



Stacking purse seine net on the tuna clipper "West Point" (BCF Tuna Resources Laboratory, La Jolla, California).

UNITED STATES

VALUE OF 1966 CATCH IS NEAR 1965 RECORD

The value of United States fishery products to commercial fishermen in 1966 is forecast at \$445 million, only about \$1 million short of the 1965 record.

The volume of the catch is expected to be 1.1 billion pounds, the lowest since 1947.

The total value remains high despite the smaller catch because the harvest of high-value fishery products, those people eat, is about the same level of recent years--2.5 billion pounds--and price levels approximate last year's. The sale of edible fishery products makes up, by far, the largest part of fishermen's income.

Shrimp and Pacific salmon are again ranked one-two among dollar earners. Shrimp

are bringing fishermen the highest average prices per pound in the history of the fishery.

The drop in the total fish catch reflects the decline in the industrial fish catch--primarily the dramatic decrease in the menhaden catch. The menhaden catch plummeted from 1.7 billion pounds in 1965 (36 percent of the total catch of all species) to 1.133 billion pounds in 1966. While the total value of menhaden was down, average prices were up because prices in the fish meal industry, a prime user of menhaden, were the highest in its history. (BCF/Branch of Fishery Statistics.)

Coming issues of COMMERCIAL FISHERIES Review will report the 1966 catch in greater detail.

SITUATION AND OUTLOOK

Supplies of edible fishery products at the beginning of November 1966 were the heaviest ever for that date. Compared with a year earlier, stocks of frozen products were substantially higher. There were marked increases in holdings of fillets and steaks of cod, flounder, and ocean perch. Stocks of fish sticks and portions, halibut, salmon, and many lobster tails also were higher. Storage holdings of frozen shrimp, scallops, and crabs (including crab meat) were down. Among canned products, holdings of salted herring were plentiful compared with 1965.

The fine run of pink salmon in Alaska in 1966 and a good run of reds assure plentiful stocks of canned salmon for coming months. Supplies of canned tuna appear adequate; the run to date is running well ahead of last year.

Imports of edible fishery products likely will exceed those of 1965. However, the 1966 beginning inventory was lighter than 1965, so total supplies in 1966 may fall somewhat short of the amount available in 1965.

Overall, retail prices for fishery products advanced throughout 1965 and the first three quarters of 1966. Further gains seemed likely as the last quarter began.

Present indications are that per-capita consumption of edible fishery products for 1966 will be 10.8 pounds; last year it was 11 pounds. Very little change is in prospect for fresh and frozen or cured fishery products, but consumption of canned fishery products will fall off a little.

The Year Ahead

The outlook for 1967 is for a continued high rate of per-capita consumption at only slightly higher prices. Total domestic production may not increase over 1966's but increasing imports will supplement domestic production.

Increasing worldwide consumption of the sea's resources is expected. The world catch of fish and shellfish has more than doubled during the past decade--from about 60 billion pounds to more than 120 billion. The United States catch has not increased, but imports have risen. Some experts predict a several-fold increase in the world catch and even estimate that man is now taking only about 4 percent of the harvestable living resources. (BCF/Branch of Current Economic Analysis.)



President Johnson Signs Fish Protein Concentrate Bill

President Lyndon B. Johnson signed the Fish Protein Concentrate Bill in Anchorage, Alaska, on November 2, shortly after returning from the Far East. As enacted, the bill (S. 2720) is Public Law 89-701.

The purpose of the act is to set up a pilot program that will produce low-cost protein concentrate from fish. The act authorizes the appropriation of \$1 million to build a Government-owned plant, and \$1,555,000 annually for 5 years, beginning in fiscal 1968, to lease a second plant and to operate both plants.

The President said: "I am today signing a bill which marks another advance in this Nation's commitment to eliminate poverty, famine, and disease throughout the world. This measure will make it possible to apply the results of research from the laboratory to the economic large-scale production of a wholesome, nutritious protein concentrate.

"Protein deficiency is a problem even in our own country here in America. But even more important, it is the greatest cause of childhood disease and illness throughout the world--and particularly in the less developed countries.

"The fish protein concentrate to be developed in this program will be used to fortify foods of many kinds without changing their taste or their texture. It is easy to transport, because 85 percent of the world's population, almost 3 billion people, live less than 500 miles from the sea. It can be made available without the need for special storage or refrigeration and its use throughout the world will not require any change in food custom or habits.

"The boundless fishery resources of the seas are as extensive as the seas themselves. Marine biologists tell us that the oceans could support an annual catch of 400 to 500 billion pounds of fish and that is a very important source of animal protein.

"Nevertheless, despite the world's increased fishery efforts, 85 percent of this great potential supply goes unused every year. This fish protein concentrate program offers us an opportunity to utilize our fishery

resources, to provide the world with a protein source of great value at a very low cost, to help our commercial fishing industry to prosper. This is a challenge and it is an important beginning."



October Wholesale Prices and Indexes for Edibles

Wholesale prices for edible fishery products (fresh, frozen, and canned) decreased slightly from September to October 1966. The October index was 131.3 percent of the 1957-59 average; it dropped 0.1 percent from September but was 11.3 percent higher than October 1965. Prices were generally lower than in September, but there were substantial increases for several selected items.

The subgroup index for drawn, dressed, or whole finfish rose 0.4 percent from September to October--mainly because of sharply higher prices at Boston for ex-vessel large haddock (up 43.2 percent); landings were light, demand good, and market strong. Prices were lower at New York City for western fresh and frozen king salmon (down 7.2 percent) and down slightly for western halibut (market supplies were the frozen



Cutting first fillet.

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, October 1966 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/		Indexes (1957-59=100)			
			(\$)		Oct. 1966	Sept. 1966	Aug. 1966	Oct. 1965
			Oct. 1966	Sept. 1966				
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					131.3	131.4	129.5	118.0
Fresh & Frozen Fishery Products:					136.1	137.0	133.5	121.7
Drawn, Dressed, or Whole Finfish:					136.2	135.6	131.8	131.9
Haddock, lge., offshore, drawn, fresh.	Boston	lb.	.21	.15	164.0	114.5	109.9	181.0
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.47	.48	139.0	142.0	142.0	142.0
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.93	1.00	129.6	139.7	136.2	117.0
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.62	.83	91.8	123.1	109.7	78.3
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.67	.88	108.9	143.2	145.7	99.9
Processed, Fresh (Fish & Shellfish):					138.1	137.6	130.9	119.1
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.54	.45	131.2	109.3	111.8	119.0
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	1.12	1.11	131.2	130.1	130.1	101.4
Oysters, shucked, standards.	Norfolk	gal.	8.75	9.00	147.5	151.8	134.9	141.2
Processed, Frozen (Fish & Shellfish):					128.6	132.0	131.5	107.6
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.43	.42	109.0	106.4	109.0	100.1
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.40	.41	115.8	118.7	115.8	117.3
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.32	.32	110.5	112.2	114.0	107.0
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	1.16	1.20	137.5	142.3	142.3	102.6
Canned Fishery Products:					123.3	122.0	122.9	113.0
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	28.00	28.00	122.0	122.0	124.2	117.7
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	12.95	12.95	115.0	115.0	115.0	102.6
Mackerel, jack, Calif., No.1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	8.00	8.00	135.6	135.6	135.6	120.9
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	11.25	10.25	144.3	131.5	131.5	121.9

1/Represent average prices for one day (Monday or Tuesday) during week in which 15th of month occurs. Prices are published as indicators of movement, not necessarily absolute level. See daily Market News Service "Fishery Products Reports" for actual prices.

Source: U. S. Department of Labor, Bureau of Labor Statistics.

product). October prices for Great Lakes fish were down considerably from September's high Jewish Holiday levels. Compared with October 1965, the subgroup index for October was up 3.3 percent; prices were up for salmon and fresh-water fish species.

Haddock Prices Higher

Substantially higher prices for fresh haddock fillets (up 20 percent) were largely responsible for 0.4-percent rise in subgroup index for fresh, processed, fish and shellfish. Prices at New York City for South Atlantic fresh shrimp rose 0.8 percent from September, but prices dropped for standard shucked oysters (down 2.8 percent). The index was 16 percent above October 1965; prices for all subgroup items were higher.

Prices declined from September in subgroup for processed, frozen, fish and shell-

fish; index dropped 2.6 percent from September. The exception was flounder fillets (up 2.4 percent). Chicago prices for frozen shrimp were down 4 cents a pound from September but were still sharply higher than a year earlier. The October 1966 index was 19.5 percent higher than October 1965, because of higher prices for all items except haddock fillets.

Higher prices from September to October for canned Maine sardines (up 9.7 percent) were responsible for a 1.1 percent rise in index for canned fishery products. October prices for other canned fish were the same as September's. The 1966 pack of Maine sardines through October was 1.1 million standard cases--about 9 percent below the 1965 period. October 1966 prices were higher than October 1965 prices for all canned fish products; the subgroup index was up 9.1 percent. (BCF Market News Service.)



Industrial Fishery Products

FISH MEAL SUPPLY IS UP 7.6%,
SOLUBLES DOWN 13%

Based on domestic production and imports, the supply of fish meal available in the U. S. for the first 9 months of 1966 was 502,329 short tons--35,626 tons (7.6 percent) more than 1965 period. Domestic production was 51,742 tons (24.9 percent) lower, but imports were 96,775 tons (38.8 percent) higher than in January-September 1965. Peru continued to lead with shipments of 216,476 tons.

The U. S. supply of fish solubles during January-September 1966 was 73,671 tons--down 13 percent from same period in 1965. Domestic production of fish solubles decreased 13.7 percent, but imports increased 0.8 percent.

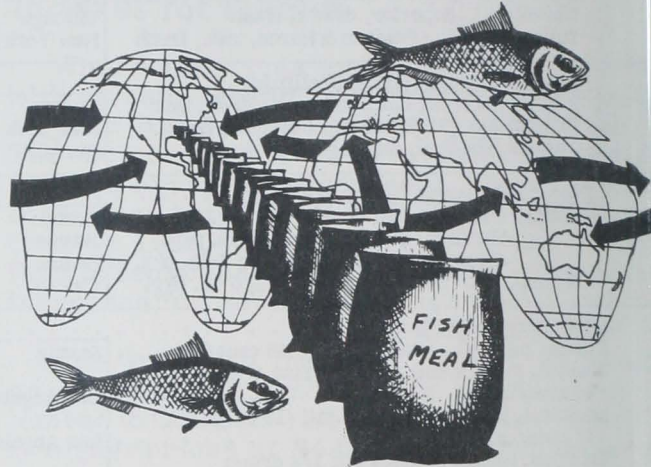
Supply of Fish Meal and Solubles,
January-September 1966

Item	Jan.-Sept.		Total 1965
	1966	1965	
. . . (Short Tons) . . .			
Fish Meal and Scrap:			
Domestic production:			
Groundfish	7,971	9,347	10,696
Herring	9,794	11,622	12,932
Menhaden 1/	107,706	154,367	175,959
Tuna and mackerel	22,876	18,709	25,399
Unclassified	8,047	14,091	17,360
Total production 2/.	156,394	208,136	242,346
Imports:			
Canada	35,310	32,623	43,830
Peru	216,476	204,345	209,801
Chile	65,179	5,132	5,651
Norway	15,096	49	78
So. Africa Rep.	6,040	2,900	5,100
Other countries	7,834	4,111	6,206
Total imports	345,935	249,160	270,666
Available fish meal supply	502,329	466,703	524,717
Fish Solubles 3/:			
Domestic production			
	69,883	80,958	94,839
Imports:			
Canada	1,184	1,253	1,488
Mexico	303	175	227
Peru	1,941	1,504	2,598
Other countries	360	825	825
Total imports	3,788	3,757	5,138
Available fish solubles supply	73,671	84,715	99,977
1/Includes other species.			
2/Does not include a small quantity of shellfish and marine animal meal and scrap because production data are not available monthly.			
3/Wet-weight basis except for imports from South Africa Republic (included in "other countries").			
Source: BCF, and U. S. Department of Commerce, Bureau of the Census.			



U. S. and World Fish Meal Situation and Outlook

World production of fish meal during the first 9 months of 1966 was up significantly from a year earlier, several trade sources indicated. Shipments from exporting countries were down about a tenth. Inventories in several important exporting countries were above the same 1965 period.



U. S. supplies of fish meal during January-September 1966, excluding production from shellfish and marine mammals, were 502,329 tons. This was second only to the 1964 record of 554,000 tons available to the domestic market. Domestic production totaled 156,000 tons, down a fourth from 1965. But it was more than offset by imports of 346,000 tons--almost 40 percent above the same 1965 period.

The most significant development in the domestic industry was the drastic reduction in the menhaden resource. It was substantially below the low levels of several years. Landings have trended downward since the record 1961 catch.

Output of menhaden meal was 30 percent below the 1965 period and 38 percent below average. Gulf Coast output was down almost a fourth; the Atlantic Coast output was 44 percent below January-September 1965.

1966 Domestic Demand was Strong

Domestic demand for fish meal in poultry rations continued strong in 1966. Broiler production was up 9 percent, and broiler prices averaged about 6 percent above 1965. Peruvian prices were well above those of a

earlier during early 1966, but by June were below: by \$11 per ton. Prices for the third quarter averaged 12 percent below the 1965 period. Little domestic meal was available before June but, when it became available, cost as much as Peruvian meal. During July-September, menhaden meal was quoted at \$13-14 a ton above Peruvian fish meal at New York City. Peruvian meal averaged \$12.25 per ton in September--compared to \$11.20 for menhaden meal.

While prices of most important broiler feed ingredients declined \$3 to \$9 per ton from first to second quarter levels, soybean meal advanced \$7 per ton. Hot and dry weather caused soybean crop prospects to weaken and contributed to soybean meal price advances. However, weather improved in August. The October U. S. Department of Agriculture Crop Report estimated the 1965-66 soybean crop at 927 million bushels, 8 percent above the August estimate and 10 percent above a year earlier. Soybean meal prices dropped materially in September, when the September Crop Report first indicated a large soybean crop. Prices of most other broiler protein feed ingredients declined less significantly.

