FISH-FLOUR COOKIES AT U.N. A U.N. staff member gives Mark Allen of United Kingdom a taste. Arthur Goldschmidt, a U.S. delegate, brought the cookies and protein-enriched soft drinks.

The Economic and Social Council, discussing the world's protein shortage, stressed that protein was needed most by growing children.

A report before the Council warns that lack of protein threatens 300 million children with retarded growth and possible mental damage. ("The New York Times")

U.S. FISHERMEN LANDED ABOUT 4.1 BILLION POUNDS IN 1968

In 1968, the fishermen of the United States landed approximately 4.1 billion pounds with an exvessel value of about $442 million--an increase of about 80 million pounds and $5 million above 1967. These are preliminary figures.

The catch of fish used as food decreased; the catch of fish for industrial products increased.

Exvessel prices for most species increased, but there were notable exceptions as a result of foreign competition.

The total U.S. supply of fish and shellfish set a record because imports increased significantly.

MENHADEN

Landings of menhaden increased more than 180 million pounds. This reversed the downward trend of 1967, when the 1.2-billion-pound catch was the lowest since 1951. However, landings did not reach those of the peak period, 1959-62, when over 2 billion pounds were taken each year. The greatest increase in 1968 took place in the Gulf; it was followed by the Chesapeake and Middle Atlantic States. Menhaden were nearly one-third of total landings of fish and shellfish in 1968.

SHRIMP

The most valuable U.S. fishery--shrimp--grew stronger. Demand was relentless and prices rose through 1968. The catch topped the 1967 record by a small percentage. This resulted primarily from Alaska's expanding fishery and, to a lesser extent, Maine's.

The catch from the Gulf of Mexico, the most important shrimping area, decreased from 1967's high volume. The value of shrimp to fishermen, much higher than that of any other species, was about $100 million--a drop of about 3% from 1967. Production of canned and breaded shrimp increased. The canned pack was the greatest since the 1930s.

ALASKA'S SALMON

The Alaskan salmon fisheries recovered from the disasterously low production in 1967. The canned pack was nearly doubled. The catch rose over 100 million to about 240 million pounds. Most of this resulted from the catch of more pink salmon. Because the salmon catch in Washington and Oregon fell, the overall increase in U.S. salmon landings rose only 80 million pounds in 1968.

TUNA

The tuna fleet, exclusive of the Puerto Rican part, caught 30-35 million fewer pounds in 1968 than in 1967. The exvessel price increased slightly over the 1967 price, so overall value of the landings to fishermen went up.

The catch of albacore and yellowfin was higher, skipjack's was cut in half, and that of bluefin was at about the 1967 level. Albacore were in good supply in the north Pacific Ocean. Landings in Oregon set a State record.

The U.S. canned pack of tuna (including Puerto Rico's) processed from domestic landings and the catch by foreign nationals was about at the 1967 production level of 20 million standard cases.

PACIFIC HALIBUT

The Pacific halibut fisheries fared poorly. Although frozen inventories in early 1968 were not excessive, competition from imported fish products created problems. Compared with the 1967 period, lower prices for Pacific halibut prevailed throughout virtually the entire fishing season. Exvessel prices were lower in May, when the fishing season in major waters opened, and fewer vessels participated. Although prices increased during latter 1968, the fishing season was just about over.

The U.S. and Canadian catch from the convention area was around 49 million pounds (dressed weight). This was 9.5 million pounds fewer than the quota and the lowest since 1935.

The Canadian catch was 59 percent, the highest proportion taken by the Canadian fleet in this century.

U.S. landings of approximately 20 million pounds (equal to about 27 million pounds live weight) were more than 30 percent less than in 1967. They were the lowest since the recording of annual landings data began in 1915.

NEW ENGLAND LANDINGS

Compared with 1967, 1968 landings at principal New England ports declined less than 1 percent in volume--and rose 9% in value. The high exvessel value of sea scallops accounted for most of the increase in total value.

The catches of important species, except sea herring, that increased were: flounders, whiting (silver hake), and cod. Combined, these increased over 16 million pounds and $1 million. Of the 3, cod alone dropped in exvessel price--down 13%. The other volume species, haddock and ocean perch, fell 28% and 12% in quantity, and 15% and 13% percent in value. The catch of yellowtail, the most important species of flounder, increased 23% and its value 20%. Landings of fish for industrial use in New England were up 10% in volume but down 1% in value. The canned pack of Maine sardines, from domestic and imported sea herring, was the greatest since 1954; it was over 200,000 cases above the 1967 pack of $1\frac{1}{4}$ million standard cases.

ALASKA'S SEA SCALLOPS

The development of Alaska's sea scallop fishery was noteworthy. Throughout most of 1967, BCF, State agencies, and industry conducted experimental fishing. Then, in January 1968, commercial production began. By October, 8 vessels were fishing: 4 converted vessels from the northwest Pacific Coast, and 4 transfers from New Bedford, Mass.

Sea-scallop landings topped 2 million pounds of edible meats with an exvessel value of over $2 million. A record trip was set for all ports when one vessel on an 11-day trip landed 68,000 pounds. Despite a sea-scallop scarcity in Atlantic fishing areas, principally off New England, Middle Atlantic and Chesapeake States, landings exceeded 1967's low production of 10 million pounds of edible meats. High prices were principally responsible for the higher catch: average exvessel price soared over 50% above 1967's. At New Bedford, Mass., the main Atlantic Coast port, converted and new vessels entering the scallop fishery increased the fleet to at least 44 by year's end. This was the largest fleet fishing sea scallops in recent years. Also, some boats at other Atlantic Coast ports, as far south as North Carolina, took part.

ALASKA'S KING CRABS

King crabs were scarce and landings were only about 85 million pounds. This species, fished extensively in recent years, peaked in 1966 at 159 million pounds. The 1967 landings were 128 million pounds. Late in 1968, exvessel prices increased over 250 percent above those of a year earlier. These prices were a strong incentive for increased fishing effort.

DUNGENESS CRABS

Dungeness crab production set a recordof nearly 50 million pounds, more than 12 million above 1967 and about 4 million pounds above the 1948 record. Because king crabs were scarce, some vessels shifted to the Dungeness crab fishery. This produced a record Alaskan catch of nearly 16 million pounds, about 3 million above the previous high in 1964.

BLUE CRABS

Blue-crab landings were far fewer and prices substantially higher than in 1967. Blue crabs were scarce in the Atlantic coastal area. Major catch decreases occurred in the normally high-productive Chesapeake Bay area. Because of the high exvessel price, fishing increased in virtually all areas. Although overall catch fell about 30%, its value to fishermen was near the $8 million they had received in 1967.

GREAT LAKES

In 1967, for the first time in the Great Lakes fisheries, coho salmon (1.5 million pounds) taken from Lake Michigan were sold commercially. The 1968 commercial catch was slightly greater.

FOREIGN TRADE

Imports of fishery products--in volume and value--set records in 1968. The declared value was about $795 million. In 1967, the figure was $709 million. In 1966, the previous high year, it was $720 million.

Fish meal, a valuable ingredient in animal feed, comprises the bulk of nonhuman food imported. Its imports increased more than 150,000 tons above 1967's record of 651,000 tons. Greater shipments from Peru and, to a lesser extent, Chile, were responsible.

The quantity of imported fishery products for human food was nearly 1.7 billion pounds -- up from 1.5 billion pounds in 1967 and 1.6 billion pounds in 1966. Nearly all commodities gained. Among these were all species of fresh and frozen marine and fresh-water fish, including fillets and blocks, frozen tuna, fresh and frozen northern and spiny lobster, and canned sardines. Canned tuna was up slightly. Shrimp products were imported at about the 1967 high volume, but the percentage of raw peeled and canned meats increased, while raw, shell on, headless decreased. Receipts declined for such canned products as bonito or yellowtail, oyster meats, crabmeat, and lobster meat.

Exports of domestic fishery products for human food were down over 20 million pounds from 108 million pounds exported in 1967 and 110 million pounds in 1966. Salmon, principally canned but also fresh and frozen, fell most. Canned squid shipments were about the same, and canned sardines were up only slightly from 1967.

Exports of menhaden oil through September 1968 dropped to about half the quantity shipped from U.S. ports in January-September 1967. Exports of menhaden oil in 1967 were 76 million pounds.

UNITED STATES

State of U.S. Fisheries Outlined by BCF Director

Speaking at "Fish Expo" in Boston, Mass., on October 16, H. E. Crowther, BCF Director, outlined "The State of Our Fisheries." The text follows:

Some of us in the Bureau of Commercial Fisheries are often asked by the press to comment briefly on the condition of the U.S. fishing industry. I am concerned each time this is asked of me because it is difficult to give a precise answer.

Our so-called domestic fishing industry is not a single entity. It is made up of as many segments as there are fisheries--each an industry within itself. Even the segments have parts or sectors, such as the producers (fishermen and boatowners), the processors, and the distributors. Also, processors and sellers of imported products are part of the U.S. fishing industry. Each segment and part has its own interests and problems and these may differ widely. The present condition of our fisheries or their sectors varies from record prosperity to severe depression.

During the past year many writers have pointed out repeatedly that the United States has fallen from second to sixth place in world fishery production. This fact usually is cited as if it were a disgrace for the United States to be in this position. In my opinion, our rank in world fisheries production is much less important than the economic condition of our fisheries. If it could be said that our domestic fishing industry had found it economically possible to expand its production to supply the U.S. demand for fishery products, I would be satisfied, even if we ranked 25th as a fisheries nation.

Unfortunately, we have not expanded our production. We have less than 7 percent of the world population, but we consume about 11 percent of world fishery production. Our per capita utilization of fish has increased almost 100 percent since 1957. We have the most attractive fishery market in the world, yet we supply less than 30 percent of the U.S. demand from the catch of our vessels. Of even more concern is the apparent trend in production. Our domestic catch has dropped nearly 20 percent by weight since 1960. Yet, under these conditions some of our fisheries have flourished. This is further evidence that our fisheries are separate industries. Let us take a look at the present condition in some of our established fisheries from the point of view of the producer and the processor.

PRODUCER

Here in New England some of our major segments, such as the haddock fishery, find it difficult to operate at a profit. The resource on Georges Bank, on which the industry depends heavily, has suffered from a series of years of poor spawning survival. The last successful spawning (1963) which could have carried the haddock industry through the later years of poor survival was hit hard by the massive Soviet fleet just when the fish were large enough to be caught. In the market place, as well as on the fishing grounds, New England producers are facing severe competition from imported fishery products and from domestic food products.

In the Middle and South Atlantic area in 1967, the menhaden industry experienced one of its poorest years. A severe resource problem caused by poor survival due to unknown environmental causes or overfishing, or both, tied up vessels and closed plants. In addition to having limited quantities of fishmeal to sell, menhaden producers faced a market flooded with imported meal and a severely depressed market for oil.

The Gulf of Mexico brings a completely different story. For the first time in history a U.S. fishery (for shrimp) brought $100 million to fishermen. The year 1967 was the best ever for our shrimp industry. Not only was the resource in good shape, but the market continued to expand in spite of relatively high prices.

For the tuna industry of the Pacific Southwest, 1967 was one of the most successful years on record. Although the yellowfin tuna fishing season was shortened by the regulations imposed by the Inter-American Tropical Tuna Commission, the U.S. industry succeeded in landing over 71,000 tons of yellowfin tuna and 60,000 tons of skipjack. The tuna industry is an example of a segment of our fishery which overcame its foreign competition through improved efficiency.

In the Pacific Northwest, in 1967, the halibut industry began to feel the effect of incidental catches of halibut by foreign and domestic trawlers. Although the trawlers were seeking other species, the massive volume of their catches, especially by the foreign vessels, meant that millions of young halibut were caught and did not survive. Since halibut do not enter the longline fishery until they are 8 or 9 years old, the effect of the incidental catch was delayed in appearing. Along with reduced catches, prices of halibut were down, so this industry did not have a successful year in 1967. No improvement is evident thus far in 1968.

In Alaska, 1967 produced one of the smallest packs in the history of the Alaska salmon fishery through the unique and unfortunate coincidence of low cyclic abundance of all species--and in virtually all districts. But 1968 was much better because of a near record run of pink salmon which is expected to produce a pack of nearly 2,000,000 cases, compared to a meager yield of 345,000 cases in 1967.

In the Great Lakes area, we saw the inexpensive alewife dominate the fisheries, while in other inland areas, the remarkable catfish farming industry continued its rapid growth.

While our older, established fisheries were experiencing success mixed with failure, some new fisheries appeared, and other comparatively new ones expanded. The new Alaska scallop fishery continues to attract attention because of the high rate of catch and the price of the product. Catches of more than 45,000 pounds of shucked scallops in 10 days--at a landed price of over $1 per pound--would be attractive to nearly anyone. Whether the resource is large enough to sustain this level of fishing is the question scientists are asking.

Another relatively new scallop resource--the calico scallop in the South Atlantic--continues to look promising. It may turn out to be a resource equal to that of shrimp in the Gulf and South Atlantic.

A large hake resource in the Pacific Northwest and an untapped thread herring population in the Gulf of Mexico are waiting to be harvested.

Off the coast of Maine, the new shrimp fishery continues to produce and show promise. The tanner crab fishery in Alaska continues to expand to make up for the reduced abundance of king crab.

These and other new fisheries have contributed to the total U.S. catch. Had it not been for their development, U.S. production would have declined even more. Over the recorded history of U.S. fisheries, the catch has been maintained only by constantly seeking new species or new stocks. Resource after resource has figured prominently in the catch and later dropped to a position of minor importance. Thus, the U.S. fisheries have barely held their own by shifting to new resources as the yield of older fisheries diminished. Yet, while our catches have remained static or declined over the past 10 years, foreign vessels have taken more and more fish off our coasts. In 1967, the foreign catch in waters adjacent to our coasts was estimated to be about 7 billion pounds, which is more than the total U.S. catch.

The established and new fisheries referred to are composed of only a few of the species which make up the total so-called U.S. fishing industry, but they represent a fair cross-section. From these few examples I think it should be clear that it is impossible to generalize regarding the condition of our industry.

On the other hand, although segments of our fisheries vary greatly in many respects, some of the problems they face are identical:

1. Many are feeling the effects of declining resources due, at least in part, to foreign competition.

2. A number are plagued with resource failures due to problems which we as a nation have brought on ourselves. Pollution, destruction of estuaries, and overfishing are taking their toll of some of our fishery resources.

3. Some are finding it increasingly difficult to compete with imported fishery products as well as a variety of attractive protein products from other domestic sources.

How can we solve these major problems?

1. The problem of foreign competition for the resource is difficult. However, in the near future we must find a solution. By some means, some type of international management system must be put into effect, and the special interests which coastal nations have in resources off their coasts must be protected. Many people are at work trying to find a solution to this problem.

2. Resource failures, even within our own waters, will never be eliminated completely as long as we harvest wild species which depend on favorable oceanographic conditions for their survival. But we should be able to prevent resource destruction caused by the unwise acts of man. When our public becomes fully aware of and is sufficiently concerned about the effects of pollution and the destruction of estuarine areas, action will be taken. Whether this will come soon enough to save many species of fish is anyone's guess.

3. Foreign competition in some of our markets can be met by only two methods: (a) some form of assistance to the domestic industry to compensate for subsidies by foreign governments and/or (b) lowering the cost of producing domestic fishery products. Possible means of reducing costs center around mechanization of locating, harvesting, and processing procedures--and elimination of economic barriers, such as illogical regulations, which hamper the production of domestic fishery products.

PROCESSOR

In common with the producer, the processing segment of our industry has no single answer to its problems. However, processors are generally in much better shape than producers. Their position is much more flexible in regard to supply of raw material and in prices paid for fish and received for their finished products. But even within the same fishery, some processors are enjoying profitable operations and find ready markets for their products at acceptable prices, while others find it difficult to move their products at a profit.

Some processors operate modern, efficient, and well-managed plants that are comparable with the best in any other food industry in the United States. They produce products of a quality anyone would be proud of. Other processors of fishery products cannot boast of the same efficiency, and the quality of their products leaves much to be desired. In many cases, quality is sacrificed for profit. This type processor tends to tarnish the image of the entire fishing industry, weakens the demand for fishery products in general, and eventually puts himself out of business.

Has there been any improvement in quality over the past few years? I am sure there has, for more and more companies are producing better products. But there are still inferior products on the market. Unfortunately, even a small percentage of poor quality products hurts the entire industry, for it creates uncertainty in the mind of the consumer. Eliminate this uncertainty, and we will see per-capita consumption rise. Perhaps this can be done through development and promotion of an identification shield used by processors dedicated to quality. However, I am afraid that the only certain method is through mandatory inspection.

Millions of pounds of fish are inspected each year under the Bureau's (BCF) voluntary inspection program, paid for by processors packing inspected products. Fishery products produced by these companies are of high quality when they leave the plants. However, the program has one shortcoming--it cannot be used by the entire industry. For only those plants producing a substantial volume can afford the inspection program. So far, we have tried unsuccessfully to find a formula which would make the voluntary inspection program available to small plants. We are still trying.

If mandatory inspection of fish and fishery products should come to the United States, and most of us believe it will, we can expect hardships for some companies and some vessel owners. But, if the mandatory inspection program is a reasonable one, and the industry can weather the first few years of its operation, there is no doubt that the entire industry will benefit.

At this point, let me mention that some few fishing vessels and some few processing plants are not the only ones responsible for quality loss. I am disturbed when I see how fresh or frozen seafood is handled in some distribution outlets. When I see fishery products stored at temperatures far too high to maintain proper quality, I think of the quality control that went into it at the plant, only to be neutralized by carelessness at the point of distribution. Any program designed to insure wholesome and high-quality products for the consumer must include all steps in product handling from the point of capture until it is in the hands of the consumer.

NEW PRODUCTS

When we look at the price and the demand for fishery products today, we find an unusual situation. Some luxury products, such as king crab and shrimp, are enjoying unprecedented demand. Even with substantial price increases, demand exceeds supply. But, while some luxury products enjoy this success, our "bread and butter" products such as groundfish are in trouble. There have been many explanations for this. Perhaps it is the quality, the flavor, the effect of promotion, the ease of preparation, or the desire of the consumer for something new in food that has influenced demand. Perhaps all of these have had an effect. Whatever the reason, I think this gives us a clue for future success. In my opinion, one of the greatest potentials in the industry is product development. Not just a slight modification, but a new product developed from our low-priced fish, such as cod and whiting, or from some underutilized species, such as herring and hake. Some will say it is not possible. I do not agree, for all of these species have the basic ingredients needed for an excellent food. The protein of such fish is unequaled and the texture is desirable.

I predict that in time a completely new fishery product will be developed--one that is such a "natural" that it will be accepted immediately. In this era of unbelievable technical developments, who can say that this is impossible? There is no doubt in my mind that it is possible! In my opinion, a highly acceptable product is waiting to be developed, and when it comes along we will say, "Why didn't I think of it?"

Who will develop these products? So far Government has stayed out of this type of research, except by special invitation from a specific segment of an industry facing a particular problem. If the fishing industry can do the job, it should. If industry cannot handle it alone, perhaps it should call the Government for assistance. As far as my position as Director of the Bureau of Commercial Fisheries will permit me to do so, I offer a proposal. We are prepared to join you in seeking new types of fishery products--products which will allow us to upgrade some of our lower-priced species or use some of the unutilized raw materials off our coasts. We will join you in efforts to produce a luxury-type food product that will be in demand. By join, I mean a joint effort between industry and Bureau staff. Together, we have an excellent chance for success.

One final thought. I am annoyed when I hear the "fishing industry" referred to as a sick industry. It is true that some segments are in trouble, in many instances through no fault of their own. But, as I mentioned earlier, some parts of our industry are progressive and profitable. It is possible that our entire industry could be upgraded if we could properly identify the problems it is facing, and then propose effective solutions. To do this, the Bureau is suggesting a Master Plan for Commercial Fisheries, which we hope would become a joint effort of industry (producers and processors), States, Universities, the Federal Government, and any organization interested in fisheries. Soon we will arrange meetings with all groups who have an interest in a particular fishery (such as the New England groundfish) to attempt to reach agreement on program priorities. The plan is too complex to explain in the limited time available, but it will be published soon and described at future meetings. By seeking the advice of those who have worked in or with each segment and part of our industry, we should be able to make real progress in charting our course for the future.

Plan to Overcome World Hunger Outlined by 'American Assembly'

The world's rapidly increasing population will reach 6 to 7 billion by the year 2000. Breakthroughs in food technology--the development of new, high-yield seeds, for example--make it possible to feed such a large population. But serious food shortages in the remaining years of this century can be prevented only if 2 decisive forces are brought to bear simultaneously on the problem: reduced population growth and increased food production in the world's hungry nations.

This was the theme of the 34th American Assembly, which met at Arden House, Harriman, New York, Oct. 31-Nov. 3, 1968.

The American Assembly, an affiliate of Columbia University, was established by Dwight D. Eisenhower in 1950. It conducts nonpartiasn meetings and publishes books illuminating important issues of U.S. policy. The latest Assembly was attended by 73 persons from agriculture, law, business, government, education, communications, the military, the clergy, and other fields. The participants included some of the Nation's leading authorities on food production and population problems. They reached general agreement on a final report.

