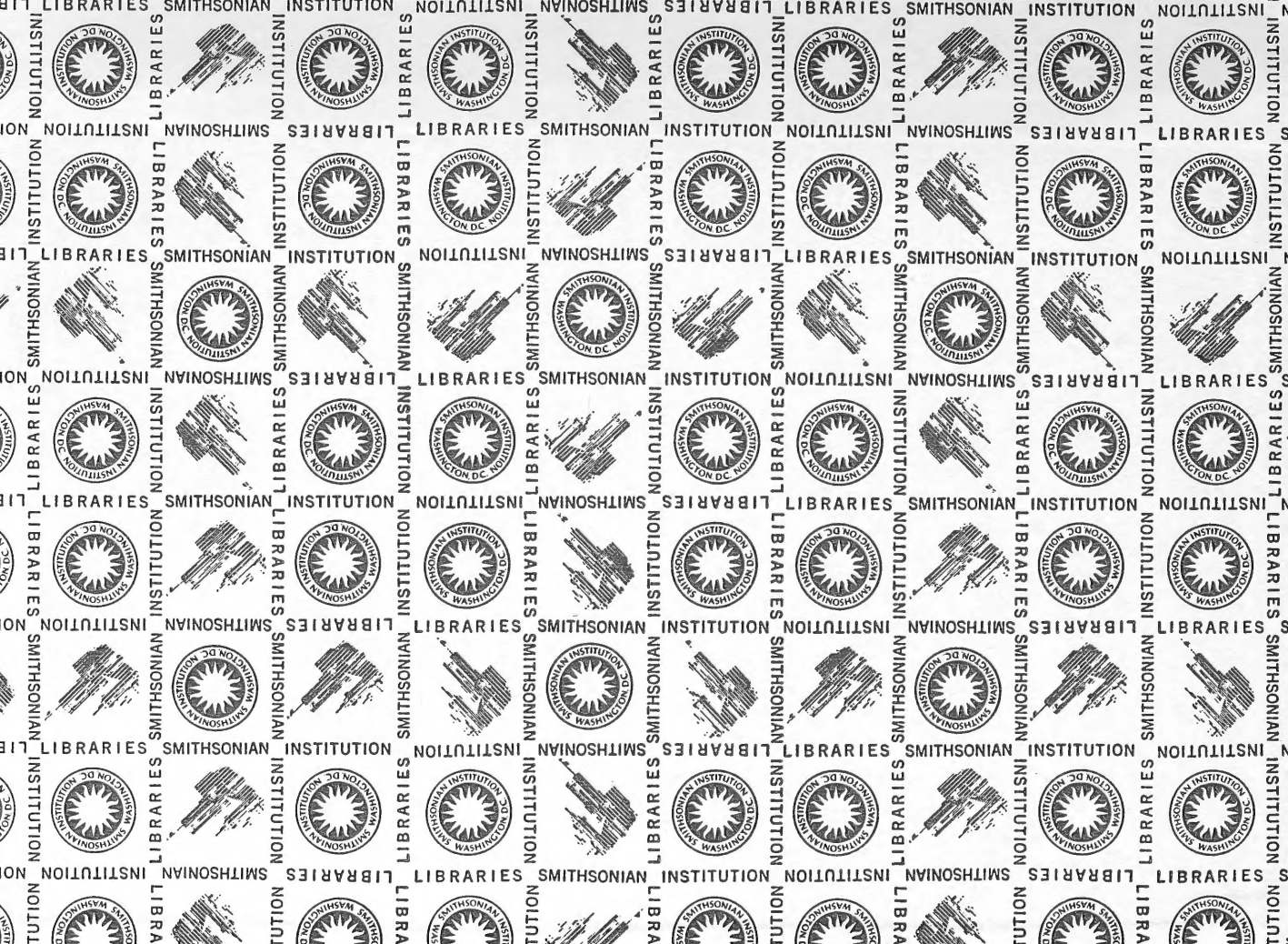
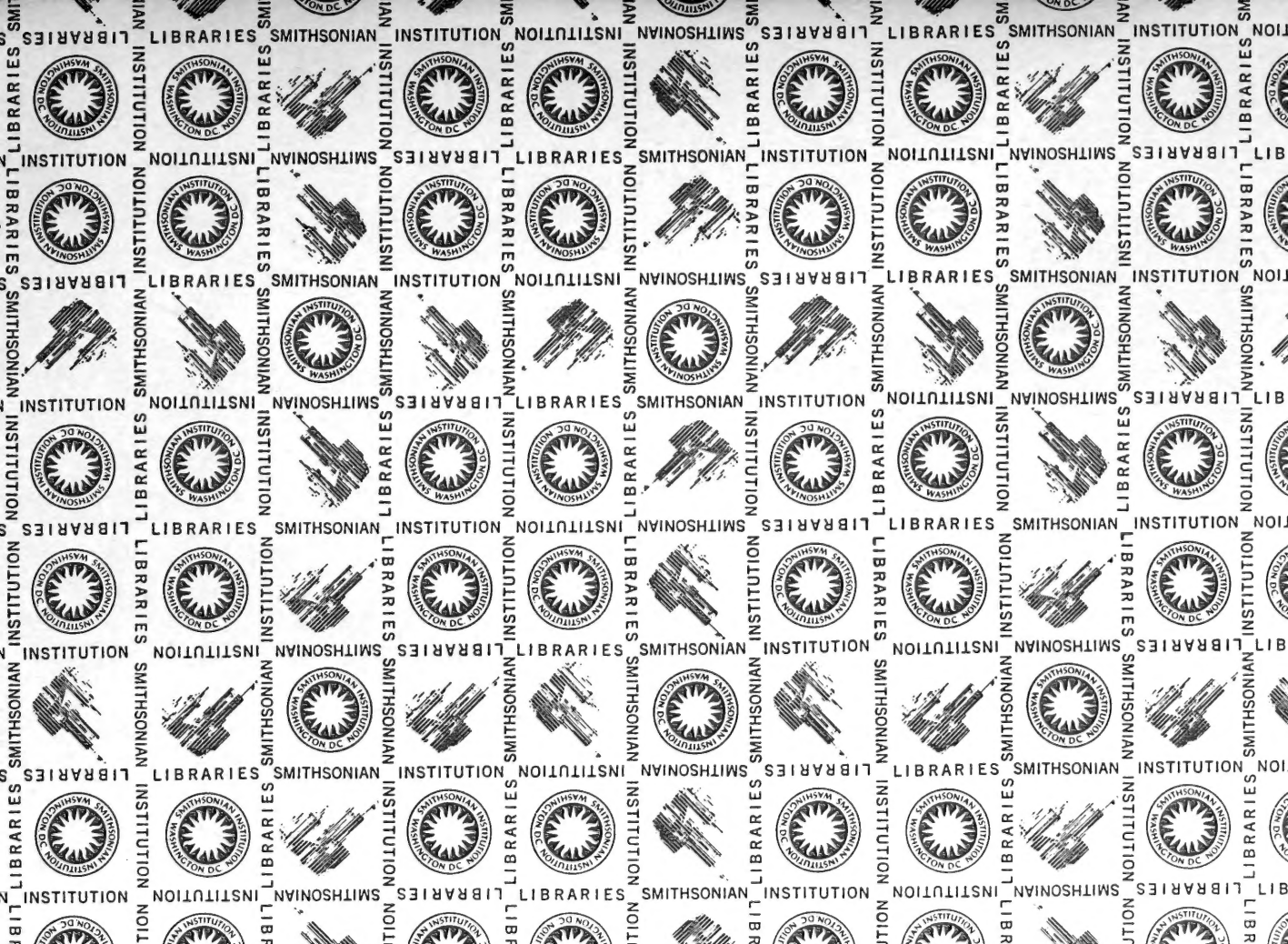

SMITHSONIAN INSTITUTION LIBRARIES


SMITHSONIAN INSTITUTION LIBRARIES

COMMERCIAL FISHERIES REVIEW

Vol. 19, No. 1 JANUARY 1957

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor

J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Live bait fishing for skipjack tuna or "aku" is Hawaii's most important fishery. (See pp. 1-8 of this issue.)

Contents Continued Page 103

COMMERCIAL FISHERIES REVIEW

January 1957 Washington 25, D.C. Vol. 19, No. 1

DEVELOPMENT OF "HONEYCOMBING" IN HAWAIIAN SKIPJACK TUNA

By Tamio Otsu*

CONTENTS

BACKGROUND

The skipjack tuna (Katsuwonus pelamis) supports the most important fishery in the Hawaiian Islands--landings smount to about 10 million pounds annually. It is abundant during the summer months (May-September), when more than 75 percent of the annual catch is made. Besides the usual problems besetting any fish-

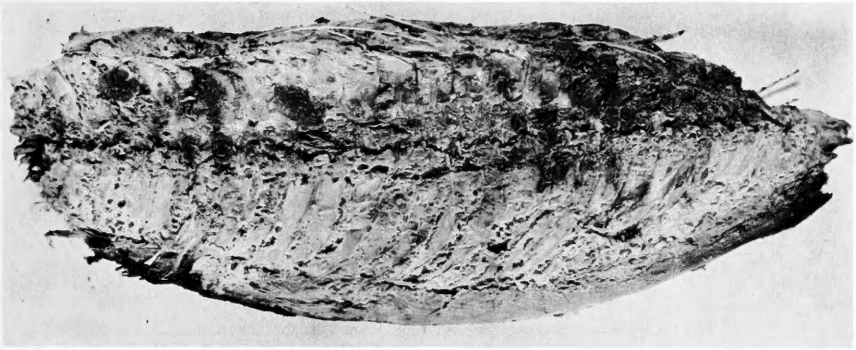


Fig. 1 - An extensively honeycombed skipjack tuna fillet after precooking.

ery, the industry is troubled from time to time with honeycombing, a pitted and cellular condition which appears in some of the fish during precooking, making the meat unsuitable for canning. During 1956 about 58,000 pounds of skipjack were so affected.

* Fishery Research Biologist, Pacific Oceanic Fishery Investigations, U. S. Fish and Wildlife Service, Honolulu, T. H.

Incidental to studies on skipjack distribution and abundance, the Service's Pacific Oceanic Fishery Investigations conducted several experiments to ascertain whether degree of sexual maturity, size of fish, or type and intensity of refrigeration were related to the appearance of honeycombing during precooking. These experiments suggest that honeycombing is independent of sexual maturity or fish size, but clearly show that it can be induced by holding the fish without refrigeration. Further, they suggest that slight variations in the holding temperature have a striking effect on the length of time required to induce honeycombing, small increases in temperature greatly accelerating the development of the condition. This is believed to be the key to the pronounced seasonality of the problem in Hawaii, where it is significant only during the summer months.

DESCRIPTION OF HONEYCOMBING

The term "honeycombing" is applied to the meat of cooked fish which is pitted and cellular in appearance. Figures 1 and 2 show an extreme case of this condition as it appears after precooking at the cannery. For comparison, the appearance

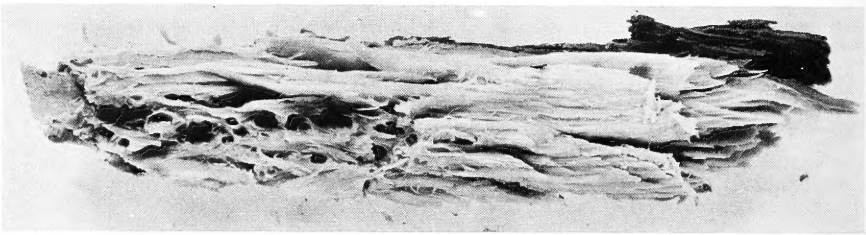


Fig. 2 - A closeup of a piece of honeycombed meat taken from the fish shown in figure 1.

of a normal, nonhoneycombed fish after precooking is shown in figure 3. There are various degrees of honeycombing; in some cases a slight trace may appear in the region of the nape, while in others the condition may be found throughout the entire

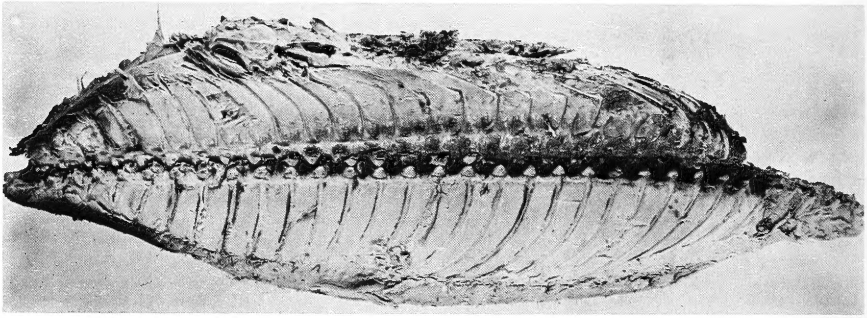


Fig. 3 - A normal nonhoneycombed skipjack tuna fillet after precooking.

body. During the course of the experiments discussed in this paper, it was observed that honeycombing starts at the nape and works posteriorly towards the caudal region. There were also some indications that it begins in the interior of the fish near the backbone and progresses outward.

Honeycombing should not be confused with another condition in the fish in which the meat has a texture variously described as "putty," "mushy," or "jellied." The latter condition is probably caused by sporozoan infection of the muscles as described for yellowfin tuna meat by Arai and Matsumoto (1953).

SEXUAL MATURITY

PROCEDURE: In order to study the relationship between honeycombing and sexual condition of the fish, 131 female skipjack were examined from a load of fish butchered and precooked on August 11, 1954. Ovaries were collected to determine the degree of ova maturity. When the fish were canned on August 12, they were examined for evidence of honeycombing.

RESULTS AND DISCUSSION: Of the 131 fish, ranging in weight from 14 to 18 pounds, 7 (5.3 percent) were honeycombed. The degree of maturity of these 7 as well as of 19 normal fish was estimated by measuring 10 eggs of the largest group in the ovaries (table 1). The mean size of the largest group of eggs in the ovaries was about the same for all ovaries examined. Furthermore, no gross differences were detected between the ovaries of honeycombed and normal fish; all appeared to be in the same stage of maturity. Hence, this experiment indicated no relationship between honeycombing and the sexual state of the fish.

Table 1 - Results of Ova Measurements Made to Determine Degree of Sexual Maturity of Normal and Honeycombed Female Skipjack Tuna

Honeycombed Fish		Normal Fish	
Fish Size (Dressed Weight)	Mean Ova Size	Fish Size (Dressed Weight)	Mean Ova Size
Lbs.	mm.	Lbs.	mm.
14	.587	-	.572
14 1/4	.590	-	.585
15 1/2	.574	14	.605
16	.565	14 1/4	.572
16	.594	15	.561
16 1/2	.574	15	.596
15 1/2	.608	15	.563
		15 1/2	.592
		16	.601
		16	.598
		16 1/2	.594
		16 1/2	.579
		16 1/2	.594
		17	.598
		17	.609
		17	.607
		17	.576
		17 1/2	.607
		17 1/2	.618
15.5	.585	Mean 16.1	.591

REFRIGERATION

Experiments designed to test the effect of refrigeration followed this general pattern: (1) a group of skipjack were taken from a school by live-bait fishing; (2) a portion of the group were frozen within an hour or two as controls; (3) the remainder received various experimental treatments prior to freezing.

EXPERIMENT NO. 1--Crushed Ice vs. Freezing: On July 25, 1954, 66 skipjack (16 to 24 pounds) were taken from a school 60 miles off the southwest coast of the island of Hawaii: 26 were dry frozen within an hour of capture; 1½ hours later the remaining 40 were packed in crushed ice in an unrefrigerated brine well.

The iced fish were repacked the next day, since the ice melted rapidly and many of the fish on the bottom were immersed in water. In order to control this excessive melting, partial refrigeration was resorted to on the morning of July 27,

approximately 45 hours after the start of the experiment. The brine tank temperature was lowered to 40° F. in order to reduce the rate of melting and was occasionally lowered further to 20° F. in order to refreeze the melted ice. Unfortunately, this resulted in freezing the fish, so this experiment in essence tests immediate freezing against 45 hours in crushed ice.

More fish were added to the freezer from another school fished on July 28, bringing the total of dry-frozen fish to 40. These were almost the same size as the first group (15-24 pounds).

The 80 skipjack (40 dry-frozen and 40 "iced") were delivered to the cannery on August 1, a week after the beginning of the experiment. The two groups of fish were butchered and precooked on August 2 in two separate cartloads. They were examined and packed on August 3.

Results and Discussion: All except two fish were in excellent condition. These two, both from the "iced" group, were rejected, one for a very slight trace of probable honeycombing near the nape and the other for a slightly "mushy" texture. The defects in both cases were detected only after the most critical examination.

This experiment indicates no significant difference in the condition of fish frozen immediately after capture and those held in crushed ice for a period of 45 hours prior to freezing.

EXPERIMENT NO. 2--Freezing vs. Holding at Sea-Water Temperature: On August 16, 1954, 80 skipjack (15-32 pounds) were taken 20 miles north of the island of Molokai: 40, selected at random, were frozen within 1½ hours of capture; the remaining 40 fish were held in unrefrigerated circulating sea water for 14 hours (15 hours from capture) before they were frozen. The sea-water temperature during this period ranged between 78.0° F. and 79.0° F. and averaged 78.4° F. This is the type of storage generally used by commercial fishermen in Hawaii for cannery deliveries. The length of time fish are held in sea water prior to delivery at the cannery, where they are held in brine at 32° F., depends on the location of the catch and other operational factors.

Table 2 - Results of Experiment Testing the Condition After Precooking of Fish Frozen Shortly After Capture and Fish Held in Sea Water for 14 Hours Before Freezing

	Dry Frozen Immediately			Held in Sea Water 14 Hours 1/		
	Number Rejected 2/	Number Accepted	Total 3/	Number Rejected 2/	Number Accepted	Total 3/
Males	0	18	18	20	3	23
Females	1	19	20	14	1	15
Total	1	37	38	34	4	38

1/ These fish were on deck for 1 hour before being stowed. Temperature of sea water ranged from 78.0° F. to 79.0° F., averaging 78.4° F. during the experiment.
2/ Rejected because of honeycombing.
3/ Only 38 of the 40 fish in each lot were followed through the cannery. Identification tags were lost on the remaining 4 fish.

Just prior to freezing, the unrefrigerated fish were somewhat soft, but none emitted any "off" odor nor showed noticeable signs of decomposition. The two groups of fish (40 dry-frozen and 40 held in sea water) were delivered to the cannery on August 30, 1954, and were butchered and precooked on August 31 and canned on September 1.

Results and Discussion: Of the 38 frozen fish followed through the cannery, only 1 (2.6 percent) was found to be honeycombed; of 38 that had been held in sea water, 34 (89.5 percent) were honeycombed (table 2). Size and sex distributions of the two groups were similar (tables 2 and 3). The stomachs of both groups

were generally well filled, and many contained partly digested young skipjack, suggesting that their immediate precapture histories were essentially identical.

This experiment coincided with the peak of the skipjack season, and at the time honeycombing was quite common in the commercial catch, which is held in sea

Table 3 - Size of Fish in the Experiment Testing the Condition After Precooking of Fish Frozen Shortly After Capture and Fish Held in Sea Water for 14 Hours Before Freezing

	Size Groups (cm.) 1/					Not Recorded	Total
	67-70	71-74	75-78	79-82	83-84		
Fish frozen...	5	27	3	2	0	1	38
Fish held in sea water...	9	14	9	5	1	0	38

1/ The fish ranged in size from 67 to 84 cm. in total length or approximately 15 to 32 pounds each in weight.

water from the time of capture until delivery at the cannery. The results of this single experiment did not in themselves answer the question of whether or not the skipjack are at this season somehow inherently more susceptible to honeycombing than at other times. They did, however, strongly suggest that the phenomenon could, at this season, be produced to a high degree in one batch of fish and almost completely prevented in another batch of similar fish simply by regulating the temperature at which the fish were held after capture.

EXPERIMENT NO. 3--Varying Time in Sea Water vs. Immediate Freezing: On May 25, 1955, 82 skipjack averaging 7 pounds and ranging from about 5 to 11 pounds in weight were taken a few miles off Oahu. The control group of 32 fish selected at random was frozen within 1 hour after capture. The remaining 50 fish were put in unrefrigerated circulating sea water, and at 5-hour intervals groups of 10 fish were transferred from the sea water to the freezer, the last group being transferred after 25 hours in sea water (26 hours from time of capture). The temperature of the sea water during the 25 hours ranged between 74.7° F. and 75.6° F. and averaged 75.3° F. On May 28, 1955, the 82 experimental fish were delivered frozen and held frozen until June 8 when they were air-thawed; they were precooked on June 9, and examined on June 10.

Results and Discussion: The results (table 4) were in general consistent with those obtained in experiment No. 2. The control group of 32 fish was completely

Table 4 - Results of Experiment No. 3

Group	Number of Fish	Hours in Sea Water 1/	Cannery Results		Remarks 2/
			Number Honeycombed	Percentage Honeycombed	
A	32	0	0	0.0	Completely acceptable
B	10	5	0	0.0	Do.
C	10	10	0	0.0	Do.
D	10	15	0	0.0	Do.
E	10	20	10	100.0	Degree of honeycombing about 80 percent in each fish
F	10	25	10	100.0	Degree of honeycombing about 95 percent in each fish

1/ All fish were on deck for 1 hour before being stowed. Sea-water temperature, 74.7° F. - 75.6° F., averaging 75.3° F.
2/ Observations by a cannery representative.

acceptable with no trace of honeycombing, but the experimental groups gave varying results. There was no honeycombing in those held from 5 to 15 hours (6-16 hours from capture) in sea water, but the 20- and 25-hour groups (21-26 hours from capture) were all honeycombed. In the previous experiment fish held in seawater for 14 hours developed honeycombing, while in this instance the 15-hour group did not. The significant differences between the two experiments were: (1) the first experiment was conducted in August and the second in May; (2) the sea-water temperature averaged 78.4° F. in August and 75.3° F. in May; (3) the fish used were smaller in May; (4) the fleet was experiencing honeycombing in August but not in May. In view of these differences, the results appear to indicate that honeycombing is a seasonal phenomenon only in that it is related to seasonal changes in the sea-water temperature, and that it can probably be produced in Hawaiian skipjack at any season if the fish are kept at high enough temperatures for a long enough time.

EXPERIMENT NO. 4--Varying Time in Sea Water vs. Immediate Freezing: Following the same design as in the previous experiment, this trial used 90 fish averaging 28 pounds (25 to 34 pounds) each taken a few miles off the northwest coast of Oahu on June 9, 1955: 40 fish (Group A) were placed in the freezer within 1½ hours of capture; the remaining 50 fish were held in circulating sea water for varying lengths of time up to 25 hours (27 hours from capture). The sea-water temperature during the 25-hour interval ranged between 75.0° F. and 76.5° F., averaging 75.8° F.

The following observations were made at the time of transfer of fish from sea water to the freezer.

Group	Hours In Sea Water	Remarks
B	10	Fish with slight off-odor but quite firm
C	15	Do.
D	20	Fish with ripe odor; meat somewhat softer
E	25	Fish with ripe odor; soft meat; deteriorating

Unfortunately, as the ship's freezer was overcrowded, the fish did not freeze properly, and when they were delivered to the cannery's freezer on June 10, 28 hours after the start of the experiment, only a few of the control group were completely frozen. On June 14 the fish were removed from the cannery freezer to thaw. It was found at this time that four fish had lost their tags. These pairs had been tied together in pairs with a single label, and since two groups of 10 were exactly two short, it was known that the four unlabeled fish had come from only two groups. By comparing the general condition of the two pairs of unidentified fish with the two groups, it was possible to make probable assignments. Pair X was in condition comparable to the remaining 8 fish of group C, and pair Y to group D (see table 5).

Table 5 - Results of Experiment No. 4

Group	Number of Fish	Hours in Sea Water 1/	Cannery Results		Remarks 2/
			Number Honeycombed	Percentage Honeycombed	
A	40	0	0	0.0	One fish with a "putty" texture
B	10	5	1	10.0	One fish with "very faint trace of what could be the start of honeycombing"
C (X)	8 2 (?)	10 10 (?)	1 1	20.0	Two fish with "slight trace of what could be start of honeycombing" at nape--only at the surface
D (Y)	8 2 (?)	15 15 (?)	8 2	100.0	All honeycombed; degree of honeycombing 5, 10, 10, 20, 20, 20, 20, 20, and 50 percent, all at nape
E	10	20	10	100.0	All honeycombed; degree of honeycombing 20, 20, 20, 20, 25, 40, 40, 45, 45, and 80 percent. All at anterior portion of body, none in caudal region
F	10	25	10	100.0	All honeycombed; degree of honeycombing 10, 20, 40, 50, 55, 55, 55, 80, 80, and 90 percent. Only caudal region unaffected

1/ All fish were on deck for 2 hours before being stowed. Sea-water temperature, 75.0° F.-76.5° F., averaging 75.8° F.
2/ Observations by a cannery representative.
(?) Indicates probable assignment of fish in the group as discussed in text.

Results and Discussion: There was a definite progression in the degree of honeycombing with the length of time the fish were kept in sea water (table 5).

Generally, the fish held in sea water for 15 hours or more were badly honeycombed; however, there were a few fish in the other groups which had possible traces of the condition. It may be relevant to reiterate here that in this experiment the fish did not freeze properly until they had been transferred to the cannery's freezer, 28 hours after the start of the experiment. This may have been the reason for the development of some honeycombing in the groups refrigerated after only 5 and 10 hours in sea water.

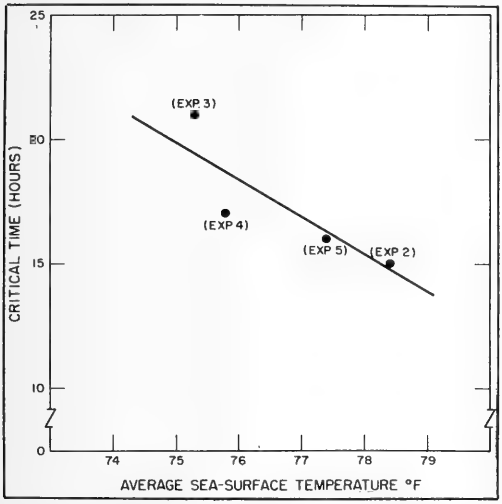


Fig. 4 - The relationship between average sea-water temperature and the length of time fish were held before honeycombing developed. (The sea-water temperature is the average surface temperature for the period in which the fish were held in sea water. Temperatures were obtained from bucket thermometer and thermograph readings. The "critical time," which is the time required to induce honeycombing in 90 percent of the fish, includes the time the fish were on deck prior to treatment.

Note: The critical time was not definitely established in experiment No. 2 since only one group of fish was held in sea water.)

This experiment, both in terms of results and design, closely resembled the preceding test, except that the fish were larger (28 pounds versus 7 pounds) and the sea water was slightly warmer. At the time of the experiment (June) the commercial fleet was not experiencing honeycombing.

EXPERIMENT NO. 5--Varying Time in Sea Water vs. Immediate Freezing: The final experiment in the series was conducted on 80 skipjack taken 19 miles off the west coast of Hawaii on August 17, 1955. These fish averaged $4\frac{1}{2}$ pounds in weight and ranged from about $3\frac{1}{2}$ to 5 pounds. The control group of 10 fish was frozen within 1 hour of capture and the remaining 70 were held in circulating sea water for lengths of time varying from 6 to 24 hours (7 to 25 hours from capture) and then frozen. The sea-water temperature in the brine well containing the fish ranged between 76.2° F. and 80.0° F., averaging 77.4° F. The 80 fish were delivered to the cannery's freezer on August 26, 1955, precooked on August 31, and examined on September 1.

Results and Discussion: The results (table 6) were essentially similar to those obtained in the previous experiments. Some honeycombing was evident in fish kept unrefrigerated for 13 hours, but the bulk of the honeycombing occurred in groups left unrefrigerated for 16 hours or longer. Here again the results clearly indicated a progression in the degree of honeycombing with the length of time the fish were held in unrefrigerated sea water.

SUMMARY

The results of these experiments are remarkably consistent in showing that honeycombing develops in Hawaiian skipjack held without refrigeration, independent of sexual maturity or size of the fish. The seasonality of occurrence observed in the commercial landings (the condition is usually noticed during the summer) is not at all apparent in the experimental results, as honeycombing resulted from delayed refrigeration in experiments performed at different times of the year. It appears that the rate of honeycombing is more rapid at higher sea-water temperatures (fig. 4), and since the months of highest water temperatures in Hawaii coincide with the peak

skipjack season and peak "honeycombing season," it may be inferred that there is a close relationship between water temperature and honeycombing.

The relative fishing success during the peak skipjack season may also affect the onset of honeycombing. Generally, more fish can be taken from a single school during the peak than during the off-season. This may mean that larger numbers of fish are put into the bait well at one time, possibly causing an appreciable rise in the temperature of the sea water, because the body temperature of skipjack immediately after capture is generally higher than the water temperature (Uda 1941). Furthermore, it is believed that the skipjack undergoes an initial increase in temperature for several hours after landing, similar to that reported for the albacore (Scagel 1949). If, under these circumstances, the circulation in the bait well were impeded by a large quantity of fish, it would take considerable time for the temperature of the water in the well to revert to the normal sea-water temperature, and thus the tendency for honeycombing to develop in the warm summer sea water would be aggravated.

Table 6 - Results of Experiment No. 5

Group	Number of Fish	Sea Water 1/	Cannery Results		Remarks 2/
			Number Honeycombed	Percentage Honeycombed	
A	10	0	0	0.0	All in good condition
B	10	6	0	0.0	Do.
C	10	9	0	0.0	Do.
D	10	12	3	30.0	Slight traces on these three fish
E	10	15	9	90.0	Slight to minor on these fish--all at the nape
F	10	18	10	100.0	All honeycombed; degree of honeycombing 20-75 percent
G	10	21	10	100.0	All honeycombed; degree of honeycombing 95-100 percent
H	10	24	10	100.0	All honeycombed; degree of honeycombing 100 percent in each fish

1/ All fish were on deck 1 hour before being stowed. Sea-water temperature, 76.2° F.-80.0° F., averaging 77.4° F.
2/ Observations by a cannery representative.

Although it has been shown that there is a relationship between lag in refrigeration and honeycombing, the basic cause of the condition has not been determined. Further experiments are necessary before precise methods of eliminating or reducing the condition can be prescribed. The results of these few experiments, however, do suggest that in Hawaii a modest amount of refrigeration on the boats would postpone the development of honeycombing long enough to permit delivery of the fish in good condition to the canneries' chill tanks. It might suffice to handle the catch in crushed ice, or simply to add a little ice to the sea water in which the fish are held aboard the boats.

LITERATURE CITED

Arai, Yoro and Koichi Matsumoto
1953. On a New Sporozoa, Hexcapsula neothunni gen. et. sp. nov., from the Muscle of Yellowfin Tuna (Neothunnus macropterus., Bull. Jap. Soc. Sci. Fish. 18 (7): pp. 293-298

Scagel, R. F.
1949. Body Temperatures (Rectal) of Albacore. Fish. Res. Bd. Canada, Pac. Biol. Sta. Circ. 17: p. 23.

Uda, Michitaka
1941. The Body-Temperature and the Bodily Features of "Katuo" and "Sanma." Bull. Jap. Soc. Sci. Fish. 9 (6): pp. 231-236. (English translation--U. S. Fish and Wildlife Service, Spec. Sci. Rept.: Fish. 51: pp. 18-24).

SHRIMP EXPLORATIONS OFF THE WASHINGTON COAST, FALL 1955 AND SPRING 1956

By Edward A. Schaefers* and Harold C. Johnson*

SUMMARY

Shrimp explorations off the Washington coast were conducted by the Service's exploratory fishing vessel John N. Cobb during the fall (October 18 to November 9) of 1955 and spring (March 27 to April 19) of 1956. These explorations were carried out in cooperation with the State of Washington Department of Fisheries' shellfish division. Gear used during the fall exploration included a 20-foot beam trawl and a small West Coast box-type otter trawl. Gear used during the spring exploration included a 20-foot beam trawl, a small West Coast box-type otter trawl, and a 40-foot Gulf of Mexico shrimp trawl.

Fishing results during the fall exploration showed that pink shrimp (Pandalus jordani) were widely distributed at various depths over the entire area explored. The best drag with the beam trawl caught 150 pounds of heads on shrimp an hour and the best drag with the otter trawl caught 600 pounds of shrimp an hour.

Fig. 1 - Method of attaching port door to wing of Gulf shrimp trawl. Starboard door was attached in same manner. Arrow indicates forward portion of "lazy line."

Fishing results during the spring exploration showed that of the three types of gear used, the Gulf shrimp trawl was the most efficient and practicable type of gear for catching shrimp on these grounds. Of the 51 drags made with this gear, 25 caught shrimp in amounts ranging from 300 to 2,200 pounds an hour. The two most promising localities which appeared to offer the best prospects for the development of a commercial shrimp fishery are between the mouth of the Moclips River and the mouth of Connor Creek, and between Grays Harbor and Cape Shoalwater.

BACKGROUND

Explorations for shrimp off the Washington coast were undertaken by the U. S. Fish and Wildlife Service's exploratory fishing vessel John N. Cobb during the fall of 1955 and the spring of 1956. These explorations were carried out in cooperation with the State of Washington Department of Fisheries' shellfish division whose personnel participated in the collection of data aboard the vessel and examined samples of shrimp in the laboratory after the completion of each trip.

During the fall exploration (October 18 to November 9, 1955), 45 drags were made with a 20-foot beam trawl and 7 drags were made with a small West Coast

* Fishery Methods and Equipment Specialists, Exploratory Fishing and Gear Development Section, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

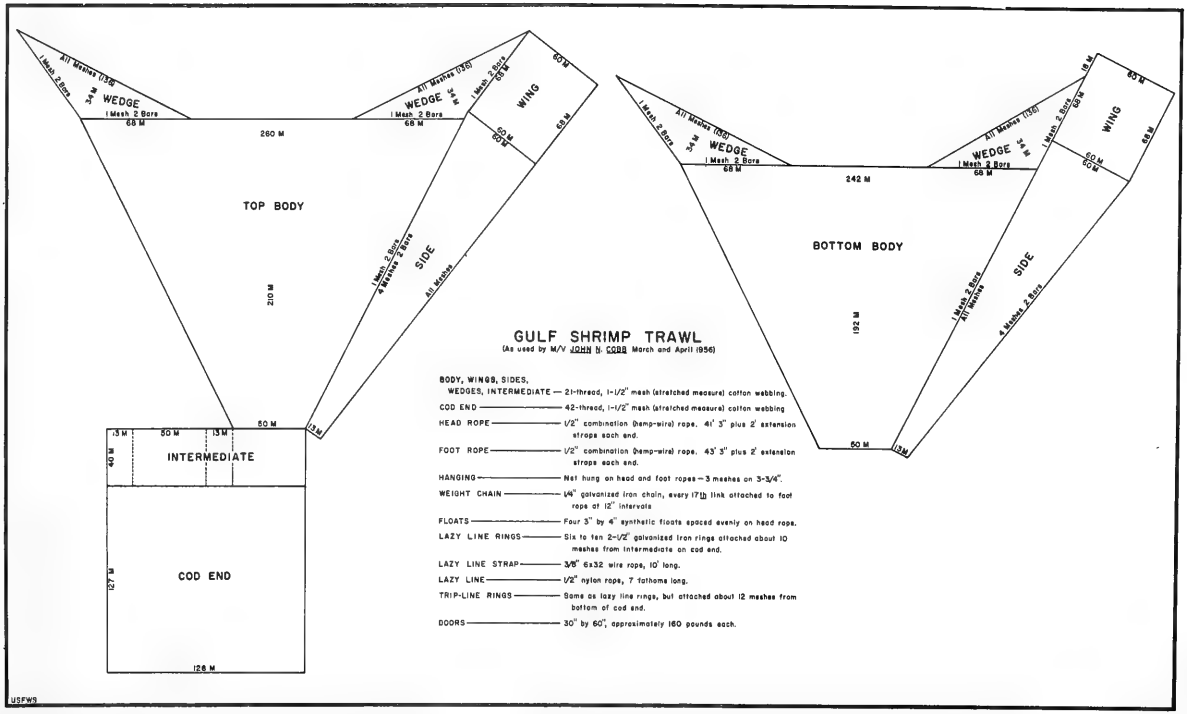


Fig. 2 - Gulf shrimp trawl used during the spring (March 27 to April 19, 1956) exploration by the exploratory fishing vessel John N. Cobb.

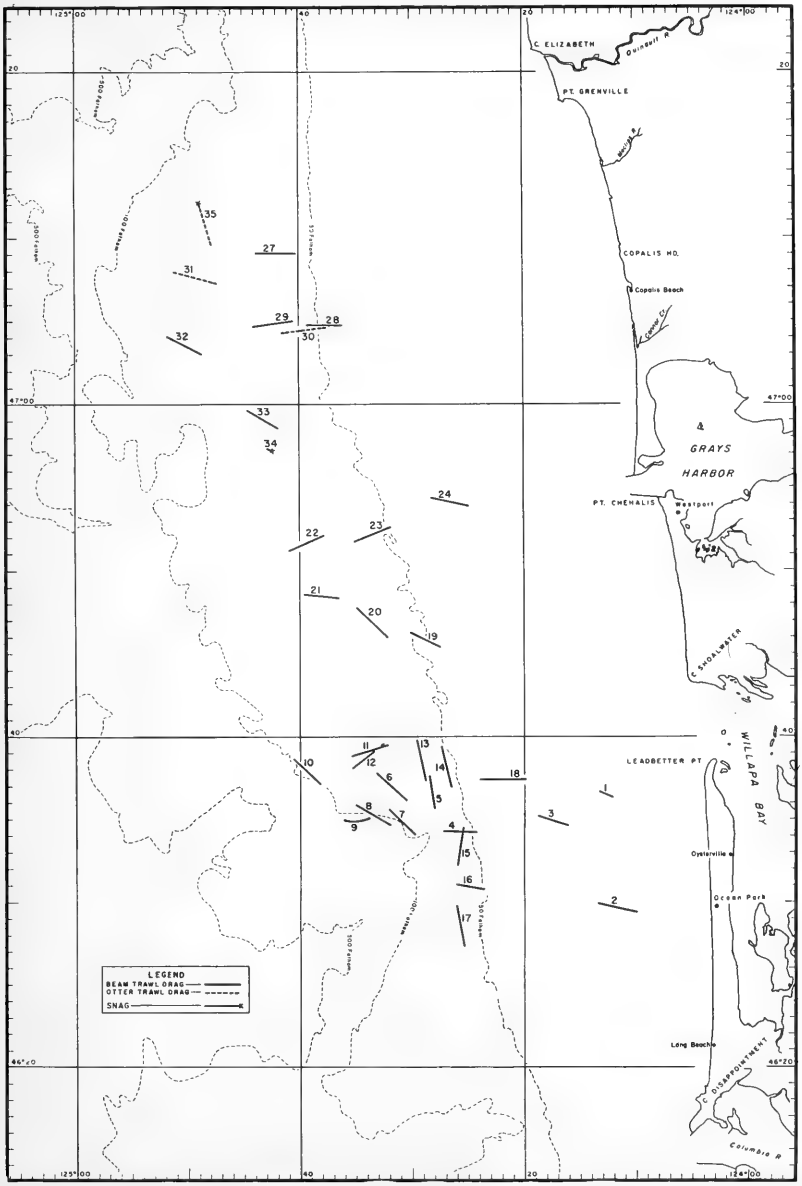


Fig. 3 - Location of beam-trawl drags and otter-trawl drags between Ocean Park and Cape Elizabeth, fall (October 18 to November 9, 1955) exploration.

box-type otter trawl. During the spring exploration (March 27 to April 19, 1956), 51 drags were made with a 40-foot Gulf of Mexico shrimp trawl, 39 with a 20-foot beam trawl, and 4 with a small West Coast box-type otter trawl.

Detailed information concerning each drag made during the fall exploration is tabulated in table 1 (see pages 19 and 20), and the location of each drag is diagrammatically illustrated in figures 3 and 4, respectively. Detailed information concerning each drag made during the spring exploration is tabulated in table 2 (see pages 21, 22, 23, and 24), and the location of each drag is diagrammatically illustrated in figure 8.

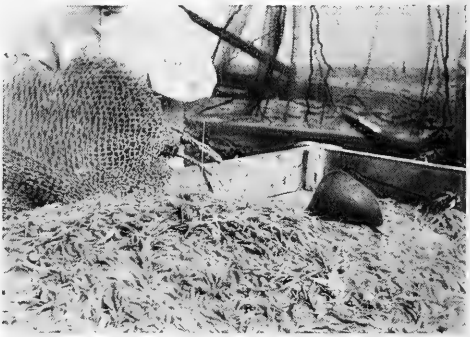


Fig. 4 - Emptying a beam-trawl catch on sorting table located on the deck of the John N. Cobb. Beam-trawl catches usually contained few fish requiring little time or effort to separate fish from shrimp.

THE AREA EXPLORED AND BOTTOM CONDITIONS

Fishing operations during the fall exploration were carried out between latitudes 46°27' N. and 48°04' N., a distance of 97 miles north and south and from $4\frac{1}{2}$ to $28\frac{1}{2}$ miles offshore. The area covered is approximately between Ocean Park and Carroll Island. Fishing operations during the spring exploration were carried out between latitudes 46°21' N. and 47°42' N., a distance of 81 miles north and south and from 11 to 31 miles offshore. The area covered is approximately between Long Beach and Destruction Island.

Successful shrimp explorations off the Oregon coast in 1951 and 1952 (Pruter and Harry 1952) by the Fish Commission of Oregon indicated that the largest concentrations of pink shrimp (Pandalus jordani) were taken in areas with a green-mud or a mixed mud-and-sand bottom, at depths between 60 and 80 fathoms.

Navigational charts of the Washington coast show that in the area between Ocean Park and Carroll Island the width between the 50- to 100-fathom contours varies from approximately 3 to 15 miles with green-mud bottom at numerous localities between these contours throughout this area. Although drags were made at depths ranging from 21 to 116 fathoms during the fall exploration and at depths of 48 to 139 fathoms during the spring exploration, the majority of the drags during both explorations were made between the 50- and 100-fathom contours.

A commercial fishery for bottom fish with otter trawls has been carried on off the Washington coast for a number of years, and generally favorable trawling bottom throughout the area was known to exist prior to the start of the fall shrimp exploration. The locations of known bottom obstructions were obtained from commercial fishermen engaged in the otter-trawl fishery, and these known obstructions were avoided as much as possible during both shrimp explorations. Nevertheless, during the fall exploration, one beam-trawl drag resulted in a broken beam and one otter-trawl drag resulted in net damage, while during the spring exploration two beam-trawl drags resulted in broken beams and eight Gulf shrimp-trawl drags resulted in net damage. Five of the drags with the Gulf shrimp trawl which resulted in net damage were made between Cape Shoalwater and Long Beach. Only one beam-trawl drag here resulted in a broken beam. With the exception of this one particular locality and the small number of localized bottom obstructions encountered in the rest of the entire area, the bottom dragged was considered excellent for all three types of gear.

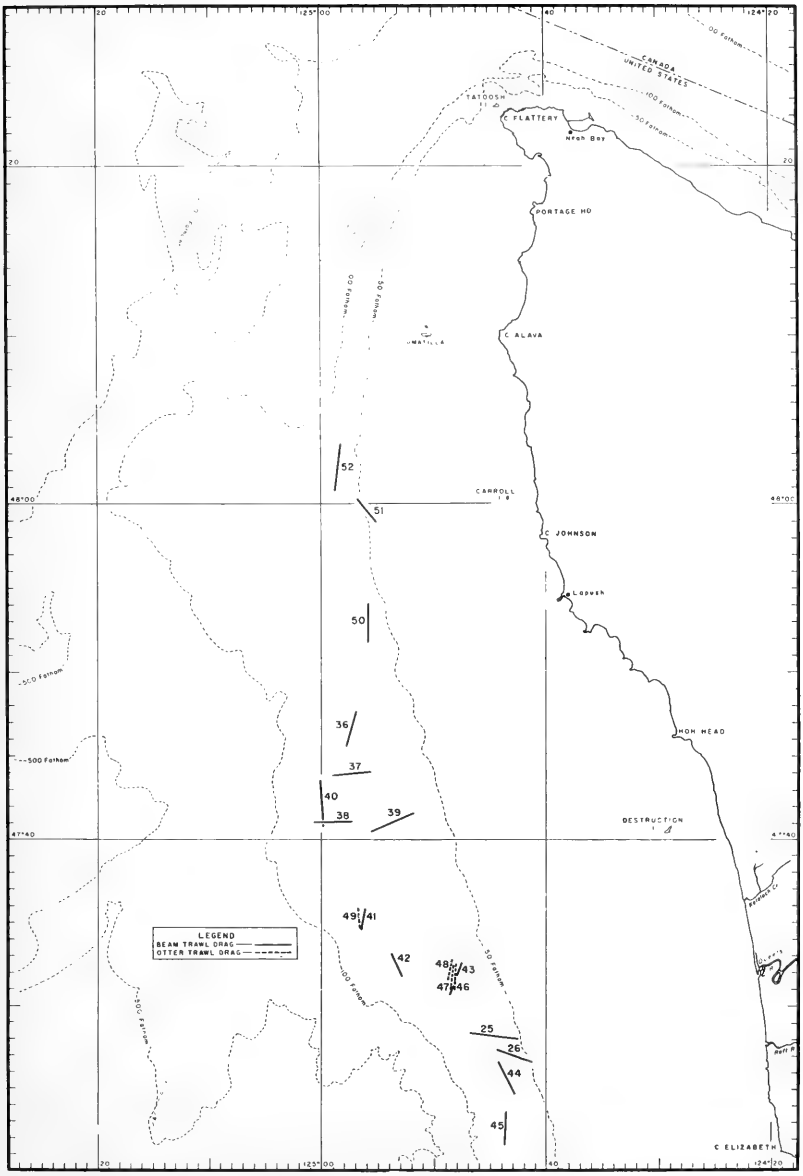


Fig. 5 - Location of beam-trawl drags and otter-trawl drags between Cape Elizabeth and Carroll Island, fall (October 18 to November 9, 1955) exploration

GEAR USED

BEAM TRAWL: The 20-foot beam trawl used was constructed to the same specifications as the beam trawl used during shellfish explorations in Alaskan waters by the John N. Cobb. (Details of the beam trawl are described by Ellson and Livingstone 1952.) Nets of both 15-thread $1\frac{1}{4}$-inch, and 36-thread $1\frac{1}{2}$-inch mesh[1] cotton webbing, 150 meshes deep, were used. The beam was a hemlock pole approximately 8 inches in diameter at the center and cut down to 6 inches at each end to allow for attachment of the "D" frames or runners, which were made of bar iron $\frac{5}{8}$-inch thick and 6 inches wide. As a precautionary measure against possible mudding, which later proved unnecessary, the width of the bottom part of each "D" frame was increased to 16 inches by welding on a $\frac{5}{8}$-inch iron plate. After the hemlock beam was broken, 6 x 6-inch milled spruce beams were used. The beam trawl was towed at an average speed of 2 knots with an average scope[2] of 2.8 to 1.

OTTER TRAWL: The otter trawl used was a 600-mesh West Coast box-type trawl with a head rope 45 feet long and a foot rope 54 feet long. The wings, body, and intermediate of the trawl were $1\frac{1}{2}$-inch mesh cottom webbing and cod ends of both $1\frac{1}{4}$-inch mesh and $1\frac{1}{2}$-inch mesh cotton webbing were used. (Details of the otter trawl are described by Schaefers and Smith 1954.) "Dandy-line" gear 13 fathoms in length extended from the doors to the wings of the net. The net was set from the stern and brought aboard over the starboard side. The otter trawl was towed at an average speed of 2.7 knots with an average scope of 3 to 1.

Fig. 6 - Emptying the West Coast box-type otter trawl on the deck of the John N. Cobb. Many fish were present in catches with this gear, making separating of shrimp difficult.

GULF SHRIMP TRAWL: The Gulf shrimp trawl (fig. 1) used during the spring shellfish exploration of the John N. Cobb is referred to as a 40-foot flat trawl in the Gulf of Mexico shrimp fishery. (See Bullis 1951 for a description of various types of shrimp trawls used in the Gulf of Mexico shrimp fishery.) The trawl was set from the stern of the vessel and towed from a single trawl cable. A bridle, 25 fathoms in length on each leg, led from the end of the trawl cable to the doors. The net was attached to the doors with a 2-foot extension of the head rope and foot rope. The catch was hauled aboard over the stern using a "lazy line" (fig. 2) which ran from one trawl door back to the cod end. The Gulf shrimp trawl was towed at an average speed of 2.6 knots with an average scope of 3 to 1.

FISHING RESULTS

FALL EXPLORATION: Fishing results with the beam trawl during the fall exploration showed that pink shrimp (Pandalus jordani)[3] were widely distributed at various depths over the entire area explored. All drags[4] with the beam trawl caught shrimp

1/ All mesh sizes in this report refer to stretched measure.

2/ Ratio of trawl cable out to depth of water.

3/ Any mention of shrimp in the discussion refers to this species. The small infrequent catches of side-stripe shrimp (Pandalopsis dispar) are tabulated in the fishing log. Other species of shrimp were frequently taken but only in insignificant quantities and are not included in the discussion or the fishing log. These were Crangon species and Spirontocaris species.

4/ Drags in which the gear did not reach bottom are not included.

in amounts ranging from a "trace" [5] to 150 pounds per hour, [6] with the majority of the drags producing over 40 pounds per hour. Although drags were made at depths of 21 to 116 fathoms, the best catches were made at depths of approximately 40 to 90 fathoms on bottom consisting of green mud or a mixture of green mud and sand. Of the 9 beam-trawl drags that caught over 100 pounds of shrimp an hour, 7 were made at depths of 51 to 71 fathoms, and 2 were made at depths of 78 to 88 fathoms. Localities which produced over 100 pounds of shrimp an hour are located off Willapa Bay, off Grays Harbor, off Cape Elizabeth, and off the Queets River. For the best beam-trawl catches see drags 5, 20-23, 27, 32, 41-43, and 45 in the fishing log. Shrimp from these drags ranged from 115 to 166 whole (heads-on) shrimp a pound. [7]

Although only a limited number of drags were made with the small West Coast box-type otter trawl, results indicated that this gear was considerably more effective than the beam trawl in taking shrimp in the area explored off the Washington coast. This was probably due to the larger size of the otter trawl and the faster speed at which the otter trawl was normally towed resulting in more bottom being fished than when using the beam trawl for a similar period of time.

Off Copalis Head four beam-trawl drags at depths of 44 to 81 fathoms caught from 55 to 95 pounds of shrimp an hour and 3 otter-trawl drags at depths of 48 to 80 fathoms caught from 240 to 600 pounds of shrimp an hour. Off the Queets River, a beam-trawl drag at 61 to 65 fathoms that caught 120 pounds of shrimp an hour was approximately duplicated by an otter-trawl drag at 61 to 63 fathoms which caught 270 pounds of shrimp an hour. In this same locality in deeper water a beam-trawl drag at 77 to 88 fathoms caught 110 pounds of shrimp an hour while an approximate duplicate otter-trawl drag at 81 to 85 fathoms caught 50 pounds of pink shrimp an hour. This was the only drag in which the otter trawl failed to catch more shrimp per hour than the best beam-trawl drag of the entire fall exploration.

Fig. 7 - A clean catch of shrimp taken with the Gulf shrimp trawl.

Beam-trawl catches usually contained only small quantities of incidental fish, requiring little time or effort in separating the fish from the shrimp. Otter-trawl catches, however, usually contained larger quantities of fish [8] in relation to the shrimp, making it impracticable to separate all the shrimp.

Shrimp taken in the otter trawl appeared to be smashed in varying degrees, probably due in part to the pressure of the fish against them while in the net. For these reasons it was decided that the use of the small otter trawl for catching shrimp would not be practicable in a commercial operation, and it was decided to experiment in the use of a Gulf shrimp trawl during future shrimp explorations off the Washington coast. It was believed that a 40-foot Gulf shrimp trawl would catch more shrimp than the beam trawl because of its increased spread and faster towing

5/ "Trace" = less than one pound of shrimp.

6/ During the fall exploration all drags in which the gear reached the bottom were of 1-hour duration with the exception of drags number 1 and 34 which were beam-trawl drags and drags number 48 and 49 which were otter-trawl drags. The catches for drags number 48 and 49 have been converted to an hourly basis in the discussion.

7/ For details of number of whole shrimp per pound for various drags see tables 1 and 2.

8/ Data concerning fish taken along with the shrimp have been turned over to the State of Washington Department of Fisheries shellfish division for processing.

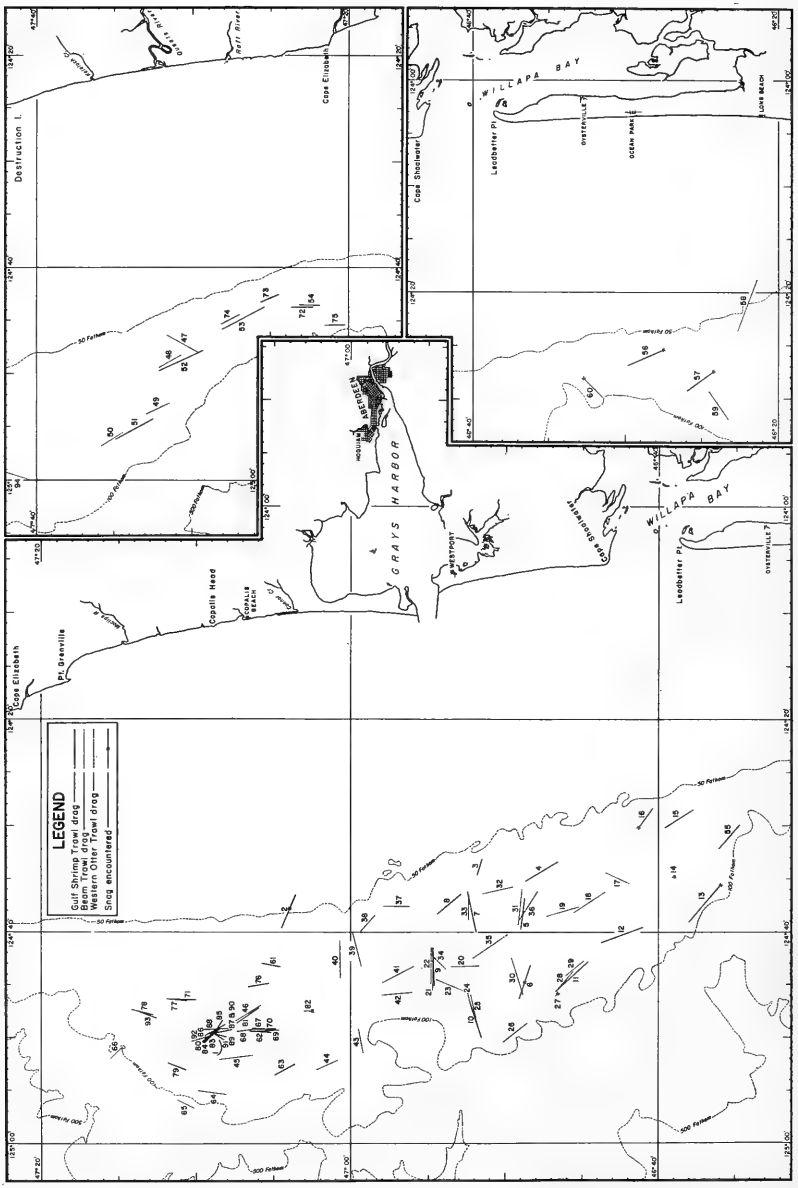


Fig. 8 - Location of beam-trawl drags, otter-trawl drags, and Gulf shrimp-trawl drags, spring exploration (March 27 to April 19, 1956).

speed resulting in more bottom being fished per hour. It was also believed that the 40-foot Gulf shrimp trawl would catch less fish than the West Coast box-type otter trawl because of its shorter wings, less overhang, and the method of attaching the doors almost directly to the net rather than having "dandy-line" gear leading from the doors to the net as in the case of the West Coast otter trawl. These beliefs proved to be true during the spring shrimp exploration.

SPRING EXPLORATION: The best shrimp catches during the spring exploration were made with the Gulf shrimp trawl. Of the 51 drags made with this gear, 25 caught shrimp in amounts ranging from 300 to 2,200 pounds an hour.[9/]

These 25 drags were made in the area between the mouth of Queets River and Oysterville at depths ranging from 61 to 87 fathoms. The two most promising localities which appeared to offer the best prospects for the development of a commercial shrimp fishery are between the mouth of the Moclips River and the mouth of Conner Creek, and between Grays Harbor and Cape Shoalwater.

Between the mouth of the Moclips River and the mouth of Connor Creek a total of 21 daytime and 4 nighttime drags were made with the Gulf shrimp trawl. Excellent shrimp catches were made during daytime hours in 15 of 16 drags at depths of 69 to 79 fathoms. With the exception of drag No. 1 which caught 175 pounds of shrimp, the other 15 drags at these depths caught from 980 to 2,200 pounds of shrimp an hour and averaged 1,407 pounds of shrimp an hour. Included in these 15 drags which were all made on green mud bottom were a series of 7 "production" drags (Nos. 85-91), each of 30-minutes duration made over a 6-hour period between 6:00 a.m. and 12 noon on April 18. These 7 drags, at depths of 74 to 79 fathoms, produced a total of 5,210 pounds of shrimp, with an average of 744 pounds of shrimp per 30-minute drag. The shrimp from these "production" drags averaged from 117 to 148 whole (heads on) shrimp a pound.

The remaining 5 daytime drags with the Gulf shrimp trawl in this locality at various depths from 48 to 66 fathoms and from 83 to 86 fathoms caught from a trace to 250 pounds of shrimp an hour.

Drags with the beam trawl in this locality at depths of 73 to 81 fathoms caught from 90 to 200 pounds of shrimp an hour and drags at over 90 fathoms caught insignificant quantities of shrimp.

The four nighttime drags, all made with the Gulf shrimp trawl, were approximate duplicates of daytime drags which had produced excellent catches of shrimp. The nighttime drags, however, produced only insignificant catches of shrimp ranging from 8 to 14 pounds of shrimp an hour. These drags, each of 30 minutes duration, were started from $1\frac{1}{2}$ to 4 hours after sunset. Results of these nighttime drags suggest that shrimp trawling may not be productive during certain hours of darkness in this area during this season of the year.

Evidence that individuals of this species of shrimp do come off the bottom at night was subsequently obtained in early June 1956, off the northern end of Vancouver Island during a midwater trawl expedition for fish by the John N. Cobb. A drag with a midwater trawl at depths of $43\frac{1}{2}$ to 50 fathoms over bottom depths of 109 to 121 fathoms caught 186 individual pink shrimp. This drag, of 1-hour duration was started $4\frac{3}{4}$ hours after sunset. With the exception of a small-mesh liner in the cod end, the mesh size of the rest of this midwater trawl was too large to effectively capture shrimp, and more shrimp would probably have been taken if the entire net were of a small-mesh size.

9/ Catch results have been converted to a rate-per-hour basis as some variation occurred in the duration of a considerable number of individual drags during the spring exploration.

The one nighttime beam-trawl drag made during the fall exploration caught 65 pounds of shrimp an hour. This drag was started 2½ hours after sunset and was not a duplicate of a daytime drag.

Between the entrance of Grays Harbor and Cape Shoalwater a total of 28 drags were made at depths of 54 to 93 fathoms. Of these 28 drags, 16 were made with the beam trawl, 9 with the Gulf shrimp trawl, and 3 with the western otter trawl. Except for 1 drag at 54 to 56 fathoms which caught only 6 pounds of shrimp an hour and another which snagged, the other 7 drags with the Gulf shrimp trawl caught from 230 to 700 pounds of shrimp an hour. These 7 drags were made at depths of 57 to 87 fathoms. The best drag was made on a green mud bottom while the remaining drags were on a bottom composed of green mud and sand.

