mineral exploration and exploitation on the commercial and sport fishery resources; and information on aquatic life which relates directly or indirectly to administration of the Outer Continental Shelf lands by BLM or Survey.

The Outer Continental Shelf is an area more than three times that of Texas: 140,000 square miles off the Atlantic Coast, 135,000 off the Gulf Coast, 25,000 square miles off the Pacific, and 550,000 square miles off Alaska.

Census Bureau

FISH INCLUDED IN SURVEY OF CANNED FOODS STOCKS

An annual survey of inventories covering distributors' stocks of specified canned foods, including fish, as of December 31, 1967, is planned by the U. S. Bureau of the Census. This is the usual survey covering 30 canned and bottled products, including vegetables, fruits, juices, and fish. The survey would begin not earlier than 30 days after the October 20th publication of the notice in the "Federal Register." This survey and previous ones provide the only continuing source of information on stocks of specified canned foods held by wholesalers--and in warehouses of retail multiunit organizations.

Scientific Sampling of Firms

Reports will not be required from all firms. They will be limited to a scientifically selected sample of wholesalers and retail multiunit organizations handling canned foods. This should provide year-end inventories of the items with measurable reliability. These stocks will be measured in terms of actual cases, with separate data requested for "all sizes smaller than No. 10" and for "sizes No. 10 or larger." (In addition, multiunit firms reporting separately by establishment will be requested to update list of their establishments maintaining canned food stocks.)