Their Report Summarized

The following is a summary of their report:

Because death rates have declined dramatically--without corresponding drops in birth rates--the world's population will double by 2000 A.D. More food, especially more protein, will be needed to provide nutritionally adequate diets. In the next 25-30 years, the developing nations will need at least a 4% annual increase in food production.

There is hope that the population by 2000 A.D. can be fed with present technology and continuing research. "But the necessary widespread and effective application of this technology will require major economic, social and political changes in developing countries, and a much larger scale of effort. Such efforts must be accompanied by continuing, concerted and expanded assistance from advanced nations."

Probably for the remainder of the century, most of the increased food eaten by the world's population will come from farm land; most of the food needed by nations with booming populations will come from their own agricultural resources.

The essential elements to eliminate world hunger are:

- "Effective measures to reduce population growth;
- Effective measures to increase food production in hungry nations, and to assure its effective distribution to all persons in the population of each country, with interim food aid from advanced countries;
- Economic, political and social changes in developing countries designed to promote total economic development, without which the above cannot be achieved; and
- Substantial assistance toward all these objectives by the advanced countries."

Recognizing these objectives, the 34th American Assembly went on to emphasize that "effective action is urgently needed now." It recommended the following:

- Programs to reduce population growth should be expanded immediately. Only the success of these and other programs can prevent civil disorder and political collapse. Reductions in population growth rate "are as important in fostering economic and human development generally as they are in reducing the strain on national food supplies."

The present birth-control programs in developing nations should be broadened and new programs begun that emphasize voluntary family planning. The UN and its agencies should assume leadership in these efforts.

- It is urgent that national and international research efforts be coordinated and expanded. These must focus on the obstacles to increases in productivity and profitability of most crop and animal species in most developing countries.

• The advanced nations should help the developing nations to achieve large increases in:

1. Availability and use of "inputs" into production--improved crop varieties, particularly with higher protein content and quality, water, arable land, and fertilizer, pesticides, and machinery produced locally where possible;

2. "Protein consumption from low cost sources such as fish and oil seeds, as well as livestock and poultry";

3. Enrichment of foods with essential minerals and chemically produced nutrients (vitamins & amino acids);

4. Government and private investment in marketing and processing systems to move food from farm to all countries.

5. Private and public communication media to inform producers and consumers.

• To achieve at least the 4% annual increase in food production, the amount of money (and its effectiveness) invested in developing the economy should be increased greatly.

• The food aid to hungry nations should not retard their agricultural development. Emphasis in the future should be on improving nutrition through more protein and sound economic growth--and less on the amount of food and surplus crop disposal.

• International trade and monetary policies should be changed to foster economic growth in all countries. They should enable developing nations to earn foreign exchange through trade rather than through grants and loans.

• Qualified technical personnel are needed in food production, marketing, and distribution to improve nutrition. "In the long run, first-rate national institutions in each country should meet these needs." U.S. universities can make a unique contribution.

• Hungry nations should provide strong incentives for farmers to adopt production-increasing techniques—incentives such as price guarantees, subsidies, improved seeds, fertilizer, and insecticides.

• To intensify farm production, local and foreign industry should supply critical goods and services.

• "The United States should press for international arrangements to insure that the oceans, outside reasonable territorial limits, be available for the use and benefit of all mankind. We acknowledge the importance of marine products as a source of protein and we urge continued and accelerated research on its economic feasibility and consumer acceptance. It should be emphasized, however, that for the remainder of this century at least, most of the increased food consumed by the world's people will come from farm land."

• The search for new plants and possible uses of wild animal life should be pushed. Playing useful roles are the research centers that are assembling and classifying valuable plant and animal genetic material useful to produce new and improved foods.

• Farmers of developing nations should be encouraged to set up cooperatives.

• All segments of the American public should be made aware of the accomplishments of U.S. foreign assistance--"and of the need for continuing and greatly enlarged commitments of resources to this purpose in the future."

• The U.S. and other nations should give more support to the United Nations and other international institutions in their dealings with agricultural development and population growth.

BCF Defines Continental Shelf Fishery Resources

BCF has identified certain shellfish, crustaceans, and sponges as resources of the U.S. Continental Shelf. These include: tanner, king, and stone crabs; red and pink abalone; Japanese abalone; queen conch; and 4 kinds of sponges.

H. E. Crowther, BCF director, notes that this list is the first of a series. The series will be based on studies being made by BCF scientists and will include other marine animals important to U.S. fisheries.

"Bartlett Act"

A 1964 Federal law, the "Bartlett Act," describes fishery resources of the Continental Shelf as those which, at the harvestable stage, "are immobile or are unable to move except in constant physical contact with the seabed or the subsoil of the Continental Shelf." Under the law, foreign-flag vessels may not take species so defined by the Secretary of the Interior from the U.S. Continental Shelf--except as provided by law or under international agreement to which the U.S. is a party. This definition also is used in the 1964 Geneva Convention on the Continental Shelf; the U.S. is a signatory.

Good Pacific Albacore Season Ends

A series of intense fall storms, some reaching down to southern California, high winds, and heavy seas forced almost all boats fishing albacore to return to their home ports by the end of October 1968, reports BCF La Jolla. Oregon set a new production record in 1968 with more than 41 million pounds of albacore landed--surpassing the 1967 record of 29 million pounds.

Total albacore production for Washington, Oregon, and California will be near 54-56 million pounds. This will make 1968 one of the top 4 years since 1940. Up to the last week in October, Oregon's share was about 76% of the total Pacific coast catch. This reflected a major geographic change in the center of albacore availability.

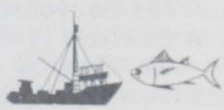
More Fishing Effort

Although the 1968 catch suggests near-record fishing conditions, this was not the case, say the La Jolla scientists. More fishing was done than in 1967--especially by halibut and salmon boats moving into the tuna fishery because they were having poor seasons. Albacore tuna schools were reported widely scattered this season with very few usual fishing "signs"--"few jumping or breezing fish, few porpoise, few birds, scarcity of bait-fish schools, etc."

Jigboats fared reasonably well, but baitboats reported trouble finding "school fish" that would take live bait. Live bait was scarce in the Pacific Northwest. Many baitboats resorted to trolling and chumming jig lines with frozen and salted bait--rather than make long runs to southern ports where live-bait supplies were adequate. Unfavorable wind and sea conditions also contributed to poor baitboat catches during most of the season, and seriously hampered purse-seining.

Change in Fishery

A price dispute early in the season probably cost the industry about 2 weeks of good fishing in late June and early July. All preseason survey evidence available to La Jolla's Fishery Forecasting group pointed to the earliest appearance of albacore tuna off southern California in the past 3 years. Also, the center of the fishery moved into Oregon-Washington waters. This forced most of the albacore fleet to unload in ports that did not have enough facilities to handle this year's catch. Unloading delays became a major problem during the season's peak in August. About 1 week of prime fishing time was lost to each boat discharging fares in northern ports. Also, while awaiting their turn to unload, some boats that rely on ice refrigeration lost much poundage to deterioration.



Lake Michigan Alewife Catch Declines

The expected 1968 commercial production of alewives from Lake Michigan is about 25 million pounds. It was 42 million pounds last year. Only half the pound nets used in 1967 were operated this year--and there was a corresponding 50 percent drop in pound-net catch.

The reduction in nets was caused by closing of 2 of the 3 fish-meal plants.

Commercial landings of alewives from Lake Michigan since the fishery began in 1956 were:

Year	Pounds	Year	Pounds
1956	400	1963	5,396,000
1957	220,000	1964	11,743,000
1958	1,356,000	1965	14,007,000
1959	1,264,000	1966	29,002,000
1960	2,370,000	1967	42,000,000
1961	3,195,000	1968	1/25,000,000
1962	4,742,000		

1/Estimated figure.

Deepwater Traps Yield Record Landing of New England Lobster

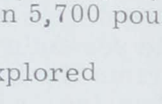
The "Homarus" recently landed more than 10,000 pounds of live lobsters at Gloucester, Mass., a record for a single trip. The trip lasted 8 days; one day's fishing time was lost to bad weather. Fishing began daily with first light and did not go beyond 4:30 p.m.; there was no night fishing.

The Homarus is operated by Deep Deep Ocean Products of Gloucester, which began fishing in May 1968. A second company vessel, the "Red Diamond," recently began fishing. Prior trips by company vessels had not landed more than 5,700 pounds.

"Delaware I" Explored

Successful gear trials and exploratory fishing conducted by BCF's Gloucester Exploratory Fishing Base in spring-summer 1968 demonstrated the harvesting possibilities of this type of fishery. One good experimental catch was made by BCF's Delaware I June 12 on the slope between Shallop and Veatch Canyons in 109 fathoms. Using a string of 11 pots, 89 lobsters weighing 158.5 pounds were taken in 24 hours, an average of 14.4 pounds per pot.

Experimental catches exceeding 4 pounds of lobsters per pot for fishing time of 24 hours or less have been made between 63 and 109 fathoms at various locations, primarily near heads of canyons along the outer edge of Georges Bank. Experimental rectangular trap gear used measured: (1) Type A--40"x 60"x18"; (2) Type B--36"x48"x18".



U.S. Agencies Will Act Quickly When Oil Is Spilled

President Johnson approved on Nov. 13, 1968, a Federal interagency plan to produce quick, united action when oil and other hazardous materials are spilled in U.S. waters. The plan was signed in September by the heads of Interior, Transportation, Defense, and Health, Education, and Welfare.

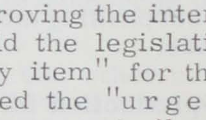
A National Joint Operations Center for Oil and Hazardous Materials Water Pollution Incidents has been set up at Coast Guard Headquarters in Washington, D.C. It will coordinate Federal action when major spills of oil and other hazardous materials occur. Representatives of the 4 departments will be available at the center when needed.

LBJ Cites 'Torrey Canyon'

President Johnson gave "dramatic and tragic examples" of the damage from oil pollution. He cited the sinking of the oil tanker Torrey Canyon off Britain in 1967--and the tanker "Ocean Eagle" off Puerto Rico in March 1968.

In March, Mr. Johnson asked Congress to hold financially liable the owners and operators of ships and shore facilities for the full cost of cleaning the oil pollution they cause. The Senate and House passed different bills and the legislation died.

When approving the interagency plan, the President said the legislation should be a "high priority item" for the next Congress. He emphasized the "urgent" need for new authority to prevent oil pollution--and to require polluters to pay for their damage.



Japanese Water-Pollution Study Team Visits

A Japanese water-pollution study team visited the U.S. Department of the Interior in Washington, D. C., in November before leaving on a 10-day tour of the U.S. The visit was part of the U.S.-Japan Cooperative Program in Natural Resources.

The program includes studies of common problems concerning "water, air, energy, wind and seismic damage, undersea technology, and agricultural problems." It began in 1964 with the U.S.-Japan Committee on Trade and Economic Affairs. In October 1967, a U.S. study team of water-pollution experts visited Japan. Other Japanese experts also have visited the U.S.

Team and Tour

Leading the 5-man team was Dr. Kenichi Hanada, Chief, Water Pollution Control Division of the Government Resources Research Institute, Tokyo. Experts of Interior Department and the Department's Federal Water Pollution Control Administration explained the U.S. water-pollution-control program.

After Washington, the Japanese inspected advanced water treatment and research facilities and conferred with officials in Cincinnati, Ohio; Chicago, Ill.; and Portland & Corvallis, Ore.

U.S. Proposes Conservation Measures in Northwest Atlantic

The U.S. announced on Nov. 14, 1968, proposed amendments to regulations on the size of meshes in trawl nets used in the northwest Atlantic fisheries. The proposals were published in the "Federal Register" on Nov. 6 and the public given 30 days to comment.

The amendments followed recommendations of the 14-member International Commission of the Northwest Atlantic Fisheries (ICNAF). All 14 governments, including the U.S., agreed to the changes.

The Changes

The changes extend mesh-size regulations to more species and to previously uncovered areas of northwest Atlantic. New species include ocean perch, halibut, grey sole, yellowtail flounder, Greenland halibut, pollock, white hake, black back sole, and dab.

H. E. Crowther, BCF Director, said extension of U.S. fishing efforts into new Atlantic areas necessitated protection of resources by extending conservation measures. He added that other ICNAF nations are adopting new regulations. (See Canada, p. 75.)

Fishery Products Affected by Airlines' Rate Increases

United Airlines and American Airlines have filed increases in general commodity rates on shipments under 1,000 pounds ranging to 120%, effective Jan. 1, 1969. These will affect fishery products.

Interior Secretary Udall protested the increases and requested an investigation. The National Fisheries Institute (NFI) filed a protest on Nov. 14, 1968.

Other air carriers also are considering rate increases on small shipments.

Catfish Farmers to Meet

Catfish Farmers of America will hold their First Annual Convention on February 7 & 8, 1969, at the Fontainebleau Motor Hotel, in New Orleans, Louisiana.

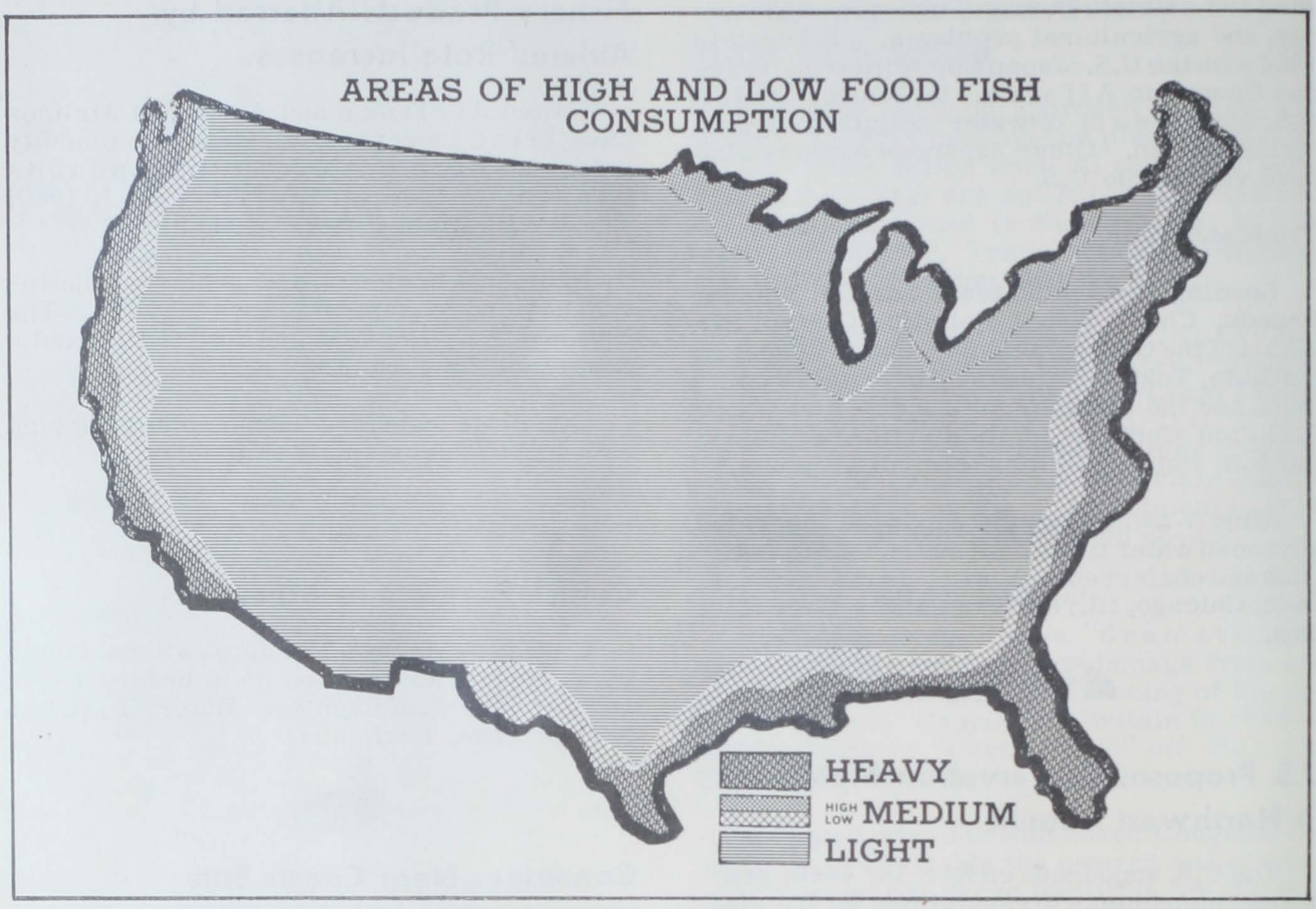
Consumer Near Coasts Eats More Seafood Than Inlander

Year after year, the U.S. consumer eats between 10 and 11 pounds of fish and shellfish. While quantity has remained much the same, the kinds of seafood eaten have changed significantly. Canned tuna has soared in popularity and canned salmon has declined. Per-capita consumption of shrimp has increased, but that of oysters has declined. Prepared and packaged fishery products have multiplied to meet the demand of housewives for seafoods that involve virtually no work.

Regional Differences

Where the consumer lives largely determines how much seafood he eats. If he lives near the coasts, he eats more seafood than the person in the interior U.S. (See chart on p. 14.)

BCF and industry are developing processing methods to enable inland areas to receive better-quality fish and shellfish. BCF is investigating irradiation of fishery products to determine whether fresh fishery products can be kept fresh longer on grocery shelves. Air shipments have increased.



First All-Aluminum Shrimper Will Fish Gulf of Mexico in 1969

The world's first all-aluminum shrimp trawler, an 83-foot craft, will be built by Graham Boats of Pascagoula, Miss., and go to work in the Gulf of Mexico in summer 1969. This was reported by the Aluminum Company of America.

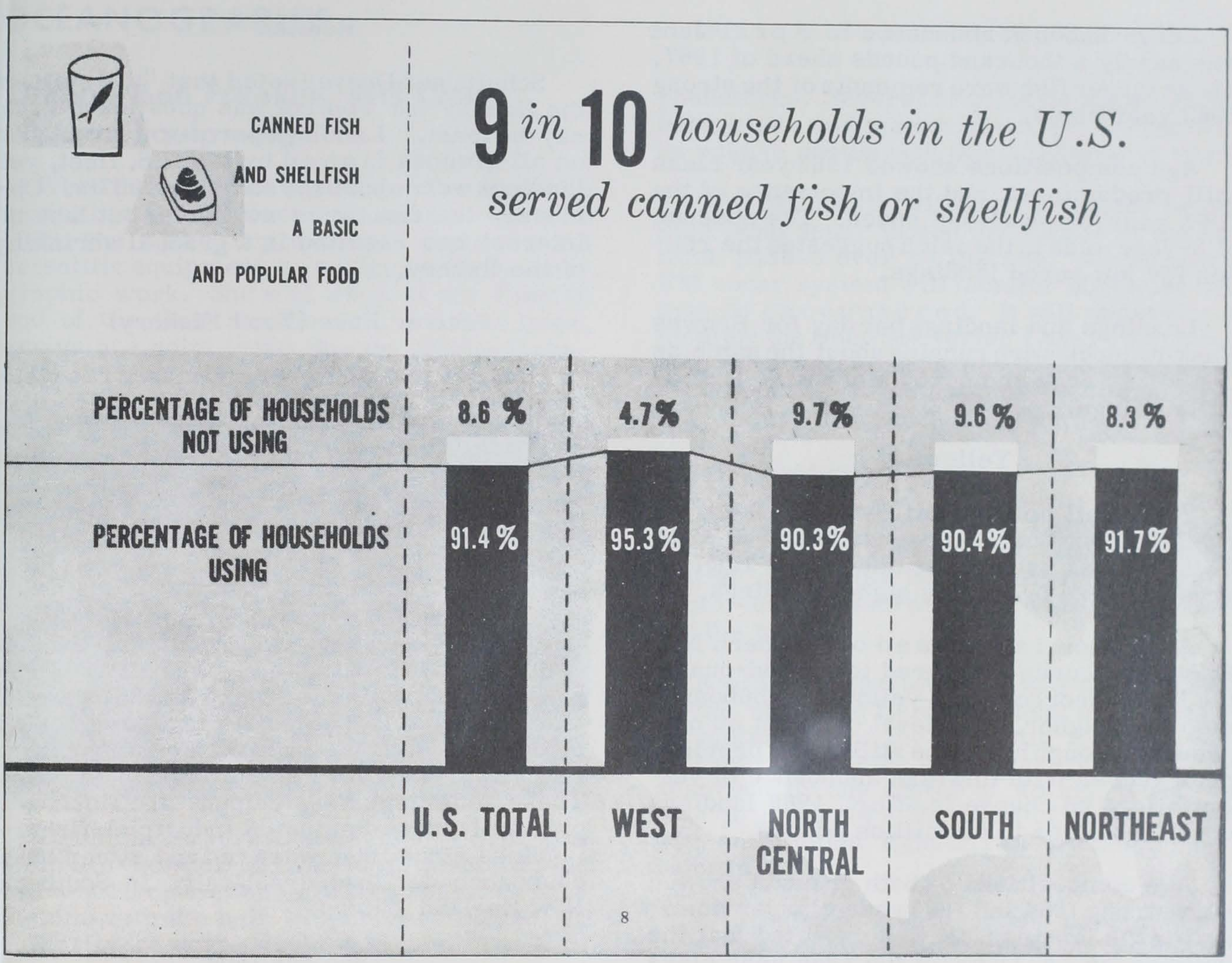
Charles Graham, president of Graham Boats, explained why he chose aluminum for the boat:

"Use of aluminum will result in lower operating costs and permit faster speeds both en route to fishing grounds and homeward-bound with a full load. We won't have to paint or sand blast the boat, thereby reducing maintenance costs. Under peak load conditions, the boat will require less draft than a steel or wood unit. Further, we can safely predict a much longer life for the craft."