Of the 16 beam-trawl drags, 1 resulted in a broken beam, 8 caught from 120 to 275 pounds of shrimp an hour, and the remainder caught from 3 to 90 pounds of shrimp an hour. The majority of the beam-trawl drags which caught over 120 pounds of shrimp an hour were made in approximately the same locations as some of the better Gulf shrimp-trawl drags. The 3 otter-trawl drags caught from 150 to 600 pounds of shrimp an hour. The sizes here ranged from 109 to 182 whole (heads-on) shrimp a pound

Commercial quantities of shrimp were also taken with the Gulf shrimp trawl between Cape Elizabeth and Kalaloch Creek at depths ranging from 57 to 83 fathoms. The majority of the drags with this gear in this locality caught from 420 to 720 pounds of shrimp an hour with only 1 drag [10/] producing less than 420 pounds of shrimp an hour. Drags with the beam trawl caught from 140 to 250 pounds of shrimp an hour.

While drags in this locality produced commercial quantities of shrimp, the shrimp were consistently small, averaging from 161 to 214 whole (heads-on) shrimp a pound. These small shrimp may be present only at certain seasons of the year, as shrimp taken from drags in this locality during the fall exploration showed a marked variation in size running from 100 to 166 whole (heads-on) shrimp a pound.

Between Cape Shoalwater and Long Beach 8 drags were made with the Gulf shrimp trawl at depths of 54 to 105 fathoms, with only 1 drag resulting in a catch of over 300 pounds an hour. This drag (No. 55), of 1-hour duration, was made at 75 to 80 fathoms and caught 315 pounds of shrimp. Five of these drags encountered snags which resulted in torn web. Beam-trawl drags in this area caught only small amounts of shrimp and 1 drag resulted in a broken beam.

SHRIMP ICING EXPERIMENTS

Shrimp were held on ice during the spring exploration for as long as 96 hours with little change noted in the texture of the shrimp meat before or after cooking. The cooked shrimp meat was equal in flavor and color to that of shrimp cooked soon after being landed. It was noted, however, that after 48 hours on ice the pink color of the whole shrimp appeared to have faded to a paler shade. After a day on ice, the shrimp were much easier to peel than when first caught.

WEATHER CONDITIONS

Fishing operations during the fall exploration were seriously curtailed by adverse weather conditions, with no trawling possible on 9 of the 23 days the vessel was in the area of fishing operations.

Weather conditions were generally favorable for fishing operations during the spring exploration with trawling possible on all but 5 of the 24 days the vessel was in the area of fishing operations.

10/ Drag Nos. 53 and 54 are not included. These drags, made during adverse weather conditions, captured only trace amounts of shrimp and were approximately duplicated by drags No. 74 and 72, respectively, which caught 720 and 420 pounds of shrimp an hour.

Table 1 - Fishing Log--Shrimp Exploration Off The Washington Coast--Fall 1955--John N. Cobb

Drag number	1 (B.T.) 1/	2 (B.T.)	3 (B.T.)	4 (B.T.)	5 (B.T.)	6 (B.T.)	7 (B.T.)	8 (B.T.)	9 (B.T.)	10 (B.T.)	11 (B.T.)	12 (B.T.)	13 (B.T.)
Date	10/18/55	10/19/55	10/19/55	10/19/55	10/19/55	10/13/55	10/20/55	10/20/55	10/20/55	10/20/55	10/20/55	10/20/55	10/21/55
Latitude N.	46°36.3'	46°29.5'	46°34.7'	46°34.2'	46°35.6'	46°37.8'	46°34.1'	46°34.7'	46°35.1'	46°37.2'	46°38.8'	46°39.6'	46°37.3'
Longitude W.	124°12.1'	124°10.0'	124°16.2'	124°24.2'	124°28.0'	124°33.2'	124°29.7'	124°32.0'	124°33.9'	124°38.2'	124°35.4'	124°32.5'	124°28.8'
Loran reading	24W-3890	24W-3715	24W-3779	24W-3770	24W-3784	24W-3806	24W-3763	24W-3769	24W-3772	24W-3792	24W-3816	24W-3827	24W-3805
Loran reading	24Y-3489	24Y-3487	24Y-3479.5	24Y-3460	24Y-3451	24Y-3437	24Y-3445	24Y-3439	24Y-3433	24Y-3420	24Y-3430	24Y-3440	24Y-3450
Course, magnetic 2/	272°	260°	266°	250°	329°	110°	291°	278°	245°	290°	051°	211°	325°
Sea	Smooth	Smooth	Smooth	Slight	Slight	Slight	Slight	Slight	Smooth	Slight	Slight	Slight	Calm
Depth range in fathoms	25-28	21-28	34-39	50-69	62-65	71-74	81-84	89-91	100-116	89-93	68-76	69-77	57-61
Type of bottom	gy. S.	gy. S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn.-gy.M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	-	gn. M. & S.	gn. M. & S.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	-	Clear	Clear
Time on bottom in minutes	30	60	60	60	60	60	60	60	60	60	-	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/													
Pink	Trace 4/	Trace	14 (117)	35 (140)	130 (127)	18 (134)	75 (164)	80 (119)	40 (121)	30 (119)	-	45 (142)	75 (119)
Side-stripe	-	-	-	-	-	-	1 (78)	2 (73)	2 (75)	-	-	-	-
Total shrimp catch in pounds	-	-	14	35	130	18	76	82	42	30	-	45	75
Remarks	-	-	-	-	-	-	-	-	-	-	Net not on bottom	-	-

Drag number	14 (B.T.) 1/	15 (B.T.)	16 (B.T.)	17 (B.T.)	18 (B.T.)	19 (B.T.)	20 (B.T.)	21 (B.T.)	22 (B.T.)	23 (B.T.)	24 (B.T.)	25 (B.T.)	26 (B.T.)
Date	10/21/55	10/21/55	10/21/55	10/21/55	10/21/55	10/22/55	10/22/55	10/22/55	10/22/55	10/22/55	10/23/55	10/28/55	10/28/55
Latitude N.	46°39.4'	46°34.5'	46°30.8'	46°29.7'	46°37.4'	46°45.4'	46°46.0'	46°48.4'	46°51.2'	46°51.8'	46°53.9'	47°28.1'	47°26.7'
Longitude W.	124°27.4'	124°25.5'	124°23.6	124°26.0'	124°20.0'	124°27.5'	124°32.2'	124°36.5'	124°41.0	124°35.1'	124°24.9'	124°42.5'	124°41.2'
Loran reading	24W-3931	24W-3772	24W-3728	24W-3714	24W-3812	24W-3905	24W-3907	24W-3928	24W-3952	24W-3970	24W-4011	24W-4053	24W-4053
Loran reading	24Y-3455	24Y-3457	24Y-3459	24Y-3452	24Y-3473	24Y-3459	24Y-3444	24Y-3429	24Y-3411	24Y-3435	24Y-3473	24Y-3286	24Y-3305
Course, magnetic 2/	145°	167°	258°	148°	214°	273°	291°	254°	044°	047°	259°	254°	266°
Sea	Smooth	Smooth	Smooth	Smooth	Smooth	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight
Depth range in fathoms	52-53	55-61	49-54	58-60	41-47	48-52	57-61	65-71	62-69	51-56	36-43	53-63	50-56
Type of bottom	br.-gn.M.& G.	gn.M.S.& Sh.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	-	gn. S.	gn. M. & S.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	-	Clear	Clear
Time on bottom in minutes	60	60	60	60	60	60	60	60	60	60	-	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/													
Pink	40 (115)	65 (139)	45 (126)	30 (134)	70 (125)	75 (150)	110 (158)	140 (145)	130 (148)	140 (161)	-	40 (121)	70 (107)
Side-stripe	-	-	-	-	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	40	65	45	30	70	75	110	140	130	140	-	40	70
Remarks	-	-	-	-	-	-	-	-	-	-	Net not on bottom	-	-

Note: For explanation of footnotes and abbreviations, see p 20.

Table 1 - Fishing Log--Shrimp Exploration Off The Washington Coast--Fall 1955--John N. Cobb (Contd.)

Drag number	27 (B.T.) 1/	28 (B.T.)	29 (B.T.)	30 (O.T.)	31 (O.T.)	32 (B.T.)	33 3/ (B.T.)	34 (B.T.)	35 (O.T.)	36 (B.T.)	37 (B.T.)	38 (B.T.)	39 (B.T.)
Date	10/31/55	11/1/55	11/1/55	11/1/55	11/1/55	11/1/55	11/1/55	11/5/55	11/5/55	11/6/55	11/6/55	11/6/55	11/6/55
Latitude N.	47°09.1'	47°04.8'	47°05.1'	47°04.7'	47°07.3'	47°03.1'	46°58.6'	46°57.3'	47°09.7'	47°47.8'	47°44.1'	47°41.0'	47°40.5'
Longitude W.	124°40.3'	124°36.2'	124°40.6'	124°37.6'	124°47.3'	124°48.7'	124°41.9'	124°12.9'	124°47.8'	124°56.8'	124°55.7'	125°00.6'	124°55.5'
Loran reading	2H4-41145	2H4-41115	2H4-41105	2H4-41110	2H4-41103	2H4-41058	2H4-41033	2H4-41017	2H4-41122	2H4-41253	2H4-41250	2H4-41229	2H4-41213
Loran reading	28S-31400	28S-31428	28S-31405	28S-31421	28S-33621	28S-33631	28S-31404	28S-31400	28S-33531	28S-30291	28S-30701	28S-30701	28S-31041
Course, magnetic 2/	214°	214°	239°	239°	261°	273°	277°	090°	321°	173°	241°	067°	014°
Sea	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Rough	Moderate	Moderate	Moderate	Slight	Slight	Slight
Depth range in fathoms	55-61	44-53	55-63	48-59	72-80	77-81	64-69	70-71	73-77	62-65	63-72	70-84	57-65
Type of bottom	gn. M.	gn. M. & S.	gn. M.	gn. M. & S.	gn. M.	gn. M.	-	S. & Blds.	gn. M.	gn. M.	gn. M. & S.	gn. M.	gn. M. & S.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Snag	Snag	Clear	Clear	Clear	Clear
Time on bottom in minutes	60	60	60	60	60	60	60	7	60	60	60	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/													
Pink	90 (151)	60 (123)	55 (149)	240 (--)	600 (118)	95 (115)	65 (104)	Trace 4/	250 (148)	40 (124)	45 (123)	85 (120)	55 (125)
Side-stripe	-	-	-	-	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	90	60	55	240	600	95	65	-	250	40	45	85	55
Remarks	-	-	-	-	-	-	-	Beam broke	Net torn	-	-	-	-

Drag number	40 (B.T.) 1/	41 (B.T.)	42 (B.T.)	43 (B.T.)	44 (B.T.)	45 (B.T.)	46 (O.T.)	47 (O.T.)	48 (O.T.)	49 (O.T.)	50 (B.T.)	51 (B.T.)	52 (B.T.)
Date	11/6/55	11/7/55	11/7/55	11/7/55	11/7/55	11/7/55	11/8/55	11/8/55	11/8/55	11/8/55	11/8/55	11/9/55	11/9/55
Latitude N.	47°40.8'	47°35.8'	47°33.2'	47°32.7'	47°26.6'	47°23.6'	47°32.5'	47°32.5'	47°32.9'	47°31.7'	47°51.8'	48°00.3'	48°03.6'
Longitude W.	124°59.8'	124°56.2'	124°53.8'	124°47.5'	124°44.3'	124°43.5'	124°48.1'	124°48.3'	124°48.3'	124°56.5'	124°55.8'	124°56.7'	124°58.2'
Loran reading	2H4-41231	2H4-41230	2H4-41230	2H4-41219	2H4-41212	2H4-41232	2H4-41247	2H4-41246	2H4-41247	2H4-41225	2H4-41262	2H4-41270	2H4-41270
Loran reading	28S-30771	28S-31140	28S-31771	28S-32181	28S-32871	28S-33131	28S-32161	28S-32161	28S-32121	28S-31418	28S-29951	28S-29061	28S-28661
Course, magnetic 2/	333°	169°	132°	177°	130°	160°	161°	165°	170°	332°	337°	119°	165°
Sea	Slight	Moderate	Moderate	Moderate	Slight	Slight	Slight	Moderate	Slight	Smooth	Smooth	Moderate	Moderate
Depth range in fathoms	78-81	78-88	78-79	61-65	57-58	63-65	61-64	61-64	61-63	81-85	51-57	48-51	56-57
Type of bottom	gn.M. & Sh.	gn.M.S.& Sh.	gn.M.S.& Sh.	gn. M. & S.	gn. M. & S.	gn. M. & S.	-	-	gn. M. & S.	gn. M. & S.	gn. S. & Sh.	gn. S.	gn. S.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	-	-	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	60	60	60	60	60	60	-	-	30	30	60	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/													
Pink	45 (120)	110 (163)	150 (166)	120 (135)	80 (124)	125 (139)	-	-	135 (100)	25 (100)	60 (130)	Trace 4/	Trace
Side-stripe	-	-	-	-	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	45	110	150	120	80	125	-	-	135	25	60	-	-
Remarks	-	-	-	-	-	-	Net not on bottom	Net not on bottom	-	-	-	-	-

1/Indicates type of gear; B.T. - beam trawl, O.T. - otter trawl.
2/Course given is between starting point and end point.
3/Figures in parentheses indicate number of whole shrimp per pound.
4/"Trace" - less than one pound of shrimp.
5/Night drag.

Symbols for Types of Bottom:

Blds. - boulders M. - mud
br. - brown S. - sand
gn. - green Sh. - shells
gy. - gray

Table 2 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb

Drag number	1 (G.S.T.) [1]	2 (G.S.T.)	3 (G.S.T.)	4 (G.S.T.)	5 (G.S.T.)	6 (G.S.T.)	7 (G.S.T.)	8 (G.S.T.)	9 (G.S.T.)	10 (G.S.T.)	11 (G.S.T.)	12 (G.S.T.)
Date	3/27/56	3/27/56	3/27/56	3/31/56	3/31/56	3/31/56	3/31/56	3/31/56	3/31/56	3/31/56	4/1/56	4/1/56
Latitude N.	47°08.6'	47°04.4'	46°51.7'	46°46.5'	46°48.7'	46°48.3'	46°51.8'	46°52.7'	46°54.6'	46°52.3'	46°46.7'	46°43.7'
Longitude W.	124°51.6'	124°39.6'	124°34.7'	124°33.5'	124°36.8'	124°34.1'	124°40.0'	124°36.4'	124°41.5'	124°46.4'	124°45.6'	124°41.1'
Loran reading	2H-4098	2H-4101	2H-3970	2H-3911	2H-3931	2H-3915	2H-3961	2H-3979	2H-3990	2H-3952	2H-3891	2H-3865
Loran reading	2S-3333	2S-3411	2S-3437	2S-3440	2S-3428	2S-3402	2S-3415	2S-3430	2S-3408	2S-3386	2S-3392	2S-3411
Course, magnetic [2]	073°	090°	084°	307°	254°	266°	055°	298°	246°	229°	116°	138°
Sea	Moderate	Rough	Rough	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight
Depth range in fathoms	77-78	48 -56	54-56	57-60	65-72	76-83	61-70	60-62	69-77	82-86	82-87	76-84
Type of bottom	gn. M.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M.	S. & hrd.
Trawling bottom	Clear	Snag	Clear	Clear	Clear	Snag	Clear	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	60	60	30	60	60	60	60	60	60	60	60	60
Shrimp catch in pounds: (whole shrimp per pound) [3]												
Pink	175 (167)	Trace [4]	3	240 (134)	250 (131)	Trace	300 (131)	230 (120)	350 (120)	400 (182)	700 (142)	20 (151)
Side-stripe	-	-	-	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	175	Trace	3	240	250	Trace	300	230	350	400	700	20
Total shrimp catch, hourly basis	175	Trace	6	240	250	Trace	300	230	350	400	700	20
Remarks	-	Net torn	-	-	-	Net torn	-	-	-	-	-	-

Drag number	13 (G.S.T.) [1]	14 (G.S.T.)	15 (G.S.T.)	16 (G.S.T.)	17 (B.T.)	18 (B.T.)	19 (B.T.)	20 (B.T.)	21 (B.T.)	22 (B.T.)	23 (B.T.)	24 (B.T.)
Date	4/1/56	4/1/56	4/3/56	4/1/56	4/1/56	4/1/56	4/2/56	4/2/56	4/2/56	4/2/56	4/2/56	4/2/56
Latitude N.	46°38.0'	46°39.1'	46°37.6'	46°40.3'	46°41.9'	46°43.5'	46°45.1'	46°53.4'	46°54.7'	46°54.7'	46°54.6'	46°52.4'
Longitude W.	124°39.1'	124°34.8'	124°28.5'	124°28.3'	124°35.4'	124°36.3'	124°37.7'	124°43.3'	124°45.4'	124°41.4'	124°44.4'	124°45.8'
Loran reading	2H-3801	2H-3819	2H-3809	2H-3842	2H-3852	2H-3870	2H-3888	2H-3972	2H-3980	2H-3991	2H-3982	2H-3955
Loran reading	2S-3417	2S-3432	2S-3451	2S-3453	2S-3431	2S-3429	2S-3424	2S-3400	2S-3389	2S-3408	2S-3394	2S-3389
Course, magnetic [2]	109°	116°	306°	285°	002°	304°	322°	157°	068°	248°	085°	231°
Sea	Slight	Moderate	Moderate	Moderate	Moderate	Moderate	Slight	Slight	Slight	Slight	Smooth	Smooth
Depth range in fathoms	90-105	73-74	60-62	54-60	68-72	72-74	69-74	73-75	69-78	68-77	76-82	82-86
Type of bottom	Cl. S. & Blds.	Blds. & hrd.	gn. M. & S.	gn.S.Blds.& G.	gn. M. & S.	gn. M. & S.	gn.S.Cl.& hrd.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.
Trawling bottom	Snag	Snag	Clear	Snag	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	60	7	60	44	60	60	60	60	60	60	60	60
Shrimp catch in pounds: (whole shrimp per pound) [3]												
Pink	5 (116)	-	150 (130)	30 (115)	30 (118)	25 (109)	3	225 (109)	120 (133)	175 (149)	200 (142)	65 (176)
Side-stripe	-	-	-	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	5	-	150	30	30	25	3	225	120	175	200	65
Total shrimp catch, hourly basis	5	-	150	41	30	25	3	225	120	175	200	65
Remarks	Net torn	Net torn Hung up	-	Net torn Hung up	-	-	-	-	-	-	-	-

Note: For explanation of footnotes and abbreviations, see p. 24.

Table 2 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb (Contd.)

Drag number	25 (B.T.) 1/	26 (B.T.)	27 (B.T.)	28 (B.T.)	29 (B.T.)	30 (B.T.)	31 (B.T.)	32 (B.T.)	33 (B.T.)	34 (O.T.)	35 (O.T.)	36 (O.T.)
Date	4/2/56	4/3/56	4/3/56	4/3/56	4/3/56	4/3/56	4/3/56	4/3/56	4/3/56	4/4/56	4/4/56	4/4/56
Latitude N.	46°31.8'	46°30.1'	46°46.7'	46°46.6'	46°44.9'	46°48.8'	46°49.1'	46°49.5'	46°52.3'	46°54.8'	46°52.0'	46°49.0'
Longitude W.	124°18.9'	124°30.4'	124°16.1'	124°45.7'	124°42.8'	124°45.9'	124°39.3'	124°35.8'	124°36.5'	124°42.0'	124°32.5'	124°38.8'
Loran reading	24-3940	24-3918	24-3890	24-3890	24-3876	24-3914	24-3931	24-3942	24-3973	24-3990	24-3958	24-3931
Loran reading	25-3374	25-3369	25-3390	25-3393	25-3404	25-3390	25-3418	25-3432	25-3429	25-3405	25-3404	25-3420
Course, magnetic 2/	055°	119°	111°	109°	298°	050°	074°	325°	249°	202°	124°	101°
Sea	Smooth	Smooth	Smooth	Smooth	Slight	Slight	Slight	Slight	Moderate	Rough	Moderate	Moderate
Depth range in fathoms	82-86	92-93	87-88	82-87	82-85	76-82	64-71	62-63	62-65	70-74	72-75	65-69
Type of bottom	gn. M. & S.	gn. S. & St.	gn.M. & gy.Cl.	gn. M.	gn. M.	gn. M.	gn. M. & St.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.
Trawling bottom	Clear	Clear	Clay bank	Clear	Clear	Clear	Clear	Clear	Soft	Clear	Clear	Clear
Time on bottom in minutes	60	60	10	60	60	60	60	60	60	30	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/												
Pink	90 (156)	40 (163)	-	150 (153)	275 (123)	40 (125)	120 (116)	90 (110)	120 (118)	300	150 (121)	325 (120)
Side-strips	-	Trace 4/	-	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	90	40	-	150	275	40	120	90	120	300	150	325
Total shrimp catch, hourly basis	90	40	-	150	275	40	120	90	120	600	150	325
Remarks	-	-	Boom Broke Hung up	-	-	-	-	-	-	-	-	-

Drag number	37 (B.T.) 1/	38 (B.T.)	39 (B.T.)	40 (B.T.)	41 (B.T.)	42 (B.T.)	43 (B.T.)	44 (B.T.)	45 (B.T.)	46 (B.T.)	47 (B.T.)	48 (B.T.)
Date	4/7/56	4/7/56	4/7/56	4/7/56	4/8/56	4/8/56	4/8/56	4/8/56	4/8/56	4/8/56	4/9/56	4/9/56
Latitude N.	46°56.1'	46°58.4'	46°59.2'	47°00.6'	46°57.9'	46°56.0'	46°59.5'	47°00.8'	47°08.5'	47°07.4'	47°29.7'	47°30.7'
Longitude W.	124°37.6'	124°38.4'	124°43.2'	124°44.3'	124°44.8'	124°45.7'	124°49.2'	124°52.1'	124°52.0'	124°48.4'	124°48.0'	124°48.2'
Loran reading	24-4017	24-4040	24-4036	24-4047	24-4018	24-3995	24-4021	24-4025	24-4096	24-4100	24-4238	24-4241
Loran reading	25-3425	25-3421	25-3397	25-3390	25-3390	25-3387	25-3366	25-3348	25-3331	25-3356	25-3240	25-3230
Course, magnetic 2/	338°	290°	053°	067°	130°	333°	236°	313°	150°	125°	007°	307°
Sea	Moderate	Moderate	Moderate	Moderate	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Slight
Depth range in fathoms	57-58	56-59	59-69	60-69	72-78	78-81	85-91	89-91	78-81	70-73	58-65	64-66
Type of bottom	gn. M.	gn. M. & S.	gn. M. & S.	gn.M.S. & St.	gn. M. & S.	gn. M. & Cl.	gn.M.S. & St.	gy. M. & G.	gn. M. & S.	gn. M.	gn. M. & S.	gn. M. & S.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	60	60	60	60	60	60	60	60	60	60	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/												
Pink	10 (102)	35 (103)	30 (119)	65 (104)	55 (125)	4	25 (156)	50	90 (157)	125	140	250 (163)
Side-strips	-	-	-	-	-	-	Trace 4/	Trace	-	-	-	-
Total shrimp catch in pounds	10	35	30	65	55	4	25	50	90	125	140	250
Total shrimp catch, hourly basis	10	35	30	65	55	4	25	50	90	125	140	250
Remarks	-	-	-	-	-	-	-	-	-	-	-	-

Note: For explanation of footnotes and abbreviations, see p. 24.

Table 2 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb (Contd.)

Drag number	49 (B.T.) 1/	50 (B.T.)	51 (G.S.T.)	52 (G.S.T.)	53 (G.S.T.)	54 (G.S.T.)	55 (G.S.T.)	56 (G.S.T.)	57 (G.S.T.)	58 (B.T.)	59 (B.T.)	60 (B.T.)
Date	4/9/56	4/9/56	4/9/56	4/9/56	4/9/56	4/9/56	4/12/56	4/12/56	4/12/56	4/12/56	4/13/56	4/13/56
Latitude N.	47°31.5'	47°34.5'	47°34.9'	47°32.1'	47°28.1'	47°23.1'	46°36.0'	46°29.9'	46°26.0'	46°22.6'	46°23.2'	46°31.6'
Longitude W.	124°52.8'	124°55.5'	124°56.2'	124°49.7'	124°45.8'	124°43.5'	124°32.2'	124°26.9'	124°29.1'	124°23.6'	124°32.0'	124°29.9'
Loran reading	2H4-4228	2H4-4228	2H4-4227	2H4-4210	2H4-4241	2H4-4230	2H4-3785	2H4-3715	2H4-3665	2H4-3628	2H4-3630	2H4-3733
Loran reading	2H5-3197	2H5-3155	2H5-3148	2H5-3210	2H5-3266	2H5-3317	2H5-3439	2H5-3450	2H5-3441	2H5-3453	2H5-3432	2H5-3443
Course, magnetic 2/	312°	306°	129°	133°	130°	159°	110°	135°	122°	089°	033°	023°
Sea	Slight	Moderate	Moderate	Moderate	Rough	Rough	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Depth range in fathoms	79-81	82-84	82-83	64-66	58-60	62-65	75-80	62-71	69-80	48-60	76-77	85-103
Type of bottom	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M. & S.	gn. M.	gn. M. & S.	M.	M. S. & St.	Cl. & M.	gy.M.S. & Cl.	M. & S.	Cl.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Snag	Snag	Clear	Clear	Clay bank
Time on bottom in minutes	60	60	60	60	60	30	60	60	60	90	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/												
Pink	240 (198)	180 (198)	590 (214)	720 (161)	Trace	Trace	315 (133)	100 (114)	Trace	Trace	10 (170)	Trace
Side-stripe	---	Trace 4/	Trace	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	240	180	590	720	Trace	Trace	315	100	Trace	Trace	10	Trace
Total shrimp catch, hourly basis	240	180	590	720	Trace	Trace	315	100	Trace	Trace	10	Trace
Remarks	-	-	-	-	-	-	-	Net torn	Net torn	-	-	Beam broke

Drag number	61 (G.S.T.) 1/	62 (G.S.T.)	63 (G.S.T.)	64 (B.T.)	65 (B.T.)	66 (B.T.)	67 5/ (G.S.T.)	68 5/ (G.S.T.)	69 (G.S.T.)	70 (G.S.T.)	71 (G.S.T.)	72 (G.S.T.)
Date	4/15/56	4/15/56	4/15/56	4/15/56	4/15/56	4/15/56	4/15/56	4/15/56	4/16/56	4/16/56	4/16/56	4/16/56
Latitude N.	47°04.5'	47°06.5'	47°04.9'	47°08.0'	47°10.2'	47°14.8'	47°06.3'	47°06.0'	47°06.1'	47°04.8'	47°10.0'	47°22.2'
Longitude W.	124°43.3'	124°49.4'	124°53.5'	124°55.4'	124°56.6'	124°50.9'	124°49.1'	124°49.1'	124°49.1'	124°49.2'	124°46.5'	124°43.8'
Loran reading	2H4-4090	2H4-4088	2H4-4059	2H4-4080	2H4-4093	2H4-4130	2H4-4087	2H4-4081	2H4-4084	2H4-4073	2H4-4130	2H4-4225
Loran reading	2H5-3391	2H5-3352	2H5-3332	2H5-3312	2H5-3297	2H5-3313	2H5-3354	2H5-3355	2H5-3353	2H5-3357	2H5-3360	2H5-3321
Course, magnetic 2/	348°	160°	128°	345°	004°	293°	160°	330°	151°	336°	339°	337°
Sea	Moderate	Moderate	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Smooth
Depth range in fathoms	62-62	76-78	83-86	90-94	126-139	100-111	76-78	75-76	76-77	74-76	69-70	63-65
Type of bottom	gn. M.	gn. M.	gy. M.	M. & S.	gy. M. & S.	gn. M. & S.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	30	30	30	60	30	45	30	30	30	30	30	30
Shrimp catch in pounds: (whole shrimp per pound) 3/												
Pink	80 (139)	800 (131)	4	Trace 4/	Trace	Trace	4 (135)	7 (121)	490	525 (164)	1100 (132)	210 (169)
Side-stripe	-	-	-	-	1 (48)	Trace	-	-	-	-	-	-
Total shrimp catch in pounds	80	800	4	Trace	1	Trace	4	7	490	525	1100	210
Total shrimp catch, hourly basis	160	1600	8	Trace	2	Trace	8	14	980	1050	2200	420
Remarks	-	-	-	-	-	-	-	-	-	-	-	-

Note: For explanation of footnotes and abbreviations, see p. 24.

Table 2 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb (Contd.)

Drag number	73 (G.S.T.) 1/	74 (G.S.T.)	75 (G.S.T.)	76 (G.S.T.)	77 (G.S.T.)	78 (G.S.T.)	79 (G.S.T.)	80 (G.S.T.)	81 (G.S.T.)	82 (G.S.T.)	83 2/ (G.S.T.)
Date	4/16/56	4/16/56	4/16/56	4/17/56	4/17/56	4/17/56	4/17/56	4/17/56	4/17/56	4/17/56	4/17/56
Latitude N.	47°24.5'	47°26.9'	47°21.5'	47°05.2'	47°10.6'	47°14.2'	47°11.8'	47°09.6'	47°07.3'	47°03.0'	47°08.7'
Longitude W.	124°42.5'	124°44.5'	124°45.5'	124°44.9'	124°46.5'	124°47.4'	124°52.4'	124°50.5'	124°48.6'	124°47.4'	124°49.5'
Loran reading	-	28H-42L2	28H-42L4	28H-4092	28H-4135	28H-4160	28H-4123	28H-4111	28H-4099	28H-4061	28H-4107
Loran reading	-	28S-3283	28S-3315	28S-3381	28S-3358	28S-3340	28S-3318	28S-3337	28S-3354	28S-3370	28S-3345
Course, magnetic 3/	311°	309°	156°	328°	342°	172°	178°	117°	122°	162°	295°
Sea	Smooth	Smooth	Smooth	Slight	Slight	Slight	Slight	Moderate	Moderate	Moderate	Moderate
Depth range in fathoms	57-58	58-60	77-82	65-66	69-70	76-78	86-86	76-79	70-74	75-77	77-80
Type of bottom	gn. M. & S.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. S.	gn. M.	gn. M.	hrd.	gn. M.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Snag	Clear
Time on bottom in minutes	30	30	30	30	30	30	30	30	30	10	30
Shrimp catch in pounds: (whole shrimp per pound) 3/											
Pink	185 (175)	360 (208)	125 (197)	125 (138)	610 (132)	490 (148)	2 1/2	900 (141)	430 (130)	10	5 (111)
Side-stripe	-	-	Trace 4/	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	185	360	125	125	610	490	2 1/2	900	430	10	5
Total shrimp catch, hourly basis	370	720	250	250	1220	980	5	1800	860	60	10
Remarks	-	-	-	-	-	-	-	-	-	Net torn Hung up	-

Drag number	84 5/ (G.S.T.) 1/	85 (G.S.T.)	86 (G.S.T.)	87 (G.S.T.)	88 (G.S.T.)	89 (G.S.T.)	90 (G.S.T.)	91 (G.S.T.)	92 (O.T.)	93 (B.T.)	94 (B.T.)
Date	4/17/56	4/18/56	4/18/56	4/18/56	4/18/56	4/18/56	4/18/56	4/18/56	4/19/56	4/19/56	4/19/56
Latitude N.	47°08.9'	47°08.3'	47°09.4'	47°08.2'	47°09.4'	47°08.0'	47°09.0'	47°08.1'	47°08.8'	47°12.6'	47°40.5'
Longitude W.	124°49.9'	124°48.4'	124°49.8'	124°49.4'	124°49.2'	124°49.9'	124°49.7'	124°50.2'	124°49.8'	124°48.2'	125°00.0'
Loran reading	28H-4108	28H-4108	28H-4113	28H-4103	28H-4115	28H-4100	28H-4110	28H-4100	28H-4108	28H-4115	28H-4230
Loran reading	28S-3343	28S-3353	28S-3342	28S-3347	28S-3345	28S-3345	28S-3343	28S-3343	28S-3343	28S-3341	28S-3078
Course, magnetic 3/	138°	297°	128°	332°	155°	355°	144°	007°	324°	357°	355°
Sea	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Slight	Slight	Slight
Depth range in fathoms	76-78	75-79	74-78	76-78	74-77	76-77	74-77	75-77	78-81	75-77	77-83
Type of bottom	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.	gn. M.
Trawling bottom	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	30	30	30	30	30	30	30	30	30	60	60
Shrimp catch in pounds: (whole shrimp per pound) 3/											
Pink	5 (96)	1050 (128)	650 (125)	925 (142)	855 (124)	560 (117)	590 (141)	580 (148)	35	200	70
Side-stripe	-	-	-	-	-	-	-	-	-	-	-
Total shrimp catch in pounds	5	1050	650	925	855	560	590	580	35	200	70
Total shrimp catch, hourly basis	10	2100	1300	1850	1710	1120	1180	1160	70	200	70
Remarks	-	-	-	-	-	-	-	-	-	-	-

1/Indicates type of gear; B.T. - beam trawl; O.T. - otter trawl; G.S.T. - Gulf shrimp trawl.
2/Course given is between starting point and end point.
3/Figures in parentheses indicate number of whole shrimp per pound.
4/"Trace" - less than one pound of shrimp.
5/Night drag.

Symbols for Types of Bottom:

Blds. - boulders hrd. - hard
Cl. - clay M. - mud
G. - gravel S. - sand
gy. - gray St. - stones
gn. - green

LITERATURE CITED

Bullis, Harvey R.
1951. Gulf of Mexico Shrimp Trawl Designs. U. S. Fish and Wildlife Service Fishery Leaflet 394 (September).

Ellson, J. G., and Robert Livingstone, Jr.
1952. The John N. Cobb's Shellfish Explorations in Certain South-Eastern Alaskan Waters, Spring 1951. Commercial Fisheries Review, vol. 14, no. 4 (April), pp. 1-20 (also separate no. 311).

Pruter, Alonzo T., and George Y. Harry, Jr.
1952. Results of Preliminary Shrimp Explorations Off the Oregon Coast. Fish Commission of Oregon Research Briefs, vol. 4, no. 1 (December), pp. 1-13.

Schaefers, Edward A., and Keith A. Smith
1954. Shellfish Explorations in the Yakutat Bay Area, Alaska, by the John N. Cobb, Spring 1953. Commercial Fisheries Review, vol. 16, no. 3 (March), pp. 1-12 (also separate no. 368).

MULTIMILLION-DOLLAR MEAT PROMOTION PLAN

Programs conducted by competing protein producers, such as outlined below, emphasize the need for the commercial fishing industry to collaborate on national promotional programs to maintain and increase its markets. In today's competitive market, local, regional, and national fish-producing groups cannot overlook any opportunity to make the consumer want to buy fish in preference to other competing products.

If the attitudes of several hundred livestock producers are representative, the livestock industry may be ready to indorse a multimillion-dollar national livestock meat promotion plan. A recent survey revealed that nearly 99 percent of the persons polled by the Iowa Beef Producers Association indicated a further need for research, education, and promotion to increase the consumption of meat The program would be financed by a uniform check-off on all livestock sold for slaughter. At the end of each calendar month, these funds would be forwarded to a national livestock promotion commission for distribution. A straight across-the-board five cents per 100-pound-weight assessment is being considered which will raise about $28,000,000 yearly. Of the funds so derived, 40 percent would be slated for the National Livestock and Meat Board; another 40 percent will be distributed among the National Livestock Councils, e.g., the National Beef Council, and the National Lamb Feeders Association; and the remaining 20 percent of the funds would go to the State producer councils.

CHEMICAL COMPOUNDS FORMED DURING THE SPOILAGE OF FISH

ABSTRACT

A progress report on a chromatographic study of the protein-breakdown products appearing in the meat of fish during spoilage. Free ninhydrin-reactive components such as the amino acids were studied on homogenates of iced round fish and of minced fish throughout a 15-day storage period. No ninhydrin-reactive compounds other than those reported were observed. No significant increases in free amino acids were noted though free lysine apparently decreased in quantity during storage.

INTRODUCTION

Different types of spoilage occur in fish of different species and even in fish of the same species, depending upon such factors as the variations in the chemical constituents of the muscle of different species, the conditions of handling during storage, and the kinds of enzymes and bacteria involved. A knowledge of why different types of spoilage occur under various handling conditions and of what types of chemical compounds are formed would be of great value in preservation studies and in the development of objective tests for determining the freshness of fish. Consequently the Seattle Fishery Technological Laboratory of the U. S. Fish and Wildlife Service began a study of the various types of chemical compounds that are formed in the meat of fish when spoilage occurs.

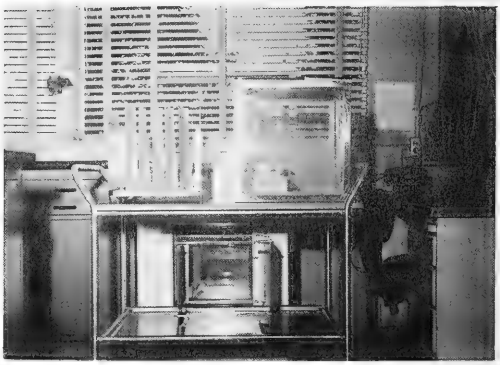


Fig. 1 - Chromatographic equipment.

Work to date has included a preliminary investigation of protein-breakdown products such as amino acids and amines. Qualitative (identifying) and semi-quantitative (not wholly precise measurement of amounts) determination of these substances have been made by means of filter-paper chromatography. This technique is well adapted for making preliminary separations and identifications of the wide range of substances that may form in small quantities in fish meat during spoilage.

In paper chromatography, a small drop of the solution containing the substances to be separated is applied to a strip or a sheet of filter paper at a short distance from one end of the paper. The drop is allowed to dry. The end of the paper nearest to the spot is placed in the "developing" solvent, which usually is water con-

taining an organic solvent. The developing solvent flows by capillary action past the original spot and up the length of the paper. Because the various substances in the original spot have different rates of flow in this solvent, they are separated and may be identified by position, shape, and color of the spots that form subsequently. Although much work has been done in recent years in the field of paper chromatography, in any particular application much additional research work often is necessary on the use of various combinations of solvents, filter papers, and methods of detecting spots before the compounds in any particular product can be separated and identified satisfactorily.

The free amino acid content in fish of varying degrees of freshness has been investigated by several workers. Amano and Bito (1950) found glycine, alanine, and glutamic acid in all species examined and also found that other amino acids appeared during the decomposition of fish muscle. Jones (1954) found that the free amino acid composition of North Sea codling muscle varied with the season and changed considerably when the muscle was stored in ice, owing (1) to leaching by the melting ice and to the action of autolytic enzymes during the earlier period of storage and (2) to the added effects of spoilage micro-organisms during the later period of storage.

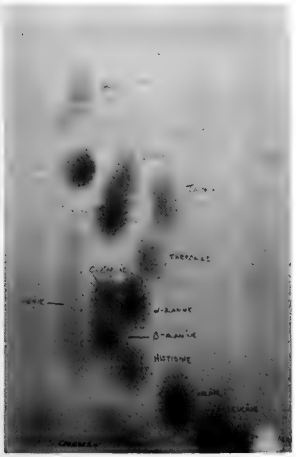


Fig. 2 - Standard chromatogram.

Pacific cod (Gadus Macrocephalus) was chosen for the studies reported in the present paper because it is a fish that is available throughout the year in relatively large quantities in Seattle. The cod were stored in two different forms: whole fish and ground fish muscle. Often in experimental work it is desirable to grind and mix all of the fish being studied in order that the samples will be homogeneous and representative of the entire lot. Grinding the fish, however, may introduce variables that are not present in work with the whole fish. The data presented here include results both from whole fish and from ground fish.

EXPERIMENTAL PROCEDURE

The reaction of ninhydrin with compounds containing the amine groups--such as amino acids and amines--to give distinctive colored compounds is used as the basis for studying protein-breakdown products during the spoilage of fish. In the present work, the free amino acids and other ninhydrin-reactive substances in cod muscle were studied by two-dimensional paper chromatography to determine what changes in the ninhydrin-reactive substances occur as the muscle deteriorates during refrigerated storage.

Two groups of fish were studied. The first group, called lot 1, consisted of Pacific cod that had been stored aboard the vessel in the round in ice for 4 or 5 days. The second group, lot 2, was not iced but was stored for 2 days aboard the vessel on top of other iced fish. The second lot of cod was used to check the results obtained with the first one. The difference in treatment of the cod aboard the fishing vessel was not part of the experimental design and is reported only to make the history of the samples complete. The exact treatment given each lot of fish is shown in table 1.

In the analysis of the samples for free amino acids and other ninhydrin reactive substances, the aqueous fraction was extracted from cod muscle by the method outlined by Block, Durrum, and Zweig (1955). The procedure used is as follows:

1. Mix 25 grams of cod meat with 80 milliliters of absolute ethanol in an electric blendor for 5 minutes.
2. Separate out the solid material by suction filtration, wash the solids with 80-percent ethanol, add the washings to the filtrate, and then discard the solids.
3. Transfer the filtrate to a separatory funnel, add three volumes of chloroform to each volume of the filtrate, and shake the mixture thoroughly.
4. Allow the two layers in the funnel to separate, then discard the bottom layer.
5. Concentrate the aqueous (upper) layer to a volume of 5 to 10 milliliters (accurately measured).

The ninhydrin-reactive constituents of the extract are separated by two-dimensional paper chromatography. The solvent used for separation in the first direction consists of liquid phenol and metal-free water (4:1 v/v) and 0.04 percent 8 hydroxyquinoline; the solvent used for separation in the second direction consists of 2,6-lutidine, 2, 4, 6-collidine, water, and diethylamine (100:100:100:3 v/v) (Block et al. 1955). The various compounds that separate are detected by dipping the chromatograms in 0.25 percent (w/v) ninhydrin in acetone (Toennies 1951). After the chromatogram is dried in a hood, the color is developed by placing the chromatogram in a warm oven at about 85° C. for 5 to 10 minutes. Spots of varying colors and shapes appear as a result of the reaction between ninhydrin and the various separated compounds.

Table 1 - Changes in Free Amino Acid Content (As Determined by Paper Chromatography) of Cod with Length of Time of Refrigerated Storage

Lot	History of Samples: Aboard Vessel	History of Samples: At the Laboratory: Treatment	History of Samples: At the Laboratory: Storage Time	Sample No.	Free Amino Acids Content 1/: Lysine	Free Amino Acids Content 1/: Valine and Leucines	Free Amino Acids Content 1/: Glutamic Acid, Glycine Taurine, Proline, α- and β-Alanine
			Days				
1	Pacific cod, in the round, stored in ice for 4 or 5 days	Fillets cut into small particles in meat chopper, mixed thoroughly, filled into jars with snap-on plastic covers, and stored at 34° F.	0	7M	+	+	+
			12	8F	Trace	Trace	+
			15	9E	-	Trace	+
		Round fish stored in ice	15	9D	-	+	+
2	Pacific cod, not iced but stored on top of other iced fish for 2 days; the internal temperature of the cod was 42° to 46° F. when they were obtained.	Fillets cut into small particles in meat chopper, mixed thoroughly, filled into jars with snap-on plastic covers, and stored at 34° F.	0	10B	+	+	+
				10C	+	+	+
				10D	+	+	+
				10F	+	+	+
			6	11A	Trace	Trace	+
				11B	+	Trace	+
			10	12A	-	+	+
				12C	-	+	+
				12B	Trace	+	+
			27	12G	-	+	+
		Round fish stored in ice	6	11C	+	+	+
				11D	+	+	+
			10	12D	Trace	+	+
				12E	Trace	+	+

1/ A plus indicates that a definite chromatographic spot was found, and a minus indicates that no spot was found.

A series of standard solutions containing various combinations of pure amino acids and amines are also chromatographed, and each of the various compounds is ultimately identified on the "standard" chromatogram. The spots appearing on the chromatograms of the various cod samples then are identified by comparing them with the known spots on the standard chromatogram.

RESULTS

The data obtained with lot 1 (table 1) indicated the following: (1) free lysine, valine, leucines, glutamic acid, glycine, taurine, proline, and α-and β-alanine were present in the fresh samples; (2) no changes were detected in the amount of glutamic acid, glycine, taurine, proline, and α-and β-alanine as the samples were stored; (3) the amounts of valine and of leucines decreased in the ground samples stored in jars at 34° F. but not in the whole fish stored in ice; (4) the amount of lysine decreased both in the ground sample stored at 34° F. and in the whole fish stored in ice.

The results obtained with lot 2 are in essential agreement with those obtained with lot 1, except that the amounts of valine and of leucines decreased only in the ground samples stored for 6 days but not in any of the other ground samples.

Except for the amino acids shown in table 1, no other ninhydrin-reactive compounds were found by the experimental procedure used.

SUMMARY

In a study of the various types of chemical compounds that are found in fish meat when spoilage occurs, Pacific cod (Gadus macrocephalus) were stored in the round in ice, and samples of the ground cod were stored in jars at 34° F. Paper chromatography was used to detect the ninhydrin-reactive compounds. Free lysine, valine, leucines, glutamic acid, glycine, taurine, proline, and α- and β-alanine were detected in the fresh samples. Lysine decreased in quantity in the samples during storage. No changes in the quantities of glutamic acid, glycine, taurine, proline, and α- and β-alanine were detected. The results obtained to date are not sufficiently conclusive to establish a definite difference between whole samples and ground samples. Other than the compounds already reported in this summary, no other ninhydrin-reactive substances were found by the experimental procedure used.

--DAVID T. MIYAUCHI AND DONALD C. MALINS, CHEMISTS
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

LITERATURE CITED

Amano, K., and Bito, M.
1950. Changes in Free Amino Acids Generated by Decomposition of Fish Muscle. Bull. Japan Soc. Sci. Fisheries, vol. 16, no. 12, pp. 10-16. Chemical Abstracts, vol. 47, p. 7693e.

Block, Richard J.; Durrum, E. L.; and Zweig, G.
1955. A Manual of Paper Chromatography and Paper Electrophoresis. Academic Press Inc., Publishers, New York, p. 84.

Jones, N. R.
1954. Factors Affecting the Free Amino Acid Composition of Fresh and Iced Skeletal Muscle of North Sea Codling (Gadus callarias). Biochem. Jour., vol. 58, no. 4 (December), pp. xlvii-xlviii.

Toennies, G., and Kolb, J. J.
1951. Anal. Chem., vol. 23, no. 6 (June), pp. 823-826.

"GRAYING" IN CANNED SHRIMP

Research on the most prevalent form of discoloration--"graying"--in canned wet pack shrimp has shown that the discoloration is dependent upon the age or condition of the shrimp prior to canning. That is, as the age of the shrimp in ice increased, both the pH and the amount of "graying" increased in the canned product. It was also noted that black iron sulphide container discoloration was more likely to occur with an elevated product pH (Food Technology, May 1956).

TECHNICAL NOTE NO.36 - DETERMINING FISH CONTENT OF FROZEN FRIED FISH STICKS

ABSTRACT

This report describes the basic procedure for determining the content of the meat of fish in frozen fried fish sticks. The procedure offers packers a simple and rapid method of analysis that can be used conveniently as a tool in the control of quality. The procedure is useful also in determining compliance with the proposed standards for grades of frozen fried fish sticks.

INTRODUCTION

The voluntary Federal Standards for Grades of Frozen Fried Fish Sticks (Federal Register 1956) provide that frozen fried fish sticks contain not less than 60 percent, by weight, of fish meat. The Technological Laboratory of the U. S. Fish and Wildlife Service at East Boston, Mass., developed a method of analysis capable of determining compliance with this requirement.

The method that was developed is simple and rapid. It consists, essentially, of the following steps: (1) weigh the whole frozen fried fish stick, (2) dip the fish stick in a colored solution (copper sulfate) at room temperature for a specified time, (3) remove the coating on the fish stick by scraping the stick with a spatula, (4) weigh the remaining fish meat, and (5) calculate the content of fish meat in the fish stick by use of the formula:

$$\text{Percent fish meat} \quad \frac{(\text{wt. of fish meat after removal of coating}) \ 100}{(\text{wt. of whole frozen-fried fish stick})}$$

PROCEDURE

APPARATUS AND MATERIALS:

1. Triple-beam or similar rapid-weighing balance that is sensitive to $\pm$ 0.05 gram.
2. Two-liter beaker.
3. Copper-sulfate solution.
4. Immersion thermometer.
5. Clip tongs of wire, plastic, or glass.
6. Stop watch or regular watch with second hand.
7. Ordinary paper towels.
8. Spatula, 4-inch blade with rounded tip.
9. Container for waste breading and fish.
10. Glass funnel, medium size.
11. Glass wool, coarse filter paper, or paper towel.

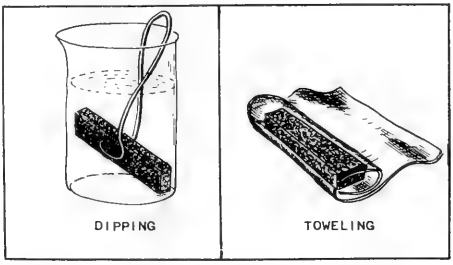
PREPARATION OF THE DIPPING SOLUTION: Dissolve approximately 250 grams of copper sulfate crystals ($CuSO_4 . 5H_2O$) in a small quantity of hot water. Add cold water to bring to 1 liter. Cool to room temperature.

PREPARATION OF SAMPLE: Maintain samples in refrigerated storage at temperatures of 0° F. or lower. Remove individual fish-stick samples only as immediately needed for the analysis.

Determination:

1. Remove the frozen fish stick from the refrigerated storage and weigh the fish stick to the nearest 0.1 gram immediately (within 20 seconds). Do not use broken or damaged fish sticks or those with large voids in the coating.

2. Employing the clip tongs, promptly immerse the fish stick into the copper-sulfate solution for the appropriate time specified (table 1). Allow the tongs to remain attached to the fish stick (fig. 1) to avoid delay in the subsequent removal of the fish stick from the solution.



3. At the end of the interval specified in table 1, promptly remove the fish stick from the solution, roll the stick lightly in a paper towel, press the towel lightly against the stick on all sides to absorb excess moisture, and then unroll the towel. The rolling, pressing, and unrolling should be completed in not more than 7 seconds.

Table 1 - Dipping-Time Guide

Temperature of the Copper-Sulfate Solution	Temperature of the Frozen Fried Fish Sticks		Dipping Time	
			Fish Sticks Fried in Nonhydrogenated Oils	Fish Sticks Fried in Hydrogenated or Hardened Oils 2/
	Degree F.	Degree C.	(Seconds)	
Room Temperature 1/ (65° to 85° F.)	0 to -10	-18 to -23	20 to 25	25 to 30
	-10 to -15	-23 to -26	20 to 25	30 to 40
	-15 to -20	-26 to -29	25 to 30	35 to 45
	-20 to -30	-29 to -34	30 to 35	45 to 60

1/ The exact temperature, within this range, was found not to be critical.

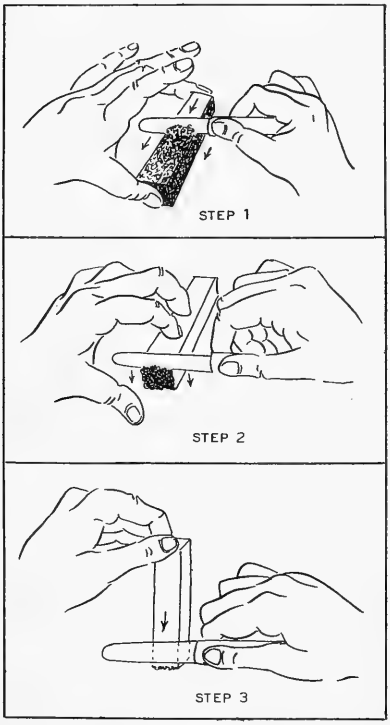
2/ A crude method for determining whether a fish stick has been fried in hydrogenated or hardened fats is as follows: Remove a small portion of the coating from one stick. Place the material in a test tube, add several ml. of ether or acetone, and shake lightly. Decant a portion of the solvent solution onto a piece of paper towel. Hydrogenated or hardened fats leave a white solid spot on the paper after the solvent has evaporated.

4. Under adequate lighting, remove the coating from the top side of the fish stick. To do this (a) grasp the fish stick (which is lying flat on the towel) by the ends (fig. 2, step 1); (b) place the spatula on the top surface of the fish stick at the end that is away from the operator and press the spatula into the coating perpendicular to the surface, being careful not to penetrate the meat of the fish stick; and (c) quickly draw the spatula blade

over the fish stick in one long continuous motion, removing the coating. The fibrous-appearing fish meat should remain, whereas the yellow coating should roll off.

5. Quickly repeat operation 4 on the three remaining sides. These operations remove the major potion of the coating from the four principal surfaces, with only four quick strokes. This phase of the removal of the coating on all four sides should be completed within 20 seconds.

6. Discard any samples that show more than a trace of blue coloring on the fish meat due to excess penetration of the copper sulfate solution through voids in the coating of the fish stick.



7. Remove the coating from the two ends of the fish stick. To do this, hold the blade of the spatula at and parallel to the end, and cut away the coating (fig. 2, step 2).

8. Remove from the still-frozen fish stick any remaining coating, which appears as a yellow film, by use of the rounded tip of the spatula. Scrape the fish lightly, taking care to scrape only those surfaces where the film remains.

9. Remove any coating on the edges by holding the fish stick upright and cutting away the coating with the blade of the spatula being held almost parallel to the edge of the fish stick (fig. 2, step 3).

10. Weigh the fish meat remaining.

11. Calculate the amount of fish meat by use of the formula:

$$\text{Percent fish meat} = \frac{(\text{weight of fish meat}) \; 100}{(\text{weight of whole stick})}$$

DISCUSSION

The weighings and the removal of the coating should be carried out as rapidly as is compatible with good care. The following precautions should be observed:

1. The total elapsed time for analysis of each fish stick should not exceed $3\frac{1}{2}$ minutes. A period of time greater than this may (a) permit errors resulting from the condensation of moisture on the fish stick or loss of water from the fish into the coating and (b) by allowing the fish stick to thaw or soften, make it difficult to scrape off the coating without removing some of the fish meat.

2. Care should be taken to scape only those portions of the fish stick where the coating remains and not to rescrape any exposed portion of the fish meat.

3. Any samples showing excessive penetration of the dipping solution (more than a trace of blue coloring on the fish meat) should be discarded. The speed of penetration through the coating to the surface of the fish meat depends upon (a) the temperature of the fish stick and (b) the thickness and consistency of the coating. The exact dipping time therefore should be adjusted for the particular product, within the ranges specified, by experimentation. For control testing of the same commercial production of fish sticks, plain water may be substituted for the copper-sulfate solution, once the dipping time has been standardized for the particular product. The copper-sulfate solution can be used over and over, provided it is clarified by filtration through filter paper, glass wool, or paper towel.

4. Copper sulfate is a poison. Hence the discarded fish sticks should not be recoated or be used to feed animals.

Note: The author gratefully acknowledges the aid of Mr. Boris O. Knake who drew the illustrations.

--ANTHONY J. FRASCATORE, JR., CHEMIST
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE, BOSTON, MASS.

LITERATURE CITED

1956. Federal Register, July 21, pp. 5475-5477-9. Part 52--Processed Fruits and Vegetables, Processed Products thereof and certain other Food Products. Subpart-United States Standards for Grades of Frozen Fried Fish Sticks.

RAISING OF SHRIMP

The success of an enterprise to raise shrimp would depend, among other things, upon proper preparation of nursery and rearing ponds. One kind of shrimp known scientifically as Penaeus monodon Fabricus, has been cultivated in Philippine estuarine ponds with an average production of 280 pounds per acre over a period of six months.

The shrimp are caught by dip nets when about one half inch long, and then placed in the nursery ponds about 20 square yards in size. These nurseries must be cleaned of predators, such as fish and crabs, and have a flow of tidal water. The water depth is kept at about $1\frac{1}{2}$ to 4 inches. Screens prevent escape of the small shrimp and the entrance of predators.

The larger rearing ponds are drained and cleaned before planting the shrimp from the nursery ponds. They are usually about 1 to 3 acres in size.

To raise shrimp in Florida would meet with specific problems. Conditions are such that while possible it is not believed to be generally practical to attempt such an enterprise.

--Sea Secrets, The Marine Laboratory, University of Marine, Coral Gables, Fla.

Animal Foods

MANUFACTURERS ORGANIZED: The American Pet Food Manufacturers, a division of American Feed Manufacturers Association, was organized during a meeting in Chicago in September 1956. This organization is of special interest to the fishing industry since it acts as a spokesman for the pet-food manufacturers, and supplies technical advice to its members.

The Pet Food Research Committee consists of chairman Dr. John W. Bernotavicz, Gaines Division, General Foods Corporation, Kankakee, Ill.; vice chairman H. C. Schaefer, Ralston Purina Co., St. Louis; Dr. Paul R. Record, Security Mills, Knoxville, Tenn.; Dr. Victor Heiman, Kasco Mills, Inc., Waverly, N. Y.; Dr. J. E. Hunter, Allied Mills, Inc., Libertyville, Ill.; Dr. E. M. Gildow, Carnation Milk Farms, Carnation, Wash.; Dr. John A. Pinkos, the Quaker Oats Co., Rockford, Ill.; and Dr. W. J. Monson, the Borden Co., Elgin, Ill.

The Research Committee aids in interpretation and distributing to its members and the general public the data obtained from industry-sponsored research conducted at the University of Wisconsin, Madison. It also evaluates and publishes abstracts of scientific articles on dog nutrition as published in a number of technical journals.

The Research Committee is an excellent contact for dependable information by the members of the fishing industry which are interested in finding new outlets for raw, semiprocessed, or processed fishery products in pet foods.

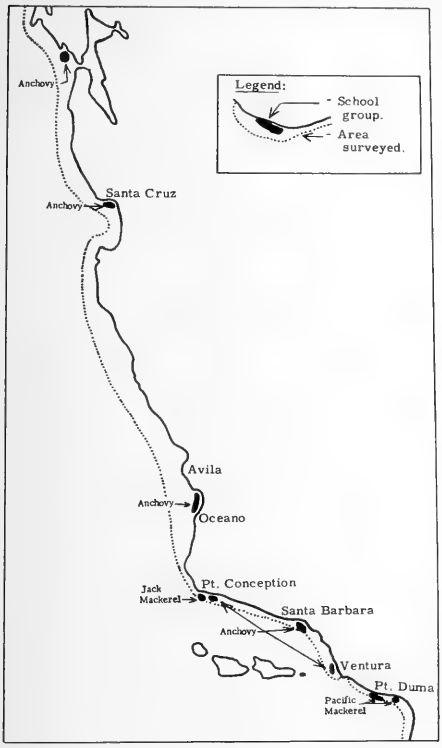
Cans--Shipments for Fishery Products, January-September 1956

Total shipments of metal cans during January-September 1956 amounted to 86,019 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 74,848 tons in the same period of 1955. The peak season for packing some important fishery products usually ends on or before September. The 1956 pack of important items such as Maine sardines, Pacific salmon, and tuna will exceed those for 1955.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.

California

PELAGIC FISH DISTRIBUTION, ABUNDANCE, AND BEHAVIOR STUDIED BETWEEN BODEGA BAY AND SAN DIEGO (Airplane Spotting Flight 56-9): In order to study pelagic fish distribution, abundance, and behavior off Southern California, an airplane spotting flight was made by the California Department of Fish and Game Cessna (1359D) airplane between October 27-29 1956. This flight followed immediately upon a period of stormy weather. As heavy swells and winds were encountered over most of the area north of Pt. Vicente, the observations made north of this point may not be true indications of the amount of fish present. It is known that fish schools tend to disappear during windy periods, especially the mackerels.