Cook

World supplies of fish meal, fish solubles, and fish oil in 1966 are expected to be about as large as 1965, depending largely on Peruvian production in late 1966. The catch of Peruvian anchovies during September is reported almost 8 times the September 1965 figure.

U. S. supplies of fish meal in 1966 were expected to be larger than in 1965. Only 100 tons of fish meal production or imports were needed in the last quarter to boost U. S. supplies above a year earlier. January-September 1966 supplies are only 2 percent below the 1965 annual total. However, imports of Peruvian meal may be down during the last quarter. There is some indication that a large part of the Peruvian industry may be curtailing exports to raise prices. On the other hand, if imports from other countries continue at the rate of past months, some inshipments can be expected from Canada, Chile, and South Africa.

As world demand for meat increases, both U. S. and foreign demand for fish meal and solubles as poultry and animal feed ingredi-

ents will increase. The domestic broiler production rate is expected to continue above 1965 during the third quarter of 1966. The broiler industry appears able to maintain or even exceed its recent production rate. This is indicated by a 10-percent increase in chicks placed on feed 7-14 months earlier for replacements in the U. S. broiler egg supply flock.

Soybean prices have fallen substantially since the September 9 upward revision in the 1965-66 crop estimate. The lower prices have depressed prices of most other protein feed ingredients. Further price declines are likely among some ingredients before prices firm.

Supplies of fish oil for domestic consumption and export probably will be down from a year earlier because current season U. S. production is not expected to add significantly to inventories. (BCF Div. of Economics, Branch of Current Economic Analysis, Industrial Fishery Products Section, Nov. 2, 1966.)



Shrimp Imports Rise 5.2%

Imports of all shrimp (fresh, frozen, canned, and dried) for January-September 1966 were 117.9 million pounds, compared with 112.1 million pounds in 1965 period--up 5.2 percent. Imports from Mexico totaled 38.2 million pounds, compared with 35.2 million pounds in 1965 period--up 8.5 percent.

Shrimp imports (fresh, frozen, canned, and dried) in September 1966 were 15 million pounds; they were 12.2 million pounds in September 1965. September 1966 imports of fresh or frozen heads-off shrimp (shells-on) were 9.9 million pounds; peeled and deveined, 3.8 million pounds; frozen breaded (raw or cooked), 2,550 pounds; and other types (some dried and canned) about 1.2 million pounds.

Mexico shipped 4.4 million pounds (compared with 3.7 million in September 1965): 3.1 million fresh or frozen heads-off shrimp (shells-on); peeled and deveined 1.3 million; and other types, 82,375 pounds.

¹/Imports of "other types" were peeled in airtight containers or canned (217,946 pounds); cooked but not breaded (268,428 pounds); dried (15,872 pounds); and unspecified (736,292 pounds).



Can Shipments for Fishery Products Increase



During January-August 1966, 2,153,668 base boxes of steel and aluminum were used to make cans shipped to fish and shellfish canning plants. During the same period in 1965, 2,077,256 were used.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. A "Base box" is an area of 31,360 square inches--equivalent to 112 sheets 14" x 20" size. Tonnage figures for steel (tinplate) cans are derived by using factor 23.7 base boxes per short ton of steel.

Source: U. S. Department of Commerce, Bureau of the Census.



Defense Department Changes Finfish Purchases

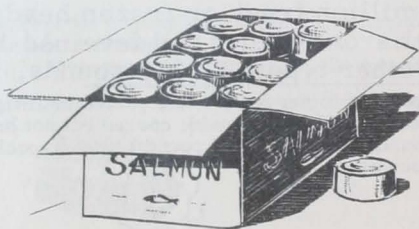
Total purchases of the Department of Defense (DOD) this year are about the same as 1965. A sharp drop in canned fish purchases was offset by a substantial gain in purchases of fresh and frozen fish products. Haddock portions have been the 1966 volume leader--double the quantity bought in a comparable period of 1965. Tuna, 1965's leading item, was down 60 percent in 1966. This loss was offset partly by larger salmon purchases.

DOD purchases of fresh and frozen fish products account for roughly 3 to 4 percent of the total domestic market for purchases of comparable items, and about 1½ percent of canned items.



Canned Salmon on USDA'S "Plentiful List"

Canned salmon is on this month's Department of Agriculture "List of Foods in Plentiful Supply." The list will be distributed to newspapers, radio and TV stations, and other media to apprise them of the canned salmon supply situation.



Also, USDA will ask food retailers, brokers, and distributors to promote and merchandise canned salmon. BCF's fishery marketing specialists and home economists will follow up by contacting local cooperators to ask support in getting the message to homemakers.



Marketing

SURVEY SHOWS FISH PRODUCTS MORE POPULAR

Fishery products are becoming more popular with consumers, according to market studies conducted by Gorton's of Gloucester, Mass., a leading New England fish-processing firm.



Three of every 10 homemakers are more inclined to serve fish and seafood today than they were just 2 or 3 years ago, the survey shows. There is a continuing interest in serving fishery products among Catholic and non-Catholic families: The possible end of "fish on Friday" for Catholics has not affected this interest.

The survey was undertaken when the fishing industry became alarmed by rumors that Catholics might be allowed to eat meat on Friday. The results among Catholic homemakers were so reassuring that Gorton's enlarged its consumer study to include a representative sampling of American housewives. Among Catholics only, 80 percent said they will continue to serve fishery products even if the Friday ban is lifted. And almost 75 percent will abstain from meat one day a week even if the Church no longer requires it.

9 of 10 Homemakers Serve Fish

A general sampling of homemakers shows that 9 out of 10 serve fishery products. Of

ts group, about two-thirds serve it one or
re times weekly; in addition, as many as
out of 10 frequently order it when eating
6.

The survey shows that 7 of 10 homemak-
e prefer eating fish in a restaurant because
ty do not like or know how to cook it.
il M. Jacobs, executive vice president of
eton, said: "The finding presents a major
allenge to the trade. We are facing a sit-
uion where we must educate the American
homemaker that preparing fish and seafood
now just as easy as preparing any other
od. She must be taught that the new frozen
fish and seafood entrees and appetizers have
minated the need for traditional prepara-
tion. All she has to do is heat and serve."

At present, 6 of 10 consumers buy frozen
fishery products, but only 2 of 10 believe they
buy the frozen more often than fresh or can-
ned. Mr. Jacobs added: "The homemaker
must be taught that when she buys a 'cook
tile frozen' fish or seafood product she is
buying a product that retains all of its origi-
nal freshness. We can increase the frequen-
cy with which homemakers buy the frozen
products if we can get this message of con-
venience plus taste plus freshness to the
American housewife."

Editor's Note: Meatless Fridays ended for
U.S. Catholics on December 2, 1966.



Bluefin Fishery Sets Record

The U. S. west coast bluefin fishery reach-
ed the highest production total since it began
in 1919. By September 24, the estimated
catch was 33,708,000 pounds--almost 2 mil-
lion pounds more than the previous record
year. The 1966 record was attributed to:
high fishing effort; the recent addition of
modern high-capacity vessels that extended
the fleet's range, both offshore and to the
south; favorable fishing weather, particular-
ly in early summer; and the unusual abun-
dant catch of bluefin.



Albacore Season Nears Record in Northwest But Poor in California

Near-perfect late summer weather and
smooth seas contributed to a near-record al-
bacore season in the Pacific Northwest. On
September 28, Oregon-Washington landings
were an estimated 18,224,000 pounds, only
19,326 pounds less than the 1945 record.

But California landings were only 10,352,000
pounds--one of the poorest seasons since
1945.

This unusual distribution of albacore was
due to the very early warming in the Pacific
Northwest, so the fish either by-passed Cali-
fornia waters or did not linger long enough in
their northward migration.



1965 Great Lakes Landings Same as 1964

The U. S. landings of Great Lakes fish in
1965 were 55.9 million pounds, about the same
as 1964. Also, Canada's Great Lakes landings
totaled about 46.9 million pounds. About half
the U. S. catch came from Lake Michigan; al-
most all the Canadian catch was from Lake
Erie.

Some First-Half 1966 Landings

MICHIGAN: From January-July 1966, the
commercial catch was 2,313,000 pounds above
the same period in 1965. Carp, chubs, and
lake herring production decreased 190,700,
648,000, and 143,700 respectively. Alewife
catches were up 2,886,900 pounds; smelt,
216,100 pounds; and whitefish, 290,800 pounds.

WISCONSIN: During January-June 1966,
alewife catches decreased 2,101,500 pounds;
chubs, 268,000 pounds; and yellow perch,
165,800 pounds. The only large gains were
made by carp and suckers--124,700 and
147,000 pounds. Several large alewife pro-
ducers probably have not reported.

OHIO: From January-July 1966, landings
were only slightly higher (39,400 pounds) than
same period of 1965. However, certain spe-

cies varied considerably from 1965: Carp landings were up 394,800 pounds; catfish catches were down 227,000 pounds; sheepshead production was off 1,777,100 pounds; white bass harvest increased 165,600 pounds; yellow perch landings rose 1,566,800 pounds; and yellow pike production declined 64,600 pounds.



Spacecraft May Help Increase Fish Catch

Space vehicles of the future may be used to help man catch more fish from the oceans, Under Secretary of the Interior Charles F. Luce said October 5 to the Atlantic States Marine Fisheries Commission at Portland, Me. Mr. Luce noted that BCF is looking intensively to new developments to increase the efficiency of the U. S. fishing fleet.

"One interesting aspect of this is the possible use of spacecraft to obtain oceanographic and fishery data," Mr. Luce added. "Experiments and feasibility studies underway now in the use of spacecraft include determination of sea surface temperature using infrared detectors, radar detection of surface water disturbances caused by surface feeding fish schools, estimation of wave height by radar, detection of chemical fish trails at the surface of the water left by migratory schools of fish. . .and direct spotting of large marine mammals by high resolution photography. American astronauts have been briefed on fishery and oceanographic research and they have already supplied us with much useful information."

Under Secretary Luce predicted that the total consumption of commercial fish and fishery products in the United States, both from domestic and imported sources, will jump to nearly 28 billion pounds a year by the year 2000. The present consumption is about 12 billion pounds.

The Department of the Interior's Fish and Wildlife Service is the official research agency for the Atlantic States Marine Fisheries Commission--the Nation's oldest interstate marine fishery organization, founded by interstate agreement in 1941.



TV Camera Shows Tests at 45,000 Feet

A television camera has been developed by its Instrumentation Department that shows effects of tests conducted at simulated depths down to 45,000 feet, says the U. S. Naval Oceanographic Office. The camera operates from the outside of a high-pressure test-and-evaluation vessel and relays a clear picture to a TV monitor. The picture shows what is happening to instruments having to withstand pressures in the ocean's deepest known parts--up to 20,000 pounds per square inch.

The TV camera is light and compact enough to be handled easily by one man, but the test vessel weighs 18 tons and has a plug-type cover weighing 4,000 pounds. The test device is capable of accepting instruments up to eight feet in length.

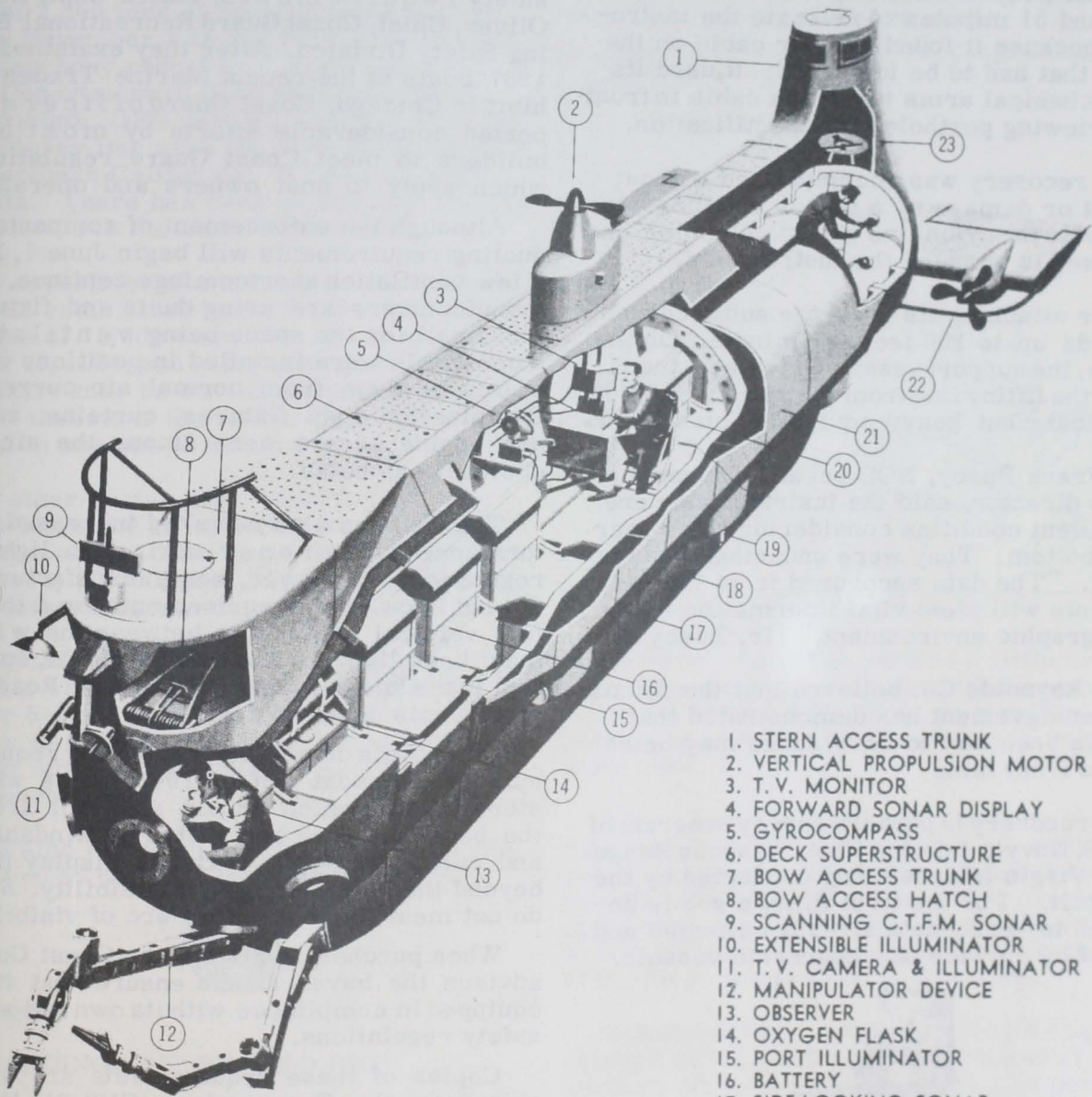
The closed-circuit TV monitoring system clearly shows how instruments will react when subjected to pressures claimed by manufacturers. "Some instruments disintegrate, others collapse, but many perform as claimed," William L. Bryan of the Naval Oceanographic Office states. "It is better to test our instruments here in a laboratory, rather than risk having a failure at sea. Savings in time and money are great, in addition to averting any serious injuries to personnel."