The new shrimp boat will be refrigerated and thus permit it to remain in the Gulf for extended periods while maintaining highest product quality. Air-conditioned quarters and pilot house will provide relief to shrimper crews who often work in temperatures of 100 degrees or more. The boat will carry the latest electronic navigational aids. It will be operated by Gulf City Fisheries, Inc., also headed by Graham.

Canned Fish or Shellfish Served in 9 of 10 U.S. Homes

Most U.S. families eat canned seafood, an important protein food. Fish contain about 18 percent protein, which is highly digestible and often recommended in diets for old people. Fish supply 5-10% of the nation's animal protein for people.



Large amounts of canned fish or shellfish are eaten in every part of the U.S., although the kinds differ from region to region.

Good Food

The fats in fish are polyunsaturated, which many researchers believe is important in the human diet. The percent of fat in different fishes varies: from less than 1% for the cod family to 20-25 percent for salmon or mackerel.

Canned fish and shellfish are good sources of B complex vitamins. These include thiamine, riboflavin, niacin, vitamin B_6, and vitamin B_{12}. They also contain useful amounts of calcium, phosphorus, iron, copper, and iodine.

New England Landings April-June 1968 Reported

Groundfish and sea scallop fished by New England fleets during April-June 1968 have been reported by R. L. Schultz and F. A. Dreyer of BCF's Woods Hole (Mass.) Biological Laboratory:

Haddock

Haddock landings from Georges Bank for the first 6 months of 1968 were off about 15 million pounds, and landings per day declined about 3,200 pounds, compared to the 1967 period. This decline in haddock landings and abundance was due to a scarcity of scrod.

Scrod abundance for April-June 1968 dropped 57 percent from 1967, a result of poor recruitment from the 1964 & 1965 year classes.

Large-haddock abundance in April-June was nearly a thousand pounds ahead of 1967. These larger fish were remnants of the strong 1963 year class.

Age compositions showed 1963 year class still predominant, and the importance of the 1962 year class all but ended. The absence of 3-year-olds in the catch suggested the reason for low scrod landings.

Landings and landings per day for Browns Bank haddock were running about the same as in 1967. Large and scrod abundance showed little change.

Yellowtail

Yellowtail landings in first-half 1968 were running about 4 million pounds ahead of 1967. Both Georges Bank and Southern New England grounds were producing higher landings.

Abundance increased on Southern New England grounds compared to second-quarter 1967. Georges Bank yellowtail abundance also was higher. The level of effort on both grounds, though high, was still below previous peak years. With this high abundance of yellowtail and no change in effort, 1968 landings could end close to 65 million pounds.

Age compositions on both grounds showed very strong 1964 and 1965 year classes dominating the landings. It was expected that the success or failure of the 1966 year class would influence the continuance of this increasing trend of yellowtail abundance in 1969. The 1964 and 1965 year classes should continue to contribute substantially to the fishery in 1969.

Cod

Cod landings for the first 6 months of 1968 were about 3 million pounds higher than the 1967 period due to a daily increase. It was difficult to ascertain whether this reflected an increase in true abundance. With haddock relatively scarce, changes in fishing pattern may have been influencing cod-abundance index.

Redfish

Schultz and Dreyer noted that "the state of the fishery for redfish was questionable, to say the least." Landings per day were higher on all grounds fished by the U.S. fleet, yet landings were about the same as 1967's. Obviously the fish were available, but lack of interest has resulted in a gradual shrinking of the fishery.

Silver Hake (Food Fishery)

The silver hake fishery appeared recovered from the 1966 & 1967 labor and price disputes. Landings were ahead of 1967 for the first 6 months. Landings per day were lower on Georges Bank and higher in the Gulf of Maine in 1968, but total abundance remained about same.

Industrial Fishery

Despite increases in red and silver hake catch per day, landings in first-half 1968 remained about the same as in 1967 period. Total industrial landings were running behind 1967. This decrease resulted mainly from reduced landings of species other than hake. These other species, eelpout and flounders primarily, have dominated industrial-fishery landings since 1966, when red and silver hake abundance declined drastically in Southern New England waters.

Sea Scallops

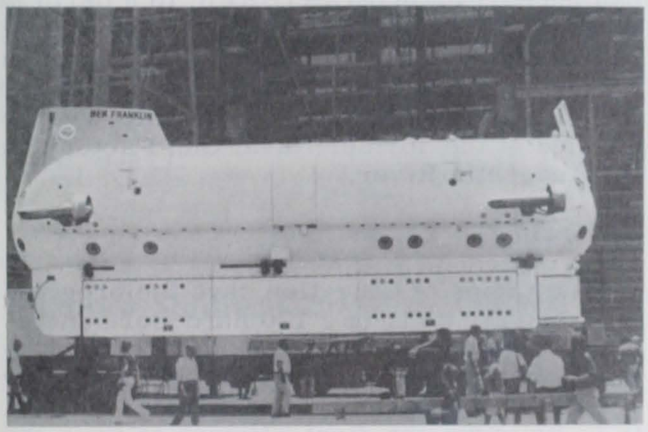
Sea scallop landings from the Middle Atlantic were slightly ahead of 1967 but still far below 1965-1966 levels. Georges Bank landings were very low for April-June 1968. The thing that seems to keep the fishery alive is the price of scallops to the fisherman (1.15-1.20).

The 1967 "Albatross IV" survey showed an increase in scallop abundance. However, it failed to materialize in 1968 commercial landings data. Landings per day have remained low on both grounds.

OCEANOGRAPHY

Drifting 'Ben Franklin' Will Carry Modern Equipment

When the research submarine Ben Franklin begins her Gulf Stream drift mission early in 1969, she will carry the most sophisticated scientific equipment available for oceanographic work. She will start at the Florida end of the Gulf Stream and, 4 weeks later, arrive at a point in the Stream off Massachusetts.



Grumman Aircraft Engineering Corp., Ben Franklin's owner and operator, developed the world's largest nonmilitary research submarine with the help of Jacques Piccard, an authority on deep-diving vehicles. The U.S. Oceanographic Office (NOO) provided most of the sub's scientific equipment. Also, it will send 2 or 3 oceanographers on the mission and provide the surface support ship.

The Mission

The scientists will drift with the Gulf Stream in the 50-foot, 130-ton sub. Data supplied to them by a current sensor system mounted on the top deck will enable them to measure the sub's relative current speed and diversion.

The vehicle has a 36-man-week life-support capability. The scientists will be able to view their surroundings from 2 external camera systems designed to provide stereo photographs of the sea floor--and two 70 mm. cameras integrated into a closed-circuit television system to observe marine life and phenomena. Several bracket-mounted, hand-held, still- and motion-picture cameras will be used to photograph the scientists at work.

The scientists will use a narrow-beam, side-scan sonar to see the outline of the sea floor passed over by the sub. A continuous FM sonar system will monitor obstacles that may be encountered. It will observe and monitor the Deep Scattering Layer--horizontal, sound-scattering bands of marine life that often produce "false bottoms" on the recording traces of echo-sounding devices.

Special Equipment

The scientists will use a water-sensing pod to measure on magnetic tape continuous digital information on temperature, salinity, depth, and pressure of the water surrounding the sub.

A proton magnetometer will provide data on the magnetic field and local anomalies--irregularities in the magnetic field pattern. A transmissometer will measure the light absorbed by one meter of water. It may be able to determine the level of natural light with an ambient light meter, still being developed.

A turbulence measurement instrument is expected to determine fluid velocity by temperature change--and then produce a profile of the current shear (the whirlpool-like turbulence where 2 opposing currents meet) from top to bottom of the sub. An acoustic system will determine continuously the sub's total depth and the total water depth.

Although the sub is equipped with four 25-horsepower AC electric motors, she was designed to be propelled northward along the Gulf Stream by the current itself. This will provide the scientists with a noiseless research and observation platform. The Ben Franklin is expected to hover in midwater for "continuous observations of the same volume of ocean for the entire 4-week mission."

See article by Jacques Piccard, p. 53.

U.S. Exchanges Nautical Charts With Other Nations

The U.S. Naval Oceanographic Office (NOO) exchanges nautical charts on a continuing basis with 48 foreign nations, a 47-year-old tradition. Most of the 48 are members of the International Hydrographic Bureau headquartered in Monaco.

The world-wide exchange was proposed in London in June 1919 at a 25-nation International Hydrographic Conference. Delegates also considered the idea of exchanging "sailing directions, notices to mariners, light and buoy lists, tide tables and other hydrographic (charting and mapping) publications."

Began in 1921

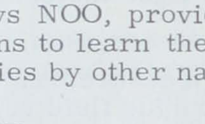
The exchange of nautical charts and other hydrographic publications began in 1921 when the International Hydrographic Bureau, which resulted from the 1919 conference, went into operation. As the major U.S. ocean-charting agencies, NOO and the Coast and Geodetic Survey act for the U.S. in all official matters at the Bureau.

No country can chart the world's oceans covering 70% of the earth's surface. So the exchange, says NOO, provides an effective way for nations to learn the results of surveying activities by other nations.

A Case History

NOO noted that "16 reported dangers of various types" were included in the 1954 edition of a chart of the Gulf of Siam. But after a detailed survey in 1961-62 by the USS 'Maury' and 'Serrano'--2 NOO hydrographic survey ships--12 of the charted shoals were disproved and removed from Oceanographic Office charts.

This information was speeded to the International Hydrographic Bureau, which removed the shoals from its "Doubtful Hydrographic Data." As a result, NOO said, all nations in the Bureau learned that their mariners could "once again proceed (through the Gulf of Siam) on the most direct routes with safety and assurance."



Train Unemployed for Jobs in Oceanography

ESSA's "Explorer" has become involved in a new kind of discovery. She has been transferred to the U.S. Office of Education for use as a floating classroom to train "hard core unemployed" for jobs in oceanography. The 219-foot, 1,900-ton hydrographic survey vessel, launched in 1939, was decommissioned in January 1968.

The Office of Education said the vessel will be towed from Norfolk, Va., where it had been decommissioned, to a berth in Washington, D. C., by Ogden Technological Laboratories, Inc. The firm will establish the curriculum and provide instructors for the $155,000 program. The ship will be berthed at the former Naval Gun Factory on the Anacostia River.

To Train 120 Youths

The Office of Education says the program is aimed at training 120 hard-core unemployed young men between 16 and 22 from the Washington area as oceanographic aides for positions in government and private industry. It is believed the first attempt to train the disadvantaged in oceanography. The 15-month program provides for classes of 40 hours per week lasting 8 to 10 weeks.

Nautical Charts Issued for Alaskan Arctic Coast

The Coast and Geodetic Survey (CGS) has issued 29 nautical charts of Alaska's Arctic Coast following the discovery there of major oil deposits. The large-scale charts are revised editions of those previously published by CGS for the Navy but classified until now. They are based on topographic and hydrographic surveys made from 1945-53 and 1961-62 and provide the most detailed coverage of this area.

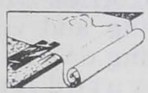
What Charts Cover

CGS notes that the charts cover the remote coastal area extending from Point Hope east to the Canadian border. A revised edition of another once-classified chart has been issued for the Cape Romanzof area in western Alaska, south of Norton Sound.

The area covered includes Prudhoe Bay, where large oil deposits have been discovered; Scammon Bay, Point Hope, Marryatt Inlet, Cape Lisburne, Point Lay, Kasegaluk Lagoon, Icy Cape, Avak Inlet, Wainwright, Peard Bay, Point Barrow, Admiralty Bay, Smith Bay, Cape Halkett, Harrison Bay, Camden Bay, and Demarcation Bay.

The Cape Romanzof chart is numbered 9374. Those for the Arctic Coast are 9450 through 9478. They are published at a scale of 1:50,000.

CGS expects the new charts to provide a major assist in developing Alaska's mining and petroleum industries. They may be purchased for $1 from CGS nautical chart agents in Alaska, or by mail from CGS, 121 Customhouse, 555 Battery Street, San Francisco, Calif. 94111.



Biologist Studies Dangerous Fishes

Dangerous marine animals, including fishes that bite and those that sting, are being catalogued according to species, environment, and geography by Florence Rieken, a marine biologist and oceanographer at the U.S. Naval Oceanographic Office (NOO).

As an example of what may be published when enough material is gathered, she said: "We are thinking about presenting updated information on shark attacks in a manuscript, which eventually may be compiled into a technical publication. The article not only would list the shark species known to attack man but also would give the geographic locations of shark attacks along with the seasons the attacks occurred."

Similar manuscripts may be prepared on highly venomous fishes, such as the stonefish and other reef fishes known to sting man. These also would list the species of venomous fishes, environmental factors, and geographic locations.

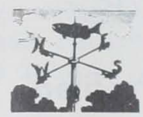
Sonic Fishes & Mammals

Mrs. Rieken also is compiling information on sonic fishes and mammals, such as porpoises, known to emit sounds, and on schooling fishes, such as herring.

The material on sonic fishes and mammals may be compiled into handbooks for Navy sonarmen. Articles on schooling fishes may help sonarmen. They would be able to use the environmental data to determine if echoes to sound signals are being returned from the schools or from a submarine. Eventually, the information on schooling fishes may benefit fishermen.

Asks for Data

Mrs. Rieken has completed filing the information she collected on dangerous marine and sonic animals. She asks that new data on shark attacks, and poisoning or stinging incidents by venomous fishes, be sent to the Commander of the U.S. Naval Oceanographic Office, Suitland, Maryland 20390, marked for her attention.



Scientists Prepare Worldwide Ocean Chart

The world's oceans conceal rugged terrain and scientists of the U.S. Naval Oceanographic Office (NOO) are charting part of it for the International Hydrographic Bureau. They will complete the project's first phase by January 1969.

The scientists are collecting depth measurements, from soundings, that reveal the ocean-floor contour for Pacific and Atlantic Ocean areas up to 2,000 miles off the North and Central American Coasts. In addition to NOO ships, they are using sounding data observed by naval and merchant ships.

These measurements, plus those collected by the U.S. Coast and Geodetic Survey for two areas--one in Pacific, the other in Atlantic--are the U.S. contribution to a scientific chart being prepared by the International Hydrographic Bureau to show the topography of the world's oceans.

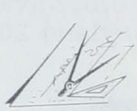
The World Chart

The chart, "General Bathymetric Chart of the Ocean," will have 24 full-color sheets: 16 will provide coverage between the Arctic and Antarctic circles at a scale of 1:10,000,000; 8 at 1:3,100,000 will cover the 2 polar areas.

William Opalski, director of the NOO project, reported: "More than 900,000 soundings have been disseminated to foreign countries for use in the compilation of their plotting sheets for the world-wide bathymetric chart."

The Netherlands, Great Britain, Brazil, and France are coordinating their work with NOO.

The International Hydrographic Bureau has 42 member nations. It coordinates the work of hydrographic (ocean charting & mapping) agencies in its worldwide effort "to produce accurate navigation and scientific charts for mariners and scientists of all nations."



Ocean Bottom 'Profiled' by New Device

A device designed to outline the sediment layers that underlie the sea floor is being tested by scientists of the U.S. Naval Oceanographic Office (NOO), Geological Survey, and Princeton University. They are in the Caribbean aboard the 285-foot, 2,580-ton USNS "Kane," the Navy's newest oceanographic research ship.

The NOO scientists are using an acoustical profiler belonging to the Geological Survey to "investigate the cover of sediments over the substructure" of the Puerto Rican Trench between the Virgin Islands and Curacao.

The Profiler

The profiler, a "sparker," is housed in a mobile unit and is lashed in position to the Kane's upper deck. It is capable of discharging electrical shocks 15,000 to 20,000 feet into the sediment layers beneath the sea floor.

L. E. Garrison, a Geological Survey geologist, explained: "The acoustical energy bursts generated by the profiler are designed to penetrate the sediment layers. Portions of the sound 'sparks' are expected to be reflected from the layers, returned to receiving hydrophones towed 15 to 20 feet beneath the ocean's surface, and recorded on magnetic tape. Recorders can transfer the sonic echoes into graphic profiles that can be visually inspected. By examining the profiles, the scientists, hopefully, will be able to separate the sedimentary layers down to the ocean basement--the igneous or metamorphic rock complex underlying the sedimentary rock structure" that begins in the Puerto Rican Trench 27,000 feet beneath the ocean's surface.

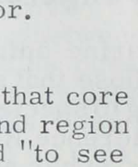
M. W. Buell Jr., NOO oceanographer, stated that the information expected to be revealed by the profiles will be added to data gained from coring and will be "correlated with all the existing data." This information will be incorporated into Navy programs aimed at developing knowledge about the ocean and the sea floor.

Core Samples

Buell added that core samples dredged in the Caicos Island region of the Bahamas are being inspected "to see if the sediment age can be determined in an effort to gain a better idea of the history of the ocean floor." The scientists also are taking samples of the water column to learn more about "the circulation of the subtropical underwater and other significant water mass intrusions" into the Caribbean.

The 'Sparker'

The 'sparker' is capable of generating 200,000 joules (one joule equals one watt-second of energy). Later, when it is merged with the Kane's shipboard system, the 'sparker' is expected to produce 233,000 joules--"the hottest spark ever to be put into the ocean."



Foreign Fishing Off U.S. in October 1968

NORTHWEST ATLANTIC

In October 1968, 177 vessels from East and West Germany, Romania, and Spain were sighted, 8 more than in September.

Soviet: Sixty-seven different vessels were sighted--19 factory stern trawlers, 39 medium side trawlers, 2 factory base ships, 4 refrigerated transports, 2 repair tugs, and 1 tanker. Early in the month, they were concentrated 40-50 miles east of Cape Cod and Nantucket (Great South Channel) catching light-to-moderate amounts of herring. About mid-month, they shifted to areas 30 miles south of Martha's Vineyard and Nantucket, where catch was mostly whiting. A small group spent the month fishing herring on Cultivator Shoals.

Polish: The fleet--3 stern trawlers, 18 large side trawlers, 2 factory ships, and 1 cargo vessel--continued to fish more or less apart from other fleets. Except for one sighting of 23 vessels on northeast Georges Bank, only scattered vessels were observed off Cape Cod and Nantucket. Limited catches of herring were seen.

East and West German and Romanian: One Romanian freezer stern trawler, 38 East German, and 35 West German trawlers and support ships fished herring from 14-50 miles east of Cape Cod and Nantucket.

Spanish: An estimated 12 stern and side trawlers were seen pair trawling on the inner shoals of Georges Bank.

New Fishing Area

Twenty-four East and West German and 5 Polish vessels were sighted 20-25 miles east of Portsmouth, N.H. (Jeffreys Ledge). U.S. fishermen have been reporting foreign vessels there for several weeks.

Gulf of Mexico and South Atlantic

No foreign vessels were reported south of Cape Hatteras, or in the Gulf.

California

Soviet: Five vessels were sighted. Two factory stern trawlers and a refrigerated transport were observed fishing about 25 miles west of Half Moon Bay, just south of San Francisco. A third stern trawler was sighted off the Klamath River south of the Oregon border.

Off Pacific Northwest

Soviet: Twenty-two large stern factory trawlers, 10 processing and support vessels, and 3 exploratory research vessels were sighted: half off Oregon and half off Washington. During the third week of October, most were fishing Pacific hake off Washington. For the third consecutive month, no medium side trawlers were seen; this indicated a Soviet switch to stern factory trawlers in the northeast Pacific.

Japanese: Two long-liners, 2 stern trawlers, and 1 cargo vessel were sighted. (The Japanese press recently reported that 7 trawlers in this area had taken about 50,000 metric tons.)

Alaska

Soviet: Forty-four vessels were sighted. In October 1967, the Soviets fished only ocean perch; this year they fished a variety of groundfishes. Early in the month, their ocean perch fishery centered along the Aleutians, with about 14 stern trawlers and 2 refrigerated transports. About mid-month, the effort shifted into the Gulf; by month's end, only about 5 stern and 2 medium trawlers, and 1 reefer remained off Aleutians.

Five medium trawlers and 1 reefer fished pollock, perch, gray cod, sable fish, and flatfish, just off Continental Shelf edge in central Bering Sea. About mid-month, 5-6 medium trawlers began fishing north of Fox Islands.

Japanese: The winter decline in fishing off Alaska continued; the number of vessels dropped from nearly 80 early in the month to just over 50 at the end. Still, this was more than twice the Japanese effort in October 1967.

The Gulf of Alaska ocean perch fishery was continued by 4-7 stern trawlers. One vessel, processing about 20 tons a day, was bringing 6 to 8 tons aboard in one drag. Three stern trawlers fished ocean perch along Aleutians, and 12 stern trawlers, with one factoryship, were active along the 100-fathom curve in eastern and central Bering Sea.