Airplane spotting flight 56-9 (Oct. 27-28, 1956).

Sardines continued scarce but Pacific mackerel continued more abundant than in the previous season. Anchovies were much less abundant than in September throughout the entire coastal area.

Anchovy: The large concentration of anchovies observed off Avila and Oceano in September remains the largest school group in central California. Over 100 schools were seen in this area in September but only 18 schools were seen during this flight. This decrease in abundance may be due in part to stormy seas but it may also be due to the seasonal fluctuation in abundance as exhibited by anchovies in the past. Over the past three seasons there has been a build-up of anchovy stocks in the inshore area in early spring with a peak of abundance from May-August followed by a breaking up of concentrations in October and November.

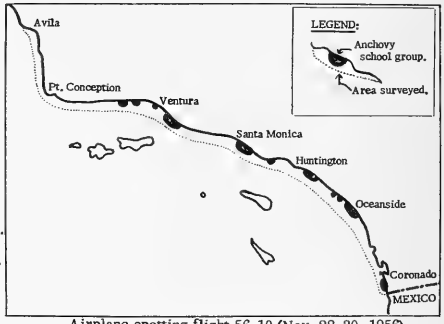
A tally indicates that 114 anchovy schools and 462,000 square feet of total area of fish were tallied in each 10-mile section of the coast from San Francisco to La Jolla in which anchovies were found.

Sardine and Pacific Mackerel: No schools of pure sardines were seen during this flight. Commercial aerial spotters found sardine schools at the surface at night but failed to find any during the daytime. Pacific mackerel schools were visible in the daytime and commercial catch sampling revealed that many of the Pacific mackerel schools contained varying amounts of sardines. Pacific mackerel schools were less in abundance during this flight than in September but then continue to be well scattered along the coast and in fair numbers.

Jack Mackerel: Three large schools of jack mackerel were seen near Pt. Conception. It was reported that a large concentration of mixed jack mackerel and Pacific mackerel were near Pt. Mugu but these were not observed, due possibly to the strong winds blowing in this area when scouted.

* * * * *

AIR SURVEY OF PELAGIC FISH DISTRIBUTION (Flight 56-10): Anchovy schools were found to be plentiful by the California Department of Fish and Game during flights by its Cessna 1359D (November 28-30, 1956) over the inshore area between Avila and San Diego. Schools of sardine and both Pacific and jack mackerel, observable from the airplane, were absent from this area during the period of the flight. However, it was known from other sources that schools of these three species were present off the Southern California coast at the time of the flight and it is assumed that these schools were below the surface during the daytime flights or outside the range of the survey area. Five schools of unidentified small fish were observed about two miles north of Avila.



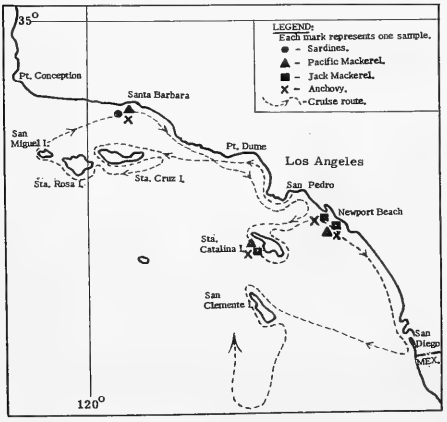
Airplane spotting flight 56-10 (Nov. 28-30, 1956).

During the course of the flights 630 schools of anchovies were observed from Goleta to Coronado, covering an estimated 8.5 million square feet of surface. Anchovy schools were numerous south of Santa Barbara and continue to be the most abundant pelagic species in southern California. Due to exceptionally calm and clear weather excellent coverage was made of the inshore area. The distribution and abundance of anchovies was comparable to that observed on the September 1956 flight (56-8), and it is now apparent that the results of the October 1956 flight (56-9) were probably not representative. Scouting in October was done during a period of strong winds and heavy swells and fish apparently school deeper during this weather.

No anchovy schools were observed in the Avila-Pt. Conception area of the coast on this flight.

* * * * *

PELAGIC FISH SURVEYS OFF SOUTHERN AND LOWER CALIFORNIA (M/V N. B. Scofield, Cruises 6 and 7): The third and fourth of a series of five 1956 cruises for the purpose of assessing the relative abundance of Pacific sardines, Pacific mackerel, jack mackerel, and northern anchovies of the Southern California and Baja California coasts were made between September 25-October 13 (cruise 6) and October 25-November 12, 1956 (cruise 7) by the California Department of Fish and Game research vessel M/V N. B. Scofield.



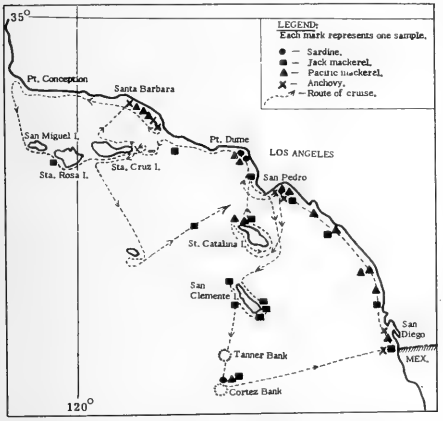
Pelagic fish survey by M/V N. B. Scofield (Cruise 56-S-7, Oct. 25-Nov. 12, 1956).

Results of Cruise 6: A total of 96 light stations were occupied. Sardines were taken under the light at 3 stations, Pacific mackerel at 16, jack mackerel at 15, and anchovies at 7. In addition to the samples collected, Pacific mackerel were observed under the light but could not be taken at 3 stations, jack mackerel at 5, and anchovies at 1.

The vessel traveled 530 miles scouting for fish; 67 schools of sardines were

observed, 82 Pacific mackerel, 12 anchovy, and 13 schools of sauries. A total of 116 unidentified schools were observed. Of those it was felt that the majority were jack or Pacific mackerel.

Sea surface temperatures during the cruise ranged from 13.12° C. (55.6° F.) near Pt. Conception to 20.74° C. (69.3° F.) at Del Mar. Sardines were taken in waters with a temperature range of 16.89° C. (62.4° F.) to 17.72° C. (63.9° F.)



Pelagic fish survey by M/V N. B. Scofield (Cruise 56-5-6, Sept. 25- Oct. 12, 1956).

Results of Cruise 7: A total of 66 light stations were occupied, of which 1 yielded sardines, 6 northern anchovies, 3 Pacific mackerel, and 3 jack mackerel.

The vessel scouted 392 nautical miles, 98 schools of fish were visually observed, of which 15 were sardine, 36 northern anchovy, 4 mackerel, and 43 unidentified. The sardines were most abundant in Santa Monica Bay and the Santa Cruz Island area.

Rockfish specimens were taken by hook and line at Anacapa Island, Santa Cruz Island, Catalina Island, San Clemente Island, La Jolla, and Cortez Banks. A total of 113 specimens representing 16 species were taken.

Surface temperatures and bathythermograph casts were taken at all stations. Surface temperatures throughout the cruise ranged from a minimum of 12.50° C. (54.5° F.) at San Miguel Island to a maximum of 16.68° C. (62.1° F.) at Avalon Harbor, Santa Catalina. The surface temperature at which sardines were sampled was 14.50° C. (58° F.)

Federal Purchases of Fishery Products

VETERANS ADMINISTRATION INCREASES USE OF FROZEN FISH FILLETS: Veterans Administration will increase the use of frozen fish fillets in its 173 hospitals in the nation by 330,000 pounds a year at an estimated cost of $132,000 that Agency's Area Medical Director at Boston reported in mid-December. Only domestically-produced fillets will be bought.

The extra usage is expected to result from more frequent offerings of fillets on selective menus which give hospital patients a choice of food.

Last year (fiscal 1956), nearly three million pounds of fish and other sea foods costing more than $1,000,000 were consumed by VA's average daily patient load of about 110,000 veterans. Supply officers in VA hospitals purchase all fish locally on an open-market purchase.

It is estimated that about 60 percent of last year's consumption was fresh and frozen fish, mostly the latter.

The extended use of selective menus is changing food patterns, in that foods formerly considered unpopular with a majority of the patients frequently are chosen when offered as an alternate to traditionally popular items.

* * * * *

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY THE DEPARTMENT OF DEFENSE, OCTOBER 1956: A total of 2,182,329 pounds (valued at $1,097,720) of fresh and frozen fishery products for the use of the Army, Navy, Marine Corps, and Air Force were purchased in October 1956 by the Military Subsistence Supply Agency. This was an increase of 11.5 percent in quantity and 10.1 percent in value as compared with the previous month. When compared with October 1955, purchases were higher by 9.3 percent in quantity and 25.3 percent in value.

For the first 10 months of 1956 purchases totaled 22,416,612 pounds, valued at $11,202,529--an increase of 5.5 percent in quantity and 22.1 percent in value.

Prices paid for fresh and frozen fishery products by the Department of Defense in October averaged 50.3 cents a pound, lower by 0.6 cents than the 50.9 cents paid in the previous month, but higher by 6.4 cents than the October 1955 price.

In addition to the purchases of fresh and frozen fishery products reported, the Armed Forces generally make some local purchases which are not included in the data given above. Therefore, actual purchases are somewhat higher than indicated, but it is not possible to obtain data on local purchases made by military installations throughout the country.

Fisheries Loan Fund

APPROVAL OF FIRST LOANS ANNOUNCED: The first five loans to be granted from the new Fisheries Loan Fund have been approved by the United States Fish and Wildlife Service, the Secretary of the Interior announced on December 28, 1956.

One of these loans is to an applicant in Massachusetts, two are to California applicants, and two to Alaska fishermen. The loans will be "official" when the applicants sign the terms set forth in the loan agreement. The loans will be closed and serviced for the Department of the Interior by the Small Business Administration.

The total of the five loans is $41,500. Other applications are in the final stages of processing. On file and being handled as rapidly as possible are approximately 70 other valid applications totaling $2,300,000.

The Fisheries Loan Fund was established by the Fish and Wildlife Act of 1956, approved by the President on August 8, "to make loans for financing and refinancing of operations, maintenance, replacement or repair of fishing gear and vessels, and for research into the basic problems of fisheries." Applications for shore installations or needs other than those set forth above are not eligible.

The loan applications are well distributed over the country. From New England have come applications for $919,500; from the West Coast there are requests for $960,000. Gulf fishermen are seeking $274,000; those of the Middle and South Atlantic $48,000; Alaskans are requesting $72,500; and Great Lakes fishermen are asking $40,300.

The broad objective of the fisheries loan fund is to provide financial assistance which will aid the commercial fishing industry to bring about a general upgrading of the condition of both vessels and fishing gear in order to produce more efficient and profitable fishing operations.

The initial $10 million provided by the 1956 act is a revolving fund. The rate of interest on all loans granted is at present fixed at five percent a year. The period of maturity of any loan shall be determined and fixed according to circumstances, but in no case can it exceed a period of 10 years.

Florida

FISHERIES RESEARCH, JULY-SEPTEMBER 1956: The following are some excerpts from the Quarterly Report on Fisheries Research, September 1956, of the Marine Laboratory of the University of Miami.

Mullet Marketing Survey: The mullet marketing study, a joint project of the Florida State Board of Conservation and the U. S. Fish and Wildlife Service, was completed and a report submitted. The brief summary accompanying the report points out:

"Recommendations presented in this report involve active cooperation between industry, state, and Federal governments. No direct subsidies are recommended at either the Federal or state level, but legislative action in certain fields is recommended at the state level, and assistance in the form of technological and marketing aid is recommended to the industry from the state and Federal governments.

"The depressed condition of certain segments of the Florida fishing industry was found to be intimately associated with the fortunes of the mullet fishery, which therefore received the major attention in this study.

"It was found that the source of a great part of the United States supply of edible food fish has shifted since World War II. So have the methods of preparation and the methods of marketing. These technological advances and marketing innovations have been the answer of the fishing industry to the demands of an increasing population and greater national prosperity. It is believed that the Florida fisheries have not gone as far as others in this progress and that their markets have suffered as a consequence."

Small Shrimp Studies: During July, August, and September 1956, trips were made on the M/V Manboy to the Tortugas shrimp fishing grounds and the regular sampling of the escapement of small shrimp through the cod end of varying mesh sizes was continued. The September trip concluded the contract with this vessel and data have now been gathered throughout one year. These are being processed and a report is being prepared covering this project. A recommendation was made to the State Board of Conservation that if regulations are imposed to restrict the capture of small shrimp, the best regulation at present seems to be a minimum mesh size of $2\frac{1}{4}$".

The U. S. Fish and Wildlife Service took two scientists of the Marine Laboratory aboard its M/V George M. Bowers to make observations on catches from the Tortugas fishery. During this cruise a study was made on the effect on small pink shrimp of passing through the meshes of a trawl. A tank on the vessel's deck supplied with fresh sea water made it possible to observe the shrimp for an extended period of time. It is already possible to report that it appears likely that nearly all shrimp survive the passage through the net, thus removing a possible flaw in this type of regulation.

An analysis of the Tortugas pink shrimp fishery has been commenced. This analysis should provide information on the trends in abundance from the beginning of the fishery in 1950 to the present, upon which intelligent regulations can be based to provide maximum sustained yield.

Spoilage Control in Shrimp: Studies were begun to determine the preservative action on shrimp of aureomycin ices prepared with three different stabilizers. Results from the tests indicate that carrageenin is the best stabilizer used in conjunction with aureomycin.

Studies of carrageenin-aureomycin ices are continuing and tests are currently under way to determine the effect on black spot development of aureomycin ice when prepared with a low calcium content carrageenin.

Fish Rancidity and Pigmentation Studies: Further tests were continued on the application of seven different antioxidants and sequestering agents to breaded mullet in the control of rancidity. Results from the tests run on mullet which had been frozen for a period of four months indicate that combinations of ionol with citric acid and carboxy-methyl-cellulose has a definite effect on the controlling of rancidity which would ordinarily have developed.

Taste panel scores on an experiment designed to determine the retarding effect of ionol on the development of rancidity when applied to fresh mackerel, in almost all cases indicated that the onset of rancidity had been retarded when compared to a

control of non-treated mackerel stored for the same length of time.

A series of tests were run using ionol to control the bleaching of defrosted or thawed red snappers. These tests have shown that the characteristic red pigment can be retained in samples treated with ionol after as long as a six months storage period. The controls, which had not been treated, showed bleaching.

Food Irradiation Sterilization Site Chosen

The selection of Sharpe General Depot at Stockton, Calif., as the site of the U. S. Army Ionizing Radiation Center was announced jointly on November 9 by the Department of Defense and the Atomic Energy Commission. The center will investigate the use of ionizing radiation in the preservation of food.

The Army's Quartermaster Research and Development Command at Natick, Mass., will direct operations of the center. Work is expected to begin during the 1957 fiscal year and the center is expected to be in operation late in 1958.

"Initially," it was announced, "the center will have as its primary mission the development of methods of utilizing ionizing radiation to preserve foods and to determine the economic feasibility of such a process. The processing area will be designed so that a large variety of products may be handled and so that major modifications in processing lines may be effected.

"This aspect of the center's activities will be performed in conjunction with the Quartermaster Food and Container Institute, Chicago, which is conducting the overall Quartermaster Corps research and development program."

Note: See Commercial Fisheries Review, August 1956, p. 30.

Great Lakes Fishery Investigations

BIOLOGICAL STUDIES OF FISH POPULATIONS IN SAGINAW BAY AND SOUTHERN LAKE HURON (M/V "Cisco," Cruise 8): The primary purpose of cruise 8 by the Service's M/V Cisco (October 23-November 5, 1956) was to investigate the fall distribution and spawning condition of fish populations in Saginaw Bay in southern Lake Huron. Gill nets (1-, $1\frac{1}{2}$-, 2-, $2\frac{1}{4}$-, $2\frac{1}{2}$-, $2\frac{3}{4}$-, 3-, and 4-inch) were set on the bottom off Sand Point, Charity Island, and Fish Point in Saginaw Bay, and in 25 fathoms and 50 fathoms in southern Lake Huron between Harbor Beach and Goderich. Oblique gill-net sets were made off East Tawas in 13 and 26 fathoms and a bull net (300 feet long, 120 meshes deep) was set in 26 fathoms off East Tawas.

Bloaters (Leuchichthys hoyi) made up a considerably larger percentage of the catch of the 50-fathom set in Lake Huron than was the case during the summer. The bloaters were for the most part small. Long jaws (L. alpenae), L. kiyi, and a few L. reighardi were also taken in this set. The bulk of the fall-spawning longjaws and L. kiyi were still not ripe, although a very few of the longjaws had completed their spawning. The catch in the 25-fathom set was larger than that of the deeper set and was predominately bloaters (366 of this species). There were also 6 L. reighardi; 1 lake herring (L. artedi) and 68 smelt (Osmerus mordax). This latter species appears to move out into deeper water in late summer and fall.

The catches in Saginaw Bay were generally light, although a large catch of small perch (Perca flavescens) was made in the small mesh off Fish Point. Four walleyes (Stizostedion vitreum vitreum) were caught off Sand Point, 27 off Charity Island, and one off Fish Point. Sixteen of them were tagged and released. Other species taken in the bottom sets were herring, white suckers (Catostomus commersoni), white

bass (Lepibema chrysops), carp (Cyprinus carpio), stonecat (Noturus flavus), sauger (Stitzostedion canalense), and smelt. Only one smelt was caught. Apparently there are relatively few adult smelt in the Bay at the present time.

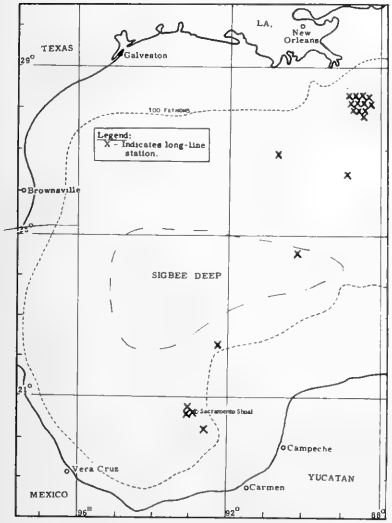
The 13-fathom oblique nets took only one fish, a herring, and the oblique set in 26 fathoms caught several bloaters, longjaws, smelt, and 2 herring. The herring were near the surface, while the other fish were scattered from 13 fathoms beneath the surface to the bottom. The bull net, which was set so that its float line was 110 feet beneath the surface, caught 9 herring, 13 longjaws, 54 bloaters, 2 L. kiyi, and 55 smelt. Although the gill net catches indicate that the herring have begun to move into Saginaw Bay for spawning, none of them was found to be in a spawning condition.

Trawling tows were made off East Tawas in from 7 to 10 fathoms. The catches were practically all smelt fry and alewife (Pomolobus pseudoharengus) fry. Approximately 10,000 alewives ranging in size from 2 to $3\frac{1}{2}$ inches were taken in one 12-minute tow at 7 fathoms.

Hydrographic transects were run from Bay City to East Tawas, East Tawas to Harbor Beach, Harbor Beach to Goderich, East Tawas to Oak Point, and Hat Point to Au Sable Point. The latter two transects were made as part of a synoptic study that was carried out in cooperation with the Michigan Conservation Department.

Due to continued unseasonably warm weather, surface water temperatures showed practically no decline during the cruise. Temperatures were mostly 11-12° C. (51.8-53.6° F.), with extremes ranging from 7.0° C. (44.6° F.) to about 13° C. (55.4° F.), except near the mouth of the Saginaw River where the water was considerably warmer.

Gulf Exploratory Fishery Program



M/V Oregon cruise 41 (Nov.16-Dec. 13, 1956).

GOOD CATCH OF YELLOWFIN TUNA MADE IN GULF (M/V Oregon, Cruise 41): Thirty-five tons of yellowfin tuna were caught in the Gulf of Mexico on 20 sets of long-line gear, during cruise 41 of the Service's exploratory fishing vessel Oregon (November 4-December 13, 1956). The sets averaged 67 baskets (670 hooks) each.

The cruise was divided into two sections. From November 16-30, 10 sets were made between the Mississippi Delta and the Gulf of Campeche. Highest catch rates were found in the Mississippi Delta area (6.6 yellowfin/100 hooks) and west of Sacramento Shoal in the Gulf of Campeche (3.7 to 8.6 yellowfin/100 hooks). Through the central Gulf, catch rates varied from 0.2 to 1.3 yellowfin tuna/100 hooks. The average weight of yellowfin in the Campeche area was 76 pounds, compared to an average weight of 123 pounds in the northern Gulf.

During December 3-13, 10 sets were made in an area 30 to 40 miles southeast of South Pass. Catch rates varied from 3.7 to 8.6

yellowfin/100 hooks, and during the first seven days over 25 tons were landed.

The yellowfin tuna ranged in weight from 15 to 185 pounds, and averaged 116 pounds each for the entire trip; 12 percent of the 603 yellowfin caught were damaged to some extent by sharks. The remaining whole yellowfin weighed 61,844 pounds.

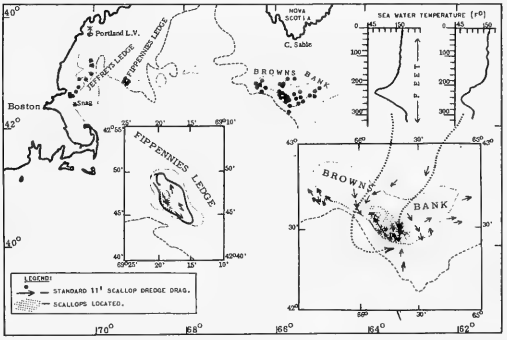
In addition, 9 broadbill swordfish (1,330 pounds), 11 white skipjack, 7 blackfin tuna, 35 white marlin, 4 blue marlin, 14 wahoo, and 107 sharks (5 species) were caught on the long lines. Three white marlin and two blue marlin were tagged and released.

Menhaden and croakers were used as bait. Catch rates on the menhaden were 4.4 yellowfin/100 hooks, compared to 1.7/100 hooks for croakers.

Large surface schools of mixed blackfin tuna and white skipjack were observed daily throught the cruise. During the early morning hours of December 11, large surface schools of spawning mullet were observed under the dip-netting lights, at lat. 28°25' N., long. 88°44' N. in over 750 fathoms.

North Atlantic Fisheries Exploration and Gear Research

SCALLOP BEDS FOUND ON BROWNS BANK (M/V Delaware, Cruise 28): The first exploratory cruise for new scallop grounds was made by the Service's research trawler Delaware during a trip to Browns Bank that ended November 27, 1956. It was discovered that Brown's Bank supported a sizable population of small sea scallops. The cruise was made as part of the Service's program to investigate areas where commercial scallopers do not operate, but which may be of potential value to the commercial scallop fleet.



M/V Delaware cruise 28, Nov. 13-20 and Nov. 23-27, 1956

The initial exploration, consisting of 38 tows over a portion of Browns Bank, found a condition similar to that reported by Canadian exploratory research in 1953 and 1954. The Delaware found a scallop concentration exists in one area, as 15 bushels were taken during one 40-minute tow. However, the size of shell averaged $3\frac{3}{4}$" and the yield of scallop "eyes" (meats) was found to average 57 a pound. The condition of the scallop stocks in this area evidently has not changed markedly in size composition during the past two years. Tows outside the scallop-producing area many times resulted in extensive gear damage.

Two casts with the Bathythermograph in the area of scallop concentration indicated a bottom water temperature similar to that found on the surface with an intrusion of 5° F. cooler water over the area between 180 and 260 feet.

The second phase of the exploration consisted of tows in the Jeffreys Ledge and Fippennies Ledge areas. One 20-minute tow by the Delaware on Fippennies

yielded 75 scallops of 4½" and 5" size with 37 eyes a pound. Heavy weather hampered operations all during the second phase and prohibited any further exploration in this area for its commercial potential.

North Atlantic Fisheries Investigations

YOUNG FISH DISTRIBUTION SURVEYED BY "ALBATROSS III" (Cruises 81 and 82): During the course of two cruises (November 2-10 and November 13-21, 1956), the Service's research vessel Albatross III made 94 trawl tows in New England waters--65 in the Gulf of Maine, and 29 in the offing of southern New England, Long Island, and New Jersey. Operation was favored by unusually good weather conditions for the time of year.

The objectives were to determine the distribution and number of young-of-the year and older demersal fish in New England waters and to undertake special studies on haddock, whiting, sea herring, and red hake (ling) concerned with the distribution of stocks, food habits, and age and growth; to conduct high-frequency ground wave propagation studies relative to future work with telebouys and transponding units which will be used to transmit data on ocean conditions to receiving units ashore.

Census work on bottom fish populations and invertebrate life was successfully carried out and hydrographic data collected. Ground wave propagation transmissions were made when time permitted.

Principal species caught in the Gulf of Maine were haddock, whiting, ocean perch, fluke, red hake, skates, and dogfish in addition to over 25 other species. In the offing of southern New England whiting, butterfish, red hake, and dogfish dominated the tows.

Young-of-the-year haddock were found largely in the Gulf of Maine and were very scarce in southern New England waters. Young-of-the-year whiting were numerous over the entire fishery especially at depths between 20 and 40 fathoms.

Ground-wave propagation studies so far show a workable range of 40 miles can be expected from operation on a carrier frequency of 28,100 kilocycles.

The Albatross III left Woods Hole on November 27 for three days to test an underwater TV camera as an observation device in trawl nets.

* * * * *

HADDOCK AND COD TAGGED ON GEORGES BANK (M/V Albatross III, Cruise 84): Over 80 otter-trawl caught cod and haddock were tagged on Georges Bank during a cruise (December 6-14, 1956) by the Service's research vessel Albatross III. The tagging area on Georges Bank was north of 41°20' N. latitude and east of 67° 40' W. longitude. Twenty-eight tows, mostly of one hour duration, were made in depths ranging from 20 to 60 fathoms. The catch was culled and specimens chosen were held for a few minutes in a large tank of running sea water at about 50° F. Only fish which appeared to be lively were tagged, and records were kept of the length of each tagged fish and its apparent condition on release. Two working days were lost because of bad weather.

The fish tagged and released included 698 haddock, 30-64 cm., yellow Petersen disc on left opercle; 113 cod, 31-115 cm., yellow Lea tag anchored by plastic strip inserted in coelom; 1 halibut, 110 cm., tagged like cod.

Oregon

TROLL-CAUGHT SALMON LANDINGS FOR 1956: The landings of troll-caught chinook or king salmon in Oregon in 1956 were the highest recorded since 1922, according to a December 19, 1956, news release by the Fish Commission of Oregon.

The high chinook salmon troll catch of approximately 4 million pounds was made even though the season opening was delayed 30 days last spring. Chinook trolling off the Colunbia river was considered only fair this year, but landings at other Oregon coastal areas were up considerably from previous years.

Silver or coho salmon landings by trollers at Oregon ports in 1956 totaled more than 3 million pounds, which was considered good but not exceptional. Silver salmon troll catches through August this year were higher than the five-year average for the period, but lighter landings were made in September and October 1956, probably due to the switch from salmon fishing to albacore tuna fishing by many boats late in the season.

The Fish Commission biologist in charge of troll salmon studies said the later troll season opening in 1956 was adopted to give added protection to declining fall chinook salmon runs in the Columbia River. Previous fish tagging and fin-marking experiments have indicated that Columbia River fall chinook are concentrated between Grays Harbor and the mouth of the Columbia in early spring and are fished heavily during the first part of the trolling season.

The biologist stated that the delayed opening of the troll season resulted in increased spawning escapements of fall chinook salmon to hatcheries and natural spawning areas in the lower Columbia system in 1956. More stringent restrictions on gill-net fishing in the Columbia were also considered a factor in the increased fall Chinook escapements.

Sampling of troll catches was continued by the Fish Commission this year with examination of 147,000 chinook and salver salmon, primarily at Astoria and Newport. During the season 100 fin-marked fish were observed in the catches sampled. Analysis of the marked fish recoveries will provide further information concerning survival and ocean migration of salmon and the percentage of fish caught in different areas along the coast.

Oysters

FREE LIQUID STILL LIMITED TO 5 PERCENT BY WEIGHT: Regulations for the fresh shucked and canned oyster trade which were adopted by the National Conference of Weights and Measures at the annual meeting in Washington, D. C., the last week in May 1956 stated that:

The regulations for "Raw or Fresh Oysters" indicated that the "raw or fresh oysters in tins, glass, or other containers .... shall not contain more than 10 percent liquid ... ."

The U. S. Food and Drug Administration points out that there has been no change in the standards under the Federal Food, Drug, and Cosmetic Act which provide for a limit of only 5 percent free liquid by weight.

Puget Sound Canned Salmon Pack, 1956

The total pack of canned salmon in the Puget Sound area of Washington amounted to about 278,000 standard cases (48 1-lb. cans), according to preliminary data compiled by the U. S. Fish and Wildlife Service.

Table 1 - Washington's Puget Sound Canned Salmon Pack 1952-56

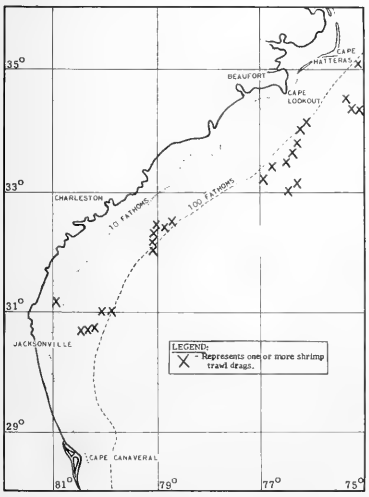
Species	1/1956	1955	1954	1953	1952
	(Standard Cases 2/)				
Red or sockeye	115,111	121,913	579,575	216,984	214,540
Chinook or king	3,000	10,177	6,281	3,985	7,887
Silver or coho	72,000	73,526	33,596	54,943	173,238
Pink	8,000	436,280	14,059	452,054	4,711
Chum or keta	80,000	88,672	294,799	154,476	297,494
Total	278,000	730,568	928,310	882,442	697,870

1/ Preliminary estimates. 2/ 48 1-lb. cans.

The canned salmon pack includes 140,000 cases packed from Puget Sound-caught fish, 98,000 cases from Alaska-caught fish, and 40,000 cases from imported fish from British Columbia. The pack was much lower than anticipated due to a very poor run of chum salmon, both in Puget Sound and British Columbia and also because it was the off-year for pink salmon.

South Atlantic Exploratory Fishery Program

ROYAL-RED SHRIMP DISTRIBUTION SURVEYS CONTINUED (M/V Combat, Cruise 6): The coastal area of the South Atlantic, between Florida and North Carolina, was surveyed for concentrations of royal-red shrimp in two trips (mid-October to mid-November 1956) by the Service's chartered vessel M/V Combat. The first trip in October was designed to obtain further information on the apparent dispersal of the royal-red shrimp following the passing of the hurricane in September.



Location of exploratory trawling stations by the M/V Combat during October-November 1956.

Catches in the St. Augustine area, where large concentrations were located, prior to the hurricane, contained only small numbers of shrimp. Seven drags with a 40-foot shrimp trawl in 180 to 200 fathoms resulted in catches of only 15 pounds of shrimp an hour or less.

In late October, trawling coverage extended southward, out to depths of 230 fathoms. On October 25, good fishing concentrations were located in 150-160 fathoms ENE. of Daytona Beach. Twenty-four hours of round-the-clock fishing yielded over 800 pounds (heads-on) shrimp. The trip was then discontinued due to depth-recorder trouble.

During October 31-November 19, the Combat carried out exploratory dragging off the coasts of Georgia, South Carolina, and North Carolina. Using a 40-foot trawl, night trawling off South Carolina in 23-25

fathoms caught large rock shrimp (Sicyonia sp.) at rates of 25 to 35 pounds an hour. Twelve drags in 18-50 fathoms in daytime failed to catch a single commercial shrimp.

Between Cape Hatteras, N. C., and Cape Fear, Fla., 15 drags were made in 125 to 250 fathoms. Two of these resulted in the loss of trawl and doors and

The shrimp vessel Combat chartered by the U. S. Fish and Wildlife Service for exploratory fishing in the South Atlantic waters between Florida and North Carolina.

several other drags severely damaged the trawls. Several species of deep-water shrimp were caught, but in very small numbers. Most abundant was the small (60 count, heads-off) Penaeopsis megalops, although the best catch contained only three pounds.

* * * * *

MIDWATER TRAWL TESTED ON MENHADEN (M/V George M. Bowers, Cruise 7-A): Midwater trawling for menhaden (Brevoortia tyrannus) in the Cape Hatteras area during November 1956 produced no fish. All surface schools of fish dispersed when trawling approaches were made by the Service's exploratory fishing vessel George M. Bowers during a 34-day cruise that ended December 4, 1956. No evidence of their subsurface scattering was detected on the depth sounder. Movie and still cameras were used to record the setting and hauling of the 40-foot nylon midwater trawl, the behavior of menhaden schools, and certain aspects of the commercial fleet's purse-seining operations.

This cruise attempted to determine the effectiveness of the single-boat midwater trawl in taking pelagic fish. Between November 7-11 systematic day and night scouting operations were conducted with depth sounders offshore from Cape Lookout to Cape Hatteras. No surface or midwater schools of fish were located. After the appearance of menhaden on November 23, four tows with the midwater trawl were unsuccessful when set on large surface schools. Visual observations of numerous menhaden schools revealed erratic southerly movement.

From November 29-December 3, scouting operations continued from Charleston, S. C., to Cape Canaveral, Fla., between the 15-fathom depth curve and the edge of the continental shelf. No surface or midwater concentrations of fish were observed.

A fisheries biologist from the Service's Beaufort Menhaden Investigations Laboratory cooperated in these field operations and was aboard to conduct plankton tows to determine the distribution of menhaden eggs and larval forms.

Considerable time was lost during the cruise due to bad weather.

The George M. Bowers was scheduled to depart Miami January 3, 1957, on a three-week cruise to the northeastern Gulf of Mexico waters of the continental shelf. Mission of the cruise was to continue experimental midwater trawling in joint operation with the U. S. Fish and Wildlife Service's exploratory fishing vessel Oregon based at Pascagoula, Miss.

South Carolina

FISHERIES BIOLOGICAL RESEARCH PROGRESS, SEPTEMBER-DECEMBER 1956: Oyster Research: In October 1956 a small lot of seed oysters was shipped from Bears Bluff to the Chesapeake Biological Laboratory at Solomons, Md., thus continuing the cooperative study on seed oysters begun $6\frac{1}{2}$ years ago. An ever-increasing need for seed oysters in the Chesapeake Bay region makes these cooperative studies more important, Progress Report No. 30 (September-December 1956) of the Bears Bluff Laboratories points out.

Closely allied to seed oyster studies are the investigations made during the quarter on the growth and mortality of young of-the-year oysters. Likewise, experiments on the use of a substitute cultch for setting of young oysters will prove useful to the development of a seed oyster industry in South Carolina.

Shrimp Research: Offshore exploratory fishing during the quarter added to the present knowledge of South Carolina's offshore fishing potential. However, no startling discoveries were made. The offshore research vessel T-19 made 43 experimental drags in depths up to 45 fathoms. Commercially-valuable species caught included rock shrimp (Sicyonia brevirostris), scup or porgy, vermillion snapper, sea bass or blackfish, fluke, large croaker, but no commercial shrimp in depths greater than 6 fathoms.

Previous experimental tows made by Bears Bluff research vessels pointed out that brown shrimp were making up the bulk of the catch in May through August 1956. The proportions began to shift by September when only 35 percent of the shrimp caught were brown. During the quarter the trend was completely reversed and in October, November, and December, white shrimp made up 95 percent of the catch. This presumably is a near-normal seasonal situation except that in previous years the shift in populations occurred earlier--even in August.

The increased abundance of white over brown shrimp during the quarter can be oversimply explained by two happenings: (1) the dispersal and disappearance at sea of the large brown shrimp after spawning in September and (2) the seaward migration of small white shrimp from inshore waters.

These white shrimp, if they follow the pattern of other years, will remain under the beaches until next spring. They consitute the residual stock from which next year's crop is derived. The South Carolina General Assembly, in March 1956, gave increased protection to these shrimp by extending the limits of the closed season for commercial shrimp fishing. The season is now closed from December 15 to March 15.

The Laboratories' records for the fourth quarter compared with the same period in previous years indicate that white shrimp were not as abundant. If overfishing is solely responsible for this indicated decline in the population of white shrimp, it then follows that the longer closed season should result in a more abundant crop next spring.

Crab Research: In October 1956, the biologist in charge of crab investigations for the Department of Research and Education of Maryland, came to Bears Bluff to study and measure South Carolina blue crabs. The trawler Constance and the Laboratories' research vessel T-19 secured the necessary crabs for measurement. Studying only the adult female crabs that had already reached their maximum growth, the biologist came up with the following tabulations: South Carolina crabs are 0.2 percent smaller than Delaware Bay crabs but 14.4 percent larger than those from New Jersey; 3 percent larger than Chesapeake Bay crabs; 4 percent larger than those of North Carolina; and 6.5 percent larger than Florida crabs.

Salt Water Ponds: In late November an automatic flood gate in one experimental salt-water pond failed to close properly and due to near tides the pond water remained very low. Predation on the fish and shrimp in the pond by ducks (Mergansers) seemed heavier than usual, so this pond was completely drained on December 13.

A check-up on the shrimp and fish stocked on August 6, when last the pond was drained, showed that 5 of the 6 black drum (Pogonias cromis) were gone. The remaining one had apparently grown from 6.5 to 13 inches. All spot (Leiostomus xanthurus) were gone, as were all croaker (Micropogon undulatus). Some mullet (Mugil sp.) remained but 66.6 percent had disappeared. Those remaining showed little growth. More than 500 white shrimp (Penaeus setiferus) had been stocked in August, but now only one white shrimp was recaptured. This individual had grown about one inch in length--at least in December it measured one inch more than those of the largest shrimp stocked.

The leaking flood gate had not displaced the screens to the pond so that it is probable that the missing specimens did not escape but were either eaten by ducks or otters, or just died.

Some fish and shrimp had entered the pond since August 6. These, because of the screening, must have entered when quite small: 13 spotted shrimp (Penaeus duorarum) 4.5 inches in length; 17 winter sea trout (Cynoscion nebulosis) with a mode of 7 inches; and 5 mullet with a mode of 6 inches were harvested on December 13.

The total harvest of stocked and naturally-recruited specimens to the pond was small but the results give an indication of heavy mortality, much of which can be blamed on predation by water fowl.

Transportation

RAIL FREIGHT AND EXPRESS RATE INCREASES GRANTED: Effective December 28, 1956, the Interstate Commerce Commission granted interim rail freight rate increases. The increases will be 5 percent within the West, 7 percent within the East, and 5 percent on traffic moving between the East, West, or South. No increases were granted for traffic moving wholly within the South, as the hearing on the Southern Railroad's request for a 7 percent increase is set for January 7, 1957.

Maximum increases were prescribed on several commodities, including a 7 cents a 100-lb. maximum on canned or preserved food products. No increase was prescribed for refrigeration or demurrage charges. The Commission also stated that it would expect the railroads to refund any difference between these increases and any lesser increases that may be prescribed as a result of the forthcoming investigation of the carriers' principal petition for a 15-percent increase in Ex Parte 206.

The Commission also decided not to suspend the Railway Express Agency's tariffs providing for a 4-percent increase in all express rates and charges, effective December 27, including reicing charges. The Eastern railroads' petition for a 15-percent increase in express rates within Eastern territory was still pending.

United States Fishing Fleet[1/] Additions

A total of 30 fishing vessels of 5 net tons and over were issued first documents as fishing craft during November 1956, according to the U. S. Bureau of Customs.

Table 1 - U. S. Vessels Issued First Documents as Fishing Craft, by Areas, November 1956 and Comparisons

Area	Nov.		Jan.-Nov.		Total
	1956	1955	1956	1955	1955
	(Number)				
New England	-	1	14	18	18
Middle Atlantic	-	1	23	13	13
Chesapeake	11	7	120	51	54
South Atlantic	5	3	111	64	65
Gulf	7	5	96	97	103
Pacific	3	2	74	112	117
Great Lakes	4	2	6	9	9
Alaska	-	4	40	35	35
Hawaii	-	-	-	3	3
Virgin Islands	-	-	-	-	1
Total	30	25	484	402	418

Note: Vessels assigned to the various sections on the basis of their home ports.

Table 2 - U. S. Vessels Issued First Documents as Fishing Craft, by Tonnage, November 1956

Net Tons	Number
5 to 9	17
10 to 19	7
20 to 29	3
30 to 39	1
40 to 49	1
100 to 109	1
Total	30

This was 5 vessels more than the number reported for the same period last year.

The Chesapeake area in November led with 11 newly-documented craft, followed by the Gulf with 7, the South Atlantic with 5, the Great Lakes with 4, and the Pacific with 3.

A total of 484 fishing vessels was documented for the first time during the first eleven months of 1956--an increase of 82 craft or 20 percent as compared with the corresponding period of a year earlier. During the first eleven months of 1956, Chesapeake led all other areas with 120 newly-documented vessels, followed by the South Atlantic area with 111.

1/ Includes both commercial fishing and sport fishing craft.

U. S. Foreign Trade

Table 1 - United States Foreign Trade in Edible Fishery Products, September 1956 With Comparisons

Item	Quantity			Value		
	Sept.		Year	Sept.		Year
	1956	1955	1955	1956	1955	1955
Imports:	(Millions of Lbs.)			(Millions of $)		
Fish and shellfish:						
Fresh, frozen, & processed 1/	56.3	58.2	769.9	17.5	16.4	206.4
Exports:						
Processed 1/ only (excluding fresh & frozen)	4.4	4.1	91.0	1.7	1.7	21.6

1/ Includes pastes, sauces, clam chowder and juice, and other specialties.

EDIBLE FISHERY PRODUCTS, SEPTEMBER 1956: Imports of edible fresh, frozen, and processed fish and shellfish in September decreased 24 percent in quantity and 21.9 percent in value as compared with August 1956. Compared with September 1955 the imports for September 1956 were lower by 3.3 percent in quantity, but were higher by 6.7 percent in value. September 1956 imports averaged 31.1 cents a pound as compared with 28.2 cents a pound for the same month in 1955.

Exports of processed fish and shellfish in September 1956 declined about 8 percent in quantity compared with the previous month, but were 8 percent above September 1955. The September 1956 value of these exports was 54.5 percent higher than the previous month, but was unchanged from September 1955 a year ago.

* * * * *

GROUNDFISH FILLET IMPORTS DECLINE IN NOVEMBER 1956: During November 1956, the United States imported a total of 5.7 million pounds of cod, haddock, hake, pollock, and ocean perch fillets and blocks. This was a decrease of 5.4 million pounds (49 percent) compared with imports during the same month in 1955. The decrease was due primarily to lower imports from Canada (down 1.5 million pounds).

Groundfish and ocean perch fillets received from Canada during November 1956 amounted to 5.0 million pounds or 87 percent of the total. The remaining 13 percent was received from Iceland, Denmark, the Netherlands, France, West Germany, and Greenland.

Eleven countries exported 134.4 million pounds of groundfish and ocean perch fillets to the United States during the first 11 months of 1956 as compared with 125.7 million pounds in 1955. Canada (96.3 million pounds) led all other countries with 72 percent of the 11-month total. Iceland (26.6 million pounds) was in second place, followed by Norway (3.9 million pounds), Denmark (3.0 million pounds), and West Germany (2.0 million pounds).

* * * * *

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA PROVISO: The quantity of tuna canned in brine which may be imported into the United States during April 16 through December 31, 1956, at the $12\frac{1}{2}$-percent rate of duty is limited to 28,757,393 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem.

Imports under the quota from April 16-December 1, 1956, amounted to 25,849,544 pounds, according to data compiled by the Bureau of the Customs. This leaves a balance of 2,907,849 pounds of the quota which may be imported in the last month of 1956 at the $12\frac{1}{2}$-percent rate of duty.

Wholesale Prices, November 1956

Although some cold weather prevailed in some sections of the country during November 1956, conditions at sea were, on the average, more favorable to the fishermen than during the same month a year earlier. The catches in some of the major fisheries were better than past experience would indicate--particularly in the New England haddock and whiting fisheries, the Gulf shrimp fisheries, and the West Coast tuna fishery. The November 1956 wholesale price index (118.4 of the 1947-49 average) for all edible fish and shellfish (fresh, frozen, and canned), which took a step upward following a two-month downward trend, increased 5.2 percent over October and 5.7 percent over November 1955. The changes in the index from October to November 1956 were due primarily to higher wholesale prices for fresh and frozen shrimp and haddock.

The drawn, dressed, and whole finfish subgroup index for November increased by 4.5 percent when compared with October and 7.3 percent as compared with November 1955. The major change from October to November was an 81-percent

increase in the wholesale price for fresh drawn haddock at Boston. All the other varieties in this subgroup were priced lower when compared with the previous month. The downward movement of wholesale prices for halibut and salmon between October and November does not actually represent any change in the market for these species, but merely a shift in marketing and pricing frozen instead of fresh halibut and salmon. Fresh halibut and salmon were fairly scarce in October and practically disappeared from the market in November.

Because of higher prices for fresh headless shrimp at New York City and fresh haddock fillets at Boston, the November 1956 index for processed fish and shellfish increased 8.1 percent over October and 15.7 percent over the same month in 1955. Fresh haddock fillet prices in November were up 27.7 percent from October, but were lower by 4.2 percent when compared with November 1955. Fresh shrimp prices in November were also higher by 14.8 percent as compared with October and close to 28 percent higher than for November 1955. Fresh shucked oysters were unchanged from October but were up by about 9 percent from November 1955.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, October 1956 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices1/ ($)		Indexes (1947-49=100)			
			Oct. 1956	Sept. 1956	Oct. 1956	Sept. 1956	Aug. 1956	Sept. 1955
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					112.5	114.3	114.6	107.4
Fresh & Frozen Fishery Products:					122.0	125.8	126.5	110.1
Drawn, Dressed, or Whole Finfish:					122.5	132.6	131.2	115.6
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.07	.10	67.4	100.1	101.3	106.3
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.43	.45	135.5	139.2	136.9	99.3
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.67	.68	150.6	151.7	148.3	135.1
Whitefish,L. Superior, drawn, fresh	Chicago	lb.	.75	.61	185.9	151.2	121.5	161.1
Whitefish,L. Erie pound or gill net, rnd., fresh	New York	lb.	.80	.74	161.8	149.6	131.4	161.7
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.75	.58	153.6	117.8	122.9	116.8
Yellow pike, L. Michigan&Huron, rnd.,fresh	New York	lb.	.36	.50	83.3	117.3	129.0	75.1
Processed, Fresh (Fish & Shellfish):					125.4	126.3	122.2	108.9
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.27	.29	91.9	97.0	97.0	102.1
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.71	.72	112.2	113.0	110.2	87.1
Oysters, shucked, standards	Norfolk	gal.	6.00	6.00	148.5	148.5	142.3	136.1
Processed, Frozen (Fish & Shellfish):					106.2	102.9	114.5	93.3
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.39	.40	102.1	103.4	103.4	102.1
Haddock, sml.,skins on, 1-lb. pkg.	Boston	lb.	.28	.28	86.3	86.3	86.3	84.7
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.27	.28	108.8	110.8	110.8	106.7
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.69	.64	105.7	99.2	120.4	83.3
Canned Fishery Products:					99.0	98.0	97.7	103.4
Salmon, pink, No.1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	22.65	22.65	122.0	120.0	120.0	114.8
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	10.85	10.60	78.2	76.4	76.4	92.3
Sardines, Calif., tom. pack,No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	7.75	7.50	90.4	87.5	87.5	88.1
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	7.70	7.70	81.9	81.9	79.8	87.3

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.

The subgroup index in November for frozen processed fish and shellfish reflected the higher frozen shrimp prices at Chicago. Frozen fillet prices were about unchanged from October and the same month a year ago. The November 1956 index for this subgroup increased 11.7 percent as compared with October and was up 8.1

percent over November 1955. Frozen shrimp prices rose 20.4 percent from October to November and were 15.7 percent higher than in November 1955--a reversal of the usual fall trend which is generally downward.

Prices for canned fishery products in general have moved upward steadily for the previous three months due to firm markets for both the California and Maine sardines. The subgroup index for all canned fish rose 1.6 percent when compared with the previous month, but was still about 2 percent below November 1955. The season for packing Maine sardines ended on December 1 and although the pack was fair it was below the average for the last ten years. In November the catch of California sardines was disappointingly low. Although the pack of canned tuna at the end of November was at a record level, sales have been good and shorter packs of competing canned fish have tended to strengthen the canned tuna market.

OCEAN PERCH CASSEROLE IS POPULAR

Frozen ocean perch fillets--plentiful and moderately-priced--rate very high in popularity. They have the added attraction of offering welcome relief from year's-end food budget problems.

This mild and agreeably-flavored fish is excellent in combination with other foods. A casserole containing fish (which is a high quality protein food), vegetables, and topped with pastry is a well-rounded meal in itself. Baking and serving this casserole in the same dish is an easy way to bring food piping hot to the table.

The home economists of the United States Fish and Wildlife Service recommend "Ocean Perch and Vegetable Pie" as a moderately priced well-rounded casserole dish.

OCEAN PERCH AND VEGETABLE PIE

1 POUND OCEAN PERCH FILLETS, FROZEN
1 QUART WATER
1 TABLESPOON SALT
2 TABLESPOONS BUTTER OR OTHER FAT
2 TABLESPOONS FLOUR
$\frac{1}{4}$ TEASPOON SALT
DASH PEPPER
1 CAN ($10\frac{1}{2}$ OUNCES) CONDENSED
$\frac{1}{2}$ VEGETABLE SOUP
$\frac{1}{2}$ CAN WATER
1 CUP PASTRY MIX

Thaw fillets. Skin fillets and place in boiling salted water. Cover and return to boiling point; simmer 10 minutes or until fish flakes easily when tested with a fork. Drain and flake.

Melt butter; blend in flour and seasonings. Add soup and water; cook until thick, stirring constantly. Add fish. Pour into well-greased casserole. Prepare pastry as directed. Cover casserole with pastry. Bake in a very hot oven, 450° F., for 20 to 25 minutes or until brown. Serves 6.

International

GENERAL AGREEMENT ON TARIFFS AND TRADE

ELEVENTH SESSION OF CONTRACTING PARTIES: Several issues of primary importance to the future work of the Contracting Parties to the General Agreement on Tariffs and Trade were considered during the eleventh regular session of the Contracting Parties. The Session began on October 11 and closed on November 17, 1956, in Geneva, Switzerland.

During the Session, arrangements were made for the Contracting Parties to hold comprehensive consultations during 1957 with most of the countries maintaining import quotas for balance-of-payments reasons. This will be the first general examination of such quantitative restrictions since the General Agreement was initiated in 1948.

Preliminary discussion was held with regard to the relationship of the General Agreement to current negotiations in Brussels on a European common market or customs union among Belguim, France, Germany, Italy, Luxembourg, and the Netherlands. A similar discussion took place with regard to studies in Paris which may lead to a free trade area between members of the proposed customs union and various Western European countries, such as the United Kingdom. In view of the preliminary nature of the Brussels and Paris work, it was not possible to discuss the substance to any great extent. It was agreed, however, that if these plans mature, such discussions would take place at a future time, and procedures for the consultation were established.

The way was cleared under which Nicaragua, a contracting party, and four neighboring states which are not contracting parties can form a Central American free trade area.

The session just concluded was a regular annual meeting during which the contracting parties discussed various matters which had come up under the administration of the General Agreement.

Thirty-five countries are presently contracting parties to the General Agreement on Tariffs and Trade.

Other Actions on Import Restrictions: During the session, the Contracting Parties conducted their annual consultations on discriminatory import restrictions with Australia, Ceylon, New Zealand, Rhodesia and Nyasaland, and the United Kingdom.

In each case, some progress was noted in the reduction of discrimination against dollar goods during the past year. Ceylon, in particular, made a major move in September 1956 when it removed its monetary ceilings on the licensing of dollar goods and established a de facto regime of nondiscrimination, which results in the automatic licensing of virtually all imports from the dollar area.

In addition, the United States Delegation held bilateral consultations with the delegations of 13 countries: Australia, Brazil, Ceylon, Denmark, France, Germany,

India, Italy, Japan, The Netherlands, New Zealand, Norway and the United Kingdom. These discussions covered import restrictions maintained by these countries on specific commodities which created a hardship to United States producers or were unduly discriminatory toward United States goods. In each case the United States Delegation suggested that the other country consider whether a relaxation of the restriction could be made without disrupting that country's balance-of-payments position. Fisheries products were discussed with four countries (Denmark, Germany, Norway, and the United Kingdom).

Results of the discussions were generally favorable. Several assurances of immediate favorable action were obtained; in some instances the prospect of fairly early reduction in the level of such restrictions was indicated; while in a few instances the countries indicated a need for the continuance of the restrictions. In each case, however, a full and frank discussion of the restrictions, the reasons for their maintenance, proposals for their elimination, or the need for their continuance served to provide a basis for mutual understanding and for further consultations in the future.

The Contracting Parties issued their Seventh Annual Report on the Discriminatory Application of Import Restrictions.

Note: Also see Commercial Fisheries Review, November 1956, p. 65.

GREAT LAKES FISHERIES COMMISSION

FIRST ANNUAL MEETING AT ANN ARBOR, MICHIGAN: The Great Lakes Fisheries Commission on November 20, 1956, completed a two-day annual meeting at the University of Michigan in Ann Arbor. The Commission, which was established by treaty between Canada and the United States, consists of three representatives from Canada and three from the United States. The meeting was lead by the Commission Chairman, John L. Farley of the U. S. Fish and Wildlife Service and Vice-Chairman, Dr. A. L. Pritchard, of the Canadian Department of Fisheries.

The Commission's major concerns are control of the parasitic sea lamprey in the Great Lakes, and the planning, promotion, and coordination of fishery research with a view towards maintaining fishery production from the Great Lakes on a sustained yield basis.

The most important task accomplished by the Commission at this meeting was a thorough review of the research and lamprey control operations carried out during the past season. The commission heard reports in detail from scientists from Canada and the United States who are carrying out its programs.

The Fisheries Research Board of Canada and the U. S. Fish and Wildlife Service of the United States, under the direct supervision of the Commission, engaged in a $900,000 lamprey control program during 1956. These two organizations during the past season have installed barriers on all streams tributary to Lake Superior now known to contain lamprey runs--81 barriers are now in operation. The records of rate of increase in the abundance of sea lampreys in Lake Superior emphasizes the urgent need for effective control. The number of spawning-run individuals captured in 30 streams that contained barriers in 1954-1955 were: 1954, 4,922; 1955, 8,823; 1956, 19,009. In 1956 the number of lake trout bearing lamprey scars taken in the fishery approximately doubled over 1955.

In Lake Michigan, 19 barriers were operated that took more than 54,000 lampreys in the Green Bay-northwest Michigan area, and currently barriers are being installed on 55 additional streams and should be ready for operation in 1957. In Lake Michigan the control network will be completed by early 1958.

In Lake Huron during the current season streams were surveyed and sites selected for installation of barriers. Installation is planned for 1958.

Preliminary studies in cooperation with Ohio, Pennsylvania, and New York, and the Province of Ontario have been made on the lamprey situation in Lakes Erie and Ontario.

At the same time the Commission is investigating other methods of control. One of these is the development of a direct current electrical device which will guide the lamprey into a trap where it can be destroyed. Two pilot models of such a direct-current device were tested. The results were especially gratifying. This device, if it proves out, will be more economical to operate than other types of electrical barriers.

A great deal of work has been done on chemicals which will kill lamprey but not affect other fish. The results of laboratory work with these chemicals indicate that they may be successful in the control of the lamprey before it becomes parasitic, but extensive field tests are required and a number of intricate problems will have to be solved before the Commission will know whether or not these chemicals will be useful.

Commission scientists are following up another possible means of control which would involve the use of ultrasonic vibrations. During the course of the ultrasonic experiments it was discovered that lamprey are capable of creating electrical impulses which result in an electrical field around the head region of the lamprey.

In addition to the lamprey control work, research agencies in the United States and Canada have, during the past season, carried out a quarter of a million dollar Commission research program on the fisheries.

A major aspect of these studies has been an inquiry into the direct and indirect consequences of sea lamprey predation on the deep-water populations such as lake trout, whitefish, and chubs. Further research has been carried out on fisheries not affected or little affected by sea lamprey as part of a long-term program to determine the factors that control levels of abundance and production.

These researches are being carried out on all five of the Great Lakes by scientific staffs totaling some 55 persons, operating from 7 research stations with 6 vessels at their disposal.

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

1956 FRASER RIVER SOCKEYE SALMON RUN BELOW BROOD-YEAR 1952: The 1956 run of Fraser River sockeye, including the commercial and Indian catch as well as the escapement, declined 14 percent relative to the brood-year 1952. In 1955 the run declined 17 percent relative to the brood-year 1951. Survival conditions affecting the 1956 run were slightly better than those affecting last year's run; nevertheless a negative condition existed which is not considered to be representative of normal productivity.

In spite of the decline in the total run, special consideration was given to obtaining adequate escapement with the result that the total escapement actually increased slightly over that recorded in the brood-year. The 1956 escapement of 888,000 sockeye salmon was 32.2 percent of the total run. A year ago overfishing combined with the 17-percent decline in the total run resulted in an escapement of only 14.6 percent of the run. The 1955 escapement was not favorable to maintaining the 1955 cycle on a maximum production basis, hence every effort was made in 1956 to avoid a duplication of the unfavorable 1955 catch-escapement ratio.

The total 1956 escapement was satisfactory and the individual racial escapements are considered favorable to the maintenance of this cycle on a maximum potential level of productivity. The escapement of many races showed substantial

declines in productivity, but in most cases the decline can be attributed to the gradual formation of dominant year-classes on other cycle years. These declines have been predicted for several years in the annual reports of the International Pacific Salmon Fisheries Commission.

The Chilko River, Gates Creek, and Silver Creek runs were the only dominant year-classes expected, and in each case the production and escapement was satisfactory although below the maximum expected. Chilko produced a total catch of 1,120,000 sockeye and an escapement of 647,000 for a total racial run of 1,767,000 fish. The run to Chilko has shown a consistently greater ability to escape the fishing gear than the other races. This year's Chilko escapement was 36.6 percent of the Chilko run while the escapement of all other races was only 24.4 percent. The escapement to Chilko was actually in excess of calculated requirements for maximum production, but was a necessary result of allowing the escapement of other races migrating at the same time to be maintained at a reasonable level.

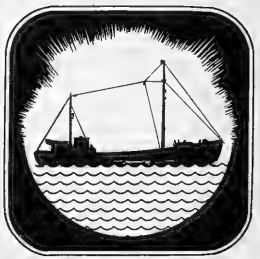
In the lower river area, the escapement to Cultus Lake appears satisfactory. The run to Weaver Creek had been seriously affected by drought conditions in the brood-year, and a substantial drop in population size was expected on the basis of the fry emergence count in the spring of 1953. For the first time in several years the Birkenhead run held relatively steady with the decrease in the size of escapement due almost entirely to a decline in the number of three-year-old fish, which have no value in reproducing the population. The Pitt River escapement was almost entirely five-year-old fish; the 32,258 fish on the spawning ground compares favorably with the figure of 37,833 recorded in 1951.

If the surplus escapement to Chilko could have been taken in the fishery, the total catch would have approached the 2,000,000 figure anticipated as the minimum catch for 1956. The actual catch was 1,802,000 for both countries, and was divided within 12,000 fish of equal division between the fishermen of Canada and the United States.

