

TRENDS AND DEVELOPMENTS

Alaska

SOVIET TRAWLERS RETURN TO GULF OF ALASKA:

In mid-March 1964, a fleet of Soviet trawlers and accompanying processing and support vessels were seen about 40 miles southwest of Yakutat, Alaska. That was the first observed appearance during 1964 of Soviet fishing vessels in the Gulf of Alaska. The fleet was probably trawling for Pacific Ocean perch, large concentrations of which were located off the Yakutat Bay area by Soviet exploratory fishing vessels in 1960 and 1961.

Although the sighting revealed a small fleet of less than 20 vessels, their appearance so far east may indicate an expansion of Soviet fisheries in the Gulf of Alaska in 1964. Large-scale Soviet fishing in the Gulf of Alaska began in 1962 and has been largely centered around the Kodiak Island area. The Soviets usually leave the Gulf of Alaska about the end of October apparently to avoid the severe winter storms.

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BRISTOL BAY RED SALMON RUN FORECAST FOR 1964:

The Bristol Bay red salmon run will number approximately 19.3 million fish, according to an announcement in February by the Commissioner of the Alaska Department of Fish and Game. The forecast is based on a joint analysis of the available information by scientists of the Alaska Department of Fish and Game, the U. S. Bureau of Commercial Fisheries, and the Fisheries Research Institute.

Of the 19.3-million fish forecast, only about 8 or 9 million are expected to be available to United States fishermen, as out of the total run must come the necessary escapement plus the high-seas catch by the Japanese.

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FOREIGN FISHING FLEETS IN BERING SEA INCREASE IN FEBRUARY:

The Soviet fleets fishing in the eastern Bering Sea, mainly northwest of the Pribilof Islands, continued to build up throughout February. Japanese fishing activities, however, remained at a low level.

More than 150 Soviet trawlers and associated support vessels were believed to be fishing in the Bering Sea in February. Major fishing emphasis was reportedly on herring and, to a lesser degree, flatfish and rockfish.

The Japanese shrimp factoryship Chichi Maru and her accompanying trawlers returned to Japan in late December 1963 for a brief refit and were back fishing in the area north of Unimak Island in the Bering Sea by early February. Two stern trawlers of the Akebono Maru type were reported fishing in the same vicinity.

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MARINE PLANTS AND ANIMALS IN SHALLOW COASTAL WATERS NEAR SITKA:

The shallow coastal waters near Sitka, Alaska, were studied for a one-week period this March by a team of diver-biologists from the U. S. Bureau of Commercial Fisheries Biological Laboratory at Auke Bay, Alaska. The major objective of the Sitka expedition was to obtain scientific information on marine plants and animals inhabiting open coast situations. In the past, study of that area has been limited to collecting from tide pools and fishing or dredging in deeper waters. Those methods are now regarded as quite crude and relatively unproductive. With the use of SCUBA equipment, diving biologists now can intensively observe, measure, and collect in regions below the tides.

The Bureau's scientific group was met at the Sitka State Ferry Terminal by members of the Alaska Department of Fish and Game who provided transportation for the divers.

announced from the Bureau's oceanographic research vessels, the Murre II, which served as a base of operations for the expedition. From Sitka, the Murre II proceeded to nearby coastal points in the vicinity of Samsing Cove and Pillar Cove. The divers made both day and night dives at those areas to count, collect and photograph the rich marine animal and plant life there.

The collections on this expedition contained 25 species, 5 of which have never been recorded before in Alaskan waters. These new record range extensions represent fish previously known only as far north as the Queen Charlotte Islands in British Columbia. Biologists made density estimates of fish populations by swimming transects and recording the numbers and kinds of fish sighted along the transect line.

Some of the divers counted octopus and obtained specimens for the Bureau's laboratory collection while other members of the expedition conducted a study of the subtidal distribution and density of the Sitka abalone. Collections were also made of other common marine invertebrate species including sea stars, sea cucumbers and sea urchins.



Alaska Fisheries Exploration

Alaska Gear Research

TRAWLING EXPERIMENTS YIELD HEAVY SHRIMP CATCHES:

Experimental drags with a 10-foot trynet produced heavy catches of shrimp near Kasaan Bay during early February. Drags 10 minutes each yielded shrimp catches of 11 pounds. The pot-fishing gear for adult shrimp studies was changed from conventional bottom sets to sets of vertical strings so as to obtain information on vertical distribution of the shrimp.



American Samoa

JAPANESE GOVERNMENT ISSUES SPECIAL PERMIT TO LAND QUEEN CHARLOTTE ISLANDS TUNA AT SAMOA:

The Japanese Fisheries Agency has issued a special permit (valid until June 1964) au-

thorizing the landing at American Samoa of tuna caught by Japanese tuna vessels (about 17) assigned to the base at Levuka, Fiji Islands. Reportedly, base facilities at Levuka are not expected to be completed until June. Also, one of the United States firms located at American Samoa is said to be faced with the problem of procuring an adequate supply of tuna due to the reluctance of Japanese tuna vessel operators to fish out of American Samoa since fishing in waters adjacent to that Island is poor. (Nihon Suisan Shimbun, Feb. 17; Suisancho Nippo, Feb. 5, 1964.)



California

SEA OTTER POPULATION SURVEY CONTINUED:

Airplane Spotting Flight 64-4-Special Project (February 13, 1964): To obtain a visual and photographic count of California sea otters (Enhydra lutris nereis), the California coastline from Morro Bay to Monterey was flown on the morning of February 13, 1964, by the California Department of Fish and Game's Beechcraft N5614D. Turbulent air necessitated flying at an altitude of about 250 feet, but visibility was excellent. One observer counted 339 sea otters, and another observer counted 351 sea otters in the area surveyed during the flight. The largest concentrations of sea otters were in the Carmel Bay area just below Cape San Martin.

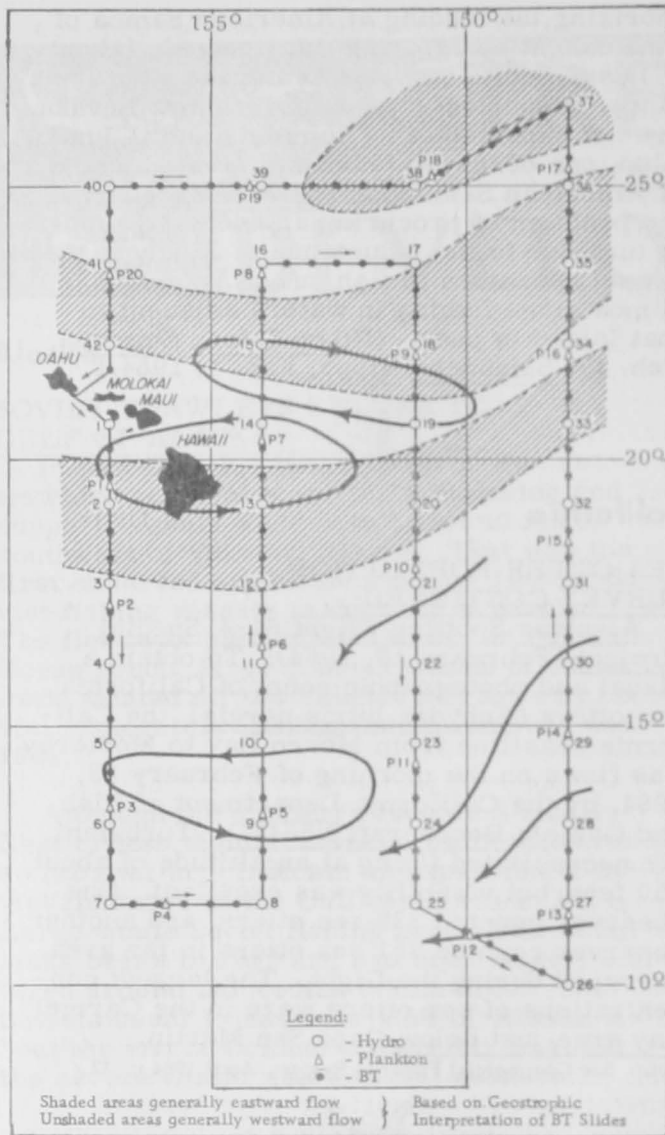
Note: See Commercial Fisheries Review, April 1964 p. 12.



Central Pacific Fisheries Investigations

NEW FISHERIES-OCEANOGRAPHIC RESEARCH VESSEL COMPLETES SUCCESSFUL MAIDEN VOYAGE:

M/V "Townsend Cromwell" Cruise 1 (February 14-March 6, 1964): The first scientific cruise of the Townsend Cromwell, the new fisheries-oceanographic research vessel operated by the Honolulu Biological Laboratory of the U.S. Bureau of Commercial Fisheries, was a success, announced the Bureau's Hawaii Acting Director on March 10, 1964. The vessel's three-week maiden voyage began on February 14, 1964, and was completed on March 6 when she returned to her base at Kewalo Basin, Honolulu, Hawaii. During the



Shows cruise track of research vessel Townsend Cromwell, February 14-March 6, 1964.

cruise she met with almost constant strong winds and rough seas.

The vessel cruised 4,500 miles and occupied its scheduled 42 oceanographic stations, sampling water temperatures and water chemistry down to depths of 4,500 feet throughout an area of 380,000 square miles to the east of the Hawaiian Islands. Detailed observations of weather were also recorded, and hauls were made with fine-meshed plankton nets to collect samples of the newly hatched larvae of skipjack (aku) tuna and other tuna species.

The first research cruise of the Townsend Cromwell also marked the initiation of a

new large-scale investigation of the trade wind zone waters around the Hawaiian Islands. According to the oceanographer in charge of the cruise, the trade winds are the most important wind system of the North Pacific Ocean, for they drive the ocean currents that carry warm water to the north and cool water to the equatorial region, thereby moderating the climates of western America and eastern Asia. The projected study will contribute to scientists' understanding of the mechanisms by which the trade winds move the ocean's waters and will eventually improve the accuracy of forecasting of climatic trends in the sea and over the land. The trade winds are of direct importance to Hawaii's major fishery, for their strength and steadiness determine the type of water which the currents bring to bathe the Islands. This in turn determines whether fishing will be good or poor during the summer skipjack fishing season.

During this cruise, a standard watch for bird flocks and fish schools was maintained during daylight hours. Only scattered birds were seen throughout the cruise except east of Hawaii along 154° W. and north of the Islands along 157° W. where bird flocks were observed.

Note: See Commercial Fisheries Review, March 1964 p. 32.

PLANKTON STUDIES GIVE CLUES TO INDIAN OCEAN-ATLANTIC ZOOGEOGRAPHICAL RELATIONS:

Problems in the zoogeography of marine animals--their large-scale distribution in relation to geographic features--are interesting in themselves and of practical importance in several ways. The solution of such problems for example, may reveal the boundaries of resources of commercially-valuable fish, and thus contribute to the intelligent planning of fishery management measures. Zoogeographical studies can also lead to a better understanding of the biology of small animals that are important in the food chain of the larger creatures which man directly utilizes. When it comes to the zoogeography of planktonic animals, which have little or no power to move except as the currents carry them, study of the distribution of species provides valuable indications of the patterns of oceanic water circulation.

Recently, a marine biologist specializing in that type of "indicator organism" research

at the Biological Laboratory of the U. S. Bureau of Commercial Fisheries in Honolulu, Hawaii, discovered in his samples of small planktonic crustaceans evidence of a remarkable broad separation between certain animal populations of the equatorial Atlantic and the Indian Ocean. The biologist's studies are primarily concentrated on the copepods, which are small and somewhat shrimp-like animals, individually well under an inch in length, but in the aggregate bulking very large in the economy of the sea and the food chains of most oceanic fishes. The biologist had earlier found that certain species of one family of copepods, the Candaciidae, in the central Pacific Ocean showed quite distinct patterns of occurrence, coinciding with the major patterns of circulation of the ocean waters.

Participation of the Bureau's Honolulu Biological Laboratory staff in the International Indian Ocean Expedition is providing an opportunity to discover whether similar copepod-ocean current relations are to be found in other parts of the world's oceans. United States research vessels, in the course of their 1963-64 schedule of biological field work will collect more than two thousand samples of Indian Ocean plankton. Study of the copepods in those collections is already under way, and it appears from the preliminary findings that in the Indian Ocean, as in the Pacific, certain species of the family Candaciidae are associated with waters of certain temperature and salinity characteristics. For example, the distributions of some copepods are associated with water of the type found primarily in the Arabian Sea, while others are indicators of the equatorial water or the south-central water of the Indian Ocean.

It is known that water from the equatorial regions of the Indian Ocean flows south along the southeast coast of Africa as the Agulhas Current. During the southern summers this current may extend around the Cape of Good Hope to the South Atlantic, and thus afford a possible avenue for equatorial Indo-Pacific plankton animals to reach the Atlantic and mingle there with their counterparts in the Atlantic plankton. It has not been known, however, how far west the influence of the Agulhas Current reaches, nor consequently whether mixing of the equatorial Indian Ocean and Atlantic faunas actually occurs.

The Bureau's laboratory planktologist has found, by examining the candaciid copepods in collections taken around the coasts of South Africa by the research ship *Vema* of the Lamont Geological Observatory, Columbia University, that the transport of Indo-Pacific equatorial plankton into the Atlantic appears to be small. Although copepods typical of the tropical Indian Ocean were common in the Agulhas Current off the southeastern coast of Africa, they faded out of the samples before the Cape of Good Hope was reached. A conjecture was that the few animals which may reach the southern tip of Africa either are carried by the currents onto shallow coastal banks and die of inshore conditions to which they are not adapted or are turned back eastward by encountering the West Wind Drift. If any survived those obstacles and passed the Cape, they would then fall in with the cold, upwelled waters of the Benguela Current, extending 200 to 300 miles offshore along the southwestern coast. This cold current was found to be heavily populated by Antarctic and inshore species of plankton.

The copepod species used by the biologist as indicators of equatorial Indian Ocean water did not turn up in Atlantic collections any farther south than the Gulf of Guinea, which meant that more than 1,500 miles separated the Indian Ocean and Atlantic populations. This distance implies a genetic isolation that might be expected to result in anatomical differences between specimens of the same species from the two oceans. A search for such differences is now being made and, if found, they will support the hypothesis of independent plankton populations in the Indian Ocean and the equatorial Atlantic.



Exports

SHRIMP VESSEL EQUIPMENT SOLD TO COLOMBIA FIRM BY UNITED STATES COMPANY:

A company in Savannah, Ga., has arranged to sell shrimp vessel equipment to a firm in Colombia. The transaction with the South American firm involves several hundred thousand dollars. Export insurance for the contract was provided by the U. S. Export-Import Bank in the form of a 4-year credit guarantee, which was negotiated with the assistance of the Savannah Regional Export

Expansion Committee of the U. S. Department of Commerce. (International Commerce, March 2, 1964.)