Fig. 1 - The refrigerated Soviet transport "Arkhip Kvindgi" (Sibir class) with SRTM 8-403 alongside transferring cargo. (Photo: Zahn)

Fig. 2 - Spanish fishing stern trawler "Villalba," owned and operated by a Vigo fishery firm.

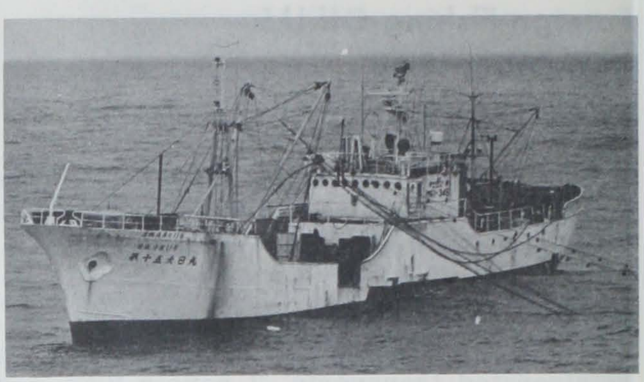


Fig. 3 - A Japanese Danish seiner in eastern Bering Sea. A fleet of 12-15 accompanies a factoryship engaged in production of fish meal, oil, and minced fish meat. In photo, net has been fastened to working gear on foremast and ship is dead in water. (Photo: J. Branson)

The minced fish meat and fish-meal fleets in eastern and central Bering Sea--6 factory ships and 108 trawlers in late September--were reduced to 2 factory ships and 20 trawlers by late October.

The 2-fleet factoryship crab fishery in the eastern Bering Sea ended in October. The first fleet left early in the month; the second followed within 10-14 days. Japanese sources had reported that only 79% of the quota had been reached by mid-September, and that the fishery would have to be extended into October. Since only one fleet fished extensively in October, the quota may not have been achieved this year.

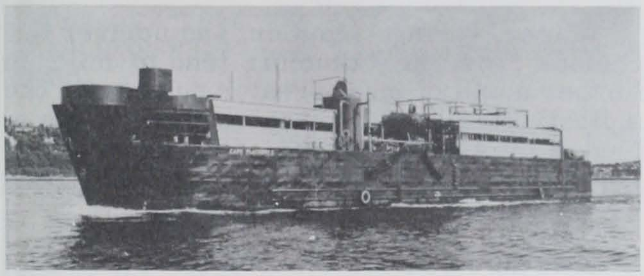
Five Japanese long-liners fished sablefish in the Gulf of Alaska throughout October 1968. One ship, boarded by a BCF agent, was taking about 5 tons daily--95% sablefish and 5% ocean perch.

STATES

Washington

FLOATING FPC PLANT BEGINS OPERATION IN PUGET SOUND

A surplus 196-foot Navy rocket ship has been converted into a floating fish protein extraction plant, the 'Cape Flattery I.' It is based at Neah Bay, Wash., on the Makah Indian Reservation.



The Cape Flattery I.

The plant uses the Vio Bin Corp. process: a solvent is mixed with the fish to extract the oil and water at low temperatures, producing a concentrated protein. The odorless processing aboard ship does not pollute the surrounding waters. The protein concentrate is blown to shoreside milling, storage, and bagging facilities.

The Cape Flattery I will use scrap fish--hake, ratfish, dogfish, and skate. It has the capacity to process 200 tons of fish daily.

For Animals First

At first, the Cape Flattery Co. plant will produce concentrated fish protein as a food additive for pets, fish hatcheries, mink breeders, livestock and poultry, and for industrial uses. Within 6 months, the process will be refined to produce FPC for human consumption. The FPC will be an odorless, tasteless powder that can be stored indefinitely. When added to rice, bread, corn, or other grain and liquid foods, it will provide a protein-rich meal.

U.S. Aid

The plant was financed partially through a $650,000 loan from the Economic Development Administration (EDA) of the Commerce Department. Shareholders invested $500,000. The Makah Tribe obtained a $141,000 loan and grant from EDA to finance construction of a tribal public dock. The new plant employs tribe members.

The former navy vessel was converted by the Marine Construction & Design Co. (Marco) of Seattle. The project began in December 1967 with the dismantling and moving by truck of a practically unused Vio Bin fish-meal plant from Greensport, Long Island.

* * *

3 VESSELS FISH PUGET SOUND HAKE

In late November 1968, 3 vessels--'Radio,' 'Wisconsin,' and 'Voyager'--were fishing for hake in Puget Sound. The Radio was landing its catches, to be made into pet food, at La Conner, Wash., the Wisconsin and Voyager were delivering to a fish-meal plant at Everett, Wash.

Total landings since this season began in October 1968 were about 1 million pounds. Since the fishery began in 1965, it has extended from September or October into May or June of the following year. Seasonal catches have been about:

	Pounds Landed
1965-66	6,200,000
1966-67	10,700,000
1967-68	8,160,000
1968-69 (To Nov. 21, 1968)	1,000,000

* * *

NEW BOOK ON CHINOOK & COHO SALMON

A forthcoming book by Washington Department of Fisheries marine biologist Sam Wright, "The Origin and Migration of Washington's Chinook and Coho Salmon," answers such questions as where these fishes go after leaving their home streams, who catches them, and with what gear.

Wright states that salmon from 2 different river drainages, and often stocks within the same river, rarely show identical patterns of fresh-water residence, downstream movements, growth, ocean dispersions, relative availability, upstream migrations, and spawning preference. He bases his conclusions on marking and tagging investigations by Washington, Oregon, California, Alaska, and Canadian fisheries agencies.

Wright notes that 1 of 4 chinook and coho salmon caught in Washington waters during 1968 (and 1969) will be examined for missing fins or other markings by the Department of Fisheries. Caught salmon may carry a tag (disc or loop type) affixed early in their lives. They may have a very small, coded, magnetic-wire tag in the snout. Or, having been fed chemical compounds when young, they bear identifying "rings" on their bones.

Sport vs. Commercial?

He says the common opinion that sport and commercial fishermen compete directly for salmon is often not true. The commercial salmon trollers often fish isolated grounds outside the 1-day range of coastal ports. By the time ocean sport fishing reaches its maximum, many trollers have switched gear and are searching offshore waters for albacore. Also, many shallower, confined coastal waters are essentially sport fishing "preserves" because efficient trolling is not practicable.

As knowledge of salmon grows, Wright adds, rules about commercial net fisheries and fresh water sport fisheries become complex, often difficult to understand. This is simply evolution toward maximum economic and recreational use of each stock--plus the provision of optimum escapements to perpetuate the resource.

In Puget Sound, net and sport fishermen often operate in same area concurrently, but the fishes caught differ in size, maturity, and habits. Backbone of the sport chinook and coho catch is the feeding, immature fish that will strike the lure or baited hook. These fish offer good sport, but they would often have little commercial value. The larger, mature chinook and coho returning to Puget Sound streams have ended their active feeding by the time they reach inner Sound waters. So only a few of the many thousands passing through can be taken on sport gear. On many occasions when large hatchery-produced runs have passed through intense sport fisheries, only an insignificant number were taken.

Wright describes chinook and coho movements from several Pacific Northwest streams:

CHINOOK SALMON

Columbia River: Lower River fall-run chinook move northward and contribute to British Columbia troll fisheries off west coast of Vancouver Island; few are taken south of Central Oregon or north of Vancouver Island. Amazingly, the largest numbers occur off north Washington and in Strait of Juan de Fuca; fall-run chinook caught here are much more likely to be of Columbia River origin than those caught off mouth of Columbia itself.

Winter, spring, summer, and upriver fall chinook from the Columbia tend to migrate further north in much greater numbers. The indications are that many move offshore to feed in the Gulf of Alaska. Ocean catch distribution is around 75% off Alaska and British Columbia, and 25% off Washington.

Coastal Streams: Chinook from Washington coastal streams move northward; over 75% of ocean catch is off British Columbia and Southeastern Alaska. "Contrary to popular belief, only a small number are taken offshore of Grays Harbor."

Puget Sound: Fall chinook from its streams also move northward; a minor part goes south. The ocean catch is about 90% off British Columbia and Southeastern Alaska, 10% off Washington. However, large numbers remain inside Puget Sound for appreciable periods; these immature feeders contribute importantly to sport fisheries. When they move seaward, they are less available to the ocean fisheries than several other major stocks; a greater percentage escapes the ocean fishery and returns to Puget Sound--to be exploited by commercial net and sport fisheries.

COHO SALMON

Columbia River: Coho show pronounced movements to the north and south but the latter dispersion is dominant. Off Washington, they become steadily less abundant from south to north; abundance reaches a low north of Cape Flattery. The southward movement--more extensive and lengthy--makes these stocks vitally important to fisheries off California and Oregon. These fisheries depend on a single age class or brood year during each fishing season, so the annual catches fluctuate more violently than with chinook; there, annual production is masked by the various ages and stream residence categories entering the catch.

Coastal Streams: Coho produced in Grays Harbor and Willapa Bay tributaries differ markedly from their nearby Columbia River counterparts. They disperse primarily to the north; ocean harvest is mainly in fisheries off central and northern Washington. Sizable numbers move off Vancouver Island and are exploited by the Canadian troll fleet. Returning adults enter the commercial net and river sport fisheries. The harvest of precocious males, or 2-year-old "jacks," reaches significant proportion only in the river anglers' creel.

Puget Sound: Again, significant coho migrations occur north and south in the ocean. Their abundance declines steadily from south to north along Vancouver Island's west coast and north to south along Washington. As a result, the catch is divided about equally between the fisheries of Washington and British Columbia. These stocks also contribute to Washington and Canadian net fisheries in the Strait of Juan de Fuca--and to Washington's Straits sport fishery and net and sport fisheries in inner Puget Sound. They differ markedly from other coho stocks. Many remain in Puget Sound and never migrate to sea; they form backbone of the sport fishery. The drainages nearest the available foraging (and fishing) areas often contribute most to the catch.

Wright concludes that it is possible to estimate with reasonable accuracy the major coho stocks contributing to Washington's salmon fisheries on an annual basis. Unlike chinook, the major stocks are much more likely to originate in drainage systems near each fishery. Several interrelated factors are responsible for this. On the average, cohoes spend much less time in the ocean due to their younger age at maturity, so their migration distance tends to be much less than the chinooks. They also show random dispersions to north and south, unlike the dominant northward movements of chinook. And, probably most important, their "catchability" or susceptibility to hook-and-line gear does not lessen as quickly as fall chinook approaching their home streams.

Oregon

RECORD SHRIMP CATCH

In 1968, 41 shrimp boats fishing off Oregon landed a record 11,000,000 pounds in Oregon ports, reports the Oregon Fish Commission. In 1967, 10.4 million pounds had set a record by a substantial margin. During the past 10 years, the annual average catch in Oregon waters has been only 3.5 million pounds.

Landings might have gone even higher in 1968 except for interruptions from bad weather and a cost-price squeeze in May, June, and July.

A very strong 1966 year class comprised well over 60% of the 1968 catch. It was the major contributor to the record.

The Shrimp Beds

Typically, shrimp beds are the green mud bottoms 4 to 20 miles off the coast. Beds off northern Oregon and near Coos Bay have been especially productive during the past 10 years.

In 1968, however, the Port Orford bed stole the limelight. It set a new catch-per-effort record for the Pacific coast, except for Alaska.

Coos Bay accounted for more than 4 million pounds. It was high port for 1968. Astoria landings were 2.3 million, and Port Orford's 1.3 million pounds. Newport landings, partly from a bed located during a Fish Commission shrimp cruise in spring 1966, reached 2 million pounds. Other significant shrimp beds are offshore near Brookings and Garibaldi.

* * *

SPRING CHINOOK HATCHERY RETURNS SET RECORD

In 1968, a record 41 percent of the spring chinook escapement over Willamette Falls returned to the Oregon Fish Commission's Willamette and Marion Forks hatcheries, reports Ernest Jeffries, commission fish culture director. Commission hatcherymen estimated the total return to the 2 hatcheries of 12,800 fish. In recent years, up to 30% of this run returned to the 2 stations.

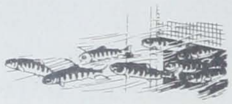
Nearly a third of the estimated 31,500 spring chinook passing over the falls returned to the Willamette Hatchery alone, a remarkably high hatchery return for spring chinook.

10,000,000 Eggs

From the fish arriving at Marion Forks and Willamette, commission hatcherymen took more than 10 million eggs. The bulk of the spring chinook eggs are taken at the Willamette and Marion Forks hatcheries, and at 2 other Willamette tributary hatcheries, McKenzie and South Santiam. Together, the 4 hatcheries rear about 5 million spring chinook each year for release into the Willamette system.

Reason for Hatcheries

The Willamette and Marion Forks hatcheries were constructed by the U.S. Army Corps of Engineers to compensate for fish losses caused by construction of Detroit and Lookout Point Dams. The Corps provides the bulk of the annual operating expenses.



Alaska

OIL POLLUTION CONTINUES
IN COOK INLET

"Oil pollution incidents continue to occur at an alarming rate despite the joint-pollution-control efforts by State and Federal conservation agencies," reports BCF Juneau.

On Oct. 23, 1968, a break in Shell Oil's pipeline from Platform "A" occurred on Middle Ground Shoal. It spread an estimated 1,000 barrels of crude oil over Cook Inlet waters off Kenai. The Federal Water Pollution Control Administration (FWPCA) reported the oil spread over an area 30 miles long and 6 miles wide. The pipeline, the Inlet's oldest, has been the source of several oil spills in recent years.

9 Unreported Incidents

Also, surveillance and patrol flights over the Inlet during October 1968 by BCF, Bureau of Sport Fisheries and Wildlife, FWPCA, and the Alaska Department of Fish and Game revealed 9 incidents of pollution that had not been reported voluntarily by industry.

"The full impact of oil pollution on the important fish and wildlife resources of Cook Inlet is unknown," BCF Juneau states. However, in early October 1968, conservation officials picked up 115 guillemots and 4 murres along 6 miles of beach south of Anchor River. It was estimated that about 250 dead or dying birds could have been recovered. In addition, mallards and pintails taken in the Redoubt Bay area showed signs of exposure to oil pollution.

Texas

HATCHERIES PRODUCED
16 MILLION FISH IN FY 1967-68

Texas Parks and Wildlife Department fish hatcheries produced and distributed 15,942,693 fish during fiscal year 1967-68. This is 14 percent above the 13,986,413 fish in the 1966-67 fiscal year.

The cost of rearing and distributing each fish was 2.37 cents for the 1967-68 period, compared with 2.05 cents in the 1966-67 period.

Types and numbers of fish were: Black bass, 13,090,760; warmouth bass, 108,000; sunfish, 112,915; channel catfish, 2,191,388; flathead catfish, 2,100; black crappie, 97,675; white crappie, 49,530; hybrid sunfish, 226,675; and blue catfish, 63,650.

Cod end coming over rail of BCF's research vessel 'Silver Bay' during bottom-fish explorations off Florida. (Photo: J. B. Rivers)

BCF'S VERY LONG LINE

BCF casts a vibrant line that connects the commercial fisherman's catch in the ocean, gulf, and inland waters to consumers across the U.S. Strung along it are BCF responsibilities to find fish; devise the best ways to catch and keep them wholesome until port is reached; study the most economical ways of unloading, freezing, processing, and distributing them to the Nation's consumers; provide data to the industry on the kinds and prices of fish, and where and when they are available, so that industry can make informed decisions; and provide information to the public ranging from price to preparation of fish.

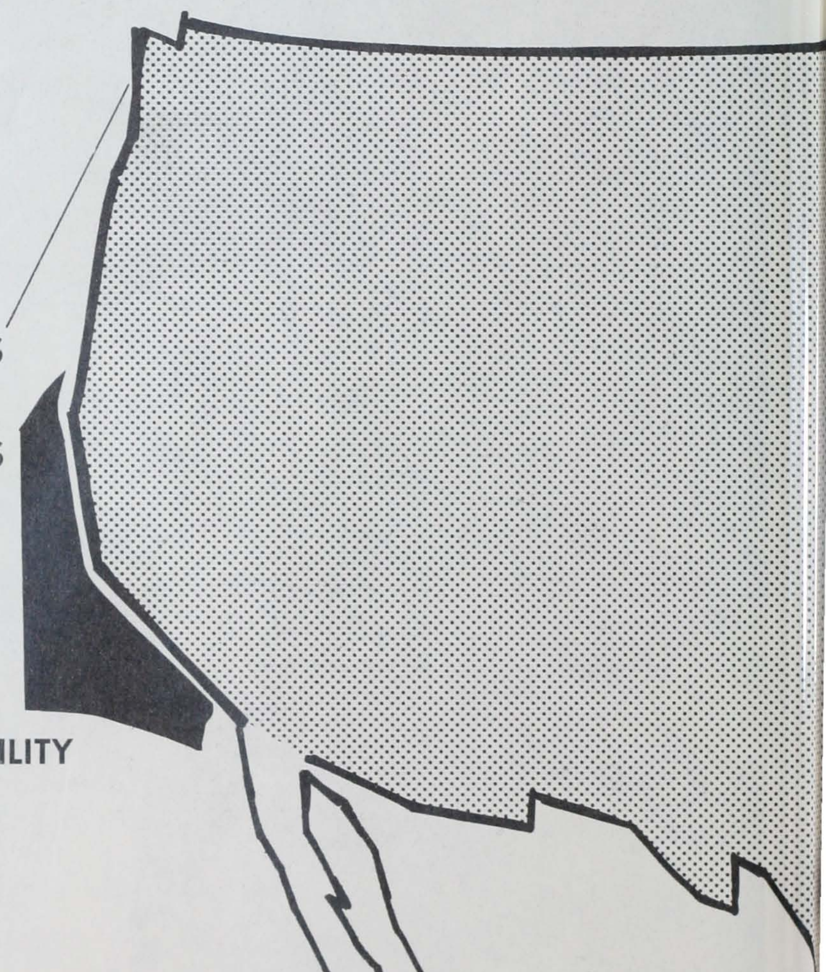
BCF supplies loans to the fishing industry, helps train scientists, and connects the U.S. with other nations to protect several fisheries and the U.S. fisherman's interests.

Juneau

- POT-TYPE GEAR for catching 'spot' shrimp
- DUTCH TRAWL

Seattle

- LARGE MIDWATER TRAWLS
- UNIVERSAL TRAWLS
- DEPTH-TELEMETRY SYSTEMS
- HAKE EXPLORATIONS



La Jolla

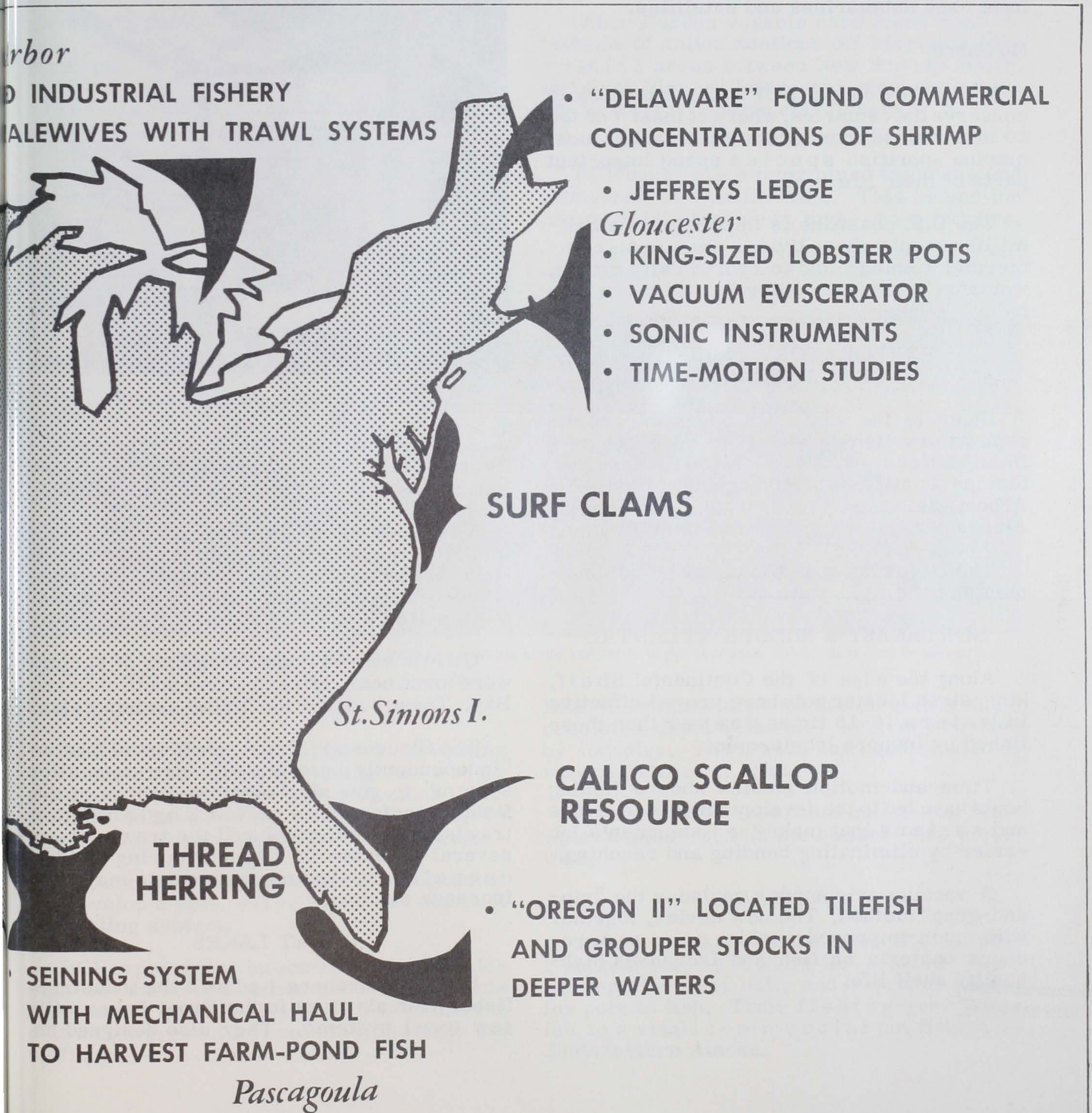
- FORECASTS ALBACORE & BLUEFIN TUNA AVAILABILITY
- EVALUATE POTENTIAL FISHERY RESOURCES
- DEVELOP UNDERUTILIZED RESOURCES
- IMPROVE FISHING FLEET EFFICIENCY

Vast Responsibilities

BCF's responsibilities begin with the inland waters and the sea. Its scientists sail aboard modern oceanographic vessels from Woods Hole, Mass., Miami, Fla., La Jolla, Calif., Seattle, Wash., and Honolulu, Hawaii, to study the physical quality of the sea and the plants and animals in it. They study species of fish off U.S. coasts and gather information on size of fish resources, rates of decline or increase, and the effects of large catches on a fish population.