In conclusion, it may be said that the 1956 run approached very closely to the minimum expected, but well below the maximum potential. The escapement is considered satisfactory for maintaining the cycle at a potentially high level of productivity.

NORTHWEST ATLANTIC FISHERIES COMMISSION

Mesh regulations for the trawl fishery for Cod and Haddock in Subareas 3, 4, and 5: Agreed to by the Commission in its 1955 Annual Meeting, mesh regulations for the trawl fishery for cod and haddock in subareas 3, 4, and 5 have been accepted by the Governments concerned and were expected to be put in force by the beginning of 1957 Proposals for some minor changes in these regulations, dealing with saving gear used and with exemptions in order to avoid impairment of fisheries conducted primarily for species other than cod or haddock, were made by the Commission at its 1956 Annual Meeting. These proposals were transmitted by the Depositary Government to the member countries. Acceptance by governments has up to date been received from Norway.



Annual Meeting: The Commission in its 1955 meeting agreed to a change in the 1949 Convention in order to make possible the holding of Annual Meetings not only in North America but in any of the participating member countries. The United States Department

of State has now informed the Secretariat on August 21, 1956, that all ten member governments had approved this amendment to the 1949 Convention, the Commission's December 3, 1956 newsletter points out.

The 1957 annual meeting will be held in Lisbon, Portugal, May 20-25. It will be preceded by meetings of the Standing Committee on Research and Statistics on May 17-18, and followed by a Workshop on Population Dynamics and on the Selectivity of Fishing Units, May 27 to June 3.

The Food and Agriculture Organization of the United Nations and the Conseil Permanent International Pour l'Exploration de la Mer have accepted an invitation by ICNAF to hold their proposed meetings on the same or similar problems in Lisbon at the same time, in order that the three organizations could hold joint meetings, when convenient. To ensure the fullest possible cooperation of the three organizations in the Workshop, a "steering committee" has been set down composed of one member from each of the three sponsoring organizations.

The meeting will take place in the sea coast resort of Estoril some 15 miles from the center of Lisbon.

TERRITORIAL WATERS

NORWAY AND RUSSIA NEGOTIATE ON TERRITORIAL WATERS: Negotiations began on December 3 between Norway and Soviet Russia to determine the point of demarcation of the fisheries territorial waters boundary between the two countries in the Varangerfjord area. The negotiations now in progress were the result of a request by Norway to the Soviet Union for a meeting to solve the problems arising from the seizure of more than 20 Norwegian vessels by the Soviets during recent months. The Norwegian vessels were allegedly fishing in Soviet territorial waters (Morgenbladet, December 3, a Norwegian daily newspaper).

UNITED NATIONS

TERRITORIAL WATERS AND FISHERY JURISDICTION CONSIDERED BY COMMITTEE: The sixth committee of the United Nations began consideration on December 3, 1956, of the report of the International Law Commission (ILC) on the "Final Report on the Regime of the High Seas, the Regime of the Territorial Sea, and Related Problems." Included in this report are recommendations regarding international limits to territorial waters and fishery jurisdiction, which are important to the fishery industries.

On November 27 the United States introduced, together with 22 co-sponsoring nations, a resolution calling for endorsement of the recommendation of the ILC that its report on the law of the sea be referred to a special international plenipotentiary conference for study and consideration, which would take account of the legal, technical, biological, economic, and political aspects of the problem.

The United States resolution refers the ILC report to the specialized conference as the basis for its consideration of the various problems involved in the development and codification of the law of the sea. This resolution is entirely procedural and it had been hoped that any substantive discussion on the merits of the various topics covered by the ILC report would be deferred until this contemplated special conference had been convened.

While the United States believes that future consideration of these matters should be concerned also with the technical and biological aspects when appropriate to their context, a considerable number of delegations at this meeting would have the primary if not the total emphasis of future discussions rest on political and economic considerations.

Two proposals were put forward by Canada and Venezuela, that would go far in defining the limits on territorial waters and fisheries jurisdiction.

The Canadian spokesman recalled that his country has historically promoted the three-mile limit to territorial waters. He noted that many countries including his own had already found such a narrow limit to be inadequate or insufficient with regard to customs, fiscal matters, and sanitation control, and that as a consequence many countries had already established a 12-mile contiguous zone to deal with these matters. The Canadian delegate observed that it was the opinion of his government that the narrow three-mile territorial limit was now also insufficient to permit proper control and regulation of fisheries by the coastal state, adding that Canada was submitting an extension of a contiguous zone for the control and regulation of fisheries to 12 miles, for consideration by the proposed world conference. He added that under this compromise plan the breadth of the territorial sea would still remain at three miles, but that fishery regulations and control would be divorced from other considerations in the territorial sea. According to the Canadian spokesman, this separate fisheries treatment would allow each state to control its fisheries without the complication of international law and that this specialized extension would not endanger freedom of the seas nor air navigation.

The Venezuelan delegation presented support for a 12-mile territorial sea with the privilege of extending fisheries zones further if and when they saw fit, and it was particularly noted that his country recognized no historic right of any country in this respect.

General debate on the report of the ILC report was continued the week of December 10 by the sixth committee of the United Nations. Delegates from most of the countries represented at the session were able during the week to state their positions.

The positions voiced generally followed the historic position taken by each country in recent years. Regarding the compromise proposal introduced by Canada a week earlier only one nation--Ireland--took notice of it in public discussion. Also, there was little informal comment on the Canadian proposal among the delegates.

It appeared that the countries favoring a 200-mile jurisdiction, such as Chile, Ecuador, and Peru, receded somewhat from their former extreme positions to the extent of stating that if conservation problems connected with fishing off their coasts are accommodated, their interest in extended sovereignty would diminish.

From comment in debate, most countries seemed to favor adoption of the United States proposal to endorse the recommendation of the ILC that its report on the law of the sea be referred to a special international conference for study.

On December 20 the sixth committee of the United Nations concluded its consideration of the ILC report and adopted a resolution referring the general subject of the Law of the Sea to a plenipotentiary conference to be held in Rome, early in 1958.

This resolution was introduced by 23 nations: Australia, Brazil, Ceylon, Cuba, Denmark, Dominican Republic, France, Greece, Guatamala, Mexico, Netherlands, New Zealand, Norway, Pakistan, Panama, Philippines, Portugal, Spain, Sweden, Thailand, United Kingdom of Great Britain and Northern Ireland, United States, and Uruguay. A total of 65 countries approved the resolution, with one dissenting vote--Iceland.

In view of the numerical support for this resolution, it may be expected to receive approval of the General Assembly. It is not known when the resolution will come before the General Assembly.

The text of the final resolution is as follows:

"The General Assembly,

"Having received the report of the International Law Commission covering the work of its 8th Session which contained draft articles and commentaries on the Law of the Sea,

"Recalling that the General Assembly in Resolution 798(8) of December 7, 1953, 'having regard to the fact that the problems relating to the high seas, territorial waters, contiguous zones, the continental shelf and the superadjacent waters were closely linked together juridically as well as physically,' decided not to deal with any aspect of those matters until all the problems involved had been studied by the International Law Commission and reported upon by it to the General Assembly.

"Considering that its Resolution 899 (9) of December 14, 1954, requested the International Law Commission to submit its final report on those subjects in time for the General Assembly to consider them 'as a whole' at its Eleventh Session,

"Taking into account also Paragraph 29 of the Commission's report wherein, 'the Commission considers--and the comments of governments have confirmed this view--that the various sections of the Law of the Sea hold together, and are so closely interdependent that it would be extremely difficult to deal with only one part and leave the others aside,'

"1. Expresses its appreciation to the Commission for its valuable work on this complex subject;

"2. Decides, in accordance with the recommendation contained in Paragraph 28 of the Commission's report, that an international conference of plenipotentiaries should be convoked to examine the Law of the Sea, taking account not only of the legal, but also of the technical, biological, economic and political aspects of the problem, and to embody the results of this work in one or more international conventions or such other instruments as it may deem appropriate;

"3. Recommends that the conference should study the question of free access to the sea of land-locked countries, as established by international practice or treaties;

"4. Requests the Secretary-General to convoke such a conference in Rome early in March 1958;

"5. Invites all states, members of the United Nations, and states, members of the specialized agencies to participate in the Conference and to include among their representatives experts competent in the fields to be considered;

"6. Invites the interested specialized agencies and inter-governmental bodies to send observers to the conference;

"7. Requests the Secretary-General to invite appropriate experts to advise and assist the Secretariat in preparing the conference, with the following terms of reference:

"a. To obtain in the manner in which they think most appropriate from the invited governments any further provisional comments the governments may wish to make on the Commission's report and related matters, and to present to the conference in systematic form any comments made by the governments and the relevant statements made in the Sixth Committee in the Eleventh and previous sessions of the General Assembly;

"b. To present to the conference recommendations concerning its method of work and procedure, and other questions of an administrative nature;

"c. To prepare or arrange for the preparation of working documents of a legal, technical, scientific or economic nature in order to facilitate the work of the conference;

"8. Requests the Secretary-General to arrange also for the necessary staff and facilities which would be required for the conference, it being understood that the technical services of such experts as are needed will be utilized;

"9. Refers to the conference the Commission's report as a basis for its considerations of the various problems involved in the development and codification of the Law of the Sea; and also the verbatim records of the relevant debates in the General Assembly, for consideration by the conference in conjunction with the Commission's report;

"10. Requests the Secretary-General to transmit to the conference all such records of world-wide or regional international meetings as may serve as official background material for its work;

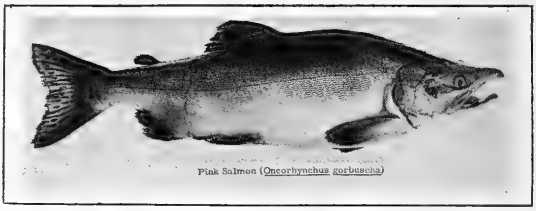
"11. Calls upon governments invited to the conference and the groups thereof to utilize the time remaining before the opening of the conference for exchanges of views of the controversial questions relative to the Law of the Sea;

"12. Expressed the hope that the conference will be fully attended."

Note: Also see Commercial Fisheries Review, October 1956 p. 41 and September 1956 p. 49.

UNITED STATES AND CANADA SIGN PINK SALMON CONSERVATION AGREEMENT

The United States and Canada on December 28, 1956, signed in Ottawa a Protocol to the Sockeye Salmon Convention of 1930 placing the pink salmon of the Fraser River System under the terms of the Convention. Signing on behalf of the United States were Ambassador Livingston T. Merchant and William C. Herrington, Special Assistant for Fisheries and Wildlife to the Under Secretary of State. Minister of Fisheries James Sinclair signed for Canada, a December 28, 1956, news release from the State Department announced.



Pink Salmon (Oncorhynchus gorbuscha)

The Protocol amends the 1930 Convention in a number of ways. Its most important change is to place the pink salmon of the Fraser River System under the jurisdiction of the International Pacific Salmon Fisheries Commission. The Commission which was established in 1937 consists of three representatives each from the United States and Canada. It has had since 1937 the responsibility for the investigation and management of the Fraser River sockeye salmon. Its success in the sockeye fisheries has been outstanding.

The Commission will now have the same powers of research and regulation over pink salmon as it has over sockeye salmon. It is charged with so regulating the pink salmon fisheries as to achieve maximum sustainable productivity of the pink salmon stocks. At the same time it must, so far as is possible, divide the catch equally between United States and Canadian fishermen. The Convention area remains unchanged. It covers Juan de Fuca Strait, part of Georgia Strait, the Fraser River System, and an area of the high seas of the Pacific Ocean. The Fraser River pink salmon, which make their spawning runs every two years through the Straits, account for much of the $10,000,000 pink salmon catch made every other year by the fishermen of Washington and British Columbia.

Other modifications made by the Protocol in the Convention include an increase in the size of the Commission's Advisory Committee and a greater flexibility in the Commission's power to issue regulations in certain areas. The Protocol also provides for intensive investigation by the Commission and by research agencies on both sides of the border of all pink salmon stocks which enter Convention waters. The Protocol calls for a United States-Canadian Government meeting in its seventh year of operation for a review of research findings and a consideration of further arrangements for pink salmon conservation.

The Protocol is subject to the advice and consent to ratification of the United States Senate. It will enter into effect upon the exchange of ratifications by the two Governments.

The Protocol is as follows:

PROTOCOL

Between the United States of America and Canada to the Convention for the Protection, Preservation and Extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May 1930.

The Government of the United States of America and the Government of Canada, desiring to coordinate the programs for the conservation of the sockeye and pink salmon stocks of common concern by amendment of the Convention between the United States of America and Canada for the Protection, Preservation and Extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, hereinafter referred to as the Convention,

Have agreed as follows:

Article I

The Convention as amended by the present Protocol shall apply to pink salmon with the following exception:

The understanding stipulated in the Protocol of Exchange of Ratifications signed at Washington on the 28th day of July, 1937, which provides that "the Commission shall not promulgate or enforce regulations until the scientific investigations provided for in the Convention have been made, covering two cycles of sockeye salmon runs, or eight years;" shall not apply to pink salmon.

Article II

The following words shall be deleted from the first sentence of Article IV of the Convention:

". . . that when any order is adopted by the Commission limiting or prohibiting taking sockeye salmon in any of the territorial waters or on the High Seas described in paragraph numbered 1 of Article I, such order shall extend to all such territorial waters and High Seas, and, similarly, when in any of the waters of the United States of America embraced in paragraph numbered 2 of Article I, such order shall extend to all such waters of the United States of America, and when in any of the Canadian waters embraced in paragraphs numbered 2 and 3 of Article I, such order shall extend to all such Canadian waters, and provided further . . . ."

Article III

The following paragraph shall be added to Article VI of the Convention:

"All regulations made by the Commission shall be subject to approval of the two Governments with the exception of orders for the adjustment of closing or opening of fishing periods and areas in any fishing season and of emergency orders required to carry out the provisions of the Convention."

Article IV

Article VII of the Convention shall be replaced by the following Article:

"The Commission shall regulate the fisheries for sockeye and for pink salmon with a view to allowing, as nearly as practicable, an equal portion of such sockeye salmon as may be caught each year and an equal portion of such pink salmon as may be caught each year to be taken by the fishermen of each Party."

Article V

Paragraph (3) of the understandings stipulated in the Protocol of Exchange of Ratifications signed at Washington on the 28th day of July, 1937, shall be amended to read as follows:

"That the Commission shall set up an Advisory Committee composed of six persons from each country who shall be representatives of the various branches of the industry including but not limited to, purse seine, gill net, troll, sport fishing and processing, which Advisory Committee shall be invited to all non-executive meetings of the Commission and shall be given full opportunity to examine and to be heard on all proposed orders, regulations or recommendations."

Article VI

1. The Parties shall conduct a coordinated investigation of pink salmon stocks which enter the waters described in Article I of the Convention for the purpose of determining the migratory movements of such stocks. That part of the investigation to be carried out in the waters described in Article I of the Convention shall be carried out by the Commission.

2. Except with regard to that part of the investigation to be carried out by the Commission, the provisions of Article III of the Convention with respect to the sharing of cost shall not apply to the investigation referred to in this Article.

3. The Parties shall meet in the seventh year after the entry into force of this Protocol to examine the results of the investigation referred to in this Article and to determine what further arrangements for the conservation of pink salmon stocks of common concern may be desirable.

Article VII

Nothing in the Convention or this Protocol shall preclude the Commission from recording such information on stocks of salmon other than sockeye or pink salmon as it may acquire incidental to its activities with respect to sockeye and pink salmon.

Article VIII

The present Protocol shall be ratified and the exchange of the instruments of ratification shall take place in Ottawa as soon as possible. It shall come into force on the day of the exchange of the instruments of ratification.

In witness whereof the undersigned, duly authorized by their respective Governments, have signed this Protocol and have affixed thereto their seals.

Done in duplicate at Ottawa this 28th day of December 1956.

The conference between United States and Canadian delegates also took note of the serious threat which offshore net fishing poses to the conservation of both pink and sockeye salmon stocks and adopted a resolution calling this matter to the attention of the governments and recommending immediate action on their parts to solve the problem.

Algeria

SHRIMP FISHERY: The Algerian catch of shrimp for 1953-55 averaged 1,559 metric tons a year and was made up predominantly of small gray shrimp, about 40-45 count to the pound heads on. About 80 percent of the catch is taken from off the coasts of the Departments of Algeria and Oran.

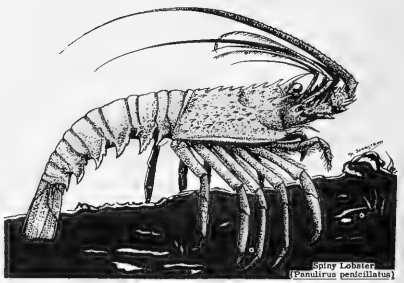
The export market is almost exclusively confined to shipments to France, according to an October 31, 1956 dispatch from the United States Consul in Algiers. Exports of shrimp to France are combined with those of spiny lobster and other crustaceans, and it is therefore impossible to estimate the quantity and the value.

There are no shrimp canneries in the country and equipment employed by the fishermen is reported to be old and outmoded. The catch is all made by vessels of Algerian registry, and it is believed that no foreign capital is invested in the fishery.

There is no government program, at present, devoted to the development of the shrimp fishery. The market is limited somewhat by the high cost of transport from Algerian ports to the French market. As far as it can be determined at this time, France has no restrictions on the importation of shrimp, but it is possible that such restrictions could be applied to protect the market for Algerian shrimp.

Australia

HIGH STANDARDS SET FOR FROZEN SPINY LOBSTER TAIL INDUSTRY: The problems encountered in maintaining a high standard of quality for Australian spiny lobsters are discussed in an article by Dr. Keith Sheard, a fisheries research officer of Australia's Division of Fisheries and Oceanography, which appeared in the October 1956 issue of the Australian Commonwealth Director of Fisheries Fisheries Newsletter. According to Dr. Sheard, the Australian frozen spiny lobster tail trade is a luxury industry depending for success on a high standard of quality. Excerpts from the article follow:


Spiny Lobster (Panulirus penicillatus)

Processing and refrigeration of spiny lobster or crayfish in Australia are of a high standard and the inspection system of the Australian Department of Primary Industry is first class, while the exporters show a high degree of responsibility. The packing plants, however, can process the spiny lobster only in the condition they get them. They cannot improve an already damaged product, particularly when the damage is not easily visible. And yet, any bruising of the spiny lobster, anything that leads to a leakage of blood into the tissues, can result in an unappetizing product, when it is marketed months later, and thousands of miles away.

In 1950, when the Australian export industry of frozen spiny lobster tails was still in its early stages a pamphlet, Care in the Handling of Crayfish, was published as Fisheries Bulletin No. 3 of the West Australia Fisheries Department. This work showed that a number of kinds of darkening or discoloration of the meat could occur during freezing, cold storage, or on thawing. In each case the remedies proved to be very simple even though the chemistry of the discoloration process was often most complicated.

If the shell above the blackened areas is examined very carefully it will often show signs of bruising, and further that the underlying tissues have been damaged. This often happens during catching or sorting, or transport to the factory or freezer boat.

When a spiny lobster is caught and hauled to the surface, the change in its living conditions is sudden and very great. The temperature is altered from the coolness of the sea bottom to the warmth or heat of the boat and bags. The spiny lobster is brought very quickly from its usual darkness to bright sunlight and from high to low pressures. Its oxygen supply becomes limited to the small quantities contained in the film of water around the gills; this oxygen supply, which is renewed very slowly from the air, decreases as the temperature rises. Since there is no current of water to carry them away, the waste products spread over and poison the gills. Changes then occur in the spiny lobster meat and the animal weakens and at length dies. During these changes the meat becomes less and less fit for processing and poor quality frozen tails result.

If, in addition to this, the spiny lobster is crushed or bruised, or otherwise badly handled, each damaged spot leaks its small amount of blood and fluid. Sooner or later darkening appears and the tail loses in value.

Even very simple care on catcher and transport boats, and while the spiny lobster are stored for processing, can make considerable difference to the quality of the pack.

For example, a major cause of bruising and injury is the practice of packing large spiny lobster with small ones. To offset this many fishermen use bag holders, and have two bags open, one for large and one for small spiny lobster. Where wells are used, one side is kept for the larger spiny lobster and the other for the smaller. The large are very powerful and the smaller can be badly damaged as the big ones struggle, particularly in the bags.

Every fisherman, in order to safeguard his income is urged to take precautions along the following lines to insure that every care is taken to see that the spiny lobsters are not injured or damaged at any time.

(a) The spiny lobster should be kept in the light for as short a time as possible, and should always be kept out of direct sunlight.

(b) Temperatures should be kept low.

(c) Overcrowding in wells or crates should be avoided.

(d) Storage in crates or wells should always be in strong currents or tides.

(e) Spiny lobster should not be stored in boat wells or in crates at the sea surface during periods of calm, hot weather.

(f) No spiny lobster, whether loose or in bags, should be exposed to the wind, as this rapidly dries the film of water on the gills.

(g) Bags should never be stored in layers such that there is any crushing or bruising affect on the spiny lobster either during storage and transport or on the weighing scales.

* * * * *

TASMANIA SCALLOP CATCH SETS NEW RECORD: During the 1956 scallop season the production of scallop meats in the Australian State of Tasmania reached

a record total of 525 tons. This total compares with 511 tons of scallop meats in 1955. The new beds located in Norfolk Bay produced 363 tons of scallop meats, according to the Australia Commonwealth Director of Fisheries Fisheries Newsletter of November 1956.

A large proportion of the Norfolk Bay scallops were mature and towards the end of July showed signs of spawning. However, additional beds of smaller scallops were located and most boats operated on them until the end of the season. Many fishermen reported having located other beds where young scallops were plentiful, so prospects for future years appeared to be sound.

* * * * *

WHALE MEAT EXPORTED TO THE UNITED STATES: In addition to pearl shell, spiny lobster, whale oil, tuna, and shrimp. Australian fisheries have now added a new export--whale meat for use as animal food.

The whale meat is being exported by the whaling station at Byron Bay, northern New South Wales. The company had a contract to supply a minimum of 150 tons of the meat in 1956 to a firm in California.

The contract is the result of two visits to Australia by the Vice-President for the United States company.

The meat is chilled and minced through 1-inch plate at the whaling station, frozen at Byron Bay and Coolangatta, and held at Brisbane in cold storage pending shipment.

The Perth newspaper West Australian says another whaling company has received an offer from the California firm for 2,000-3,000 tons of whale meat. "A spokesman" for the company said no decision would be made until after the 1956 whaling season, states the Fisheries Newsletter for September 1956.

* * * * *

SHRIMP FISHERY CONTINUES TO SHOW PROMISE: Modern packing and processing methods, plus the assurance of regular refrigerated cargo space to both the east and west coasts of the United States, has added shrimp to the list of profitable fishery products exported by Australia. It was predicted in the November 2, 1956 issue of The Fishing News, a British fishery trade publication, that exports to the United States market will reach 1 million pounds by the middle of 1957 and be close to 5 million pounds (valued at US$2.8 million) by 1961.

The center of the shrimp fishery for the export trade is located in Evans Head, a small town about 510 miles north of Sydney on the east coast of Australia. The Evans Head Fishermen's Cooperative, which was formed eight years ago, has a fleet of 41 vessels equipped for offshore fishing. These vessels will concentrate on the shrimp fishery. The Cooperative will sell their shrimp catches to an Australian export firm which acts as agents for a United States marketing firm.

The shrimp cooperative located at Evans Head has purchased machinery from the United States for washing, grading, deheading, and peeling the shrimp. The shrimp will be layer-packed by hand in 2-, 5-, and 7-pound packages for quick freezing. A new building and a quick-freezing plant valued at US$90,000 are now under construction at that port.

Australia does not produce the jumbo size shrimp (about 10-15 count), but has one variety known as the tiger shrimp, which will average 2-3 a pound. This species

varies in color from olive green to light brown and sometimes weighs as much as one pound each. There are three other distinct varieties, the small green school shrimp, the green or brown king shrimp, and the cream-colored banana shrimp, which is a tropical variety found in quantity only in Queensland waters. The Australians prefer the small green school shrimp, but the banana variety is the type that will be exported to the United States. This type, headless and peeled, will range from 25-35 a pound. The small green school shrimp and the tiger shrimp are found on muddy bottom, the king shrimp on sandy bottom, and the banana shrimp have been caught at varying depths and times--during the daytime in 15 fathoms, at night between 25-30 fathoms.

Some of the Evans Head trawlers are fitted with echo-sounders which enable them to fish in deep water where the larger varieties are found. Most of the vessels have ship-to-shore radios for contact with the base plant, for obtaining the latest information on weather conditions and on areas of good production.

The fisherman are now beginning to reap the benefit of intensive research on the part of the New South Wales Department of Fisheries over the past few years.

The new shrimp fishery is reported to be no gold mine for the shrimp trawlers and fishermen. The price paid to the boats for heads-on shrimp is about 25 U. S. cents a pound. A weight loss of almost 40 percent in the heading and peeling process, plus other coasts such as packaging, freezing, transport, etc., add considerably to the export value and the ex-vessel price cannot be higher than 25 cents a pound.

Note: Also see Commercial Fisheries Review, November 1956, p. 71-73; October 1956, p. 52; April 1956, p. 30; and February 1956, p. 44.

Canada

BRITISH COLUMBIA SALMON PACK, 1956: The British Columbia pack of canned salmon for the 1956 season ending in November totaled 1.1 million standard cases (48 1-lb cans), the Canadian Department of Fisheries reported on December 5, 1956.

The pack of canned salmon during 1956 was 20.9 percent below the previous year's pack and was down about 28.5 percent from the average for the six-year period 1951-56. The pack of pink salmon was lower (56.3 percent below 1955), but this was not unexpected as 1956 is not a cycle year for this species. The sockeye or red salmon pack was up 30.8 percent from 1955, but was disappointing as a better catch was anticipated from the relatively good year-classes between 1951 and 1953.

Table 1 - British Columbia Canned Salmon Pack, 1951-56

Species	1956	1955	1954	1953	1952	1951
	(Standard Cases--48 1-lb. Cans to Case)					
Sockeye (red)	320,124	244,821	680,718	510,147	449,494	428,299
Spring (king)	11,639	17,853	14,080	13,049	9,279	13,698
Steelhead	1,248	1,590	3,733	3,030	3,763	3,656
Blueback	10,549	10,544	4,302	2,055	5,583	13,237
Coho (silver)	202,456	175,179	123,778	108,109	59,370	291,303
Pink	363,181	831,253	335,550	794,764	679,182	735,468
Chum (keta)	203,633	124,860	580,575	394,113	91,886	460,421
Totals	1,112,830	1,406,100	1,742,736	1,825,267	1,298,557	1,946,082

Note: Also see Commercial Fisheries Review, December 1955, p. 51.

* * * * *

NEW FISHING VESSEL "SLEEP ROBBER" IS A VERSATILE TYPE: Canada's newest and most modern fishing vessel, the Sleep Robber, sailed from Vancouver on her maiden trip at the end of September 1956 and began fishing for halibut in the Pacific ocean.

The Sleep Robber, built to special design for its owner, has just about everything that is known to make a fishing vessel efficient and comfortable for its crew.

Built in New Westminster, British Columbia, the vessel is an entirely new type which can be used for seining, both for salmon and herring, halibut long-lining, and otter trawling.

The new fishing vessel is 72 feet in length, with a beam of 20 feet. She is powered by a Diesel engine with actuated reverse and reduction gear, which develops 360 Bhp. continuously and is naturally aspirated. It turns a 68 x 43 four-blade propeller at 340 r.p.m. The vessel cruises at 10 knots and is capable of a 12-knot speed when necessary.

The builders of the vessel point with special pride to the main winch, which, they say, is the most advanced feature in the design. This is combination equipment, partly hydraulic and partly mechanical, which operates seines, long lines, and dragger gear.

A striking feature in the appearance of the ship is the absence of the seine table, now becoming a thing of the past, supplanted by a power block suspended from the boom, which takes over the work of hauling in the seine net.

The mast and boom of the Sleep Robber are of steel, and stainless steel is much in evidence in interior fittings. However, the hull of the vessel is mostly timber. Oak frames and fir went into the hull, with plywood for the housing. Decks are of fibre glass, as also are the two lifeboats. Bulkheads are of steel.

In the galley are an oil stove and a gas range, with a deep freezer and a refrigerator for the crew's food supplies. The men's berths are equipped with wash basins of stainless steel and there is a shower for general use.

Navigation equipment includes two radiophones, a radar, a direction finder, and a combination echo-sounder. The latter gives readings for 530 fathoms on slow scale and 65 fathoms on fast scale for herring, and a recording sounder for night running.

An intercom system will reach members of the crew in any part of the vessel. In time-off periods the men will be able to see what is going on in the world by means of two television receivers, one in the captain's room and one in the crew's quarters.

The fish hold is provided with special hold-over plates to preserve ice and thus prolong fishing time. A brine-freezing refrigeration system is installed. The maximum carrying capacity is estimated at 150 tons of herring or lesser quantities of salmon, halibut, or trawl fish.

The cost of building and equipping the Sleep Robber is estimated at approximately C$150,000, according to the September 1956 Trade News of Canada.

* * * * *

NEWFOUNDLAND SALT FISH INDUSTRY REVIVAL PROPOSED: During an address before, the opening session of the Newfoundland Fishermen's Federation Convention, the Prime Minister of Newfoundland states his government will support actively a revitalization of the salt fish industry in that Province.

The Prime Minister indicated that the policy of the provincial government would be to encourage the improvement of the salt cod fishery, rather than the frozen fish industry. This would reverse recent trends towards expansion of the frozen fish industry.

* * * * *

TWELVE-MILE LIMIT FOR FISHERIES TERRITORIAL WATERS PROPOSED: At a meeting of the United Nations' Committee Six in New York on December 7, 1956, the Canadian delegate stated Canada would oppose extension of territorial waters beyond 3 miles for various reasons, including security. He stated further, however, that 3 miles was not adequate for jurisdiction over fisheries and, in view of the fact that nations recognize special jurisdiction for customs, sanitation, etc., over a contiguous zone of 12 miles, he stated it was reasonable to include fisheries in this contiguous zone. He emphasized that the jurisdiction of the coastal state over fisheries within this zone must be complete.

Committee Six has been considering the report of the International Law Commission pertaining to all aspects of the law of the sea, including the Continental Shelf, breadth of the territorial sea, innocent passage, etc.

When Committee Six resumes its work, it is expected that many nations will have comments on Canada's proposal.

Debate on the recommendation of the International Law Commission that another world conference be held on fisheries has indicated that most nations will favor such a conference early in 1958.

Denmark

SECOND INTERNATIONAL FISHERIES TRADE FAIR: The Second International Fisheries Trade Fair will be held at the Exhibition Hall Forum in Copenhagen from from September 27 until October 6, 1957. It was decided to hold the second fair after many exhibitors, who exhibited at the first fair, requested the sponsors to hold another fair in the near future. Preparations are already under way for the next meeting between people in the fishing industry from all over the world. This is due to the fact that the First Fisheries Trade Fair was a much greater success than anticipated, large sales were made, exhibitors made many useful contacts, and the interest shown in the entire fishing industry was much greater than anticipated.

The May 1956 Fair was the first fair of its kind on an international basis. Nearly 50,000 people visited the Forum, and half of them were buyers or prospective buyers, who during the 10 days of the exhibition ordered goods amounting to about US$14.5 million.

A fair of even larger scope and greater variety is now being prepared in Copenhagen for the autumn of 1957. It has already been proved that the geographical position of Copenhagen makes it ideal for international fairs. It is a city which has an airport and a harbor with frequent connections with the rest of the world. It possesses good hotels and ideal exhibition areas at Forum and at the harbor.

The sponsors state that everybody interested in the fishing industry is welcome to participate in the fair, but exhibitors are advised to forward their applications at an early date. The address is: The International Fisheries Trade Fair, Forum, Copenhagen, Denmark.

Note: See Commercial Fisheries Review, January 1956, p. 47.

German Federal Republic

PNEUMATIC FISH DISCHARGER DEVELOPED: A machine for unloading fish from the holds of fishing vessels that utilizes the same suction principle as the vacuum cleaner has been developed by a West German machine company. The company, which is reported to be one of the leading West German producers of pneumatic

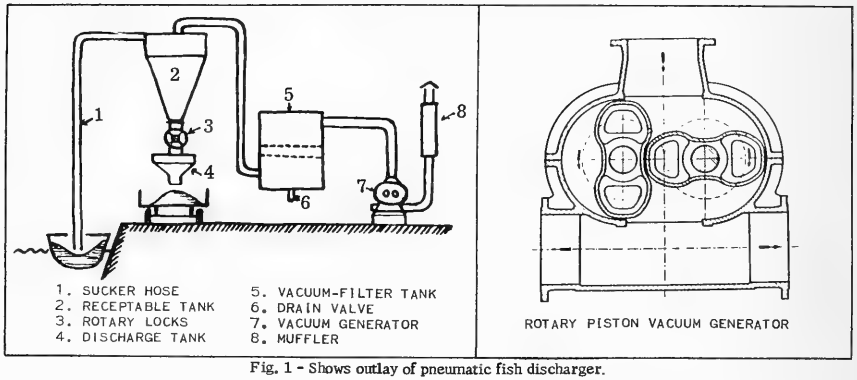


Fig. 1 - Shows outlay of pneumatic fish discharger.

conveyors, designed the new machine at the request of the Norwegian fisheries. Preliminary tests indicate that this new type unloader should be used only for discharging fish destined for reduction plants or other industrial use. Experts who have studied the pneumatic fish discharge agree that it will be extremely difficult to elim-

Fig. 2 - Shows pneumatic fish discharger set-up to unload fish directly from a vessel.

Fig. 3 - Discharge end of pneumatic fish unloader.

inate the chafing of the skin and the rupturing of the stomach walls to such a degree that the machine could be used to unload fish to be used for human consumption.

Preliminary tests of the new machine were made in the fishery port of Bremerhaven. It was found that with a crew of 3-4 operators the machine was capable of discharging about 100,000 pounds of fish an hour. This is about twice as much as is now handled by existing equipment at Bremerhaven, states a November 19, 1956, dispatch from the United States Consulate at Breman.

Tests are still being made to improve the machine, such as giving the suction tubes greater flexibility and operating range, reducing the chafing of the fish by rearranging the inlet into the receptacle tank, and in general making the operation of the machine foolproof.

Greece

FISHING INDUSTRY EXPANDS SINCE END OF WORLD WAR II: The 1954/55 fish catch by Greek fishermen amounted to 60,000 metric tons as compared with a prewar catch of 25,000-35,000 tons. Fishing activity has increased steadily since the end of World War II with the help of a development program, sponsored and financed by the United States Aid Mission.

Before the war about 3,000 small boats engaged in offshore fishing, few of which were motor driven. By 1955, the number of such boats had increased to 10,500, of which 2,500 are motor propelled. The number of motor trawlers and purse seiners increased from about 500 in 1938 to 683 in 1954 and 745 in 1955. Most of these boats are of postwar construction, and all are equipped with imported or locally-made Diesel or semi-Diesel engines. Many have cold storage and radio communication facilities and some even carry modern depth finders. Since 1953 two medium-size open-sea fishing boats have been added to the country's fishing fleet.

Fish processing also has made marked progress. Greece now has some 120 packing plants with an annual output of about 6,000 tons. There are also 2 fish-canning plants with a total annual output of 500 tons. Plans are under way for the construction of modern fish markets in a number of distribution centers, including Piraeus. These will be equipped with modern handling and storage facilities.

Progress is being made in restocking and developing fresh-water fisheries, particularly in Northern Greece.

The sponge-fishing industry also has made considerable headway since the war, mainly because of the annexation of the Dodecanese Islands, where sponge fishing is an age-long tradition. Before the war about 100 vessels engaged in sponge fishing in Greek waters and along the North African coast, bringing in an annual catch of 40 to 60 tons. In 1954, 144 sponge-fishing craft were in operation. In 1955 the number increased to 159. Production was 130 tons in 1954 and 135 tons in 1955. Competition from synthetic sponges has had an adverse effect on the demand for sea sponges and exports are becoming increasingly difficult. However, stocks have not accumulated in recent years.

Despite the very substantial progress made in agricultural and fishery production in the postwar period, Greece still depends on imports for a substantial portion of its food requirements.

* * * * *

GRANTS MADE FOR FISHING EQUIPMENT: The Greek Government has granted the sum of US$500,000 to be paid through the Bank of Agriculture for the purchase of fishing equipment. An additional sum of US$580,000 was granted for the same purpose to the owners of vessels fishing in the Atlantic Ocean, according to Aleia (September 1956), a monthly review of the Greek fisheries.

Hong Kong

INCREASED SHRIMP LANDINGS: The large increase in the number of mechanized boats engaged in shrimp trawling in 1956, as compared with 1955, resulted in rather high total landings, but with a much reduced catch per unit of effort. Ex-vessel prices were slightly higher than last year. This was due to the newly-developed export trade in frozen shrimp.

As opposed to the rest of the fishing fleet, which is almost entirely owner-operated, many shrimp trawlers are now owned and financed by persons from outside the industry. Some 30 to 40 of this latter category of vessels were temporarily laid up during the last quarter of 1956 as income did not cover expenses due to poor catches (Current Affairs Bulletin, November 1956, of the Indo-Pacific Fisheries Council).

Iceland

FISHERIES TRENDS FOR 1956: With all principal fishing seasons approaching completion in Iceland, it is possible to discern the main outline of the industry for 1956. Briefly, the total herring catch was almost double the previous year because of the better north coast season (83,000 metric tons in comparison with 45,000), and catches of all other species were about unchanged at 294,000 tons in comparison with 298,000 tons, points out a United States consular dispatch from Reykjavik (November 9, 1956).

In general Iceland will accordingly end the year with no significant carryover of stockfish, salt fish or salted herring and a smaller than usual carryover of frozen fish.

Frozen Fillets: Production of frozen fillets amounted to 44,000 tons in comparison with 43,000 tons the previous year, with just under half of the total catch of groundfish species utilized for fillets. The Soviet Bloc took 38,000-40,000 tons of fillets in 1956 in comparison with 32,000 in 1955. Of this, the U.S.S.R. took 28,000 tons in 1956 in comparison with 20,000 in 1955. Exports to the United States were about 15,000 tons in comparison with 11,000 tons in 1955. Because of the greatly increased Soviet purchases and the slightly increased purchases from the United States, there was expected to be no significant carryover on January 1, 1957. For the same reasons a larger share of the 1957 catch is expected to be diverted for freezing.

Herring Meal and Oil: Production in 1956 was expected to be about eight times that of 1955 due to the larger catches in the north. The year nevertheless was another "failure" for this industry which is equipped to handle the tremendous catches of the North Coast of the "good old days." Prices were generally unchanged; demand strong.

Other Fish Meal and Oil: Production in 1956 was higher than in 1955, since $2\frac{1}{2}$ times as much white fish was delivered to the processing plants. This resulted primarily from the storage glut in the frozen warehouses during the summer. Prices were strong, but some carryover was expected.

Fresh Fish on Ice Exported Direct: Fresh fish on ice exported direct in 1956 was almost twice that of 1955 (5,000 tons in comparison with 2,700), but it is still a small item. The trade is not generally favored by the Government since frozen fish earns the nation more foreign exchange, but during the fall, with prices in

Western Germany much higher than those in Iceland, it has been attractive to the trawler owners, a majority of whom are currently focusing their efforts in this direction.

* * * * *

TRAWLERS RESUME ICED-FISH TRADE: In spite of the agreement previously reported that two-thirds of the Icelandic trawler fleet would fish for the Icelandic freezing plants in return for higher guaranteed prices for fish, 27 trawlers are currently delivering their catches to the German market for fresh fish on ice in comparison with 22 when the agreement was negotiated, a November 1, 1956, report indicates.

Icelandic South Coast Herring Catch as of October 20, 1956 With Comparisons

Utilization	1956	1955
	(Metric Tons, Round Weight)	
Salting	7,071	10,795
Freezing	7,199	7,983
Reduction	1,124	922
Total	15,394	19,700

Prices for iced fish in Germany in October were about three times those paid in Iceland and there seemed to be little possibility that the trawlers would forego this profitable trade until the differential in prices diminished.

HERRING CATCH: The Icelandic south coast 1956 herring catch was running 25 percent under that of the previous year as of October 20.

India

ALL-INDIA FISHERIES CONFERENCE HELD IN MADRAS: The first All-India Fisheries Conference was held in Madras city on September 19 and 20, 1956. The Madras Governor inaugurated the conference and the Government of India Minister for Agriculture presided. About 100 delegates representing the various states in India, the Food and Agricultural Organization and the Technical Cooperation Mission, as well as the Norwegian fisheries experts in India participated in the conference.

Among the various developments that have taken place in the fishing industry of Madras State during this period, the Madras Minister for Agriculture enumerated these: (1) opening of new fishing grounds of different fishes; (2) establishment of a shark-liver oil industry; (3) establishment of fish farms and fish-cultural centers; (4) conservation and exploitation of tank and reservoir fisheries, pearl fisheries, and chank fisheries; (5) development of edible oyster industry; (6) utilization of sea weeds; (7) utilization of fish wastes; (8) manufacture of byproducts; and (9) dissemination of statistical and biological information to those engaged in the fishing industry. Probably to stress the importance of the fishing industry, he concluded his address stating: "It has to be noted that the agricultural food resources of the land have almost been exploited to the maximum and we have now to turn to the sea for more food."

The India Minister of Agriculture brought out the big gulf that existed between production and consumption of fish in India and pointed out that for nutrition standards the Indian population needed the minimum of 4.0 million metric tons of fish whereas production was only about 1.1 million tons. He too enumerated the various steps taken by the Indian Government and state governments to develop the fishing industry and sounded a note of satisfaction that a considerable measure of success had been achieved "in spite of the various administrative and technical difficulties." As regards development of inland fisheries, he was optimistic of the good scope offered by the construction of large reservoirs now being undertaken in connection with river valley projects and spoke of the increased fish production from the sea,

both coastal and offshore deep waters, as a result of fishing from trawlers and powered boats. He acknowledged the "fairly generous assistance" received from foreign assistance programs and made a particular mention of the technical assistance provided by the Food and Agricultural Organization, of the equipment and technical personnel provided by the United States under the Technical Cooperation Program, and of the fishing community development project under the Indo-Norwegian Project. But with all this combined effort of the Federal and state governments and the foreign experts, the Minister said, only a good beginning had been made and a great deal remained to be done to place the Indian fishing industry on its feet.

The conference reportedly discussed several phases of the fishing industry and recommended that: (1) a Central Board of Fisheries should be established to increase and coordinate fisheries research and developmental action; (2) adequate facilities should be provided for augmenting the supply of fish seed for culture purposes by increasing the number of centers and transporting such seeds in larger quantities; (3) river valley fishery boards should be set up for undertaking fishery development programs; (4) no duty should be levied on fuel and lubricating oil used by small power fishing vessels; (5) boat building yards should be established in fishing centers; (6) special facilities should be provided for the fishing industry in minor ports; (7) fish curing should be permitted in centers approved by government; (8) cooperative societies for undertaking fishing boat construction and fish marketing should be organized to raise the socio-economic status of fishermen.

The conference is reported to have examined the particular needs of the shrimp trade and made certain recommendations for consideration by the Government Railway Ministry, a September 25 dispatch from the United States Consul in Madras points out.

The delegates of the conference also visited the Madras harbor to see new power fishing boats designed by the FAO naval architect for fishing operations off the Madras coast and the Corporation Cold Storage where fish, meat, fruits, and vegetables are stored.

The Minister visualized the possibility of setting up a Fishing Corporation to deal with matters relating to fishery operations more promptly and on a scale commensurate with India's coastline and the needs of the people. He made a strong plea for the drawing up of a realistic program for putting to sea as many fishing boats as possible during the next five years. He emphasized the necessity of state governments organizing independent fisheries departments instead of subordinate or attached units if fishery development schemes are to be implemented effectively.

Indonesia

CANNED SARDINE MARKET: At the present there is practically no sardine canning industry in Indonesia, although the catch of sardines is not inconsiderable, states a November 8 dispatch from the United States Embassy at Djakarta. The domestic sardine catch in 1955 amounted to 1,891 metric tons, valued at US$748,609 (Rp. 8,478,000).

A very small amount of sardinelike fish is canned on the island of Bali (the main Indonesian sardine fisheries are in or near the Straits between Bali and Java) and supplied to the Indonesian armed forces. There are no figures available concerning the volume or value of this production. The canning factory specializes in the canning of beef, fruits, and vegetables, and only handles sardinelike fish during the November-February season.

Current consumption is increasing and the Indonesian Government is conducting an educational program to encourage the eating of more fish, including sardines. Imports have dropped off considerably from the 1951-1952 period and will probably remain at the new lower level in view of Indonesia's foreign exchange troubles, but the domestic catch of sardines is reportedly increasing gradually, with the assistance of the United States ICA teams in Indonesia.

According to the Department of Sea Fisheries, the only size of can used to pack sardinelike fish for the Army is the tall, one-pound can, or a can of approximately that size. The most popular imported sizes are the $3\frac{1}{2}$- to 5-ounce flat cans and the 8-ounce ovals, although 15-ounce ovals and one-pound tall cans are also imported.

Imported sardines packed in tomato sauce and olive oil are the most popular, representing about 40 percent of total imports of each. Sardines in brine account for the remainder of total imports. As far as can be determined, a very small amount of sardines in mustard is imported, but none in vegetable oil or in natural preparation. The low income group consumes the domestic catch and the higher income groups the imported canned sardines.

In the latter part of 1956 the retail market price of the $3\frac{1}{2}$-5 oz. can of Japanese and North African sardines packed in olive oil ranged from 10-11 cents (Rp. 11-12.5); 1-lb. tall in brine, 20-23 cents (Rp. 23-26); Portuguese 8-oz. ovals in olive oil, 15-17 cents (Rp. 17-19); and Japanese and Dutch 15-oz. ovals in tomato sauce, 9-19 cents (Rp. 10-22).

Table 1 - Indonesian Imports of Canned Sardines, 1955

Country of Origin	Quantity	Value	
	Metric Tons	Rp. 1,000	US$1,000
Japan	1,015	2,954	261
Netherlands	359	1,130	100
United States	108	316	28
Portugal	9	57	5
Norway	9	57	5
Denmark	8	46	4
South Africa	13	43	4
Morocco, Algeria, and Tunisia	11	36	4
Total	1,539	4,659	411

The United States is the third most important supplier of canned sardines to Indonesia and very likely will maintain that position in the near future. Imports of canned sardines will continue to be necessary because of the lack of cannery facilities in Indonesia; however, Indonesia's present foreign exchange position may force the Government to restrict these imports. One effective restriction against imported canned sardines is the Indonesian import surcharge of 300 percent applicable regardless of origin. It is interesting to note that American exports of canned sardines to Indonesia dropped from a postwar high of 9,699 metric tons (valued at US$995,320 or 11,272,000 rupiahs) in 1951 to the 1955 level of 108 metric tons (US$27,903 or 316,000 rupiahs). Imports of United States canned sardines in 1953 and 1954 were even lower than those in 1955. Total imports of canned sardines from all countries dropped from 18,089 metric tons (US$1,865,784 or 21,130,000 rupiahs) in 1951 to 1,539 metric tons (US$411,479 or 4,660,000 rupiahs).

Imported canned sardines are purchased by local import firms for distribution to wholesalers and retailers in the larger cities of Indonesia.

Italy

CANNED SARDINE MARKET: The Italian canning industry packs a limited quantity of sardines. The industry was more prosperous before the loss of the Istrian peninsula to Yugoslavia after World War II, states a dispatch (October 22) from the United States Embassy at Rome. Several canning plants were located in that area, the best for sardines in the Mediterranean basin. The quality of domestic fish and the high operating cost of the Italian canning industry, as compared to that of other countries, are factors which prevent competitive prices in a liberalized trade. At present two or three large companies and several small firms engage in packing preserved sardines with an estimated annual output of 500-600 metric tons; this is less than 10 percent of national consumption. According to local dealers, Italian sardines are not preferred by consumers because they are very small and have relatively large bones.

National consumption of canned sardines ranges from 6,000 to 7,000 metric tons yearly, judging from import and production figures. The most popular size of can in Italy is flat, about 180 grams (6.3 oz.) gross weight, and the condiment is chiefly olive oil except for a small percentage of Moroccan fish in vegetable oils. Sardines preserved in olive oil with special ingredients and additives such as lemon, tomato, etc., and in some instances boned, are sold only in a very few large and central groceries in main cities but have very little importance in the over-all market.

Table 1 - Representative Italian Retail Prices for Canned Sardines

Type	Gross Weight		Net Weight		Price	
	Grams	Ounces	Grams	Ounces	Lire/Can	U. S. Cents/Can
In olive oil:						
Portuguese	250	8.8	180	6.3	220	35
"	180	6.3	125	4.4	130	21
Italian	180	6.3	100	3.5	120	19
"	180	6.3	120	4.2	110	18
Moroccan	180	6.3	125	4.4	90	14

Note: Values converted at the rate of 625 lire equal US$1.

In 1955, total imports of sardines and anchovies amounted to 10,640 metric tons, of which 5,392 were from Portugal, 3,765 from Spain, 736 from French Morocco, and 581 from Yugoslavia. Efforts to distinguish the quantity of sardines and of anchovies included in this group produced the following estimates: about 5,000 metric tons of sardines were estimated to have been imported from Portugal, and the remaining 300-400 tons were anchovies; from Spain, 3,000 metric tons of anchovies and 600-700 tons of sardines. The 736 metric tons imported from French Morocco were estimated to be all sardines, while the 581 tons imported from Yugoslavia should be considered almost all anchovies. Total imports of sardines in 1955 are thus estimated at about 6,500 metric tons. From the above it appears that Portugal is the leading supplier. This is due to the following reasons: (1) imports of canned fish from Portugal, as well as from all OEEC countries, are not subject to import restrictions; (2) Portuguese sardines have a reasonable wholesale price (about US$11.00 a case of 100 flat cans, approximately 200 grams each, f.o.b. vessel Portuguese port); and (3) the Portuguese product meets the customers' taste. Yugoslav sardines are also easily absorbed by the Italian market because of their low price, but imports from Yugoslavia as well as from Spain are subject to ministerial permits, which are granted by the Italian government in periodical and limited allotments.

Imports of canned fish from the United States are subject to ministerial license. Trade circles consulted are pessimistic about possible commerce with the United States because of the difficulties importers would encounter in obtaining import permits and because American prices are considered noncompetitive.

All cans must clearly indicate the Latin name of the fish to distinguish between true sardines and similar types. The preserving product, such as olive oil, vegetable oil, etc., must also be stated on all containers.

Japan

CANNED SARDINE EXPORT PACK, DECEMBER 1955-NOVEMBER 1956: The pack of canned sardines for export by the Japanese for the 12 months ending November 30, 1956, amounted to 537,000 cases (48 15-oz. cans to a case) as compared with 420,000 cases for the similar period in 1954/55. Exports of Japanese sardines are made principally to the Philippines, Gold Coast, Belgium, Egypt, and Burma. As of November 30, 1956, 530,000 cases had been sold for export, according to a December 7 dispatch from the United States Embassy in Tokyo.

The figures for the total pack of sardines for 1956 are not available at this time, but indications are that the pack will exceed the 1955 pack of 787,000 standard cases.

* * * * *

FUNDS TO PROMOTE SALES IN U. S. VOTED BY ASSOCIATION: The Japanese International Tuna Association during its first formal meeting voted to spend the equivalent of ¥150 million (about US$417,000) during this Japanese fiscal year to promote the sale of canned tuna in the United States. The funds will be derived 50 percent from Government sources and 50 percent from industry, states a December 6 wire from the United States Embassy in Tokyo.

* * * * *

FURTHER LOSSES SUFFERED BY CULTURED PEARL INDUSTRY: Following the serious loss of pearl oysters (losses valued at US$1,219,280) suffered by the pearl oyster farms in Mie Prefecture during the month of August, additional losses of US$500,000 were caused by a late summer typhoon.

Japanese oyster experts point out that one of major reasons for these disastrous losses is due to overcrowding of the oyster rafts. The concentration of oyster farms in Mie Prefecture has reached a maximum. As a result of the overcrowded conditions in Mie Prefecture authorities have decided to move 750,000 pearl oysters out of this year's crop of 30 million pearl oysters to a Hiroshima Prefecture island in the Inland Sea this year. If this experiment proves successful, a much larger number of oysters will be transplanted in 1957, states an October 8, 1956 dispatch from the United States Consulate in Nagoya.

Note: See Commercial Fisheries Review, November 1956, p. 93.

* * * * *

RATIFICATION OF PEACE AGREEMENT WITH RUSSIA IMPLEMENTS FISHERY TREATY: The Japanese Diet on December 5, 1956, completed ratification of the peace agreement between Japan and the Soviet Union. The agreement ends the technical state of war between the two countries, provides for resumption of diplomatic relations, and covers fishing rights for Japanese in waters of Siberia controlled by the Soviet Union. It also includes a sea rescue pack and a trade and navigation protocol.

* * * * *

EXPLORATION OF WEST AFRICAN WATERS PLANNED: As a result of the fishing restrictions imposed on Japanese fleets by the Russian-Japanese fishing agreement, the Noyama Prefecture Deep-Sea Fisheries Association is contimplating

the partial shifting of its operations to the South Atlantic Ocean off the coasts of Nigeria and the Gold Coast in West Africa. The Association's fleet comprises 11 vessels of 70 to 80 tons each and some smaller craft.

The Association states that this area has never been explored or exploited and it is not, therefore, certain that profitable fishing exists there. Consequently the Association plans to send two 30-ton vessels to explore the area during the next two years. The Noyama Prefectural Government is sympathetic with the plan but has not offered financial support. The Association expects to request financial assistance from the Gold Coast Government and from the Governments of the Eastern and Western Regions of Nigeria. No such request has yet been made, states a November 20, 1956, dispatch from the United States Consul in Nagoya.

Kenya

NYLON NETS TESTED: Nylon nets may revolutionize the African inshore fishing industry on the coast of Kenya. For the past year the Fisheries Division of the Game Department has been testing and modifying nylon nets and plants to encourage Africans to use them instead of the old cotton type.

Using a powered 20-foot Danish fishing boat, the Fisheries Division operated daily on a commercial basis and kept accurate records and cost data to determine the potential of the nets and also the boat. They found that nylon catches three times more fish than cotton; three of the nets caught 61,000 pounds of fish (including shark) in one year. Moreover, the life of nylon is about six times as great as cotton.

The major handicap for African fishermen is capital outlay, for nylon costs several times as much as cotton although this is completely offset by the extra life and fewer repairs. The Danish boats are also expensive--about £700 (about US$2,000) each--but in Zanzibar the Sultan's Government intends subsidizing Africans.

The second handicap is the almost complete lack of a fish marketing and distribution organization in East Africa. Sea fish rarely arrives at Nairobi, the largest single market. This may be overcome, however, if a group of South African businessmen who recently investigated the fishing potential in Kenya decide to go ahead. They will have to establish a cold storage and distribution system.

Malaya

CANNED SARDINE MARKET: Fish constitutes one of the main staples in the diet of the peoples of Malaya because it is inexpensive and relatively abundant. In some cases, for economic and religious reasons, it is almost the only source of meat protein. Fishing is a major occupation throughout the coastal regions of Malaya. While fresh fish constitutes the main source of supply, the importation of canned and preserved fish of all varieties is very extensive.

There are no sardine-type fish available on a large scale by fishermen supplying the Malayan market. Sardines, brislings, and pilchards therefore have found a fairly sizable market among those who have acquired the taste or in those areas where distribution and seasonal factors allow canned fish to compete in price with fresh fish. Even in the most remote Malay kampongs, it is possible to find a small shop which stocks canned fish of several varieties, including sardines.

A great many more sardines have been exported from Malaya than have been imported (table 1), in spite of the absence of a domestic sardine canning industry,

Table 1 - Malayan Imports and Exports of Canned Sardines Herring and Pilchards, 1953-55

Year and Type of Product	Imports			Exports		
	Qty.	c.i.f. Value		Qty.	f.o.b. Value	
1955:	Long Tons	M$1,000	US$1,000	Long Tons	M$1,000	US$1,000
Sardines	714	866	286	1,170	1,316	434
Herring	236	312	103	11	18	6
Pilchards	3,229	3,559	1,174	124	141	46
Total	4,179	4,737	1,563	1,305	1,475	486
1954:						
Sardines	1,062	1,384	456	995	1,115	368
Herring	211	296	98	30	36	12
Pilchards	2,066	2,451	809	135	152	50
Total	3,339	4,131	1,363	1,160	1,303	430
1953:						
Sardines	1,027	1,300	429	1,307	1,585	523
Herring	328	471	156	51	69	23
Pilchards	2,321	2,797	923	87	103	34
Total	3,676	4,568	1,508	1,445	1,757	580

the United States Embassy at Singapore reports (dispatch dated August 17). Trade and government sources explain this by the fact that canned fish has a long "shelf-life: and that many of these exports (actually re-exports) have rested in warehouses for several years. They say, furthermore, that when reoccupying the country in 1945 the British brought in large stocks of canned fish for distribution to the starving populace and that many of these stocks are still in circulation. Singapore's economic prosperity to a considerable extent rests on its position as an entrepot, a position which requires local dealers to keep large inventories of those items in demand from the traditional entrepot outlets in Borneo, Indonesia, Thailand, and Burma. Exports of canned fish are actually re-exports to these surrounding territories.

Table 2 - Malayan Retail Prices and Estimated Percentage of Consumption by Size and Type of Can for Canned Sardines

Size and Type of Can	Estimated Consumption	Retail Price Per Can	
	Percent	M$	U.S.¢
1-lb. tall	45	0.55	18
1-lb. oval	40	0.55-0.75	18-25
8-oz. oval	7	0.35	12
$3\frac{1}{4}$-5 oz. flat	5	0.50-0.75	17-25
8 oz. flat	2	0.95	31
8 oz. tall	1	0.35	12
Total ...	100		

Note: Values converted at the rate of one Malayan Straits dollar equals US$0.33.

It is difficult to estimate consumption trends although local retailers believe the direction is steadily upward. If one judges in terms of similar consumer items, the annual increase should range between 5 and 10 percent, due both to the growing population and rising standard of living. Approximately 45 percent of the consumers prefer the 1-lb. tall and 40 percent the 1-lb. oval can of sardines, and 95 percent prefer sardines packed in tomato sauce. The tomato sauce is much preferred because with it can be mixed herbs and spices of the sort the various races in Malaya most enjoy.

At least 70 percent of sardine consumers belong to the low income group; 25 percent to the middle income group; and 5 percent to the high income group which confines its purchases mostly to brislings and sardines in the smaller size containers. The larger sizes are more popular with the lower income groups. The retail market price of the 1-lb. tall can of sardines is about 18 U. S. cents, and the price for the 1-lb. oval ranges from 18-25 cents (table 2).

Early in 1955 import controls on all types of canned fish of United States origin were lifted and U. S. dollar exchange has since been freely granted. There are no

import duties for canned fish brought into the free ports of Singapore and Penang. However, the Federation of Malaya imposes a 15 percent ad valorem duty on all such items except those from the Empire preference group, specifically South Africa whose level of trade with Malaya in canned fish is consequently very high. The United States, Japan, and Scandinavian countries have good shares, nevertheless, although they vary considerably from year to year.

The most common channel of distribution is from large import houses directly to the retailer, but sometimes through wholesalers. However, there are a great many medium-size food merchants who carry on extensive operations on both the retail side and in the entrepot trade and therefore do their own importing.