Federal Purchases of Fishery Products

DEPARTMENT OF DEFENSE PURCHASES, JANUARY-FEBRUARY 1964:

Fresh and Frozen: For the use of the Armed Forces under the Department of Defense, more fresh and frozen fishery products were purchased by the Defense Subsistence Supply Centers in January 1964 than in the previous month. The increase was 25.6 percent in quantity and 21.7 percent in value. Compared with the same month in the previous year, purchases in January 1964 were up 0.9 percent in quantity but down 29.6 percent in value. The purchases in January 1963 had the exceptionally high average value of 74.0 cents per pound due to large purchases of shrimp.

Purchases in February 1964 were up 17.1 percent in quantity and 15.3 percent in value from those in the same month in 1963.

Total purchases in the first 2 months of 1964 were up 8.8 percent in quantity but down 11.3 percent in value from those in the same period of the previous year. In 1964, there were larger purchases of flounder fillets, ocean perch fillets, and oysters, but small purchases of shrimp, haddock fillets, sole fillets, and halibut steaks. In addition, the average wholesale price of shrimp in early 1964 was down sharply from the levels maintained in January-February 1963.



Table 1 - Fresh and Frozen Fishery Products Purchased by Defense Subsistence Supply Centers, January-February 1964 with Comparisons

QUANTITY						VALUE					
January		February		Jan.-Feb.		January		February		Jan.-Feb.	
1964	1963	1964	1963	1964	1963	1964	1963	1964	1963	1964	1963
(1,000 Lbs.)						(\$1,000)					
2,108	2,089	2,300	1,964	4,408	4,053	1,088	1,546	1,231	1,068	2,319	2,519

Table 2 - Selected Purchases of Fresh and Frozen Fishery Products by Defense Subsistence Supply Centers, January-February 1964 with Comparisons

Product	January		February		Jan.-Feb.	
	1964	1963	1964	1963	1964	1963
(Pounds)						
Shrimp: raw headless	83,500	2/	99,400	2/	182,900	2/
peeled and deveined	73,850	2/	110,900	2/	184,750	2/
breaded	288,800	2/	349,200	2/	638,000	2/
Total shrimp	446,150	737,817	559,500	394,526	1,005,650	1,132,343
Scallops	172,750	154,800	218,350	245,000	391,100	399,800
Oysters: Eastern	99,954	2/	105,434	2/	205,388	2/
Pacific	30,200	2/	21,930	2/	52,130	2/
Total oysters	130,154	102,474	127,364	90,973	257,518	193,447
Clams	37,448	26,570	39,060	44,386	76,508	70,956
Fillets: Cod	33,196	23,944	71,350	93,294	104,546	117,238
Flounder	529,744	292,200	328,072	285,920	857,816	578,120
Haddock	1/138,594	261,880	3/221,650	233,040	4/360,244	494,920
Ocean Perch	276,000	225,240	386,600	323,092	662,600	548,332
Sole	-	70,430	-	31,502	-	101,932
Steaks: Halibut	106,525	102,605	88,000	147,515	194,525	250,120
Salmon	13,157	7,250	10,410	26,880	23,567	34,130
Swordfish	800	1,250	1,900	1,800	2,700	3,050

1/Includes 8,000 pounds of haddock portions.
 2/Breakdown not available.
 3/Includes 650 pounds of haddock portions.
 4/Includes 3,650 pounds of haddock portions.

Table 3 - Canned Fishery Products Purchased by Defense Subsistence Supply Centers, January-February 1964 with Comparisons

Product	QUANTITY						VALUE					
	January		February		Jan.-Feb.		January		February		Jan.-Feb.	
	1964	1963	1964	1963	1964	1963	1964	1963	1964	1963	1964	1963
	(1,000 Lbs.)						(\$1,000)					
Salmon	650	-	278	10	928	10	285	-	123	6	408	6
Tuna	679	3	1/	3	679	6	416	2	2/	2	416	4
Sardines	20	37	40	57	60	94	8	15	14	24	22	39

1. More than 500 pounds.
2. More than \$500.

Canned: In the first 2 months of 1964, there were substantial purchases of canned tuna, canned salmon, and canned sardines for the use of the Armed Forces. Of the 3 principal canned fishery products (tuna, salmon, and sardines), only sardines were purchased in sizable quantity in January-February 1963.

Note (1) Armed Forces installations generally make some local purchases not included in the data given; actual local purchases higher than indicated because local purchases are not obtainable.

(2) See *Commercial Fisheries Review*, April 1964 p. 14.



Why Flavors and Odors

CHEMISTRY OF VOLATILE COMPONENTS IN FISHERY PRODUCTS STUDIED:

The most reliable procedures now being used for determining the quality of fish and fishery products are dependent upon organoleptic evaluations (smell, taste, appearance). These examinations give only a superficial quality indication depending entirely on the subjective judgment of the examiner. For most purposes this method is satisfactory but provides no information regarding the chemical reactions that produce undesirable flavors and odors in fish. The mechanism of flavor and odor development is extremely complex. An understanding of the fundamental spoilage reactions is essential to reduce development of undesirable fish odors and flavors and improve product quality.

Studies on the chemistry of the volatile flavor and odor components in raw and cooked brook fillets and clam meats are being conducted by the U. S. Bureau of Commercial Fisheries Technological Laboratory at Gloucester, Mass. Some of the necessary preliminary planning for the project included purchase and construction of specialized equipment for handling extremely small quantities of very volatile compounds. Precise sampling techniques had to be developed to sample and transfer those small quantities for analysis.

Most of the compounds in the flavor and odor components of fishery products are made up of sulfides, carbonyls, and amines. Techniques for identifying the sulfides and carbonyls from flavor and odor mixtures are being investigated in an effort to relate concentrations of those compounds to fish quality. Investigations using gas chromatography have been successful in identifying several sulfide compounds (dimethylsulfide, hydrogen sulfide, and dimethyldisulfide). Colorimetric methods for total sulfide and infrared spectrophotometry for compound identification are also being investigated. Through the use of wet chemistry in conjunction with gas chromatography, volatile carbonyl compounds in clam meats have been separated. A method which permits concentration of the carbonyls using the Girard-T reagent, use of a regeneration process, and subsequent introduction into the gas chromatograph, has resulted in the detection of at least 18 carbonyl compounds in clam meats. Prior to development of this procedure, a maximum of 8 carbonyls had been detected.

Future investigations will include the identification of carbonyl compounds by mass spectrometry, investigation and identification of amines, and the investigation of odor and flavor components of other fish such as cod, pollock, and ocean perch. Also, studies will be made to determine how the odor and flavor components can be controlled or altered to increase the quality and storage life of fishery products.



Great Lakes

MIDWEST FEDERATED FISHERIES COUNCIL ORGANIZED:

The Midwest Federated Fisheries Council, an organization of existing fisheries associations in the Middle West, has been incorporated to give better representation to the fishing industry in the Great Lakes and midwestern

rivers region, and to coordinate the promotion of fishery products by the individual organizations. The Council was formed through the combined efforts of representatives of the commercial fishermen, wholesalers, brokers, processors, and large retailers.

The first objective of the Council is to seek legislation in Congress that will bring some stability to the fresh-water fisheries. All segments of the industry from the producers to the retailers have suffered in recent years because of the depredation of the sea lamprey, and unexpected marketing problems.

The affairs of the Council will be governed by a Board of Directors made up of two representatives from each of the six incorporating organizations. Provisions have been made to accept additional organizations and to provide representation on the Board of Directors. The six incorporating organizations establishing the Council are: The Seafood Club of Chicago, Michigan Fish Pro-

ducers Association, Ohio Commercial Fishermen's Association, Minnesota Fisheries Council, Wisconsin Fisheries Council, and the Fisheries Council of the Great Lakes.

A meeting was planned in Chicago, Ill., early in April 1964 to complete the organization of the Council and to outline in more detail the immediate objectives.



Great Lakes Fisheries Exploration and Gear Research

TRAWLING INVESTIGATIONS IN SOUTHERN LAKE MICHIGAN:

M/V "Kaho" Cruise 15 (Phase I--December 16-20, 1963; Phase II--January 28-February 6, 1964; Phase III--March 3-12, 1964) Investigations to determine the effects of environmental conditions on distribution of fish

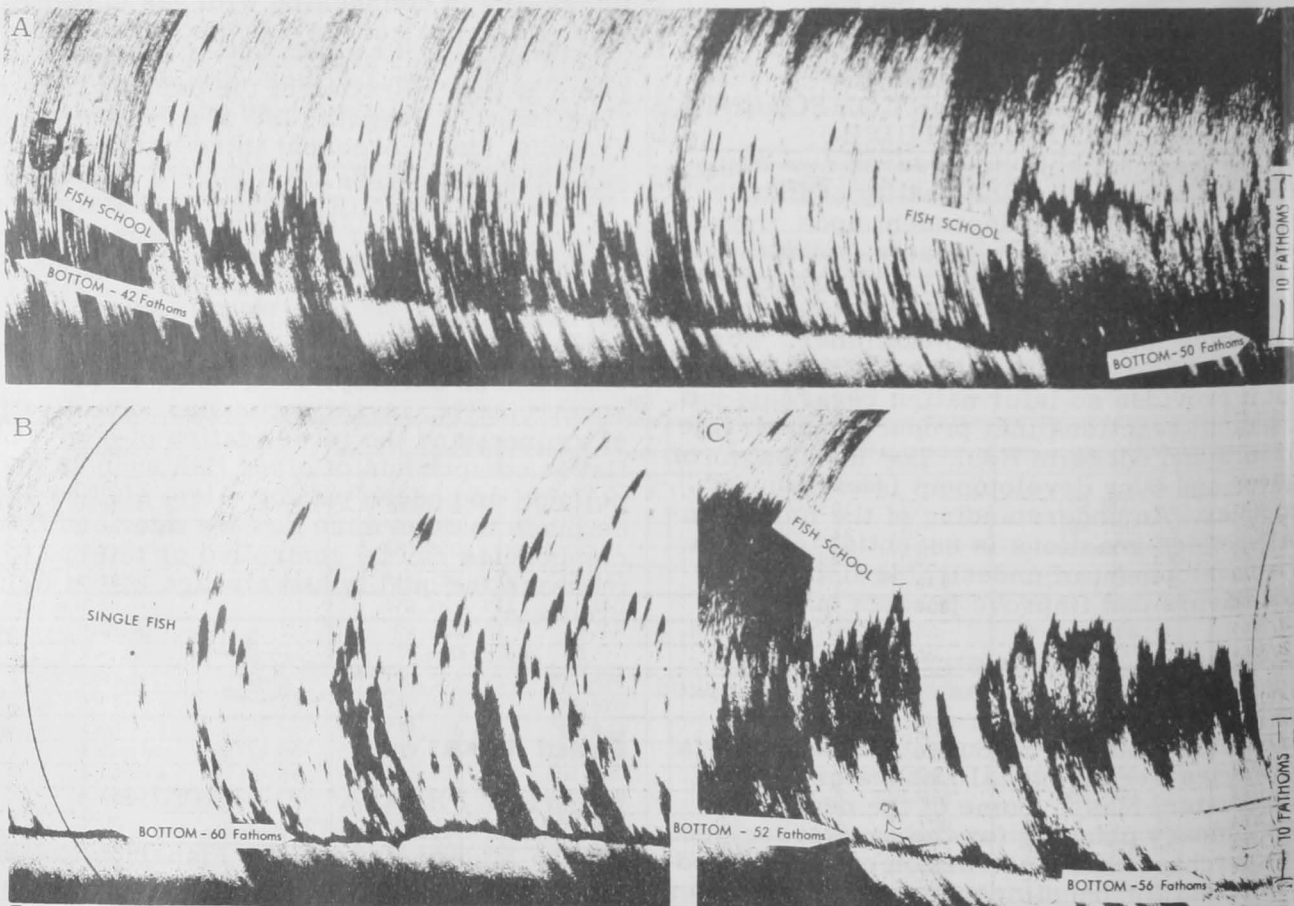


Fig. 1 - Echograms from a high resolution echo-sounder showing concentrations of fish on bottom and at midwater levels in southern Lake Michigan during M/V *Kaho* Cruise 15. A - Distribution of fish from 42 to 50 fathoms; distance traveled is 5 nautical miles at 9 knots. B - Vertical dispersion of fish at midwater levels; distance traveled is 1.5 nautical miles at 2.5 knots. C - Midwater concentrations of fish; distance traveled is 1.1 nautical miles at 9 knots.

availability to bottom trawls, and performance of bottom trawls were conducted by the U. S. Bureau of Commercial Fisheries exploratory fishing and gear research vessel Kaho in southern Lake Michigan during a three-phase cruise--December 16-20, 1963, January 28-February 6, and March 3-12, 1964. The primary objective was to study trawl performance as affected by the direction of towing in relation to water currents. The secondary objective was to obtain addi-

tional information on the seasonal effectiveness of trawls at previously established stations in southern Lake Michigan.

The cruise was highlighted during Phases II and III by the location of unusually high concentrations of alewife between 35 and 60 fathoms off Saugatuck, Mich. (fig. 1). Local commercial trawlers, following up on the information, have enjoyed productive fishing never before experienced at those depths and that time of year. During February 6-March 19, 1964, three commercial fishing vessels landed about 428,000 pounds and averaged some 9,400 pounds per hour of fishing effort.

During past explorations, large deviations in catch rate between drags made in alternating north and south direction have been noted. The results of recent limnological surveys indicate that currents in the south basin of Lake Michigan are dependent upon prevailing wind conditions which cause water currents to exceed one knot for many hours on occasion and may be either clockwise or counter-clockwise. Although other factors influence the catch rate, consistent large fluctuations make it reasonable to believe that catch rates are affected by those currents. Information regarding the influence from lake current may enable commercial trawl fishermen to account for large discrepancies in individual trawl catches.

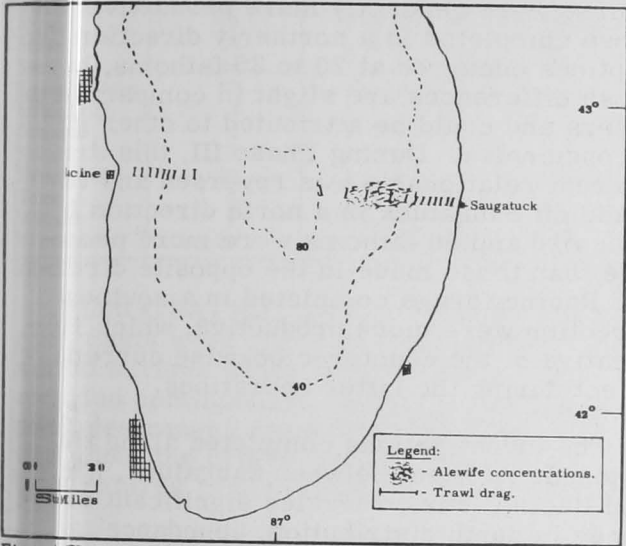


Fig. 1. Shows area of operations in Lake Michigan by M/V Kaho during Cruise 15 (December 16, 1963-March 12, 1964).