Achievements

BCF explorations have found unexploited stocks of fish and shellfish large enough for profitable commercial fishing; concentrations of sablefish, Pacific ocean perch, and hake off the Washington coast; shrimp beds in Alaskan waters, off South America's northeast coast, and brown shrimp off Florida's east coast; surf clam grounds off the mid-Atlantic coast; and chubs in the Great Lakes.



When new sources of fish are found, BCF specialists study the type and size of vessel and gear most suitable for catching the fish. BCF's midwater trawl catches commercial quantities of formerly underutilized species; it is expected to expand fishing for the Pacific Coast fisherman. BCF improvements in the shrimp trawl may make daytime trawling profitable. Its scientists have used underwater television to develop gear and adapted the telemeter to midwater trawl fishing. They have used submarines and satellites.

On Shore

On U.S. shores, BCF scientists work to conserve the estuaries, where at least 7 of the 10 most valued commercial species and most marine sportfish species spend important parts of their life cycle.

The U.S. coastline is important to a half-million people whose living comes from commercial fishing--and to sport fishermen, waterfowl hunters, boaters, swimmers, and nature lovers.

EXPLORATORY FISHING & GEAR RESEARCH

Basic to the vast BCF operation are the exploratory fishing and gear research of 6 field stations at: Gloucester, Mass., St. Simons Island, Ga., Pascagoula, Miss., Ann Arbor, Mich., Seattle, Wash., and Juneau, Alaska. These centers publish their findings.

The following are some recent achievements of the field stations:

NORTHEAST & MIDDLE ATLANTIC

Along the edge of the Continental Shelf, king-sized lobster pots have proved effective in waters 10-15 times deeper than those fished by inshore lobstermen.

Time-and-motion studies aboard fishing boats have led to the development of conveyors and sorters that make the fishermen's job easier by eliminating bending and reaching.

A vacuum eviscerator replaces the "rip-and-grap" method. The new device, together with much-improved washing devices, reduces bacteria on fish and increases high-quality shelf life.

Fig. 1 - The vacuum evisceration technique.

A leakproof, insulated, nonreturnable container enables processors to ship fresh fish longer distances than ever before.

The "Delaware" explored for surf clams in the western Atlantic between the state of Delaware and False Cape, Virginia. She found large beds south of the existing commercial fishing areas.

Commercial concentrations of shrimp were found near Jeffreys Ledge south of Casco Bay. These boosted the Maine shrimp catch.

The Gloucester, Mass., staff developed an "independently powered sonic instrumentation system" to give shipboard recordings of the fishing performance of New England otter trawls. The staff measured the trawl nets of several commercial vessels during fishing operations. The measurements may help increase catches.

GREAT LAKES

BCF researchers helped the industrial fishery for alewives in the Great Lakes with new trawl systems. They also designed an electrical trawl device for harvesting alewives. Test catches were 28% higher than those of ordinary trawls.

Increased commercial harvest--and introduction of salmon--may reduce alewife die-offs and restore the fish population balance.

BCF is conducting programs to promote the growth of the catfish industry: "gear and harvesting research, technological development, quality improvement, and Federal aid programs."

Its researchers have developed a mechanized haul seine to harvest catfish effectively. It works well with conveyor equipment used to load fish into trucks for shipment. The seine is efficient in large and small ponds down to 8 feet.

GULF & SOUTH ATLANTIC

BCF vessels discovered thread herring stocks in the Gulf of Mexico. Its staff is cooperating with industry in the northeastern Gulf to promote a new industrial fishery for this and other sardinelike species.

BCF's new "Oregon II" located stocks of tilefish and groupers in the Gulf's deeper waters.

Other Bureau vessels have found concentrations of calico scallops off Florida's east coast in 3 areas between New Smyrna Beach and Fort Pierce. Interested groups are trying to start a commercial fishery.

PACIFIC NORTHWEST

BCF exploration determined the areas and abundance of Pacific hake. This helped the commercial fishermen make good catches.

Fig. 2 - Nylon haul seine developed by BCF is stacked on pontoon barge and ready to set over stern roller. It is used in harvesting catfish from farm ponds.

Demonstrating Seine

During first-quarter 1968, 10 harvesting demonstrations with the mechanized seine were run in farm ponds in the Arkansas-Mississippi delta region. More than 200,000 pounds of fish were taken from 340 acres.

A truck-mounted line hauler is being tested "to develop a safe, efficient, and compact harvesting system."

BCF is providing information on plant design and sanitation to new processing plants in Arkansas and Mississippi. It is gathering data on the present and potential markets for catfish.

BCF-developed large midwater trawls and a precision depth-telemetry system are used by industry. The trawls have contributed to record catches of hake.

A "universal" trawl that can fish at midwater depths--and on the bottom--has tested well.

ALASKA

Researchers sought the most efficient pot-type gear for catching large-sized "spot" shrimp, the best bait, and best time period for pots to fish. Their fishing-gear trials led to a small commercial pot fishery in Southeastern Alaska.

They also tested a Dutch trawl, which has an upper and lower bag. Bottomfish and debris enter the lower bag--and shrimp the upper bag. Test fishing was encouraging: no shrimp were caught in the lower--and no bottomfish, crab, or debris in the upper. This trawl may become a useful device in the fishery for small pink shrimp.

Sonar Studies Pacific Skipjack Tuna

The scientists of BCF's Honolulu (Hawaii) Laboratory are conducting an unusual and far-reaching investigation: Not to find a fish, or a school of fish--but the population of a small tuna, Katsuwonus pelamis. It is called skipjack tuna in English and aku in Hawaiian. It is caught around the Hawaiian Islands throughout the year. The best catches have been made in summer when schools of large fish appear. Carefully kept records for the past 20 years show that 53 percent of the average annual catch of 5,000 tons is made in June, July, and August. Annual catches have ranged from 6 to 16 million pounds.

It has seemed probable to the lab's fishery scientists that, in addition to the local skipjack tuna, the Hawaiian fishery is drawing upon a migrant population--one that visits the islands in greatest numbers in summer. The scientists have concluded that these "season" fish are part of a large population resident in the central Pacific Ocean.

They assume that one of main spawning grounds of the skipjack tuna is south and east of Hawaii in the equatorial central Pacific. Fish spawned there migrate to the west coast of central America and Mexico; there several thousand tons of young fish are harvested annually. Within a few months, the scientists' assumption is, the skipjack turn westward again, returning to the central Pacific.

Several lines of scientific investigation led to this hypothesis. They pointed to the probability that the central Pacific has a very large population of skipjack tuna--and the only fishery there, in Hawaii, takes only a minuscule amount.

The Honolulu scientists forecast a yield of 100,000 tons if this skipjack population can be fished. That catch would be worth about $25 million a year to the fishermen, $62.5 million after processing, and $100 million at retail level.

The Operation

The lab was charged with the basic scientific studies required to bring this great resource into production. It equipped one of its research vessels, the "Townsend Cromwell," with a "complex, sensitive, and powerful electronic device, a continuous-transmission, frequency-modulated (CTFM) sonar to study the movements of tunas in the water." The sonar emits a sound signal whose reflection by a solid object--a tuna or tuna school--permits the operator to plot the ship's distance and direction from the object. The sonar resembles radar: the radar signal is an electromagnetic wave, but the sonar uses sound waves.

Complementing the sonar is a 14-channel electronic device that records the sonar's information. These data are automatically converted for analysis on large computers. So a tuna becomes "an echo picked up by the sonar (appearing on sonar screen as a point of light), a number in analog form on magnetic tape, a number in digital form on another magnetic tape and, eventually, Arabic numerals on a computer printout."

What They May Discover

With such information, says John C. Marr, BCF's Hawaii Area Director, the scientists will be able to determine the ways tunas move about. Now, most knowledge is obtained from sightings by fishermen when the fish ascend to the surface in pursuit of prey. "How long the schools remain at the surface, to what depths they descend, whether they maintain a schooling formation at night, how long a school lasts as a school (some scientists believe it may be throughout the lives of the fish), the routes they travel in the central Pacific--all this information, and more, will become available."

So far, most of the work has been done in Hawaiian waters because the operators of the equipment have been getting used to it.

Sonar Detects Sonic Tags

The scientists also are using the sonar as passive equipment. They are listening for a special sound: one emitted by a "sonic tag," a small sound transmitter attached to a fish. The tag now being used is 3 inches long and an inch in diameter. It broadcasts a sound pulse every second. The scientists have used the tag on little tunny (kawakawa) and on a shark. They were able to track the shark for 18 hours, the little tunnies for shorter periods. They hope that development of the tag will enable them to track tuna schools through the depths for longer periods.

By determining the behavior of individual tunas and tuna schools in Hawaiian waters, the BCF scientists expect to gain the information they need to design gear that will make possible the development of this great potential resource.

BCF Has Only U.S. Drift Buoy Program

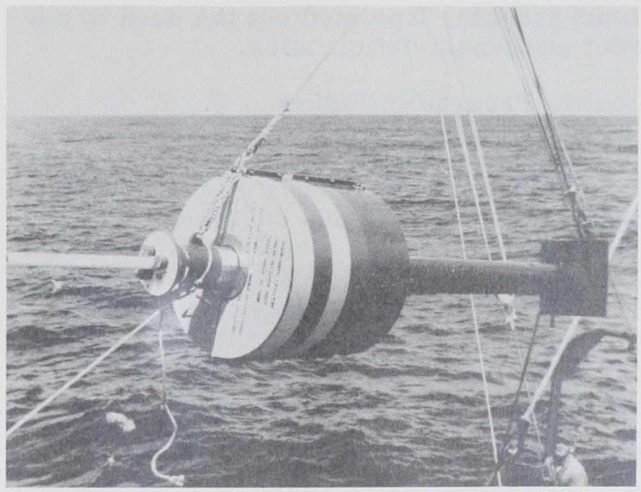
BCF has the only drift buoy program in the U.S. The program will operate from the Bureau's Seattle, Wash., Biological Laboratory with 7 operational buoys. One buoy is completely equipped with communications features that would have provided data transfer through the NASA NIMBUS satellite--but the satellite was lost at launch. The buoy now is on standby. Equipped with 8-10 sensors and the telemetry equipment needed for satellite communication, it costs about $60,000.

Needed for Program

The Seattle scientists explain the need for a drifting buoy system: Oceanographic surveys describe general patterns of circulation and distribution of water properties and organisms. However, such environmental conditions as gradients, and maximum and minimum values of water properties, can be more important to life in the sea than absolute values taken at one time and place, or seasonally biased average values. No reasonable expenditure of ship time, money, and manpower is likely to provide the detailed, 3-dimensional, synoptic, physical-chemical-biological coverage of the ocean required for marine fishery research. This is the reason BCF has developed its drifting buoy system. There is no doubt that most of the volume data gathering in the oceans will come from moored and drifting buoys--transistors turn out to be far cheaper than vessels. This application releases vessels to be used for other functions that cannot be instrumented.

The Buoys

Currently, 2 buoys are instrumented to measure temperature, depth, and salinity--and to telemeter data to research vessel or shore laboratory by HF telemetry link. The accuracy of measurements that can be expected from the sensors on these buoys is plus or minus 0.05° C. for temperature, and plus or minus 0.05 parts-per-thousand salinity. The accuracy with which the drifting buoys can be located is within 5 miles under optimum conditions, but it can range up to 30 to 50 miles when the buoys are far from shore. With satellite positioning, the accuracy is expected to be plus or minus ½ mile.



BCF Telemetry Buoy.

Sensing Units

The sensing units are inductively coupled to the cable attaching them to the buoy and contain their own power supply. A programming unit within the buoy samples the sensors on remote command from shore, or according to a pre-set schedule. Data are recorded on magnetic tape in binary format for transmission when the buoy is interrogated. A 25-watt transmitter, with power pack capable of up to one-year operation, transmits the data in response to a coded tone sequence.

Navy's TRANSIT System

Participation in TRANSIT, now the Navy Navigational Satellite System, is under consideration. Under this system, satellite orbits any buoy positions will be tracked at Seattle. When there is a favorable pass, the buoy will be switched to receive the satellite signal. Doppler shift will be received, counted, digitized, and transmitted on interrogation. All satellite orbital control, refraction correction, and computation will be conducted at the land station--and only relatively inexpensive receiving and counting equipment will be required on each buoy.

Instrumented Buoy Tested

A 30-day operational test of a fully instrumented buoy began Sept. 13, 1968, when the BCF research vessel "George B. Kelez" placed a buoy in Puget Sound. The buoy was anchored for purposes of the test. This test, only partially successful, was designed to determine the capability of new sensing units to provide data on water temperature and salinity at depth. It pointed out the need to correct equipment deficiencies.

Seattle Program's Future

As the scientists look to the program's future, they visualize buoys placed at random in the Gulf of Alaska and southward along the coast from Alaska to Washington. Eventually, the buoys will be placed according to a fixed plan.

Fish Pump Will Improve Brailing Operation

In the California wetfish (industrial) fishery, brailing--transferring catch from purse seine into vessel's hold--seems costly in time and labor. Many foreign fisheries use pumps to replace the brailing operation.

To aid the wetfish fishery, BCF's Fishery-Oceanography Center at La Jolla, Calif., has bought a rebuilt Marco Capsulpump. The pump will be installed in several California seiners for short trial periods.

Improvements Sought

The BCF researchers hope to demonstrate that mechanization of brailing "can permit a reduction in crew size, an appreciable saving in time, and a superior condition of the fish." The pump should enable 3 men to handle 100 tons of fish per hour; without the pump, 4 men brail about 25 tons an hour.

Like Finding A Fish in the Ocean

In July 1968, G. F. Kelly and C. F. Bocken of BCF's Woods Hole (Mass.) Biological Laboratory, went on a field trip to Eastport, Maine. Their purpose was to sample the population of redfish and to examine any tagged fish that might be caught.

Although they saw many tagged redfish in the water, most of the 250 caught were untagged. But one had been tagged in July 1956! During 12 years of freedom, the fish had been recaptured 3 times before.

It had grown 8 cm.--a rate of about $\frac{3}{4}$ cm. a year. The fish was in excellent condition and was returned unharmed to the water.

Woods Hole Aquarium Draws Record Crowd

During the 86 days it was open to the public this summer--June 15 to Sept. 8--the BCF Woods Hole Aquarium received a record crowd of 267,200 persons. This is 7,000 more than the record set in 1966. Average daily attendance was 3,130.

BCF-Produced Film Wins Award

The motion picture "Mullet Country" won a silver award at the International Film and TV Festival of New York on Oct. 18, 1968. The film was produced by BCF with funds provided by Florida under Public Law 88-309.

TV Documentary to Include Miami Lab's Shrimp Culture

Experiments in shrimp culture conducted by BCF's Tropical Atlantic Biological Laboratory (TABL) in Miami, Fla., will be seen on TV this winter in the American Broadcasting Co. series, "Man and his Universe." The ABC crew visited TABL October 7 and 8 and filmed aquaculture scenes inside the lab and the shrimp grounds nearby.

Florida's Calico Scallop Resources Are Evaluated

The calico scallop beds off Florida's east coast are "too dynamic," says BCF's Branch of Exploratory Fishing, to be able to find commercial concentrations consistently in the same area. Maximum concentrations are distributed between the 15- and 25-fathom depth contours from Fort Pierce to slightly above Daytona Beach.

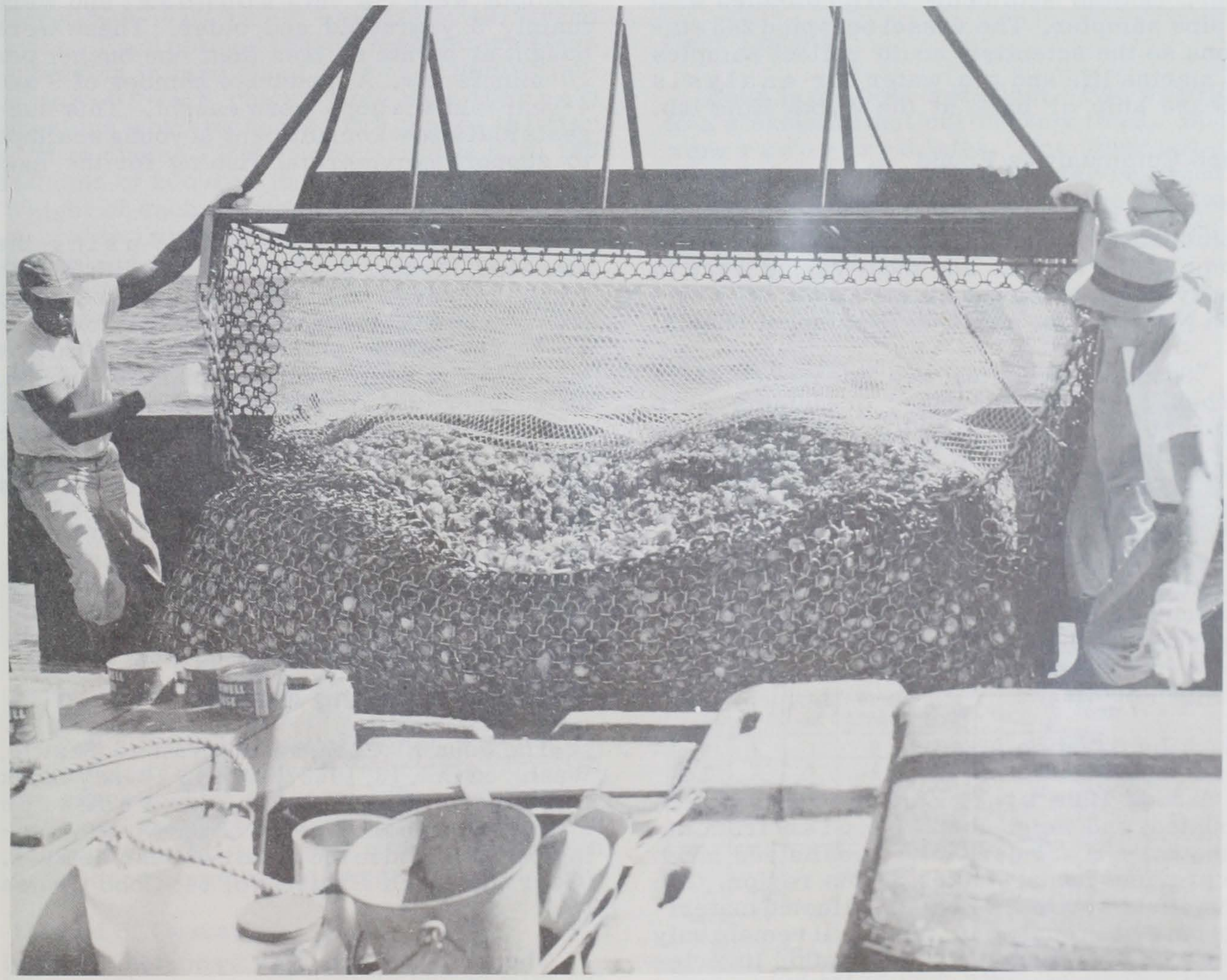
No Definitive Pattern

The area has no "definitive pattern"--except that scallops occur in bands and patches. Each patch reaches commercial size and maximum yield at different times. These depend on depth, probably influenced by water temperature, and north-south distribution.

1,200 Square Miles

The size of the calico-scallop bed is estimated at 1,200 square miles. In any month, 5-20% of this area has commercially exploitable stocks.

"The estimated growth rates of scallops are rapid and the life cycle short. The factors causing and affecting spawning, distribution, and mortality are matters of speculation at this time."