One precaution that must be observed closely is in connection with labeling requirements set by government health authorities. In one instance, the Singapore Government objected to labeling as "sardines" certain fish which were larger than normal sardines (young Clupea pilchardus).

The British armed forces in Malaya purchase considerable quantities of sardines for use as field rations. The present monthly requirement is roughly 800 cartons (100 5-oz. cans per carton). While the matter has not been thoroughly investigated, we understand that contracts are bid by local suppliers.

Mexico

SHRIMP FISHERY TRENDS, NOVEMBER 1956: The November 1956 shrimp catch by Mexican vessels was about normal for the east coast fleet, but the west coast catch was down from October. The strong northerly winds customary at this time of the year limited fishing on the East Coast to periods of good weather.

The West Coast shrimp catch picked up during the last four days of the month with the help of a good run of blue shrimp off the mouth of the Fuerte River in the northern part of Sinaloa. The weir shrimping season in southern Sinaloa and northern Nayarit, which started on September 1, was about over by the end of November. It was estimated that the catch by this type of gear would be only 20-25 percent of the 1955 season. Most of this production was either frozen or canned and practically none dried. As a rule 300-500 metric tons are dried annually for consumption in Mexico.

The shipyards at Mazatlan were busy during the month with 18 vessels under construction and three additional launched and fitting out. Ten of the new vessels on the ways are steel-hulled and are 55-65 feet in length.

Norway

FISHERIES TRENDS, SEPTEMBER 1956: Norway's 1956 cod fishing season which ended in August brought a catch of nearly 160,000 metric tons, or approximately 36,000 tons more than the previous year. The British market for fresh cod has been good, but stocks of frozen cod are increasing as this market has been less favorable.

Exports of stockfish during the first half of 1956 totaled 11,609 tons as compared with 7,298 tons the previous year, and exports of klipfish rose from 21,178 tons to 23,327 tons.

The tuna fisheries in 1956 were considered a complete failure; the catch by the end of July had only reached 900 tons as compared with 6,000 tons the previous year. By August 1, only 35 carloads of frozen tuna had been exported to Italy, as against 315 carloads in 1955.

The brisling (sprats) fisheries were also reported to have failed, and the brisling canning factories had to switch over to canning mackerel to avoid closing down entirely.

* * * * *

HERRING FISHERY TRENDS, NOVEMBER 1956: The catch of herring by Norwegian fishermen from off Iceland as of November 15 amounted to 221,640 bbls. (value about US$4.5 million) as compared with 204,000 bbls. as of this date a year ago.

The catch of brisling and small sild herring continues to fall behind that of recent years, states a November 16 dispatch from the United States Embassy in Oslo. The pack of brisling herring totaled only 168,000 cases on October 13 as compared with 243,000 cases during the same period in 1955 and 417,000 cases for the corresponding period of 1954.

The small herring or sild fishery resulted in a pack of 247,000 cases or less than half the 579,000 cases packed by October 13 in 1955. The poor catch is reflected in the exports of brisling which total less than half the number of cases exported in the first ten months of 1955.

* * * * *

MILD-CURED SALMON IMPORTS DECONTROLLED: The restrictions on the importation of mild-cured or salted salmon into Norway were reported lifted by the Norwegian delegate to the fall 1956 meetings held by member nations to the General Agreement on Tariffs and Trade at Geneva, according to a telegram received by the State Department from Geneva.

Peru

CANNED SARDINE MARKET: Peruvian production of canned sardines is of commercial importance and does not satisfy the consumer demand either in quantity or in quality, states an August 31 dispatch from the United States Embassy at Lima.

As no true sardines are found in Peruvian waters, the species canned as a substitute are small herring known locally as "Machetes" (Potamalosa notacanthoides) and "anchovetas" (Engraulis ringens). These fish are referred to as sardines. The bulk of the catch of anchovetas and machetes is used either as live bait or for fish meal. The canned pack during the canning season of September-April is estimated at 2,000 cases of 100 4-ounce cans. Peruvian sardines are packed exclusively in cottonseed oil and in 4-ounce flat cans. The number of sardines in each can varies from 4-6 due to the variable sizes of the fish caught.

The entire domestic pack is consumed locally and mainly by the middle and lower income groups. Although the pack is expected to increase gradually on account of the growing population of consuming centers, no special efforts are likely to be made by the industry in accomplishing a significant increase in the immediate future because of the market preference consumers have for the well-known imported brands.

Reliable trade sources estimate the total Peruvian annual consumption of sardines at almost 300 metric tons, of which the domestic production supplies only about 44 tons.

The present consumption trend for sardines is upward. It is believed that consumption of sardines will increase gradually in line with the growth of the population in consuming centers, principally in greater Lima and other important cities in the coastal zone. This growth in population is noticeable in foreign colonies established in Peru (such as the American and European), generally regarded as fish-minded people. This expansion of the foreign colonies is undoubtedly due to present favorable economic conditions in Peru which have attracted a considerable number of businessmen, engineers, and technicians from abroad.

Table 1 - Peru's Imports of Canned Sardines and Sardinelike Fish, 1952-55

Type of Pack	Quantity				Value				Value			
	1955	1954	1953	1952	1955	1954	1953	1952	1955	1954	1953	1952
	(Metric Tons)				(1,000 Soles)				(US$1,000)			
Sardines and substitutes packed in oil	314	168	216	272	3,293	1,709	1,904	2,437	173	90	100	128
Sardines and substitutes packed in tomato or other sauces	1	2	1	5	19	14	7	41	1	1	1/	2
Total	315	170	217	277	3,312	1,723	1,911	1,911	174	91	100	130

1/ Less than US$1,000.

Almost 99 percent of the sardines consumed in Peru are packed in the $3\frac{1}{4}$-5 oz. flat can. Sardines packed in olive oil account for almost 98 percent of total consumption; packs with cottonseed oil, tomato, and other sauces account for the remaining 2 percent. The percentage of sardines consumed by the high, middle, and low income groups is estimated at 65, 30, and 5 percent, respectively.

Retail market prices for the $3\frac{1}{4}$-5 oz. cans packed in olive oil or tomatoe sauce (imported) range from 3.20-4.50 soles (16-23 U. S. cents) a can, and the 4-oz. cans (domestic) in cottonseed oil from 2.40-2.60 soles (12-13 cents).

Imports (see table) of sardines from the United States are negligible. Importers and consumers regard sardines from Portugal, Morocco, and Spain to be of a superior quality as compared with those of the United States. The lack of aggressive advertising on the part of United States producers and exporters may also be regarded as an unfavorable factor.

Importation and distribution of canned sardines in Peru is done direct by leading foodstuffs importing firms who sell to retail merchants. Grocery stores are practically the only retail outlets for sardines.

Note: Soles converted at rate of 19 equal US$1.

* * * * *

PERUVIAN-UNITED STATES WHALING COMPANY BUILDS PLANT: A joint Peruvian-United States whaling company is expected to complete the erection of a US$500,000 plant near the northern port of Paita, by January 1957. The capacity of the plant is reported to be about 3,000 tons of sperm oil and 2,000 tons of whale meal a year. Operations are scheduled to start about April 1957. The firm recently purchased three vessels (320 tons, 1,400 hp.) from Norwegians for about US$395,000, according to an October 31, 1956, dispatch from the United States Embassy in Lima.

* * * * *

FIRST FISH TERMINAL BUILT: A new modern fish terminal for the Lima area was expected to be activated at the end of October 1956. The installations consist of six cold-storage and four freezing chambers plus an ice-making plant. The fish terminal, the first of its type, was built for a total cost of US$210,000, an October 31, 1956 dispatch from the United States Embassy in Lima states.

Poland

FIVE-YEAR PLAN FOR EXPANSION OF FISHING FLEETS: Poland's fish trawling industry opened the current season with an expanded program of operations. Last year's plan, according to a ministerial statement was completed on November 12, 1956, some 3 weeks ahead of schedule, with an increase of 13 percent over the previous year's catch of about 107,500 metric tons.

This is the first year of a new Five-Year Plan when big sums will be spent on the expansion of shipyards and the trawler industry. Originally the trawler fleet was to have increased by 19 vessels, a new base ship, and a number of cutters for salmon fishing. However, plans are being revised with a view to streamlining production and increasing the fleet.

Modernization of the vessels now in commission is being pushed ahead. The Fayderyk Chopin, the base ship, was overhauled last winter and equipped with a freezing plant. Plans have been prepared by the Fisheries Institute for the transitional period when vessels not always well adapted for distant-water operations will be in use as well as for the later period when the fishing fleet will meet all the requirements of modern fishing techniques, labor conditions, and safety at work. Polish fishing fleets may be seen as far as Greenland and the Newfoundland Banks.

Another series of improved slightly bigger trawlers will be commissioned, and the shipyards will continue deliveries of improved drifters. Base ships will continue to be delivered and by the end of the Five-Year Plan in 1960 Poland will be building trawlers of about 1,000 tons equipped with processing plants. Vessels of 9,600 tons are also to be built, each equipped with a helicopter, to be used in fishing operations. During the next two years Gdansk shipyards, Poland's biggest, will continue to build ships of the present type but will at the same time adapt themselves for the construction of new-type trawlers, several scores of which will be built during the next five years. The trawler B-14 which is now being produced is of 500 tons dead weight and has a range of 7,000 miles; it is equipped with all modern machinery and a fish-meal processing plant. An improved version of the trawler, the B-15, is to go into production in 1958 in the Paris Commune Shipyards in Gdynia. It is a very highly-mechanized vessel equipped with the necessary processing plant. The yards are also to build a number of Diesel and motor trawlers. An alternative plan for the yards submitted to the Ministry of Shipping proposes an additional construction of 850-ton super-motor trawlers of three types; one type of supertrawler with herring-salting installations; a supertrawler equipped with freezing plant; and one type with a white-fish processing plant.

The production of nets is to be increased and 99 percent of the demand will be met from home production. This is due to the opening of a new factory in Swinoujscie and factories in Bydgoszcz and Darlown. Previously most nets were imported.

The catch of sea-caught fish will increase by 50-55 percent during the Five-Year Plan so that by 1960 catches will amount to about 12-13 pounds per capita, the amount of herring being over 5½ pounds. This will mean an increase of more than 3.3 pounds of fish per capita as compared with 1955. Production of canned fish will be nearly doubled. The increase will result primarily from further development of

distant-water fishing which should more than double its catches during the next 5 years. In the first 2 or 3 years there will be further intensive explorations of the North Sea fishing grounds. By 1960, when the fish-processing trawlers have been handed over for use, Polish fishing vessels will go to the fishing grounds in the Barents Sea and the waters off Iceland, Greenland, and Newfoundland. The country will be supplied with large amounts of fish in the form of frozen fillets. Baltic catches will grow by about 20 percent during the next 5 years (World Fishing, October 1956).

Portugal

Portuguese Canned Fish Pack, January-June 1956

Product	Net Weight	Canners' Value
	Metric Tons	US$ 1,000
In Olive Oil:		
Sardines	1,204	731
Sardinelike fish	1,666	1,515
Tuna	764	635
Other species (incl. shellfish)	165	113
In Brine:		
Sardinelike fish	1,935	562
Other species	75	17
Total	5,809	3,573

CANNED FISH PACK, JANUARY-JUNE 1956: The Portuguese pack of canned sardines in oil of 539 metric tons during June 1956 failed to improve over the light pack of 625 tons the previous month and was about one-third of the 1,831 cases packed in June 1955. The pack of all canned fish in June 1956 amounted to 2,811 tons, the October 1956 Conservas de Peixe reports.

The total pack of canned fish for January-June 1956 amounted to 5,809 cases as compared with 9,897 cases in the similar period of 1955. Canned sardines in oil (1,204 cases) accounted for 21 percent of the January-June 1956 total pack, much lower than the pack of 5,779 cases for the same period in 1955.

* * * * *

1956 SALTED-COD LANDINGS FROM GRAND BANKS: The Portuguese fleet of 50 line trawlers (schooners) and 22 otter trawlers was estimated to have landed 72,850 metric tons of wet-salted cod during the 1956/57 season on the Grand Banks. The last of the fleet was scheduled to return to Portugal before Christmas 1956, states a November 29, 1956, dispatch from the United States Embassy in Lisbon.

The 1956/57 salted-cod landings, if borne out by final totals, were expected to exceed those of 1955/56 by 4,313 tons. In terms of dry-salted cod, the 1956/57 landings were expected to yield 51,000 tons (value US$18.3 million) as compared with 48,002 tons in 1955/56 (valued at US$17.3 million). The increased catch in 1956/57 was attributed to a larger fleet and improved techniques.

Note: Values converted at the rate of 28.75 escudos equal US$1.

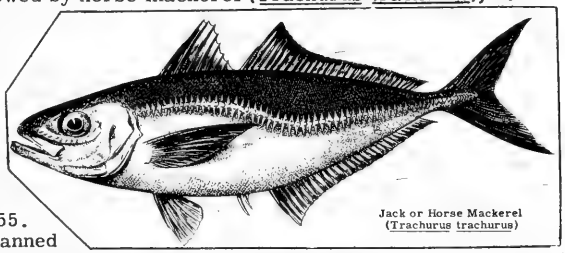
Spain

FOUR LARGE TUNA FISHING VESSELS UNDER CONSTRUCTION: The Spaniards are building four large clipper-type tuna-fishing vessels, according to a report in the French periodical Le Marin (November 9, 1956). The vessels were ordered built by an important Spanish ship chandler to be used in the tuna fishery off the Canary and Azores Islands.

It is expected that the tuna caught by these vessels will be frozen and shipped to Italian canneries, according to Italian newspaper reports.

* * * * *

VIGO FISHERIES TRENDS, OCTOBER 1956: Fishing: During the month of October about 15.3 million pounds of fish were landed and sold over the Vigo fish exchange. This was an increase of about one percent over September 1956 landings, but lower by about 10 percent than the same month in 1955. The leading variety sold over the fish exchange in October was the needlefish (Ramphistoma belune) with 3.3 million pounds; followed by horse mackerel (Trachurus trachurus), 2.8 million pounds; and sardine (Sardina pilchardus), 2.4 million pounds. Catches of albacore (Germo alalunga) were close to 330,000 pounds.


Jack or Horse Mackerel (Trachurus trachurus)

Fish Canning: The fish canneries in the Vigo area purchased 4.9 million pounds in September 1956 and 5.9 million pounds in October 1955. The principal fish products canned were needlefish and sardines. Some interest was shown in clam canning. The pack of canned clams is estimated to be about 50 percent above that for recent years. Small sardines were abundant near the river mouths and this was considered to be an encouraging sign for the return of this species in volume to Spanish waters.

The outlook for supplies of tin plate for cans was brighter at the end of the month and the Spanish Government continued to make allotments of olive oil. The price of olive oil in October was about 22-23 U. S. cents a pound, states a November 10 dispatch from the United States Consul in Vigo.

Sweden

COMMITTEE TO IMPROVE QUALITY OF FISH FORMED: A joint committee, called the Quality Committee and made up of representatives from the fishing industry, the fish processing industry, the association of fish wholesale dealers, the fish dealers' association, and Goteborg fish retailers, has been established on the initiative of the above-named groups and the Swedish governmental agricultural board. The function of the committee is to investigate possibilities of improving the quality of west coast fish and expediting transportation and deliveries of fish to consumers and thereby, it is hoped, increasing the consumption of fish.

At the first meeting of the committee in Goteborg on November 9, 1956, the handling of the catches at sea was discussed, especially with reference to more effective cleaning and sorting. The committee recommended that all big fish should be cut immediately at the throat when brought aboard in order to drain the blood. This practice is said to be followed by Norwegian fishermen and is reported to improve the quality of the fish. It was also found desirable that the fish be sorted on the boats, and that, for instance, there should be three sizes for plaice instead of two as at present.

Fish containers were also discussed and a new type of packing box made of glass fibers and plastic was demonstrated. While much more expensive than the conventional wood box, this new type is said to have the advantage of repeated use with no disagreeable odor.

The fish auctions which are held at the harbor in Goteborg were also discussed, especially with a view to having stricter quality checks, states a November 13 dispatch from the United States Consul at Goteborg.

United Kingdom

DEVICE TO PREVENT LOSS OF COLD FROM OPEN COLD STORAGE DOORS: The everyday problem of preventing cold escaping from a refrigerated chamber when the door is open may be solved by applying the principal that flowing air will imprison still air (The Fishing News, September 28, 1956, a British fisheries periodical).

By the use of this particular idea, namely the "Miniveil," the door of a refrigerated chamber registering -20° F. can be left open leading into a room at 50° F. People can walk in and out and there will be no material loss of temperature providing that it is a sizable chamber, but even small chambers can use them to great effect.

This effect is achieved by applying the principle that flowing air will imprison still air; cold air is heavier than warm air. Accordingly, when the refrigerator door opens, it naturally "falls out" and frequently can be seen in the form of vapor on the floor as it strikes the warm air of the outside room. As that cold air falls it provides space for warm air to enter at the top of the door and thus leads to an admixture of air and loss of temperature.

The "Miniveil" checks that by simply blowing a fairly strong "veil" of air from the top of the door to the floor. That veil or "waterfall" of moving air is sufficient in practice to keep the cold air from moving out.

As the refrigerated door opens it automatically switiches on a motor in the apparatus overhead. A fan starts up and drives the ordinary air down through the elongated aperture over the door right to the floor.

This apparatus costs about US$560 and solves many problems. It saves the cost of double doors. It saves even rubber doors which are apt to get torn by trucks and trolleys. It gives free passage through the door. It saves time and gives speedy handling. It does away with airlocks. It reduces the risk of accidents. It makes mechanical handling particularly simple and safe.

At one of the big ice cream factories in London where the huge turnover requires incessant transfer of goods from the refrigerated rooms, the doors are left open from early morning to closing time in the evening and there is no measurable rise in temperature.

* * * * *

FACTORYSHIP "FAIRTRY" COMPLETES TENTH TRIP: The British factoryship trawler Fairtry was scheduled to arrive at her home port of Immingham on November 4, 1956, from a three-month trip to the Grand Banks.

This trip was estimated to consist of 400 tons of fillets (mostly cod), 60 tons of whole fish, 150 tons of fish meal, and about 3,000 gallons of fish oil, according to The Fishing News of November 2, 1956.

The Fairtry landed its first trip (also from the Grand Banks) in Immingham on July 28, 1954.

* * * * *

FIRST ICELAND ICED-FISH TRIP SINCE 1952 LANDED AT GRIMSBY: The first Icelandic iced fish to reach the British market via direct landings from fishing vessels through established channels since 1952 was landed at Grimsby by the Icelandic trawler Ingolfur Arnanson on November 27, 1956. The vessel arrived when the market was short of supplies and good prices were obtained, according to a November 29 dispatch from the United States Embassy in London.

* * * * *

FREEZING FISH-AT-SEA EXPERIMENT ENDED: The fishing phase of the British White Fish Authority and British Trawlers' Federation experiment for freezing fish at sea aboard the trawler Northern Wave has ended.

Fish caught during the experiment is still being sold and 4,200 pounds were removed from cold storage for sale on the Grimsby market in mid-October, according to The Fishing News of October 16, 1956. The lot consisted of 3,500 pounds of cod and 700 pounds of haddock.

A representative of the market firm handling the fish said: "We have handled quite a lot of frozen fish for the White Fish Authority before this consignment. Though I have not sold the new lot yet, I anticipate it will go very well. In the past I have had excellent reports back from the retailers who say that the flavor is very good indeed. There has been a slight amount of discoloration, however, but that is all we can say against it. We have sold it through our own shops to canteens and cafes and reports have been uniformly good."

An official of the White Fish Authority states: "We have stocks of the fish frozen at sea still on hand, and we are releasing them gradually on the open market. A full report of the whole experiment will be issued eventually, but at the moment the fishing side has ended."

One of the biggest problems as far as Grimsby is concerned has been the lack of plants where the fish could be thawed out properly. Consequently a proportion of it was placed on the market in its frozen form and buyers had to thaw it themselves.

On the whole inland traders have given very favorable reports of the quality of the fish.

Officials stress that it must be compared with the fish which is caught and iced first on a normal voyage.

It is not intended to compare with prime-quality deep-water fish, and the experiment has been aimed at keeping the first part of the catch in good condition.

Northern Wave cod caught on the Bear Island and Iceland grounds in May and June was also sold in Hull in mid-October and met a ready demand on a day when landings were light. The frozen fish sold at prices ranging from 8.6-9.1 U. S. cents a pound, very near to prices paid for direct landings from trawlers.

FEDERAL ACTIONS

Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

CONSERVATION PROGRAM FOR FISH AND WILDLIFE RESOURCES:

The development of a blueprint by the recently-reorganized United States Fish and Wildlife Service for a broadened conservation program for fish and wildlife resources was requested by the Secretary of the Interior on December 16, 1956.

"The challenge of soundly managing our commercial fishery resources to assure a continued harvest and of meeting the growing demand for opportunities to fish and hunt at a time when those opportunities seem to be diminishing must be met head-on," Secretary Seaton declared. "A special task force will begin work shortly on a plan of action to carry out the long-range effort to meet this challenge."

Secretary Seaton's announcement coincided with a memorandum, which he directed to be distributed to all Fish and Wildlife employees, stating the broad objective of the program and calling upon the employees to contribute suggestions and proposals to further it.

The memorandum calls for a review of policies and projects, and for development of a full effort in the Service's areas of responsibility in the conservation field.

The memorandum declared the Department must "make certain that Federal, State and private conservation activities effectively supplement each other in such a way that greatest progress can be achieved."

As the result of legislation approved by the 84th Congress, the Secretary continued, the Service now has the authority to undertake greatly expanded programs for commercial fisheries. The Service is reviewing every possibility which will benefit the fishing industry. All this material will be used in developing the new program.

Preliminary material in outline form already has been submitted to Secretary Seaton, forming the basis for expanded programs both for sport fisheries and wildlife and for commercial fisheries. This outline envisions a 10-year program. It is proposed that program planning should be accomplished in two segments--immediate, short-range goals which, in turn, will contribute to long-range objectives.

The special "task force" committee is divided into two groups representing the component bureaus of the Service. These task forces will consolidate planning material, establish priorities and spell out research programs.

Interstate Commerce Commission

FISH AND SHELLFISH EXEMPTION IN REGULATIONS FOR LEASE AND INTERCHANGE OF VEHICLES FOR MOTOR CARRIERS:

New rules and regulations regarding the lease and interchange of vehicles by motor carriers requiring a minimum 30-day lease period, were issued by the Interstate Commerce Commission and became effective February 1, 1957. Among the new rules and regulations published in the December 6, 1956, Federal Register was the following part dealing with equipment used in agricultural or perishable operations which also applies to

vehicles carrying fresh or frozen fish as defined by the Interstate Commerce Commission:

> (i) *Equipment used in agricultural or perishable operations.* That such 30-day minimum period shall not apply to equipment, with driver, of a farmer, agricultural cooperative or private carrier of certain perishable property or which is exempt under section 203 (b) (6) of the act, to the extent that such equipment falls within the terms of the exceptions of section 204 (f) (1) or (2) of the act (49 U. S. C. 304 (f)), and is utilized in accordance therewith; *Provided,* That prior to the execution of the lease, the authorized carrier receives and retains a statement signed by the owner of the equipment, or someone duly authorized to sign for the owner, authorizing the driver to lease the equipment for the movement or movements contemplated by the lease, certifying that the equipment so leased meets the qualifications enumerated in section 204 (f) (1) or (2) of the act, and specifying the origin, destination, and the time of the beginning and ending of the last movement which brought the equipment within the purview of section 204 (f).

These new rules and regulations as published supersede all of the previous ones; the other parts deal with equipment, interchange of equipment, augmenting equipment and contracting requirements, and safety inspection of equipment by the authorized carrier.

Small Business Administration

LOAN TO FISHERIES COOPERATIVE IN BOSTON:

Approval of a $1,000,000 pool loan to Boston Fisheries Cooperative, Inc., 17 Fish Pier, Boston, Mass., to aid in maintaining the economy of the New England fishing industry was announced December 28, 1956, by the Administrator of the Small Business Administration.

The loan will provide working capital to assist the members of the cooperative to purchase fish during the peak production season, for immediate processing. The fish will be placed in cold storage for orderly marketing during the entire year.

SBA said that the First National Bank of Boston is participating in the loan, and will administer the $1,000,000 as a revolving fund to provide credit when it is needed.

The loan will mature in three years and will carry an interest rate of 5 percent per annum. The loan will be secured by warehouse receipts on the fish in storage. A further provision is that not more than $400,000 of the loan shall be outstanding as of April 1 of each year, to prevent unwarranted accumulation in storage.

Department of State

LAW OF THE SEA COMMENTED ON:

In an address before the World Affairs Council of Northern California at San Francisco on October 24, 1956, the U. S. State Department's Assistant Secretary for International Organization Affairs commented on the "Law of the Sea" as follows:

"There is another problem that will come up before the General Assembly relating to the law of the sea. You may know that the International Law Commission was authorized by the Assembly to study this matter, and it has now made its final report on four problems--'The Regime of the Territorial Sea,' 'The Regime of the High Seas,' 'The Contiguous Zone,' and 'The Continental Shelf.' This may sound like a very dull matter, but it could be one of the most complicated and highly charged questions the Assembly has to examine. The International Law Commission has recommended that the General Assembly summon an international conference to examine the law of the sea and to draw up such international agreements as it may deem appropriate.

"As you know, we have been having some difficulties off the coasts of Latin America, where a number of states have claimed rights to jurisdiction up to 200 miles from shore and have even interfered with our ships to give effect to these claims.

"For some centuries now the 3-mile limit has prevailed. This dates back to the Dutch jurist Bynkershoek, who contended that it would be sensible to extend, in legal theory at least, the shore limits of a sovereign state out 3 miles because that was the distance a cannon could shoot in those days.

"Meanwhile, some states have supported a 200-mile limit for certain purposes, such as the protection of fishing rights and the riches of the sea. Still other states have been inclined to favor a 12-mile limit.

"This problem involves the issues which revolve around the concept of the continental shelf and the extent to which states should be permitted to have jurisdiction over territorial seas and the submerged oil lands that may lie beneath them.

"We have not formulated any change in our own policy. We adhere to the 3-mile limit as being the soundest basis upon which to operate.

"This is the kind of problem which affects many countries and which quite properly belongs in the United Nations. It is another example of our growing interdependence and the absolute necessity of having an organization like the United Nations consider the conflicting interests of all parties concerned.

"Obviously, if each country were to determine for itself the extent of its jurisdiction over the territorial seas, chaos would result. It would be very much as though each citizen of San Francisco were to draw upon his own set of traffic regulations."

Among the subjects to be considered during the eleventh General Assembly of the United Nations, convened November 12, 1956, will be the "Final Report on the regime of the high seas, the regime of the territorial sea and related problems (resolution 899 (IX) of December 14, 1954)" by the International Law Commission.

Treasury Department

BUREAU OF CUSTOMS

APPRAISEMENT OF ENTRIES OF FROZEN WHOLE ALBACORE FROM JAPAN WITHHELD:

The Treasury Department has instructed Customs field officers to withhold appraisement of entries of frozen whole albacore from Japan pending investigation to determine whether the albacore is being sold in the United States at less than fair value.

Under the Antidumping Act a determination of sales in the United States at less than fair value would require reference of the case to the Tariff Commission, which would consider whether American industry was being injured. Both dumping price and injury must be shown to justify a finding of dumping under the law.

The two principal steps in an antidumping case are (1) to prove to the Bureau of Customs that the imported article is being sold in the United States at a price that is lower than the freely-offered price in the country of origin or at a price that is lower than the cost of production and (2) to prove to the Tariff Commission that, as a result, the domestic industry is being injured. If both of these findings are made, the Tariff Commission would determine the amount of countervailing duty that would be warranted, and would recommend to the President that he apply such a special duty to the particular shipments subject to investigation. The duty collectible is an amount equal to the difference between such purchase price or exporters sales price and the fair value as may be determined by the Bureau of Customs.

White House

ASSISTANT SECRETARY OF THE INTERIOR FOR FISH AND WILDLIFE APPOINTED:

The President on January 1, 1957, appointed Ross L. Leffler (assistant to

the executive vice president for operations of United States Steel Corp.) to be the first Assistant Secretary of the Interior for Fish and Wildlife.

Ross L. Leffler

Leffler was born in Butte, Mont., August 7, 1886, and has been very active in civic affairs and has gained considerable prominence for his civic welfare in the State of Pennsylvania and the city of Pittsburg. He was appointed a member of the Pennsylvania Game Commission in 1927, elected president in 1928, served as executive director in 1931; was reappointed to the Commission in 1935, and was elected vice president and president for a second time. He served as a member of the Commission for 28 years, 16 years as president.

He also is a member of the Izaac Walton League and helped to organize the first chapter of that organization in Pennsylvania. He also helped to organize the Federation of Sportsmen's Clubs of Pennsylvania. He is a past president of the International Association of Game Fish and Conservation Commissioners; Atlantic Deeper Waterways Association; a member of the Advisory Committee for the Economic Development of Analysis for Industrial Land and Facilities, Philadelphia; and a member of the Board of Governors, Philadelphia Maritime Authority.

UNUSUAL FISH TAG RECOVERY

The proverbial "finding a needle in the haystack" became an actuality when a plastic fish tag was returned to the Oregon Fish Commission research laboratory at Astoria, Oregon, in August 1956.

Hundreds of fish tags have been forwarded to the Commission by cooperative citizens in the past, but the "find" of the Skipper of the Marian F., Astoria drag boat, is perhaps the most unusual to date. While sorting a catch of bottom fish taken by his otter-trawl net off the mouth of the Columbia River, the Skipper noticed two red and white discs held together by a silver pin laying on the deck. The tag had apparently caught on the webbing on the net and was dredged up from the deep.

Following the "Return to Oregon Fish Commission" directions on one of the discs, the Skipper learned from biologists that the tag had been put on a 19-inch chinook salmon near the mouth of the Columbia River during a biological study in 1951.

Just how and when the fish and the tag parted company must be left to one's imagination. The Commission biologist who was in charge of the 1951 study surmised that the tag may have worked loose and dropped to the ocean floor shortly after the salmon was released. Then too, the fish could have perished, and in due time the set of discs came to rest on the bottom until dredged up by Marian F. net.

--Oregon Fish Commission News Release

CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

Legend:
1956
1955

MAINE

CUMULATIVE DATA
11 MOS. 1956 - 272.7
11 " 1955 - 248.1
12 " 1955 - 255.4

MASSACHUSETTS

CUMULATIVE DATA
7 MOS. 1956 - 308.7
7 " 1955 - 294.5
12 " 1955 - 521.6

FLORIDA

CUMULATIVE DATA
10 MOS. 1956 - 163.0
10 " 1955 - 143.6
12 " 1955 - 174.3

LOUISIANA 2/

CUMULATIVE DATA
12 MOS. 1956 - 57.1
12 " 1955 - 67.3

2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.

NEW JERSEY

CUMULATIVE DATA
11 MOS. 1956 - 502.4
11 " 1955 - 407.7
12 " 1955 - 408.1

TEXAS

CUMULATIVE DATA
11 MOS. 1956 - 124.3
11 " 1955 - 120.5
12 " 1955 - 124.9

CALIFORNIA 1/

CUMULATIVE DATA
12 MOS. 1956 - 693.1
12 " 1955 - 639.5

1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

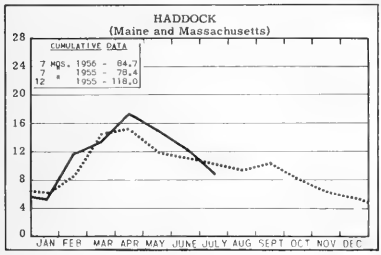
OREGON

CUMULATIVE DATA
12 MOS. 1956 - 59.3
12 " 1955 - 45.5

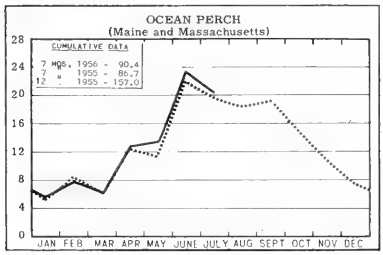
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

CHART 2 - LANDINGS for SELECTED FISHERIES

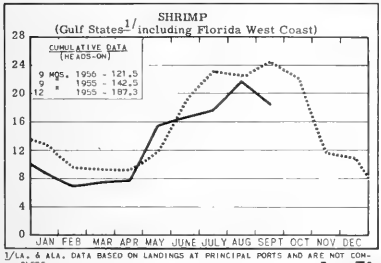
In Millions of Pounds



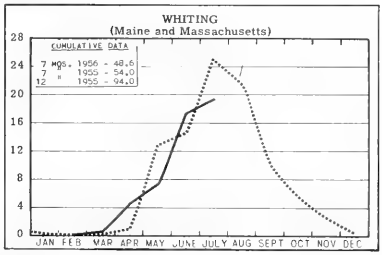
Legend:
1956
1955



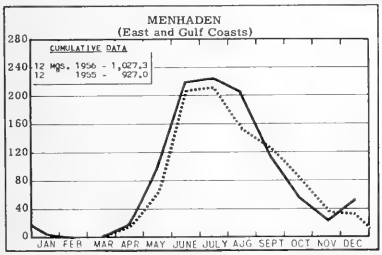
In Millions of Pounds

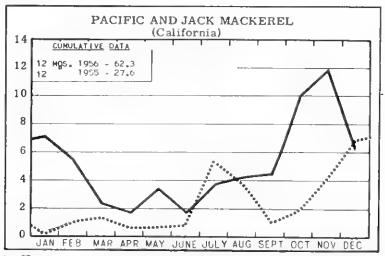


1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

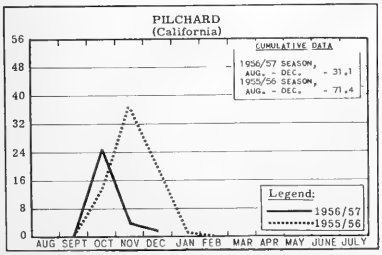


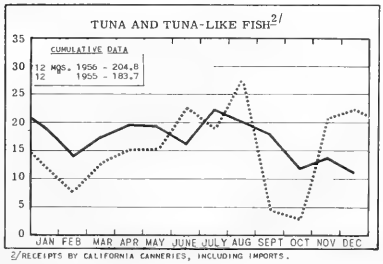
In Thousands of Tons





In Thousands of Tons

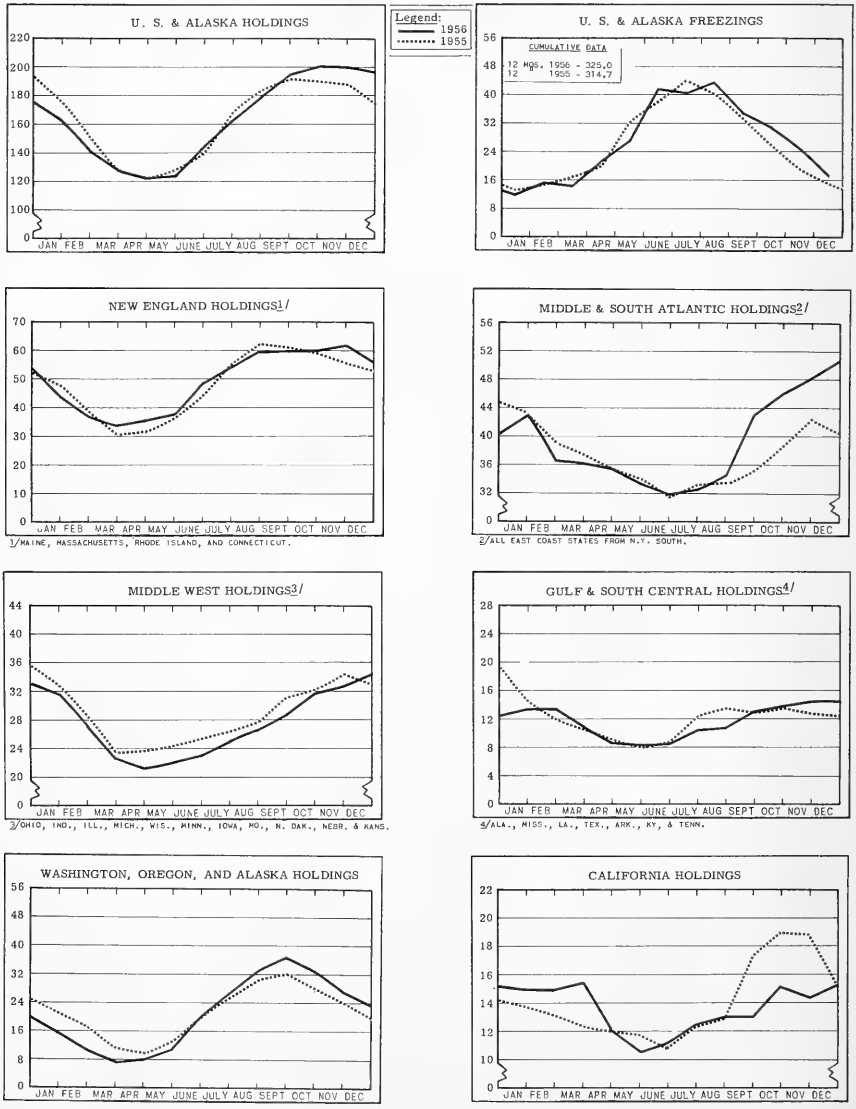




2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

In Millions of Pounds



1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.

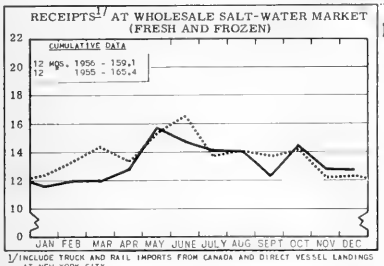
4/ALA., MISS., LA., TEX., ARK., KY, & TENN.

*Excludes salted, cured, and smoked products.

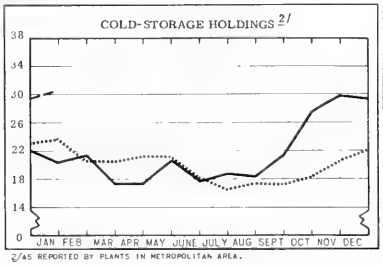
CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pounds

NEW YORK CITY

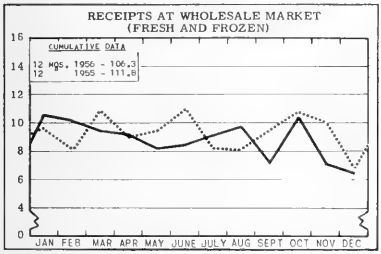


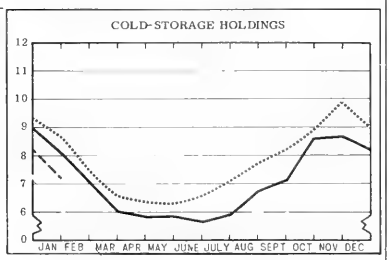
1/INCLUDE TRUCK AND RAIL IMPORTS FROM CANADA AND DIRECT VESSEL LANDINGS AT NEW YORK CITY.



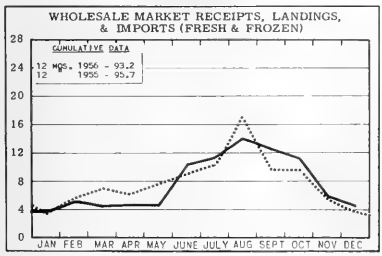
2/AS REPORTED BY PLANTS IN METROPOLITAN AREA.

CHICAGO

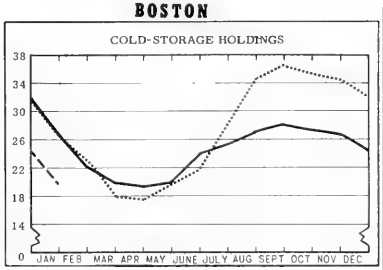




SEATTLE

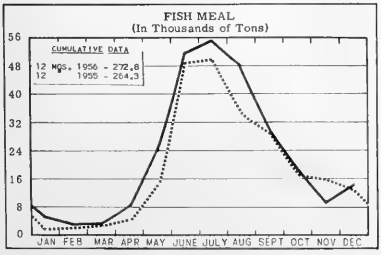


BOSTON



LEGEND:
1957
1956
1955

CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA



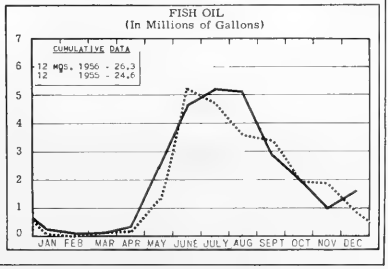
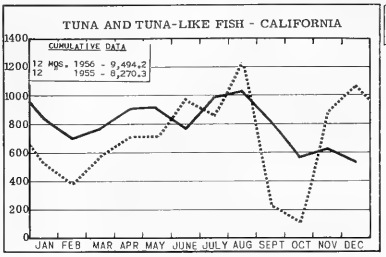
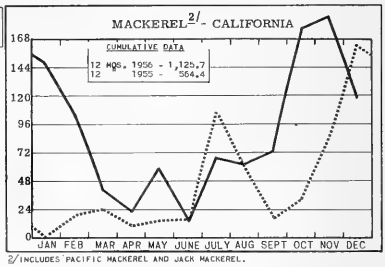


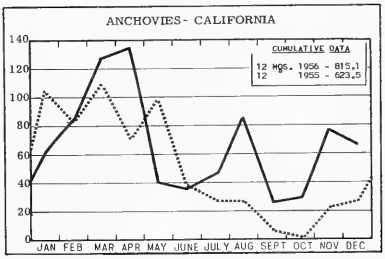
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

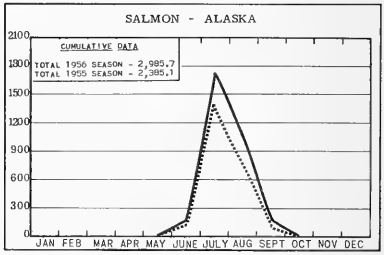
In Thousands of Standard Cases

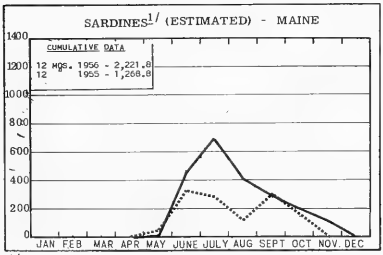




2/INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



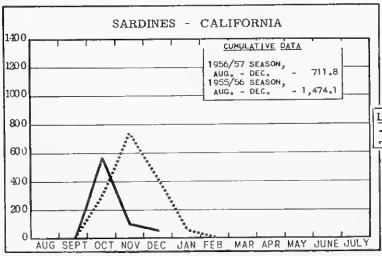


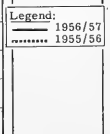


1/INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	¼ drawn	3¾ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. ½ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	½ lb.	8 oz.





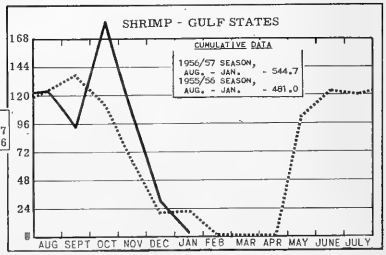
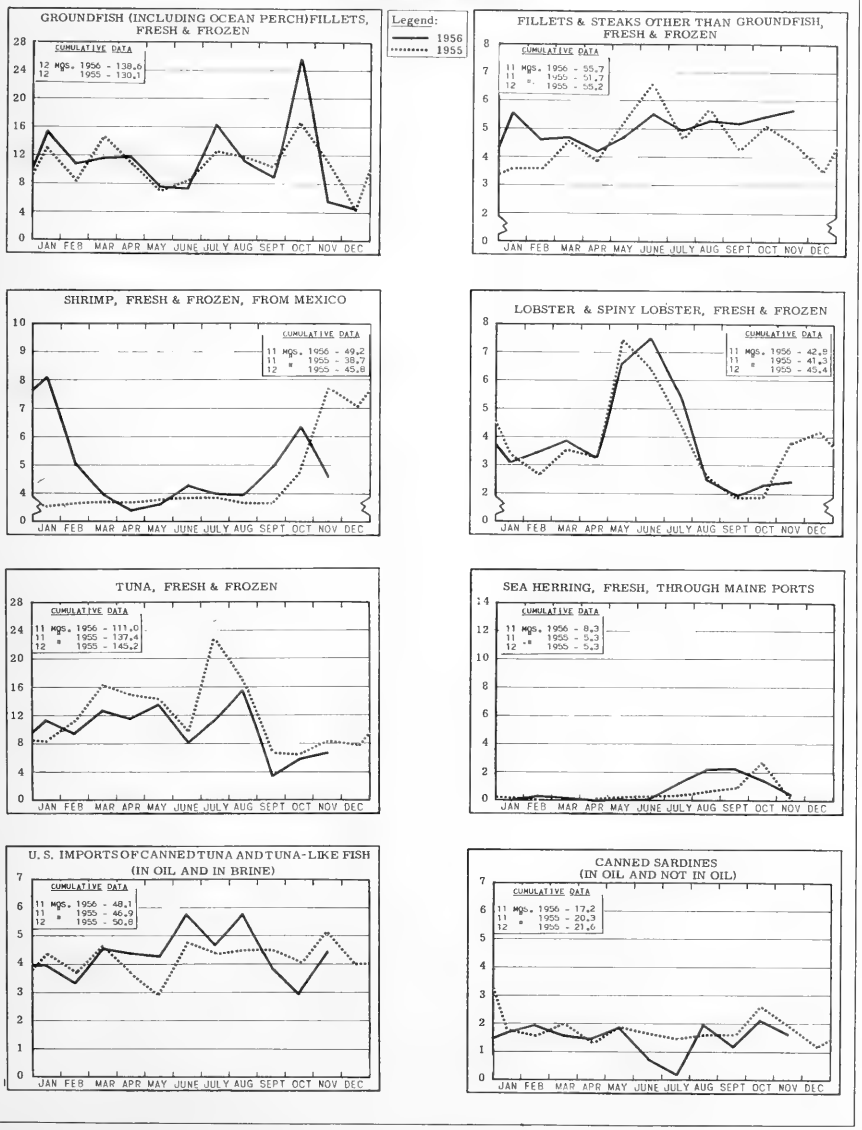
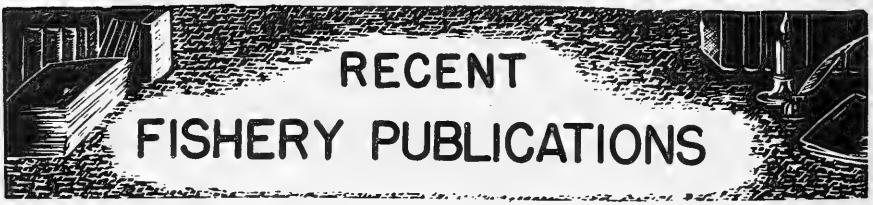


CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

In Millions of Pounds





FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
SSR.- FISH. - SPECIAL SCIENTIFIC REPORTS - FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1437 - South Atlantic Fisheries, 1955 Annual Summary, 10 pp.
CFS-1440 - New Jersey Landings, September 1956, 4 pp.
CFS-1441 - Florida Landings, August 1956, 6 pp.
CFS-1444 - Ohio Landings, October 1956, 2 pp.
CFS-1445 - Fish Meal and Oil, October 1956, 2 pp.
CFS-1446 - Shrimp Landings, September 1956, 4 pp.
CFS-1447 - North Carolina Landings, October 1956, 2 pp.
CFS-1448 - Alabama Landings, September 1956, 2 pp.
CFS-1449 - Florida Landings, September 1956, 6 pp.
CFS-1450 - Georgia Landings, October 1956, 2 pp.
CFS-1452 - Texas Landings, October 1956, 3 pp.
CFS-1453 - New Jersey Landings, October 1956, 4 pp.
CFS-1454 - Rhode Island Landings, July 1956, 3 pp.
CFS-1455 - California Landings, August 1956, 4 pp.
CFS-1456 - New York Landings, October 1956, 4 pp.

SSR-Fish. No. 169 - Average Year's Fishing Condition of Tuna Longline Fisheries, 1952 Edition, edited by Nankai Regional Fisheries Research Laboratory and translated by W.G. Van Campen, 133 pp., illus., processed, January 1956. Observations of the albacore fishing conditions in the North Pacific area are presented.

SSR-Fish. No. 173 - Central North Pacific Albacore Surveys, January 1954-February 1955, by Richard S. Shomura and Tamio Otsu, 34 pp., illus., processed, June 1956. Contains fishing results from 7 exploratory cruises in the North Pacific between January 1954 and February 1955, supplemented by Japanese commercial long-line catch data for the same period. Also included are discussions of the vertical distribution, sex composition, and tagging of albacore as well as data on the miscellaneous species of fish taken.

SSR-Fish. No. 178 - Physical Oceanographic, Biological, and Chemical Data - South Atlantic Coast of the United States, M/V Theodore N. Gill Cruise 1, by William W. Anderson, Jack W. Gehringer, and Edward Cohen, 160 pp., illus., processed, August 1956.

SSR-Fish. No. 182 - Japanese Albacore and Bigeye Tuna Size Composition Studies, translated from the Japanese by W. G. VanCampen, 48 pp., illus., processed, June 1956.

SSR-Fish. No. 184 - Longline Fishing for Tuna in the Central Equatorial Pacific, 1954, by Edwin S. Iversen and Howard O. Yoshida, 33 pp., illus., processed, August 1956.

SSR-Fish. No. 185 - Blueback Salmon (Oncorhynchus nerka) Age and Length at Seaward Migration Past Bonneville Dam, by Raymond E. Anas and Joseph R. Gauley, 46 pp., processed, October 1956.

SSR-Fish. No. 190 - Saury Distribution and Abundance, Pacific Coast, 1950-55, by Elbert H. Ahlstrom and Harold D. Casey, 69 pp., processed, November 1956.

SSR-Fish. No. 191 - Shad Fishery of the Ogeechee River, Georgia, in 1954, by James E. Sykes, 11 pp., processed, November 1956.

Sep. No. 460 - Preliminary Results of Deep-Water Exploration for Shrimp in the Gulf of Mexico by the M/V Oregon (1950-1956).
Sep. No. 461 - Iron Sulfide Discoloration of Tuna Cans, No. 4 - Effect of Retorting and Cooling Canned Fish.
Sep. No. 462 - Pilot-Plant Fish-Meal Dryer.
Sep. No. 463 - Research in Service Laboratories (December 1956): Contains these articles--- "Variation in Proximate Composition of Right and Left Fillets of Rockfish (Sebastodes pinniger) and Dover Sole (Microstomus pacificus)," "Fish Composition Studies," "Antibiotics for Fishery Products Preservation," "Tech. Note No. 35 - Improved Workmen's Stand for Processing Plants."

Research and Activities Under the Saltonstall-Kennedy Act, Fiscal Year 1956, 194 pp., illus., processed. A generously illustrated annual report of the Secretary of Interior to Congress. Briefly discusses the Act and its history, the American Fisheries Advisory Committee, and programs and allocations for 1956/57. Gives a detailed account of activities and progress in fishery biological studies of: salmon and related species; Pacific sardine;

ocean research; North Atlantic trawl fishes; Atlantic herring; Gulf of Mexico fishes; striped bass investigations; menhaden research; culture of commercial mollusks; control of oyster predators and drills; Gulf of Mexico oyster drills; albacore research; and commercial propagation of channel catfish. Also lists contracts completed as of June 30, 1956, and gives abstracts and detailed reports on commercial fishery studies of: exploratory fishing and gear research (includes North Atlantic, South Atlantic, and Gulf of Mexico explorations; Maine sardine explorations; and gear development and research) and fishery technological studies (includes Middle Atlantic and Gulf research; development of voluntary standards; chemical index for nutritive value of fish meal, and new uses for and new products from fish meal; improvement in quality of skipjack tuna; and survey of Great Lakes and Mississippi Valley fresh-water fishery). Brief reports are included on commercial fishery economic studies and statistics, and fishery education, market development, and Market News Service. Thirteen appendixes list acts, minutes of meetings, and outlines referred to throughout the report.

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Landings and Receipts of Fishery Products at Seattle, 1955, and Landings and Receipts of Fishery Products at Astoria, Oregon, 1955, by Charles M. Reardon, 37 pp., processed, 1956. (Available free from Market News Service, U.S. Fish and Wildlife Service, 421 Bell St. Terminal, Seattle 1, Wash.) The Pacific Northwest fisheries trends and their effect upon Seattle fishery products receipts for 1955 are discussed in the first part of this report. This section covers total receipts of fishery products at Seattle; sources of supply of frozen and fresh fishery products; trends in Seattle receipts of salmon, halibut, tuna, otter-trawl and long-line landings, shellfish, livers, liver oils, herring meal, and other miscellaneous fishery products. The tables present fishery landings and wholesale receipts (including approximate values) at Seattle for 1955 by species, source of origin, and by months; monthly index of receipts of certain fishery products at Seattle; carload shipments of fishery products from Seattle by months, and names, classifications, and approximate standards for fresh and frozen fishery products sold on the Seattle market. The Astoria Section includes a discussion of fisheries trends and fishery products receipts at Astoria, Ore., for 1955. This section covers the Columbia River gill-net fishery, troll and otter-trawl fisheries, and landings and wholesale receipts of fishery products at Astoria during 1955.

Boston Fishery Products Monthly Summary, November 1956, 15 pp.; Boston Fishery Products Monthly Summary, December 1956, 15 pp. (Market News Service, U.S. Fish and Wildlife Service, 10 Commonwealth Pier, Boston 10, Mass.) Landings and ex-vessel prices by species for fares landed at the Boston Fish Pier and sold through the New England Fish Exchange; and Boston frozen fishery products prices to primary wholesalers; for the months indicated.

California Fishery Products Monthly Summary, October 1956, 10 pp.; California Fishery Products Monthly Summary, November 1956, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, Post Office Bldg., San Pedro, Calif.) California cannery receipts of raw tuna and tunalike fish, herring, mackerel, anchovies, and squid; pack of canned tuna, mackerel, herring, anchovies, and squid; market fish receipts at San Pedro, Santa Monica, San Diego, and Eureka areas; California imports; canned fish and frozen shrimp prices; for the months indicated.

Gulf Monthly Landings, Production, and Shipments of Fishery Products, November 1956, 5 pp. (Market News Service, U.S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf States shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

Monthly Summary of Fishery Products Production in Selected Areas of Virginia, North Carolina, and Maryland, November 1956, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 18 S. King St., Hampton, Va.) Fishery production for the Virginia areas of Hampton Roads, Lower Northern Neck, and Eastern Shore; the Maryland areas of Crisfield, Ocean City, and Cambridge; and the North Carolina areas of Atlantic, Beaufort, and Morehead City; together with cumulative and comparative data; for the month indicated.

(Seattle) Monthly Summary - Fishery Products, November 1956, 6 pp.; (Seattle) Monthly Summary - Fishery Products, December 1956, 6 pp. (Market News Service, U.S. Fish and Wildlife Service, 421 Bell St. Terminal, Seattle, 1, Wash.) Includes landings and local receipts, with ex-vessel and wholesale prices in some instances, as reported by Seattle and Astoria (Oregon) wholesale dealers; also Northwest Pacific halibut landings; for months indicated.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

ARCTIC:

The Plankton of the Beaufort and Chukchi Sea Areas of the Arctic and its Relation to the Hydrography, by Martin W. Johnson, Technical Paper no. 1, 32 pp., illus., printed, 50 Canadian cents. Arctic Institute of North America, 3485 University St., Montreal 2, Que., Canada, July 1956.

ALMANAC:

The American Ephemeris and Nautical Almanac for the Year 1958, 593 pp., printed, $4. Nautical Almanac Office, U.S. Naval Observatory, Washington, D.C. (For sale by Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

BARBADOS:

Memorandum on the Barbados Fishing Industry for Consideration by the Marketing Committee, 29 pp., printed. Department of Science and Agriculture, Barbados, B.W.I., 1954.

CANADA:

Fisheries Statistics of Canada, 1954 (British Columbia), 14 pp., illus., printed in French and English, 25 Canadian cents. Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa, Canada. Contains tables giving the quantity and value of fishery products landed in British Columbia in 1951-54, by species and by fisheries districts; quantity and value of manufactured fishery products for 1953-54; capital equipment in the primary fisheries operations; and the number of fishermen engaged in the primary fisheries operations.

Fisheries Statistics of Canada - Newfoundland, 1954, 4 pp., illus., printed in French and English. Dominion Bureau of Statistics, Industry and Merchandising Division, Fisheries Section, Ottawa, Canada, 1956. Presents statistical data on the Newfoundland fishery. Tables show quantity and value of the principal species; capital equipment in the primary fishery operations; and number of persons engaged in the fisheries.

Fisheries Statistics of Canada, 1954 (Prince Edward Island), 22 pp., illus., printed in French and English, 25 Canadian cents. Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa, Canada. Contains tables giving the quantity and value of fishery products landed in Prince Edward Island in 1954-54, by species and by fisheries districts; quantity and value of manufactured fishery products for 1953-54; capital equipment in the primary fisheries operations; and the number of fishermen engaged in the primary fishery operations.

Progress Reports of the Atlantic Coast Stations, Atlantic Progress Reports no. 65, 26 pp., illus., printed in French and English. Fisheries Research Board of Canada, Ottawa, Canada, October 1956. Contains the following articles: "Oyster Mortalities, Old and New, in the Maritimes," by R. R. Logie; "Effect of Freezing on Coliform Bacteria and Method of Detection in Frozen Fish Fillets and Blocks," by H. P. Dussault; "Difficulties in Grading Smelt," by R. A. McKenzie; "The Bile Acids of Cod Bile," by L. C. Dugal and A. Laframboise; and "Acid Encilage from Cod and Haddock Offal," by H. C. Freeman and P. L. Hoogland.

COD:

Samples of Cod from the Convention Area 1952-55, Reported to the Commission, Length Distribution, by Erik M. Poulsen, Serial no. 426, 19 pp., processed. International Commission for the Northwest Atlantic Fisheries, Forest Bldg., Carleton St., Halifax, N. S., Canada, November 1956.

COOKERY:

Some Oyster Recipes, by Helen Evans Brown, 28 pp., illus., printed. Ampersand Press, Pasadena, Calif., 1951.

EELS:

"The Eel Fisheries of Virginia," by James Wharton, article, The Commonwealth, vol. XXIII, no. 11, November 1956, pp. 20-21, illus., printed, 25 cents. Virginia State Chamber of Commerce, 111 N. Fifth St., Richmond 19, Va. Briefly discussed are the apathy to Virginia eel in Virginia; methods of eel fishing; some reasons for the lack of eel on American menus; history of eel-eating; some misconceptions about eels; and suggestions for cooking eels.

ELECTRO-FISHING:

"Catches of Fish in New Brunswick Streams by Direct Current Electro-Fishing," by H. Godfrey, article, The Canadian Fish Culturist, issue nineteen, November 1956, pp. 1-8, printed. Department of Fisheries, Ottawa, Canada. Discusses investigations made with direct current electrical fishing gear; how fishing was carried out; and what fish were captured. Included are descriptions of tables that show differences in behaviour within the electrical field and in catchability of the more abundant species such as eels, salmon fry, "black-nosed" dace, sculpin, burbot, and others.

FISHERIES MANAGEMENT:

Concerning the Biological Basis of the Rate of Exploitation, and Means of Managing the Abundance of Fish Stocks, by G.V. Nikolsky, 16 pp., processed. (Preliminary translation by W.E. Ricker from Ocherki po Obshchim Voprosam Ikhtiologii (Essays on General Problems of Ichthyology), 1953, pp. 306-318). Fisheries Research Board of Canada, Biological Station, Nanaimo, B.C., Canada.