"Aluminaut" Recovers Instruments From Ocean Bottom

"The deepest known search and recovery mission has been successfully accomplished for the U. S. Navy by the Aluminaut, the world's deepest diving submarine," its owner, the Reynolds Co., reports. Under contract to the Naval Oceanographic Office (NOO), the 51-foot, 6-man, all-aluminum sub set a record by performing a 3,200-foot ocean-bottom search for oceanographic instruments lost over a year ago off St. Croix, Virgin Islands. The sub recovered the 2,100-pound package of instruments in 3,150 feet of water in mid-October.

The Reynolds Co. considers the search part of the mission the most difficult. On the first dive, October 12, the Aluminaut lo-



1. STERN ACCESS TRUNK
2. VERTICAL PROPULSION MOTOR
3. T. V. MONITOR
4. FORWARD SONAR DISPLAY
5. GYROCOMPASS
6. DECK SUPERSTRUCTURE
7. BOW ACCESS TRUNK
8. BOW ACCESS HATCH
9. SCANNING C.T.F.M. SONAR
10. EXTENSIBLE ILLUMINATOR
11. T. V. CAMERA & ILLUMINATOR
12. MANIPULATOR DEVICE
13. OBSERVER
14. OXYGEN FLASK
15. PORT ILLUMINATOR
16. BATTERY
17. SIDE-LOOKING SONAR
(UNDER BALLAST TANK)
18. KELL SUPERSTRUCTURE
19. SHOT BALLAST SOLENOID
20. SKIPPER
21. BALLAST TANK
22. PORT PROPULSION MOTOR
23. STERN ACCESS HATCH

cated the instruments one hour and 56 minutes after it reached the bottom. The 3 NOO scientific observers on board inspected the 2,900-ft. tangled, expensive instrument array to formulate recovery plans.

On the second dive, the Aluminaut took 3 hours and 51 minutes to relocate the instruments because it found another cable on the bottom that had to be identified. It used its two mechanical arms to lift the cable in front of the viewing portholes for identification.

The recovery was accomplished without incident or damage by a unique spool device attached to the nylon line and steel cables that were used to suspend the instruments.

After attaching its hook, the sub ascended at speeds up to 150 feet per minute. On the surface, the support vessel Privateer transferred the lifting line from the sub and hoisted the delicate but heavy equipment on board.

R. Frank Busby, NOO oceanographer and project director, said the instruments were in excellent condition considering their year on the bottom. They were undamaged and operating. "The data recovered from the instruments will yield vital information on the oceanographic environment," Mr. Busby said.

The Reynolds Co. believes that the Aluminaut's achievement has demonstrated that what has been lost to Davy Jones may be recovered from him.

The recovery is part of a survey program of the U. S. Navy's Atlantic Fleet Weapons Range off the Virgin Islands being conducted by the Aluminaut. For the first time, a sub is being used to verify data already collected and deduced by surface oceanographic vessels.



1967 Small Boats Better Equipped, Says Coast Guard

The Coast Guard is pleased with the efforts of the boating industry to improve its products and comply with Federal boating safety requirements, states Capt. David Oliver, Chief, Coast Guard Recreational Boating Safety Division. After they examined the 1967 boats at the recent Marine Trades Exhibit in Chicago, Coast Guard officers reported considerable efforts by most boat builders to meet Coast Guard regulations, which apply to boat owners and operators.

Although the enforcement of compartment ducting requirements will begin June 1, 1967, a few ventilation shortcomings continue. Some manufacturers are using ducts and fixtures too small for the space being ventilated. Some cowls were installed in positions that blocked them from normal air currents. Combination light fixtures, curtains, seats and engine covers were among the air flow obstructions noted.

The officers also reported increased conformance with proper navigation lighting regulations. However, some manufacturers did not know of the requirements for a three-foot vertical separation between the white mast head light and the colored lights, specified in the International Rules of the Road for motorboats under 40 feet.

On vessels displaying the lighting required by the Motorboat Act of 1940, some white stern lights, which should show all around the horizon, were obstructed by windshields and canopies. A few fixtures display light beyond the permitted arc of visibility. Some do not meet the prescribed arc of visibility.

When purchasing a boat, the Coast Guard advises, the buyer should ensure that it is equipped in compliance with its own and state safety regulations.

Copies of these requirements are available from the Commandant (CHS-2), U. S. Coast Guard, Washington, D. C. 20226, and the state boating offices.



STATES

California

ANCHOVY LANDINGS TOTAL 2,500 TONS

About 2,500 tons of anchovy were landed through November 1 in the 1966-67 experimental anchovy reduction fishery, the California Department of Fish and Game (DFG) has reported. DFG said all landings were in the Monterey Bay area (in Zone 5) offshore from northern California. It has a 10,000-ton quota. There has been no anchovy fishing or reduction in the other four zones.

The experimental fishery, in its second year, was established by the State with a maximum take of 75,000 tons. The fishery opened October 15, 1966, and will close April 30, 1967. The fishery may be closed on 48 hours' notice if it threatens the resource or quota is reached in any one of the five zones.

The other quotas are: Zone 1, Pt. Conception-Hueneme area, 10,000 tons; Zone 2, San Pedro area, 10,000 tons; Zone 3, San Diego area, 10,000 tons; and Zone 4, offshore from southern California, 35,000 tons.

Reporting on its anchovy tagging program, DFG said 47,400 anchovies were tagged from October 5-November 5. The total of tagged fish now is 85,200. The program is designed to learn more about anchovy populations and movements.

DFG also is experimenting to develop new techniques to improve the recovery of tags.

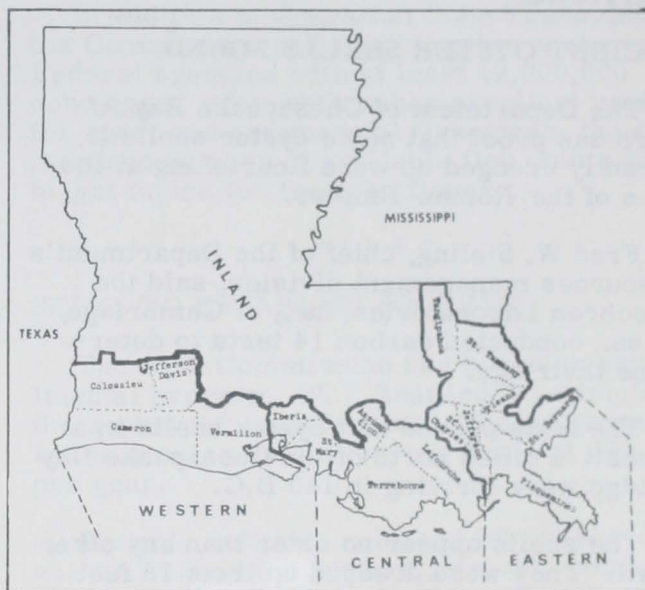


Louisiana

1966 LANDINGS HIT RECORD HIGH

Commercial landings of fish and shellfish in Louisiana coastal and inland districts reached a record high of 798.9 million pounds valued at \$38.4 million--up 95.3 million pounds (14 percent) and \$3.7 million (11 percent) over 1964. Important gains were made in catches of menhaden, shrimp, crabs, and cowfish. Louisiana again was the Nation's leading producer; it ranked fourth in value of landings.

Shrimp: Landings were nearly 62.6 million pounds, heads-on (39.8 million pounds, heads-off), worth \$19.6 million. Compared with 1964, this was an increase of 5 percent in volume and 4 percent in value.



Fishing districts of Louisiana.

Oysters: Landings yielded a little over 8.3 million pounds of meats with an ex-vessel value of \$2.4 million--a decrease of 27 percent in volume and 19 percent in value from 1964.

Blue Crab: Hard blue crabs were plentiful in most areas. Landings of 9.3 million pounds ended a downward trend which began in 1962; landings were 63 percent greater than 1964. Processors produced 578,000 pounds of fresh-picked crab meat worth \$732,000 at primary wholesale level.

Industrial Fish: Menhaden landings reached 682.4 million pounds, valued at \$11.8 million. This was an increase of 14 percent in volume and 30 percent in value over the 1964 catch. They were second to 1962's record catch, and had a record ex-vessel value.

Finfish: Landings used for human consumption were 14 million pounds worth \$2.5 million--down 1.7 million pounds (12 percent) from 1964 while the value was about the same.

Crawfish: The harvest of 8.8 million pounds valued at a little over \$1.8 million put it in fourth place among the State's leading species in volume and fifth in value.



Maryland

ANCIENT OYSTER SHELLS FOUND

The Department of Chesapeake Bay Affairs has proof that some oyster shells it recently dredged up were flourishing at the time of the Roman Empire.

Fred W. Sieling, chief of the Department's resources management division, said the Geochron Laboratories, Inc., of Cambridge, Mass., conducted carbon 14 tests to determine their age.

The tests proved that oyster shells in a deposit 4 miles north of the Chesapeake Bay Bridge were thriving in 140 B.C.

The shells appear no older than any other shell. They were dredged up from 15 feet below the bottom, said Sieling, from a 10-foot-thick deposit. The half shells are much larger; some weigh well over a pound each.

Some shells were found in a 20-foot-thick deposit, which indicate that sometimes there was a high mortality rate. They were 1,845 years old.

Sieling said the death rate could have been due to drills, boring sponges, a freshet that lowered the saline level beyond tolerance, or even an ancient form of the MSX disease.



Michigan

EDA PROCESSING PLANT COMPLETED

A full-scale pilot processing facility has been completed at Hancock, Mich. It is a project of the Commerce Department's Economic Development Administration Technical Assistance Project for the Lake Superior area. The facility is being operated by Inland Seas, Inc., a corporation formed by processors on Lake Superior. The operation

is designed primarily to produce raw, individually quick-frozen unbreaded and breaded cisco and chub fillets, and gutted and headed smelt products. BCF staff met with Inland Seas, Inc., in October to complete details of the operation.

* * * * *

MEAL PLANT PLANNED

A fish meal plant will be built at Menominee this winter. It will greatly increase the potential for harvesting more Lake Michigan alewife. Alewife production this year is already about 20 million pounds--up substantially from last year's 14.1 million pounds. Lake Michigan trawlers are expected to land 3 to 5 million pounds more by December 31, 1966.



Missouri

FEDERAL AID PROJECT PRODUCTIVE

Under the Federal Aid project, the State produced more than 62 million goldfish, bullheads, and various species of minnows--and over 5 million catfish, rainbow trout, bass, and panfish. One goldfish breeder alone reported he employed 67 persons, including 7 fishery biologists.



North and South Dakota

ESTIMATE FISH IN OAHE RESERVOIR

Based on the recovery of marked fish in the commercial fishery and trap net catches, about 8,641,000 pounds of bigmouth buffalo-fish were estimated to be in Oahe Reservoir in 1965. The reservoir is on the Missouri River in North and South Dakota. Without further recruitment, the population will support from 300,000 to 900,000 pounds of commercial production annually for the next 10 years--but will drop sharply below 300,000 after that.

The standing crop of fish, age-group II and older, was estimated to be 52 million pounds, or 239 pounds per acre. Carp made up half, but their average weight in September 1966 was only about 2 pounds. Only 1.5 percent of the commercial stocks was removed by the commercial fishery in 1964-1966.

The commercial fishery landed 40,000 pounds of buffalofish, 5,500 pounds of carp, and 2,500 pounds of carpsuckers in September. Most were taken by hoop net in the North Dakota waters of Oahe Reservoir.



Oregon

WILLAMETTE CHINOOK SET RECORD

Fish Commission biologists reported a record count of fall chinook in the Willamette River and its principal tributaries above Willamette Falls. A BCF-funded count showed more than 1,000 fall chinook above the falls at Oregon City from August 29 to October 7. There were only an estimated 200 fish in 1965, fewer in previous years, including a low of 9 in 1960. The count was especially significant because, historically, there has been no appreciable run of fall chinook in this area.

* * * * *

COHO CATCH IN COLUMBIA BEST SINCE 1929

The best catch of coho salmon, at least since 1929, in the Columbia River late fall commercial fishery was recorded this year, the Fish Commission announced.

As the season on the Columbia closed October 27, the catch was near $4\frac{1}{4}$ million pounds. The coho fishery on Youngs Bay, which enters the Columbia below Astoria, continued until October 31. Youngs Bay catches are included in Columbia's landing reports. Catches there during the final week of fishing boosted total to about $4\frac{1}{4}$ million pounds.

Operation Coho Transplant Underway

For the third consecutive year, Fish Commission hatcheries are being swamped with more coho than they need. The Commission plans to transfer up to 50,000 surplus adult coho from the hatcheries to suitable streams. More than 60,000 were transplanted during the first 2 years: 1964 and 1965.

Generally, the fish are being released in streams that do not support coho runs but potentially can; streams with recent clear-

ance projects or fishways completed; and in streams above impassable falls that have fishways scheduled for construction. Adult coho are hauled to other waters only after the hatcheries' needs of about 35,000,000 eggs are satisfied, and sufficient fish have escaped beyond the hatcheries to use the natural spawning areas.