Fishermen on BCF research vessel "Silver Bay" prepare to dump catch of calico scallops on deck during exploratory drags off Florida. (Photo: J. B. Rivers)

'AlbatrossIV' Studies Bottom-Dwelling Invertebrates Off Northeast Coast

A major recent project of the scientists of BCF's Woods Hole (Mass.) Biological Laboratory was a cruise aboard the Albatross IV to the Gulf of Maine-Georges Bank region to study the benthic (bottom-dwelling) invertebrate communities. The localities they sampled most intensively were in relatively shallow (15-60 meters) rocky-bottom areas off Maine and Massachusetts, western Nova Scotia, and deeper areas near Browns and Georges Banks.

Benthic fauna samples were collected primarily with a 1-meter naturalist's dredge--and at selected communities with a sea-scallop dredge, quahog dredge, and bottom skimmer. Bottom sediments were collected with a pipe sampler. The vessel occupied 243 stations so the scientists could collect samples of marine life and sea water for analysis aboard ship or back at the Woods Hole lab.

Rich Communities Found

The scientists came across more than 15 communities of benthic invertebrate animals. Some of the richest and most varied were in rocky areas along the Maine Coast, off western Nova Scotia, and near Nantucket Shoals.

"Sponges, tunicates, sea anenomes, starfishes, hydroids, and other organisms were present in enormous quantities in these localities. Dense beds of small bivalve mollusks (Astarte spp., Venericardia borealis) were common in muddy bottom areas along the Maine Coast. Swarms of amphipod crustaceans were present on Stellwagen Bank and Nantucket Shoals. Vast areas dominated by polycheate worms (Potamilla neglecta and Onuphis conchylega) were encountered off the northern Massachusetts coast and southwest of Nova Scotia."

Much Information Acquired

Woods Hole staff sorted, classified, counted, and weighed 60 samples from the Albatross IV cruise. The results add much to previous faunal studies of this region. The scientists say that when all collected materials have been analyzed "there will remain only a few gaps in mapping of the benthic invertebrate communities in the offshore Gulf of Maine region."

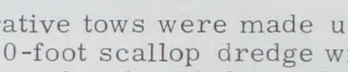
'Albatross IV' Surveys Sea Scallops of Georges Bank & MidAtlantic

The sea scallop stocks of Georges Bank and the Middle Atlantic region were surveyed in September 1968 by Albatross IV under the supervision of Henry W. Jensen, BCF Woods Hole. On Georges Bank, most of the scallops sampled were 4 or more years old. One to 6 bushels per 10-minute tow were taken at scattered locations on eastern Georges Bank.

On Southern Georges Bank, most scallops were large, 6 years and older; there was no evidence of recruitment of younger scallops. Catches averaged less than one bushel per tow.

Near Hudson Canyon, commercial-size scallops were not very abundant and were mainly 5 years old and older. These were caught at a rate of less than one bushel per 10-minute tow. A moderate number of 3 and 4-year-old scallops were caught. This suggests sufficient recruitment of young scallops to support commercial fishing for the next 2-3 years.

Comparative tows were made using the standard 10-foot scallop dredge with 2-inch rings compared with a 30-foot calico scallop trawl lined with 1-inch mesh. When towed on smooth bottom, the 30-foot trawl caught significantly more scallops than the dredge. On rougher bottom, the trawl became loaded with shells, rocks, and other debris. These made it more difficult to handle than the dredge, and required more culling of scallops from the debris brought on deck.



'Cobb's' Pot Gear Fishes Black Cod With Encouraging Results

The John N. Cobb returned to Seattle, Wash., on Oct. 18, 1968, after an 18-day black cod (Anoplopoma fimbria) gear research cruise in offshore waters of the North Washington coast and in the Strait of Juan de Fuca. (Gear Research Cruise No. 14; Cobb Cruise 98.)

The scientific staff reported: "Initial testing of pot gear for fishing black cod provided encouraging results. Effectiveness of pots opposed to longline gear was not fully evaluated due to low availability of fish and the presence of dogfish in each area."

In addition to the main objective of determining the feasibility of using trap-like gear (pots) for catching black cod, the staff aimed to: (1) determine the best size and depth of tunnel entrances for leading fish into the pot; (2) determine optimum soaking time; (3) determine whether cut bait in plastic screen bags would attract fish as opposed to open exposed bait; (4) and to determine suitable pot size for fishing and handling aboard fishing vessels.

Gear

The cruise began with 8 modified king crab pots (8' x 6' x 3') covered with 3-inch (stretched measure) webbing of 18-thread nylon. Each pot had 4 funnel-shaped openings extending inward about 10 inches and terminating at 6-inch rings. Ring size (tunnel) openings were increased to 8 inches in latter part of cruise. Pots were equipped with 140 fathoms of buoyline, buoys, and trailer buoys. Weight of each pot was 450 pounds. Near end of cruise 3 more pots, 4' x 4' x 3', were used to replace 4 of lost larger size pots.

Four skates of commercial black cod longline gear, 2 skates at one time, were used to determine availability of fish in an area, and as a standard gear to ascertain effectiveness of pots.

Bait

Commercially frozen bait herring was used in pots. The longline gear was generally baited with herring, although a small amount of octopus was used on several skates of gear.

Area of Operation

Two different areas off North Washington from 96 to 110 fathoms were selected as sites for experimental research. These areas had not been fished by black cod fishermen for several years but, at one time, were known to produce commercial quantities.

Method of Operation

Longline gear was usually baited with cut herring, but several times a bait-sized piece of octopus was put on every fourth hook. Pots were baited with herring cut into small pieces and inserted into plastic screen bait bags. The bags were then folded over at top, strung onto heavy gauge-wire bait hooks, and hung 2 to a pot between openings.

The fishing areas were first tested with longline gear to see whether black cod were present. When evidence appeared, baited pots were set individually and spaced ¼ mile to ½ mile apart in one row. Flagpoles and trailer buoys were set out at each end of set as a location aid when returning to lift the gear.

Weather

Except for first 2 days, cruise weather was poor. The Cobb was turned back 8 times due to heavy seas and high winds. Swells were 18 to 20 ft. and winds 38 to 43 knots.

Gear Losses

Four large pots were lost. Two were lost to a steamship that cut off buoy lines. Buoys were recovered later. One other pot was picked up by a trawler and later returned to Cobb; one pot remains lost. One and one-half skates of longline gear became fouled on the bottom and were lost.

RESULTS

Offshore Waters

Due to bad weather, low availability of black cod, and unscheduled surveillance assignments, the pots were lifted only 4 times. The longline gear was set and hauled 12 times, mostly in search of fish. The 2 areas fished off Northern Washington were:

Area 1	48°13' N.	124°57' W.
Area 2	48°13' N. to 48°22' N.	125°11' W.

Date	Haul	Area	No. of Pots Lifted	Water Depth	Black Cod Caught	Size (cm.)	Other Fish	Total
10/8	1	1	6	98-104F	28	45-61	2	30
10/10	2	1	4	98-104F	19	45-61	1	20
10/13	3	2	6 (4 lg.-2 sm.)	96-110F	16	65-78	2	18
10/15	4	2	6 (4 lg.-2 sm.)	96-110F	18	70-80	4	22

Between lifts 2 and 3, bait and tunnel openings to the large pots were modified. Openings on one pot were changed from 6 to 8 inches, which resulted in taking larger-sized black cod. Triggers (escape prevention) were added to 3 pots, and one pot was not changed (control). Pots with 6-inch openings and triggers caught less fish than control pot without triggers.

When a pot was baited with exposed bait, the bait was completely gone when pot was lifted. Conversely, the bait in pots where bait was in plastic screen bags was practically untouched at lifting time. These pots could be reset without rebaiting.

Longline Gear

Two skates of longline gear were set and hauled 12 times in areas 1 and 2. Four sets were made before any evidence of black cod was found. Results of sampling with longline gear were:

Date	Area	Depth	Bait	Soaking Time	Black Cod	Dog-fish	Other	Total
10/2	2	98-106F.	Herring	3 hrs.	0	43	0	43
10/2	2	98-100F.	"	2 "	0	42	0	42
10/3	2	101-110F.	"	2 "	0	4	3	7
10/3	1	100F.	"	2 "	5	22	0	27
10/7	1	101-105F.	Herr. & Octopus	2 "	0	35	1	36
10/10	1	98-101F.	"	1½ "	0	27	0	27
10/12	2	98-104F.	Herring	1 " 10 min.	1	31	0	32
10/13	2	101-105F.	"	1½ hrs.	0	39	0	39

Twice when octopus was used on every fourth hook, the octopus remained on hook after each hauling, but the herring was gone.

Total Catch Off Shore

Eighty-one black cod and 9 other incidental fish were taken in pots in offshore waters. Four lifts totaling 22 pot-sets were made. Sixteen longline sets produced 6 black cod and 253 dogfish. Less than 50 pounds of bait was used in the pots; the longline gear required 200 pounds.

Results in Strait of Juan de Fuca

On Oct. 15, 1968, operations were moved into the Strait of Juan de Fuca near Dungeness Spit, where both pots and longline gear were set in 70-78 fathoms. The longline gear was soaked 2 hours and caught 38 dogfish and 2 ratfish. The pots were hauled after soaking 6 hours and the catch was only one dogfish. The pots were taken aboard and reset in shallow water (15-20 fathoms). After soaking 15 hours, 3 dogfish and 1 large truecod were in the pots. Sandfleas had completely eaten the dogfish. The bait bags were completely covered with sandfleas, but they did not penetrate the plastic screen bags.

Note: For further information contact: Dayton L. Alverson, Bas Director, Exploratory Fishing and Gear Research Base, 272 Montlake Blvd. E., Seattle, Wash. 98102. Phone: 583-7729.

'Jordan' Studies Sonar Targets to Distinguish Anchovy

The David Starr Jordan cruised California waters in October 1968 to evaluate sonar targets in order to distinguish anchovy from non-anchovy schools; investigate the replication (return or repercussion) of the number of sonar targets per unit area and as affected by time of day, light, and schooling intensity; and to investigate the effects of sonar pulse length, transmission power and frequency on replication of sonar targets. (Cruise 28; Sonar Evaluation #2.)

Methods and Procedures

Tactical trawling: Usually at 4:30 a.m., at first sign of school formation, one school was chosen for trawling and ship conned onto site school occupied.

Sample trawling: At noon and midnight, samples were taken from 200 meters to surface with the midwater trawl.

Sonar evaluation: Two 3 x 6 km. (2 x 4 mi.) grid areas were established, one 3 km. (2 mi.) northeast of Arrow Point, Catalina Island, and one 3 km. (2 mi.) southwest of Ribbon Rock, Catalina Island. These sites were picked because of the density of targets and because they could be alternated if an unfavorable sea state was encountered on one side. The transducers were trained 90° to the right with a 5° down angle. Near-ship targets could be checked for surface signs of such well-known false targets as wakes of small boats, kelp, and flotsam. An XBT was taken with each grid to get some idea of thermal structure and effect it might have on sonar target count.

Results and Conclusions

Tactical trawling was impossible on the surface schools which formed most of the targets. By the time trawl had been set to depth, the approach of the ship either had caused school to split or veer to one side of ship. Although this behavior could be watched on the sonar PPI display, the ship could not turn on short notice at this low speed with the trawl out. Several pounds of anchovy were taken in each set, but there is no way of knowing whether these fish were part of target school or not. The scientists tried approaching the school with acoustic gear turned off--with essentially no effect. They maneuvered ship so school was on port beam, and approached it with a 270° right turn--with no effect.

In summary, the scientists report the trawl is a poor sampler of small schools of rapidly swimming organisms in the surface layer, even though some individuals are caught.

Sonar Evaluation

The Jordan occupied 36 successive grids for sonar mapping in a single place. Twelve additional grids were occupied at another time during the dark phase of the moon for comparison of night schooling. Each grid consisted of two 6 km. (4 mi.) long transects. Preliminary analyses indicate that the day-night target ratio is about 4 to 1 for the 30 kHz unit.

Possible explanations for the night decrease in number of sonar targets are: (a) some targets migrate down at night; (b) some targets are masked by planktonic volume reverberation when plankters migrate upward at night; (c) the organisms making up some targets change spacing at night so they no longer reflect underwater sound; (d) some combination of these.

In the first 75-hour run, there was an average of 19.6 targets per grid from 0400-0800, 109 targets per grid from 0800 to 1600, 25.4 targets per grid from 1600 to 2000, and 31.4 targets per grid from 2000 to 0400. Lowest concentrations were at dawn and dusk, as seen on the 30 kHz sonar. For this unit, area with the most targets was 18.5 km^2 or 5.4 square nautical miles. In all, there were 1,791 discrete targets. Further analysis will be necessary to describe similar relationships for the 11 kHz unit. Preliminary analysis of target size indicates a range of school size from 15 to 300 meters diameter. The mixed layer depth was 5 to 25 meters, with intense interval wave action through the entire survey.

'Oregon' Checks Florida's Scallop Grounds

BCF's exploratory fishing vessel Oregon returned to St. Simons Island, Georgia, on Oct. 25, 1968, after 18 days of scallop explorations off Florida's east coast. (Cruise 134, Oct. 8-25.) This was the ninth in a series of industrial development cruises to keep an up-to-date check on the Cape Kennedy calico scallop (Pecten gibbus) grounds.

The cruise purpose was to determine the best areas for commercial exploitation in the time available. Four standard transects were conducted in 10- to 40-fathom depths, as in all previous cruises in this series beginning in September 1967.

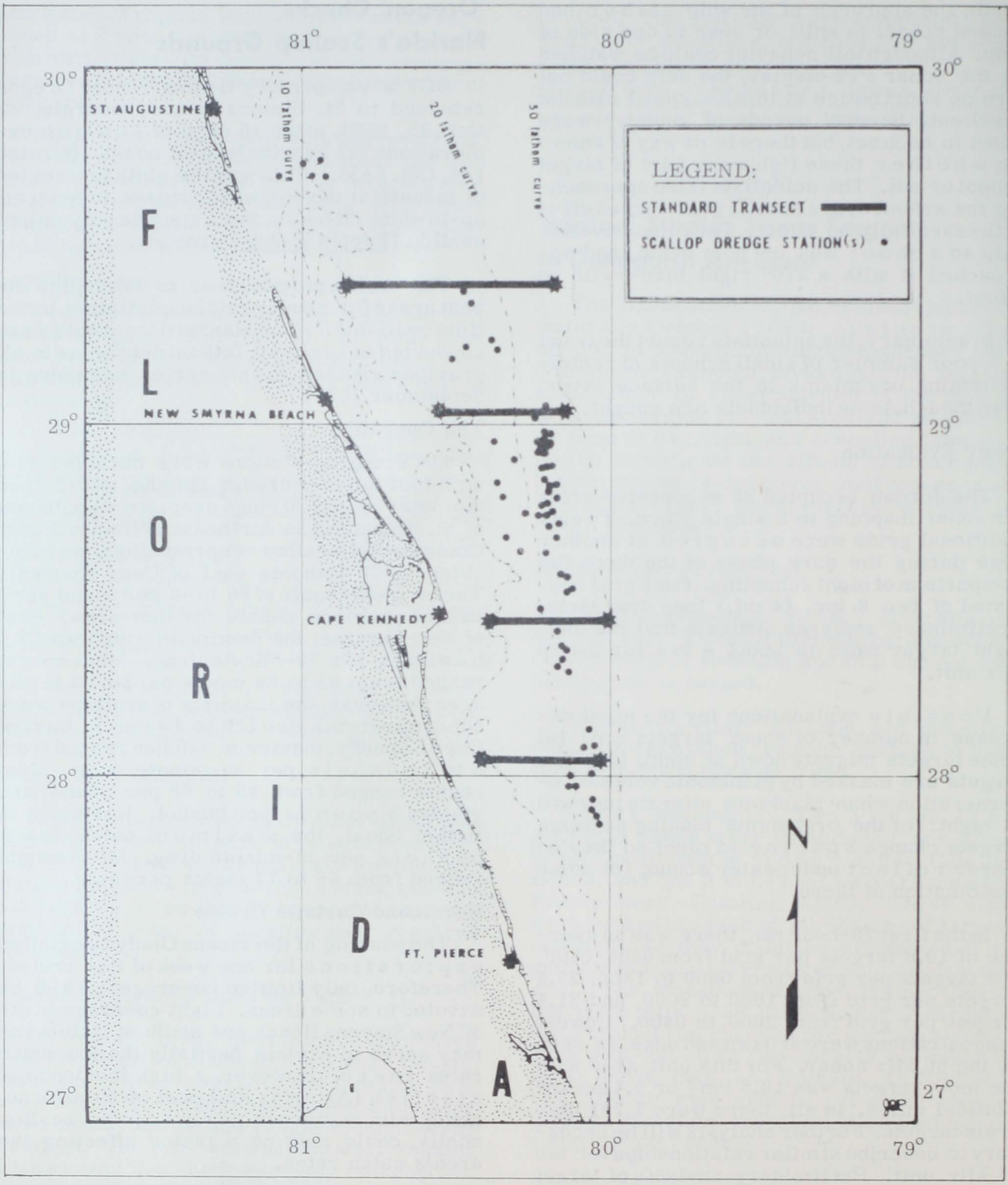
The Operation

116 dredging stations were occupied with an 8-foot tumbler dredge, finished with 2-inch diameter rings, 20 rings deep, from southeast of St. Augustine to northeast of Bethel Shoal. Commercial scallop concentrations were located in 26 fathoms east of Cape Kennedy. There, meat counts of 46 to 68 per pound surpassed previous counts for that area. East of New Smyrna, the maximum catch was 2.9 bushels per 30-minute drag. Meat counts ranged from 62 to 66 meats per pound in this area; however, the majority of scallops were subcommercial size (20 to 40 mm.). East of Cape Kennedy, maximum catches ranged from 5 to 8 bushels per 30-minute drag. Meat counts ranged from 46 to 68 per pound, and yielded 5 pounds per bushel. Northeast of Bethel Shoal, the maximum catch was 2 bushels per 30-minute drag. Meat counts ranged from 66 to 77 meats per pint.

Hurricane Curtails Cruise

The passing of Hurricane Gladys curtailed explorations for one week of this cruise. Therefore, only limited coverage could be devoted to some areas. Light coverage north of New Smyrna Beach and south of Melbourne may serve to explain partially the low catch rates there. However, a high incidence of starfish (Asterias sp.) east of Melbourne, along with numerous newly emptied scallop shells, could also be a factor affecting the area's catch rates.

Subcommercial size scallops (20 to 40 mm.) were numerous throughout the area, especially east of Cape Kennedy. There, one 30-minute drag in 22 fathoms yielded 32 bushels of seed scallops.



R/V Oregon Cruise 134, October 8-25, 1968.

'Delaware' Samples Sea Herring

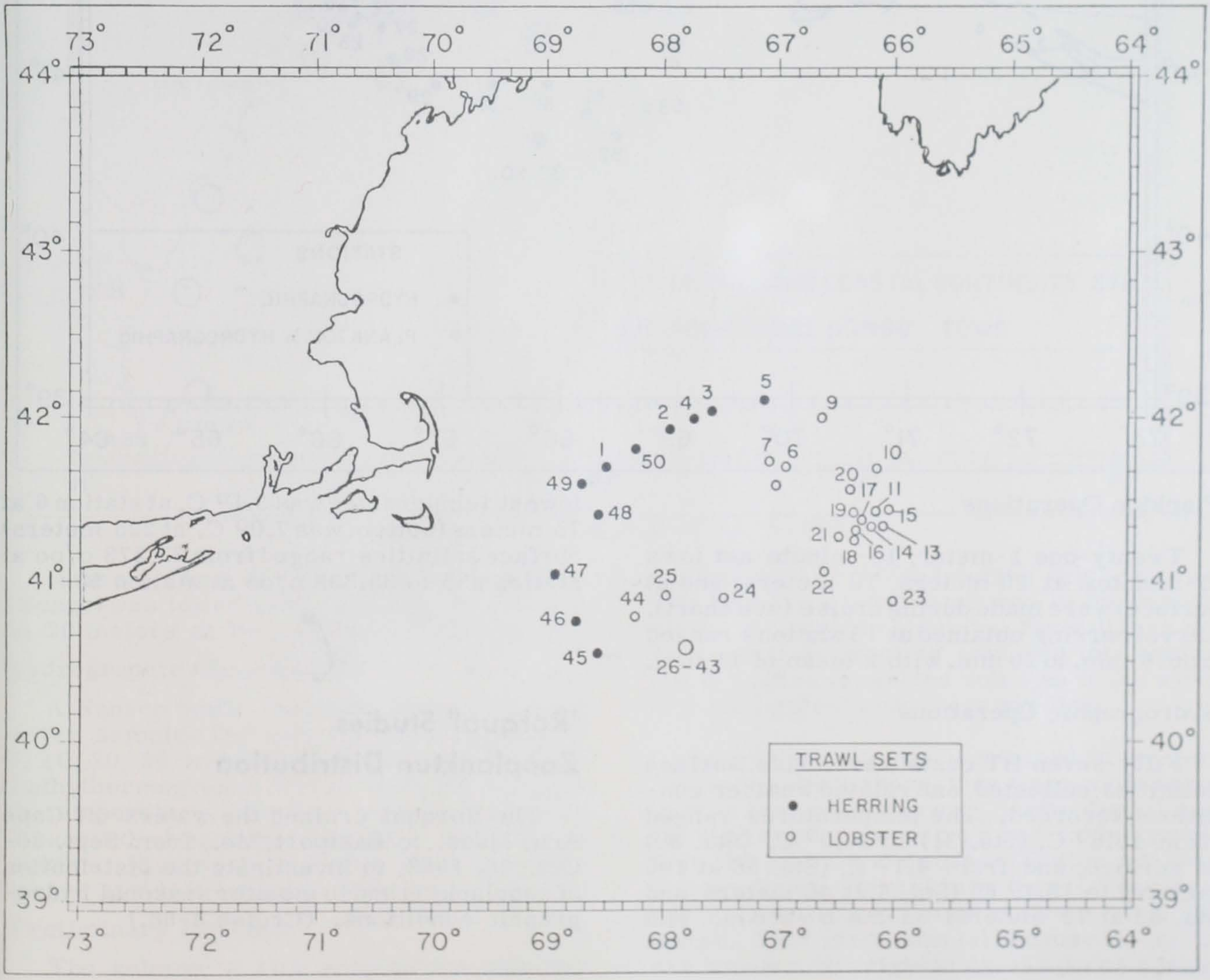
The Delaware cruised the general area of Georges Bank and the continental shelf from Corsair to Hydrographer Canyon in fine weather from Oct. 9-18, 1968. (Cruise 68-10 & Part II of 68-9.) Her purposes were to: (1) sample populations of sea herring and obtain related environmental data, (2) make plankton tows for larval herring, (3) obtain hearts from designated herring samples, and hearts and blood from designated lobster samples, and (4) tag and release lobsters.