Table 1 - Summary of Catch Rate, Species Composition, and Percentage Differential by Direction of Trawl Drag Taken off Saugatuck, Mich., during Kaho's Exploratory Cruise 15, December 16-20, 1963; January 28-February 6, 1964; and March 3-12, 1964

Date	Depth	North Drag				South Drag				Percentage Increase or Decrease South to North
		Alewife	Chub	Others	Total	Alewife	Chub	Others	Total	
12/16/63	17	120	15	10	145	860	34	26	920	+534.4
12/18/63	17	150	9	1	160	445	14	21	480	+200.0
1/28/64	5	-	-	30	30	-	-	65	65	+116.6
1/28/64	10	-	-	100	100	-	-	120	120	+20.0
1/28/64	15	-	-	240	240	-	-	340	340	+41.6
1/28/64	20	-	16	24	40	-	14	21	35	-14.2
1/28/64	25	-	128	2	130	-	203	7	210	+61.5
1/28/64	30	15	254	6	275	45	215	-	260	-5.8
1/28/64	35	3,000	30	-	3,030	3,400	25	-	3,425	+13.0
1/28/64	40	2,400	60	-	2,460	No Effort				
3/3/64	10	-	-	55	55	-	-	42	42	-30.9
3/3/64	15	10	2	73	85	5	-	75	80	-6.3
3/3/64	20	1	20	14	35	1	20	14	35	0.0
3/3/64	25	1	186	28	215	1	140	14	155	-38.7
3/3/64	30	5	200	15	220	2	80	3	85	-158.8
3/3/64	35	650	110	5	765	500	80	5	585	-30.8
3/3/64	40	400	80	5	485	80	55	5	140	-245.4
3/3/64	45	1,900	100	-	2,000	1,000	114	6	1,120	-78.6
3/3/64	50	1,300	100	-	1,400	1,100	100	-	1,200	-16.7
3/3/64	60	300	100	-	400	700	110	5	815	+103.7
3/3/64	70	510	80	10	600	No Effort				
3/3/64	80	140	35	95	270	No Effort				

Although the study of the effects of lake currents was the primary consideration this cruise, other information and samples of fish were collected as follows: (1) differential in east-west seasonal abundance and distribution of alewife and chubs, (2) availability of all species to bottom trawls, (3) seasonal length-frequency data of alewife and chubs to supplement material collected earlier for biological research, (4) collection of fish, water, and bottom samples for subsequent laboratory analysis in connection with botulism studies, and (5) collection of fish samples from various depths between 5 and 50 fathoms for life history studies.

Excellent exploratory catches of alewife were taken at 20 fathoms during Phase I, at 35 and 40 fathoms during Phase II, and at 40 to 60 fathoms during Phase III, but only along the east shore. Fair catches of chubs were taken at 15 fathoms off Saugatuck during Phase II and at 25 and 30 fathoms during Phase III. Best catches of chubs were obtained off Racine, Wis., during Phase III at 30 to 50 fathoms.

FISHING OPERATIONS: A total of 60 trawl drags was completed with a 52-foot (headrope) fish trawl during 13 days of operation--43 drags were completed off Saugatuck from 5 to 80 fathoms and 17 were made from 15 to 60 fathoms off Racine. All drags except 4 were paired tows of 30 minutes' duration and made in alternating north and south directions. Adequate warp length versus depth was employed to insure good bottom contact; and shaft r.p.m. remained constant. No gear damage was sustained dur-

ing the cruise. Bottom topography and bathymetric distribution of fish were continuously recorded with a high resolution type depth recorder.

FISHING RESULTS: The study revealed that the direction of drag in relation to the observed current may consistently increase or decrease the catch by over 50 percent (tables 1 and 2). During Phases I and II, trawl drags made off Saugatuck in a south course were generally more productive than those completed in a northerly direction. Ifceptions occurred at 20 to 30 fathoms, but those differences are slight in comparison to others and could be attributed to other gear inconstancies. During Phase III, this drag-current relationship was reversed and tows made off Saugatuck in a north direction between 10 and 50 fathoms were more productive than those made in the opposite direction. Off Racine, drags completed in a southerly direction were more productive, which is indicative of the counter-clockwise current in effect during the latter operations.

The investigations completed along the lakewide transect between Saugatuck, Mich. and Racine, Wis., revealed significant differences in depth distribution, abundance, and species interrelationship from one side of the lake to the other. The most outstanding features were the almost total absence of alewife from catches off Racine and the extremely large concentrations of that species off Saugatuck. The alewife dominated catches in that area at 17 fathoms during Phase I and from 35 to 80 fathoms during Phases II and III.

Table 2 - Summary of Catch Rate, Species Composition, and Percentage Differential by Direction of Trawl Drag Taken off Racine, Wisconsin, during Kaho's Exploratory Cruise 15, March 3-12, 1964

Date	Depth	North Drag				South Drag				Percentage Increase or Decrease South to North
		Alewife	Chub	Others	Total	Alewife	Chub	Others	Total	
3/7/64	15	-	5	15	20	-	10	20	30	+50.0
3/7/64	20	-	12	8	20	-	7	13	20	0.0
3/7/64	25	-	50	10	60	2	80	13	95	+58.3
3/7/64	30	-	195	5	200	-	200	5	205	+2.5
3/7/64	35	3	295	2	300	-	425	5	430	+43.3
3/7/64	40	1	108	1	110	1	188	1	190	+72.7
3/8/64	45	5	165	5	175	5	310	5	320	+82.8
3/8/64	50	20	245	10	275	10	400	10	420	+52.7
3/9/64	60	1	79	20	100	No Effort				

chub catches were good (300-425 pounds per half-hour drag) off Racine at 35 to 50 fathoms but only fair (200-250 pounds per half-hour drag) off Saugatuck at 25 and 30 fathoms. Only one catch contained another species in significant quantity, and that was 33 pounds of yellow perch at 15 fathoms off Saugatuck.

TABLE 5 - Other Species Taken in Lake Michigan by M/V Kaho

Species	No. of Drags Yielding	Pounds/Drag	Combined Catch (Pounds)
Chub	19	2 to 35	169
Shiner	43	1 to 94	233
Yellow perch	24	1 to 10	79
White sucker	19	1 to 10	47
Rock bass	3	1	3
Common carp	1	5	5
White catfish	3	2 to 7	16
Yellow perch	20	1 to 3	26
Bluegill	1	2	2
Whitefish	7	1 to 7	18
Yellow perch	22	1 to 319	958

HYDROGRAPHIC DATA: Bathythermograph casts were made at each station, and land surface water temperatures were recorded continuously. Surface water temperatures ranged from 32.0° to 36.0° F. throughout the cruise period, and bottom temperatures ranged from 36.0° to 40.0° F.

M/V "Kaho" Cruise 16 (March 31-April 1964): To extend knowledge on the seasonal distribution, abundance, and availability of the alewife and chub stocks in central and southern Lake Michigan to bottom trawls was the primary objective of this 10-day cruise by exploratory fishing and gear research vessel Kaho.



Exploratory Fishery Program

SHRIMP AND MENHADEN INVESTIGATIONS IN THE GULF OF MEXICO CONTINUED:

M/V "Oregon" Cruise 90 (February 17-March 13, 1964): The main objectives of this 26-day cruise along the Louisiana coast by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel Oregon were to: (1) obtain comparative data on the seasonal availability of brown shrimp (Penaeus aztecus), pink shrimp (P. duorarum), white shrimp (P. setiferus), and royal-red shrimp (Penaeus robustus); (2) investigate seasonal menhaden resources; and (3) conduct deep-water faunal trawling transects in

the northern area of the Gulf of Mexico.

Catches of white and brown shrimp were light and scattered, with most counts (heads-off) in the 21-25 and 26-30 ranges. Very few pink shrimp were taken. White shrimp were found in 6 to 20 fathoms and brown shrimp in 16 to 52 fathoms.

Royal-red shrimp were caught in light numbers between 220 and 300 fathoms, with drags in 220 to 230 fathoms yielding the best results. The largest catch of royal-red shrimp in a single 2-hour tow amounted to 26 pounds (heads-on). Heavy seas and rough bottom were encountered during much of the deep-water trawling.

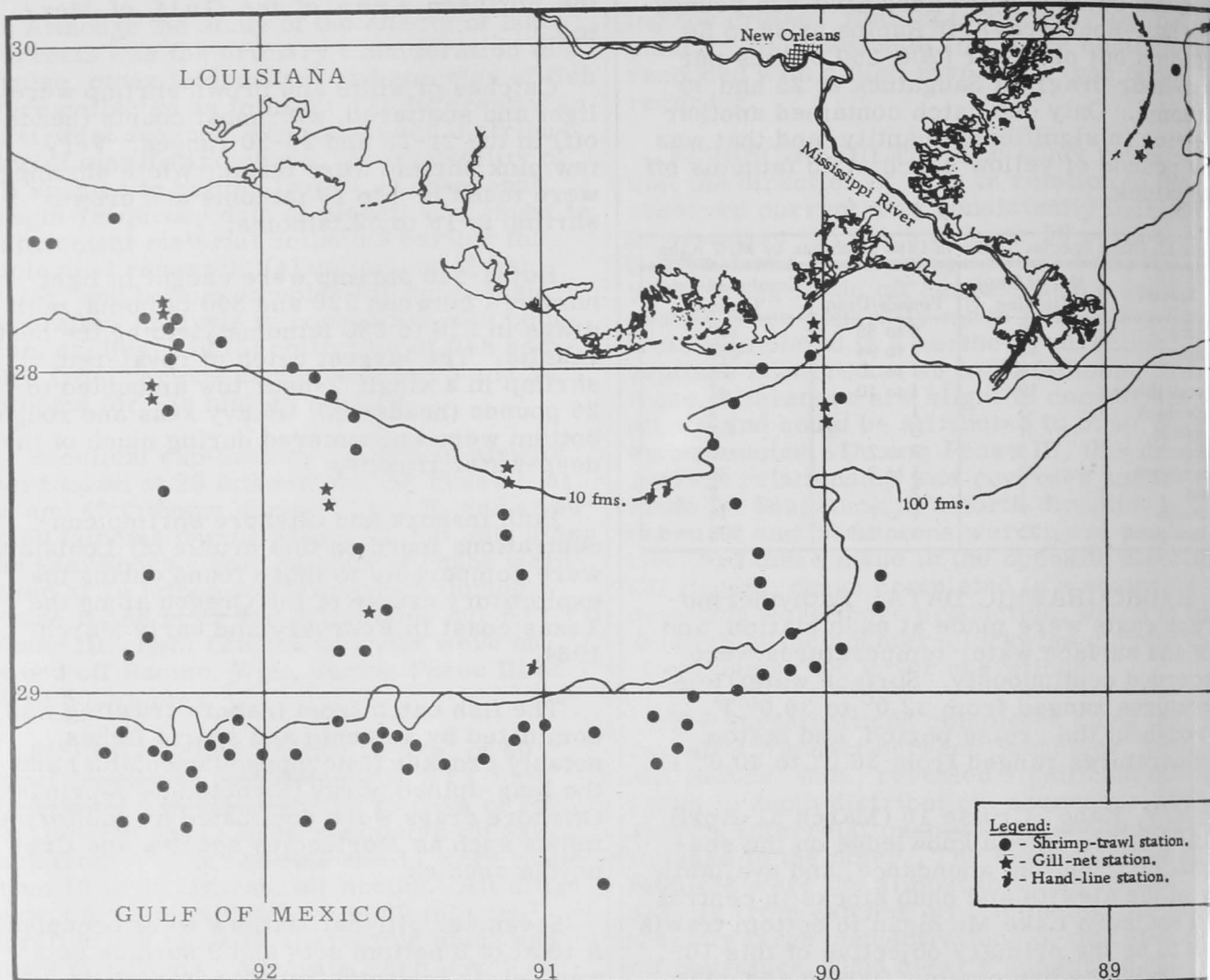
Both inshore and offshore shrimp concentrations found on this cruise off Louisiana were comparable to those found during the exploratory cruise of the Oregon along the Texas coast in February and early March 1964.

The fish catch from inshore trawling was dominated by sciaenid and sparid fishes, notably croaker (Micropogon undulatus) and the long-spined porgy (Stenotomus caprinus). Offshore drags were dominated by gadiform fishes such as Merluccius species and Urophycis species.

Seventeen gill-net stations were occupied. A total of 8 bottom sets and 9 surface sets were made in depths ranging from 6½ to 38 fathoms. The gill nets used contained No. 7 monofilament nylon thread, made up in four 300-foot sections of 2⅝-, 2¾-, 2⅞-, and 3-inch stretched mesh. Seven large-scale menhaden (Brevoortia patronus) were caught in bottom sets, 48 were taken in surface sets, and an additional 34 were taken in 65-foot flat trawl drags in shallow water. Twenty-nine bathythermograph casts were made in conjunction with the gill-net sets.

A series of mud samples was collected from selected areas within commercial shrimp grounds for viscosity, adhesiveness, and friction evaluation in connection with a study on the stimulation and response behavior of burrowed shrimp under electrical trawling conditions.

Forty-three plankton tows were made for the U. S. Bureau of Commercial Fisheries Biological Laboratory in Beaufort, N. C.,



M/V Oregon Cruise 90 (February 17-March 13, 1964).

which is also studying menhaden. An additional 12 plankton tows were made for the Florida State Board of Conservation in cooperation with their studies on the distribution of spiny lobster larvae.

Note: See *Commercial Fisheries Review*, April 1964 p. 17.



Gulf Fishery Investigations

SHRIMP DISTRIBUTION STUDIES:

M/V "Gus III" Cruise GUS-14 (February 8-March 3, 1964) and M/V "Belle of Texas" Cruise BT-33 (February 18-24, 1964): Shrimp sampling studies as well as pink shrimp marking were carried out during these cruises by the chartered research vessels Gus III and Belle of Texas of the U. S. Bureau of

Commercial Fisheries Biological Laboratory Galveston, Tex.