In addition to Operation Coho Transplant, the Commission will furnish other state and Federal agencies with at least 12,000,000 coho eggs. After yet another excellent year for sport and commercial fishermen, the tremendous number of available fish points to a bright future for the coho fishery.

* * * * *

SEEKS TO ESTABLISH SOCKEYE

The Fish Commission has begun an experimental program, BCF financed, to stimulate the sockeye salmon fishery. The program is initially set up on a two-year basis at \$20,000 per year.

Juvenile sockeye, released into reservoirs, will be studied for survival, growth, competition with other fish, food habits, distribution, length of stay, and how successfully they leave the reservoirs. The future of the experiment will be based upon the findings.

Sockeye have to stay in fresh water lakes for at least one year before migrating to the sea. Although Oregon streams with accessible lakes in the headwaters are few, it is hoped the reservoirs will replace the lakes needed under natural conditions. Fish for the new program will be obtained from the 1,000,000 sockeye eggs recently received from the Canadian Department of Fisheries. It was decided to use fish from the British Columbia area because its sockeye are almost fifty percent larger than Columbia River sockeye. Fish from the Adams River runs will be used because they migrate at about the time when conditions in the Willamette System are best.

The fish will be reared at the Fish Commission's Ox Bow Hatchery and released as fingerlings into Cougar Reservoir on the South Fork of the McKenzie River, and into North Fork Reservoir on the Clackamas. At present, biologists are investigating several other reservoirs throughout the state, principally in the Willamette Basin, to see if they

would offer suitable sockeye habitat for an expanded program.

Willamette System is Key

The new program is geared principally to the Willamette System because the Columbia River basin has lost extensive sockeye spawning grounds to hydroelectric development.

Insufficient escapement over the dams and poor passage of downstream migrants have drastically reduced the runs. The commercial fishing season on Columbia sockeye was limited to five days in 1964; for the first time in the fishery, commercial fishing for it was not allowed in 1965. The closure was based upon poor escapement in 1961--less than one-fourth the established goal.



UNIQUELY-SHAPED NORTHERN QUAHOG SPECIMEN DISCOVERED

A uniquely-shaped, three-inch long specimen of the northern quahog, *Mercenaria mercenaria*, was found this past winter in the Wickford Cove area of Narragansett Bay by a high school senior who is an amateur shell collector. The discovery was reported by Dr. Carl N. Shuster, Jr., Director of Northeast Shellfish Sanitation Research Center, U. S. Public Health Service, Narragansett Bay, R. I.

The odd shape of the shell raised a number of questions. How often does this shape occur among quahogs? Are there records of other such specimens? Since quahogs are burrowing mollusks, how well could such an asymmetrical specimen dig? Would this shape affect its ability to survive?

An initial search for information indicated that there are a few such specimens in museum collections, but the ones seen thus far are not as asymmetrical as the Narragansett Bay specimen. The only scientific article about such a shell dealt briefly with the southern quahog, *M. campechiensis*. It is assumed, therefore, that such shells if not rare are certainly not common.

Burrowing bivalves, of which the quahog is one, tend to have right and left valves matched in size and shape, whereas non-burrowing mollusks like the oyster have unequal valves. It is surmised, therefore, that an asymmetrical specimen like the one found would have difficulty in burrowing.

The Narragansett Bay specimen resembled closely some ancient fossilized genera of non-burrowing mollusks, especially *Exogyra* and *Gryphaea*. Whatever happened to the present quahog specimen perhaps triggered a latent genetic mechanism for shell shape that has been dominant in the oyster family for millions of years.

Dr. Shuster would appreciate hearing from any reader who has seen a misshapen quahog of this type and would be particularly interested in obtaining a live specimen. (*Maritimes*, vol. X, no. 2, Spring 1966.)

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

North Pacific Fishery Investigations

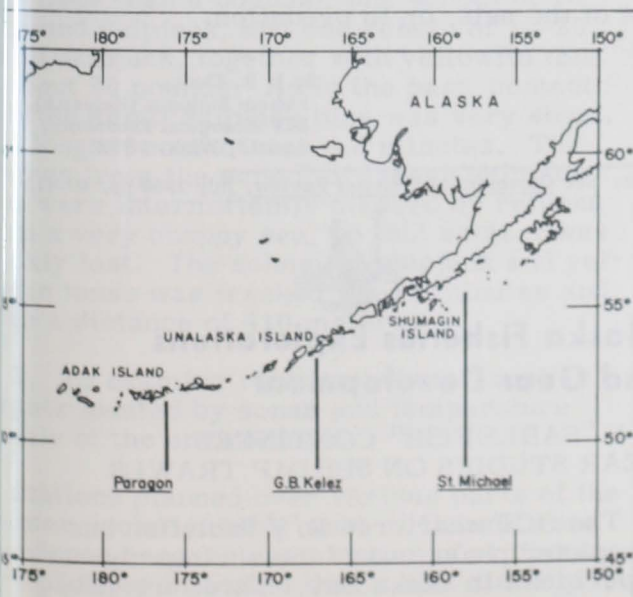
RESULTS OF SALMON RESEARCH CRUISES, SUMMER 1966

BCF conducted three research cruises in the North Pacific Ocean during June-September 1966. The objectives: to study distribution and relative abundance of immature sockeye and chum salmon, compare indices of relative abundance from catches of gill nets and purse seines fished simultaneously, and determine the percentage of salmon lost from gill nets during fishing (dropouts).

These cruises, which represented the Seattle Biological Laboratory's greatest effort in manpower and vessels in several years, were terminated in early September after successfully accomplishing their major objectives.

The charter vessels Paragon and St. Michael and the Bureau's George B. Kelez fished gill nets of various meshes. Typically, a string of gear consisted of 12 to 14 50-foot bottom shackles of 2½- and 3¼-inch mesh, and 12 to 16 of 4½- and 5¼-inch mesh (stretched measure).

A total of 119 gill net sets made in the three sampling areas (chart) produced a catch of 15,750 salmon and steelhead trout.



Areas fished by U. S. research vessels George B. Kelez, Paragon, and St. Michael, June-September 1966.

Sockeye salmon were predominant near Adak Island (Paragon), whereas chum salmon dominated along long. 167° W. (George B. Kelez) and long. 158° W. (St. Michael).

Previous studies showed that in the summer immature sockeye and chum salmon in these areas are generally present to lat. 49° N. Thus, near Adak Island, these species are found to a distance of 150 miles offshore; at long. 167° W., they are caught nearly 260 miles from shore and, at long. 158° W., they are present to approximately 430 miles offshore.

South of Adak Island, along long. 176° W., 1-winter-at-sea immature sockeye salmon were most abundant 31-45 miles offshore (lats. 51°30' N. to 51°00' N.), although abundance was only slightly less to 60 miles offshore. Abundance was at a peak July 1-10 and July 21-31. Fishing south of Unalaska Island, along long. 167° W., indicated that these young sockeye salmon were about equally abundant throughout the summer; their peak abundance occurred 90-180 miles from shore (from lats. 52°30' N. to 50°30' N.). Similarly, along long. 158° W., no peak of abundance of 1-winter-at-sea sockeye was detected. This age group occurred throughout the sampling area.

The older immature sockeye salmon (2- and 3-winters-at-sea) were distributed somewhat differently from the younger fish. South of Adak, these older fish were most abundant 31-90 miles from shore (lats. 51°00' N. to 50°15' N.); catches were too small, however, to demonstrate significant peaks of abundance. To the east, the older sockeye salmon along long. 167° W. predominated in the same area as the younger fish (90-180 miles offshore); they were more abundant late than early in the sampling season. In contrast, older sockeye salmon along long. 158° W. were abundant during early and late August and predominated from 260 to 360 miles (lats. 52°30' N. to 50°30' N.) south of the Alaska Peninsula.

Catches of chum salmon (age-2 immature) along long. 176° W. were greatest from July 1-10 in an area 31-45 miles offshore. Along long. 167° W., however, few young chum salmon were caught and no period of peak abundance was detected. At the easternmost fishing stations (158° W. long.), 2-year-old chum

salmon, though not numerous, were most abundant in late August in the northern and southern extremes of the sampling area.

Immature chum salmon (3 years and older) were scarce along long. 176° W., and catches of these older fish indicated no peak of abundance by time period or area. Along long. 167° W., the older chum salmon were much more abundant than the young; their peak of abundance fell between August 1 and 10; they were in similar abundance throughout the sampling area, except for slightly lower concentrations at the very southern stations. Abundance of chum salmon along long. 158° W. was similar throughout the sampling period; greatest numbers occurred 300-360 miles offshore (lats. 51°30' N. to 50°30' N.).

Comparisons of relative abundance between the three sampling areas (table) indi-

Purse seine and gill net catches of sockeye salmon did not reflect relative abundance in a similar manner. Catches of chum salmon indicated little relationship between the two types of gear.

Studies of Dropouts

Percentages of salmon caught in a gill net which are not present when the gear is hauled (dropouts) were estimated from periodic inspection of the nets during normal fishing. The procedure used was to patrol the nets at night from small boats, mark the location of gilled salmon, and determine their presence or absence at later patrols and when gear was hauled. Portable spotlights were used to locate fish in the net.

Dropout rates were substantial (49 percent) when measured over a period of 8-10

Average Catch of Immature Sockeye and Chum Salmon Per Shackle for Three Areas of the North Pacific Ocean, July-September 1966

Area (Long.)	Sockeye Salmon		Chum Salmon	
	1-Winter-at-Sea	2- or 3-Winters-at-Sea	2-Year-Old	3-Year- and Older
176°22' W. (Paragon)	3.53	1.07	1.84	0.58
167° W. (George B. Kelez)	2.29	1.31	1.09	3.25
158° W. (St. Michael)	1.50	2.45	0.98	2.91

cated that 1-winter-at-sea sockeye salmon were most abundant along long. 176° W., and were least abundant along long. 158° W. On the other hand, 2- and 3-winter-at-sea sockeye salmon were least abundant near Adak Island and most abundant along long. 158° W. Both the younger and older sockeye salmon had their peak of abundance at similar latitudes in the three sampling areas.

The relative abundance of chum salmon was similar to that of sockeye salmon. The 2-year-old fish were most abundant near Adak Island and least abundant along long. 158° W. The older chum salmon were more abundant along long. 158° W. and 167° W., and least abundant along long. 176° W.

Comparison of Purse Seine and Gill Net Catches

Comparative fishing was conducted with gill nets (vessel Paragon), and purse seines (vessel Storm, Fisheries Research Institute) to determine if the two forms of gear similarly reflected the relative abundance of salmon. Gill nets were fished at night and purse seines during the day in the same area.

hours. After 2-2½ hours, dropout rates were about 22 percent. The loss rate was 4 percent after one-half hour. Salmon known to be in the nets at least 2½ hours continued to drop out. The loss is attributed to escape, falling out of the nets, or to predation.

By J. R. Dunn,
Fishery Biologist (Research),
BCF Biological Laboratory,
Seattle, Wash. 98102

Note: See Commercial Fisheries Review, July 1966 pp. 40-41.



Alaska Fisheries Explorations and Gear Development

R/V "SABLEFISH" CONTINUES GEAR STUDIES ON SHRIMP TRAWLS

The BCF chartered R/V Sablefish has completed phase two of the shrimp try-net experiment in Tutka Bay. Three try-nets were sampled. The results indicate a definite possibility of developing a selectively fishing

simp trawl. Various trawl modifications suggested from these results have been incorporated into a fourth try-net, which will be best-fished in Kasitsna Bay.



Central Pacific Fisheries Investigations

"CROMWELL" STUDIES SONAR TECHNIQUES TO TRACK TUNA

The U.S. Fish and Wildlife Service's Townsend Cromwell cruised off the leeward coasts of Oahu and Hawaii during August to conduct sonar studies (Cruise 26). He had 5 major missions:

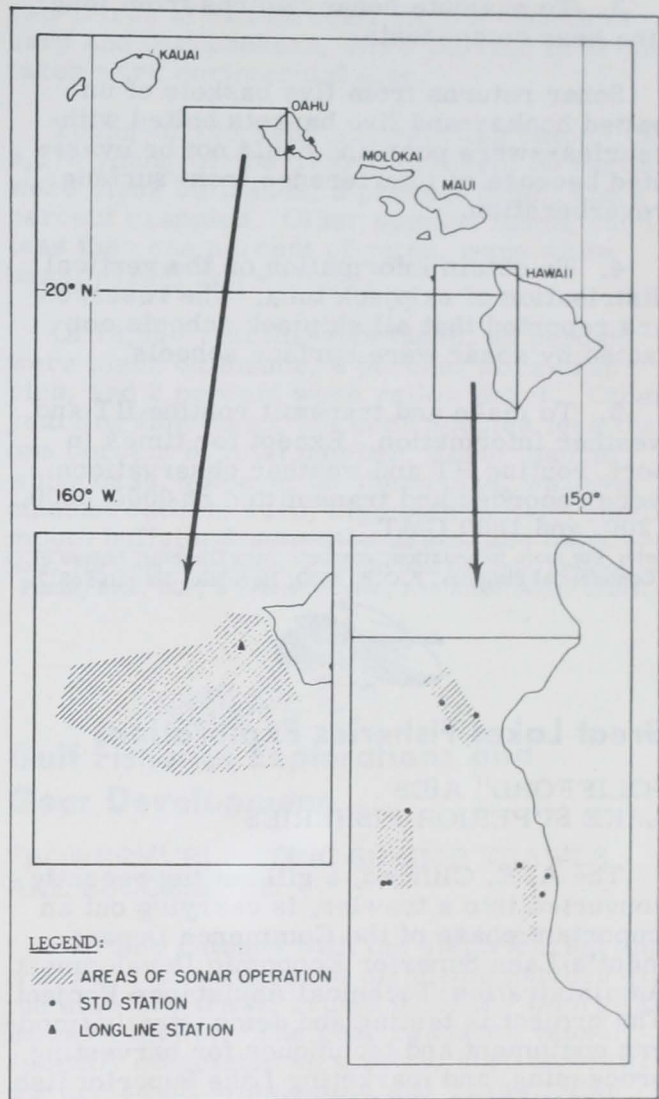
1. To develop techniques for tracking tuna schools with continuous transmitting, frequency-modulated (CTFM) sonar, with emphasis on large skipjack.