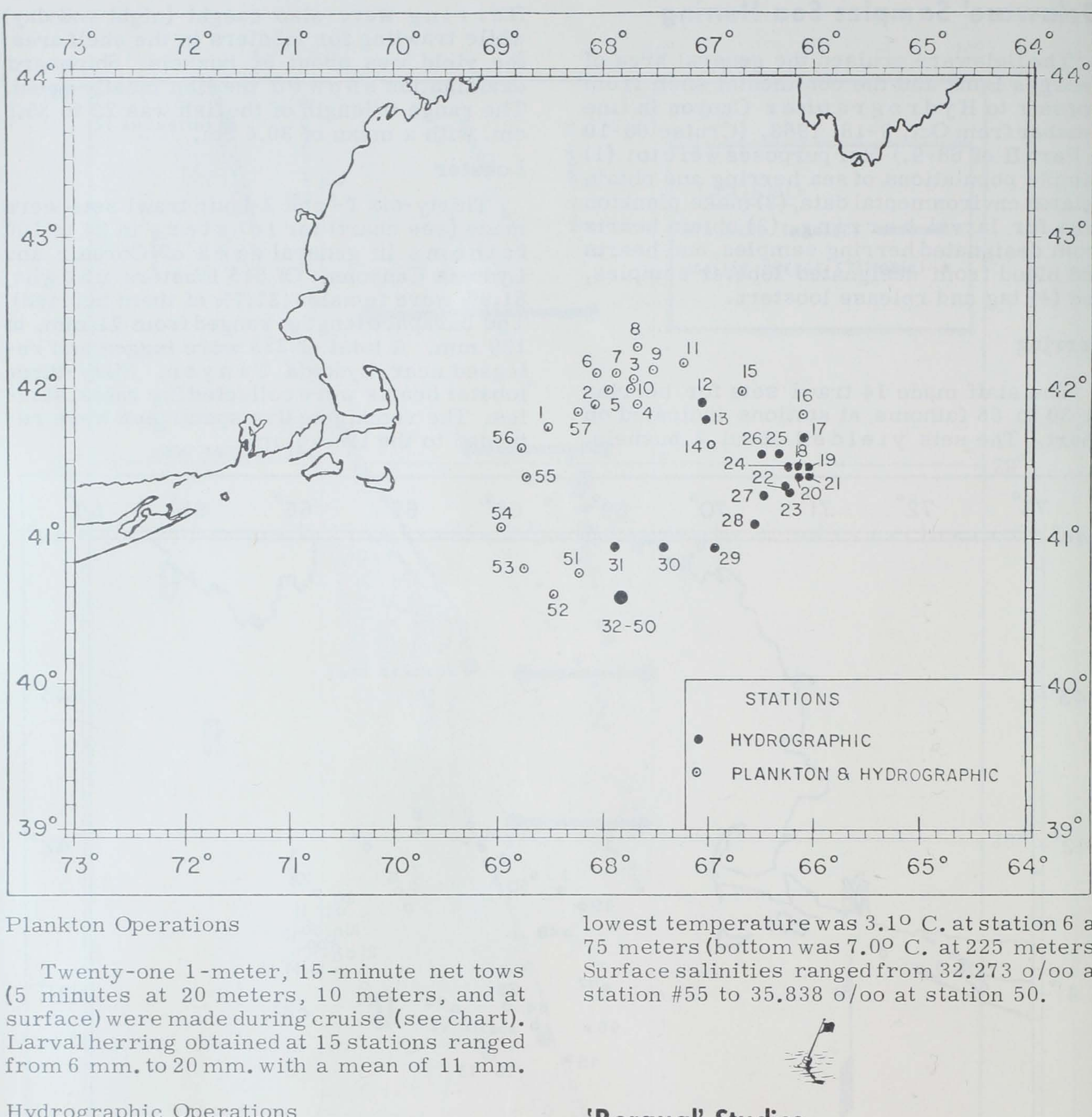
Herring

The staff made 14 trawl sets for herring in 30 to 86 fathoms at stations indicated on chart. The sets yielded about 2 bushels. Herring were also caught (night and day) while trawling for lobsters in the shelf area; the yield was about 5½ bushels. Shipboard examination showed the fish mostly spent. The range in length of the fish was 22 to 35.5 cm. with a mean of 30.6 cm.

Lobster

Thirty-six 1- and 2-hour trawl sets were made (see chart) for lobsters in 24 to 100 fathoms in general area of Corsair and Lydonia Canyons. Of 315 lobsters caught, 61.9% were females (37.7% of them berried). The carapace lengths ranged from 71 mm. to 199 mm. A total of 223 were tagged and released near Lydonia Canyon. Sixty-three lobster hearts were collected for racial studies. The remaining live specimens were returned to the laboratory.





Plankton Operations

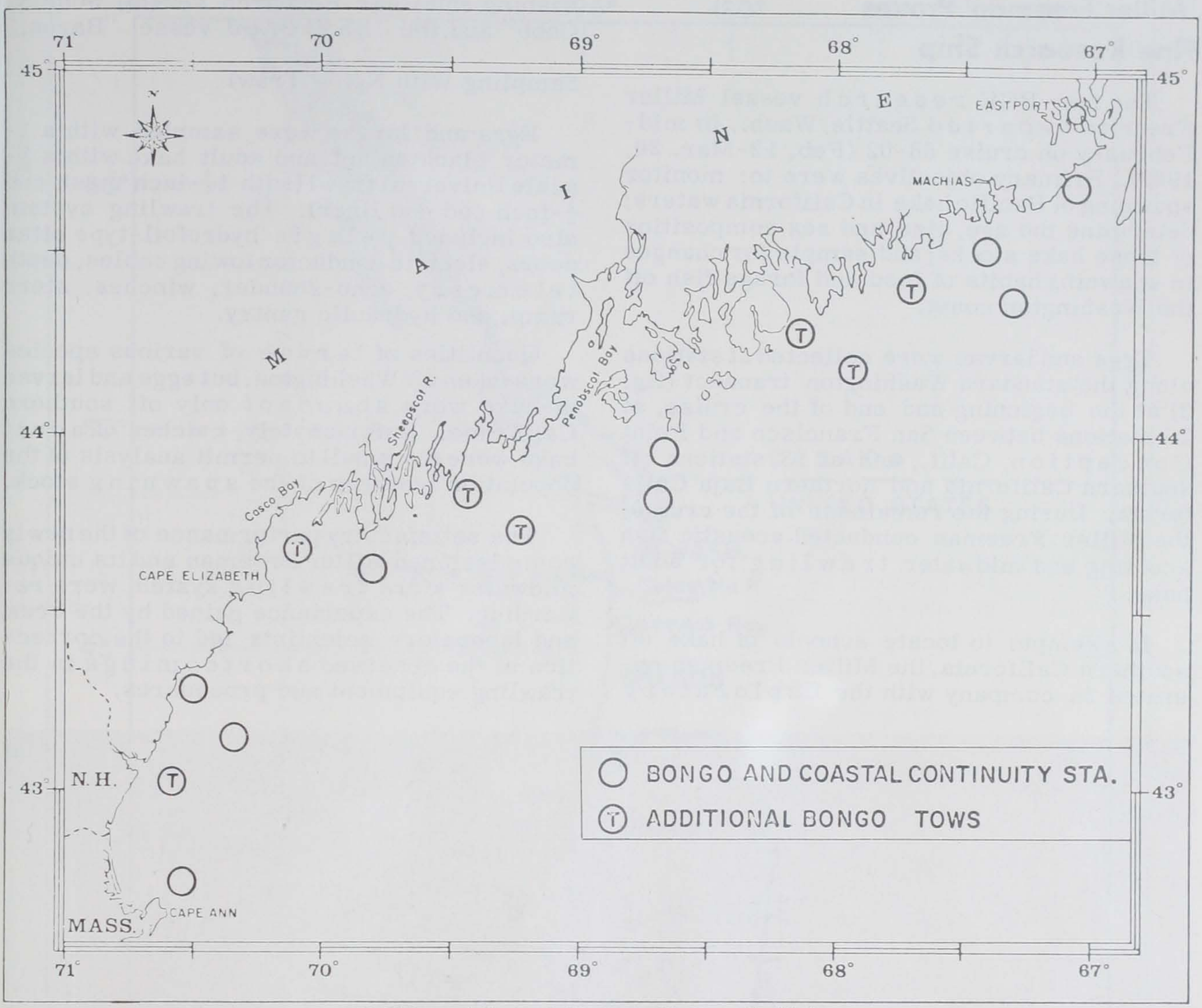
Twenty-one 1-meter, 15-minute net tows (5 minutes at 20 meters, 10 meters, and at surface) were made during cruise (see chart). Larval herring obtained at 15 stations ranged from 6 mm. to 20 mm. with a mean of 11 mm.

Hydrographic Operations

Fifty-seven BT casts were made, surface salinities collected, and related weather conditions recorded. The temperatures ranged from 13.6° C. (Sta. 31) to 20.9° C. (Sta. 50) at surface, and from 4.1° C. (Sta. 56 at 100 meters) to 15.1° C. (Sta. 4 at 40 meters and Sta. 53 at 75 meters) on the bottom. The lowest temperature was 3.1° C. at station 6 at 75 meters (bottom was 7.0° C. at 225 meters). Surface salinities ranged from 32.273 o/oo at station #55 to 35.838 o/oo at station 50.

'Rorqual' Studies Zooplankton Distribution

The Rorqual cruised the waters off Cape Ann, Mass., to Eastport, Me., from Sept. 30-Oct. 10, 1968, to investigate the distribution of zooplankton and to monitor seasonal hydrographic conditions. (Cruise 8-68.)



R/V Rorqual Cruise 8-68, Sept. 30 -Oct. 10, 1968.

A modified Brown-McGowan sampler (Bongo) was towed obliquely from the surface to 20 meters at 19 stations for 30 minutes.

Hydrographic Observations

A Nansen bottle cast was made to collect water samples for salinity determination at 0, 10, 20, 30 meters, and just above bottom. Bathythermographs traced vertical changes in temperature. Water transparency was measured at each hydrographic (continuity) station. Five surface drift bottles were released at 6 hydrographic stations.

Preliminary Findings

The volume of the zooplankton standing crop decreased from a summer mean of 5.31 cc/100m^3 of water strained by the sampling gear to 4.17 cc/100m^3 during this cruise. The greatest decrease was in the eastern area. In previous autumns, the volumes decreased from west to east, but this autumn (as in past summer) the volumes in the western and central area were similar.

Larval herring were obtained in the central and eastern areas; they were most abundant in the eastern area. Large deposits of herring eggs were reported in September from the inshore vicinities of Cutler and West Quoddy Head. Special tows were taken there, but no large quantities of larvae were obtained. This is not unusual because the larvae are known to migrate or disperse after hatching.

'Miller Freeman' Proves Fine Research Ship

The new BCF research vessel Miller Freeman departed Seattle, Wash., in mid-February on cruise 68-02 (Feb. 12-Mar. 20, 1968). Primary objectives were to: monitor spawning of Pacific hake in California waters; determine the age, size, and sex composition of these hake stocks; and sample for changes in spawning habits of food and forage fish off the Washington coast.

Eggs and larvae were collected at stations along the standard Washington transect (fig. 2) at the beginning and end of the cruise, at 20 stations between San Francisco and Point Conception, Calif., and at 13 stations off southern California and northern Baja California. During the remainder of the cruise, the Miller Freeman conducted acoustic fish scouting and midwater trawling for adult hake.

In attempts to locate schools of hake off southern California, the Miller Freeman operated in company with the Exploratory Fishing and Gear Research vessel "John N. Cobb" and the chartered vessel "Baron."

Sampling With Net & Trawl

Eggs and larvae were sampled with a 1-meter plankton net and adult hake with a $\frac{2}{3}$-scale Universal trawl (with $1\frac{3}{4}$-inch mesh and $\frac{1}{2}$-inch cod end liner). The trawling system also included pelagic hydrofoil-type otter doors, electric conductor towing cables, depth telemetry, echo-sounder, winches, stern ramp, and hydraulic gantry.

Quantities of larvae of various species were taken off Washington, but eggs and larvae of hake were abundant only off southern California. Unfortunately, catches of adult hake were too small to permit analysis of the population features of the spawning stock.

The satisfactory performance of the newly commissioned Miller Freeman and its unique midwater stern trawling system were rewarding. The experience gained by the crew and laboratory scientists led to the correction of the observed shortcomings in the trawling equipment and procedures.

Fig. 1 - The Miller Freeman.

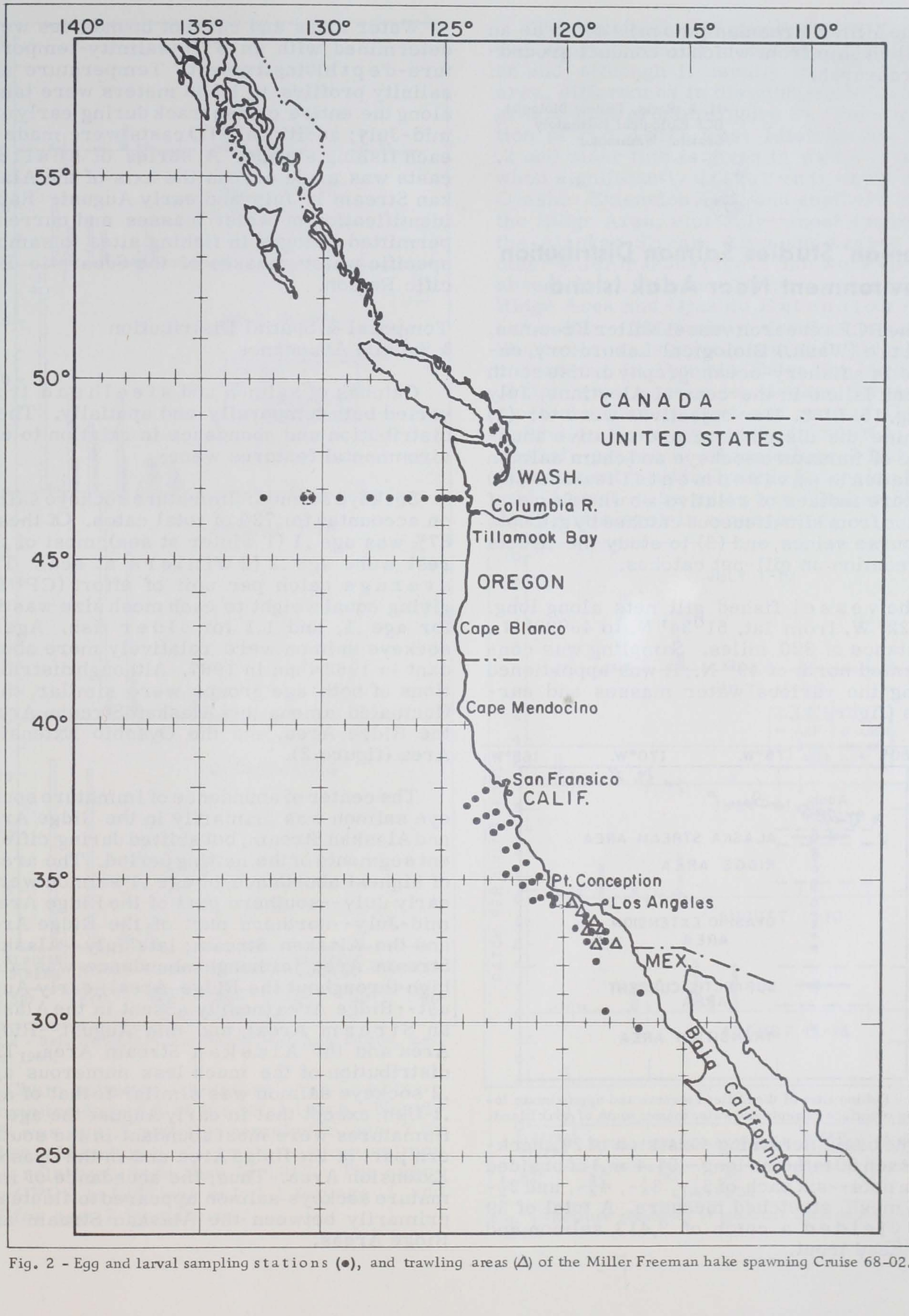


Fig. 2 - Egg and larval sampling stations (•), and trawling areas (Δ) of the Miller Freeman hake spawning Cruise 68-02.

The Miller Freeman promises to be an excellent ship from which to conduct groundfish research.

--N. B. Parks, Fishery Biologist
BCF Biological Laboratory
Seattle, Washington

'Freeman' Studies Salmon Distribution & Environment Near Adak Island

The BCF research vessel Miller Freeman, Seattle (Wash.) Biological Laboratory, engaged in a fishery-oceanography cruise south of Adak Island in the central Aleutians, July 1-Aug. 15, 1968. Her objectives were to: (1) examine the distribution and relative abundance of immature sockeye and chum salmon in relation to environmental features, (2) compare indices of relative abundance of salmon from simultaneous catches by gill nets and purse seines, and (3) to study the effects of predation on gill-net catches.

The vessel fished gill nets along long. $176^{\circ}22'$ W. from lat. $51^{\circ}34'$ N. to $46^{\circ}30'$ N., a distance of 320 miles. Sampling was concentrated north of 49° N.; it was apportioned among the various water masses and currents (figure 1).

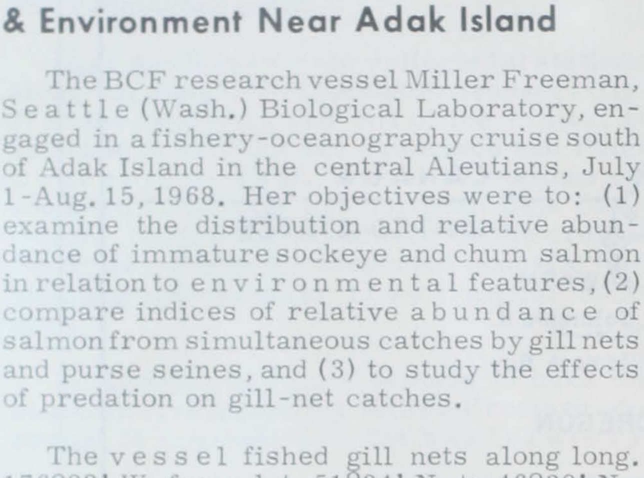


Fig. 1 - Fishing sites of the Miller Freeman and approximate location of surface currents and water masses south of Adak Island.

The basic net string consisted of 24 shackles (each 50 fathoms long--91.4 m.) of braided nylon nets--six each of $5\frac{1}{4}$-, $3\frac{1}{4}$-, $4\frac{1}{2}$-, and $2\frac{1}{2}$-inch mesh, stretched measure. A total of 39 sets yielded a catch of 3,413 salmon and steelhead trout.

Water mass and current boundaries were determined with an STD (salinity-temperature-depth) instrument. Temperature and salinity profiles to 1,500 meters were taken along the entire cruise track during early and mid-July; additional STD casts were made at each fishing station. A series of shallow casts was made across the axis of the Alaskan Stream in July and early August. Rapid identification of water masses and currents permitted changes in fishing sites to sample specific water masses of the Subarctic Pacific Region.

Temporal & Spatial Distribution & Salmon Abundance

Catches of salmon and steelhead trout varied both temporally and spatially. Their distribution and abundance in relation to environmental features were:

Sockeye salmon: Immature sockeye salmon accounted for 72% of total catch. Of these, 87% was age .1 (1 winter at sea); most of the rest were age .2 (2 winters at sea). The average catch per unit of effort (CPUE), giving equal weight to each mesh size was 8.3 for age .1, and 1.1 for older fish. Age .1 sockeye salmon were relatively more abundant in 1968 than in 1967. Although distributions of both age groups were similar, they fluctuated among the Alaskan Stream Area, the Ridge Area, and the Oyashio Extension Area (figure 2).