FISH SAUCES AND PASTES:

"Fish Sauces and Pastes Are Palatable and Nourishing," by H.S. McKee, article, SPC Quarterly Bulletin, vol. 6, no. 4, October 1956, pp. 16-17, illus., printed. South Pacific Commission, Box 5254, G.P.O., Sydney, Australia. Describes the manufacture of fish sauces and pastes utilizing supplies of fish that would otherwise be wasted. Fish sauces and pastes offer a simple way of reinforcing protein-deficient diets such as are often found in the South Pacific.

FISHWAYS AND FISH PROTECTION DEVICES:

Fish and Wildlife Appendix C of Report to the Water Project Authority of the State of California on Feasability of Construction by the State of Barriers in the San Francisco Bay System, 59 pp., illus., printed. Department of Public Works, Division of Water Resources, P.O. Box 1079, Sacramento, Calif., June 1955. Discusses fish species that would be affected by a salinity barrier, probable effect of such a barrier on fisheries and wildlife together with problems of individual species, an economic evaluation of the fisheries and wildlife resources, and fishways and fish protection devices.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

FOOD AND AGRICULTURE ORGANIZATION:

Yearbook of Fishery Statistics (Annuaire Statistique des Peches, Anuario Estadistico de Pesca)--Production and Fishing Craft (Production et Bateaux de Peche, Produccion y Embarcaciones de Pesca), 1954-55, vol. 5, 390 pp., illus., processed, US$4. Food and Agriculture Organization of the United Nations, Rome, Italy, 1956. (Sold in the United States by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.) This latest edition of the FAO Yearbook includes statistics from more than 150 countries and territories, given in 72 tables and, for the first time, important summary data are shown in diagrammatic form. Detailed tables are given for 73 selected countries which land about 75 percent of the world catch. Data available from USSR are given, broken down by species and administrative units. If the Soviet Union is added to the 73 selected countries, the details cover about 84 percent of the world catch. The Yearbook is arranged in eight sections, A to H. The first four (A, B, C, and D) give details of catch and landings. Section E gives disposition of the catch and F shows production of preserved and processed commodities. Section G deals with fishing craft and section H with the whale catch. Notes and glossaries of English, French, and scientific names of fish provide interesting and valuable background and explanatory information. The Yearbook has been enlarged and contains more detailed information than was found in previous issues. The text throughout is printed in English and French, with the Introduction, Notes, and Section titles also given in Spanish. There are five new tables of statistics in this edition. The first, A-5, shows the world catch and landings by countries arranged by regions, thus providing comparable figures for the regions. B-2, which gives catch and landings in quantities by groups of species and by countries, is also a new table. (The continental totals have been summarized in table B-1.) F-1, a summary of production of preserved and processed commodities in selected countries, is another new table, and so are H-1 and 2, which provide statistics of the catch of whales by whaling areas and by countries and whaling areas. As the foreword states, the inclusion of more information "has been made possible partly by improvements in the basic data obtained, including previously unavailable official or semi-official figures for some countries, and partly by a more extended use of estimates in the calculation of totals."

GEAR:

"Mechanical Shellfish Digger Developed," by L.M. Dickie and J.S. McPhail, article, World Fishing, vol. 5, no. 11, November 1956, pp. 49-51, illus., printed. John Trundell Ltd., Temple Avenue, London, E.C.4, England. Describes the operation and trials of the mechanical shellfish digger and the prospects of using this method of gathering clams in Canada. At present it is illegal to use any but hand-tool methods for digging soft-shell clams in the Maritime Provinces and Quebec.

"The Newfoundland Cod Traps," by Mark Ronayne, article, Trade News, vol. 9, no. 4, October 1956, pp. 3-7, illus., printed. Director of Information and Educational Service, Department of Fisheries, Ottawa, Canada. Describes in detail the evolution of the cod trap from its invention 91 years ago to its present day rating as one of the most efficient fishing devices. The author discusses the history of cod traps and cod fishing; the basic structure of the cod trap; sizes and uses of cod traps; the briefness of the cod trapping season; advantages in using the trap skiff; and others.

A New Mid-Water Trawl for Herring, by W.E. Barraclough and W.W. Johnson, Bulletin no. 104, 25 pp., illus., printed. Fisheries Research Board of Canada, Publications Office, Ottawa, Canada, 1956.

GENERAL:

"The Choice and Solution of Mathematical Models for Predicting and Maximizing the Yield of a Fishery," by Kenneth E.F. Watt, article, Journal of the Fisheries Research Board of Canada, vol. 13, no. 5, October 1956, pp. 613-645, printed. Queen's Printer, Hull, Que., Canada. The great expense of modern fisheries research programs necessitates, prior to data collection, careful consideration of the mathematical model to be used in analysis. The simplest type of model requires little information, but has poor predictive reliability. Progressively more complex models have higher information output, in the form of predictive reliability and insight into dynamics of the exploited population, but require higher information input, not only as amount of data, but array of types of data. The general form of the most complex type of model is derived by consideration of available information on the dynamics of fish populations. The specific form of the component terms and the values of the parameters must be derived in each instance through a combination of deduction and joint regression analysis. To solve the models, catch-effort data must be weighted to avoid gross errors, all readable scales must be aged, regardless of difficulty in interpretation, and various modifications of the theory and practice of tag-recapture programs are necessary. Schooling behavior and regenerated scale centers influence necessary minimum size of scale sample.

The Distribution of Fishes Found Below a Depth of 2000 Meters, by Marion Grey, Fieldiana: Zoology, vol. 36, no. 2, pp. 75-337, printed. Chicago Natural History Museum, Chicago, Ill., July 1956.

The Effect of Hydroelectric Developments on the Fishery Resources of Snake River; A Final Report, by Robert B. Irving and Paul Cuplin, 169 pp., illus., printed. Idaho Department of Fish and Game, 518 Front St., Boise, Idaho, 1956.

Tax Guide for Small Business, printed, 30 cents. Internal Revenue Service, Washington, D.C., 1956. (For sale by Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

GERMANY:

"Development of the West German Fishing Industry," by Gerhard Meseck, article, Progress, vol. 45, no. 251, Summer 1956, pp. 138-144, illus., printed. Associated Enterprises Limited, Unilever House, Blackfriers, London, E. C. 4, England. One of the most striking examples of the rebuilding of Germany's industrial strength is provided by the Federal Republic's fishing industry. The fleet has been largely replaced and a great advance made in equipment and techniques for the processing and marketing of catches. This is a survey of what has been achieved and is planned for the West German fishing industry.

INTERNATIONAL COMMISSIONS:

(International North Pacific Fisheries Commission) Annual Report, 1955, 67 pp., illus., printed. University of British Columbia, 209 Westbrook Bldg., Vancouver 8, B. C., Canada, 1956. A report in three parts containing summaries of research carried out for the Commission by research agencies of its three member nations, Canada, Japan, and the United States. Part I, Report of the 1955 Annual Meeting, covers only preliminary material since analysis of data from 1955 investigations was far from complete at the end of that year. Part II, Administrative Report, gives a very brief account of membership changes, publications, and fiscal status of the Commission. Part III, The Research Program, reports on the concentrated program to determine the continental origin of stocks of salmon on the high seas and whether there is a need for joint conservation measures for the king crab stock of the eastern Bering Sea.

JAPAN:

Bulletin of Tokai Regional Fisheries Research Laboratory, no. 13, 90 pp., illus., printed in Japanese with English summaries. Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-ku, Tokyo, Japan, June 1956. Contains, among others, the following articles: "Report on Sampling Survey for 'Iwashi' Catch and Fishing Effort;" "Body Length Distribution of the Japanese Anchovy, Engraulis japonica in Ise Bay, Mikawa Bay and Ensyu-Nada - I. Body Length in 1951 and 1952;" "Effect of Supersonic Wave on Behavior of Fish;" "Studies on the Breaking Strength of Netting Cords Made with Various Twisting Machines;" and "Relationship Between Jelly Strength and Chemical Composition of Fish Meat Jelly."

Japanese Fisheries, 133 pp., illus., printed. Sangyo Keizai Shimbun, Tokyo, Japan, 1955.

MALTA:

A Report on the Fishing Industry of Malta, by T. W. Burdon, 79 pp., illus., printed. Government Printing Office, Malta, 1956.

MAURITANIA:

La peche d'outre mer - Mauritanie (Overseas Fishing - Mauritania), by R. Moal, Science et Peche, vol. 1, no. 28, September 1955, 6 pp. printed in French. Institut Scientifique et Technique des Peches Maritimes, 59 av. R. Poincare, Paris 16, France.

OCEANOGRAPHY:

NORPAC 1955, M/V "Brown Bear," August 1 to September 19, 1955, Preliminary Data Report, by Richard H. Fleming and staff, Special Report no. 22, 104 pp., processed. University of Washington, Department of Oceanography, Seattle 5, Wash., February 1956.

OYSTERS:

Effects of Two Parasites on the Growth of Oysters, by R. Winston Menzel and Sewell H. Hopkins, 3 pp., processed. (Reprinted from Proceedings of the National Shellfish Association, vol. 45, 1954, pp. 184-186.) Department of Biology, A.&M. College of Texas, College Station, Tex.

Factors Controlling the Distribution of Oysters in a Neutral Estuary, by Nelson Marshall, 6 pp., illus., printed. (Reprinted from Ecology, vol. 35, no. 3, July 1954, pp. 322-327.) Oceanographic Institute, Florida State University, Tallahassee, Fla.

"Oil and Oysters," by James N. McConnell, article, Louisiana Conservationist, vol. 8, no. 11, October 1956, pp. 4-6, illus., printed. Louisiana Conservationist, 126 Civil Courts Bldg., New Orleans 16, La. Discusses the problems of continuing oyster production in areas where mineral activity, especially oil drilling, is increasing.

Some Phases of the Biology of OSTREA EQUESTRIS Say and a Comparison with CRASSOSTREA VIRGINICA (Gmelin), by R. Winston Menzel, no. 25, 83 pp., illus., printed. (Reprinted from Institute of Marine Science, vol. IV, no. 1, September 1955, pp. 70-153.) Oceanographic Institute, Florida State University, Tallahassee, Fla.

PAKISTAN:

The Mechanization of West Pakistan Fishing Boats, by H. Magnusson, C. S. Ohlsson, P. Gurtner and Jan-Olof Truang, FAO-ETAP Report no. 403, 82 pp., illus., processed. Food and Agriculture Organization of the United Nations, Rome, Italy, 1955.

"Preservation and Curing of Fish in East Pakistan," by Nazir Ahmed, article, Pakistan Journal of Science, vol. 5, no. 3, July 1953, pp. 117-122, printed in English. Pakistan Association for Advancement of Science, Lahore, Pakistan.

POND FISHERIES:

Barrages in Israel and their Utilization for Fish-Breeding, by Dr. A. Yashouv (Wirszubski), General Fisheries Council for the Mediterranean, Technical Paper no. 17, 10 pp., processed. Food and Agriculture Organization of the United Nations, Rome, Italy, October 1954. Barrages are natural seasonal ponds.

PRESERVATION:

"Icing Cod with Salt-Water Ice," by Paul Hansen, article, Industrial Refrigeration, vol. 131, no. 5, November 1956, pp. 20, 51, printed, single copy 25 cents. Nickerson &

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Collins Co., 433 N. Waller Ave., Chicago 44, Ill. Describes a pilot-scale investigation of the use of salt-water ice for the icing of "wet" cod. No systematic investigation was made on the raw fish, but the general impression was that the fish iced in "sea" water ice were less spoiled at the end of the experiment than those iced with ordinary ice. It seems that the over-all quality of sea-water iced fish gained more from the delay in spoilage than it lost through partial freezing and salt uptake. In the present experiment, however, the fish were iced with newly-prepared, homogeneous salt-water ice in proportions much above those used in practical icing of fish. Experiments on a more practical scale are therefore necessary before it can be seen whether salt-water ice may be of commercial value to the keeping quality of iced fish.

"The Radiation Preservation of Foods," article, Industrial Refrigeration, vol. 131, no. 5, November 1956, pp. 15-19, printed, single copy 25 cents. Nickerson & Collins Co., 433 N. Waller Ave., Chicago 44, Ill. Discusses the use of atomic radiation to preserve foods with a minimum of refrigeration by destroying insects and micro-organisms which promote decomposition and spoiling. Includes the following brief reports: "Nature of the Radiation Process," by Capt. Reuben Pomerantz; "Current State of Radiation," by Lt. Col. Truman F. Cook; "The Effect of Radiation Sterilization on Wholesomeness of Foods," by H. F. Kraybill; and "Future Potentialitites for Radiation," by Colonel William D. Jackson.

REFRIGERATION AND FREEZING:

"Influence of Freezing-Rate on the Denaturation of Cold-Stored Fish," by R. M. Love, article, Nature, vol. 178, no. 4540, November 3, 1956, pp. 988-989, illus., printed. St. Martin's Press, Inc., 103 Park Ave., New York 17, N. Y. Briefly reports the results of testing denaturation of fish frozen at different temperatures and rates of time.

RED SNAPPER:

"Alabama's Artificial Snapper Banks," by George Kyle, article, Alabama Conservation, vol. 28, no. 2, September 1956, pp. 4-7, 15, 25, illus., printed, Alabama Department of Conservation, 711 High St., Montgomery, Ala. Reports on experiments in making artificial banks in deep water in the Gulf of Mexico by planting used car bodies and heaps of scrap metal. This project was initiated when it was discovered by fishermen throughout the years that sunken ships and other hulks on the bottom of the sea prove to be good fishing spots. The artificial banks concentrate bottom-feeding fish such as snapper, grouper, jewfish, and spadefish, in an area where they can be more easily harvested by fishermen.

SALMON:

Contribution to a Biological Foundation for the Salmon Fishing Industry of the Amur Basin, by G. V. Nikolsky, 10 pp., processed. (Preliminary translation by W. E. Ricker from Trudy Soveshchaniia po Voprosam Lososevovo Khoziaistva Dalnevo Vostoka (Proceedings of a Symposium on Problems of the Salmon Industry of the Far East), 1953, pp. 160-168). Fisheries Research Board of Canada, Biological Section, Nanaimo, B. C., Canada, 1956.

SARDINES:

Les Sardinelles de la Region de Pointe-Noire--Perspectives Economiques Qu'elles Offrent (Sardines from the Zone of Pointe-Noire--Their Economic Prospects), Science et Peche, no. 31, December 1955, 6 pp., printed in French. Institut Scientifique et Technique des Peches Maritimes, 59 av. R. Poincare, Paris 16, France.

A Statistical Contribution to the Study in Ecology of Sardine (SARDINA PILCHARDUS) in the Central Adriatic, by Sime Zupanovic, Acta Adriatica, vol. VII, no. 10, 1955, 31 pp., illus., printed. Institute of Oceanography and Fisheries, Split, Yugoslavia.

SHARKS:

"Victory over the Shark," by Ralph N. Hill, article, Natural History, vol. LXV, no. 7, September 1956, pp. 352-356, illus., printed, single copy 50 cents. American Museum of Natural History, Central Park West at 79th St., New York 24, N. Y. Vividly describes the search for a repellant against sharks to protect men adrift in life belts or rafts. The author gives a detailed account of the scientific project and how it originated; experiments conducted in laboratory tanks with dog sharks; eventual discovery of copper sulphate, ammonium acetate, and other powerful repellants; search for a shark-infested ocean area suitable for further testing; experiments in the ocean and discovery of almost magical results with copper acetate; and effective methods of using copper acetate to repel sharks.

SHELLFISH:

Oyster and Mussel Culture, Rapports et Proces-Verbaux des Reunions (Reports and Verbal Proceedings of Meetings), vol. 140, part III, 61 pp., illus., printed in French and English, Kr. 17 (US$3.28). Conseil Permanent International pour l'Exploration de la Mer (International Council for Exploration of the Sea), Charlottenlund Slot, Denmark, January 1956.

SOUTH CAROLINA:

Harvest from an Experimental One-Acre Salt-Water Pond at Bears Bluff Laboratories, South Carolina, by G. Robert Lunz, Contributions from Bears Bluff Laboratories No. 21, 2 pp., printed. (Reprinted from Progressive Fish Culturist, vol. 18, no. 2, April 1956, pp. 92, 93, 94.) Bears Bluff Laboratories, Wadmalaw Island, S. C.

Mosquito Fleet, by Francis B. Taylor, 4 pp., illus., printed. (Reprinted from Bulletin of the International Oceanographic Foundation, vol. 2, no. 1, March 1956.) The Marine Laboratory, University of Miami, 439 Anastasia Ave., Coral Gables 34, Fla. Briefly discusses the recent growth of marine fisheries in South Carolina and especially mentions that most fishing was formerly accomplished by the

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

"mosquito fleet," crazily-rigged boats which are now being replaced with modern boats and equipment. Also discusses the need for research of near-shore and deep-sea fish and of shrimp, oysters, and crab. The author states that "under-utilization of the State's fishery resources could be even more a waste than overfishing. How to strike a balance between the biological factors and the economics of fishing pressure calls for uninterrupted research of local conditions and enforcement of enlightened laws."

SWEDEN:

Fiske, 1954 (Fisheries, 1954), 78 pp., illus., printed in Swedish with summary in English. Central Bureau of Statistics, Stockholm, Sweden, 1956. An account of the fisheries in Sweden in 1954. Contains statistics mainly relating to salt-water fisheries. The decline observed for several years past in the total number of fishermen continued during 1954. The primary reason for this is apparently the decrease in the supply of fish in certain areas and the fishermen's consequent adoption of some other occupation. The coastal industries have frequently offered more regular and, above all, higher incomes. At the end of 1954 the total number of fishermen was 19,552, of whom 11,731 were professional fishermen. In addition to discussions of the salt-water fishery and the fresh-water fishery, statistics are given for the number of fishermen, fishing gear, and fishing craft in the salt-water fishery, by counties, in 1954; quantity and value of fishery products in different fishing areas and by counties; and the salmon and whitefish fisheries, etc., in certain rivers in 1954. A list of fish and shellfish in Swedish, Latin, and English is also presented.

TURTLES:

"Our Vanishing Sea Turtles," by Chapman Grant, article, The Scientific Monthly, vol. 83, no. 5, November 1956, pp. 257-258, printed, 75 cents single copy. The Scientific Monthly, 1515 Massachusetts Ave., N.W., Washington 5, D.C. Discusses briefly the need for uniform legislation and conservation efforts to protect sea turtles from extinction.

TURKEY:

Balik ve Balikcilik (Fish and Fishery), vol. IV, no. 12, December 1956, 26 pp., illus., printed in Turkish with table of contents in English. Et ve Balik Kurumu, Istanbul, Turkey. Contains articles dealing with trawling in Turkish sea waters; methods of fish extraction by the use of vertical and horizontal boiler systems; biology of tuna and recommendations about new gear to the Turkish fishermen. A general survey of electricity-producing fish is also described. Recommendations about trawling methods in the Black Sea are given, and the future of Turkish fishing boats is discussed.

UNITED KINGDOM:

Sea Fisheries Statistical Tables, 1955, 38 pp., (mostly tables), printed, 4s. (56 U.S. cents). Ministry of Agriculture, Fisheries, and Food, London, England, 1956. (Available from Her Majesty's Stationery Office, London). Includes statistics on the quantity, total value, and average value of fish and shellfish production in in Great Britain (mostly England and Wales) by species, region, and other categories for 1955. Breakdowns by first-class British vessels, demersal landings, and pelagic landings are presented. Data on imports and exports are included. Also given are the number of fishermen, number and gross tonnage of vessels, and and number of first-class vessels by stations and type of gear.

U. S. CONGRESS:

Fisheries Legislation, Hearings before the Committee on Interstate and Foreign Commerce, United States Senate (Eighty-fourth Congress, second session on S. 2379, S. 3275, and S. 3339.), 299 pp., printed. Committee on Interstate and Foreign Commerce, Washington, D.C., 1956. (Available from Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky and Helen Joswick

* * * * *

Photograph Credits: Cover--P. Wilson; pp. 1 and 2--E. D. Stroup; p. 46--H. R. Bullis; p. 60--R. P. Elliott. Photographs on pages not mentioned were obtained from the Service's file and the photographs are unknown.

CONTENTS (CONTINUED)

INT.-DUP. SEC., WASH., D.C. 11811

SHRIMP FILM AND RECIPE BOOK ARE NOW AVAILABLE

Time-tested shrimp recipes are featured in the latest United States Fish and Wildlife Service sound and color fishery market development film. The film is available at many of the 140 public and private libraries which handle the Service's commercial fishery films. The film is especially designed for black-and-white or color television use.

Peppered Shrimp and Eggs

Also available is a new full-color shrimp recipe book. Both the film and the recipe book bear the title, Shrimp Tips from New Orleans. Both were produced by the U. S. Fish and Wildlife Service in cooperation with the Peelers Company of New Orleans, manufacturers of shrimp peeling and deveining equipment. The Peelers Company financed both the production of the film and publication of the book. Additional copies of the book were purchased by the Government for resale to the public through the Government Printing Office.

The film, with its New Orleans setting, authentically portrays the culture, architecture, art, and music of that famous city, with the strains of French cafe and modern Dixieland music lending additional atmosphere to the scenes. Preparation and serving of six recipes is woven colorfully into the 14-minute film.

The recipe book (Circular No. 41) contains 18 recipes, including the six which are explained in the film. It is a 20-page booklet with 17 of its pages showing shrimp dishes in natural color. Water colors of the Old and the New South lend added appeal to the publication. Ingredients of all of the recipes such as those for Shrimp Amadine, Remoulade, Creole, or Jambalaya, are available at any market and are usually already in the home kitchen.

The recipe book is for sale by the Superintendent of Documents, Washington 25, D. C. The price is 15 cents with a 25-percent discount on orders of 100 copies or more.

Organizations may borrow the film free of charge. For information on the film write the United States Fish and Wildlife Service, Washington 25, D. C.

COMMERCIAL FISHERIES REVIEW

Vol. 19, No. 2 FEBRUARY 1957

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor

J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Packaging of precooked fish sticks on continuous belt-type operation in a New England processing plant. Cooling tunnel can be seen overhead.

COMMERCIAL FISHERIES REVIEW

February 1957 Washington 25, D.C. Vol. 19, No. 2

SOME FACTORS AFFECTING "SAWDUST" LOSSES DURING THE CUTTING OF FISH STICKS

By F. J. Cocca*

ABSTRACT

Much fish is lost as "sawdust" in the cutting of fish sticks (a three-step operation). As the result of a study to reduce this loss by making the bandsaw blade more efficient, an "ideal" blade was designed. The loss of sawdust with this blade was significantly less than that with the blades that are regularly used. The data obtained in this study show the great importance of using a slicing operation rather than a sawing operation in the third step.

INTRODUCTION

Fish sticks are cut from frozen blocks of boneless and skinless fillets that have been compressed and frozen into a uniform rectangular shape. Although the sizes and shapes of the many fish blocks on the market vary considerably, the dimensions are such that, ordinarily, each properly-prepared block will produce a definite number of uniform sticks with a minumum amount of the block being lost as scrap. Even with perfect blocks, however, there is a considerable loss of "sawdust" when cutting the fish sticks. This loss ranges from 7 to 12 percent of the weight of the block.

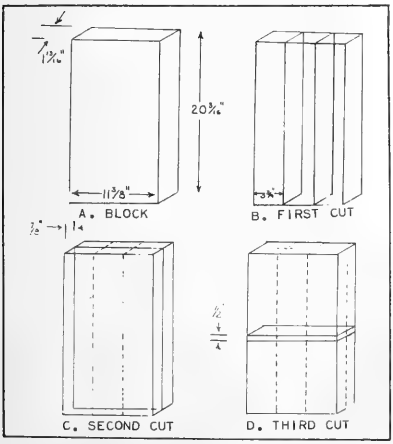


Fig. 1 - Steps in cutting fish sticks from fish blocks.

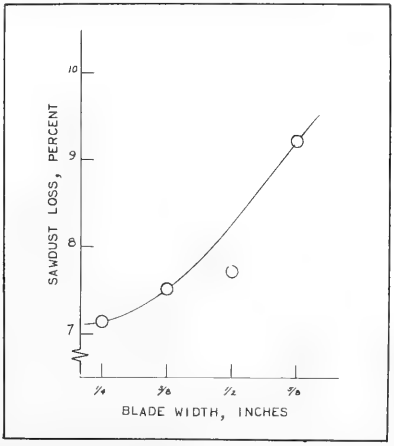


Fig. 2 - The effect of bandsaw widths on sawdust loss during the cutting of fish sticks from fish blocks.

Because the sawdust is not used in preparing fish sticks or for preparing other human food, it represents a considerable loss to the industry. The significance of this loss can be realized when the total importation of fish blocks is considered.

* Laboratory Aid, Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, East Boston, 28, Mass.

In 1955 a total of 48.2 million pounds of frozen fish blocks were imported into this country (domestic fish block production is not included in these figures). Assuming that sawing is the only method of cutting used and that the average loss of sawdust is 10 percent of the weight of the block, this loss would amount to 4.8 million pounds of fish fillets.

Fish sticks are cut from frozen fish-fillet blocks by two methods: (1) by the use of a group of bandsaws and (2) by the use of a combination of bandsaws and of guillotine cutting knives. The bandsaw blades that are used vary considerably in type and size.

Observations of commercial fish-stick cutting operations indicated that the characteristics of the bandsaw blade affected the amount of sawdust that was lost. A series of tests therefore was carried out at the Service's Fishery Technological Laboratory in East Boston to determine the effect of the type of blade on the loss of sawdust in the bandsaw cutting operations. The variables that were studied are the following: (1) width of blade, (2) number of teeth per inch, (3) type of set, (4) gauge (thickness), and (5) degree of set.

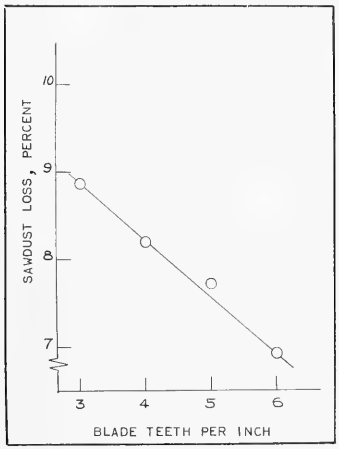


Fig. 3 - The effect of number of teeth per inch of saw blade on sawdust loss during the cutting of fish sticks from fish blocks.

EXPERIMENTAL PROCEDURE

CUTTING OF BLOCKS: The fish blocks used in this study were $20\frac{3}{16}$ inches in depth (fig. 1A). This block produced 216 whole fish sticks, each of which were $3\frac{3}{4}$ inches in length, $\frac{7}{8}$ inch in width, and $\frac{1}{2}$ inch in thickness.

In the production of the fish sticks, the blocks first were cut into three $3\frac{3}{4}$-inch sections on the $11\frac{3}{8}$-inch side (fig. 1B)--$\frac{1}{16}$ inch loss of sawdust was allowed for each cut. These three slabs then were cut into six $\frac{7}{8}$-inch sections on the $1\frac{13}{16}$-inch side (fig. 1C). Finally, these sections were cut into $\frac{1}{2}$-inch-thick fish sticks along the $20\frac{3}{16}$-inch side (fig. 1D). The sections, slabs, and fish sticks were weighed after the respective cuts and the corresponding loss of weight for each set of cuts was determined.

BANDSAW BLADES USED: The individual bandsaw blade is characterized by the following: width, number of teeth per inch, type of set, gauge, and degree of set.

The effect of the width of the blade was studied with four blades that were identical in every respect but in width. The widths studied were $\frac{1}{4}$ inch, $\frac{3}{8}$ inch, $\frac{1}{2}$ inch, and $\frac{5}{8}$ inch.

The effect of the number of teeth per inch of blade was studied by the use of four blades having the same width, set, and gauge but having 3, 4, 5, or 6 teeth per inch.

The effect of the type of set was determined by the use of three blades differing only in the type of set. The types of set investigated were regular set, [1] every-tooth set, [2] and no set. In all of the experiments in which the teeth were set, the

1/ A repeating series in which one tooth is bent to the right of the body of the blade, the next tooth is bent to the left, and the third tooth is not bent (fig. 6).

2/ A repeating series in which one tooth is bent to the right and the next is bent to the left.

bandsaws were set 0.007 inch on each side, making a total degree of set of 0.014 inch and, because the blades had a gauge of 0.025 inch, an "effective thickness" 3/ of 0.039 inch.

The effect of the gauge of the blade on the loss of sawdust was studied by the use of four bandsaw blades that differed only in thickness. The gauges studied were 0.020 inch, 0.025 inch, 0.028 inch, and 0.032 inch.

The effect of the degree of set was studied by the use of three bandsaw blades differing only in the degree of set. All of the blades had the same gauge of 0.025 inch. The blades had a total set of 0.006, 0.014, or 0.022 inch and thus an "effective thickness" of 0.031, 0.039, or 0.047 inch, respectively.

Because the bandsaw is a sensitive tool, the manufacturer had difficulty in making the bandsaw blades to the exact specifications. Consequently, unavoidable variation introduced a slight uncertainty in the results. Nevertheless, the data give a good indication of the general variations in the loss of sawdust that may be expected with each kind of blade.

DISCUSSION OF RESULTS

EFFECT OF WIDTH: The effect of the width of the blade in causing loss of sawdust is shown in table 1 and figure 2. Within the range used, the wider the blade

Table 1 - Effect of the Characteristics of the Bandsaw Blade on the Loss of Sawdust During the Cutting of Fish Sticks From Fillet Blocks

Blade Characteristics Under Test	Description of the Blades					Original Weight of Block	Cutting Losses 1/							
	Width	Teeth Per Inch	Type of Set 2/	Gauge	Effective Thickness 3/		First Cut		Second Cut		Third Cut		Total	
	Inch			Inch	Inch	Grams	Grams	Percent 4/	Grams	Percent 4/	Grams	Percent 4/	Grams	Percent 4/
Effect of width of blade	1/4	5	ETS	0.025	0.039	6232	31	0.50	107	1.72	307	4.92	445	7.14
	3/8	5	ETS	0.025	0.039	5932	32	0.54	112	1.89	302	5.10	446	7.52
	1/2	5	ETS	0.025	0.039	6096	33	0.54	117	1.92	321	5.27	471	7.73
	5/8	5	ETS	0.025	0.039	5822	38	0.66	144	2.48	358	6.14	540	9.28
Effect of number of teeth per inch of blade	1/2	3	ETS	0.025	0.039	6048	37	0.61	137	2.27	362	5.98	536	8.86
	1/2	4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
	1/2	5	ETS	0.025	0.039	6096	33	0.54	117	1.92	321	5.27	471	7.73
	1/2	6	ETS	0.025	0.039	5894	27	0.45	106	1.80	276	4.68	409	6.94
Effect of type of set 5/	1/2	4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
	1/2	4	REG	0.025	0.039	5979	35	0.58	134	2.25	323	5.40	492	8.23
Effect of gauge of blade	1/2	4	ETS	0.020	0.034	5858	32	0.55	112	1.91	283	4.85	427	7.30
	1/2	4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
	1/2	4	ETS	0.028	0.042	5881	36	0.62	141	2.39	347	5.89	524	8.91
	1/2	4	ETS	0.032	0.046	5866	42	0.72	155	2.64	389	6.62	586	9.98
Effect of degree of blade	1/2	4	ETS	0.025	0.031	5982	32	0.53	120	2.01	316	5.28	468	7.82
	1/2	4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
	1/2	4	ETS	0.025	0.047	6034	34	0.56	136	2.28	354	5.87	524	8.69
"Ideal" blade	1/2	6	REG	0.020	0.034	5948	26	0.44	103	1.74	254	4.27	383	6.44

1/ Averages of three replicate samples.
2/ ETS: Every tooth set; A repeating series in which one tooth is bent to the right and the next is bent to the left.
REG: Regular set; A repeating series in which one tooth is bent to the right, the next tooth is bent to the left and the third tooth is not bent.
3/ Effective thickness is the thickness of the blade plus the total set.
4/ Expressed as percent of the original block.
5/ A blade with no set was tested, but it proved completely unsatisfactory.

the greater was this loss. Thus, a blade of minimum width would reduce the loss of sawdust substantially. A practical limit, however, is placed on the possible decrease of width because a blade that is too narrow reduces the efficiency of the cutting operation. Also, the narrow blade ($\frac{1}{4}$ inch) bends under pressure causing nonuniformity of the cuts, and the probability that the blade will break is increased.

EFFECT OF NUMBER OF TEETH: An increase in the number of teeth per inch of blade (from 3 teeth to 6 teeth) progressively reduced the loss of sawdust from 8.86 percent to 6.94 percent (table 1 and figure 3). On the other hand, increases in the number of teeth per inch resulted in progressively increasing the clogging of the blade because the sawdust could not be removed efficiently by the small gullets (spaces between the teeth). The clogging with the blades used, however, was not serious, although the problem would probably be aggravated by the use of blades containing more teeth per inch.

EFFECT OF TYPE OF SET: The loss of sawdust that was incurred by a blade having a regular set was 8.23 percent, and the loss that was incurred by a blade

3/ "Effective thickness" is the thickness of the blade plus the total set.

having an every-tooth set was 8.20 percent. Theoretically, the loss of sawdust obtained from each blade should be the same because the gauge and "effective thickness" (a function of gauge and degree of set) on both blades was the same. In agreement with theory, the small difference (8.23 percent versus 8.20 percent) found in the experiment was not significant.

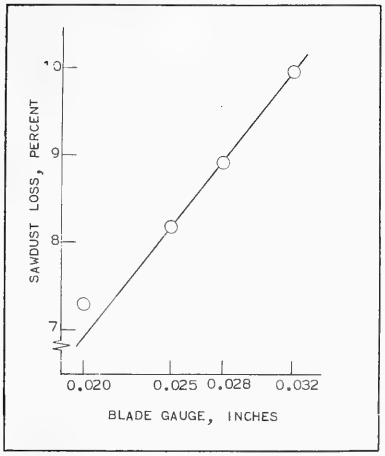


Fig. 4 - The effect of bandsaw gauge on sawdust loss during the cutting of fish sticks from fish blocks.

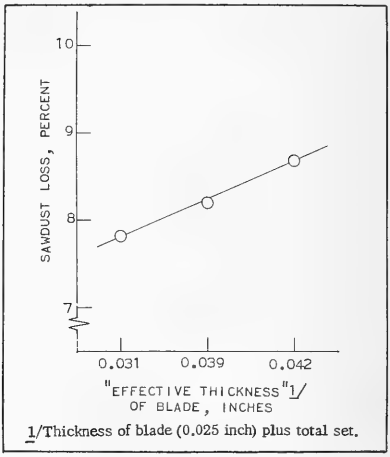


Fig. 5 - The effect of set of a bandsaw on dust during the cutting of fish sticks from fish blocks.

A bandsaw having no set was tested. The blade did not cut rapidly or satisfactorily. The sawdust formed became clogged between the blade and the surface of the meat; this clogging caused the blade to bend, resulting in a curved cut. A set in the blade is necessary, therefore, to prevent the accumulation of sawdust, to permit the blade to pass freely through the material being cut, and to prevent the cut from being curved.

EFFECT OF GAUGE OF BLADE: An increase in the thickness of the bandsaw blade from 0.020 inch to 0.032 inch caused a progressive increase of sawdust loss from 7.30 percent to 9.98 percent (table 1 and fig. 4). Using a blade of minimum thickness therefore would reduce the loss of sawdust.

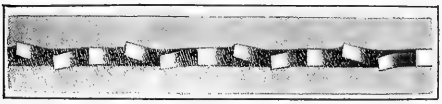


Fig. 6 - Regular set of bandsaw blade.

EFFECT OF DEGREE OF SET: An increase in total set (from 0.006 inch to 0.022 inch) caused a stepwise increase in the loss of sawdust from 7.82 percent to 8.69 percent (table 1 and fig. 5).

"IDEAL" SAW BLADE: After these factors had been considered, an "ideal" bandsaw blade was designed which was thought would decrease the loss of sawdust about as much as is possible. The blade that was chosen had the following characteristics: $\frac{3}{8}$ inch in width, 6 teeth per inch, regular set, 0.020-inch gauge, and 0.007-inch degree of set. The $\frac{3}{8}$-inch blade was chosen instead of a $\frac{1}{4}$-inch blade because the former held up much better under operating conditions than did the latter. The $\frac{3}{8}$-inch blade functioned about as well, however, as did a $\frac{1}{2}$-inch blade. A blade with 6 teeth per inch was selected despite the fact that a greater number

of teeth per inch tended to clog the blade with sawdust; however, given a regular set instead of an every-tooth set, the blade did remove the sawdust rapidly enough. Regular set was chosen because a blade with such a set cut more rapidly than did a blade with an every-tooth set. The 0.007-inch degree of set was selected instead of the 0.003-inch degree of set because it was believed that the latter did not have enough set to operate satisfactorily.

The 6.44-percent loss of sawdust incurred by the "ideal" blade (table 1) was 7.21 percent less than that incurred by the regularly-used blade having the least loss of sawdust and was 35.4 percent less than that incurred by the regularly-used blade having the most loss of sawdust.

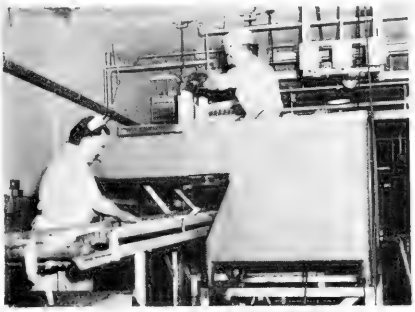


Fig. 7 - Frozen fish slabs fed into the guillotine cutter are sliced into individual fish sticks, which drop on to the conveyor belt for processing.

EFFECT OF THE VARIOUS PHASES OF CUTTING: The relative importance of each cut, in terms of loss of fish for each of the various types of blades, may also be observed in table 1. The first cut (fig. 1B), which passed through a relatively small length-depth area of the block, in all cases caused a relatively small loss in weight (0.45 to 0.72 percent). The second cut (fig. 1C), which passed through the large length-width area, caused a noticeably greater loss in weight (1.72 to 2.64 percent). The third cut (fig. 1D), which passed through the relatively small-depth-width area, caused the greatest loss of all (4.68 to 6.62 percent) because of the large number of cuts made when each of the six slabs formed by the previous two cuts were sawed into thirty-six $\frac{1}{2}$-inch fish sticks (making 216 fish sticks in all). These data show the great importance of using a slicing or nonsawdust-forming cutting operation in the third step (fig. 7).

SUMMARY

Fish sticks are cut from frozen blocks of fillets in a three-step operation that results in the loss of 7 to 12 percent of the weight of the block as "sawdust." To help to minimize this loss, the Fishery Technological Laboratory at East Boston carried out a series of tests to determine the effect of the type of bandsaw blade on the loss of sawdust in the bandsaw cutting operations.

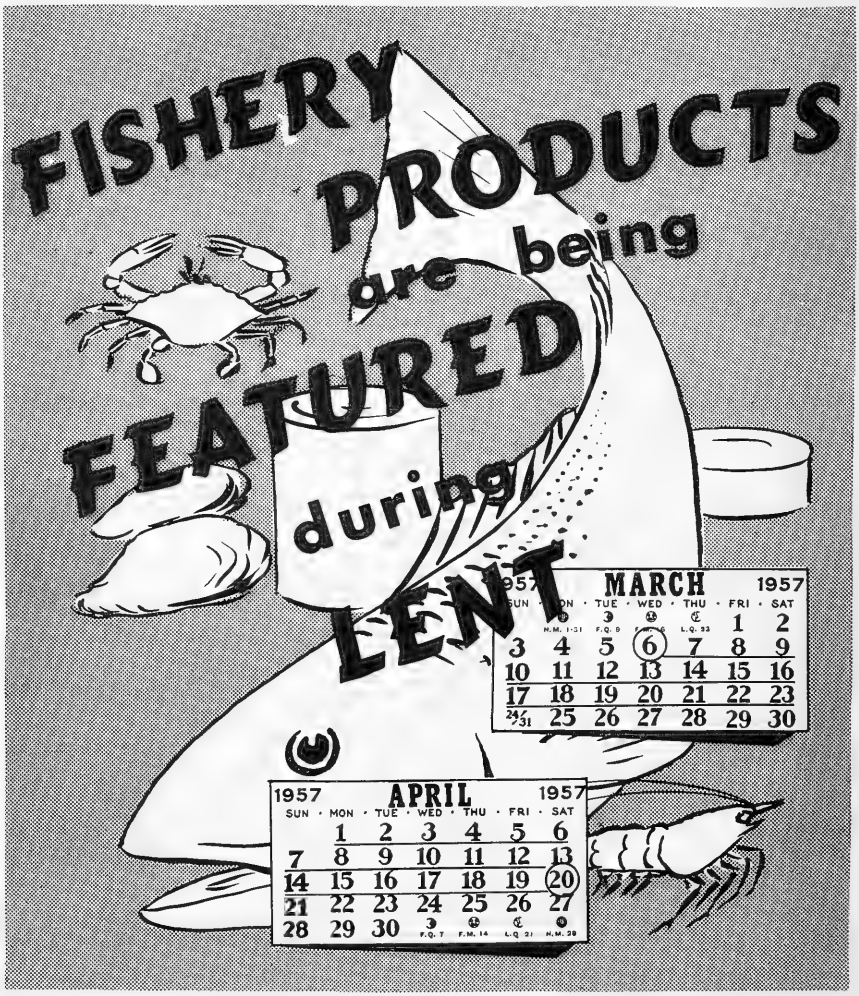
Increases in width, in thickness, and in degree of set of the bandsaw blades caused the amount of fish that was lost as sawdust to increase. An increase in the number of teeth per inch of blade caused the amount of fish that was lost as sawdust to decrease. The type of set--regular set or every-tooth set--had no effect on the amount of fish that was lost.

From these observations, an "ideal" bandsaw blade was designed to reduce the loss of sawdust to a minimum. The loss of sawdust incurred by this blade was 7.21 percent less than that with the regularly-used blade producing the least loss of sawdust and was 35.4 percent less than that with the regularly-used blade producing the most loss of sawdust.

In the study of the regularly-used bandsaw blades, it was found that about 0.6-percent sawdust was lost in the first step in the cutting operation, that about 2 percent was lost in the second step, and that about 6 percent was lost in the third step. These data show the great importance of using a slicing or nonsawdust-forming cutting operation in the third step.

LITERATURE CITED

Dassow, John A.; S. R. Pottinger, and John Holston
1956. Refrigeration of Fish. Part 4 - Preparation, Freezing, and Cold Storage of Fish, Shellfish, and Precooked Fishery Products. U. S. Fish and Wildlife Service, Washington 25, D. C. Fishery Leaflet 430, pp. 75-120.



IRON SULFIDE DISCOLORATION OF TUNA CANS[1/]

No. 5 - Effect of Salt, Oil, and Miscellaneous Additives

By George M. Pigott* and M. E. Stansby**

ABSTRACT

Effect of additives as potential causetive agents in the iron sulfide discoloration of tuna cans was investigated. Copper salts caused can corrosion but no iron discoloration. A series of chemical compounds at levels normally found in canned tuna did not cause discoloration. Source of salt or of vegetable oil added had no effect on discoloration.

BACKGROUND

The formation of black iron sulfide deposits in certain batches of canned tuna has caused members of the tuna-packing industry much concern in recent years. This paper, the fifth in a series of six papers reporting the findings of an investigation into the factors associated with iron sulfide formation (Pigott and Stansby 1955), reports the effects of various additives on sulfide discoloration in tuna cans.

EFFECT OF SALT AND OIL

About $\frac{1}{8}$ ounce of salt and 1 to $1\frac{1}{2}$ ounces of vegetable oil are added to each can of tuna ($\frac{1}{2}$can) before it is seamed and retorted. A series of experiments were carried out to investigate the effect of salt and oil on can discoloration and to determine whether different batches of salt or oil affect the formation of discoloration in different ways.

Table 1 - Acid Number and Free Fatty Acid Values Obtained with Various Vegetable Oils Used in Commercial Canning of Tuna

Type of Oil	Source of Oil	Acid Number		Free Fatty Acid	
		Received 1/	Processed 2/	Received 1/	Processed 2/
	Packer	(Number)		(Percent 3/)	
Olive	A	0.51	0.51	0.25	0.25
Soya	A	0.06	0.07	0.03	0.03
Soya (recovered) 4/	A	0.06	0.06	0.03	0.03
Oil (stored) 4/	B	0.09	0.09	0.04	0.04
Oil (as received) 4/	B	0.03	0.04	0.01	0.02
Oil (recovered) 4/	B	0.03	0.03	0.01	0.01
Olive	C	1.56	1.59	0.79	0.80
Soya (stored in tanks) 4/	C	0.08	0.08	0.04	0.04
Soya (stored in drums) 4/	C	0.07	0.07	0.04	0.04
Soya	D	0.06	0.06	0.03	0.03

1/ Oil as received from cannery.
2/ Same as in 1/ but oil processed for 75 minutes at 240° F.
3/ Calculated as oleic acid.
4/ By the packers supplying samples.

Rock salt and table salt from several commercial sources were used (1) in experimental solid packs of yellowfin tuna that normally formed discoloration in single-enamel cans 2/ and (2) in similar packs of albacore that did not normally form the discoloration. The amount of salt or the source of salt had no effect upon the extent of can discoloration in these studies. However, if no salt was added to the yellowfin packed with added vegetable oil, no discoloration was found whatever.

Vegetable oils for experimental packs were next obtained from several tuna packers. When used in these experiments, the oils had no effect on can discoloration

*Formerly Chemical Engineer, Continental Can Company, Seattle, Wash.
**Chief, Pacific Coast and Alaska Technical Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

1/ This investigation, which was carried out at the Seattle Technological Laboratory, U. S. Fish and Wildlife Service, was jointly sponsored by the Continental Can Company and the U. S. Fish and Wildlife Service

2/ Unless otherwise stated, all tuna canned throughout this investigation were canned in single-enamal cans like those that were used by industry when initial outbreaks of sulfide discoloration occurred.

in the packs of the yellowfin and albacore from the same lots used in the salt source studies. These oils were also analyzed for free fatty acid content, both before and after heat processing. No increase in free fatty acid content was found after the oils were processed 75 minutes at 240° F. These results are shown in table 1.

Oil from discolored and from normal packs of tuna were analyzed for free fatty acids (table 2). The results showed no important differences in free fatty acid content of normal, spoiled, and sulfide-discolored packs.

The yellowfin that normally caused can discoloration was packed using various combinations of soya oil, saturated brine (room temperature), and salt. If both salt and free oil, or salt and free water, or free water alone were present in the canned product, can discoloration took place (table 3). On the other hand, if a free liquid was not present, no iron sulfide was formed. Thus, free liquid seems to be necessary before can discoloration will occur. The effect of free liquid will be further discussed in the next paper of this series, where work on the effect of free liquid in flaked tuna pack is reported.

Table 2 - Free Fatty Acid Content of Oil from Canned Tuna

Source of Oil	Free Fatty Acid Content
	Percent 1/
Packs from normal tuna	0.101 to 0.272
Packs from badly-spoiled fish	0.343 to 0.372
Discolored commercial packs	0.129 to 0.486

1/ Calculated as oleic acid.

EFFECT OF ADDING MISCELLANEOUS SUBSTANCES

Several substances that are known to be present in canned tuna, or that might possibly affect the formation of metal sulfide when introduced into the product, were added to experimental packs of yellowfin and albacore tuna. In each case, cans containing no additives were packed as controls. Fish that had a history of causing can discoloration as well as those that had never caused discoloration were used in the control packs. Fatty acids were added to experimental packs of albacore and yellowfin to determine the effect of free fatty acid on can discoloration. Acetic acid, butyric acid, oleic acid, and stearic acid were added in various amounts from 0 to 1 percent by weight of can contents. These acids were also added to cans containing only vegetable oil and sodium sulfide. When large quantities of the acids were present, very extensive discoloration was produced, both in the cans containing fish and in those containing only sodium sulfide and oil. However, the amounts that had to be added to obtain consistent discoloration in cans of tuna that normally did not cause the iron sulfide deposit were far above those found in the commercially-discolored tuna packs.

Table 3 - Effect of Oil and Salt on Can Discoloration in Solid Pack Tuna 1/ 2/

Additives			Discoloration
Soya Oil	Saturated Brine	Salt	
.....(Ounces).....			(Degree)
$1\frac{1}{2}$	0	$\frac{1}{8}$	Medium
$1\frac{1}{2}$	0	0	None
0	$1\frac{1}{2}$	0	Heavy
0	0	0	Medium 3/
0	0	$\frac{1}{8}$	Medium 3/
0	0	0	None 4/
0	0	$\frac{1}{8}$	None 4/

1/ All packs were processed for 75 minutes at 242° F.
2/ Cumulative results of 3 experiments of 96 cans each. Total of 288 cans approximately evenly divided into the 7 groups.
3/ Considerable free water was present after retorting.
4/ No free water was present after retorting.

Trimethylamine and trimethylamine oxide have been shown to affect the amount of tin going into solution in cans of herring (Jakobsen and Mathieson 1946). These substances were added to packs of albacore and yellowfin in quantities up to 1 percent by weight. The addition of trimethylamine increased tin sulfide staining but neither substance showed any effect on can discoloration from iron sulfide formation.

Glycerine, tartaric acid, sucrose, and glucose in quantities up to 1 percent by weight were added to yellowfin and albacore to see if polyhydroxy groups affected iron sulfide can discoloration. No consistent correlation of can discoloration to the presence of these substances was noted.

Monosodium glutamate, which is added by some tuna packers to enhance the flavor of the fish, was found to have no effect on can discoloration when added in amounts up to 1 percent of the total can contents.

Copper and tin ions have been considered important catalysts in the corrosion of can metal. Cuprous chloride, cupric chloride, and stannous chloride were added to albacore tuna packs in various amounts from 1 part per million to 1 part per hundred, by weight. It was found that these metals, when present in this experimentally canned albacore tuna, did not affect the ordinary type of can discoloration. However, cuprous or cupric ions, when added at a level of 100 parts per million or greater, caused corrosion within the cans resulting in hydrogen evolution and pinhole leaks.

CONCLUSIONS

1. The presence of added salt was necessary before the yellowfin tuna solid packs (with added vegetable oil) used in this investigation would cause iron sulfide discoloration of the cans.

2. The source of the salt and vegetable oil samples when added to experimental packs had no effect upon the iron sulfide can discoloration.

3. Free fatty acids (at levels normally found in canned tuna), trimethylamine, trimethylamine oxide, glycerine, tartaric acid, sucrose, glucose, and monosodium glutamate, when added to the experimental packs did not foster or hinder can discoloration to any extent.

4. Cuprous and cupric salts, when added to the experimental packs, caused can corrosion, but not iron sulfide discoloration.

LITERATURE CITED

Jakobsen, F., and E. Mathiesen
1946. Corrosion of Containers for Canned Foods. Matamatisk Naturvidenskapalig Klasse, No. 5, pp. 6-112.

Pigott, George M., and Maurice E. Stansby
1955. Iron Sulfide Discoloration of Tuna Cans. No. 1 - Theory of Iron Sulfide Formation in Cans. Commercial Fisheries Review, vol. 17, no. 10, pp. 34-39. (Also Separate No. 418.)

1956. Iron Sulfide Discoloration of Tuna Cans. No. 2 - Analytical Methods. Commercial Fisheries Review, vol. 18, no. 2, pp. 5-9. (Also Separate No. 429.)

1956. Iron Sulfide Discoloration of Tuna Cans. No. 3 - Effect of Variables Introduced by the Fish. Commercial Fisheries Review, vol. 18, no. 6, pp. 8-12. (Also Separate No. 439.)

1956. Iron Sulfide Discoloration of Tuna Cans. No. 4 - Effect of Retorting and Cooling of Canned Fish. Commercial Fisheries Review, vol. 18, no. 12, pp. 13-16. (Also Separate No. 461.)

COLD-STORAGE LIFE OF FROZEN FISH IMPROVED BY BETTER HANDLING PRACTICES

The advantage of using the best possible handling procedures to gain the maximum cold-storage life of frozen fish was forcefully demonstrated by a recent experiment completed in December 1956 and carried out at the Service's Fishery Technological Laboratory. Some pink salmon, which with normal commercial handling procedures have a frozen storage life of six months or less, were kept in good condition for 14 months. The methods employed were not laboratory procedures but rather practical methods which could be adopted commercially and which consisted merely of using low-storage temperature and extra-careful glazing and packaging.

A batch of pink salmon (a species with a short storage life because of great susceptibility to oxidation) was procured in October 1955. These fish were frozen and stored for future laboratory tests. Because it was realized that oxidation would be a problem, special precautions were taken. An extra heavy ice glaze was applied and the individual, whole, glazed fish were stored in polyethylene bags to prevent the loss of the ice glaze. The fish were then stored at -20° F. In December 1956 after 14 months in cold storage, several of the fish which remained were removed, examined, cooked, and eaten. Although some slight discoloration had developed, the fish were still in good marketable condition.

This demonstrates the importance of using low (at least -20° F.) storage temperatures for frozen fish and of protecting whole fish against oxidation by use of a thick ice glaze with precautions against loss of glaze, or for renewal of the glaze at appropriate intervals.

IDENTIFICATION OF TUNA PIGMENTS

Development of off-colors of various shades (such as green or brown) in canned tuna during processing has long been a matter of concern to tuna processors. Nothing has been known as to the chemical nature of either the naturally-occurring pigments, or those which form during canning and which result in the normal desirable pink color or undesirable green or brown colors. U. S. Fish and Wildlife Service chemists and staff members of the Food Technology Department of the University of California, working in a collaborative program at Davis, Calif., have now identified the chemical nature of the normal pink pigment which forms during the canning operation, and have found means for insuring that it will develop when tuna is canned. Work is continuing toward identification of the abnormal undesirable colored pigments which sometimes develop.

When tuna is canned, the neutral grayish shade of the raw tuna meat normally is converted to a light pink color which is considered desirable by the consumer.

It is the pigment responsible for this color which has been identified as a hemochrome, a compound related to blood pigments. When exposed to air, the pink color fades rapidly to an undesirable tan color. With knowledge as to the chemistry of these changes, it may be possible to stabilize this desirable pink pigment when the contents of the can are exposed to air.

REVISED FEDERAL SPECIFICATIONS FOR BREADED SHRIMP PROPOSED

Copies of the proposed Federal Specification for "Shrimp, Frozen, Raw; Breaded," PP-S-315 dated January 21, 1957, were distributed to members of the industry for review and comment. This specification supersedes Interim Federal Specification PP-S-00315 dated July 12, 1956. This draft was prepared by the Quartermaster Corps Food and Container Institute for the Armed Forces, Chicago, Ill., and Fishery Technological Laboratory, U. S. Fish and Wildlife Service, East Boston, Mass. It is based on information which the Institute and the Service have obtained through technological research and through consultation with the industry.

As a result of industry and Armed Forces comments on the Interim Specification, certain revisions were made in the proposed draft of the Federal specification. For this reason further industry coordination is being carried out.

Pertinent revisions concern redesignation of coating content range; classification by types of inspection procedures; addition of classes; redefinition and clarification of defects; and readjustment in tolerances for defects such as black spots, fragments, damaged and broken shrimp, and loose crumbs.

Single copies of the proposed draft were mailed to approximately 200 packers, brokers, and distributors of breaded shrimp, to members of related industries, and to trade and research organizations for comment.

USE OF X-RAY FLUOROSCOPY FOR FISH BONE DETECTION SHOW PROMISE

Fish bones, long a problem to the fishing industry, may be detected in processed fishery products on the production line by means of fluoroscopy or X-rays. Preliminary research at the Service's Boston Fishing Technological Laboratory, using the latest methods and equipment in X-ray analysis, has shown very promising results for the detection of bones, cartilage, and foreign objects such as metal, stones, etc., that, as in all foods, are occasionally found in fishery products.

Approximately 50 packages of commercially-packed frozen precooked fish sticks were examined under a fluoroscope screen. Eighteen of these packages proved to be positive, i.e., bones or foreign objects were seen on the screen. These 18 packages were later examined by crushing the sticks by hand and feeling for the bones. Fifteen of these packages were found by this method of examination to contain bone or cartilage, two had pieces of metal present, and the remaining package contained what appeared to be a small stone. All of the other 32 packages that were negative by fluoroscopic examination, i.e., showed no evidence of bones or foreign matter, were also found to be free of such material when examined by hand. These preliminary results thus show considerable promise for successful fluoroscopic detection of bones and other extraneous material that might be present in fish sticks.

The research into this problem will be intensified by full-scale commercial tests to determine if fluoroscopy can be successfully applied by the fish processor as a tool in helping to maintain the highest quality in fish and fishery products.
Note: See Commercial Fisheries Review, November 1955, p. 1.

FREEDOM OF THE SEAS AND SOVEREIGNTY OVER THE SEAS

"Freedom of the seas and sovereignty over the seas by adjacent countries are simply incompatible doctrines," Senator Leverett Saltonstall (Republican-Massachusetts) told members of the National Fisheries Institute on April 16, 1956, at their Eleventh Annual Convention at Miami Beach, Fla.

Senator Saltonstall was speaking of the failure of the Inter-American Council of Jurists at their Mexico City meeting to study and discuss adequately conervation problems. "Responsible officials of our government," he said, "are most disturbed about the actions taken, with no study and little discussion."

"The United States, "he said, "second to Japan, is the largest fishing country of the world. We harvest close to five billion pounds of food from the sea each year. While most of this comes from off our own shores, our fishermen fish in the high seas off the coasts of many other countries, and the fishermen of a good many other countries fish in the high seas off our coasts, too."

Since we are a leader in conserving natural resources, the Senator went on to say, we have found peaceful means of protecting the harvest of the seas without detriment to the "freedom of the seas" doctrine, and we cannot afford to injure that doctrine.

Treaties are now in effect with other nations on the seal, halibut and salmon fisheries of the North Pacific; Great Lakes fisheries; Southeast Pacific tuna fisheries; Northwest Atlantic fisheries; and world whale fisheries.

"Friendship with our good neighbors to the south has long been a keystone in our foreign policy," he reminded his audience. "International cooperation, mutual study of mutual problems, calm discussion and debate of ideas, and multilateral approach to the solution of political, economic, judicial, security, social and defense questions has made the relations between the nations of the Americas a model for the rest of the world."

Senator Saltonstall also reported on the money spent under the Saltonstall-Kennedy Act, which provides the Fish and Wildlife Service $3 million a year for three years. ...

--Excerpt from address at National Fisheries Institute Eleventh Annual Convention, April 16, 1956.

California

ANCHOVIES ABUNDANT IN SOUTHERN CALIFORNIA WATERS: Despite fishing pressure that has steadily increased since 1951, there are now more anchovies in Southern California waters than you can scoop up in a season of heavy netting. This report should make pleasant news for commercial fishermen, ocean sport fishermen, and researchers, although biologists of California's Department of Fish and Game temper their enthusiasm on a note of caution.

While there is an abundance of anchovies, they do not appear to be as old, on the average, as they once were. Biologists consider this a warning sign that a downward population fluctuation may be indicated.

Agencies taking part in the California Cooperative Oceanic Fisheries Investigations program, now only four years old, have found that fishing pressure hasn't hurt the southern anchovy population at all.

From 1951 to 1955 commercial landings of anchovies in Southern California (Point Concepcion to San Diego) amounted to 80,204 short tons and the live bait catch to 31,152 tons, a total of more than 111,000 tons. But the evidence shows that nature has provided the anchovy with four consecutive years (1951-1954) in which survival of its spawn was abundant enough to more than compensate for all deaths occurring during this period.

For instance, the number of larval anchovies taken in the area from Point Concepcion to Point San Juanico, Baja California, has doubled from 1951 to 1955. This means that either the spawning population has doubled or there was a decided increase in the survival rate of eggs and newly hatched larvae over previous years.