Sonar returns from three dead skipjack, supported singly at the surface by airborne balloons, showed echo strength was affected by changes in the fish's dorsoventral orientation. Returns were strongest when the fish were in the normal swimming position; when they were canted, returns were considerably weaker.

In 50 hours of searching for tuna schools, the sonar contacted 3 schools of small skipjack (less than 8 pounds), one school of 10-pound skipjack, and one school of 10-20 pound skipjack, together with yellowfin tuna about 50 pounds. As in the past, contact with the small skipjack tuna was very short. The longest contact was 4.5 minutes. The returns from the school of larger skipjack were intermittently masked by returns from a very choppy sea, so that contact was quickly lost. The school of skipjack and yellowfin tunas was tracked for 18 minutes and to a distance of 410 meters.

2. To examine relation between depth of targets located by sonar and temperature profile of the environment.

Stations planned over various parts of the counterclockwise eddy west of Hawaii were abandoned because examination of temperature profiles indicated that it was directly downstream of Alenuihaha Channel. In their stead, three other stations were selected (see track chart): one over a bank that sloped from 500 to 1,500 fathoms in a somewhat ex-



Track chart Townsend Cromwell Cruise 26.

posed area, another over a similar bank but in a well protected area, and a third in an exposed area with the bottom at 2,300 fathoms. A sonar search pattern of 24-hour duration was executed three times at each station. STD casts were made at the end of each 24-hour search.

A total of 879 targets was located: of these 44 were identified as porpoises, 1 as marlin, and 1 as a school of skipjack tuna. Rates of target contacts during night search were 2.5 per hour for surface targets and 0.5 per hour for non-surface targets; during day search, 3.6 and 1.7 per hour, respectively. Surface targets, 77 percent of contacts, occurred most frequently between the hours of 0800 and 1200. The depth distribution of the non-surface targets appeared to be centered at, or just above, the salinity maximum.

3. To evaluate sonar returns from long-line gear components.

Sonar returns from five baskets of unbaited hooks--and five baskets baited with sauries--were poor and could not be evaluated because of interference from surface reverberation.

4. To obtain information on the vertical distribution of skipjack tuna. The researchers reported that all skipjack schools contacted by sonar were surface schools.

5. To make and transmit routine BT and weather information. Except for times in port, routine BT and weather observations were recorded and transmitted at 0000, 0600, 1200, and 1800 GMT.

Note: For more information, contact: Area Director, Bureau of Commercial Fisheries, P.O.B. 3830, Honolulu, Hawaii 96812.



Great Lakes Fisheries Explorations

"CLIFFORD" AIDS LAKE SUPERIOR FISHERIES

The A. E. Clifford, a gill net tug recently converted into a trawler, is carrying out an important phase of the Commerce Department's Lake Superior Economic Development Administration-Technical Assistance Project. The project is testing and demonstrating modern equipment and techniques for harvesting, processing, and marketing Lake Superior fish more effectively and economically than is possible with traditional operations. The vessel was converted under a cooperative agreement between Commerce and Interior Departments. BCF gives technical assistance. (Cruise Nos. 1, 2, and 3.)

The Clifford completed three 5-day exploratory fishing cruises during the third quarter of 1966. The combined cruises produced 8,490 pounds of fish: 67.5 percent chubs (mostly bloaters), 10.8 percent cisco, 9.8 percent smelt, 5.8 percent suckers, and 4.4 percent lake trout. The remaining 1.7 percent was miscellaneous, mostly burbot and common whitefish.

The vessel has fished for chubs and smelt on a part-time basis. Attempts to establish markets for the relatively small bloater chubs, which are readily available to trawls,

met with little success until recently. As a result, fishing effort and catches have been nowhere near the actual potential. The vessel produced 27,611 pounds of fish during only 60 hours of fishing over 4 months, mainly chubs (82 percent), smelt (10 percent), and cisco (4 percent).



Inland Fisheries Explorations and Gear Development

"HIODON" CONTINUES OAHE RESERVOIR STUDIES

The R/V Hiodon conducted an experimental cruise (No. 10) in Zones 3, 4, and 6 of Oahe Reservoir during September 1966. The reservoir is on the Missouri River in South and North Dakota. The vessel completed 102 drags to compare catches of three different size trawls (40 drags); to compare daytime catches with nighttime catches (16 drags); to collect biological samples (2 drags); and to effect a maximum catch of commercial species in two areas of the reservoir (44 drags).

Fishing Results: The 102 drags took 8,000 fish (age group II or older) that weighed 17,468 pounds--an average of 78 fish or 171 pounds per drag. As usual, carp dominated the catch composition: 63 percent of total weight. Buffalofish also were prominent: 23 percent of the weight. The pattern of progressively larger catches in late summer and fall was similar to 1965.

Trawl comparison drags: 40 drags were made with three trawls (35-, 45-, and 52-foot headrope) to determine possible variations between trawls in rate of catch and species composition. The trawls took fish in about equal quantity, but the 35-foot net took a smaller proportion of buffalofish and a somewhat larger proportion of carp and carpsuckers than did the other two trawls.

Day-night comparison drags: 16 drags were made to compare catches made during daytime with catches made at night in the same area and using the same gear. Four drags were made in the morning (7:00 a.m. to 9:30 a.m.); six drags during late afternoon (4:30 p.m. to 6:30 p.m.); and six drags at night (8:00 p.m. to midnight). The average catch per drag during late afternoon (271

ponds) was about the same as during the night (278 pounds), but the early morning catches were considerably less productive (112 pounds). Carp comprised a larger portion of the late afternoon catch than at either of the other time periods. Carpsuckers were about the same percentage of the catch during all periods; buffalofish were a larger part of the early morning and nighttime catches than during the late afternoon; and goldeye made up over 2 percent of the catch only at night.

Commercial production drags: 44 drags were made to catch commercial species in the largest quantity possible. Results are analyzed on the quantity of fish taken per standard 15-minute drag and on "operational hours": i.e., hours required to complete trawling in a local area. Operational hours include shooting, dragging, and hauling time, time spent in cruising from one drag site to another in a localized area, and delays resulting from minor or routine maintenance of gear. Operational hours do not include the time required for travel from one major trawling area to another.

Most of one day was spent trawling in a "marginal production area" (upper Zone 4). Drag sites here consist of small scattered bays, so considerable time was lost in travel from one drag site to another. Seven operational hours produced only 70 trawling minutes. The take of commercially saleable fish was 65 pounds per 15-minute drag, or 43 pounds per operational hour. The commercially saleable poundage was: 84 percent carp, 10 percent river carpsucker, 5 percent bigmouth buffalo, and 1 percent channel catfish. ("Commercially saleable" are species designated commercial by the State, and are species and sizes the local industry can use.) All the bigmouth buffalo and 86 percent of carpsuckers were commercial size, but only 67 percent of catfish and 34 percent of carp were that large.

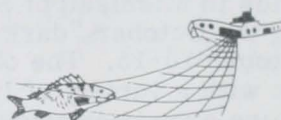
Twenty-four operational hours (560 trawling minutes) were spent on a prime trawling area in Zone 6. The catch of commercially saleable fish was 89 pounds per 15-minute drag, or 137 pounds per operational hour. The commercial poundage was 55 percent bigmouth buffalo, 38 percent carp, 3 percent smallmouth buffalo, 2 percent river carpsucker, 1 percent goldeye, and 1 percent freshwater drum and channel catfish combined. Nearly all buffalofish and goldeye,

two-thirds of channel catfish, one-fourth of carp and carpsuckers, and 8 percent of drum taken were commercial size.

Young-of-the-year and yearling catch: Of 3,370 young-of-the-year fish taken, 90 percent were black bullheads, 5 percent drum, and 4 percent crappies. Other species taken, each less than one percent of catch, were white bass, perch, and walleye.

Of 18,360 yearling fish taken, 92 percent were black bullheads, 4 percent were crappies, and 2 percent were yellow perch. Other yearling fish taken, but each species less than one percent of total number, were: sauger, white bass, goldeye, northern pike, walleye, channel catfish, carp, bigmouth buffalo, smallmouth buffalo, freshwater drum, and burbot.

Note: For more information, contact: Base Director, Exploratory Fishing Base, BCF, 5 Research Drive, Ann Arbor, Mich. 48103.



Gulf Fisheries Explorations and Gear Development

"BOWERS" ELECTRIC SHRIMP TRAWLS ARE SUCCESSFUL

Daytime catches with the electrical shrimp trawl are about equal to nighttime catches with the standard trawl, cruise 67 of the George M. Bowers shows. The gear research vessel recently completed an electric shrimp-trawling cruise off Mississippi and Texas. Two simultaneously towed 40-foot Gulf of Mexico flat trawls were used. The starboard trawl was equipped with components of the electrical system; the port trawl with a single tickler chain. Comparison tows lasted one hour.

Daytime electric trawl catches averaged 96 percent of the night non-electric trawl catches. The weight averages of the catches were 15.5 lbs./hr. for the daytime electric trawl--and 16.2 lbs./hr. for the night non-electric trawl. The day non-electric average was 0.5 lbs./hr.--and the night electric average was 9.9 lbs./hr. The researchers are trying to take underwater motion pictures of the electrical trawl while fishing. If successful, the films should explain the lower catch rates of the electrical trawl at night.

An efficiency of 96% for the daytime electrical trawl, compared to the night standard

trawl, is a commercially productive catch rate. This catch average also adds considerable support to the success the system experienced during the Bowers cruise off the Alabama and Mississippi coasts: an efficiency of 109% for the daytime electric trawl. The catch weight averages were 17.7 lbs./hr. for the daytime electric trawl--and 16.3 lbs./hr. for the night non-electric trawl.

Cruises 66 and 67 of the Bowers show the electrical shrimp trawl to be very effective on the Alabama, Mississippi, and Texas coastal shrimping areas.

* * * * *

ATTRACTION OF ANCHOVIES TO LIGHT STUDIED

The Bowers conducted light attraction studies on anchovies in Mississippi Sound (Cruise 68) during the October "dark-of-the-moon" phase--October 10-15. The objective was to experiment with a variety of light sources to determine attraction rates and behavior control of Gulf anchovies (Anchoa sp.).

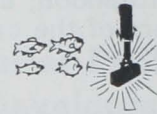
Four experimental lighting arrays were used: a 90-lamp bank of incandescent lights capable of 13,500-watt output; a 2-lamp bank of mercury vapor lights with 2,000-watt output; a 3-lamp, 3,000-watt bank of incandescent lights; and single 6 VDC seal-beam lamps. Variable intensity controls were used on each unit. Experimental fishing and sampling gear included a 215-foot fine mesh purse seine, gill nets, and dip nets.

Throughout the study period, strong winds, choppy seas, and heavy turbidity greatly restricted operations, observations, and the effectiveness of light attractors. But generalized observations indicated that the mercury vapor lights were most effective in attracting both anchovies and clupeids to the vessel. By switching to the 90-lamp bank of incandescent lights, circular milling behavior was quickly established--and then the "school" could be held through successive dimming down to one low intensity lamp. Weather conditions permitted only one purse seine set that yielded about 200 pounds of anchovies, and 10 pounds of thread herring (Opisthonema oglinum), scaled sardines (Harengula pensacola), and small numbers of harvestfish (Peprilus paru), bumpers (Chloroscombrus chrysurus); and cutlassfish (Trichiurus lepturus).

Six-bulb banks of red incandescent lights attracted primarily squids and eels. No measurable results were obtained with a five-bulb bank of blue lights.

To obtain menhaden samples, gill-net sets were made in the Sound in cooperation with BCF's Beaufort Biological Laboratory.

Note: For more information, contact: Base Director, Exploratory Fishing and Gear Research Base HQ, Pascagoula, Miss. 39567.