The center of abundance of immature sockeye salmon was primarily in the Ridge Area and Alaskan Stream, but shifted during different segments of the netting period. The areas of highest abundance of age .1 salmon were: early July--southern part of the Ridge Area; mid-July--northern part of the Ridge Area and the Alaskan Stream; late July--Alaskan Stream Area (although abundance was also high throughout the Ridge Area); early August--Ridge Area (nearly absent in the Alaskan Stream Area); and mid-August--Ridge Area and the Alaskan Stream Area. The distribution of the much less numerous age .2 sockeye salmon was similar to that of age .1 fish, except that in early August the age .2 immatures were most abundant in the southern part of the Ridge Area and in the Oyashio Extension Area. Thus, the abundance of immature sockeye salmon appeared to fluctuate primarily between the Alaskan Stream and Ridge Areas.

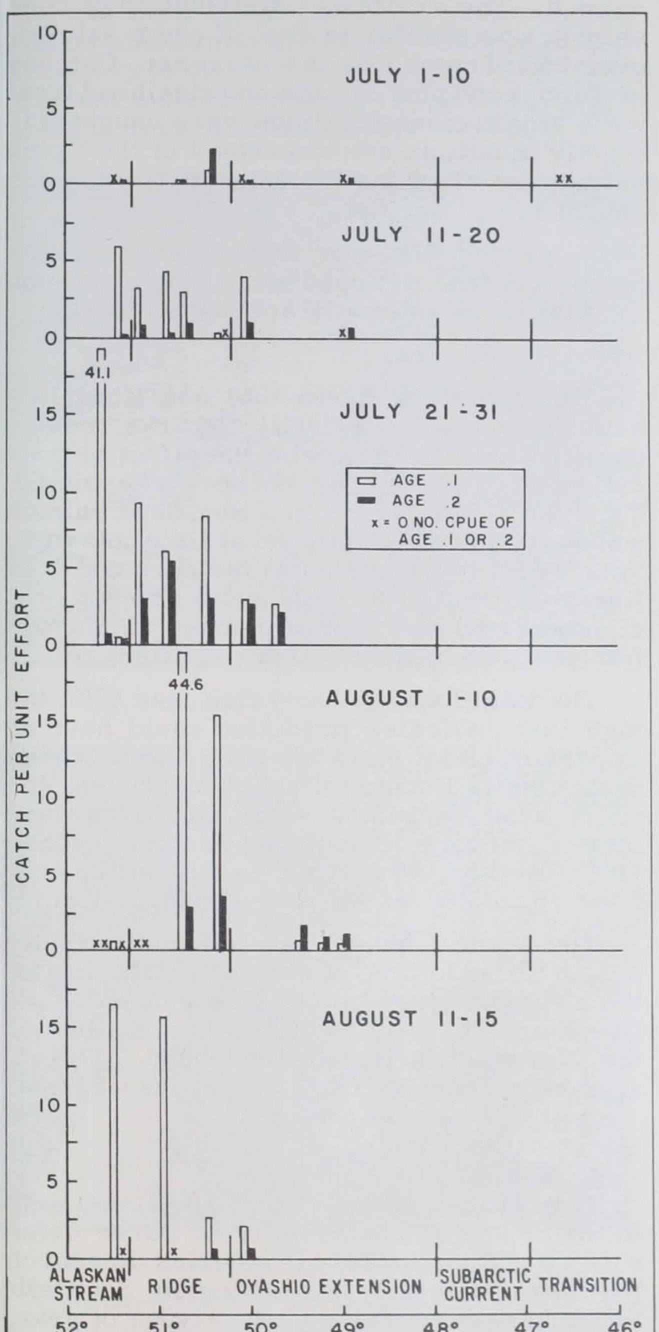


Fig. 2 - Relative abundance of immature sockeye salmon, summer 1968.

Chum salmon: Immature chum salmon accounted for 16% of the total catch. Nearly 60% was age .1 and the remainder age .2 or older. Abundance of immature chum salmon was relatively less than in 1967. The average CPUE in 1968 was only 1.1 for age .1, and 0.7 for age .2 immatures.

The distribution of immature chum salmon was roughly similar to that of sockeye salmon and, although it usually covered a wider area, differences in distribution between age groups were greater (figure 3). The distribution of age .1 fish was: (distribution of age .2 and older fish is given in parentheses when significantly different) early July--Oyashio Extension Area and southern part of the Ridge Area; mid-July--most abundant in the Alaskan Stream Area and scarce in the other water masses (age .2 fish were virtually absent from Alaskan Stream and scarce in Ridge Area and Oyashio Extension Area); late July--moderately abundant in Alaskan Stream Area, relatively scarce in Ridge Area, and absent in Oyashio Extension Area (age .2 fish were scarce in Alaskan Stream and most abundant in northern part of Oyashio Extension Area, near lat. 49°30' N.); early August--scarce in all areas (age .2 fish were still concentrated in Oyashio Extension Area); mid-August--abundant in Alaskan Stream Area and scarce in other areas.

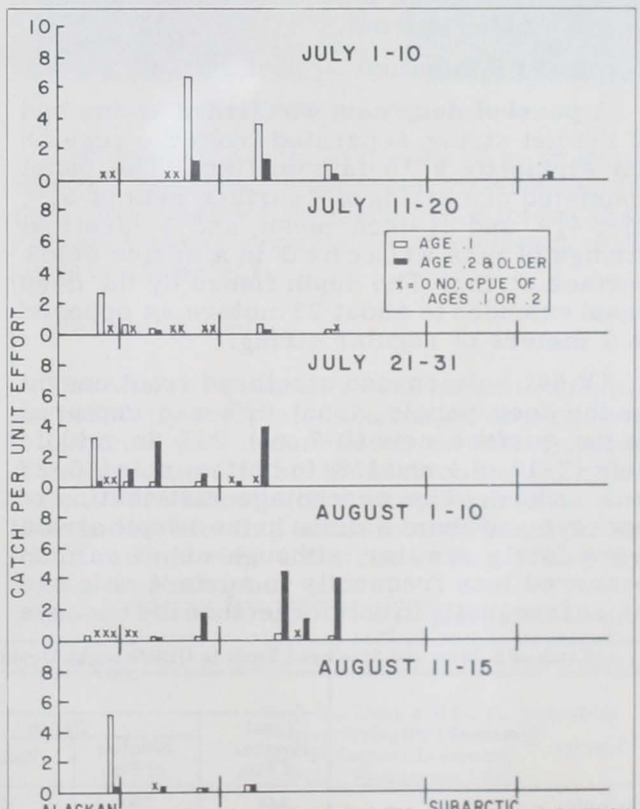


Fig. 3 - Relative abundance of immature chum salmon, summer 1968.

Immature chum salmon then, appeared to shift in abundance among Alaskan Stream, Ridge, and Oyashio Extension Areas.

Other species: Coho salmon made up about 10% of total catch; a few pink and chinook salmon and steelhead trout were also taken. Most salmon were caught in Ridge and Oyashio Extension Areas in late July and early August. Only 13 steelhead trout were captured, mostly from Oyashio Extension Area south of lat. 50° N.

Significance of Catches

The catches of immature sockeye and chum salmon suggested that abundance of the immature fish was not constant in any area--but changed as successive fluctuating waves passed from one water mass to another. These results also raise the possibility that these species may migrate from south to north before turning west in the Alaskan Stream and Ridge Areas.

Data are inadequate to infer migration patterns for coho, pink or chinook salmon, or for steelhead trout.

Vertical Distribution

A panel of deep nets was fished at one end of the net string, separated from the regular net string by a 15-fathom line. The panel consisted of a string of 4 surface nets of $5\frac{1}{4}$-, $3\frac{1}{4}$-, $4\frac{1}{2}$-, and $2\frac{1}{2}$-inch mesh, and 2 identical strings of nets attached in a series below surface string. The depth fished by the deep panel extended to about 23 meters as opposed to 7 meters of regular string.

Of 647 salmon and steelhead trout caught in the deep panels, about 62% was captured in the surface nets (0-7 m.), 23% in middle nets (7-15 m.), and 15% in bottom nets (15-23 m.), table. The percentage distribution of sockeye and chum salmon in the 3 depth strata were fairly similar, although chum salmon occurred less frequently in surface nets and more frequently in bottom net than did sockeye salmon. The vertical distribution of coho salmon was similar to that of chum salmon; over 25% of catch was in bottom net. Catches of chinook and pink salmon and steelhead trout were small; chinook salmon were caught primarily in bottom net, whereas 4 of the 7 pink salmon, and 6 of the 7 steelhead trout, were caught in surface net.

Deep nets will be used in the future to examine further the vertical distribution of salmon in relation to water masses and currents.

Predation Studies

Although it is known that sea lions, fur seals, birds, and possibly sharks feed on salmon caught in gill nets, the effect of predation on catch rate has not been determined. To investigate this relation, dead salmon were attached to the gill net at time nets were set. The fish were tied to the cork and lead lines. Normally, 20 fish were attached per night and records kept of number of "decoy" fish recovered when nets were lifted.

The total loss of decoy fish was 67%; the high loss indicates predation could have an important effect on catch rate. Loss tended to decline as distance offshore increased. Inshore, where sea lions, seals, and birds were more numerous, loss of decoys often reached 100%. Beyond 100 miles, loss was still great, from 15 to 57%, and averaged nearly 40%.

The loss of decoy fish was not directly proportional to size of salmon catch. In 4 of the 5 sets in which total catch was less than five fish, 100% of decoy fish was lost; in 8 of the 9 sets in which catch exceeded 100 fish, an average of over 70% of the decoys was lost.

Comparative Fishing

The Miller Freeman made 10 gill-net sets in the immediate vicinity of purse-seine vessel 'Commander' (Fisheries Research Institute, University of Washington, Seattle)1/ to compare catch rates of the 2 types of gear.

Catch of Salmon and Steelhead Trout in Gill Nets, by Depth of Net, During Studies of Vertical Distribution in Spring 1968

Species	Total Number of Fish	Depth of Gill Net: 0-7 m Number of Fish	0-7 m Percentage	7-15 m Number of Fish	7-15 m Percentage	15-23 m Number of Fish	15-23 m Percentage
Sockeye.	444	290	65.3	111	25.0	43	9.7
Chum	105	53	50.5	26	24.8	26	24.7
Pink	7	4	57.1	1	14.3	2	28.6
Coho	73	43	58.9	11	15.1	19	26.0
Chinook.	11	3	27.3	1	9.1	7	63.6
Steelhead.	7	6	85.7	0	0.0	1	14.3
Total.	647	399	61.7	150	23.1	98	15.2

1/Under contract to BCF.

Because both types had been used to index salmon abundance in Adak Island Area, it was necessary to determine extent to which these different methods of sampling agreed in providing indices of salmon and trout populations.

Fig. 4 - Setting nets from the Miller Freeman.

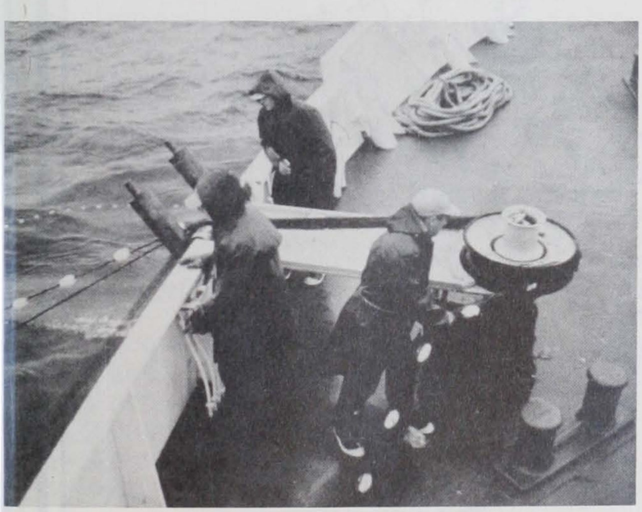


Fig. 5 - Hauling gill nets aboard Miller Freeman.

Comparison of purse seine and gill-net catches in previous years indicated considerable discrepancies in catch. Indeed, it showed little correlation in abundance or species composition. Comparisons in 1968 also indicated similarities and inconsistencies previously observed. Large gill-net catches were correlated with large purse-seine catches; large purse seine catches, however, did not necessarily accompany large gill-net catches.

Fig. 6 - Taking STD from Miller Freeman.

Comparisons of these 2 types of gear were difficult because of inherent differences in gear and methods of fishing. (Factors that influence such comparisons are subject of a separate paper[2/].)

A Successful Cruise

The Miller Freeman's 1968 summer cruise successfully completed the major objectives. It obtained new information on distribution of salmon in relation to environmental features. This information was presented at the 15th Annual Meeting of the International North Pacific Fisheries Commission (Seattle, Wash.) in November 1968.

2/Craddock, Donovan R. 1968. Comparisons of gill net and purse seine catches of salmon in North Pacific Ocean. Unpublished MS, Biological Laboratory, BCF, Seattle, Wash.

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'Manning' Explores for Shrimp in Kodiak Island Area

BCF's John R. Manning returned to Juneau, Alaska, on Oct. 2, 1968, after a 13-week combination exploratory fishing and gear research survey for shrimp in the Kodiak Island area (Cruise 68-2).

The area included selected bays along the eastern and western shores of Kodiak Island, offshore waters along the eastern shore of Kodiak Island, Shelikof Strait, and bays along the Alaska Peninsula between Cape Douglas and Wide Bay.

Cruise objectives were to (1) test-fish a BCF-developed 2-bag shrimp trawl on commercial fishing grounds to determine degree of separation of groundfish and debris from shrimp; (2) gain information on distribution and size of commercially interesting shrimp species: pink (Pandalus borealis), coonstripe (P. hypsinotus), humpy (P. goniurus), and sidestripe (Pandalopsis dispar); (3) make

Area of operations Cruise 68-2.

exploratory tows for shrimp in areas preselected by local Kodiak fishermen to determine if commercial size catches could be harvested; (4) conduct a preliminary bulk-shrimp pumping trial to see if shrimp could be pumped from a test tank, and (5) log sightings of foreign fishing vessels for Branch of Enforcement and Surveillance.

During survey, 102 drags were made. Trawls utilized were (1) an 85-foot Universal shrimp trawl--23 drags, (2) a 66-foot Kodiak shrimp trawl--59 drags, (3) a 70-foot two-bag shrimp trawl--16 drags, and (4) a 40-foot Gulf shrimp trawl--4 drags.

The largest catch occurred 35 miles east of Two Headed Island, during tow 69, over a bottom depth of 81 to 90 fathoms. There, 26,400 pounds of Alaska pollock (Theragra chalcogrammus) were collected in a haul of assorted groundfish totaling 28,800 pounds.

Exploratory Fishing

Shrimp explorations were conducted in inshore and offshore waters of Kodiak Island and Shelikof Straits (Fig. 1) using a standard commercial 66-foot shrimp trawl. Fifty-seven stations were fished throughout the survey area. Catches ranged from 0 to 13,500 pounds of shrimp per hour fished, and averaged 1,343 pounds per hour for all drags.

Pounds of Shrimp	No. of Drags
0 - 499	31
500 - 999	6
1,000 - 1,999	7
2,000 - 2,999	6
3,000 - 2,999	3
over 4,000	7

Drags that produced over 1,000 pounds per hour were made in Marmot Bay, Marmot Gully, 13 miles ESE Geese Island, Wide Bay, Raspberry Strait, south and north Arms Uganik Bay, Uganik Bay, and Uganik Passage, Kuliak Bay, Kinak Bay, 5 and 7 miles east of Kiukpalik Island, and Kukak Bay.

Universal Shrimp Trawl

Preliminary tests were made with an 85-foot universal shrimp trawl designed by BCF's Exploratory Fishing & Gear Research Base in Seattle, Wash. The universal trawl is designed to be fished either off-bottom at intermediate depths, or on bottom.

Initial trials were conducted in Viekoda Bay during daylight. During all dragging, a light off-bottom trace of shrimp was showing on echo sounder. Four drags were made with the trawl doors from 3-7 fathoms above bottom. In all cases, the trawl's footrope came into contact with bottom as shown by composition of catch. Four drags also were made at mid-depths: the trawl doors were 7-33 fathoms above bottom. The on-bottom catches of shrimp ranged from 301 to 2,160 pounds and averaged 1,173.5 pounds per hour fished; the mid-depth catches ranged from 85-858 pounds and averaged 430.7 pounds per hour fished.

One very noticeable difference between on-bottom and mid-depth catches was species composition. The former consisted of 67.12% pink, 26.27% humpy, 5.55% sidestripe, and 1.05% coonstripe shrimp; the mid-depth catches consisted of 80.78% humpy, 18.74% pink, and .48% sidestripe. No coonstripe shrimp were taken at mid-depths. The average catch per hour of humpy shrimp was about same for on-bottom (307.8 pounds per hour) and mid-depth drags (348 pounds per hour); pink and sidestripe shrimp increased in on-bottom drags. The on-bottom and mid-depth experiments with universal trawl were continued in Marmot Bay. Three 1-hour drags were made in Viekoda Bay procedure. The on-bottom drag produced 666 pounds of shrimp; the mid-depth trials (3-9 fathoms off-bottom) caught 200 pounds and (28-53 fathoms off-bottom) 33 pounds.

Two-Bag Trawl Tests

Sixteen test tows were made with the 2-bag trawl. Gear testing was conducted in areas routinely fished by commercial trawlers: Marmot Bay (1), Uganik Bay (4), Kiliuda Bay (4), Sitkalidak Strait (2), and off Dangerous Cape (2). Three more tows were made in Viekoda Bay on western side of Kodiak Island. Sampling depth varied between 32 and 85 fathoms in Viekoda Bay, and between 41 and 74 fathoms along eastern shore of Kodiak Island. Results from 15 test tows showed 83.33% (17,078 pounds) of shrimp collected in shrimp bag, while 16.66% (3,415.5 pounds) was collected in fish bag. The percentage composition of groundfish was 12.46% (1,276 pounds) in shrimp bag, and 87.53% (8,962.4 pounds) in fish bag.

Shrimp-Pumping Trials

A capsule pump like those in South American anchovetta fishery was used in shrimp-pumping trials aboard Manning. The submersible pump housing was lowered into a test tank filled with seawater and shrimp. Results of trials were negative. The shrimp, unlike fish, did not flow toward and into pumping stream. A vertical mass of shrimp remained surrounding the housing after water had been pumped from test tank. An adapter designed to increase the pump's effective drawing range will be installed during planned tests aboard a commercial trawler in the future.

BCF Scientist Aids Coast Guard's Glacier Study

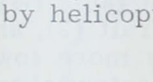
Roger Theroux of the Woods Hole Biological Laboratory took part in a Coast Guard survey in summer 1968 of west Greenland waters aboard the USCGS "Eastwind". The survey was the first in a series of annual expeditions by the International Ice Patrol.

The project's objectives are "to determine the number of icebergs calved from the glaciers, and to survey the glacier fronts and environmental conditions affecting discharge, including the hydrography, bottom sediments and benthic organisms."

Theroux collected and studied benthic animals and helped collect bottom sediments.

The Operation

The field party joined the Eastwind at Thule, Greenland, and moved south along coast to Sondre Strømfjord. "Samples and observations for hydrographic and benthic studies were collected most frequently in fjords servicing berg-producing glaciers." Personnel went by helicopter to survey and mark glaciers.



Fast-Sinking Purse Seine Is Shaping Up

The July 1968 Commercial Fisheries Review reported the development of a fast-sinking purse seine that will provide tuna fishermen with more efficient gear.

In designing the "hybrid" net, M. Ben-Yami, visiting investigator from the Israel Department of Fisheries, worked with Roger Green, Fishery Biologist at BCF's Fishery-Oceanography Center at La Jolla, Calif. They attempted to combine "the fast-sinking qualities of the North Atlantic purse seine with the strength, deep-fishing, and ease of handling of the California tuna seine." Model tests of this net were very encouraging. So a full-scale net, 460 fathoms by 55 fathoms, was built in spring 1968 in a San Pedro net yard. It was field tested successfully with the help of Jerry Jurkovich, gear technician from the BCF Exploratory Fishing and Gear Research Base in Seattle, Wash.

Sea Trials

The initial sea trials showed that the new net sank about 70% deeper and at a significantly faster rate than conventional 7-strip tuna purse seines. The hybrid purse seine also maintained its initial diameter well into pursing. This was in contrast to conventional nets, whose tightly hung webbing during sinking causes the floats to bunch and the net's diameter to shrink; this results in crowding fish by a diminishing circle of webbing before escape routes are closed. "The deep, square cut ends (gavels) of the net, with their long, separately pursing, breast lines, showed no tendency to foul or roll in the purse line and were handled without loss of time. Also, because the gavels hang nearly vertically beneath the boat, the new net offered a very reduced escape route for fish."

A Minor Problem

Only one minor problem has been encountered: the net is somewhat more difficult to stack and takes longer than others. But with practice and modified handling techniques, this time may be shortened. The researchers expect that sinking rates and depths will increase as the net is "broken in" during fishing by removal of excess tar and increasing flexibility.