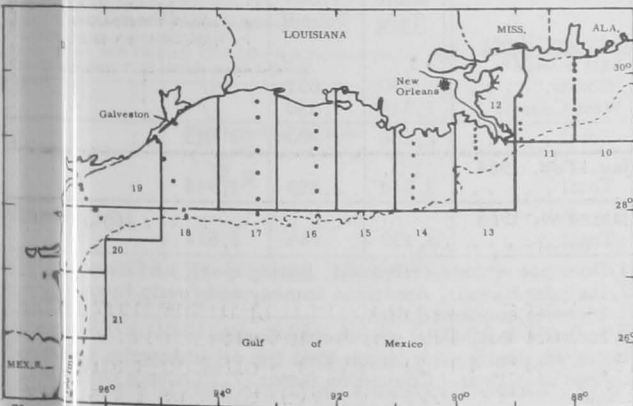
During shrimp sampling in the northwestern Gulf of Mexico, 8 statistical areas (13, 16, 17, 18, 19, 20, and 21) off Louisiana and Texas were covered, with the Gus III surveying eastern stations and the Belle of Texas covering western stations. Standard 3-hour tows with a 45-foot shrimp trawl were made. Shrimp catches were spotty. The only good catch of brown shrimp consisted of 46 pounds of 12-15 count taken at a 25-fathom station off Cameron, La. White shrimp catches consisted mainly of the 41-50 count size which were found off the Texas coast in less than 10-fathom depths of area 18 (26 pounds), area 19 (34 pounds), and area 20 (21 pounds). Area 20 also yielded 34 pounds of 21-25 count white shrimp from 10-20 fathoms. Pink shrimp

were found in only 2 tows, and in both cases the quantity was less than 1 pound.

During the combined cruises of the Gus III and the Belle of Texas, 66 bathythermograph casts were made including 26 on the Tortugas shrimp grounds. Ten special plankton-sled tows on the bottom and 40 regular oblique-step plankton tows in mid-depths were completed. Between the Mississippi Delta and Key West, Fla., 10-drift-bottle streams were established and 12 drift bottles were released at each station.

In addition to shrimp-sampling work, the Gus III completed a pink-shrimp marking station on the Tortugas shrimp grounds off southern Florida. Approximately 3,000 pink shrimp were captured, stained, and released.

"Gus III" Cruise GUS-15 (February 28-March 3, 1964 and March 17-22, 1964): Shrimp catches were generally spotty during this cruise in the Gulf of Mexico by the charter research vessel Gus III. The cruise was conducted in two separate portions within an area of operations extending from off the coast of Louisiana westward to lower Texas. Standard 3-hour tows with a 45-foot shrimp trawl were made in each of the statistical areas covered.



Statistical area pattern of M/V Gus III during cruise GUS-15, February 28-March 3, 1964.

White shrimp catches were fair in the 0-10 fathom depth of area 14 (18 pounds of 20-30 count), area 16 (10 pounds of 15-20 count), and area 20 (21 pounds of 31-40 count). The 10-20 fathom depth in area 13 yielded 13 pounds of brown and white shrimp about evenly divided between sizes 15-20 and 25-30 count. The largest catch of brown shrimp (18 pounds of 31-40 count) during this cruise was from that depth in area 19.

During the two portions of this cruise, 51 bathythermograph and 39 nansen bottle casts were made. A total of 29 special plankton-sled tows on the bottom and 50 oblique-step plankton tows were also completed.

Notes: (1) Shrimp catches are heads-on weight; shrimp sizes are the number of heads-off shrimp per pound.
(2) See Commercial Fisheries Review, Apr. 1964 p. 19.



Hawaii

SKIPJACK TUNA LANDINGS, FEBRUARY 1964:

Skipjack tuna landings in Hawaii in February 1964 were about 280,000 pounds. This was 73,000 pounds above the 1948-1963 average for the month. The cumulative catch in January-February 1964 was about 755,000 pounds, or 249,000 pounds above the 1948-1963 average for the 2-months period.

During February 1964 there were 78 productive trips giving an average of 3,590 pounds per trip. Individual catches ranged from 90 pounds to 12,550 pounds. Oahu-based vessels landed 79 percent of the total catch.



Industrial Fishery Products

USE OF FISH REDUCTION PRODUCTS IN POULTRY AND ANIMAL NUTRITION HIGHLY REGARDED:

Mixed feed manufacturers in Delaware, New Jersey, New York, and Pennsylvania, were visited during February 3-11, 1964, by the Chief of the U. S. Bureau of Commercial Fisheries Technical Advisory Unit and the Animal Nutritionist attached to the Unit. Also visited at that time were Agricultural Experiment Stations in those States with the exception of New Jersey, and a visit was made to the Connecticut Agricultural Experiment Station. Observations made by the two nutritionists during the trip and conclusions based on those observations follow:

Practically all the feed-mill officials visited expressed very high regard for fishery by products in poultry and swine nutrition. A definite preference for United States-produced fish meal was expressed by nearly every feed manufacturer visited, the reason usually given for such preference being greater uniformity of the product. There seems to be a general agreement among industrial nutritionists that the most economical poultry and swine rations, all things considered, are those that are supplied with reasonably liberal amounts of fish meal. But this has not always been true, as one research director visited during the trip observed. For example, only two years ago some nutritionists believed that economies could be effected by omitting fish meal and instead enriching feed mixtures made up entirely of grains and other materials of vegetable origin with synthetic amino acids. Experience has shown that the rations lacking fish meal are

not equal to those containing the fish product and that such omission from poultry rations is false economy.

Levels of fish meal utilization were found to be quite liberal in the area visited. At mills relatively near reduction plants, average utilization is around 7 percent in broiler rations whereas in broiler rations produced by mills farther from fish meal supplies it is around 5 percent. The use of fish meal is relatively liberal in rations for young pigs in Pennsylvania, a typical commercial ration in that State containing 2.5 percent fish meal. However, about twice that level is recommended by experiment station workers at the Pennsylvania State University. Rations are based upon University recommendations containing 5 percent fish meal both in prestarter and starter rations. Pennsylvania leads in pork production among the northern Atlantic Coast States.

A large feed mill in New York State produces a fish food that is 25 percent fish meal and, in addition, incorporates fish meal in rations for laboratory animals.

A possible valuable effect of fish meal on ruminants was suggested to a professor of the Agricultural Experiment Station, University of Delaware (Newark), by a practical livestock man. The suggestion was the feeding of fish meal to prevent cracked hooves in cattle. The professor pointed out that such suggestions, on further investigation, are often found to have practical value. The experiment station workers visited on the trip are, without exception, enthusiastic about the values of industrial fish products in poultry and animal nutrition. Workers at the Agricultural Experiment Station of Cornell University, Ithaca, N. Y., have demonstrated that highly unsaturated lipids increase the food value to poultry of saturated fats like tallow by means of a synergistic interaction. (Menhaden oil is a highly unsaturated lipid.)

U. S. FISH MEAL AND SOLUBLES:

Production and Imports, January 1964: Based on domestic production and imports, the United States available supply of fish meal for January 1964 amounted to 32,813 short tons--12,033 tons (or 57.9 percent) more than during January 1963. Domestic production was 447 tons (or 19.6 percent) less, but imports were 12,480 tons (or 67.5 percent) higher than in January 1963. Peru continued to lead other countries with shipments of 25,090 tons.

U. S. Supply of Fish Meal and Solubles, January 1964 with Comparisons			
Item	January		Total 1963
	1/1964	1963	
(Short Tons).....		
Fish Meal and Scrap:			
Domestic production:			
Menhaden	2/	-	179,971
Tuna and mackerel	1,124	1,708	21,626
Herring	2/	2/	7,425
Other	714	577	32,624
Total production	1,838	2,285	241,646
Imports:			
Canada	4,150	2,905	50,925
Peru	25,090	12,672	291,544
Chile	-	2,918	24,249
Norway	-	-	1,819
So. Africa Republic	1,528	-	12,296
Other countries	207	-	2,274
Total imports	30,975	18,495	383,107
Available fish meal supply	32,813	20,780	624,753
Fish Solubles:			
Domestic production 2/	1,135	1,422	96,224

(Table continued on next column.)

Product	January		Total 1963
	1/1964	1963	
 (Short Tons)		
Imports:			
Canada	85	148	2,033
Iceland	-	-	5
So. Africa Republic	109	-	4
Other countries	164	-	4,277
Total imports	358	148	6,777
Available fish solubles supply	1,493	1,570	102,999

The United States supply of fish solubles (including homogenized fish) during January 1964 amounted to 1,493 tons--a decrease of 4.9 percent as compared with the same month in 1963.

U. S. FISH MEAL, OIL, AND SOLUBLES:

Production by Areas, February 1964: Preliminary data on U. S. production of fish meal, oil, and solubles for February 1964 as collected by the U. S. Bureau of Commercial Fisheries and submitted to the International Association of Fish Meal Manufacturers are shown in the table.

U. S. Production ^{1/} of Fish Meal, Oil, and Solubles, February 1964 (Preliminary) with Comparisons				
Area	Meal	Oil	Solubles	Homogenized
	Short Tons	1,000 Pounds (Short Tons)	
February 1964:				
East & Gulf Coasts	560	651	4/	-
West Coast ^{2/}	1,546	1,330	4/	-
Total	2,106	1,981	813	-
Jan.-Feb. 1964 Total	3,944	2,689	1,948	-
Jan.-Feb. 1963 Total	5,132	748	2,614	50

1/Does not include crab meal, shrimp meal, and liver oils.
 2/Includes Hawaii, American Samoa, and Puerto Rico.
 3/Includes condensed fish.
 4/Includes East, Gulf, and Pacific Coasts.
 Note: Beginning with March 1963 fish oil is shown in pounds instead of gallons. Conversion factor, 7.75 pounds equal 1 gallon.

Production, January 1964: During January 1964, a total of 1,838 tons of fish meal and scrap and 708,000 pounds of marine animal oil was produced in the United States. Compared with January 1963 this was a decrease of 447 tons in meal production and 284,000 pounds in oil production.

The quantity of fish solubles manufactured in January 1964 amounted to 1,135 tons--237 tons less than in January 1963.

Production of tuna and mackerel meal amounted to 1,124 tons which accounted for 61 percent of the January production. Oil from tuna and mackerel (456,000 pounds) comprised 64 percent of the January oil production.

Amount of 30,975 tons of fish meal was imported during January 1964--an increase of 67 percent as compared with January 1963.

Product	January		Total
	1/1964	1963	1963
... (Short Tons) ...			
Fish Meal and Scrap:			
Herring	2/	2/	7,425
Mackerel 3/	2/	-	179,971
Sablefish, Pacific	1	6	27
Round mackerel	1,124	1,708	21,626
Unclassified	713	571	20,597
Total	1,838	2,285	229,646
Shrimp, marine-animal meal and scrap	4/	4/	12,000
Total meal and scrap	4/	4/	241,646
Fish Solubles:			
Mackerel	2/	-	73,970
Other	1,135	1,372	15,030
Total	1,135	1,372	89,000
Homogenized condensed fish	-	50	7,224
... (1,000 Pounds) ...			
Oil:			
Herring	2/	2/	5,726
Mackerel 3/	2/	-	165,037
Sablefish, Pacific	-	-	4
Round mackerel	456	290	5,654
Other (including whale)	252	134	7,588
Total oil	708	424	184,009

1/Primary data.
 2/Includes with unclassified.
 3/Includes small quantity of thread herring.
 4/Manufactured on a monthly basis.
 Note: Beginning with February 1963 fish oil is shown in pounds instead of gallons.
 Conversion factor, 7.75 pounds equal 1 gallon.



Mississippi

SHRIMP CATCH FROM MISSISSIPPI SOUND ANALYZED:

The Mississippi State Gulf Coast Research Laboratory is sampling and studying postlarval shrimp in Mississippi Sound. The research is being done under contract for the U.S. Bureau of Commercial Fisheries. A total of 100 postlarval shrimp taken from Mississippi Sound during inshore sampling in November

Classification	Composition Species of Shrimp		
	Brown	White	Pink
Percent from shrimp sampled, Nov. 1962-Oct. 1963	61.3	32.3	6.3
Commercial catch, 1962	61.0	31.9	6.9

Note: The percentage breakdowns by species do not add to 100 percent.

1962-October 1963 have been identified. The samples included 37,250 penaeid shrimp belonging to the 3 commercial species. Of those, 5,257 were juvenile. Catch composition data for the 1962 commercial catch in Mississippi Sound were also obtained.

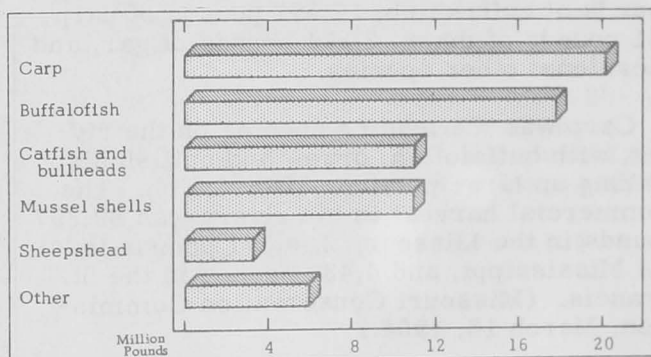
The postlarval shrimp study in Mississippi Sound will continue through November 1964. (Gulf Coast Research Laboratory, March 6, 1964.)



Mississippi River Fisheries

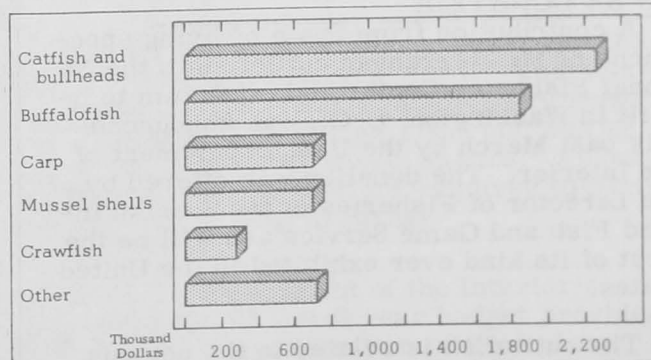
FISHERY LANDINGS, 1962:

Commercial landings of fish and shellfish in the Mississippi River drainage area in 1962 amounted to 69.4 million pounds with a landed value of \$6.5 million--down 8.7 percent in quantity and 6.8 percent in value as compared with the 1961 landings.



Mississippi River catch, 1962.

The four leading species were carp (20.3 million pounds), buffalofish (17.8 million), catfish and bullheads (11.1 million), sheepshead (3.3 million). Those four species with a combined value of a little more than \$5.0 million, accounted for about 95 percent of the total finfish landings of 55.8 million pounds.



Value of Mississippi River catch, 1962.