North Atlantic Fisheries Explorations and Gear Development

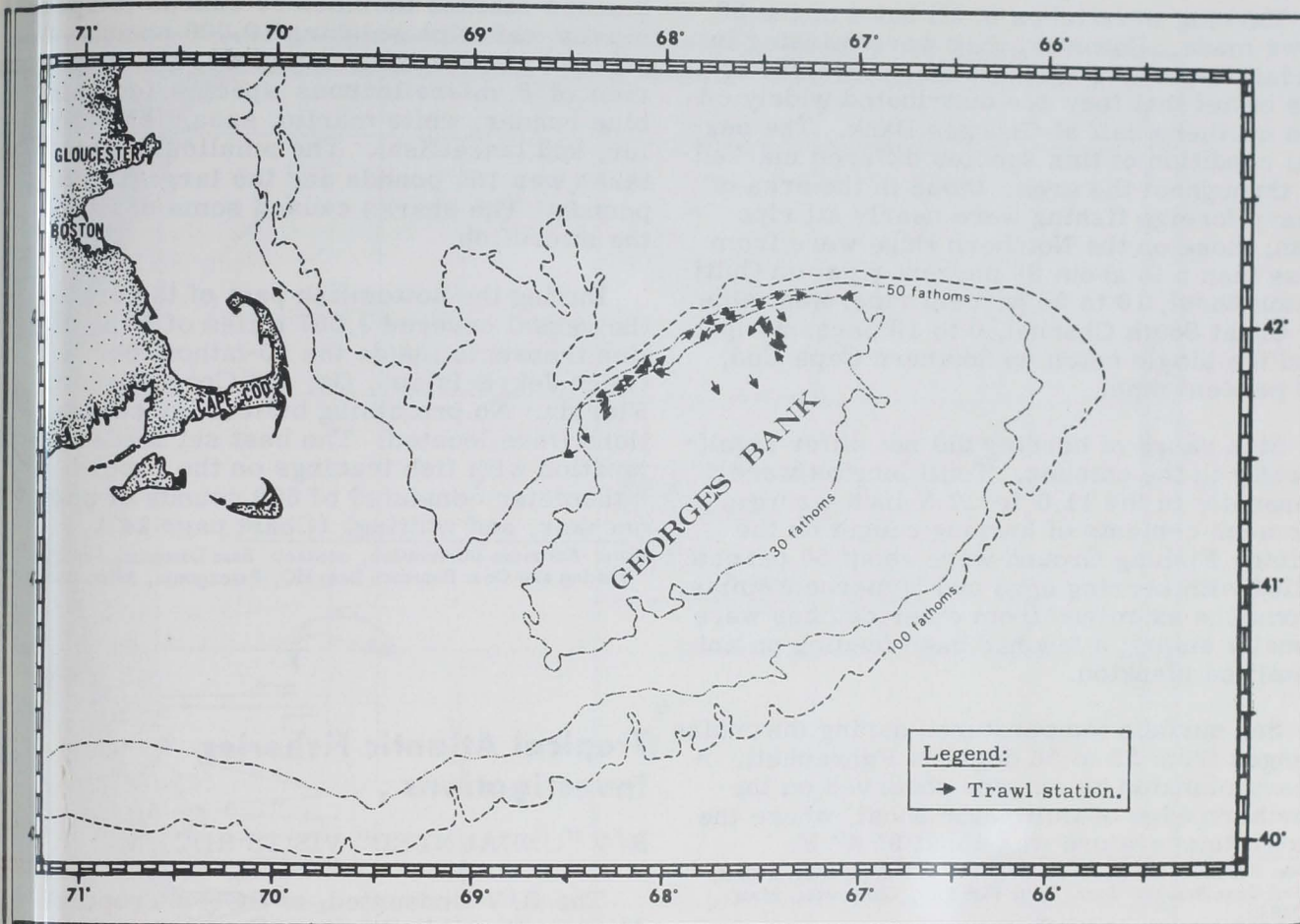
"DELAWARE" SEEKS INDUSTRIAL FISH ON GEORGES BANK

The exploratory fishing vessel M/V Delaware returned from the Georges Bank area to Gloucester, Mass., on October 10 after completing the second in a planned series of exploratory cruises for industrial fish species (Cruise 66-8, Sept. 29-Oct. 10, 1966). Thirty-three tows were made with a Dutch herring trawl specifically to evaluate herring (Clupea harengus) distribution, relative abundance, and availability to this type of gear. The major part of the survey was conducted on the northern half of Georges Bank, from Cultivator Shoal to the Northern Edge, at depths of 16 to 52 fathoms (see cruise chart). Also, electronic fish sounding and ranging transects were made both in the fishing areas and while steaming to and from Gloucester.

Commercial concentrations of herring were found in the northeastern section of the Winter Fishing Ground. A fleet of 35 to 40 foreign vessels, mostly Soviet factory-stern trawlers was actively fishing here; estimated catches of 10,000 to 35,000 pounds were observed.

The main objectives of this cruise were: (1) to investigate the seasonal distribution and relative abundance of industrial fish (primarily herring) in the area of Georges Bank and adjacent parts of the Gulf of Maine, (2) determine the availability of these species to a Dutch herring trawl, and (3) to obtain biological and environmental data relative to collected species.

A Dutch herring trawl was used. Two types of kites (fiberglass and plywood) and varying



M/V Delaware Cruise 66-8, Sept. 29-Oct. 10, 1966.

numbers of spherical (8-inch diameter) floats lashed up the headrope, and wooden spacers were used for roller gear.

Fishing activities were conducted in areas of suspected fish abundance--generally based on data from previous cruises and information received from Government aerial surveillance of foreign fishing activity. Echo-sounding and ranging transects were conducted between trawl sets and during bad weather, when fishing was impractical.

Tows with the Dutch net were made during the daytime and were usually 1-hour long at about four knots. Oceanographic data were collected at every tow, and biological specimens were examined for size, weight, stomach content, and sexual maturity from selected catches.

Results: Definite commercial concentrations of herring were found in the Winter Fishing Ground area between 41°55' N., 66°25' W. and 41°58' N., 67°28' W. at depths

of about 20 to 30 fathoms. Although the vessel's maximum catch was 3,300 pounds for a 1-hour tow, a tenfold catch was observed on a Soviet vessel, probably the result of a 2-hour tow. The observed catches of several vessels of the large foreign fleet averaged over 10 thousand pounds. Their powerful modern vessels apparently experience little difficulty in handling nets that appeared twice as large as the Dutch herring trawl. A dense fog and competition for space prevented the Delaware's crew from fully evaluating the possible production from this area.

Two other areas produced fair catches of industrial fish species. Over 9,000 pounds of mixed fish, including 7,000 pounds spiny dogfish (*Squalus acanthias*) and 1,260 pounds herring, were caught in a 1-hour tow in 32 to 34 fathoms between the Peaked Hill Buoy and W or "E" Buoy off northeastern Cape Cod. Catches included over 2,600 pounds of mixed industrial fish, mostly herring or silver hake (*Merluccius bilinearis*), on northern Cultivator Shoal.

Herring were taken in all but 4 of the 33 tows made. However, they were missing in widely separated tows, which substantiates the belief that they are distributed widely on the northern half of Georges Bank. The sexual condition of this species differed markedly throughout the area: those in the area of heavy foreign fishing were nearly all ripe fish; those on the Northern Edge were from less than 5 to about 30 percent ripe; on Cultivator Shoal, 10 to 50 percent ripe; west side of Great South Channel, 0 to 10 percent ripe; and the single catch on northern Cape Cod, 50 percent ripe.

Size range of herring did not differ significantly in the catches. Total lengths were generally in the 11.0 to 12.5 inch range. Stomach contents of herring caught on the Winter Fishing Ground were about 50 percent filled with herring eggs and 50 percent empty. Stomachs examined from other catches were usually empty; a few had been feeding on unidentified plankton.

Sea surface temperatures during the cruise ranged from 55 to 58 degrees Fahrenheit. A heavy plankton bloom was observed on the northern edge of Cultivator Shoal, where the water temperature was about 55.4° F.

Note: For more information, contact: BCF Exploratory Fishing and Gear Research Base, State Fish Pier, Gloucester, Mass. 01930.



South Atlantic Fisheries Investigations and Gear Development

"OREGON" STUDIES AVAILABILITY OF SWORDFISH AND BOTTOMFISH

The R/V Oregon returned to St. Simons Island, Georgia, on September 26 after a 19-day exploratory fishing cruise off southern Georgia and the Florida east coast (Cruise 112). Objectives: to continue seasonal observations on availability of swordfish to longline gear, and to survey distribution availability of inshore bottomfish stocks by otter trawl.

Five nighttime and one daytime 50-60 basket longline (10 hooks to a basket) sets were made between the axis of the Gulf Stream east to the 1,000-fathom curve. Twenty swordfish weighing 1,678 pounds (89-lb. average) were taken in the 6 sets. Miscel-

laneous catches included 58 sharks (6 species mostly whitetip) weighing 10,000 pounds, 2 bigeye tuna weighing 72 pounds, and 9 specimens of 6 miscellaneous species (dolphin, blue runner, white marlin, spearfish, escolar, and lancetfish). The smallest swordfish taken was 18 $\frac{1}{4}$ pounds and the largest 205 pounds. The sharks caused some damage to the swordfish.

During the bottomfish part of the cruise, the vessel covered 1,067 miles of fish detection transects inside the 10-fathom curve between Jekyll Island, Ga. and Cocoa Beach, Florida. No promising bottomfish concentrations were located. The best set made in conjunction with fish tracings on the recording fathometer consisted of 860 pounds of spot, croaker, and whiting. (Chart page 24.)

Note: For more information, contact: Base Director, Exploratory Fishing and Gear Research Base HQ, Pascagoula, Miss. 39567.



Tropical Atlantic Fisheries Investigations

R/V "UNDAUNTED" VISITS RECIFE

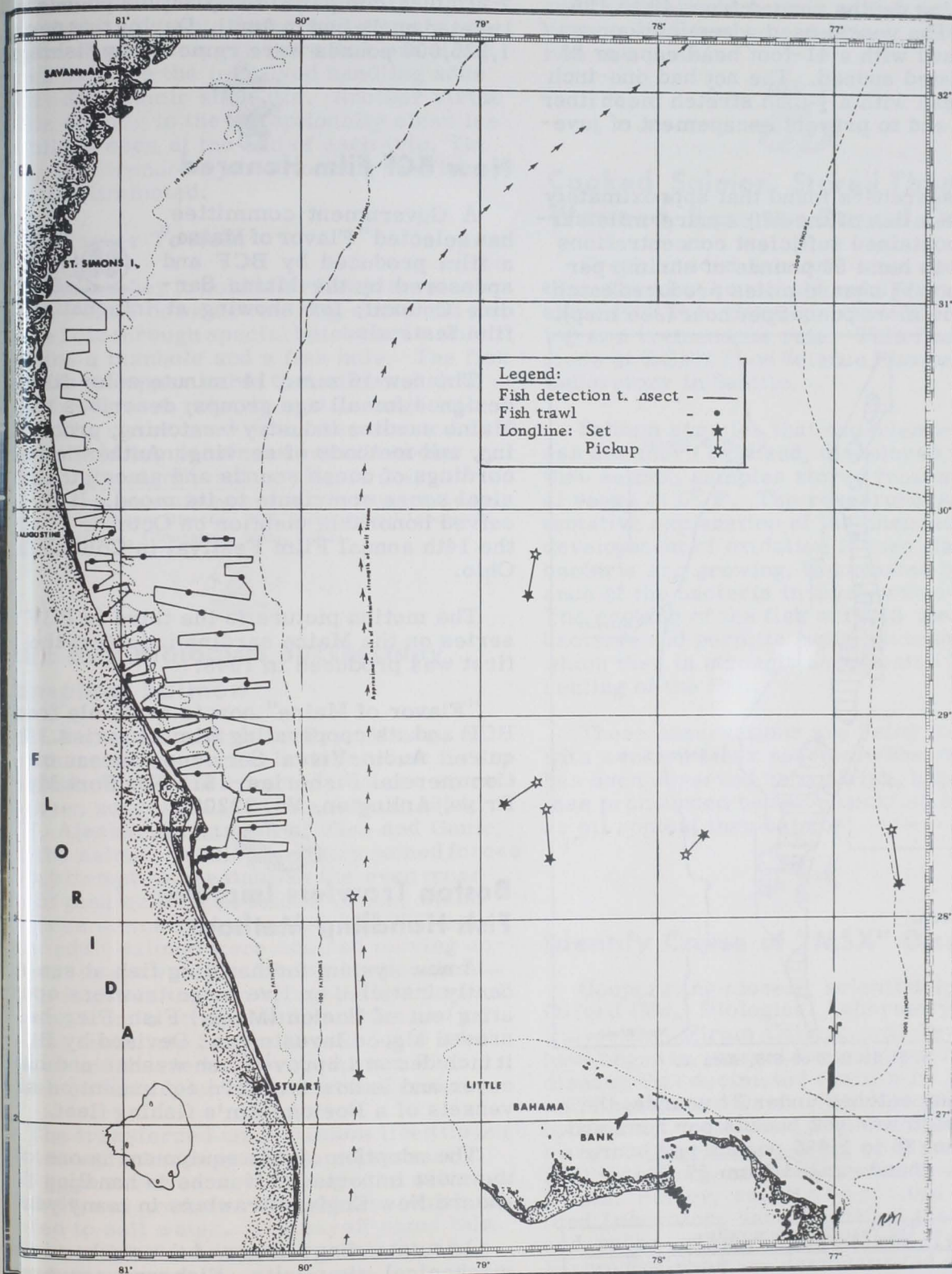
The R/V Undaunted, of BCF's Tropical Atlantic Biological Laboratory, recently stopped in Recife, Brazil, on a 4-day visit. The visit followed extensive fishery and oceanographic study in the western tropical Atlantic. The staff held open house and later invited local reporters and photographers to witness a demonstration cruise around Recife. The U. S. Information Agency and local press publicized the visit and the Undaunted's work.



California's "Scofield" Samples Coastal Shrimp

The State of California's N. B. Scofield returned to San Pedro September 13 after a 5-week cruise in coastal waters primarily to sample shrimp. (Cruise 66-S-5 Shrimp.) The cruise areas were the coastal waters from Oregon border to Eureka, California, and off Point Rincon, Santa Barbara.

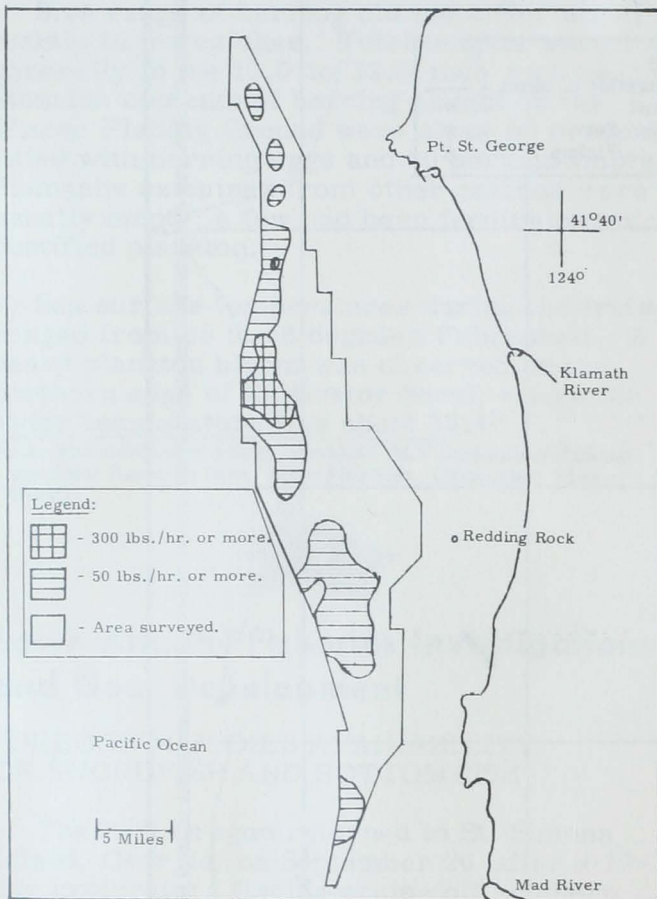
The 156 tows were randomly distributed over the 270 square-mile survey area between



R/V Oregon Cruise 112, September 8-26, 1966.

the Mad River's mouth and the Oregon border. Fishing depths ranged from 40 to 105 fathoms. The vessel used a semiballoon, gulf shrimp trawl with a 41-foot head rope or 25-foot estimated spread. The net had one-inch stretch mesh with a 1/2-inch stretch mesh liner in the cod end to prevent escapement of juveniles.