That the spawning population actually has increased is substantiated by data from other sources. Results of the State's aerial survey show a marked increase in the number of schools sighted in 1956 over the previous two years in the 500-mile stretch between Morro Bay and Punta Baja in Baja California

The same cannot be said for the anchovy population off Monterey and San Francisco. There was a peak concentration in Central California in 1952, but since that date only limited numbers have appeared. Apparently, total mortality (including fishing mortality) was greater than the addition of young fish into the population. Fish born in early 1954 contributed to a slight comeback of the anchovy in Central California in 1955, but this did not compare to the increase in the southern part of the State.

Between 1951 and 1955 only 37,633 tons were landed at Monterey and San Francisco.

Does this mean that anchovies may have moved to Southern California in early 1953 when they "disappeared" from Central California waters? Or does it mean that heavy fishing, coupled with poor survival of eggs and larvae, lowered the population to a level where it was no longer economically feasible to continue fishing?

Can anchovy populations be expected to vary considerably in abundance from natural causes alone and will these variations occur, fishing or not? Also, will a continual state yearly catch of 35,000 tons never endanger Southern California stocks?

Some of these questions can be answered now, but others await the results of continuing and intensive research.

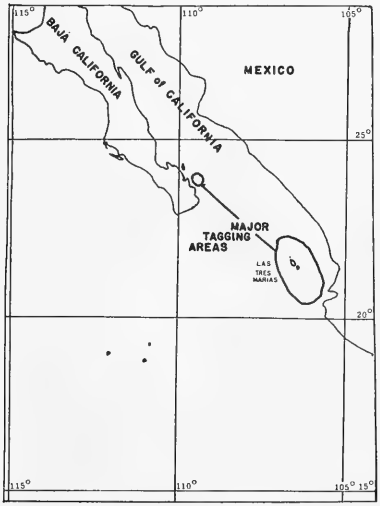
Samplings from 1952 to 1955 proved that the anchovies did not move to Southern California from the central area. In fact, up to now all information on the fish points to the fact that there is a marked separation between the stocks to the north and south of Cape San Martin, southern Monterey County, and that the two "populations" should be considered separately, especially concerning problems of fishery management.

Fortunately, laws prevent uncontrolled take of anchovies in California waters. The Fish and Game Commission has steadfastly denied permits to reduce whole anchovies into meal and oil, and in 1954 the Legislature enacted a law setting a maximum yearly take. Up to now this legislation has not had an effect upon the anchovy population, for the catch has been less than the maximum set by law.

The economic demand for anchovies has lessened considerably since the peak demand year of 1953, and the catch is not expected to reach the 35,000-ton bag limit allowed for the the period between April 1, 1956, and March 31, 1957, unless new markets for canned anchovies arise. Should the markets for anchovy products arise, the abundant stocks now available in Southern California could furnish the desired fish--at least for a year (Outdoor California, December 1956).

* * * * *

TUNA TAGGING TRIP SUCCESSFUL (M/V Sun Pacific Cruise 56-C-5): Biologists of California's Department of Fish and Game tagged 912 tuna with the help of the crew of the tuna clipper Sun Pacific during a trip (October 28-December 9, 1956) to the fishing grounds off Lower California, Los Muertos Bay, and the Las Tres Marias islands. In addition to the tagging of yellowfin and skipjack tuna, the objectives of the cruise were (1) to test the relationship of color (red, white, and blue) and the tagging position on the fish on recovery of type "G" tags, (2) to assess the occurrence of marine life by bait-net hauls, hook-and-line fishing, and night light stations, and (3) to make oceanic observations.



Sun Pacific tuna tagging cruise (Cruise 56-C-5), Oct. 28-Dec. 9, 1956.

A majority of the tuna, 99 yellowfin and 741 skipjack were tagged and released in the vicinity of the Las Tres Marias Islands, Mexico. Of the remaining tagged fish, 70 skipjack were tagged and released in the Gulf of California off Los Muertos Bay and 2 yellowtail were released off Punta Abreojos, Baja California. Table 1 lists the number of fish released by tag colors.

The surface water temperatures in the fishing areas around the Las Tres Marias Islands ranged from 25.8° C. to 27.9° C. In contrast to this range of slightly over 2° C,

the water temperatures off Los Muertos Bay were quite stable, ranging only 0.4° C., 26.8° C. to 27.1° C.

A small collection of specimens were obtained from night light stations, bait hauls and hook and line fishing.

Table 1 - Number of Fish Tagged and Released

Species	No. of Colored Tags Used			Total
	Red	White	Blue	
Skipjack	269	272	270	811
Yellowfin	35	32	32	99
Yellowtail	2			2
Total.....	306	304	302	912

Cans--Shipments for Fishery Products, January-October 1956

Total shipments of metal cans during January-October amounted to 100,876 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 91,353 tons in the same period of 1955. During the month of October packers of canned shrimp, California sardines, and tuna were active. The pack of Maine sardines during October was fair.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.

Federal Purchases of Fishery Products

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY THE DEPARTMENT OF DEFENSE, NOVEMBER 1956: The U. S. Military Subsistence Market in November 1956 purchased 2,162,888 pounds (value $1,118,194) of fresh and frozen fishery products for the use of the Armed Forces. This was about one percent less in quantity but 1.9 percent more in value than the purchases in October 1956, and 11.0 percent more in quantity and 30.2 percent more in value than November 1955.

Purchases of Fresh and Frozen Fishery Products by Department of Defense (November and the First 11 Months of 1956 with Comparisons)

QUANTITY				VALUE			
November		Jan.-Nov.		November		Jan.-Nov.	
1956	1955	1956	1955	1956	1955	1956	1955
(1,000 Pounds)				($1,000)			
2,163	1,948	24,580	23,202	1,118	859	12,321	10,031

Purchases of fishery products during the first 11 months of 1956 totaled 24,579,500 pounds valued at $12,320,723--5.9 percent more in quantity and 22.8 percent more in value than the purchases for the similar period in 1955.

Prices paid for these fishery products by the Department of Defense in November averaged 51.7 cents a pound as compared with 50.3 cents the previous month and 44.1 cents a pound in November 1955.

In addition to the purchases of fresh and frozen fishery products reported, the Armed Forces make some local purchases which are not included above. Therefore, actual purchases are higher than indicated, but it is not possible to obtain data on the local purchases by military installations throughout the country.

Fish-Hatchery Food From Anchovies Caught Near Santa Barbara, California

Enormous numbers of fish are raised in the various fish hatcheries of this country. In the rearing of these fish, large quantities of food are used. Among the matrials employed to feed the hatchery fish are frozen ground anchovies.

The principal steps in the production of fish-hatchery food from anchovies at Santa Barbara, Calif., are as follows:

1. The anchovies are caught with a modified lampara net in the waters off Santa Barbara and then are taken to port.

2. At the Santa Barbara wharf, the anchovies are pumped from the hold of the fishing vessel and are loaded into a truck.

3. The truck carries the anchovies to a production plant, where they are ground, extruded into paper bags, rapidly frozen, and then stored for subsequent shipment to the fish hatcheries. 1/

The remainder of this article gives a photographic report of these various steps.

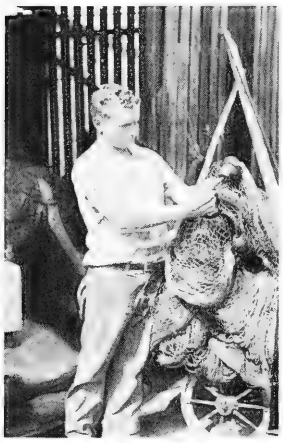


Fig. 1 - The Captain of the trawler Linda shows a portion of the type of net used in catching anchovies. This net is a modified lampara. Note the fine mesh used for catching small fish.

Fig. 2 - Lowering the suction hose into the hold of the Linda of Santa Barbara. Note the end of the hose near the hold.

1/ The feeding of hatchery fish is a complex science beyond the scope of this article to discuss. Many factors, for example, must be considered in the use of a feed, such as the presence of thiaminase, a substance that is found in anchovies and and other fish.

Fig. 3 - Pump and pump operator. This suction pump has an unloading capacity of 3,200 pounds of anchovies per minute. The pump is operated by a 40-horsepower 220-volt electric motor actuating a vacuum pump producing 25 inches of vacuum.

Fig. 4 - Pumping anchovies into the elevator. To facilitate pumping, the captain fills the hold partially with sea water. The rubber suction hose and pump then carries the anchovies to the elevator scale house.

Fig. 5 - Scale house, operator, and tank truck. The operator weighs the anchovies as they come off the elevator. The weighing is done by means of a trip bucket. When the bucket is filled with 500 pounds of anchovies, the operator releases the bottom, and the anchovies then are carried by endless belt to the chute leading into the tank truck.

Fig. 6 - Tank truck partially filled. This truck, when filled, contains 9 tons of anchovies. These anchovies are about $6\frac{1}{2}$ inches in length.

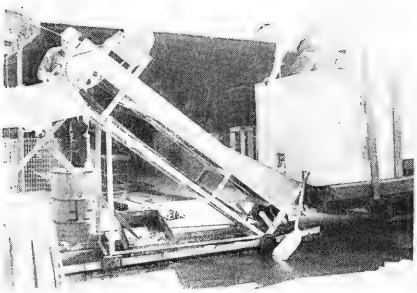


Fig. 7 - Feed conveyor. This conveyor feeds into the grinder.

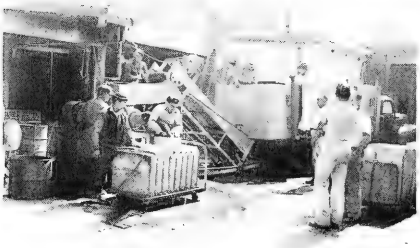


Fig. 8 - Over-all view of grinding operation.

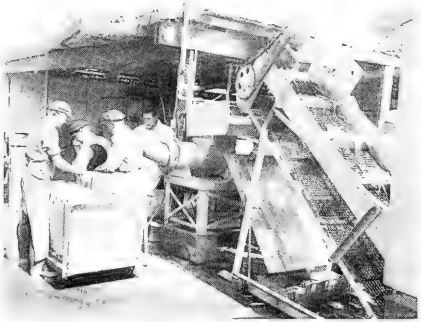


Fig. 9 - Grinder. The grinder has a capacity of 40 tons of anchovies per day. A spiral shaft operated by an electric motor forces the anchovies through any size hasher plate desired. In the photograph, a $\frac{1}{4}$-inch hasher plate is being used.

Fig. 10 - Multiwall paper bags and cart. The bags are 13 x 4 x 31 inches in size, and each one accommodates 50 pounds of groundfish. The inner wall of the bag is 60-pound, wet-wax, wet strength. The outer wall is 50-pound, natural kraft paper printed to indicate the type of fish, the size of grind, and the date the fish were placed in the freezer. The printed bag eliminates hand stenciling and thereby reduces labor costs. The carts hold 16 bags, totalling 800 pounds of ground fish when the bags are filled. Note that the bags are inserted into a partitioned plywood frame that prevents sagging of the bags and provides a uniform package. The frame is removable from the cart for cleaning purposes.

Fig. 11 - Extruder. After the anchovies pass through the hasher plate, they are extruded from this rubber inner tube. The purpose of the inner tube is to speed up the bag filling. As one bag is filled, the end of the tube is pinched and moved to the next bag in the line. When the bags on one side of the cart are filled, the cart is reversed, and the operation is continued without loss of motion.

Fig. 12 - Closure of bags. The tops of the bags are folded double and are fastened with four staples across the top. As the bags on one side of the cart are filled, those on the other side are stapled.

Fig. 13 - Cart of filled bags being taken into the sharp freezer.

Fig. 14 - Loading bags onto the coils of the sharp freezer. The temperature in this freezer is -30° F. The capacity of the coils is 360 50-pound bags or 9 tons of fish. The bags remain on the coils for 48 hours to insure thorough freezing. The anchovies shown in these photographs were caught, brought to port, unloaded, processed, and placed in this sharp freezer within 6 hours.

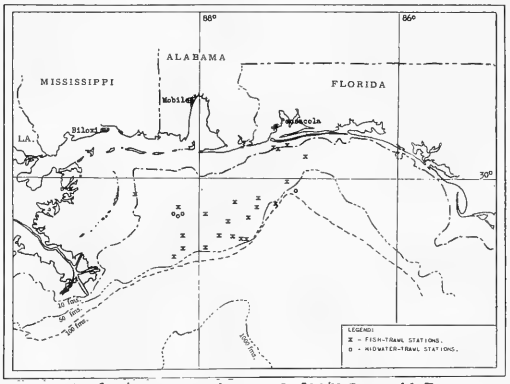
Fig. 15 - Storage of the bags. After the fish have been sharp frozen, they are removed to frozen storage at 0° F. Lying on top of the bags in the foreground is a part of the gravity conveyor used to remove the fish from the sharp freezer to this storage room. The metal pipe stands are of graduated height and are used to support the gravity conveyor. This storage room has a capacity of 40 tons.

Note: The author gratefully acknowledges the aid of George W. Schreck, President of Farallone Fisheries of Santa Barbara, and Captain Lloyd Lindwall of the trawler Linda.

--BY F. BRUCE SANFORD, CHEMIST,
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

Gulf Exploratory Fishery Program

BOTTOM AND MIDWATER TRAWLS TRIED IN GULF (M/V Oregon Cruise 42 and George M. Bowers Cruise 8): Gear trials, using New England-type otter trawls and midwater trawls, were carried out in the Northeastern Gulf of Mexico from January 7-25, 1957, by the Service's Exploratory fishing vessels Oregon and George M. Bowers.



Cruise 42 of M/V Oregon and Cruise 8 of M/V George M. Bowers (Jan. 7-25, 1957).

Twenty-three drags were made over rough and broken bottom using 60' and 52' "eastern" and No. 36 New England-style trawls. Each net was fished with 70' of rollers, standard V-D gear, on 10-fathom legs. These drags were made, for the most part, in areas where bad bottom had prevented previous sampling with shrimp trawls by the Oregon. Only one net was damaged during the trials.

During the midwater trawl tests by the Oregon, telemeter readings were checked by depth recorders aboard the George M. Bowers. Accuracy of the telemeter was found to be within one fathom at all depths tested. Thirty- and fifty-foot square midwater trawls were used.

Large numbers of scrap species were caught during the bottom-trawl tests. Catches of porgies (Stenotomus), croakers, and spot varied from 1,500 to 3,000 pounds per hour drag. Several species of larger food fishes not common to shrimp trawl catches were landed, including 283 red snappers ($\frac{1}{2}$ to 30 pounds each), and large porgies (Pagrus) weighing five to eight pounds each.

During the cruise, 106 subsurface schools of fish were recorded on the Oregon depth recorders. The two largest schools were in excess of 300 yards in diameter. Attempts to sample schools with both midwater and fish trawls were generally unsuccessful. Several of the drags, however, caught small quantities of anchovy, sardine (Sardinella), chub mackerel, and rough scad (Decapturus). On several occasions large numbers of anchovy and sardine were observed "showering" through the relatively large mesh (2" to 5") as the trawls surfaced.

Hawaii

GRANTS FOR RADIOACTIVE MARINE RESEARCH: The U. S. Atomic Energy Commission has renewed a two-year contract with the University of Hawaii increasing its grant for investigation of radioactivity in marine organisms. The new contract allows the University $34,000 for continued radioactive marine research at Coconut Island. Instead of using one radio isotope at a time, as the Marine Laboratory has been doing previously, emphasis will now be on use of mixtures of radioactive materials as encountered in wastes from atomic power plants.

Future experiments outlined will attempt to find out what happens to fish and other marine organisms that live their entire lives in surroundings slightly more radioactive than they are now. (Current Affairs Bulletin, Indo-Pacific Fisheries Council.)

□□□□□□

Maine Sardines

CANNED STOCKS JANUARY 1, 1957: Distributors' stocks of Maine sardines totaled 344,000 actual cases as of January 1, 1957, an increase of 18,000 cases, or 6 6 percent, over the 326,000 cases held by distributors on January 1 a year ago, according to estimates made by the U. S. Bureau of the Census.

Canners' stocks on January 1, 1957, as reported by the Maine Sardine Industry were 879,000 cases (100 3¼-oz. cans), as compared with 475,000 cases on the same date in 1956.

Table 1 - Canned Maine Sardines--Wholesale Distributors' and Canners' Stocks, January 1, 1956 with Comparisons

		1956/57 Season		1955/56 Season				
		1/1/57	11/1/56	7/1/56	6/1/56	4/1/56	1/1/56	11/1/55
Distributor	1,000 Actual Cases	344	388	154	160	268	326	354
Canner	1,000 Standard Cases 1/	879	1,016	315	64	152	475	625

1/ 100 3¼-oz. cans equal one standard case.

The pack of Maine sardines from the beginning of the season on April 15, 1956, to the end of the packing season on December 1, 1956, totaled 2,221,793 standard cases.

Market Outlook for Fishery Products

JANUARY-MARCH 1957: Adequate supplies of most fish and shellfish are foreseen for January-March 1957, despite the seasonal lull experienced by the Nation's commercial fishing industry. This is reported in the Commercial Fisheries Outlook, January-March 1957, a quarterly publication of the United States Fish and Wildlife Service.

Oysters will be in their prime and in demand; Pacific Coast dungeness crab will be in good supply; imports, frozen stocks, and canned supplies plus some fishing, which will continue despite winter storms, will keep most supplies adequate.

Because of a number of promotional and educational campaigns conducted in 1956, the buying public should be better informed on matters pertaining to food fish in 1957; also the late Lenten season may have a strengthening effect upon demand.

The East Coast oyster industry, still not fully recovered from the hurricane damage of recent years, will be active during the quarter but will probably not be able to meet the demand. Pacific oyster producers have reported unusually heavy demand this season from soup and stew packers and even with new oyster beds coming into production in California, the industry will be pushed to satisfy consumers.

Shrimp landings in the Gulf picked up in October, but November storms cut production considerably. Imports during the quarter will be substantial but will probably not be as high as during last winter. Cold-storage supplies are lower, but probably sufficient. Canned supplies are about the same as a year ago.

Salmon, largely because of the 25-percent increase in the Alaska catch during the 1956 season, is in better supply than a year ago, but is far from being plentiful.

Cold-storage holdings of frozen salmon are higher and mild-cured supplies are lower. Canned salmon supplies are somewhat higher than a year ago. Imports of fresh salmon from Japan and Canada were lower in recent months, but canned salmon imports were considerably higher.

Swordfish, whiting, and canned Maine sardine supplies are moderate, but canned tuna and California mackerel stocks are heavy. Halibut is in good supply because of a good seasonal catch. Haddock and ocean perch supplies are liberal, with cod, pollock, flounder, and sole stocks moderate.

Fish sticks, the first fishery product to bear the U. S. shield and grade label, are available in greater quantities and are meeting an increased demand.

The demand for clams and lobsters is good and the amounts available light; sea scallops are available and the market is firm.

Oregon

ELECTRONIC FISH COUNTER TESTED: The first extended field trials of a transistorized electronic fish counter in the United States was begun in Oregon in November 1956, according to a November 27, 1956, news release of the Fish Commission of Oregon.

The device was installed in a fishway at Bonnie falls on the north fork of Scappoose creek, a lower Columbia river tributary. The Fish Commission biologist in charge of Columbia river projects said fish tallies recorded by the electronic counter will indicate the status of steelhead and silver salmon runs utilizing the 11 miles of spawning and rearing area made available by construction of the Bonnie falls fishway in 1952.

Use of the counter at Bonnie falls will also provide the U. S. Fish and Wildlife Service with detailed information on extended field performance of the device, including maintenance costs on a "production" basis. The biologist and the engineer of the U. S. Fish and Wildlife Service who installed the counter said preliminary short-term tests of the system have been made in Alaska and Washington.

This is how the electronic fish counter works. Fish movement is channeled through two plastic "tunnels" that lie on the bottom of the uppermost pool of the fishway. Within each tunnel, two distinct electrical fields of low voltage are created electronically.

As a fish moves through one of the tunnels, it causes more electricity to flow, since fish meat is a better conductor of electricity than water. Then the increased flow of electricity trips a series of electronic relays. These relays actuate a "logic device" that records passage of the fish, either upstream or downstream, depending upon the sequence in which the tunnel relays are tripped.

Small fish can be eliminated from total counts by setting the device to record only fish above a certain size. Fish under 15 inches will be excluded from counts at Bonnie falls.

Fish are not injured by the electrical fields in the tunnels due to the low voltage. German scientists have found that fish can swim through fields of electricity of up to one volt in strength with no injury. About three-tenths of a volt is created in the fish-counter tunnels.

The transistorized electronic fish counter is a product of several research teams. N. C. Lethlean first used the conductivity method to count fish in Scotland. Electronics specialists and biologists at the U. S. Fish and Wildlife Service Fish Counting Laboratory in Seattle invented a new system which also uses this principal. A private Los Angeles firm engineered and produced the counter now being used at Bonnie falls by biologists and engineers of the Oregon Fish Commission.

About 25 electronic fish counters will be in use throughout the United States in the near future, according to the U. S. Fish and Wildlife Service biologist.

* * * * *

SOFT SHELL CLAMS PLENTIFUL IN SOME AREAS: Clam diggers have apparently been overlooking good beds of soft-shell clams in Nehalem Bay, Oregon, according to a 1956 survey by an Oregon Fish Commission shellfish biologist.

The biologist considers the condition of the Nehalem soft-shell beds excellent from the standpoint of size, abundance, and quality of clams present. In some areas of Nehalem bay, more than one clam per square foot of bed was discovered. An average of 1 soft-shell clam per 3 square feet of bed was found for 4,600 square feet of all clam flats checked in the survey.

Softshell clams were also found to be abundant on 8,000 square feet of clam beds on the Kilchis-Wilson river flats in Tillamook Bay. The quality of the Tillamook Bay bivalves from a meat yield standpoint was considered only fair, but these clams had not yet recovered from the effects of spawning.

A third survey of 9,500 square feet of soft-shell clam beds at the mouth of the Siuslaw river indicated that fewer clams are present than in earlier years. Experiments are being conducted to see if transplanted soft shell clams from other bays can be used to help improve the condition of the Siuslaw beds.

Oysters

PRELIMINARY EXPERIMENTS TO DEVELOP A NEW MECHANICAL METHOD FOR CONTROL OF OYSTER DRILLS: Some biologists and oyster growers believe that the oyster drill, Urosalpinx cinerea, is not able to emerge when buried beneath several inches of bottom substrate. However, no reliable field observations or results of experiments, conducted under controlled conditions, are available to support these conclusions. The primary purpose of the experiments described in this bulletin was, therefore, to determine the extent of mortality of drills, Urosalpinx cinerea, when buried at different depths beneath a mixture of mud-sand or mud alone. The studies were made by the Service's Biological Laboratory at Milford, Conn., and described in Bulletin No. 13, November 27, 1956.

The experiments were conducted in enamel pans, measuring 4" x 10" x 14", through which a stream of water flowed continually. Each pan was divided into two equal sections by plastic screening. This arrangement rendered it possible to observe simultaneously two groups of drills in the same pan. Mud or a mixture of mud and sand was taken from the tidal flats near the laboratory. The material was washed a number of times to eliminate the excess of decomposed organic matter and then passed through a $\frac{1}{8}$-inch-mesh screen to remove any large pieces that could aid drills in their vertical movements. During the period of observation, the temperature of the running sea water ranged between 18.0° (64.4 F.) and 21.09° C. (69.8° F.), and the salinities, between 24.0 and 25.0 parts per thousand.

In the earlier experiments, the mud-sand mixture was allowed to settle over the drills, thus burying them. This method, however, was considered unsatisfactory since it was found difficult to distribute the mixture evenly over the drills. Therefore, in all the experiments described here, the drills were pressed into the substratum by means of forceps. The depth was determined by a plastic ruler held against the forceps and was measured from the top of the drill shell to the mud-sand water interface. Various sizes of U. cinerea, ranging between 8.0-25.0 millimeters ($\frac{1}{8}$-inch), were used. The criterion of emergence was the time the drill was free to breathe, i.e., when the siphon was exposed above the bottom layer.

When the drills were buried beneath 2.0 centimeters or less of bottom material there was virtually no mortality. When buried at a depth of 3.0 cms., approximately 40 percent could not reach the surface and eventually died; at 4.0 cms., 75 percent died; and at a depth of 6.0 cms., 92 percent did not emerge. Emergence from soft mud was higher than from harder substrate. The drills experienced no difficulty in moving along the mud surface. Both large (25.0 mm.) and small (8.0 mm.) drills moved through the mud, even though submerged to half their height.

At the temperature prevailing during these experiments a heavy mortality usually began after three days, and at the end of six days practically all buried drills were dead. Further studies will determine the effect of different temperatures on the ability of drills to emerge from under a bottom material. They will also be extended to evaluate the method in connection with the control of another species of drill, Eupleura caudata.

To determine any difference in rate of emergence in relation to the size of the animal, both large (average 24.0 mm.) and medium (average 14.0 mm.) drills were buried in mud-sand substrate. The smaller drills emerged in approximately one-half the time needed by the larger individuals.

In those instances in which the drills did not emerge they were at the same depth at the termination of the experiment as originally placed. This observation indicates that there had been little or no movement. It also appeared that those U. cinerea, which started the ascent to the surface, were always successful in reaching their goal. In other words, they never stopped at any intermediate depth. Those that remained in their original position eventually perished.

On the basis of these experiments a simple method which may be practical for controlling oyster drills in many areas is suggested. The method consists of burying the drills under several inches of bottom material. This can be easily accomplished by using modified types of such devices as agricultural plows to turn over layers of bottom soil several inches deep and, thus, bury the drills. Prior to the use of such plows, however, it may be necessary, in some instances, to dredge from the bottom any accumulation of shells that is heavy enough to hinder the plowing.

We believe that bottom plowing, as a method of drill extermination, will be especially effective if repeated at approximately two-week intervals. In that case, the second plowing should bury the drills that escaped the first time.

Further studies may indicate the time of year that plowing will be most effective. Possibly, one such period is late fall or early winter when the temperature becomes low enough to render drills inactive. Under such conditions, the drills should not be able to emerge from even a thin layer of bottom deposit and, regardless of the lowered metabolic activities, should eventually suffocate and die.

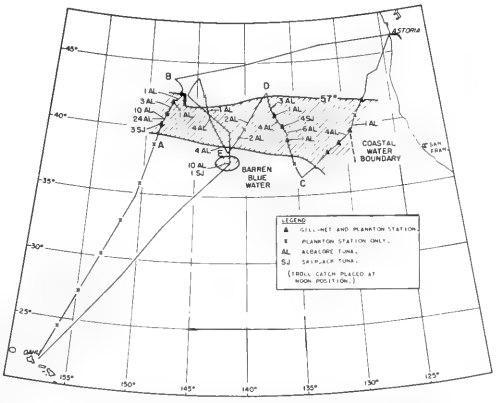
If the mechanical aspects of the suggested method can be properly developed and refined, it should become of considerable help to the oyster growers in many sections of this country and abroad where the bottom is soft enough for plowing.

Furthermore, the construction and use of plows should be considerably cheaper than such complicated and expensive devices as suction dredges. Yet, it appears quite probable that the efficiency of plows will be considerably greater than that of small suction dredges or other devices, such as drill traps.

Since the Milford Laboratory will continue the work for developing this method, comments and suggestions from oyster biologists and members of the oyster industry would be appreciated.

Pacific Oceanic Fishery Investigations

ALBACORE DISTRIBUTION AND ABUNDANCE INVESTIGATED NORTH OF HAWAII (M/V John R. Manning Cruise 33): The fall distribution and abundance of albacore tuna in the oceanic area between Hawaii and the coastal-water boundary off the United States west coast was investigated by the Service's research vessel John R. Manning (October 17-December 11, 1956). This cruise was made in conjunction with that of the Service's research vessel Charles H. Gilbert (October 22- December 11, 1956).



John R. Manning Cruise 33 (Oct. 17-Dec. 11, 1956).

Nine to twelve shackles of gill nets were set on 11 stations. Due to weather conditions these were confined to only three sections, A to B, Astoria to C, and C to D (see chart). Three albacore were caught by this means. In addition to numerous sharks and Bramidae, 7 skipjack and 1 porpoise were also caught.

Six lines were trolled at between 6 and 7 knots on the 5 sections crossing the area mentioned above, except where weather conditions forced a reduction in the number of trolling lines to prevent tangles. By this means 79 albacore tuna were caught which broke down into 3 distinct size groups: 34 albacore 8 to 10 pounds, 38 albacore 13 to 18 pounds, and 7 albacore 22 to 25 pounds. In addition there was one troll-caught skipjack tuna.

Of the troll-caught albacore, 59 were tagged with California-type vinylite tags and released; 22 were labeled with a metal tag and frozen for canning--all of these were sexually immature. Seven gonads and 10 stomachs were preserved and morphometrics were taken on 12 albacore.

Length, sex, and spawning condition were obtained of 7 skipjack caught. Other biological and environmental observations were also made.

Although the results of gill-netting were disappointing, the troll catches when fitted into the environmental conditions provided interesting information. All catches were made in an area with well defined limits: the 57° F. isotherm on the cold side

and on the warm side the boundary of the barren and blue central northeastern Pacific water. The latter could be readily determined from the bathythermograph sections and to a lesser degree from Secchi disk readings.

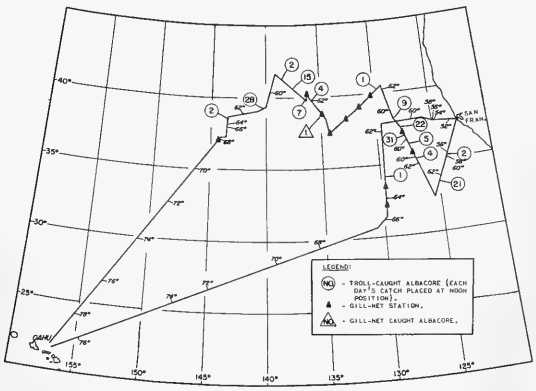
In the central water the disk could generally be seen at a depth of 16 to 18 fathoms with a blue color, Forel No. 2. Proceeding northward into the water where albacore were found, the depths were between 10 and 12 fathoms and the color blue-green, Forel No. 3 or 4. In the coastal water the depths were 7 to 9 fathoms and the color was green, Forel No. 6.

Of interest were also the surprisingly small samples obtained from the half-hour surface plankton hauls. This, together with a very stable 200-foot deep mixed surface layer and relative high transparency and blueness of the water in the albacore zone, suggests that the dormant period of organic production had set in.

Finally, it is worthy to note that this has been the first time that skipjack were caught by means of POFI gill-nets. In the first instance, 3 were taken at 40° N., and 148° W.; the temperature was 64° F. Later, at 40° N. and 136° W., 4 were taken at a temperature of 60.3° F. All weighed close to six pounds each.

* * * * *

ALBACORE DISTRIBUTION AND ABUNDANCE SURVEYED EAST OF HAWAII: (Charles H. Gilbert Cruise 31): As part of a continuing study of the seasonal fluctuations in abundance of albacore tuna and in conjunction with surveys of the inshore albacore populations being made by the states of California, Oregon, and Washington, the Service's research vessel Charles H. Gilbert surveyed (October 22-December 11, 1957) the area off the Pacific west coast between latitude 35° to 41° N. and longitude 145° to 126° W.



M/V Charles H. Gilbert Cruise 31 (Oct. 22-Dec. 11, 1956).

Eleven gill-net stations were occupied during the cruise (see chart). At each station 11 or 12 shackles of nylon gill nets were fished. The nets were 50 fathoms in length and the stretched-mesh size varied from $4\frac{1}{2}$ to $7\frac{1}{2}$ inches. With a complete set of 12 shackles there were 2 shackles of $4\frac{1}{2}$" mesh, 4 of $5\frac{1}{2}$", 4 of $6\frac{1}{2}$" and 2 of $7\frac{1}{2}$". In addition to the gill nets, two shackles of trammel nets were fished on the first station. Because of extensive tangling and damage sustained on the first station the trammel nets were omitted from subsequent sets. Only one albacore (7 pounds) was taken on the nets. The albacore was caught at 38°30' N. latitude, 134°54' W. longitude and was found gilled in one of the $6\frac{1}{2}$" mesh shackles. In addition to the albacore, the gill-net catch consisted of 127 great blue sharks, 2 mako sharks, 181 pomfrets, 33 squid, and part of the head of a spearfish.

A total of 154 albacore were caught in 4,365 hours of trolling. A maximum of 8 lines were fished at any one time using a variety of feather and plastic jigs. Two

big-eyed and 11 dolphin were also taken by trolling. The best single day's catch was 31 albacore landed from 42 strikes at about 37° N. latitude, 127°30' W. longitude.

Seventy pounds of small tilapia were carried in the bait tank with the intention of chumming albacore and fishing them by pole and line. The procedure followed was to chum tilapia whenever three or more simultaneous strikes occurred on the trolling lines. Although we were unsuccessful in raising any fish, we did catch one albacore by trolling which contained several small tilapia and one piece of cut bait in its stomach. The mortality of the tilapia was very low (generally less than six a day) in spite of crossing several temperature discontinuities. The greatest change occurred just west of San Francisco with a 7.5° F. rise in surface temperature within two hours. The range in temperature the tilapia were subjected to was a maximum of 81.5° F. southwest of San Francisco.

A total of 114 albacore and 1 big-eyed were tagged and released using the California-type white plastic tags. Three of the tagged fish were double-tagged using an experimental dart tag as a second tag.

Morphometric measurements were taken on 26 albacore tuna. Forty-one stomachs and gonads were saved for detailed study. The majority of the albacore were sexually immature with ribbonlike gonads.

A 30-minute surface plankton tow was taken at 10 of the 11 gill-net stations. In addition 24 30-minute oblique plankton hauls down to 140 meters were taken.

The "Sea Scanar" was operated on the cruise with the hope of locating albacore without visible surface signs. Only in one instance were we able to attribute returns as those being made by albacore. This occurred at 37°18' N. latitude, 127° 45' W. longitude and positive identification was made when albacore were observed jumping.

Rough Fish Control Measures Intensified

States are attacking the rough fish menace chemically, electrically, and mechanically in their efforts to find ways and means of controlling those unwanted populations with a minimum of injury to game species, U. S. Fish and Wildlife Service officials report. If an effective method is developed, one of the most difficult fish-management problems of the present time will be rendered much less complicated, state and Federal fishery biologists agree.

Much of the work which the states are doing is being carried on with Federal Aid funds which come from a 10-percent tax on sport fishing rods, reels, creels, and lures. The attack on rough fish has been going on for years but if the Federal Aid projects are a criterion the tempo was increased in 1956. During that year when five states which had immediate problems were "cleaning up" 20 lakes and ponds with rotenone, 16 States were conducting 29 research projects on how to control rough fish without damage to the fish the sportsmen seek.

One of the mechanical ways of controlling rough fish in a lake is to lower the level of the water immediately after the rough fish have spawned along the shallow edges, exposing the eggs to the drying sun and wind. This system presupposes two things--that the lake is inhabited by a game species which spawns at a time different from that of the rough fish, and that it is feasible to reduce the lake level at the proper time.

During the year South Dakota, with the cooperation of the Corps of Engineers, fluctuated the level of the new Fort Randall Reservoir, preventing successful reproduction of a large portion of the trash fish without harming the game species.

Several states have turned to the field of electricity for the answer to the problem of selective killing of rough fish. Wisconsin has carried on some basic research in the relations between electrical factors and electrode design as well as the amount of electrical energy fish receive when in various electrical fields. Studies indicate that carp can be electrically "herded" or concentrated in a small area from which they can easily be removed. More work must be done on this project before any definite decisions can be made. New York, Florida, and Kentucky have also done research on electrical control of fish.

Texas, Florida, and Kentucky have continued to secure promising results with low concentrations of rotenone for selectively killing gizzard shad, drum and, to some extent, carp. (Previous experiments in other States have indicated that some fish which have been rendered helpless can be revived if the rotenone is removed with other chemicals, making it possible to save game fish which have been victims along with the unwanted species. Rotenone, officials point out, is not an internal poison but rather paralyzes a fish's gills, making breathing impossible).

Washington reclaimed 843-acre Cavanaugh Lake with rotenone; Idaho cleared up its Stanley Lake of 179 acres in the same way; Minnesota killed the rough fish in another seven lakes which have a total of 89 acres; and Maine used rotenone in six ponds totaling 270 surface acres. Oregon continued its vigorous chemical attack on trash fish--it used rotenone to rid its 1,113-acre Lake of the Woods in Klamath County and three of its tributary streams of tons of carp and yellow perch. Oregon also rehabilitated Malheur Reservoir, Beulah, Warm Springs, Thompson Valley Reservoirs, and the tributary streams. (The Fish and Wildlife Service previously rehabilitated Malheur Lake on the Malheur refuge.)

Saltonstall-Kennedy Act Fisheries Projects

COMMERCIAL FISHERIES STUDIES ALLOTTED ADDITIONAL FUNDS: Funds allotted for market, technological and biological research, and for the exploration and development of American commercial fisheries were increased by $3,595,000 by the Secretary of the Interior. With the $3,000,000 currently allotted for this work, the total now available is $6,595,000.

The Secretary's action was based upon provisions of the Fish and Wildlife Act of 1956 which increased the amount of money available to the United States Fish and Wildlife Service under the Saltonstall-Kennedy program to aid the domestic fishing industry. Funds for this activity are provided from customs receipts on fishery products. Expenditure of $6,595,000 now available for the fiscal year ending June 30, 1957, will be under the direction of the Bureau of Commercial Fisheries.

In some instances long-range projects will be contracted with state, college or private research organizations during this fiscal year but the work performed over a longer period.

Funds available through the Saltonstall-Kennedy sources are larger this fiscal year than normal because the Fish and Wildlife Act of 1956 permitted the use of some accrued receipts. In the future the amount of money available through this source will approximate $4,500,000 a year.

The new allocations increased the amounts available for fishery biological studies in the commercial fishery field from $1,376,500 to $3,394,000, an addition of $2,017,500.

Other commercial fishery studies, which include exploration and gear research, economic research, market reports, market development, and education, and technological research, have been allotted $2,814,000, an increase of $1,395,500 over the initial amount granted. Miscellaneous items including administration, total $387,000 under the new allotment, compared with $205,000 previously.

The additional funds will help the Bureau of Commercial Fisheries begin work on the backlog of fishery problems which have been calling for attention for some years but for which funds were not available.

An allotment of $630,000 will finance a three-year research program on tuna. Studies will be undertaken in the area fished by the Pacific Coast tuna men, a vast region north of the equator and extending for several hundred miles into the Pacific ocean. This work will include research of hydrographic fronts, food prevalence under varying oceanic conditions, tuna and tuna bait fish behavior under changing conditions, and numerous other items which will help technicians understand and forecast tuna abundance.

Coastal and offshore biological research was granted an additional $1,009,500, making $2,073,200 available for that purpose. Alaska salmon research will get $389,600 of this money which will give a big impetus to research in that important fishery. Total available for the Alaska salmon research is $572,600. Projects include development of methods for more accurately predicting salmon runs and measuring escapement, studies of migration patterns of red and pink salmon and causes of pink salmon mortality during the fresh-water phase of its life history. Nearly $84,000 of the new money was earmarked for Pacific herring studies in Alaska and $130,000 was allocated to study Alaska's king crab.

Because more biological data is needed on sea scallops, flounders, whiting, and ocean perch, $145,000 was added to the $294,000 designated for the North Atlantic trawl fishery. North Pacific ocean fisheries got $90,000; menhaden research got $121,000, principally for work in the Gulf of Mexico; Atlantic striped bass work got $20,000 added to $32,000; and $30,000 was added to the Gulf of Mexico expenditures for improvement of research facilities.

Oyster problems got the bulk of the extra shellfish research money, $108,000. Under the previous allocation, the New England, Gulf, and Middle Atlantic oyster fisheries each had $25,000 for research matters and $75,000 was allocated for new blue crab research. The total now set up for shellfish research is $258,000.

Inland commercial fisheries, principally the Great Lakes, which had no Saltonstall-Kennedy research funds originally, received $195,000 of the new funds.

Of the $1,395,500 added to commercial fishery studies, exploratory fishing and gear research got $453,300; technological studies, $386,700; fishery statistics, $50,500; economic studies, $104,000; market development and education, $300,000; and market news, $101,000. Total available for these various studies from fiscal 1957 funds is now $2,814,000.

The added exploratory fishing and gear research funds will permit the Service to expedite and expand its survey of resources available to domestic vessels. More adequate information on the extent and character of potential resources and the best means of harvesting them will be sought. The new money will permit more extensive exploration work in the North Atlantic for trawl fish and scallops, shrimp in the South Atlantic, bottom or midwater varieties in the North Pacific, as well as more thorough exploration of shrimp and other potentialities in the Gulf and Caribbean. The total amount available for exploration and gear research is $757,300.

Research in fishery technology has been along two major lines. One is to devise ways and means of retaining fish freshness for a longer period to give inland America an opportunity to enjoy "ocean fresh" fish and fish products. The other is to devise new uses for industrial products such as fish meal and fish oil.

To the $459,000 originally set aside for this work has been added $386,700 to make a total of $845,700. Nearly $80,000 of the new funds have been allocated to the new laboratory under construction in Mississippi for work on Gulf technological problems. This is in addition to $40,000 now available for Gulf oyster-processing and transporting problems.

About $50,000 has been added to the $127,000 designated for development of standards for prepared fishery products, and $100,000 has been allotted for developing improvements in blue crab processing techniques to meet new standards. And $80,000 has been provided for radiation preservation research on fishery products as part of the President's Atoms for Peace programs; $50,000 for extending tuna-quality studies to the processing stages; and smaller amounts for development of a chemical index for fish meal, and for new uses for fish oil and meal.

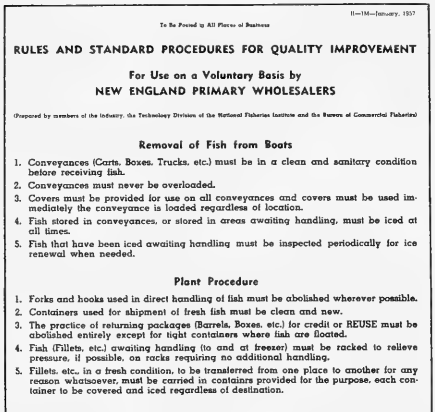
Economic studies, especially on fish consumption, have been allotted $242,000 under the revised plan, of which $104,000 represents added funds. For the promotion of the use of domestic fishery products by marketing studies and educational means $300,000 was added to the original $317,500

The bulk of the added money--$250,000--is for market development activities, including special marketing programs, and intensive studies of market patterns. Because the Nation is only partially covered with respect to school-lunch and similar programs, the balance will be devoted to filling these gaps.

The additional funds also permit an opportunity to strengthen the Fishery Market News Service in the major fish marketing and producing areas of the Nation. For this work $101,000 of the additional funds was allocated.

Standards

FRESH FISH QUALITY IMPROVEMENT RULES AND STANDARD PROCEDURES: The program to put into effect the Rules and Standard Procedures for quality improvement of fresh fish began on January 1, 1957. These rules are for both fishermen and primary wholesalers, wholly on a voluntary basis. They were developed by the



II—1M—January, 1957

To Be Posted in All Places of Business

RULES AND STANDARD PROCEDURES FOR QUALITY IMPROVEMENT

For Use on a Voluntary Basis by
NEW ENGLAND PRIMARY WHOLESALERS

(Prepared by members of the industry, the Technology Division of the National Fisheries Institute and the Bureau of Commercial Fisheries)

Removal of Fish from Boats

1. Conveyances (Carts, Boxes, Trucks, etc.) must be in a clean and sanitary condition before receiving fish.
2. Conveyances must never be overloaded.
3. Covers must be provided for use on all conveyances and covers must be used immediately the conveyance is loaded regardless of location.
4. Fish stored in conveyances, or stored in areas awaiting handling, must be iced at all times.
5. Fish that have been iced awaiting handling must be inspected periodically for ice renewal when needed.

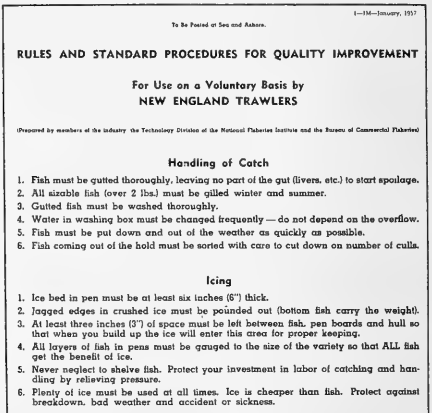
Plant Procedure

1. Forks and hooks used in direct handling of fish must be abolished wherever possible.
2. Containers used for shipment of fresh fish must be clean and new.
3. The practice of returning packages (Barrels, Boxes, etc.) for credit or REUSE must be abolished entirely except for tight containers where fish are floated.
4. Fish (Fillets, etc.) awaiting handling (to and at freezer) must be racked to relieve pressure, if possible, on racks requiring no additional handling.
5. Fillets, etc., in a fresh condition, to be transferred from one place to another for any reason whatsoever, must be carried in containers provided for the purpose, each container to be covered and iced regardless of destination.

Sanitation

1. Carts, boxes and conveyances of any kind must be washed thoroughly, immediately after they become empty of fish.
2. Plant and equipment must be subject to constant washing down when plant (or store) is in operation.
3. Responsibility for plant cleanliness must be specifically assigned to a person (or persons).
4. Exterminators (individuals or firms) must be employed for the control of rodents, vermin, flies, etc.
5. Fish operations (filleting, cutting, etc.) practiced in the open must be abolished. Proper cover and facilities must be available.
6. Clothing of all personnel must be kept in a clean condition consistent with the requirements demanded in the handling of food.
7. Smoking in filleting rooms and wrapping rooms — on lines, tables or benches used for processing — must be abolished.

This poster is white and gives fresh fish quality improvement rules and standard procedures for use by New England Primary Wholesalers.



I—1M—January, 1957

To Be Posted at Sea and Ashore.

RULES AND STANDARD PROCEDURES FOR QUALITY IMPROVEMENT

For Use on a Voluntary Basis by
NEW ENGLAND TRAWLERS

(Prepared by members of the industry the Technology Division of the National Fisheries Institute and the Bureau of Commercial Fisheries)

Handling of Catch

1. Fish must be gutted thoroughly, leaving no part of the gut (livers, etc.) to start spoilage.
2. All sizable fish (over 2 lbs.) must be gilled winter and summer.
3. Gutted fish must be washed thoroughly.
4. Water in washing box must be changed frequently — do not depend on the overflow.
5. Fish must be put down and out of the weather as quickly as possible.
6. Fish coming out of the hold must be sorted with care to cut down on number of culls.

Icing

1. Ice bed in pen must be at least six inches (6") thick.
2. Jagged edges in crushed ice must be pounded out (bottom fish carry the weight).
3. At least three inches (3") of space must be left between fish, pen boards and hull so that when you build up the ice will enter this area for proper keeping.
4. All layers of fish in pens must be gauged to the size of the variety so that ALL fish get the benefit of ice.
5. Never neglect to shelve fish. Protect your investment in labor of catching and handling by relieving pressure.
6. Plenty of ice must be used at all times. Ice is cheaper than fish. Protect against breakdown, bad weather and accident or sickness.

Sanitation

1. The hold must be dried out and painted thoroughly at least once a year.
2. The hold must be washed completely after the discharge of each trip. After thorough washing, sprinkle entire area with salt or any other similar agent.
3. Pen boards must be washed and scrubbed immediately after they come out of the hold. Keep pen boards painted. Replace worn or beat-up boards immediately.
4. Working tools, which come in contact with fish, must be kept clean and free of rust.
5. Culls must be handled quickly when discharging trip. Do not throw them back on deck. Place them immediately in iced container on the dock.
6. Facilities provided for personal cleanliness must be used.

REMEMBER ALWAYS THAT YOU ARE HANDLING FOOD

This poster is colored yellow and gives fresh fish quality improvement rules and standard procedures for use by New England Trawlers.

Technology Division of the National Fisheries Institute under the terms of its contract with the Bureau of Commercial Fisheries of the United States Fish and Wildlife Service, through discussions with the various state and Federal agencies, universities, unions, associations, and other groups which are interested in the problem of product quality improvement in the fishery industries. The contract was financed by funds provided by the Saltonstall-Kennedy Act of 1954.

This is the initial application of the Rules on the Atlantic Coast. As developed and adopted, the rules consist in reality of two sets: one set designed for use on the New England trawlers; the second for use by New England primary wholesalers. As an important part of its contract, the N. F. I. Technology Division will prepare for distribution as supplementary information simplified versions of the extensive technical literature which has been developed by the U. S. Fish and Wildlife Service and other agencies in the fisheries research field. The expansion of the program will proceed as rapidly as is consistent with a thorough job at each stage. Appropriate rules will be developed for each of the other levels in the distribution chain. The basic Rules will then be adapted to conform to the many varieties of fish found on our national market. Each set of Rules will be prepared on a different colored background so that it may be easily identified as pertaining to a specific variety of fish, geographical area, or stage in the distribution chain.

United States Fishing Fleet[1/] Additions

DECEMBER 1956: A total of 36 fishing craft of 5 net tons and over were issued first documents as fishing craft during December 1956. This was 20 vessels more than the reported number for the corresponding month of 1955, reports the Bureau of Customs.

Table 1 - U. S. Vessels Issued First Documents as Fishing Craft, December 1956 with Comparisons

Area	December		Annual Totals			
	1956	1955	1956	1955	1954	1953
			(Number)			
New England	1	-	15	18	23	20
Middle Atlantic	3	-	26	13	15	19
Chesapeake	18	3	138	54	93	83
South Atlantic	8	1	119	65	119	116
Gulf	4	6	100	103	313	264
Pacific	2	5	76	117	117	164
Great Lakes	-	-	6	9	6	7
Alaska	-	-	40	35	27	53
Hawaii	-	-	1	3	1	3
Puerto Rico	-	-	-	-	2	-
Virgin Islands	-	1	-	1	-	-
Unknown	-	-	-	-	1	-
Total	36	16	521	418	717	729

Note: Vessels assigned to the various areas on the basis of registered home ports.

During December 1956 the Chesapeake area led all other localities with 18 newly-documented fishing vessels, followed by the South Atlantic States with 8, the Gulf area with 4, the Middle Atlantic States with 3, the Pacific States with 2, and the New England States with 1.

YEAR 1956: A total of 521 vessels was documented for the first time as fishing craft during 1956 compared with 418 during 1955--a gain of 25 percent. The increase in newly-documented fishing craft during 1956 occurred in the Middle Atlantic, Chesapeake, and South Atlantic areas. Decreases were noted in all other areas.

Table 2 - U. S. Vessels Issued First Documents as Fishing Craft, 1938-56

Year	Number	Year	Number
1946	1,085	1956	521
1945	741	1955	418
1944	635	1954	717
1943	358	1953	729
1942	358	1952	675
1941	354	1951	780
1940	320	1950	812
1939	357	1949	1,002
1938*	376	1948	1,184
		1947	1,300

*Data partly estimated.

Historical data covering the years 1938 to 1956 inclusive, reveal that during the 19-year period 12,722 vessels were issued first documents as fishing craft.

1/ Includes both commercial and sport fishing craft.

U. S. Foreign Trade

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA PROVISO: The quantity of tuna canned in brine which may be imported into the United States during April 16 through December 31, 1956, at the 12½-percent rate of duty is limited to 28,757,393 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem.

Imports under the quota from April 16-December 31, 1956, amounted to 27,741,867 pounds, according to data compiled by the Bureau of Customs. This left a balance of 1,015,526 pounds of the quota which was not utilized during the calendar year of 1956. Since the quota for the period indicated in 1956 was not exceeded, no imports of tuna canned in brine were entered at the duty of 25 percent ad valorem.

* * * * *

EDIBLE FISHERY PRODUCTS, OCTOBER 1956: United States imports of edible fresh, frozen, and processed fish and shellfish in October increased 62 percent in quantity and 48 percent in value as compared with September 1956. Compared with October 1955 the imports for October 1956 were higher by 23 percent in quantity and 41 percent in value. October 1956 imports averaged 28.4 cents a pound as compared with 24.7 cents a pound for the same month in 1955. Both groundfish fillets (including ocean perch) and canned salmon during the month were up sharply from October 1955.

Table 1 - United States Imports of Edible Fishery Products, October 1956 With Comparisons

Item	Oct. 1956	Oct. 1955	Year 1955	Oct. 1956	Oct. 1955	Year 1955
	(Millions of Lbs.)			..(Million of $)..		
Imports:						
Fish and shellfish:						
Fresh, frozen & processed 1/	91.2	74.3	769.9	25.9	18.1	206.4
Exports:						
Fish and shellfish:						
Processed 1/ only (excluding fresh & frozen)	11.8	5.7	91.0	2.9	1.6	21.6

1/ Includes pastes, sauces, clam chowder and juice, and other specialties.

Exports of processed fish and shellfish in October 1956 increased about 168 percent as compared with the previous month and 107 percent above October 1955. The October 1956 value of these exports was 71 percent higher than the previous month and 81 percent above the same month in 1955. The sharp increase over September 1956 and October 1955 was due primarily to heavier exports of California sardines.

* * * * *

GROUNDFISH FILLET IMPORTS: Year 1956: Imports of cod, haddock, hake, cusk, and ocean perch fillets (including blocks) into the United States totaled an estimated 138.6 million pounds in 1956. This was an increase of approximately 1.1 million pounds above the previous record of 137.5 million pounds in 1954. Compared with 1955, it represented an increase of about 8.5 million pounds.

Eleven countries exported groundfish fillets to the United States during 1956. Canada (99.8 million pounds) led all other countries and accounted for 72 percent of the total. Iceland (27.1 million pounds) was in second place with 20 percent of the import total, followed by Norway (4.1 million pounds), Denmark (3.0 million pounds), West Germany (2.0 million pounds), and France (919 thousand pounds). Imports from the United Kingdom, the Netherlands, Greenland, Miquelon and St. Pierre, and the Union of South Africa accounted for only 1 percent of the total.

December 1956: During December 1956, a total of 4.3 million pounds of groundfish fillets (including blocks was received in this country. This was an increase of 4 percent (160 thousand pounds) as compared with the corresponding month of 1955.

Groundfish and ocean perch fillets received from Canada during December 1956 totaled 3.7 million pounds and amounted to 84 percent of the month's total receipts.

Iceland accounted for 10 percent, and the remaining 6 percent was received from Norway, Denmark, and West Germany.
Note: See Chart 7 in this issue.

Wholesale Prices, December 1956

December 1956 was a month of light production for many of the United States fisheries due to low seasonal abundance for some important varieties, curtailed fishing effort before and after the Christmas holidays, and bad weather. Some unusually bad fishing weather was reported in the middle and north Atlantic areas. The December 1956 wholesale prices index (116.1 of the 1947-49 average) for all edible fish and shellfish (fresh, frozen, and canned) declined about 2 percent from the previous month, but was 3.1 percent higher than the December 1955 index.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, December 1956

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices1/ ($)		Indexes (1947-49=100)			
			Dec. 1956	Nov. 1956	Dec. 1956	Nov. 1956	Oct. 1956	Dec. 1955
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					116.1	118.4	112.5	112.6
Fresh & Frozen Fishery Products:					126.6	130.9	122.0	121.1
Drawn, Dressed, or Whole Finfish:					118.6	128.0	122.5	117.0
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.09	.12	92.7	122.1	67.4	124.3
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.35	.37	108.3	112.9	133.5	85.1
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.64	.65	143.8	144.9	150.6	133.1
Whitefish,L. Superior, drawn, fresh	Chicago	lb.	.61	.59	151.2	146.3	135.9	131.4
Whitefish,L. Erie pound or gill net, rnd., fresh	New York	lb.	.71	.74	143.6	149.6	161.8	136.5
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.71	.70	145.4	143.4	153.6	132.2
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.36	.34	84.4	80.3	83.3	102.0
Processed, Fresh (Fish & Shellfish):					134.7	135.5	125.4	124.1
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.30	.35	103.8	117.4	91.9	132.7
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.82	.82	129.6	128.8	112.2	113.4
Oysters, shucked, standards	Norfolk	gal.	6.00	6.00	148.5	148.5	148.5	136.1
Processed, Frozen (Fish & Shellfish):					118.2	118.6	106.2	114.2
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.40	.40	103.4	103.4	102.1	104.7
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.28	.28	87.9	87.9	86.3	91.0
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.28	.27	110.8	108.8	108.8	112.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.82	.83	126.0	127.3	105.7	116.5
Canned Fishery Products:					101.2	100.6	99.0	100.5
Salmon, pink, No.1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	22.65	22.65	120.0	120.0	120.0	114.8
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.20	11.20	80.8	80.8	78.2	85.1
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	9.00	8.35	105.0	97.4	90.4	81.7
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	7.70	7.70	81.9	81.9	81.9	92.6

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.

The drawn, dressed, and whole finfish subgroup index for December decreased 9.3 percent as compared with November and exceeded that for the same month in 1955 by only 1.4 percent. Although there was a drop of 24-25 percent in fresh drawn haddock ex-vessel prices at Boston, this has little significance due to the

wide fluctuations from day to day for fresh haddock, as well as for other fresh fish, during periods of temporary fluctuations in landings. Prices for the other six items in this subgroup in December varied only slightly from November and were higher than a year earlier in all cases except for lower yellow pike prices.

No significant changes in the fresh processed fish and shellfish subgroup occurred from November to December. A drop of 11.6 percent in fresh haddock fillet prices at Boston in December was offset largely by fractionally higher prices for fresh shrimp. When compared with December 1955, this subgroup index for December 1956 was higher by 8.5 percent with lower (down 21.8 percent) fresh haddock fillet prices more than offset by increases in fresh shrimp prices. Prices for fresh shucked oysters, which are in short supply, remained unchanged from November to December 1956 and were 9.1 percent higher than for December 1955.

The December 1956 subgroup index for frozen processed fish and shellfish was almost unchanged (down less than 1 percent) from November and up 3.5 percent from December 1955. Frozen fillet prices were unchanged for haddock and flounder and up slightly for ocean perch. Frozen shrimp prices at Chicago were lower by one percent in December 1956, but higher by 8.2 percent when compared with the same month in 1955.

Prices for canned fishery products in December 1956 continued the tendency to creep upwards first noted in September. Prices were unchanged for all items in this subgroup except California sardines, which advanced 7.8 percent from November and were 28.5 percent higher than in December 1955. After a promising start, the California sardine season, as it advanced, fell far short of estimates and prices were withdrawn by the packers in order to conserve stocks for commitments. Maine sardine prices this December were down about 11.5 percent from the same month in 1955 because this season's pack was almost double the abnormally low pack in 1955.

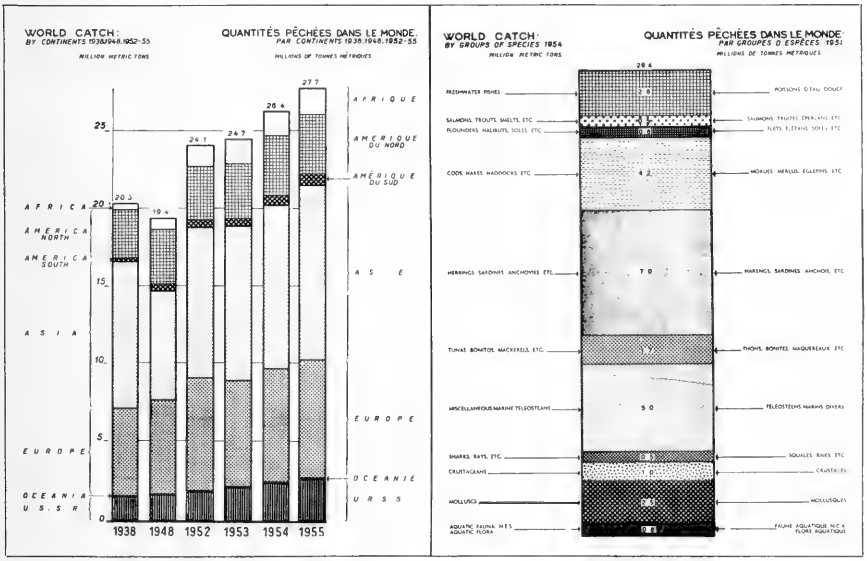
CORRECTION

The news item "U. S. Fish Catch May Set All-Time Record in 1956!" on page 51 of the December 1956 issue of Commercial Fisheries Review contained an error in the first sentence, which should have read: "United States and Alaska fishermen may catch more than 5 billion pounds of fish in 1956 and . . . ."