Mississippi River shellfish production in 1962 totaled 13.6 million pounds valued at \$1.1 million. Mussel shell production of 11.0 million pounds with a value of \$708,000 made up about 80 percent of the shellfish total. Crawfish landings followed with 2.3 million pounds valued at \$272,000. (Mississippi River Fisheries--1962, C. F. S. No. 3408.)



Missouri

COMMERCIAL FISHERIES CATCH IN 1963:

Commercial fishermen took nearly 180 tons of fish in 1963 from the 3 rivers and 1 lake where commercial fishing was permitted in Missouri.

Lake Wappapello, open in 1963 for its first full year of commercial fishing, produced 75,800 pounds of fish, including 54,979 pounds of buffalofish, 17,577 pounds of carp, 651 pounds of drum, 2,274 pounds of gar, and occasional other species.

Carp was the leading species on the rivers, with buffalofish, drum, and catfish also making up large portions of the catch. The commercial harvest in the rivers was 89,397 pounds in the Missouri, 189,571 pounds in the Mississippi, and 4,439 pounds in the St. Francis. (Missouri Conservation Commission, March 16, 1964.)



National Fisheries Center and Aquarium

VARIETY OF AQUATIC SPECIMENS TO BE DONATED:

A contribution from Spain of living specimens of Mediterranean cuttlefish to the National Fisheries Center and Aquarium to be built in Washington, D. C., was announced this past March by the U. S. Department of the Interior. The donation was offered by the Director of Fisheries of the Spanish Inland Fish and Game Service and will be the first of its kind ever exhibited in the United States.

The cuttlefish is related to the octopus and squid and has been well known from an-

cient times as a producer of dark brown sepia, a favorite writing and illustrating medium of Japanese artists for centuries. Although the cuttlefish is considered an edible species in Europe and is in favor with a specialized trade in some parts of the United States, its main value today is for the production of cuttlebone which is used in bird cages for canaries to sharpen their beaks. The "bone" is enclosed by the skin of the animal's back and actually constitutes what remains of the mollusk shell originally worn by its ancestor.

The Acting Director of the Center said it is expected that aquariums throughout the United States and the world will contribute specimens of aquatic life to the \$10 million research and education facility to be built in Washington, D. C. "There are good indications that Japan will provide some of the colorful fish that abound in the Japanese Archipelago," he said. "One of these is the red tai, an important food fish and a relative of the porgy. This species is striking because of its bright red color."

The Center's Acting Director said one of the important contributors will be the Steinhart Aquarium in San Francisco. The curator for Steinhart said his aquarium will donate Pacific moray eels, swell sharks and leopard sharks, and the giant Pacific octopus--the world's largest species. The Pacific octopus reaches a spread of up to 15 feet and a weight of 120 pounds. Other aquariums in the United States are expected to contribute such specimens as piranha, rays, sharks and dolphins.

A survey has shown that the dolphin--particularly known as a porpoise--is the favorite of aquarium visitors because of its high intelligence, according to the Center's Acting Director. In second place are the sea horse and the more ominous creatures such as the octopus, shark, piranha, electric eels, moray eels, and the sting ray. "These animals have a special fascination," he said. "People are especially curious about things they believe are dangerous, but the reputation of some of the creatures is not fully deserved."

The octopus, for example, has an ancient reputation for being the terror of the deep but in reality it is a comparably mild animal. The reputation persists only because the octopus appears ferocious. The octopus, however, could be extremely dangerous because it has all the equipment, including a poisonous

bite that paralyzes fish. But in its natural habitat, the octopus is skittish as far as man is concerned. In captivity, it loses its fear of man and at times becomes almost tame. Coming into contact with the octopus is more likely to be injurious to the marine animal than to man, it is said. "It isn't difficult to pull away from its suction cups," the Acting Director said. "If you do it too quickly, you might tear off the horny cap the octopus has over each suction."

Other species seen in many aquariums is the piranha. The piranha is not spectacular in size or design, but the paradox of its reputation and mild appearance give that South American fish a special attraction. The piranha is said to be especially dangerous near Indian villages where garbage is thrown in the rivers. The piranha learns to associate splash with food. In more remote areas, however, the piranha is not likely to attack a swimmer unless it smells blood.

The specimen most sought by all aquariums and one which the Washington, D. C., Fisheries Center hopes to obtain, is the coelacanth, or "living fossil" fish. Fossils of the coelacanth are found in strata of the Middle Devonian Era, which began about 325 million years ago. It occurred first as a freshwater fish but later showed up as a marine fish in the Triassic Era, beginning about 190 million years ago. Then none were found and it was believed the coelacanth had been extinct for at least 100 million years.

The first scientific awareness that the coelacanth was still living occurred in 1938 when one was caught in a trawl off the southern coast of Africa. The fish measured about five feet in length and was taken from a depth of about 250 feet. The Center's Acting Director said a few coelacanth were caught in the 1950's in the same area but none remained alive for more than several hours. He said the coelacanth is a true fish, but on the evolutionary tree it is close to amphibians such as the salamander branched off. He noted that the paired pectoral fins of fish, which become shoulders and arms in evolution, and the pelvic fins, which become hind legs, are in the advanced stages of becoming limb-like in the coelacanth. "Finding that fish alive is like finding a living dinosaur," he said.

The Fisheries Center at Washington, D. C., plans to have 1,300 kinds of aquatic life--one

of the largest collections in the world. It is expected that many will be donated and the remainder will be purchased. There are some species of aquatic life that it will not be practical to keep at the Center. They include the barracuda, which despite its viciousness is too delicate and nervous to withstand captivity. In confinement, it continually smashes into the sides of its tank and dies of the injuries. The manta ray, which reaches a spread of 22 feet, requires too much area for swimming. Also, it depends on plankton for food, and aquariums cannot supply the microscopic animals and plants in sufficient amounts.

Other species ruled out are those from the deepest parts of the ocean because such fish live in an area of great pressure. When they are brought to the surface they suffer from decompression and usually die. The release of pressure causes small air bubbles to form and block blood vessels. The Fisheries Center plans to display models of the deep ocean fish in a simulated habitat called "Creatures of the Abyssal Depths."

The Center is to be constructed on a 20-acre site at Hains Point in East Potomac Park in Washington, D. C., and is expected to attract 3 million visitors a year. Completion is expected about 1967.

Note: See *Commercial Fisheries Review*, April 1964 p. 22, October 1963 p. 28, July 1963 p. 45.

* * * * *

ARCHITECTS SELECTED TO DRAW PLANS:

The selection of two architectural firms to jointly prepare plans for the National Fisheries Center and Aquarium in Washington, D. C., was announced on March 10, 1964, by General Services Administrator Bernard L. Boutin and Secretary of the Interior Stewart L. Udall.

The firms awarded the contract for the plans are in Los Angeles, Calif., and Madison, Wis. Completion of preliminary drawings and alternate design concepts was expected to take about three months. An estimated 20 months will be required to complete final working drawings.

The U. S. Department of the Interior's proposed 1964/65 fiscal year budget provides \$500,000 for the preparation of final plans. Financing arrangements for the \$10 million

Center are unique in that they provide that the Government research and educational institution will be self-supporting. Both construction and operation costs are to be paid from an admission charge to all except student groups.

The Center will show one of the world's largest collections of aquatic animals in near natural habitat. There will be extensive research facilities for such studies as genetics, reproduction, nutrition, fish diseases, antibiotics produced by marine animals, and experimental ecology.

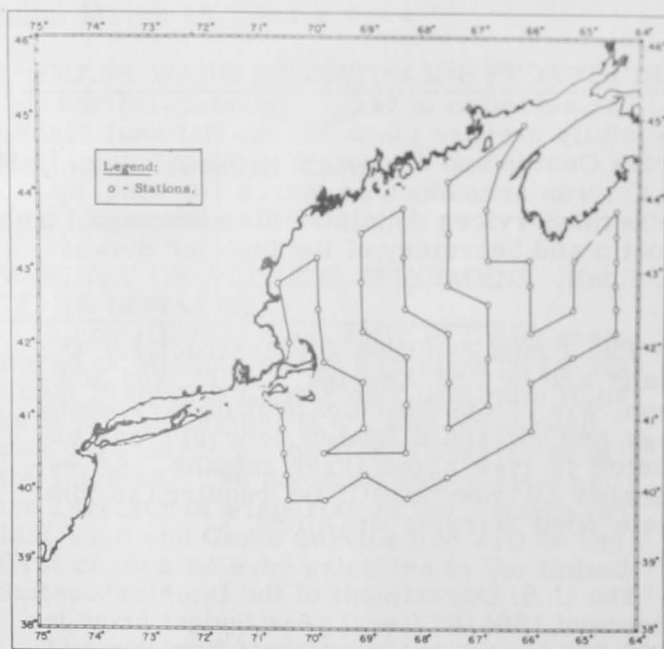
The National Fisheries Center will be administered by Interior's Bureau of Sport Fisheries and Wildlife.



North Atlantic Fisheries Investigations

HYDROGRAPHIC-PLANKTON SURVEY IN THE GULF OF MAINE:

M/V "Albatross IV" Cruise 64-2 (February 24-March 7, 1964): To collect data on hydrographic conditions and zooplankton distribution and abundance over the Continental Shelf in the Gulf of Maine area of the North Atlantic were the main objectives of this cruise by the U. S. Bureau of Commercial Fisheries research vessel Albatross IV.



Albatross IV Cruise 64-2 (February 24-March 7, 1964): Vessel track and hydrographic-plankton stations.

Planned observations were completed at 53 of the 54 plankton-hydrographic stations scheduled. At each station, samples for temperature, oxygen, salinity, chlorophyll, and zooplankton were taken. A total of 98 bathythermograph observations were made, and 265 drift bottles and 265 sea-bed drifters released.

Two oblique tows with a midwater trawl were made in deep water off the edge of the Continental Shelf. The Myctophidae taken on those tows was forwarded to a scientist associated with the British Museum.

At the start of the cruise, an attempt was made to secure live haddock for blood samples and aquarium specimens, but the operation was hampered by poor weather conditions.



Oceanography

EDUCATIONAL GRANTS FOR 1964 AWARDED BY INTERIOR DEPARTMENT:

Graduate educational grants to 17 universities as part of the National Oceanographic Program were awarded by the U. S. Department of the Interior, Secretary Udall announced on March 11, 1964.

The universities awarded those grants will select outstanding student scientists, who have been graduated or are about to be graduated to receive 1- or 2-year grants. The awards will be available at the beginning of the 1964 fall semester. Grants will be for study in the fields of economics, fishery technology, taxonomy (science of classification), physical and chemical oceanography, marine biology, and fishery biology.

The 1964 awards by Interior will support 20 new student recipients. Part of the funds also may be used to continue the training of seven students already participating in the study program. Grants provide for payment of tuition fees and a living expense allowance of \$3,000 a year. Married students with children receive an additional \$1,000 family allowance. At the close of the academic year each student's progress is reviewed before a second-year grant is approved.

Secretary Udall said the program began in 1962, following Congressional action, to

ases in developing scientists in fishery oceanography. It is administered by Interior's Bureau of Commercial Fisheries, which makes \$200,000 available each year for the student program. Selection of institutions to receive the grants is made by the Department of the Interior with the advice of a panel representing leading universities and research institutions. All qualified institutions are invited to participate in the program. Grants were made to 17 universities in 1963 and 12 in 1962.

Student applications for grants are made directly to the university of their choice. The actual number of participating students will depend upon decisions by the universities in selecting students for one or two-year participation.

Universities to receive the 1964 grants and fields of study are:

- University of California at Berkeley, fishery technology;
- University of California at San Diego (Scripps Institution of Oceanography), oceanography and marine biology;
- Columbia University (Lamont Geological Observatory), oceanography;
- Cornell University, taxonomy;
- Duke University, marine biology;
- University of Hawaii, marine biology;
- Iowa State University, fishery biology;
- The Johns Hopkins University, oceanography;
- Massachusetts Institute of Technology, oceanography and fishery technology;
- University of Miami (Institute of Marine Science), fishery biology and taxonomy;
- University of Michigan, fishery biology and taxonomy;
- North Dakota State University, fishery technology;
- Oregon State University, oceanography and fishery technology;
- Rhode Island, marine biology or oceanography;
- University of Virginia (Virginia Institute of Marine Science), marine biology;
- University of Washington, fishery economics, oceanography, and fishery biology; and
- University of Wisconsin, fishery biology.

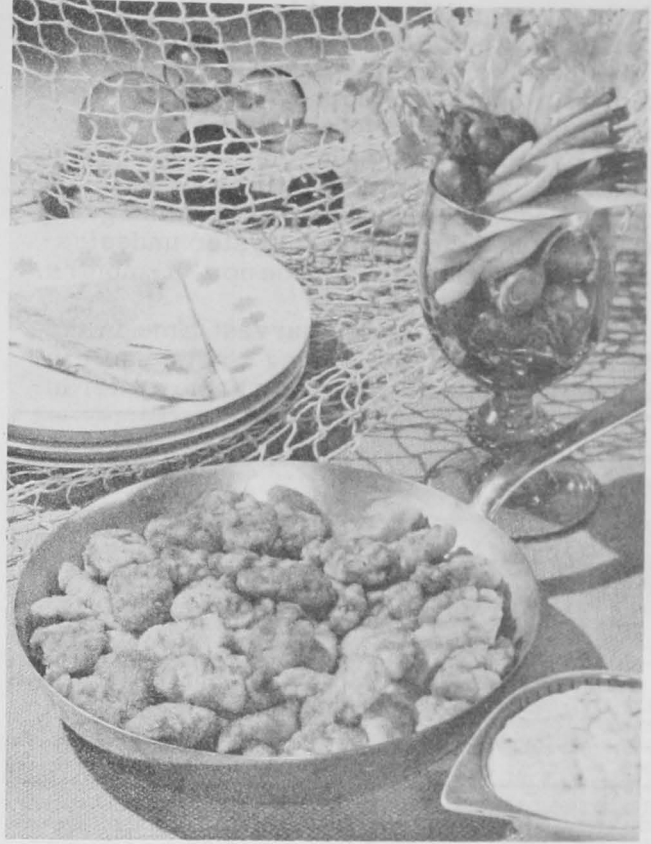
Noted in Commercial Fisheries Review, May 1963 p. 34.



Oysters

HARVEST IN SPRING
MONTHS SUGGESTED:

the belief that oysters are good to eat during months that have an "R" is a myth according to biologists of the U. S. Bu-



Maryland pan fried oysters (see p. 11 for recipe).