The researchers found that approximately 101 square miles of the 270 square-mile survey area contained sufficient concentrations to provide at least 50 pounds of shrimp per hour. About 17 square miles produced catches of 300 or more pounds per hour (see map).



N. B. Scofield 66-S-5, Area A.

Excluding catches under 34 pounds, the average catch was 162 pounds per hour and ranged from 35 to 1,496 pounds per hour. Counts per pound ranged from 57 to 151; the mean was 100.

The Year-Class Composition	
Year-Class	Percent by Number
0 (1966)	63.6
I (1965)	22.1
II (1964)	13.8
III (1963)	.5

Estimated total poundage on the bed was 2,210,000, compared to 5,086,000 pounds estimated on the bed in April. During this period 1,225,000 pounds were removed by fishing.



New BCF Film Honored

A Government committee has selected "Flavor of Maine," a film produced by BCF and sponsored by the Maine Sardine Council, for showing at international film festivals.



The new 16 mm., 14-minute color film, designed for all age groups, describes the Maine sardine industry--catching, processing, and methods of serving. Authentic recordings of ocean sounds and an original musical score contribute to its mood. It received honorable mention on October 7 at the 14th annual Film Festival in Columbus, Ohio.

The motion picture is the third in BCF's series on the Maine sardine industry; the first was produced in 1948.

"Flavor of Maine" now is available from BCF and its cooperating film libraries. Inquire: Audio-Visual Services, Bureau of Commercial Fisheries, 1815 No. Fort Myer Drive, Arlington, Va. 22209.



Boston Trawlers Improve Fish Handling Methods

A new system for handling fish at sea recently installed on five large trawlers operating out of Boston (Mass.) Fish Pier has proved a good investment. Devised by BCF, it includes an improved fish washer and hatch cover and is now standard equipment on all vessels of a Boston firm's fishing fleet.

The adoption of this equipment is one of the most important advances in handling fish aboard New England trawlers in many years.

An outstanding feature of the washer is its mechanical simplicity. Fish are conveyed through it by a flume originating from the deck hose. Since only a few fish are in the washer at any one time and need not be fork-

out, they reach the hold in much better condition than fish handled by more traditional methods. Vessels fitted with these washers are reported to get more fish out at top prices because the improved handling adds about a day to their shelf life. Another virtue of this washer is the exceptionally clean ice and bilges seen at the end of each trip. On deck, the strenuous job of forking the fish down is eliminated.

From Washer To Hold

From washer to hold after fish leave washers, they slide down dewatering chute and enter the hold through special hatch cover which contains a manhole and a fish hole. The fish hole has a flapper valve that allows fish to pass through but retards heat leakage into hold. The cover need never be removed at sea, so hold temperatures remain cooler--producing a significant saving in ice.

For more information on systems for handling fish at sea, contact: Laboratory Director, BCF Technological Laboratory, Emerson Avenue, Gloucester, Mass. 01931.



Auke Bay Biologists Successfully Transplant Salmon

BCF biologists at Auke Bay, Alaska, report that the experiment to transplant fish to reestablish salmon runs in a barren stream has been successful. In late August 1964, BCF, Alaska Department of Fish and Game, and the salmon canning industry joined forces in an attempt to reestablish the even-year run of pink salmon in Sashin Creek, which had been virtually decimated; in 1962, only eight adult salmon were counted moving upstream to spawn. The biologists decided to try to improve the run by carrying live adult salmon from a stream with surplus and releasing them into Sashin Creek; 1,886 adult pink salmon were transferred from Bear Creek on Kuiu Island into Sashin Creek.

The transferred adult salmon lived through the transplantation and spawned normally. The eggs survived well through the winter of 1965-66 and produced 320,000 fry, which migrated to salt water. The payoff came this fall when 6,000 adults returned to Sashin Creek to spawn.

There are now over two million eggs in the gravel at Sashin Creek. Biologists are

optimistic that this run will be reestablished, and that transplantations of this type may help restore similar badly depleted runs or establish new runs.



Cooked Salmon, Stored Then Warmed, Becomes Rancid Quickly

Fresh or iced salmon--when cooked and then stored at household refrigerator temperature (40° F.)--develops rancidity upon warming at a tremendous rate. This finding was made at BCF's Food Science Pioneer Research Laboratory in Seattle.

Salmon samples that experience this process are more oxidized, discolored, and rancid than salmon samples stored frozen for several years at 0° F. The researchers offer this tentative explanation of the phenomenon: the development of oxidation in iced fish, in which bacteria are growing, is arrested by the presence of the bacteria in a yet-unknown manner. The cooking of the fish arrests the action of bacteria and permits rapid oxidation at 40° F., which then is strongly accelerated by a reheating of the fish.

These observations are being followed up with work on other species. The same effect has been observed on rockfish, but here it is less pronounced because rockfish have a lower oil content than salmon.



Identify Cause of "MSX" Disease

Cooperating closely, scientists of BCF's Oxford (Md.) Biological Laboratory, Rutgers University, Hiram College, and Texas A & M have begun to unravel the enigma of the "MSX" disease that decimated oysters in Delaware and Chesapeake Bays. The disease is caused by a newly recognized protozoan, which was named *Minchinia nelsoni* by Haskin and Stauber of Rutgers and Mackin of Texas A & M. Couch, Farley, and Rosenfield of the Oxford Laboratory have identified the prespore and spore stages. Barrow and Taylor of Hiram College have demonstrated by fluorescent antibody studies that the spores identified at Oxford are those of *Minchinia nelsoni*. To control a disease, knowledge of its cause

and the parasite's life cycle usually are essential. The university research was largely supported by BCF contracts.



Chinese A-Blasts Affect Oysters

Studies at BCF's Radiobiological Laboratory at Beaufort, N.C., have detected radioactivity in oysters caused by the Chinese nuclear explosions. The findings result from a program to study marine organisms that have accumulated radioactive materials. Several common marine invertebrate species in the Beaufort area serve as biological indicators for various types of radiation pollution.

Fallout radioactivity from Red China's second nuclear bomb test on May 26, 1965, was detected in the oyster, *Crassostrea virginica*. Prior to this blast, radioisotopes with relatively long active periods (about 1 year)--ruthenium 106, zinc 65, manganese 54, and potassium 40--were found in oyster tissue. Eleven days after the blast, additional radioisotopes in the oysters included: cerium 141, ruthenium 103, zirconium 95-niobium 95, and barium 140-lanthanum 140.

These short-lived radioisotopes showed that increased radioactivity was due to fresh fallout. Lesser amounts of fresh fallout were detected in marine organisms after the first and third tests. Extremely sensitive detecting equipment measured the radioactivity, which was far below dangerous levels for man. Apparently, the organisms lose accumulated radioactivity quite rapidly: fresh fallout is detectable in samples for only a few weeks after each test.



Analyze King Crab Data

The length frequencies of male king crab caught during the trawl survey by the BCF's chartered vessel "Sonny Boy" in the Bering Sea have been completed. The catch was dominated by noncommercial size crab--less than 125 mm. carapace length. The most abundant group of commercial size crab occurred between 125 mm. and 140 mm. The researchers have nearly completed comparing the 1966 length frequencies with those collected from 1957 to 1961.



Combine Heat and Irradiation to Pasteurize Dungeness Crab Meat

The Seattle Technological Laboratory initiated a study of the feasibility of combining heat pasteurization and irradiation pasteurization to extend the refrigerated shelf life of high-quality, fresh, Dungeness crab meat. Previous tests indicated that Dungeness crab meat can be successfully heat-pasteurized by the process used in the blue crab industry.

The scientists hope that by combining low-dose irradiation (less than 0.2 megarad) and mild heat treatment (180° F.) storage life can be increased significantly--and without producing the adverse odor and flavor changes that accompany either higher irradiation dose or prolonged heat treatment above 180° F. In a 2-week test period, with storage at 34° F., two groups of samples were of good quality. However, the taste panel preferred the sample irradiated at 0.2 megarad followed by heat pasteurization.



Conduct Time-Temperature Studies of Salmonella in Fish Meal

The College Park and Pascagoula Technological Laboratories are cooperating in a time-temperature study to determine the process requirements for consistently producing a meal free of salmonella. The widespread incidence of salmonellosis and the incrimination of fish meal as a carrier of the causative organism inspired the study. Following various time-temperature treatments, the meals were submitted to College Park for nutritive value assessments.

Determinations of thermal destruction were made on several meals contaminated with a mixture of 5 salmonella strains. The heat treatment ranged from 150° F. for 60 minutes to 230° F. for a few minutes. Nutritive value determinations revealed that no significant damage was caused by the various heat treatments required to destroy all salmonella organisms.



Radiate Mackerel to Study Vietnamese Food

Scientists of the Gloucester Technological Laboratory (Mass.) are using the Marine Products Development Irradiator (MPDI) to sterilize samples of fatty fish fillets (mackerel) for a Cornell University study. The study involves the manufacture of "Nuoc-Nam," a fermented fish condiment used a great deal by the Vietnamese. The condiment is made by a process of autolytic degradation of fish protein in strong brine; enzymes from fish intestines cause the breakdown. The sterilized mackerel fillets will be used to study if and how "Nuoc-Nam" can be made by the Vietnamese.



Galveston Studies Distribution and Abundance of Shrimp Larvae

BCF's Biological Laboratory at Galveston, Texas, has begun a study to obtain estimates of abundance of planktonic-stage Penaeus species and to determine their vertical distribution in relation to water temperature. Plankton collections are made in waters off Galveston ranging from 9 to 55 meters (5-30 fathoms) using a Clarke-Bumpus sampler. Three cruises have been completed and the examination of plankton samples begun.

Also, efforts were resumed to locate concentrations of Penaeus sp. postlarvae before they enter Galveston Bay. Simultaneous bottom-towed and plankton tows were made in one to seven meters ($\frac{1}{2}$ to 15 fathoms). So far, only two tows have been examined. Results show that Penaeus sp. are abundant along the bottom inside 9 meters (5 fathoms). During August and September, both white and grooved (either brown or pink) shrimp postlarvae are present in these shallow waters.



Shrimp Cultivated in Artificial Ponds

At Galveston, too, about 4,000 postlarval white shrimp, spawned and reared to postlarvae under laboratory conditions, were stocked in one of the $\frac{1}{8}$ -acre ponds in July. The shrimp were held over an 11-week period and no water was added or drained. Food

was provided by fertilizing the pond prior to stocking, and twice thereafter, to induce the growth of plankton. Instead of a commercial fertilizer used in past experiments, chicken manure was applied to a single location within the pond. About one cubic yard of fertilizer was used in each application.

Shrimp grew at an average rate of 1.3 mm. and 0.1 g. per day. They attained a count size of 50 whole shrimp per pound over this 11-week period. During the first 5 weeks, however, they grew rapidly (2.3 mm. and 0.17 g. per day) then a marked decrease in growth was evident--apparently associated with decrease in plankton density, reflected in the chorimeter values. Additional fertilizer has been applied to the pond to restimulate plankton and shrimp growth.



Studies Life History of Pink Shrimp off Florida

The Galveston program of nighttime sampling of pelagic postlarvae Penaeus sp. (probably P. duorarum) shrimp entering Florida Bay continued during July-September. Semi-monthly plankton samples were collected at the surface, middepth, and bottom of Whale Harbor Channel. From a low in February, the abundance of postlarvae increased gradually during the spring. There were peak catches in late May and in July, August, and September. Distribution of postlarvae in the water column was variable--apparently related to the incident light at each level. The highest percentages of postlarvae in the bottom nets were obtained near or during the full moon, and when the sky and water were exceptionally clear; conversely, the highest percentages of shrimp in the surface nets were associated with dark nights and/or turbid waters.

Daytime suction sampling of benthic postlarval and juvenile Penaeus (8-100 ml. total length) was continued in shallow water seagrass beds in Florida Bay. A comparison of May-August samples for 1965 and 1966 showed that the average catch per square meter (m^2) in 1965 was 1.1 shrimp, compared with 1.6 in 1966.

Exploratory shallow-water shrimp samples were taken in Florida Bay and along the Florida Keys from Key Largo to Big Pine Key. A pushnet and pullnet were used to obtain samples. Young shrimp were particularly

abundant (10 shrimp per m.²) at sites to the west (Sandy Key) and southwest (Key Vaca). Shrimp were scarce (2 or less per m.²) from Key Largo to Lower Matecumbe Key. In eastern Florida Bay, density was also low. These observations indicate that postlarval recruitment and/or survival increases toward western and southwestern Florida Bay.



Method Found to Peel Pink Shrimp

After considerable research, the Technological Laboratory at Ketchikan, Alaska, has developed a satisfactory method to peel pink shrimp--thus overcoming a primary obstacle to the commercial production of a high-quality product. The whole shrimp are heated at 165° F. for 15 seconds to set the pink color, then heated at 110° F. for 3 minutes to loosen the shell for easy removal by a mechanical peeler. Based on the success of this process, a private firm is installing a pilot plant in Wrangell, Alaska. BCF will cooperate in semicommercial-scale trials.



Lake Trout Thrive on Alewives

A recently completed experiment by the BCF Biological Laboratory at Ann Arbor (Mich.) showed that 5 pounds of alewives eaten by 2-year-old lake trout resulted in an increase of 1 pound in trout biomass. The trout grew rapidly on a diet of alewives. Their body weight increased by 36 percent in 5 weeks. A control group of lake trout, which was fed a standard hatchery diet, experienced a weight increase of 26 percent during the same period. Conversion efficiency was low during the first week while the trout were adapting to the new diet; however, it increased during the second week and stabilized at about 19.5 percent. This corresponds to a conversion ratio of about 5:1.