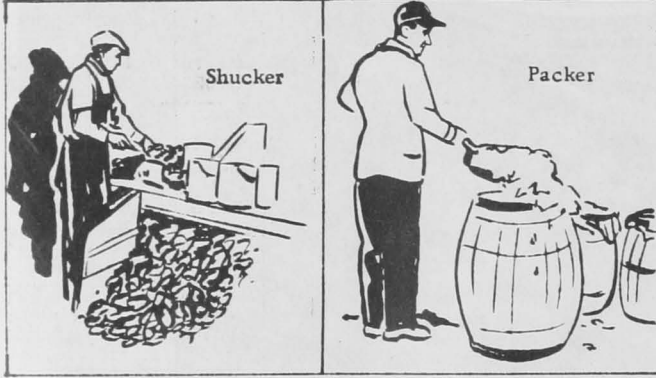
reau of Commercial Fisheries. Oysters usually reach their peak of perfection in May and June--months that have no "R" in them. Oysters are fatter and taste better in the spring because at that time they begin to store glycogen, and animal starch, in preparation for the spawning season in summer.

During summer and early fall, oysters become thinner, their nectar becomes comparatively watery, and their flavor declines. The fattening cycle usually does not resume until October or November. The harvest of oysters, however, usually begins in September or October--a time when oysters generally are not at their best.

Several reasons for the conflict between harvesting and natural growth were explained by the Bureau of Commercial Fisheries' Assistant Director for Biological Research. The oyster harvest is begun in early fall because the demand is seasonal and the prices are highest at that time. The seasonal demand may have been caused by the "R-month" myth. Another reason is that most oysters are marketed in the raw shucked state and, in the early

days, storage life probably was longer in cooler weather. Some of the origins of the "R-month" myth may have been lost in history, but one of the apparent origins is the spawning methods of the European oyster. That oyster is unique in that its young are retained by the mother until tiny shells are developed. The presence of the small gritty shells makes the European oyster undesirable for human food during the non "R-months."

Changing the oyster harvest time in the United States to late spring could result in important economic benefits to the oyster in-



dustry. Oyster mortalities usually are heaviest in summer, and losses of 25 to 50 percent are not uncommon. Thus, an earlier harvest could result in obtaining many more bushels of oysters in a given area. Further, because oysters are fatter in the spring, there would be a much greater yield of meats in each bushel harvested.

The tradition of the fall harvest is unlikely to change, however, until enough consumers become aware that the "R-month" rule is a myth and start asking for oysters in spring months.



Pollution

CONFERENCE ON MILFOIL CONTROL:

A conference on the Eurasian water milfoil problem was held early in 1964 in Annapolis, Md. The meeting (the Fifth Annual Workshop) was attended by about 60 specialists, including officials of state and Federal agencies, universities, and the chemical industry. The prolific growth of milfoil (an aquatic plant) is causing problems in Chesapeake Bay and other areas.

The chairman of the meeting stressed that realistic estimates must be made of the present and potential threat by milfoil to recreational use of water, to real estate values, to shellfish, and to wildfowl feeding areas. Careful attention must also be given to any possible dangers resulting from the use of chemicals in controlling milfoil. All of those estimates are necessary in reaching wise decisions on control.

The problems associated with milfoil were further outlined in a speech by the Director of the Natural Resources Institute of the University of Maryland. He traced the rapid growth of water milfoil in the upper Chesapeake Bay since 1959, its wide distribution, and the present threat to Chesapeake Bay resources. He cited the substantial success which has been achieved in the development of chemical methods which can control milfoil in local areas. But he also mentioned the need for additional information on chemical methods of control. Precise methods for detecting herbicide residues are needed. A better understanding of the biological effects of chemicals on marine life, wildlife, and plants is needed, and specific information should be developed to guide those state agencies which must set regulations.

It was reported that new areas were invaded by milfoil in 1963, including the Patuxent River in Maryland, additional areas in Virginia, parts of the Tennessee Valley, and other locations. Tidal waters have been found to pose exceptional difficulties in control.

Maryland state officials have established a procedure for considering requests to use certain herbicides in Maryland waters. This procedure will apply to the requests of individuals or groups who wish to control water milfoil in late May or June (the only time it is susceptible). The Maryland Department of Tidewater Fisheries will handle requests affecting tidal water, and the Maryland Game and Inland Fish Commission will handle requests affecting fresh water areas. Both agencies will work closely with the Maryland Health Department and Water Pollution Control Commission in reviewing requests.

Looking to the future, biologists report that certain insects present on milfoil in Pakistan, and a plant-eating fish from Japan called the "sogyo," are under study as possible aids in control.

Specialists described plans for chemical control of 750 acres of water in the Tennessee Valley. Scientists also discussed plans to screen and test new herbicides, and plans for a thorough study of any direct or indirect effects on plants and animals.

Current Federal legislation which might assist in future efforts to control milfoil was summarized by the U. S. Army Corps of Engineers. (Natural Resources Institute, University of Maryland, February 24, 1964.)



Salmon
NEW FISH FARM IN WASHINGTON STATE ESTABLISHED BY COOPERATIVE EFFORT:

A new salmon fish farm in Washington State will start production in 1964 through the joint efforts of a sport fishermen's club, landowners, and the Washington State Department of Fisheries. The new natural production area is Campbell Slough in the Humpback River Delta about nine miles northwest of Sequim, Wash. The slough comprises approximately 10 acres of water area which drains into North Bay.

Land owner in the area built a dike and installed a tide gate near the outlet of the slough to reclaim the area as a fresh-water lake. The Fisheries Department surveyed the slough, and took water samples for analysis to determine the site's potential for salmon production. The results were favorable. Water quality is such that chinook fingerlings can be raised to migrant size without a feeding program. After scrap fish are reared from the slough by rotenone treatment, chinook salmon will be planted.

A sport fishermen's club in Grays Harbor will purchase all the material necessary for a permanent fish-rearing installation, and the State Fisheries Department will complete the project, thus Washington will gain a new fish farm through the multiple efforts of the fishermen, land owners, and the Fisheries Department.

Adult salmon returning to the new fish farm will contribute to the commercial and sport fisheries offshore, at Westport and Grays Harbor. (Washington State Department of Fisheries, February 28, 1964.)

Shrimp

UNITED STATES SHRIMP SUPPLY INDICATORS, FEBRUARY 1964:

Item and Period	1964	1963	1962	1961	1960
..... (1,000 Lbs., Heads-Off)					
Total landings, So. Atl. and Gulf States:					
April	-	4,427	3,358	3,171	4,728
March	-	3,632	3,331	4,754	4,099
February	4,000	3,986	4,123	3,910	3,784
January	6,160	3,993	3,840	5,686	5,402
December	-	9,409	8,615	6,538	7,099
January-December	-	138,187	105,839	91,396	141,035
Quantity canned, Gulf States 1/:					
April	-	105	12	9	66
March	-	92	86	35	117
February	309	281	241	90	204
January	359	592	492	183	266
December	-	2,175	1,879	816	894
January-December	-	29,468	23,322	14,500	26,394
Frozen inventories (as of end of each mo.) 2/:					
April 30	-	24,954	15,637	27,492	20,502
March 31	-	27,970	16,607	31,345	23,232
February 29	-	28,039	19,012	37,612	29,063
January 31	43,896	28,487	21,328	37,842	34,332
December 31	-	45,764	31,577	19,755	40,913
Imports 3/:					
April	-	11,082	10,210	9,208	7,733
March	-	13,618	9,658	10,347	8,545
February	-	12,100	10,599	8,932	7,657
January	13,272	13,139	12,907	12,338	8,596
December	-	16,296	15,798	15,442	12,411
January-December	-	151,530	141,183	126,268	113,418
... (c/lb., 26-30 Count, Heads-Off) ...					
Ex-vessel price, all species, So. Atl. and Gulf Ports:					
April	-	83.6	82.2	55.4	60.6
March	-	85.5	80.9	56.0	56.3
February	4/57-65	85.7	78.9	53.5	51.8
January	4/57-69	85.0	76.3	52.5	49.5
December	-	59.6	82.9	75.2	54.2
November	-	52.3	84.5	73.5	54.0
October	-	53.3	90.0	68.7	53.0
September	-	57.9	90.9	70.1	52.2
Wholesale price, froz. brown (5-lb. pkg.) Chicago, Ill.:					
April	-	100-105	94-97	69-70	74-75
March	-	102-106	94-95	69-71	65-68
February	73-82	102-106	93-95	69-71	65-67
January	78-83	102-106	91-94	69-71	64-66
December	-	75-83	101-107	91-92	68-70
November	-	71-78	105-110	89-92	69-73
October	-	67-75	108-115	83-90	69-73
September	-	73-77	113-118	87-90	65-70

1/Pounds of headless shrimp determined by multiplying the number of standard cases by 30.3.
 2/Raw headless only; excludes breaded, peeled and deveined, etc.
 3/Includes fresh, frozen, canned, dried, and other shrimp products as reported by the Bureau of the Census.
 4/Range in prices at Tampa, Fla.; Morgan City, La.; area; Port Isabel and Brownsville, Texas only.
 Note: February 1963 landings and quantity used for canning estimated from information published daily by the New Orleans Fishery Market News Service. To convert shrimp to heads-on weight multiply by 1.65.

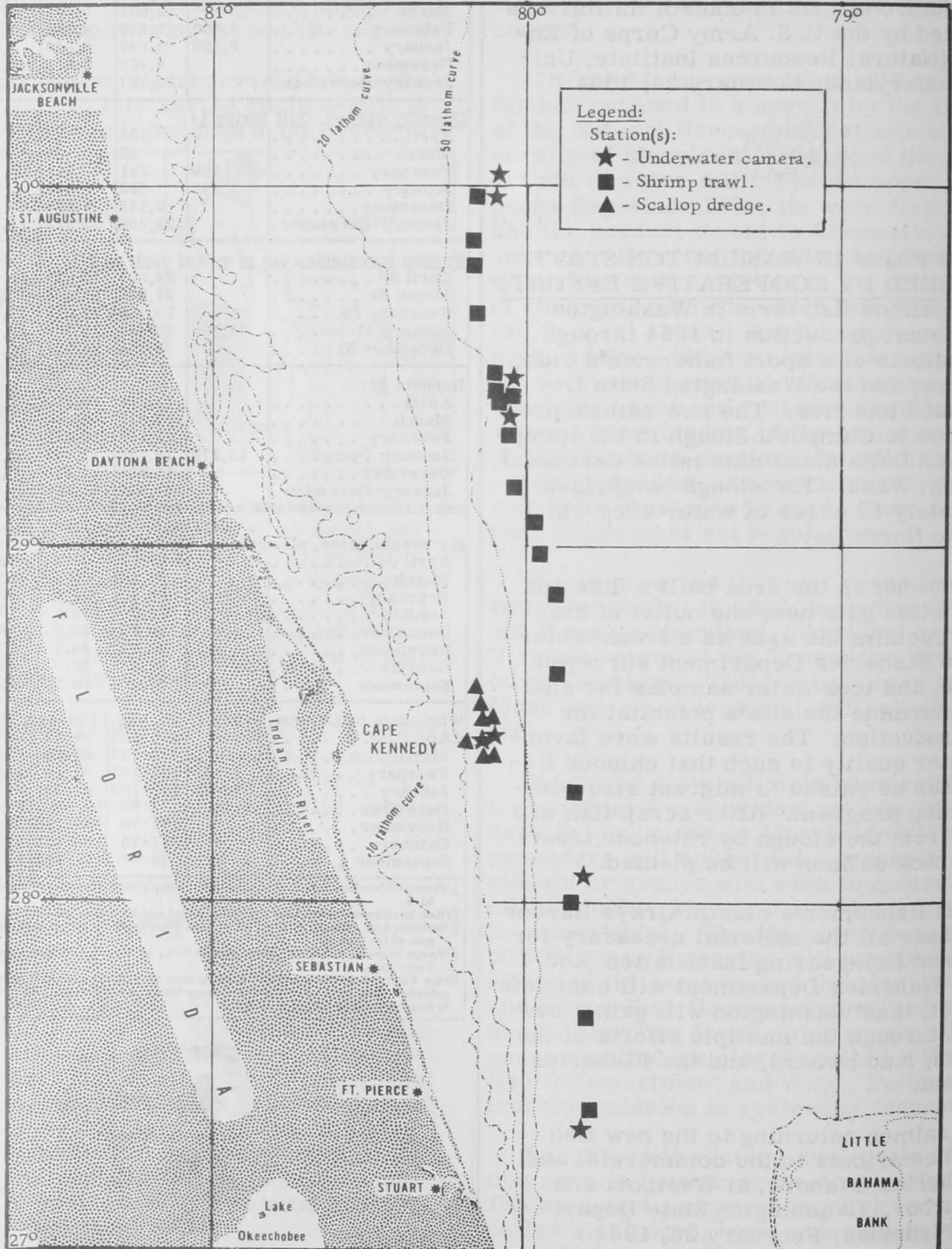


South Atlantic Exploratory Fishery Program

ROYAL-RED SHRIMP AND CALICO SCALLOP GROUNDS PHOTOGRAPHED:

M/V "Silver Bay" Cruise 54 (February
4-16, 1964): To obtain bottom photographs

in the center of the royal-red shrimp range (200 fathoms) off Florida's east coast was the main objective of this cruise by the U.S. Bureau of Commercial Fisheries exploratory fishing vessel Silver Bay. For this purpose an underwater camera was used at 8 stations extending from St. Augustine southward to below Fort Pierce.



Shows the station pattern of M/V Silver Bay Cruise 54, February 4-16, 1964.

Total of 500 feet of 35 millimeter black and white film was exposed in royal-red shrimp depths with a self-contained still camera equipped with electronic flash. Attempts to obtain 16 millimeter motion picture footage were unsuccessful because of heavy seas. An additional 200 feet of 35 millimeter black and white film was exposed on bottom on the calico scallop grounds (26 1/2 fathoms) off Cape Kennedy. Development of test film strips aboard the vessel showed that good photographs were obtained in both deep ranges.

At depths of from 160 to 225 fathoms, 18 shrimp trawl drags yielded small catches of royal-red shrimp, ranging up to 70 pounds (22 to 46 heads-on count) for each 3-hour drag. An unusually low bottom temperature of 58° F. was obtained in 225 fathoms east of Daytona Beach.

Catches of calico scallops on this cruise ranged from a few individuals to 4 bushels for each drag. These were made in eight 30-minute drags using a 6-foot tumbler dredge in the 25 to 28 fathoms depth range off Cape Kennedy. The scallop meats were in fair condition and averaged 105 count to the pound.



South Carolina

FISHERIES BIOLOGICAL RESEARCH PROGRESS, JANUARY-MARCH 1964:

Report on the progress of biological research by the Bears Bluff Laboratories, Wadswail Island, S. C., for January-March 1964 follows:

Oyster Studies: Experiments were continued on the supplemental feeding of oysters during this period. Again the studies indicate that oysters maintained in 12 x 12 foot concrete tanks, when fed with cracked rice, gained 3.5 percent in underwater weight in a month when compared with oysters of similar size and weight used as controls and unfed. This was true for controls both in the experimental tanks and in trays suspended under the Laboratory docks on We Creek.

Shrimp Studies: Catch-per-unit-of effort in experimental trawling throughout coastal waters during January-March 1964 indicated that most commercial species of

marine organisms were less abundant than during the same periods in 1963 and 1962.

Year	Spot	Croaker	White Shrimp	Blue Crabs	
				Mature	Immature
1964	0.7	9.5	-0.1	3.2	9.4
1963	7.9	10.2	3.2	8.1	8.6
1962	22.1	18.6	26.3	14.1	23.9

As can be seen in the table, a continual decline in the abundance of the species listed, with the exception of immature blue crabs, has taken place since 1962. White shrimp were almost nonexistent in experimental trawling during the first 3 months of 1964, and only two specimens were found in more than 75 standard trawl drags. It is apparent from this that very few white shrimp wintered-over in coastal waters.

Spot and mature blue crabs also showed considerable declines in numbers during January-March of 1964 as compared with the same quarters in 1963 and 1962. Croakers, while only slightly less numerous at stations during the 1964 quarter as compared with that of 1963, nonetheless showed a general pattern of decreased abundance for the three year period.

The reasons for the decline in abundance of commercial species during January-March over the past three years are not known at present. One possibility is that a very slight decline in average water temperature along the coast is responsible for the changes noted, although no such changes have been observed in the course of shrimp survey studies. It is possible that these changes, however, have been so gradual and slight as to escape detection by ordinary methods. It has been observed that spiny dogfish (*Squalus acanthias*), a small species of shark ordinarily found in colder northern waters, has become increasingly abundant in coastal waters during the past three years, and this may give some indication that water temperatures are playing a part in the changes which have taken place during that period.

Plankton Studies: Experimental plankton collections were made from Little River, south of Calibogue Sound, during January-March of this year. Postlarval brown shrimp began to appear in plankton samples in early February 1964, but reached no significant abundance until late February and early March. To date the postlarvae have been

slightly less abundant at plankton stations located from Charleston Harbor south to Calibogue Sound, S. C., than during the same period of 1963. Recruitment of those post-larvae at stations located north of Charleston Harbor has been greater than to the south, and through March of this year has been slightly improved over that of 1963.

On the whole, the outlook for brown shrimp in 1964 appears about the same, if perhaps even less promising, as the outlook in 1963 was at the end of the first quarter.

Larval and postlarval spot, menhaden, and flounder showed normal or above normal recruitment in coastal waters January-March 1964. Phenomenal numbers of postlarval menhaden were observed in Breach Inlet and Little River Inlet during February and March of this year. Apparently successful offshore spawning of spot and menhaden, as well as flounder, took place in December and January resulting in the unusual abundance of these fishes in plankton collections.

Pond Cultivation: The major ponds at the Laboratory are being prepared to begin further experiments on the cultivation of shrimp in ponds. The flood gates to the 1-acre "Fish Pond" have been adjusted to allow a flow of about 1½-acre feet of water in and out of the pond on each tide. When the flood gates are thus adjusted about 18 inches of water remains in the pond at all times. Post-larval brown shrimp (*Penaeus aztecus*) made their appearance in We Creek, which waters feed the ponds, beginning on March 9. The flood gates were to remain open until the first part of April in an attempt to trap a sizable population of postlarval shrimp in the pond for "pasturing" and growth.

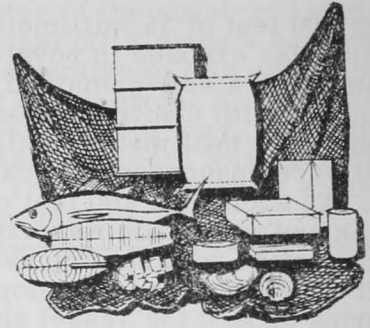


United States Fisheries

MORE FISHERY PRODUCTS USED IN UNITED STATES IN 1963:

A record 11.2 billion pounds of fishery products were landed and imported in the United States in 1963 as compared with the previous high of 10.4 billion pounds in 1962. Some 6.7 billion pounds of fish was converted into industrial fishery products, with the remainder used for human food.

The increased supply of fishery products in the United States in 1963 was due to a gain of more than 1.5 billion pounds which was used for industrial products--mostly fish meal. But the United States per capita consumption of edible fishery products for the year dropped about one-tenth of a pound from 1962. Plentiful supplies of poultry and beef at relatively low prices were believed responsible for the lower consumption of fishery products.



For the first time, imports accounted for more than half of the total supply of fishery products in the United States. Landings by domestic fishermen in 1963 provided only about 42 percent of the total as compared with 52 percent in 1962. United States fishery landings of 4.75 billion pounds during the year with an ex-vessel value of \$378 million provided about 55 percent of the edible fish supply for the United States and only about 34 percent of the inedible supply were used for industrial products.

Despite a 600-million-pound drop from the previous year in the United States fishery landings, and a decrease in value of \$18 million, the 1963 value was second only to 1962 when it was \$396 million. Most of the decline in landings was due to the lower menhaden catch (down 568 million pounds)--a species used for fish meal and oil. Landings also were lower for salmon, whiting, ocean perch, Pacific mackerel and sardines, haddock, Maine herring, and blue crab. But total United States shrimp landings were up 49 million pounds, 2 million pounds more of king crab were landed, and landings of yellowtail flounder were up 22 million pounds from 1962.

A review of the United States 1963 commercial fishery landings by regions follows:

New England and North Atlantic: There was a large increase in landings of North Atlantic tuna, but groundfish landings such as cod, haddock, and ocean perch, were down. Herring was down because of low demand. Most of the sharply increased yellowtail flounder landings were at New Bedford, Mass. The domestic tuna catch in the North Atlantic was a record breaking 18 million pounds.

Middle Atlantic: Menhaden landings dropped sharply to only 366 million pounds, about 400 million pounds below 1962.

Chesapeake Bay: There was a sharp decline in crabs and menhaden. Croaker and oysters also were down.

South Atlantic: The poorest shrimp landings in years were experienced, but a record was established in the catch of blue crabs. Menhaden landings showed a strong rise.

Gulf of Mexico: Oyster production set a new record, and shrimp landings were the best since 1955. Menhaden and blue crabs were down slightly.

Pacific Coast and Hawaii: There were good landings of Pacific hake, but yellowfin was down, with virtually no catch in the over-all quantity of tuna landed. Sardines again failed to appear in quantity off southern California. In Washington a large pink salmon run brought the total salmon catch to 55 million pounds, compared with 23 million pounds in 1962. The catch of Dungeness crabs was less than normal.

Alaska: King crab production set a record. The salmon catch was down due to smaller runs. Halibut landings were below 1962 but the Dungeness crab catch was up nearly 3 million pounds.

The United States with about 6 percent of the world fishery landings in 1963 remained in fifth place among the world's leading fishing nations. Japan ranked first, followed by Peru, Communist China, and the Soviet Union.



U. S. Foreign Trade

IMPORTS OF CANNED TUNA UNDER QUOTA:

United States imports of tuna canned in brine during January 1-February 29, 1964, amounted to 4,234,009 pounds (about 201,619 standard cases), according to preliminary data compiled by the U. S. Bureau of Customs.

The quantity of tuna canned in brine which can be imported into the United States during the calendar year 1964 at the 12 1/2-percent rate of duty has not been announced; however in 1963 the quota was 63,130,642 pounds (about 3,006,221 standard cases of 48 7-oz. cans). Any imports in excess of that quantity would have been dutiable at 25 percent ad valorem.

PROCESSED EDIBLE FISHERY PRODUCTS, JANUARY 1964:

United States imports of processed edible fishery products in January 1964 were up 14.4 percent in quantity and 2.2 percent in value from those in the previous month. In January 1964, there were higher imports of mackerel fish fillet items, fish blocks and slabs, and canned sardines (in oil and not in oil). The increase was partly offset by a sharp decline in arrivals of canned tuna in brine.

Compared with the same month in 1963, imports in January 1964 were up 29.0 percent in quantity and 35.9 percent in value. There was a substantial increase this January in imports of fish blocks and slabs, cod fillets, ocean perch fillets, flounder fillets, sea catfish fillets, yellow pike fillets, canned tuna in brine, canned sardines (in oil and not in oil), and canned oysters. But there was a

noticeable decline in imports of haddock fillets.

Exports of processed edible fish and shellfish from the United States in January 1964 were up 2.3 percent in quantity but down 28.6 percent in value from those in the previous month. A sharp increase in exports of the lower-priced canned mackerel was about offset by a decline in shipments of canned squid and the higher-priced canned salmon and canned shrimp.

Compared with the same month in 1963, the exports in January 1964 were up 18.9 percent in quantity but down 6.3 percent in value. This January there were much larger exports of canned mackerel and shipments of canned shrimp were also somewhat higher, but exports were down sharply for canned salmon and canned squid.

Notes: (1) Prior to October 1963, the data shown were included in news releases on "U. S. Imports and Exports of Edible Fishery Products." Before October 1963, data showing "U. S. Imports of Edible Fishery Products" summarized both manufactured and crude products. At present, a monthly summary of U. S. imports of crude or nonprocessed fishery products is not available; therefore, only imports of manufactured or processed fishery products are reported. The import data are, therefore, not comparable to previous reports of "U. S. Imports of Edible Fishery Products."

The export data shown are comparable to previous data in "U. S. Exports of Edible Fishery Products." The export data in this series of articles have always been limited to manufactured or processed products.

(2) See Commercial Fisheries Review, April 1964 p. 37.

AIRBORNE IMPORTS OF FISHERY PRODUCTS, DECEMBER 1963:

Airborne fishery imports into the United States in December 1963 were up 38.1 percent in quantity and 32.1 percent in value from those in the previous month. The increase was due mainly to greater arrivals of shrimp from Venezuela.

Raw headless shrimp continued to make up the bulk of the airborne shrimp imports--in December 1963, shipments consisted of 702,423 pounds of fresh or frozen raw headless, 12,267 pounds of frozen raw peeled, and 34,996 pounds of unclassified shrimp. About 98 percent of the airborne shrimp arrivals in December entered through the U. S. Customs District of Florida. The remainder entered through the Customs Districts of Laredo (Tex.) and Puerto Rico.

Airborne imports of shellfish other than shrimp in December consisted of 73,777 pounds of fresh or frozen spiny lobster products and 13,660 pounds of scallops, all of which entered through the Customs District of Florida.

Total airborne imports of fishery products in 1963 were about the same as those in 1962, although there were changes in shipments from individual countries. A sharp increase in airborne shipments of shrimp from Venezuela in 1963 was partly offset by a decline in airborne shrimp shipments from Panama, Costa Rica, Nicaragua, El Salvador, and Guatemala. The leading shellfish items other than shrimp imported by air in 1962 and 1963 were live northern lobsters from Canada and fresh and frozen spiny lobster products from Central and South American countries. Airborne shipments of north-

Imports and Exports of Processed Edible Fishery Products, January 1964 with Comparisons

	Quantity		Value	
	January		January	
	1964	1963	1964	1963
1. Lbs./.....	49.2	37.9	14.0	10.3
2. Lbs./.....	4.4	3.7	1.5	1.6

1. Includes only those fishery products classified by the U. S. Bureau of the Census as "Manufactured foodstuffs." Included are canned, smoked, and salted fishery products. The only fresh and frozen fishery products included are those involving substantial processing, i. e., fish blocks and slabs, fish fillets, and crab meat. Does not include fresh and frozen shrimp, lobsters, scallops, oysters, and whole fish (or fish processed only by removal of heads, viscera, or fins, but not otherwise processed).

2. Includes fresh and frozen.

U. S. ^{1/} Airborne Imports of Fishery Products, January-December 1963 with Comparative Data						
Product and Origin 2/	1963		1963		1962	
	December		Jan.-Dec.		Jan.-Dec.	
	Qty. 3/	Value 4/	Qty. 3/	Value 4/	Qty. 3/	Value 4/
	1,000 Lbs.	US\$ 1,000	1,000 Lbs.	US\$ 1,000	1,000 Lbs.	US\$ 1,000
Fish:						
Mexico	-	-	264.8	70.0	964.5	160.3
British Honduras	-	-	43.5	10.7	39.8	8.7
Honduras	-	-	16.5	4.3	2.8	0.6
Japan	5/	0.1	2.0	8.3	-	-
United Kingdom	1.0	1.9	4.5	9.3	0.7	1.8
Iran	-	-	1.2	7.4	13.9	142.9
France	0.5	0.5	10.6	11.1	0.3	0.7
Rumania	-	-	-	-	1.9	15.9
Panama	-	-	0.9	0.4	7.8	1.3
U.S.S.R.	-	-	26.8	70.2	-	-
Canada	2.2	0.9	2.2	0.9	22.1	17.6
Costa Rica	-	-	-	-	5.6	0.9
Other countries	-	-	3.5	0.9	39.0	12.8
Total Fish	3.7	3.4	376.5	193.5	1,098.4	363.5
Shrimp:						
Guatemala	-	-	141.6	74.0	321.9	164.2
El Salvador	40.3	28.8	338.0	219.0	716.5	447.9
Honduras	-	-	99.8	52.3	39.8	25.2
Nicaragua	12.3	6.7	517.3	181.3	1,008.6	343.6
Costa Rica	46.5	24.1	644.8	308.4	819.9	370.5
Panama	91.7	58.7	1,633.0	890.2	1,867.1	1,055.2
Venezuela	547.7	201.1	5,048.2	2,297.9	3,380.1	1,815.3
Ecuador	-	-	111.6	39.4	12.2	3.4
France	-	-	2.6	0.9	-	-
Mexico	-	-	13.2	6.9	24.7	9.0
Netherlands Antilles	-	-	-	-	3.1	2.7
Argentina	-	-	-	-	10.5	4.9
British Honduras	-	-	7.9	8.6	-	-
Jamaica	11.2	2.9	11.2	2.9	-	-
Total Shrimp	749.7	322.3	8,569.2	4,081.8	8,204.4	4,241.9
Shellfish other than Shrimp:						
Mexico	-	-	101.1	60.8	94.0	61.6
British Honduras	34.1	29.3	378.6	311.1	317.1	219.3
El Salvador	-	-	5.0	3.6	7.1	5.1
Honduras	-	-	17.0	7.0	141.5	104.5
Nicaragua	18.7	13.3	183.2	113.3	18.7	16.2
Costa Rica	-	-	73.8	60.1	7.1	6.0
Jamaica	20.1	17.1	85.6	67.3	43.3	30.2
Netherlands Antilles	-	-	45.5	32.7	58.0	34.8
Colombia	-	-	8.0	21.7	1.8	5.1
Ecuador	-	-	2.2	1.8	3.7	2.1
Tunisia	-	-	0.8	0.9	-	-
Leeward and Wind- ward Islands	-	-	1.6	0.5	31.3	11.9
British Guiana	-	-	1.7	0.3	-	-
Canada	-	-	213.3	109.2	224.1	91.1
Venezuela	-	-	13.7	6.0	32.3	20.3
Panama	14.1	7.1	19.1	10.9	1.0	1.0
Guatemala	-	-	-	-	12.9	6.3
Bahamas	-	-	5.3	5.2	37.5	12.3
Dominican Republic	0.4	0.1	25.7	23.9	33.2	28.3
Yugoslavia	-	-	1.2	0.7	-	-
Trinidad	-	-	-	-	2.3	1.0
Other countries	-	-	2.0	2.9	8.3	12.0
Total Shellfish (ex- cept shrimp)	87.4	66.9	1,185.4	839.9	1,075.2	669.1
Grand Total	840.8	392.6	10,131.1	5,115.2	10,378.0	5,274.5

1/Imports into Puerto Rico from foreign countries are considered to be United States imports and are included. But United States trade with Puerto Rico and with United States possessions and trade between United States possessions are not included.