Tagged Seal Pups Weigh Less Than Untagged

A 10-year series of pups weights has shown that tagged pups weigh significantly less than untagged pups a week after tagging, reports

BCF's regional office in Seattle. In 1966, the researchers found that mere handling of pups also produces weight differences. Several hundred pups, marked by shearing a small patch of fur from the top of the head, furnished a small reservoir of "handled" pups. A week after shearing, "handled" pups weighed less than "unhandled" (unsheared) pups. Handling and subsequent weight loss (or failure to gain) may lessen the individual's chances of survival at sea.



Sealskin Prices Are Down

The prices of sealskins at the semiannual auction of the Fouke Fur Company, October 13-14, in Greenville, S. C., were down from the record high sale in April 1966. About 21,000 Alaska fur sealskins were offered for sale for the account of the U. S. Government. Prices for skins that were dressed, dyed, machined, and finished (DDM&F) declined about 15-20 percent; Lakoda prices dropped about 20-25 percent.

Average prices per skin, and percent change from the April 1966 sale (in parentheses), were: Blacks \$117.51 (-19.4%); Mataras \$96.18 (-18.3%); Kitovis \$95.76 (-15.3%); Lakoda naturals \$81.06 (-21.4%); Lakoda Browns \$48.19 (-14.2%); Lakoda Blacks \$45.17 (-29.3%).



Workshop Discusses Swordfish and Tuna Longlining

BCF and industry members talked about swordfish and tuna longlining at a workshop in Gloucester, Mass. The participants agreed that longlines are most efficient for catching subsurface swordfish and tuna, and that the U.S. market for these species is virtually unlimited.

They noted some factors hindering the fishery's expansion: loss of gear, lack of suitable refrigerated vessels for preserving tuna catch, and lack of suitable electronic equipment for locating lost longline gear. The participants believed these adverse factors eventually will be overcome.



Keels Laid for Winter Hake Fishery

Again this year, BCF's Seattle Base is using depth telemetry gear to vessel owners who have markets for the winter hake fishery in Puget Sound. Last year, this fishery produced about 6 million pounds. Some vessels already have the gear and started fishing.

Also, the captain of the commercial trawler "Radio" has offered the use of his vessel for experimental fishing for herring with a BCF-owned midwater anchovy trawl. The Seattle Base will provide gear and personnel to complement the study.



Keel Laid for BCF Exploratory Vessel

On November 3, the keel was laid for the exploratory fishing research vessel "Delaware II," at the South Portland Engineering Co. in Maine. The vessel will be commissioned in late 1967.

The 155-foot, 1,000-hp. Delaware II will replace the Gloucester-based Delaware as BCF's primary vessel for fisheries exploration and gear research in the western North Atlantic north of Cape Hatteras. The vessel, of stern trawler design, also will be used to demonstrate commercial stern trawling techniques to an industry largely founded on side trawling.

The Delaware now in service is a familiar sight along the northeast coast. The 148-foot stern trawler was built for commercial service in Maine in 1937, saw extensive naval service during World War II, and was used by the German fishing industry in the years right after the war. Since 1949, it has been used in BCF's fisheries technological and exploratory fishing offshore research programs.



Dr. J. L. McHugh Named BCF Acting Deputy Director

Dr. J. L. McHugh, who has been Assistant Director for Biological Research since joining BCF in 1959, has been named Acting Deputy Director. He succeeds Harold E. Crowther, the newly designated Acting Director.

For 8 years before coming to BCF, Dr. McHugh was Director of the Virginia Fisheries Laboratory and Professor of Marine Biology at the College of William and Mary, Williamsburg, Va.

He was born in Vancouver, B. C., and received his bachelor's and master's degrees from the University of British Columbia. He served the Biological Staff of Canada's Fisheries Research Board from 1938 until 1941. During World War II, he was an infantry officer with the Canadian Army in England and France.



Dr. J. L. McHugh

After earning his doctor of philosophy degree at the University of California's Scripps Institution of Oceanography, Dr. McHugh moved to Virginia to head the State's marine behavior program at Gloucester Point. He became a United States citizen in 1958.

He is the author of 70 publications on fishery biology, ichthyology, and biological oceanography, a member of scientific societies, and a trustee of the International Oceanographic Foundation. He has been a member of many United States delegations to international fishery meetings in Europe, Latin America, and the Far East.



FEDERAL ACTIONS

Department of the Interior

FISHERIES LOAN FUND HAS PROVIDED NEARLY \$22 MILLION

From the inception of the Federal Fisheries Loan Fund in 1956, through September 30, 1966, the Fund's Administrator, BCF, received 1,864 applications for \$48,298,257. By September 30, 1966, 977 applications (\$21,773,930) had been approved, 587 (\$13,674,137) declined or found ineligible, 275 (\$9,355,902) had been withdrawn by applicants before processing, and 25 (\$1,422,386) were pending. Of those approved, 353 were for amounts less than applied for; the total reduction was \$2,071,902.

Recent Applications

The following applied recently for loans:

Olaf M. Johnson, Rural Route 2, Oconto, Wis. 54153, for construction of a used 52.3-foot, registered length, vessel to fish for alewives.

Adolf G. Olofson, 1516 Tongass Ave., Ketchikan, Alaska 99901, to buy a used 38-foot wood vessel to fish for salmon, halibut, crab, and shrimp.

Fred Schneider, 12809 Kalnor Ave., Norwalk, Calif. 90650, to construct a new 63-foot steel vessel to fish for albacore, yellowfin and skipjack tuna, swordfish, groupers, squid, anchovies, and bonito.

Seven Seas, Inc., Box 1243, Ponce, Puerto Rico 00712, to build a 153-foot, overall length, steel vessel to fish for tuna.

Robert A. and Billie S. Thackwell, 1417 Brookhill Dr., Fort Myers, Fla. 33901, to buy a used 55.1-foot, registered length, wood vessel to fish for shrimp.

Sylvester J. Chieslak, Box 24, Coho, Alaska 99570, to buy a used 32-foot vessel to fish for salmon, halibut, and crab.

Donald F. and Cecilia W. Kiesel, 1214 Donna Drive, Fort Myers, Fla. 33901, to buy a new 80-foot steel vessel to fish for all commercial species of shrimp.

Cecil E. Prior, Loudville, Maine 04564 to build a new 32-foot wood vessel to fish for lobsters.

Notices of the applications were published in the Federal Register, October 28, 1966.

* * * * *

FISHING VESSEL MORTGAGE INSURANCE PROGRAM

Since the mortgage insurance program began on July 5, 1960, BCF, the program's administrator, received 139 applications for \$16,267,107. Of the total, 102 applications were approved for \$7,212,421, and 18 applications for \$6,017,812 were pending on September 30, 1966.

During the third quarter of 1966, BCF received 17 applications for \$5,888,862.

* * * * *

FISHING VESSEL CONSTRUCTION DIFFERENTIAL SUBSIDY

From the first applications for a differential subsidy under BCF's expanded program received in December 1964, through September 30, 1966, BCF received 75 applications for an estimated \$17,398,500 in subsidies. Public hearings were held on 54 applications; 49 applications for subsidies estimated at \$12,322,000 were approved; 9 subsidy contracts totaling \$1,464,351 were carried out.

* * * * *

SUBSIDIES HELP BUILD STERN TRAWLERS

On November 4, the Department of the Interior announced that federal funds totaling \$5.2 million will help build two stern trawler factoryships--the largest fishing vessels to operate from U. S. ports. The subsidy covers half the construction cost of \$10.5 million.

Contracts under the 1964 Fishing Fleet Improvement Act were signed November 2, 1966, by BCF and American Stern Trawlers, Inc., of New York City, the owners. Maryland Shipbuilding and Drydock Co., Baltimore, Md., will construct the trawlers.

Midiron Length

The identical trawlers, about 292 feet, will be almost the length of a football field, and about a third longer than the 195-foot "Frosty" "Frosty" "Frosty", the longest U. S. fishing vessel. The vessel was built in 1958 and fishes for menhaden in the Gulf of Mexico.

The new vessels will be the first of their type to be built or operated in the United States and will be equipped to catch, freeze, package fish fillets from such species as cod, haddock, and produce fish meal and oil. The vessel will operate in the Northwest Atlantic; the other in the North Pacific.

The subsidy law provides assistance to build modern fishing vessels that meet certain requirements. The Federal contribution equals the cost difference between building vessels in U. S. and less expensive foreign shipyards; the maximum subsidy is 50 percent of the domestic cost. Public hearings are held before any subsidies are awarded.

Including the latest contracts, 11 vessels have been subsidized. Three have been completed.

* * * * *

FIRST ANADROMOUS FISHERY FUNDS AWARDED

The Interior Department has allocated \$750,000 to the States, the first funds under the Anadromous Fish Act of 1965. The Act seeks to conserve and develop the species that go from sea up rivers to spawn--salmon, shad, etc. The Act also covers Great Lakes fishes that spawn in tributary streams.

The Federal funds are for fiscal 1967, which began July 1, 1966, and may be used to finance up to 50 percent of approved projects. Michigan received \$210,000; Washington, \$2,500; Maine, \$130,000; Oregon, \$120,000; California, \$95,000. The money will help pay for 3 projects in research, stream improvement, and construction of fishways, spawning channels, and hatcheries.

About \$2 million is available in fiscal 1967 on a matching basis to 31 States bordering the oceans or Great Lakes. The Act authorizes up to \$25 million through June 30, 1970. A State may receive more than \$1 million a year.

The Anadromous Fish Act is administered jointly by BCF and the Bureau of Sport Fisheries and Wildlife. Together, they form Interior's Fish and Wildlife Service.

* * * * *

SETS NEW PERMIT OBLIGATION FOR SEISMIC WORK

Geological Survey now requires that companies receiving permits to carry out seismic work must notify the appropriate BCF Regional Director of the time and place of this work. It also requires the companies to pay the cost of having one observer acceptable to BCF on board during the seismic work if BCF thinks it necessary.



Department of Commerce

LOANS \$30.5 MILLION TO FISHERIES IN 1965

The Small Business Administration (SBA) of the Commerce Department loaned \$30.5 million to 919 fishery firms in 1965. Recipients were firms or persons engaged in commercial fishing, operators of oyster farms, hatcheries and fish preserves, tongers and dredgers of oysters, and gatherers of sponges, seaweed, etc.

SBA also aided processors, such as canners of fish, shrimp, oysters, and clams--and those engaged in smoking, salting, drying, freezing, and packaging fresh fish products.

Distributors included wholesalers of fresh and cured fishery products and retailers of all fishery products. Some truckers of fish received loans, but they are not included in the 1965 figures.

* * * * *

AIDS CONSTRUCTION OF CALIFORNIA MOORING BASIN

The Economic Development Administration has approved a \$560,000 grant to help build a \$1,360,000 mooring basin in Noyo, northern California; the State of California is loaning \$800,000. The basin will enable the commercial fishing industry to expand.

Noyo Harbor, at the edge of the city of Fort Bragg, is the only improved harbor for about 175 miles of coastline from Bodega Bay to

Eureka. The loan and grant will permit dredging operations in Noyo River Channel and construction of a mooring basin at the river's mouth. The expanded facilities will increase the resident commercial fishing fleet from 175 to 225 boats. The number of Noyo-based trawlers also is expected to increase when the mooring basin is completed in about 18 months.

* * * * *

PLANS EXPANSION OF FOREIGN TRADE REPORTS

Plans to expand and rearrange the series of statistical reports on U. S. foreign trade beginning in 1967 were announced October 17, 1966, by the Department of Commerce's Bureau of the Census. The plan results from discussions with users of the statistics.

The new series will contain for the first time more detailed information, particularly about transportation; much information will be reported more promptly; and more summary-type data will be made available.

The Census Bureau expects that a new monthly report will be widely use, called "Highlights of U. S. Export and Import Trade," it will contain 80 pages of interrelating statistical tables identifying important movements in the trade by commodity, country, United States custom region and district, and method of transportation. The report will be scheduled for release within 30 days after the month's end.

Detailed information on the expanded and changing program is presented in a new brochure, "Guide to Foreign Trade Statistics." Since most current monthly reports will be changed, some reports discontinued, and new reports begun, users of foreign trade statistics may wish to study the "Guide" in order to decide which series will best meet their needs in 1967. Copies are available free from Bureau of the Census, Washington, D. C. 20233, or from field offices of U. S. Department of Commerce in major cities.

* * * * *

ITS SURVEY OF CANNED FOODS TO INCLUDE FISH

The Bureau of the Census is planning an annual survey of inventories covering distributors' stocks of specified canned foods, in-

cluding fish, as of December 31, 1966. Together with previous surveys, this type of survey would provide the only continuing source of information on stocks of specified canned foods held by wholesalers--and in warehouses of multiunit retail organizations.

Reports will be obtained from scientifically selected sample of wholesalers and multiunit retail organizations handling canned foods. These reports will provide year-end inventories of canned food items with measurable reliability. Also, a number of multiunit firms will be asked for information about firms maintaining canned food stocks that are not reporting now in the Canned Food Survey.

Copies of the proposed forms and a description of collection methods are available from the Director, U. S. Bureau of the Census, Washington, D. C. 20233.

* * * * *

VESSEL OWNERS TO BE ASKED FOR MORE INFORMATION

The Bureau of Customs is revising customs forms 1258 and 1259 to permit proper identification of vessel owners and to facilitate converting "Merchant Vessels of the United States" to automatic data processing. In connection with this necessary revision, the Bureau published a notice in the Federal Register, November 2, 1966.

The Bureau will request vessel owners to furnish their zip code and Internal Revenue Service employer number, or social security number. It advises that customs forms 1258 and 1259 will be revised. Marine documents will have to show the owner's Internal Revenue Service employer number, or social security number.

Pending revision, customs form 1258 shall be amended by inserting "Zip Code, and Internal Revenue Employer No. or Social Security No." following "Name and Address of Owner." Customs form 1259 shall be amended by inserting "and Internal Revenue Service Employer No." after "Full Corporate Name of Corporation," and "Zip Code" following "Business Address of Corporation."

The Bureau of Customs will mail customs form 1283 to all owners of record. This form requests the additional information needed. It also requests confirmation of address and vessels owned.