2/When the country of origin is not known, the country of shipment is shown.

3/Gross weight of shipments, including the weight of containers, wrappings, crates, and moisture content.

4/F. o. b. point of shipment. Does not include U. S. import duties, air freight, or insurance.

5/Less than 50 pounds.

Note: These data are included in the over-all import figures for total imports, i. e., these imports are not to be added to other import data published.

Source: United States Airborne General Imports of Merchandise, FT 380, December 1963, U. S. Bureau of the Census.

ern lobsters from Canada in 1963 were similar to those in the previous year. British Honduras was the leading supplier of airborne imports of spiny lobsters in both 1962 and 1963. In 1963, a sharp decline in airborne arrivals of spiny lobsters from Honduras was offset by increased spiny lobster shipments from Nicaragua. Fish fillets from Mexico were the leading finfish product (from a volume standpoint) imported by air in both 1962 and 1963, although the quantity was down

sharply in 1963. The airborne imports in both years include several high-value shipments of caviar.

The data as issued do not show the state of all products--fresh, frozen, or canned--but it is believed that the bulk of the airborne imports consists of fresh and frozen products.



Washington

LANDINGS OF FISH AND SHELLFISH, 1963^{1/}

Landings of fish and shellfish in Washington State in 1963 amounted to 147,916,231 pounds valued at \$23,027,000 as compared with landings of 116,519,289 pounds valued at \$19,534,014 in 1962.

Total Washington landings in 1963 included 53.8 million pounds of salmon, highlighted by a catch of 31.1 million pounds of pink salmon. Considering the cycle year of the pink salmon and Adams River sockeye salmon runs, the 1963 total landings (all species) are no better than average and have been exceeded 10 times during the past 28 years.

Washington Landings of Fish and Shellfish, 1963 ^{1/}		
Item	Quantity	Ex-Vessel Value
	Pounds	Dollars
Food fish:		
Salmon	53,756,307	11,759,000
Bottomfish	46,668,537	2,887,600
Other food fish (including halibut)	26,283,997	5,309,000
Industrial fish	4,297,094	27,000
Shellfish	16,910,296	3,044,400
Total	147,916,231	23,027,000

1/Preliminary.

High production was recorded in the commercial net fishery for salmon in the southern area of Puget Sound. However, in the northern areas--Port Susan, Port Gardner, and Skagit-Bellingham-Samish Bays--the chum salmon fishery was a complete failure. Sockeye salmon landings of 7.9 million pounds were good only because United States fishermen were able to catch more than their usual share of the run while Canadian fishermen were tied-up by a labor dispute.

Bottomfish landings of 46.7 million pounds were second only to the record production of 49.0 million pounds in 1945. True cod came back strong in 1963 with landings of 6.2 million pounds. (True cod landings had declined from an average of 12 million pounds between 1954 and 1959, to 2 million and 3 million pounds in 1961 and 1962, respectively.) Ocea

per landings of 15.5 million pounds were at record level.

Carp landings were also noteworthy, increasing from a range of 200,000-300,000 pounds in 1957-1960 to 825,000 pounds in 1961. 1.2 million pounds in 1962 and 1963. Catches were taken from Moses Lake, Sprague Lake and reservoir areas of eastern Washington. Virtually all of the carp catch is exported or reduced to fish meal.

Herring catch in 1963 was about average with landings of 6.9 million pounds for all uses -- reduction, bait, and human consumption.

Shellfish landings of 16.9 million in 1963 were close to an all-time low due to a decline in the harvest of oysters, shrimp, and clams. (Washington Department of Fisheries, February 28, 1964.)

SALMON CATCH BY SPORT FISHERMEN IN 1963:

Washington State sport fishermen enjoyed an animated record catch of 1,130,308 salmon in 1963, with pink salmon predominating in the catch for the first time. The pink salmon catch of 437,000 fish was far above sport catches of that species in previous years. The sport catch of chinook and silver salmon was also high. The estimated silver salmon sport catch of 428,000 was second to the record catch in 1957, and the 1963 chinook salmon sport catch of 265,000 was exceeded only in 1956 and 1957.

Fishing effort, which obviously has an important effect on catch, increased in 1963 to a total of 1,467,000 angler trips, a gain of 333,000 trips over the previous high established in 1962. Despite the high fishing intensity, the average catch per fisherman-day was 0.77 salmon, the best return to the sport fisherman since 1957.

In 1963, sport salmon catches out of Westport amounted to 173,791 fish, second only to the catch in 1962. Catches at the mouth of the Columbia River hit a record level (11,400 salmon), as did those at LaPush (22,662 salmon), and in the Strait of Juan de Fuca (229,142 salmon). In Puget Sound and the Juan Islands the total catch of 555,723 salmon was the highest ever recorded in those areas due to the large catches of pink salmon.

Since the end of World War II there has been an accelerating trend toward private boat ownership, which has impaired a sport catch estimate system based partially upon reports from boathouses and rental boat agencies. As a result of the current trends, an order of the Washington State Director of Fisheries requires all sport salmon anglers, beginning in 1964, to carry, maintain, and return to the Department of Fisheries a free, nonlimiting punch card on which they will record their salmon catches. The new system will enumerate anglers for the first time and will yield needed information on freshwater salmon catches. (Washington State Department of Fisheries, March 6, 1964.)

Note: See Commercial Fisheries Review, June 1963 p. 52.

FISHERY TECHNICIANS TO BE TRAINED AT PENINSULA COLLEGE:

Peninsula College in Port Angeles, Washington, is developing a two-year training program to prepare students as technicians for employment in fish hatcheries and fishery research laboratories. The first class is expected to start in September 1964. In addition to technical training, the course will include instruction in biology, chemistry, mathematics, English, and speech.

Peninsula College has been awarded a grant of \$29,100 by the W. K. Kellogg Foundation to assist in the development of the fishery technician training program. In addition, the Port Angeles Chamber of Commerce will construct a fish pond at the college. The Washington State Department of Fisheries will provide fingerlings for the pond and assist in its management.

This grant represents one of a series of recent commitments by the philanthropic organization to further semiprofessional and technical education in community junior colleges.



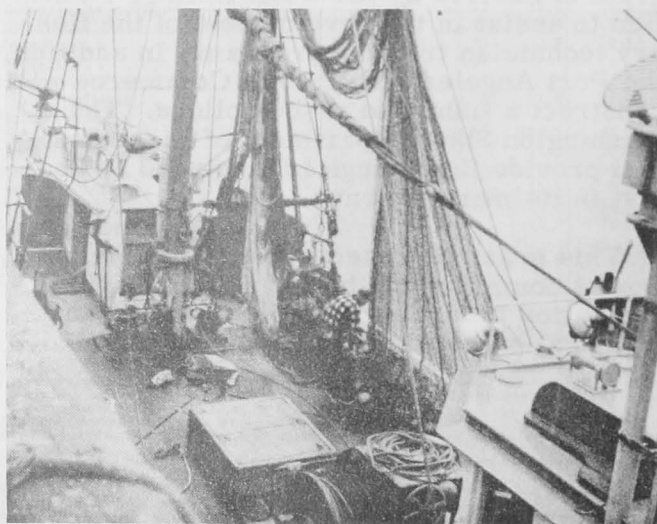
Wholesale Prices

EDIBLE FISH AND SHELLFISH, MARCH 1964:

From February to March, prices were lower for nearly all of the major fishery products listed in the wholesale price index. The exceptions were higher prices for Great Lakes fresh-water fish because of increased demand during the Jewish holidays and some increase in prices for shucked oysters, fresh shrimp, and canned Maine sardines. The March 1964

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, March 1964 with Comparisons								
Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ (\$)		Indexes (1957-59=100)			
			Mar. 1964	Feb. 1964	Mar. 1964	Feb. 1964	Jan. 1964	Mar. 1963
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					104.1	109.0	109.8	117.3
Fresh & Frozen Fishery Products:					105.5	113.2	113.0	123.0
Drawn, Dressed, or Whole Finfish:					100.9	120.8	116.5	121.2
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.08	.21	61.8	160.2	141.0	91.9
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.30	.31	89.2	90.2	96.1	122.2
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.82	.83	114.2	116.0	118.4	132.7
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.73	.58	108.2	85.8	69.4	100.7
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.70	.82	114.7	101.6	80.3	113.0
Processed, Fresh (Fish & Shellfish):					116.1	114.0	115.4	125.5
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.32	.58	77.7	140.8	142.0	94.7
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.97	.91	113.1	106.6	100.8	125.4
Oysters, shucked, standards	Norfolk	gal.	7.50	7.00	126.5	118.0	128.6	130.7
Processed, Frozen (Fish & Shellfish):					96.2	100.7	102.8	117.3
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.39	.39	98.9	98.9	98.9	97.6
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.37	.40	108.5	115.8	114.3	108.5
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.33	.33	114.0	114.0	117.5	117.5
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	.74	.77	87.2	91.3	95.5	123.4
Canned Fishery Products:					102.2	102.0	104.7	107.7
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	21.75	21.75	94.8	94.8	102.4	107.9
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.63	11.63	103.3	103.3	103.3	104.4
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	6.13	6.13	103.9	103.9	97.5	2/100.0
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	9.21	9.09	118.2	116.5	114.9	116.2

1/Represent average prices for one day (Monday or Tuesday) during the week in which the 15th of the month occurs. These prices are published as indicators of movement and not necessarily absolute level. Daily Market News Service "Fishery Products Reports" should be referred to for actual prices.
 2/New product replaced California canned sardines starting December 1962; entered wholesale price index at 100 under revised procedures of Bureau of Labor Statistics.



Trawler with nets hung out for drying. This type of trawler is the mainstay of the New England food-fish industry.

wholesale price index for edible fish and shellfish (fresh, frozen, and canned) at 104.1 percent of the 1957-59 average was down 4.5 percent from the previous month. Compared with March 1963, prices this March were generally lower for most items with the overall index down 11.3 percent.

A marked 16.5-percent drop from February to March in the subgroup index for drawn, dressed, or whole finfish was the direct result of sharply lower ex-vessel prices at Boston for large haddock (down 61.4 percent). Prices for that species in February were very high because of extremely light haddock landings. Compared with the same month a year earlier, ex-vessel haddock prices this March were lower by 32 percent. The abrupt drop in haddock prices was partly offset by substantial increases in prices at Chicago for fresh Lake Superior whitefish (up 26.1 percent) for the Passover holiday trade, and a price rise at New York City for Great Lakes round yellow pike (up 12.9 percent). As compared with March 1963, the subgroup index was down 16.7 percent. Prices this March were lower than a year earlier for all items in the subgroup except fresh-water fish.

The subgroup index for processed fresh fish and shellfish in March 1964 was down only 1.8 percent from the previous month despite sharply lower prices for fresh haddock fillets (down 44.8 percent) at Boston. Compared with the same month in 1963, fresh haddock fillet prices were lower by 18 percent. From February to March, fresh shrimp prices at New York City rose 6.1 percent and prices for standard shucked oysters at Norfolk were up 7.2 percent. Prices this March for all items in the subgroup were below those of March 1963 and the index was down 7.5 percent.

From February to March, lower prices for frozen haddock fillets (down 6.3 percent) and a decline in prices for frozen shrimp (down 3 cents a pound) at Chicago were responsible for a 4.5-percent drop in the subgroup index for processed frozen fish and shellfish. March 1964 prices for other frozen fillets were unchanged from a month earlier. As compared with March 1963, the subgroup index this March was down 18.0 percent largely because of lower frozen shrimp prices and lower prices for ocean perch fillets.

May 1964 prices for most canned fishery products were unchanged from the previous month, but canned Maine sardine prices were up 1.5 percent. Those higher prices moved the subject index up 0.2 percent from February to March. But compared with March 1963, the index was down 5.1 percent. Prices in March were lower for canned Alaska pink salmon (down 11 percent) and canned tuna prices were slightly below those of the same month a year earlier. Prices for canned Maine sardines were a little higher than in March 1963 when stocks were higher than they had been for some time.



Wisconsin

FISHERY LANDINGS, 1963:

Total landings of fish at Wisconsin ports of Lake Superior and Lake Michigan (including Green Bay) in 1963 amounted to 16.2 million pounds--1.8 million pounds or 15 percent below landings for the previous year, according to data released by the U. S. Bureau of Commercial Fisheries.

Considerably less chubs (down 28 percent) and lake herring (down 58 percent) were landed in 1963 than in 1962, but there was some increase in the landings of alewives, and yellow perch landings were up 18 percent from the previous year. The 1963 landings of the more valuable species were lower than the previous year--whitefish was down 20 percent, and lake trout landings at Lake Superior were only about one-third those of the previous year because of restrictions placed on commercial fishing for that species.



Wisconsin fishing areas.

Landings in Wisconsin during 1963 from Lake Michigan accounted for 9.9 million pounds, Green Bay 3.8 million pounds, and Lake Superior 2.6 million pounds.

Four species of fish comprised 84 percent of the 1963 landings. They were chubs 35 percent; alewives 22 percent; yellow perch 20 percent; and lake herring 6 percent. The remainder was mostly carp and lake smelt.



HOW FAST DO FISH SWIM

How fast do fish really swim? Until recently 60 m.p.h. was thought reasonable for a really fast fish, but experiments at Aberdeen Research Laboratory, Scotland, and Cambridge University with fresh-water fish, show that they do not swim at such high speeds.

So far the highest accurately recorded speed is 27 m.p.h. for four feet for a barracuda in American waters. The speed was measured by a piscatometer--an instrument made from a fishing line fitted with accurate gauges to measure the tension on the line, and the speed at which it runs out.