International

FOOD AND AGRICULTURE ORGANIZATION

UNITED STATES SECOND IN LIST OF FISHING NATIONS: The United States, with a fisheries catch of some 2,687,000 metric tons a year, is second to Japan as a fish catching nation, according to the Food and Agriculture Yearbook of Fishery



Statistics (Vol. V, Production and Fishing Craft), recently published. (Since the statistics in the yearbook are based on live (whole or fresh round) weight for both fish and shellfish, the data for the United States are higher in the Yearbook than in United States Fish and Wildlife statistics because the latter reports mollusks on the basis of the weight of edible meats instead of weight in the shell).

Although there was a slight reduction in the 1955 United States catch as compared with the 2,706,400 tons for 1954, the general trend is towards increased production, as the following figures (in metric tons) show: 2,253,100 (1938); 2,409,900 (1948); 2,390,600 (1952); and 2,437,500 (1953).

This increase in the catch over that of prewar years is in accordance with the general picture for North America and for the world in general. Table 1 illustrates the trend in fisheries production in North America during the past 17 years.

Table 1 - North American Fisheries Catch, 1938, 1948, and 1955

Area	1955	1948	1938
	(Metric Tons)		
Northern area 1/	3,660,000	3,490,000	3,100,000
Central mainland area	20,000	70,000	90,000
Central Caribbean Islands area	30,000	30,000	50,000

1/Includes the Bermuda Islands, Greenland, St. Pierre and Miquelon, Canada, and the United States (with Alaska).

Of the total catch of North America (3,800,000 tons), herring, sardines, anchovies, etc., account for the largest share, 1,260,000 tons (1955). Next come cod, hake, haddock, etc., with 630,000 tons; and third (of the fish), salmon, trout, smelt, etc., with 230,000 tons. Mollusks account for 660,000 tons and crustaceans for 220,000.

This increase in fish production is, again, in line with the world trend. According to the Yearbook, the world fisheries catch has risen from 19,390,000 (1948) to 27,720,000 metric tons (1955), excluding aquatic mammals, or more than 40 percent. The catch is now almost 40 percent higher than it was before World War II. (All data in the Yearbook are given in live (whole or fresh round) weight for both finfish and shellfish.)

The data reflect the remarkable recovery of the world's fishing industry since the war, with Japan firmly in the lead of fishing nations. In 1948 the Japanese fishing fleet landed about 2,430,000 metric tons. By 1955 the figure had risen to 4,720,000 metric tons, some 2,000,000 tons more than the second biggest fishing nation, the United States (including Alaska) which landed 2,687,000 metric tons in 1955. U.S.S.R., with an officially-published 2,500,000 metric tons (excluding aquatic mammals) is the world's third largest fish producer.

According to the Yearbook, quoting statistics published in Communist China (mainland), that country is the fourth biggest fishing nation with an estimated 2,000,000 metric tons in 1955. Other fishing nations catching more than 1,000,000 metric tons annually are Norway (1,867,000) and the United Kingdom (1,099,700).

Table 2 - World's Fisheries Catch by Continents and Regions, 1938 and 1955

Continent or Region	1938	1955	% Increase
	(Metric Tons)		%
Africa	440,000	1,620,000	168
North America	3,150,000	3,800,000	18
South America	230,000	760,000	124
Asia	9,350,000	11,280,000	27
Europe	5,540,000	7,650,000	35
Oceania	80,000	110,000	33
U. S. S. R.	1,520,000	2,500,000	66

Note: Excludes aquatic mammals, but includes all other aquatic flora and fauna.

A considerable part of the increased fish production is being used for reduction to fish meal and solubles. In 1938 some 656,000 metric tons were used for reduction purposes. Since 1948, the tonnage has increased yearly and by 1955 had reached 1,164,000 metric tons.

Among the many interesting tables in the new Yearbook is one which gives the world catch by groups of species in 1954. This table shows that herring, sardines, anchovies, menhaden, etc., make up the largest group, and account for 7,000,000 metric tons a year or 27 percent of the grand total of 26,600,000 metric tons (live weight), while the group made up of cod, hake, haddock, etc., yields 4,200,000 or 16 percent. Fresh-water fish account for 2,600,000 metric tons (10 percent) and

mollusks for 2,500,000 (9 percent). Tunas, bonitos, and mackerels account for 1,700,000 metric tons (6 percent).

The waters of the northern hemisphere temperate zone and Arctic are the most productive, yielding 18,700,000 metric tons live weight, or about 70 percent of the world total. The tropical zones account for 4,100,000 tons (16 percent), and the southern hemisphere temperate zone for 1,400,000 metric tons (5 percent).

WHALING

JOINT JAPANESE-CHILEAN WHALING FIRM PLANS: A joint Japanese-Chilean whaling firm will be formed with the Japanese and Chilean partner companies each contributing equally to the capital stock of US$1.2 million. The new venture will not only process whales into meat, oil, and meal, but will also produce frozen fish fillets and fish oils for export. A large Chilean trading firm will handle the new firm's exports and will be its United States representative.

The Chilean concern of the new firm was established in 1954, with offices at Santiago and a plant in Coronel. The plant was built under the direction of Japanese and Danish engineers, and the machinery was supplied by a Danish firm. The plant is equipped for both the processing of whales and fish. The cost of the plant exceeded 180 million pesos (about US$360,000).

According to one of the Chilean partners, the Chilean Government will soon approve the proposed partnership between the local firm and the Japanese firm. At the present time there are three representatives of the Japanese firm in Santiago discussing final details of the partnership, states a November 28, 1956, dispatch from the United States Embassy in Santiago.

The Japanese partner concern to the new firm will lease two whale catcher boats to the joint venture, complete with crews, and will also furnish 12 technicians for the plant at Coronel. The whale catcher boats are scheduled to arrive early in 1957. The processing plant is expected to employ between 150 and 200 workers when production begins.

The report from Japan that the regulations of the International Whaling Commission will be observed was confirmed by one of the Chilean partners. As soon as the details as to the partnership are complete, three Japanese will become members of the board of directors of the firm.

JAPANESE-RUSSIAN NORTH PACIFIC FISH COMMISSION

FIRST MEETING HELD: The first meeting between the Japanese-Russian Fish Commission was scheduled to meet in Tokyo on December 30, 1956. The Soviet delegation was to be headed by A. A. Ishkov, Minister of Fisheries, and was to consist of three commissioners and eight others. The first meeting was to be held on December 30 to discuss procedures. During subsequent meetings the most important subject was to determine the total amount of salmon which the Japanese will be allowed to catch in the convention area in the 1957 season. It is reported that the Japanese will insist on a minimum of 150,000 metric tons.

The Japanese felt encouraged by the fact that the Russians sent their Minister of Fisheries and a strong delegation. Due to the high level of this delegation, the Japanese believe that negotiations will be handled expeditiously and that an agreement will be reached by the end of January 1957.

Australia

DEVELOPMENT OF NEW GUINEA FISHING INDUSTRY PLANNED: An approved plan for the development of the fishing industries in Papua and New Guinea was announced in September 1956 by the Australian Minister for Territories.

The aims of the Government are to increase shell production and exports, to reduce imports of fish, and eventually to export fish. Development of the fishing industry will increase the amount of protein food available to the indigenous inhabitants and augment their cash income from trade.

The main points of the plan, which will be implemented by the Division of Fisheries of the Territory Department of Agriculture, Stock and Fisheries are:

1. Introduction of improved fishing techniques to native fishermen, including distribution to them of fishing gear.

2. Training of native fishermen ashore and as crews of Administration vessels in all aspects of fishing.

3. Encouragement of indigenous people to organize their activities to increase their consumption and trade in fish.

4. Recruitment and training by the Administration of indigenous people as Native Fishery Assistants to assist native fishermen.

Investigation of potential fishing grounds would be continued. Commercial fishing enterprises by European and native fishermen would be encouraged where they would not conflict with village communities dependent on fishing. A trawler would be acquired by the Administration.

An overseas expert had visited the Territory and visits by other overseas experts would be arranged as required. One would advise on long-line fishing for tuna.

Other objectives of the development plan were the encouragement of fresh-water fish production, particularly in inland areas, an increase in oyster production, and investigation of local production of salt for preservation.

As fishing developed, investigations would be carried out on economic and marketing aspects and an inspection system instituted. A marine biological station would be established when appropriate. (Australian Commonwealth Director of Fisheries Fisheries Newsletter, October 1956.)

* * * * *

SCALLOP FISHERY TRENDS: The scallop beds located on Australia's east coast and discovered by shrimp fishermen out of the Queensland port of Bundaberg are reported to extend some about 80 miles, from Fraser Island to Round Hill and are 25 miles in width.

The Queensland scallops are not only a different species from the Tasmanian variety but also belong to a different family. The Tasmanian scallop belongs in the family Pectinidae and the commercial catch is made up of three species, Notovola meridionalis (Commercial), Mimachlamys asperrimus (doughboy), and Equichlamys bifrons (queen). The Queensland scallop is Amusium balloti (ballot saucer scallop), one of the family Amusiidae. This species is taken in shell sizes up to 6 inches and are reported to be faster swimmers than the Tasmanian species and for this reason are caught with shrimp trawls and not the usual scallop dredges.

The market for the Queensland scallops has been extended to Sydney, according to the Fisheries Newsletter, August 1956, of the Australian Commonwealth Director of Fisheries. Two consignments were made to that market in July 1956 and were sold readily. The frozen scallop meats were packed in 5-pound cartons (six cartons to the master), and sold for about 44-45 U. S. cents a pound for single cartons and about 42-43 cents by the master carton.

* * * * *

SPINY LOBSTER FISHERY AND EXPORT TRADE 1955/56: The catch (table 1) and value of Australia's spiny lobster fishery has grown steadily during the past nine years. The catch of whole spiny lobsters reached a peak in the 1954/55 season of 20.1 million pounds. In 1955/56 the catch dropped to 18.5 million pounds, due to adverse seather during the fishing season, but the total export dollar value (US$4.3 million) was the highest on record.

Table 1 - Australian Catch of Whole Spiny Lobsters, 1954/55 and 1955/56 Seasons

Country	1955/56	1954/55
	(1,000 Pounds)	
Australia:		
West	10,530	10,906
South	4,000	4,589
Tasmania	2,900	3,259
Victoria	614	832
New South Wales	471	545
Total	18,515	20,131

The export trade in spiny lobsters has also increased steadily (table 3) and in 1955/56 amounted to 4.4 million pounds as compared with 4.7 million the previous year and 1.6 million pounds in 1948/49.

In the 1955/56 season the average price paid for spiny lobster tails f.o.b. Australia reached the high level of US$0.93 a pound with some lots bringing as high as $1 a pound late in the season. Average prices received in the 1954/55 season were close to $0.83 a pound (Fisheries News Letter of Australia's Commonwealth Director of Fisheries, October 1956).

Table 2 - Australian Exports of Spiny Lobsters (Tails and Whole), 1948/49-1955/56 Seasons

	1955/56	1954/55	1953/54	1952/53	1951/52	1950/51	1949/50	1948/49
	(1,000 Pounds)							
Tails	4,411	4,723	4,169	3,941	3,606	2,865	2,650	1,603
Whole	295	118	66	130	54	71	93	183
Total	4,706	4,841	4,235	4,071	3,660	2,936	2,743	1,786

Table 3 - Australian Exports 1/ of Spiny Lobster Tails by States, 1948/49-1955/56 Seasons

Seasons	Australia		Tasmania	Total	Dollar Earnings
	West	South			
	(1,000 Pounds)				(US$1,000)
1955/56	3,505	877	30	4,412	4,300
1954/55	3,601	1,108	14	4,723	4,200
1953/54	3,244	828	98	4,170	3,500
1952/53	2,823	956	162	3,941	3,220
1951/52	3,033	556	17	3,606	2,625
1950/51	2,221	537	107	2,865	1,850
1949/50	2,005	614	31	2,650	1,360
1948/49	1,215	324	64	1,603	1,000

1/ Exports of whole spiny lobsters not included.

Canada

DIFFICULTIES ENCOUNTERED IN GRADING NEW BRUNSWICK SMELT: During the years when two-year old smelt dominated the catches from the Miramichi River area of New Brunswick, Canada, the difficulties encountered in grading are increased, according to a report by a biologist of the Fisheries Research Board of Canada (Progress Reports of the Atlantic Coast Station, No. 65, Oct. 1956). Packers and inspectors claim (there are no actual records on the subject) that the 1949/50, 1951/52, and 1954/55 seasons were particularly bad in this respect while 1952/53 and 1953/54 were quite good.

Since 1939, as an aid in marketing, smelt have been packed in three grades, and more recently in four grades, according to length. The packers can usually judge the grade of most of the fish accurately. However, difficulty arises when many smelt are within $\frac{1}{4}$ inch of the limit between grades. Inspectors will not pass boxes of smelt when more than 5 percent of the fish are smaller than the proper grade.

The four grades now established by regulation are based on length measured from the tip of the snout to the end of the backbone at the round of the tail. These grades are: small, under 4 inches; medium or No. 2, 4 to $5\frac{1}{2}$ inches; No. 1 $5\frac{1}{2}$ to 7 inches; and extras, over 7 inches.

A study of the ages of the fish in the commercial catches and the size ranges of each age group shows how the grading trouble arises.

Between grades No. 1 and extras only a few of the fish are ever within $\frac{1}{4}$ inch of the limit, so mistakes in sorting are not important. Even if all the fish that were within $\frac{1}{4}$ inch of the grade limit were put in the higher grade, the number of undersized fish would be not more than 5 percent in all but one of the last seven commercial seasons.

Table 1 - Total Catches and Sampling Data for Miramichi Smelt Showing Proportion of Fish Within $\frac{1}{2}$ Inch (Either Side) of the Limit Between Number One and Extra Grade Smelt and Medium and Number One Grade Smelt for the 1948/49 to 1954/55 Commercial Seasons

Commercial Season	Total Miramichi Catch	Numbers Sampled	Proportion Within $\frac{1}{4}$ Inch of Limit Between	
			Number One And Extra	Medium and Number One
	1,000 Lbs.		.....(Percent).....	
1954/55	2,058	7,022	5	22
1953/54	1,183	5,106	11	16
1952/53	1,624	4,922	10	13
1951/52	854	5,647	4	25
1950/51	2,178	4,347	7	20
1949/50	1,178	5,596	2	28
1948/49	2,013	1,342	8	18

However, between grades medium and No. 1 (table 1) there are always many fish within $\frac{1}{4}$ inch of the limit. In the three bad seasons (1949/50, 1951/52, and 1954/55) from 22-28 percent of the catch was within $\frac{1}{4}$ inch of the limit. Real trouble occurred in packing during these seasons because every third or fourth fish was in the hard-to-grade group. On the other hand, there was little difficulty in 1952/53 and 1953/54. In these years there were only 13 percent and 16 percent of such fish in the catch. The 1948/49 and 1950/51 seasons showed only moderate difficulty, with 18 percent and 20 percent of borderline fish.

The difficulty is not necessarily related to the total catch, for in the three bad years the catch ranged from almost the highest in 1954/55 (2.2 million pounds) to the lowest of the seven seasons in 1951/52 (about 0.9 million pounds).

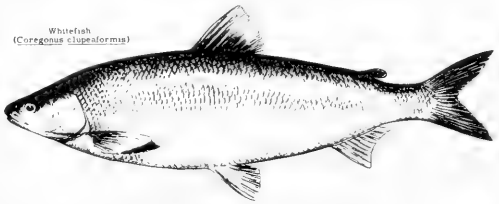
The most important fish in the catch are those nearing 2, 3, and 4 years of age and the 2's generally make up most of the catch (table 2). The 2's made up most of such fish between mediums and No. 1 and the 3's those between No. 1 and extras. The commonest size of the 2-year-old fish is usually close to the grade limit between mediums and number ones. Sampling of the catches for seven seasons demonstrated that grading difficulties were great when 2's made up a greater than average part of the catch. In the three seasons in which grading problems were most severe, the 2-year old fish made up 66 percent, 81 percent, and 70 percent of the catch respectively. In 1949/50 some 3-year olds were also near this grade limit, raising the total considerably above that of the 2-year olds alone. This is uncommon and was caused by these 3's (1947 hatch) growing more slowly than usual.

Table 2 - Percentage of "2-year-olds" in the Miramichi Smelt Catches for the 1948/49 to the 1954/55 Commercial Seasons

1954/55	1953/54	1952/53	1951/52	1950/51	1949/50	1948/49
(Percent)						
70	52	48	81	62	66	54

* * * * *

LAKE WHITEFISH: Half a dozen or so varieties of whitefish have been recorded from Canadian inland waters, but the common or lake whitefish is the only one of commercial importance in Canada's fisheries. It is found in Manitoba, Ontario, and Saskatchewan. Large landings are also made from Alberta waters and from Great Slave Lake, N. W. T. Some catches are taken by the fishermen of Quebec, New Brunswick, and the Yukon Territory. The whitefish belongs to the family Coregonidae, suborder "Salmonoidea," and thus is related to Atlantic and Pacific salmon, speckled and rainbow trout, tullibee, ciscoes or lake herring and several other fish.



In coloring the whitefish is olivaceous on the upper part of the body, with whitish sides and under portions. The lower fins may be dusky. The tail fin is deeply forked. Head and mouth are comparatively small, the scales large. The mouth is subterminal, distinguishing it from other members of the family. Some adult whitefish have a fleshy bump at the shoulders. So far as weight and body measurements are concerned, it is not possible to give exact averages for any species of fish, but the mature whitefish averages 18 inches in length and weighs about 2.5 pounds. This size makes up 75 percent or more of the catch.

The whitefish lives upon minute mollusks and crustaceans and other small aquatic creatures. Its summer habitat is the deeper, colder parts of the lakes, from which they move into more shallow water at spawning time. The spawning time varies somewhat in different years depending on the conditions of the weather and also with respect to the locality. Spawning begins in the latter part of October and continues into the first week of December. In Great Slave Lake it may continue into January in some areas.

Whitefish generally reach maturity in the third and fourth year. They mature in the eighth year in lakes where the average water temperature is low. A full-grown individual deposits from 10,000 to 75,000 eggs, depending on the fish's size.

The Northwest Territories, Manitoba, Ontario, and Saskatchewan are the main Canadian producers of whitefish. Commercial fishing for whitefish was undertaken at Great Slave Lake in the Northwest Territories for the first time in 1945.

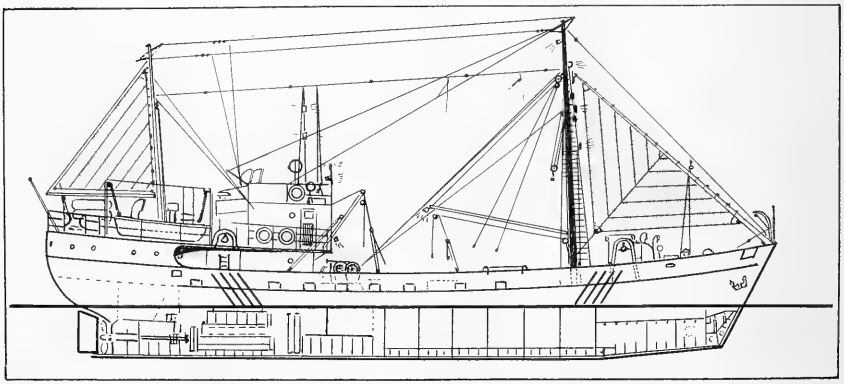
Gill-netting is the chief method used in fishing for whitefish, although stationary pound nets and trap nets are also used in some areas. In areas where winter fishing is done, and in the Prairie Provinces, the bigger part of the whitefish catch is usually taken in the winter season, the gill nets being set under the ice. The hook-and-line method of fishing for them is followed in commercial operations in Lake Simcoe, Ontario.

Virtually all of the whitefish marketed by Canadian fishermen is sold in the fresh and frozen forms, though small quantities are smoked. The catch is sold in Canada and the United States, most of it in the latter country.

The fishery resources of the Great Lakes are now under joint scientific investigation by Canada and the United States. This investigation, and an augmented program to rid the lakes of the predatory sea lamprey, are the responsibility of the International Great Lakes Fisheries Commission. (Trade News, October 1956, of Canadian Department of Fisheries.)

German Democratic Republic

SHIPYARD BUILDS TRAWLERS ON ASSEMBLY-LINE METHODS: The East German port of Stralsund, which lies on the Baltic seaboard about 20 miles northeast of Rostock, is nowadays the scene of one of the most interesting examples of mass production of fishing vessels in Europe.



Profile drawing of the 128-foot trawler constructed on assembly-line methods in East Germany.

Some eight years ago the yard, which is now turning out 100 fishing vessels a year, did not even exist. It now employs 6,000 men. Majority of these mass-produced craft are exported to Poland, Soviet Russia, and China at a cost of US$232,400 each, and it was to satisfy the big demands of these countries for fishing craft that the present method of mass production was evolved.

Full technical details of this method are not available, but it appears that, as is of course the practice in many yards in the non-communist countries, building is done in sections. Apparently the whole production process is along the lines of an automobile factory. The buildings on the outside perimeter prepare the parts for each section; those further inward are putting the parts together; the sections are then fed into a main building where they are assembled on three lines.

The final product, which is offered as a 400 horsepower fishing lugger, is registered in the highest class of the Maritime Register of the U.S.S.R. The yard states that they are very anxious to contact the Western world to draw attention to their vessels. It is anticipated that production will increase to 130 vessels a year.

Principal dimensions of the lugger are as follows: length over-all 128 ft. 3 in.; maximum breadth 24 ft. 2 in.; maximum draught 13 ft. 7 in.; power output 400 hp.; speed at displacement of 434.93 tons, 10 knots.

The vessel is a dual-purpose, steel-built drifter-trawler, designed for deep-sea work. There is 1-, 2-, and 4-man cabin accommodations fore and aft for a crew of 26, although the normal complement would be 23. Fuel-oil capacity provides for 21 days of uninterupted operation of the main engine at full power, as well as for 12 hours a day running of the auxiliaries over the same period.

Diesel power is provided by a direct-reversing, 4-stroke type 148-unit engine, developing 400 b.h.p. at 275 r.p.m. Reports say that they are "sea-kindly" and good fishing ships (World Fishing, October 1956).

German Federal Republic

CANNED SARDINE MARKET: West Germany is reported to be the biggest market in the world for canned sardines. Germany has no sardine industry of its own and imports all the sardines it consumes from Portugal, France, French Morocco, and Yugoslavia. Total imports during the past two years (table 1) averaged about 12,500 metric tons each year at a value of approximately US$6.2 million, an August 20 dispatch from the United States Consul General in Bremen reports.

Table 1 - German Federal Republic Canned Sardines (Sardina pilchardus and Culpea pilchardus), 1954-1955

Country of Origin	Quantity	Value		Quantity	Value	
	Metric Tons	DM 1,000	US$ 1,000	Metric Tons	DM 1,000	US$ 1,000
France	2.3	10	2	8.7	35	8
Yugoslavia	324.0	602	143	864.4	1,480	352
Portugal	11,717.1	24,539	5,840	9,624.6	20,960	4,988
Spain	7.7	14	3	17.5	38	9
French Morocco	386.0	844	201	2,378.6	3,803	905
Spanish Morocco	18.9	37	9	34.2	73	17
Others	-	-	-	2.2	3	1
Totals	12,456.0	26,046	6,198	12,930.2	26,392	6,280

Note: Values converted at rate of 1DM = US$0.238

An unusual situation prevails in Germany with regard to the importation and marketing of sardines. According to several spokesmen of the sardine import trade, the marketing of sardines in Germany is still subject to the stipulation that Germany shall use the designation "sardines" only for the species Sardina pilchardus and Clupea pilchardus caught in Mediterranean waters and along the European Atlantic coast up to and including the English Channel. This geographical limitation plus

the zoological definition of a "sardine" effectively limits West German imports of sardines to the present supplier countries.

West German importers have stated firmly that they definitely do not wish to import sardines and market them as such in Germany unless the sardines are actually from the area specified. These representatives furthermore frankly declared that they are not interested at all in a change in the present situation. During the last thirty years or so the designation "sardines" has become identified in the mind of the German consumer with a definite type product. Importers say that they do not want to endanger their carefully developed present market by introducing unfamiliar types of sardines.

Germany has a sizable domestic herring industry. In 1955 the total West German herring catch amounted to about 335,000 tons. Approximately half of this amount was canned--some 105,000 tons. About 40 percent of this production would compete with any product imported as canned herring. The remaining volume represents a so-called semi-preserved product, mostly the bigger type of filleted and marinated herring packed in a great variety of brines and sauces.

West German importers seriously doubt whether the United States industries could compete pricewise with the German product. The factory price for a $3\frac{1}{4}$-ounce flat can of small herring packed in natural oil is 26 Pfennigs (6 U. S. cents). This retails at 36-40 Pfennigs ($8\frac{1}{2}$-$9\frac{1}{2}$ U. S. cents) a can. In other words, to meet the domestic price, the United States product must not cost more than approximately 6 cents a can, c.i.f. West German sea port. Besides shipping costs this price would have to cover a 14-percent import duty plus a 6-percent compensation tax. German importers calculate that after the deduction of the above charges the remaining amount (about 4¢) represents about half the price at which United States fish canners are now selling their product in the United States. It has further been pointed out that, if a market were to be created for the United States product, the price quotations, at least for several of the pilot orders, would have to be lower still to provide an incentive for the importer to embark upon such an enterprise and to win the German consumer over to the new product.

Another impediment to the importation of canned herring is the fact that their purchase abroad has not yet been liberalized. Individual licenses within import quotas set by the Federal Government would still be required. As far as could be determined such quotas have never been allowed by the government which is trying to protect the domestic industry. Such protection from foreign competition is claimed to be indispensable because of the division of Germany. The canning industry, concentrated mostly in West Germany, suffered the loss of a large part of the domestic market in the East Zone.

Only 102 metric tons of canned sardines were exported by the German Federal Republic in 1955 as compared with 78 tons in 1954, mostly to the Belgium Congo and Austria.

Iceland

BECOMES PARTY TO INTERNATIONAL WHALING CONVENTION: On November 23, 1956, the Ambassador of Iceland to the United States signed the protocol to the International Whaling Convention in Washington, D. C., and deposited the ratification with the appropriate officials. This will make Iceland a party to the rules and regulations set up for the conservation of whales.

Iran

JAPANESE-IRANIAN FISHING AND MARKETING ENTERPRISE IN PERSIAN GULF AND GULF OF OMAN: Important development of Iran's marine food resources in the Persian Gulf and Gulf of Oman is anticipated following the approaching formation of a new company financed by the Seven Year Plan Organization and private Japanese capital. The enterprise plans to create new sources of foreign exchange through export trade and to fill the need for an augmented animal protein diet for the people of southern Iran. It will be complementary to a project begun a couple of years by the Plan Organization and the United States Operations Mission in Iran to rehabilitate the Government cannery at Bandar Abbas.

An Iranian-Japanese fishing and marketing venture in the waters bordering Iran's southern coastline is expected soon to begin deep-sea commercial operations after almost two years of study and trial fishing by a private Japanese enterprise. Forecasting sound opportunities for the development of foreign exchange for Iran through export trade and the provision of needed additional animal protein foods for the internal Iranian market, the Japanese company's reports led to the signing of a basic agreement on June 17, 1956, with Iran's Seven Year Plan Organization.

This agreement provides for the establishment of a joint stock company with headquarters in Abadan. Initial capitalization is to be 30 million rials (US$400,000), two-thirds to be subscribed by the Plan Organization and one-third by the Japanese company. After the third year of operation, the capital shall be increased by another 30 million rials ($400,000); and, after the fifth year, by an additional 30 million rials. Management of the joint company will be vested in a five-man board of directors: three Iranians; two Japanese. The president of the board will be Iranian and the managing director, Japanese. Fishing vessel crews and technicians will be largely supplied by the Japanese company. Actual Plan Organization participation in the company will be effected by the Chemical Industries Section, points out a December 26, 1956, dispatch from the United States Embassy at Tehran.

The company is authorized under the basic agreement to exploit fish and other edible marine life in the Persian Gulf and the Gulf of Oman, as well as to process and market its catch in Iran and abroad. Also provided for is the ownership and operation of fishing vessels, canning factories, refrigeration and ice-making plants, and related endeavors.

The Iranian market will probably be limited initially to the areas bordering the Persian Gulf, particularly in the Abadan area, where animal protein foods are not now in good supply. Export possibilities in much of the Middle East are good, according to one Japanese source. The sale of shrimp in the United States market is also believed feasible.

The key to the venture's success is stated to lie in the use of modern equipment and processing techniques, with emphasis on quick freezing of the catch on the fishing vessel itself and adequate cold-storage facilities at Abadan. The earlier studies of the Japanese company indicated that major attention should also be given to improving the present method of fish marketing along the Persian Gulf coastal areas.

Only one vessel, the Tatsuta Maru, property of the Japanese company, is now available for the operations of the new company. The ship, which carried on the trial studies, is described as a 550-ton refrigerated trawler, with a quick freezing capacity of 10 tons a day. The potential monthly catch with this equipment is estimated at from 100 to 200 metric tons a month. Additional vessels and equipment will be brought into operation following registration of the company and development of foreign and domestic markets.

The basic agreement does not give the Persian Gulf Fisheries Company a monopoly of fishing, marketing, or any other associated fields. In principal, however, equipment not available in Iran will be procured from Japan, provided Japanese prices are "not disadvantageous."

Japan

FISHERIES TECHNICIANS HOLD CONFERENCE: The Japanese Agriculture and Fisheries Technical Council held a conference beginning December 3, 1956, to discuss the various problems in connection with the Japanese fishing industry. Among the subjects under discussion were: (1) the reasons for the decline in the sardine catch in the postwar period compared to prewar catches and the results of research carried out with respect to the problems; (2) deep-sea tuna fishing and the problems raised by the restrictions imposed on albacore; (3) salmon fishing in the North Pacific and problems raised by Soviet restrictions; (4) matters involving the North Pacific Fisheries Agreement, including migration of salmon and distribution of species; (5) the forthcoming negotiations under the Russian-Japanese salmon fishing agreement.

* * * * *

FROZEN SHRIMP IMPORTS FROM RED CHINA APPROVED: An application by the four leading Japanese fishing firms to import frozen shrimp from Communist China was approved in December 1956 by the Japanese Ministry of International Trade and Industry. The shrimp will be imported on a barter basis, 2,300 cases of Japanese king crab meat in exchange for 100 tons of Chinese frozen shrimp. The Japanese government approved the application with the proviso that the shrimp be packed in blocks of 1.1 pounds and 4.4 pounds and prepared in a specified manner. These stipulations were made in order to facilitate re-export. The Ministry was reported anxious to prevent the re-export of these frozen shrimp to the United States, states a December 14, 1956, dispatch from the United States Embassy in Tokyo.

* * * * *

NATURAL FLUCTUATIONS IN POPULATIONS OF PRIME IMPORTANCE IN TUNA FISHERIES CLAIMS BIOLOGIST: Natural fluctuations in the tuna populations are of prime importance and fishing has had little permanent effect on the stocks, according to a talk given by Director Hiroshi Nakamura of the Nankai Regional Fisheries Research Laboratory at the Kanagawa Fisheries Experiment Station on August 14, 1956. This evidently represents a different point of view from the panel discussion held at Misaki, Japan, on August 23, 1956, where industry members considered the problems which might be taken up by the Tuna Fishery Investigative Committee recently established by the Japanese Fisheries Agency, and where the gist of the discussion was that lower daily catches of tuna experienced by Japanese fishing vessels in recent years might be an indication of overfishing, and that regulation might be in order some day. (See Commercial Fisheries Review, November 1956, p. 90).

In his discussion, Nakamura comments regarding the close relationship between currents and the fish faunas and points out documented instances of major changes in tuna populations, changes that could not possibly be ascribed to fishing. The final comments of Nakamura deal with forecasting tuna abundance.

Some excerpts from Nakamura's talk follow:

... If we may make some very rough approximations about the Pacific Ocean,

a. In the area where the North Pacific Current, that is the Kuroshio, is flowing to the eastward, there are fishing grounds mainly for albacore and bigeye with striped marlin and broadbill swordfish also taken.

b. In the area of the North Equatorial Current lying to the south, the fishing conditions are not clearly defined by or centered around any particular species, but if pressed, we might say that it is a fishing ground for a mixture of striped marlin, black marlin, and yellowfin. However, bigeye are abundant centered along the northern and southern boundaries of current system, and it is an important fishing ground for medium-sized vessels. This area is not a very clearly defined fishing ground, but it is thought to have an important significance as a spawning or nursery ground, and young of the tunas, spearfishes, and skipjack appear to be distributed there.

c. Next to the south is the Equatorial Countercurrent area where, as you know, the main catch is yellowfin with a mixture of bigeye and black marlin.

d. Moving into the South Equatorial Current next on the south, the northern part is a fishing ground on which yellowfin are extremely abundant. However, from the vicinity of 10° S. albacore suddenly become numerous. Until recently it was not known that there was a current boundary in this vicinity, but judging from the albacore fishing conditions we postulated that there must be a current boundary there. With the cooperation of the Daifuji Maru in carrying out oceanographic observations in this region it was found that during the season of northerly winds there is a clearly marked current boundary in the vicinity of 10° S. and it has been established that our hypothesis was correct. However, with the season of southerly winds this boundary fades out, and at the same time the albacore begin to be taken more to the northward.

The foregoing is the situation in the Pacific area and a similar situation obtains in the Indian Ocean, with each of the current systems forming a fishing ground of different characteristics.

To summarize the above,

a. Each current system is a fishing ground with its own characteristics, and when we cross the current boundaries the composition of the catch differs, or if the same species are taken, their sizes are different.

b. Consequently the current boundaries are for the fish like national borders which they cannot cross freely, and thus they are of such character as to restrain the distribution and migrations of the tunas and spearfishes.

Having gone this far, I am sure that you have all noticed a contradiction in what I have said. That is, I have stated on the one hand that the current boundaries are like national borders, which restrain the distribution and movements of the tunas and spearfishes, and at the same time I said that fish of the same species but of different sizes are taken in different current systems. If we say that the size of the fish differs with the current system, then this naturally means that there must be an interchange of fish between current systems.

I think, however, that I can eliminate this contradiction by adding the postscript that "while the fish remain in the same ecological state they do not cross the current boundaries." To put it in little more complicated terms, this means that "for the tunas and spearfishes the sea areas which are adapted to various ecological states are in different current systems and they live separately in different current systems according to their ecological state."...

It looks as if most of the tunas and spearfishes spawn throughout the year in tropical waters, but it is interesting to note that they seem to cross the current boundaries from one current system into another mainly at certain limited periods... .

In waters of high latitudes, which in some seasons are completely outside the area of distribution of the tunas, the fishing seasons are clearly marked, but in tropical waters the fishing seasons are not clear. For this reason it is easy to overlook the existence of fishing seasons in the tropical waters, but in actuality they are, as I have just said, definitely present, and every half year there is a large-scale exchange of schools of fish and a change in the character of the population, and this also causes a change in abundance.

Now if we again look at the matter of the movements of fish, it is thought that we can divide them broadly into two cases. The first is the case of movements within one current system and the second is the case of movement from one current system into another. The first may be called migration while in the same ecological state, and the second may be called migration accompanying a change in ecological state. In the first case the fish themselves are probably moving too, but mainly it is controlled by seasonal developments within the current system which is their biological envirnoment, whereas in the second case we may consider it a positive movement of the fish themselves. ...

Thus it is a mistake to say simply that the fishing is not as good as it was at some previous time without taking seasonal changes in the fish's movements into consideration and therefore conclude that the fish have grown scarcer.

Now the second case is that where the tuna have actually become fewer. We know of two or three examples of this sort. Our basis thinking with regard to this problem is to determine whether the reason for the decrease is one which can

be regulated by human power or whether it is due to natural conditions which are beyond human conditions which are beyond human control. If it is the first, then all we have to do is take positive action to remove the causes which interfere with the increase and maintenance of the resource. If it is the latter, the tuna fishery must establish itself in a form which will conform to these natural fluctuations. ...

If we take a combined view of the pattern of fluctuations in the quantity of the resources of black tuna, yellowfin, albacore, and bigeye, it is thought to be not far wrong to consider that with the present scale of the fishery the species which are going to increase regardless of how many are caught and those which are going to decrease will decrease even if they are not caught at all. Of course, if the scale of the fishery becomes much larger and if extremely efficient fishing methods appear, the story will be different, but if the fish which are going to increase do so despite fishing mortality, and if those which are going to decrease do so even though they are not fished, this means that the fluctuations in the resource are controlled by nature and that human activity need not be considered the causative factor. If this is the case, then the tuna fisheries must establish an operating regime which will conform to natural fluctuations.

Now we come to the question of how a type of organization can be developed that will conform to the natural fluctuations. I can think of no other way than to collect persistently through many years data on the basis of which we can clarify the question of whether or not there is any law or regularity to these natural fluctuations. If there were such regularity, it would probably be cyclical, and since it does not appear likely that such a secularity will be restricted to a single species in its appearance, I think that it will be easiest to grasp and the danger of falling into errors will be slightest if we take a synthetic view of all of the large tunas, spearfishes, and the skipjack as a whole. ...

We are at present putting together the 1955 edition of the charts of average year's fishing conditions based on data which we have received from you. I know that you have been urging our investigators in the markets to organize the data as early as possible, and with the whole year of 1957 as a period of preparation we are planning and hoping to begin to put out forecasts and news flashes on the fishing conditions beginning in 1958. The object of these forecasts will be to enable the fishery to conform to natural conditions. This will be the first time that we have undertaken this kind of work and since there appears to be no chance for oceanographic investigations covering the whole broad expanse of the Indian and Pacific oceans, the only method we will have for preparing these forecasts is to deduce the changes in oceanographic conditions from the reports on the fishing conditions obtained from you fishermen and then on that basis to make our predictions of the fishing conditions. If we can get you to write up the reports which we need on fishing conditions on your way back to port from the fishing grounds, and if you will turn them over to our investigators or put them in the mail as soon as you get into port, our small staff will be greatly aided and the preparation of the forecasts and news flashes will go smoothly.

Now once this work has been started, it is expected that there will be many defects in the forecasts, since it is our first attempt at this type of work, and there probably will be cases in which the forecasts will not be useful for their intended purpose, but the improvement in the quality of the forecasts will depend upon your cooperation... .

* * * * *

SALMON EXPORTS TO THE UNITED STATES INCREASED: The short pack of canned salmon by the United States and Canada has resulted in a strong demand for the Japanese pack and earlier estimates for 1956 exports have been revised by the Japanese Salmon Sales Company, the sole export agent. Exports to these countries originally estimated at 535,000 cases (48 1-lb. cans), have been revised upwards to 700,000 cases. The additional exports were subtracted from the original allotment made to countries other than the United States, Canada, and the United Kingdom.

The United Kingdom contracted for only 140,000 cases of Japanese canned salmon from the 1956 pack out of an allotment of 480,000 cases. The delay is attributed to the fact that negotiations on the renewal of the United Kingdom-Japan Trade Agreement were still in progress when this report was made. The United Kingdom was not granting import licenses for Japanese canned salmon pending the completion of the negotiations. Canned salmon figures heavily in this trade agreement.

Malaya

IMPORT DUTIES INCREASED FOR SOME FISHERY PRODUCTS: The list of Malayan imports on which higher rates of duty were levied on November 7, 1956, included the following fishery products:

Item	Commonwealth Countries		Other, Including U. S.	
	Old Rate	New Rate	Old Rate	New Rate
	.....	..(Percent Ad Valorem)....		.....
Salmon, canned (red, blue, black or or silver, sockeye	7½	15	free	7½
Fish maws and shark fins	10	20	free	10

Mexico

SHRIMP FISHERY TRENDS, 1956: Landings of shrimp from the offshore grounds at west coast Mexican ports in 1956 was estimated about one-third less than the record catch for 1955. Although the catch declined, higher prices limited the loss in the 1956 ex-vessel value to only 10 percent as compared to that of the previous year

The inshore shrimp fishery on the West Coast was a failure in 1956 due, it is believed, to light rainfall on the Pacific mountain slopes. The total production for this fishery was expected to be about 120 metric tons or less, a decline of about 60 percent from the 1955 season.

The shrimp catch on the East Coast was expected to exceed the 1955 catch slightly and the prospects for further increases in 1957 are good. Due to lower catches on the West Coast during the last quarter of 1956, it is likely that this trend will continue into 1957 and substantially lower the 1957 catch for the West Coast.

Mexican shrimp exports during 1956 were estimated at over 50 million pounds (headless) as compared with 46 million pounds in 1955. The value of the 1956 record shrimp exports was expected to exceed US$25 million. (United States Embassy, Mexico, dispatch dated January 9 and United States Consul, Nogales, dispatch dated January 2.)

The peak fishing season at Salina Cruz will probably start earlier than usual in 1957. Normally, trawlers from Mazatlan and Guaymas do not begin moving south to Salina Cruz until early February and remain until late April or May. This season five shrimp trawlers from Ciudad del Carmen were due to arrive in Salina Cruz in late December 1956, and additional boats from Mazatlan and Guaymas some time in January. The arrival of the Carmen boats marks the first season that trawlers from the Gulf of Mexico moved to the Pacific to fish the winter-spring run of shrimp near Salina Cruz.

* * * * *

NEW SHRIMP FREEZING AND ICE PLANT: A new shrimp freezing and ice making plant was being constructed in Salina Cruz, Oaxaca, Mexico. The plant, with a daily capacity of 15,000 pounds of frozen shrimp and 10 tons of ice, was expected to begin operations some time in January 1957. With the new plant, Salina

Cruz has three freezers with a daily capacity of 45,000 pounds of shrimp and 120 tons of ice, reports the United States Embassy in Mexico City (December 20, 1956).

Norway

1957 WINTER HERRING FISHING SEASON OPENS: During December 1956, Norwegian fishermen were preparing for the winter herring fishery that usually begins in January. A catch of more than one million metric tons is expected to be taken by the 30,000 fishermen and 2,700 boats that participate in this fishery.

The Norwegian research ship G. O. Sars was at sea in December to track the movements of the vast schools of herring which move into the Norwegian coast every winter. The Norwegian fishery scientists aboard the research vessel will determine exactly the time and place for the appearance of the herring schools (Fishing News, December 21, 1956).

A report late in January pointed out that stormy weather kept vessels from going after the herring shoals off Norway's west coast and up through January 24 landings were light. (News of Norway, January 24).

Pakistan

EXPLORATORY FISHING RESUMED: The exploratory fishing program in the waters off the coast of West Pakistan was resumed on the termination of the monsoon in September 1956. Special stress is being laid on the exploration of the shrimp grounds. In addition to otter trawls, which were being used during the last few years, the use of purse seins during the current season is also planned.

In previous years existence of schools of various fishes was reported by the exploratory vessels. (Current Affairs Bulletin, November 1956, of the Indo-Pacific Fisheries Council.)

* * * * *

ICA AID FOR FISHERIES: For the fiscal year 1956/57 US$525,000 and US$315,000, respectively, were allocated by the U. S. International Cooperation Administration for importing nylon twine for net making and 50 marine engines for mechanizing indigenous fishing craft. These commodities are for distribution to the fishing community on easy installment payments. These measures are in continuation of similar measures taken in 1955/56.

Peru

ANCHOVY FISH MEAL PLANT ADDITIONS OR ENLARGEMENT PROHIBITED: In a Decree dated December 1, 1956, and effective January 1, 1957, no new authorizations will be granted in Peru for the establishment of new fish meal plants or the enlargement of exisiting plants that use anchovies for reduction. The prohibition will be effective until Peruvian fisheries authorities can devise adequate measures to insure the future productivity of anchovy stocks, states a December 21, 1956, dispatch from the United States Embassy in Lima.

* * * * *

THREE WHALERS PURCHASED FROM NORWAY ARRIVED: The three whale-catcher vessels purchased in Norway by the joint Peruvian-United States whale processing firm arrived at the port of Callao on November 7, 1956, from Sandefjord, Norway. The three vessels have been registered in Peru as the Don Juan, Don Tomas, and the Don Christobal and are at present manned by Norwegian crews.

The plant at Paita in the Northern part of Peru where the vessels will be based, was under construction. Operations were expected to begin early in 1957, states a December 13, 1956, dispatch from the United States Embassy in Lima.

Note: See Commercial Fisheries Review, January (1957) p. 80.

South-West Africa

PILCHARD SEASON FOR 1956 ENDED IN OCTOBER: Although the pilchard season in Walvis Bay, South-West Africa, remained open until the end of October 1956, reliable sources reported that commercial fishing for pilchards in the area had come to an end early in October.

The season was considered by the trade to have been a successful and better-than-average one and fish factories in the area closed in October as they caught their quota for the year. It is understood that some factories in Walvis Bay did more canning in the 1956 season than ever before. The average production of fish oil during the season was around 15 gallons per ton; the maximum 29 gallons per metric ton, according to an October 20 United States consular dispatch from Cape Town.

Union of South Africa

BROWN BREAD WITH FISH-MEAL PREMIX ON THE MARKET: The South African Government-backed project to develop a fish meal protein additive to enrich bread flours was scheduled to be tested beginning November 1, 1956, in all bakeries in the Western Cape. The new enriched brown bread, with fish-meal "premix" added, will be on sale in all these outlets. The premix is made up of 2.5 ounces of fish (maasbanker) meat equivalent, 2.5 ounces of skim milk, and $\frac{1}{4}$ ounce of fat for each two-pound loaf of bread. Calcium acetate also has been added to counteract any tendency to "ropiness" and make the bread last longer. The pilot plant operated by the Government and located at Simonstown will process one ton of fish meal a day for distribution to the bakeries in the Western Cape. All enriched brown bread baked in the Western Province will have the fish meal premix added.

The development of a tasteless, ordorless fish-meal premix, a special project of the Department of Health of the Union Government, has come after four years of experimentation and an expenditure of £25,000 (US$70,000). The Secretary for Nutrition of the South African Government recently stated to a Cape Times reporter that the new fish-meal premix would add important animal protein to the diets of South Africans. He added that a person eating between 6 and 8 slices of bread daily would get from 15 to 20 percent of his animal protein needs from the bread alone.

Reports are that consumption in Cape Town of enriched brown bread is one loaf for every two loaves of other types It is hoped that consumption of the brown bread can be increased.

If the new bread proves popular in the Western Cape, the premix will be used all over the Union. Should this prove to be the case, it is estimated that about 600 tons of the premix will be needed monthly, according to an October 29, 1956 dispatch from the United States Consul in Cape Town.

Enriched bread with the special fish-meal premix is said to be subsidized by the Union Government to the amount of £900,000 ($2,520,000), in addition to a general subsidy of £8,000,000 ($22,400,000) for bread.

* * * * *

PILCHARD-MAASBANKER FISHERY FOR 1956 WORST ON RECORD: Even the widespread introduction of echo-sounders will not prevent the 1956 season on Union of South Africa's west coast from going down as one of the worst in the short history of the pilchard and maasbanker (jack mackerel) fishery. After reasonably good catches during July and August, the returns for September 1956 showed a sharp drop again.

The catch of pilchards and maasbanker for the first 9 months of 1956 totaled only 127,000 metric tons or just over half the 250,000-ton annual quota. Reports for October 1956 showed that that month was even worse than September.

Analysis of the figures to date shows that there has been no substantial drop in the pilchard catch, but there has been a drastic reduction in the maasbanker catch. The South African Shipping News and Fishing Industry Review of November 1956 reports.

U.S.S.R.

EXPERIMENTAL AND COMMERCIAL FISHING WITH ELECTRIC LIGHT: The use of electric light and fish pumps in the fisheries of Soviet Russia was described by P. G. Borisov in a paper presented at the last meeting of the Conseil International pour l'Exploration de la Mer in 1956. Some excerpts from the paper follow:

In the summer of 1945 we started our investigations in the Caspian Sea with electrical light as a stimulant to attract fish. We kept on conducting our investigations and later on transferred them to other seas--the Black and the Baltic--and to Lakes Pereslavl and Choud.

The earliest investigations carried out in the Caspian Sea indicated that the light of a common electric lamp (white light) is the most effective for attracting fish (sprat) at night, as compared to red, orange, yellow, green, and blue light; yellow light was found to be next to white in its effectiveness. In the experiments, a lamp with a waterproof socket was suspended by a waterproof cable at various depths.

In 1947 the work with electrical light in the Caspian Sea showed that more powerful electric lamps (1,000-1,500 watts) give better results in attracting sprat at night into the lighted area, which in its turn results in a bigger catch. A decline in catch was registered when the power of the lamp decreased.

Alongside with this a question was settled which is of great importance for fishing in the Caspian Sea--the question of vertical distribution of sprat on fishing grounds. It turned out that in summer (August) when the water in the upper layers becomes very warm sprat move to deeper layers where they cannot be reached by shallow purse seines. Fishing with electrical light at great depths during this period appeared to be very successful.

At the same time we described methods of commercial fishing for sprat with the help of electrical light. Three methods were described: fishing with conical nets, lift nets, and purse seines.

A special 1,000-watt lamp with the upper part of the bulb having a reflecting surface was proposed for purse seining. The lamp is inserted into a cupola-shaped buoy, the socket downwards, and is connected to an electric generator with the help of a waterproof cable. It may be kept at any distance from the fishing boat (100-200 meters or 328-656 feet). During fishing operations the boat either casts anchor or drifts. There are various designs of lift nets. The lift net used by our fishing boats was a rectangular (7 to 5 meters or 23 to 16 feet) cotton netting with a mesh size of 7-8 mm., lowered and lifted by booms. A common electrical lamp of 500 watts was attached to the center of the netting and the gear was lowered to a desired depth.

Since 1951 conical nets have been widely used in the Caspian Sea. A cone-shaped cotton netting (thread No. 34/6) with a mesh size of 7-8 mm. is fastened at its base (the upper part of the net) to a metal ring three meters (about 10 feet) in diameter. The vortex of the cone (the lower part of the net) is furnished with a metal lock which serves not only for "brailing" the fish but is a kind of sinker keeping the gear in the water in a proper (strictly vertical) position. An electric lamp of 1,000 to 1,500 watts with a waterproof socket and cable is fixed in the center of the ring with the bulb directed upwards. The length of the cable depends on the depth of fishing. In June sprat is fished in the Caspian Sea at depths of 15 to 20 meters (49 to 66 feet); in November-December at depths of 50 to 60 meters (164-197 feet) in accordance with seasonal distribution of sprat in water layers.

Conical nets are operated from both sides of the ship successively: at the time when the starboard net with the lamp on is being lifted to the dock, the port net is being lowered into water and its lamp is turned on as soon as the starboard net has been lifted. These successive operations allow time not to be wasted on attracting fish into the lighted space, for the fish concentrated around the source of light move to the side of the fishing boat from which the conical net with an electric lamp is suspended. The time during which the conical net is kept at a desired depth depends on the concentration of the fish (sprat). On heavy concentrations (catch varying from 50 to 100 kg. (110-220 pounds) per haul, the net is kept in the water for 2 or 3 minutes, the time being reduced to 1 minute when the catch per haul exceeds 100 kg. (220 pounds). When the catch per haul is small (from 10 to 25 kg. or 22 to 55 pounds) the net is kept in the water for 3 to 6 minutes. The setting and lifting of the conical net are accomplished only with the ship's winch via a pulley fixed at the tip of the boom. The lifting speed is of great significance as it affects the catch. Experience showed that the lifting of the conical net should be done at the speed of 0.45 m./sec.

Conical net fishing with light is usually done when the ship is at anchor because with the ship drifting the concentrations of fish in the underwater lighted area begin to thin out.

Strong currents, swell of the sea, or sharp winds cause a decline in catches with conical nets, the the more so if fishing is not done at great depths.

Fishing in the Caspian Sea proves the effectiveness of conical-net fishing with light. Two types of sprat are the object of fishing there: anchovy-type sprat (Clupeonella engrauliformis) and common sprat (C. delicatula caspia). Following our investigations in the Caspian Sea in 1948, commercial fishing for sprat with light started and was later on improved and developed.

At present Caspian sprat are fished in winter as well as in summer and not only on the eastern coasts of the Central and South Caspian Sea but on the western coasts too--in the waters of Daghestan and Azerbaidzhan.

A conical net requires an exceedingly small amount of netting--about 3 kg. (7 pounds) per net.

The Caspian fishermen's successes became widely known among the fishermen of other commercial basins of the U.S.S.R. The Black Sea fishermen after going to the Caspian Sea to see the new method in operation started successfully using it at home. ...

N. N. Danilevsky carried out experiments in the Black Sea on fishing with a pelagic trawl with the help of flickering electric light. Underwater lamps of 500 to 1,000 watts were tied to a rope running from the lead line to the other board. In the course of trawling the light was successively turned on for 3-5 seconds and then switched off for 12-15 seconds.

"On thinly concentrated schools the catch amounted to 700 pounds for a 20-minute haul, while on dense schools the anchovy were so abundant that the catch broke the belly of the trawl"--N. N. Danilevsky writes in Rybnoe Khozjaistvo (No. 2, 1952). Apart from anchovy, a certain number of sprat (Sprattus) and horse mackerel (Trachurus) were captured. However the experiments were not repeated.

In August-September of 1948 the first experiments with electrical light fishing were conducted by our research group in the Far East seas. The experiments showed that the fishes attracted by the above-water light at night include saury (Cololabis sajra), small smelt (Hypomesus), Japanese dace (Leuciscus brandti) and Atka fish (Pleurogrammus azonus).

Fishing was done with a pyramidal net of our own design, the only difference between it and the conical net being the shape of the entrance to the net--square instead of round. Investigations were conducted in South Primorje (Precbrazhenje Bay) as well as on the western and eastern coasts of South Sakhalin.

I Piskounov (Rybnoe Khozjaistvo, No. 7, 1949) and G. Grishchenko Proceedings of the Pacific Institute of Marine Fisheries, v. 34, 1951) point out that the Far East herring are also attracted by electric light, but only during the periods before and after spawning (in the early period of after-spawning feeding).

In the summer of 1956 extensive experimental work on saury fishing with the help of above-water electric light was carried out in the Pacific Ocean in the area between the Hokkaido latitude and the latitude of Fritz Strait. The fishing was done with lift nets of Japanese design and conical nets of our own design with the help of above-water electric light. Thirty blue 0.5 kw. electric lamps were used to attract saury to the side of the fishing boat and five red 0.5 kw. lamps--to make saury concentrate in a small surface area. Both blue and red lamps were used in sets (chandeliers).

A quadrangle of 23 to 20 meters of netting was lowered from the starboard on a bamboo pole, the lifting being done with the help of 5 ropes or wires attached to the lead line of the net. A set of red lamps was fixed above the lift net. The blue lamps on the left side of the boat remained turned on for the fish to concentrate in the lighted area. Then the port lights were turned off and the starboard red lights above the net were turned on. The saury swarming under the port lights were attracted by the red lights, immediately swam toward them underneath the boat, and became trapped in the net which was quickly lifted. The catch per haul ranged from 300 to 2,000 pounds. The conical net catches with the help of above-water light ranged from 40-60 kg. (88-132 pounds) to 200-300 pounds per haul.

The Japanese get record saury catches with the help of electric light. In 1954 their total saury electric light catch amounted to 290 million pounds.

The use of the fish pump opens up new perspectives in the field of electric light fishing. In the U.S.S.R. this idea belongs to N. S. Forshtut, an engineer, who first recorded it in 1948 after the end of the earliest period of our investigations with electric light in the Caspian Sea. He was the first to carry out experiments on Caspian sprat fishing with a fish pump. A corrugated pump intake hose was lowered into the water in depths from 11 to 24 meters (35-79 feet). A powerful electric lamp in a wire-net funnel was attached to the intake of the hose. The catches were small and many fish were greatly bruised due to imperfections in the pump used.

Pump fishing was later on improved and developed by A. F. Leksoutkin, A. F. Shishkov, and A. H. Pateev under the guidance of I. V. Nikonorov. The RB-150 fish pump used by them is installed on the deck of the fishing boat and operated by an electric motor. The hose is 100 meters (328 feet) long in order to be able to fish at greater depths. One or two 1,500-watt electric lamps are fastened at the intake of the hose.

The fish (sprat) enter the lighted area and are pumped up the hose alongside with water into a receiving tank which separates the fish from the water. Caspian sprat catches per night of fishing by one of the fishing boats, the "Toros," ranged from 700 to 16,000 pounds in December of 1954 and from 500 to 15,000 pounds in January 1955. The total catch in December 1954 amounted to 95,000 pounds and in January 1955--104,000 pounds.

Pump fishing with electric light has a number of advantages as compared to conical net fishing: it is continuous, labor-saving, and requires no netting. Thus pump fishing with electric light on a commercial basis makes the problem of net-less fishing quite a realistic one.

Everything said above applies to those species of fish which are attracted at night by electric light. About 20 species are known to be attracted by electric light in the U.S.S.R. seas; however as yet only two of them--anchovy-type and common sprats (kilka) of the Caspian Sea--are the objects of commercial fishing. Work is going on to develop commercial fishing for the Black Sea horse mackerel and anchovy (Khamsa). Commercial fishing for saury and Atka mackerel in the Far East seas has not yet been started. The question of the possibility of electric light fishing for the Pacific and North Atlantic herrings on a commercial scale has not yet been settled.

Apart from the fishes attracted by the electric light at night, there are some species which are frightened away by light and try to leave the zone of above-water or underwater light. To these species belong: lamprey (Lamperta fluviatilis), eel (Anguilla anguilla), and mullet (Mugil).

Our investigations in the Caspian and Baltic Seas showed us the way to take advantage of this peculiarity of the fish. In 1951 N. I. Sementchenko started fishing for Caspian mullet with a trammel net using the searchlight to frighten the fish away in the direction of the net. The mullet finding themselves in the brilliantly lighted space try to leave it and, being surrounded by the trammel net, are entrapped in it. Using this method N. I. Sementchenko's crew captured 47,400 pounds of mullet in 1952 and 68,500 pounds in 1953.

It should be noted that with the help of the searchlight installed at the bow of the ship we scouted not only for mullet but for other pelagic fishes with negative reaction to electric light.

V. A. Abakoumow carried out experiments on fishing for lamprey (Lampetra fluviatilis) in the Gauja River (Gulf of Riga of the Baltic Sea). In the autumn of 1954 he fished on the runs of lamprey with fyke nets by lighting the bank parts of the river and leaving the middle part in darkness. "The total catch per hour by one fyke net with the help of electric light was twice as big as that by five control fyke nets set in a weir," V. A. Abaloumov writes in Rybnoe Khozjaistvo (No. 1, 1956)... .

The efficiency of artificial light depends on a number of conditions: transparency of water, moon phase, intensity, intensity of light, species of fish, physiological condition of fish, their age, etc.

In the water basins with a small degree of water transparency (as the Azov Sea), the efficiency of the attraction of fish by light is sharply reduced. Moonlight and especially the light of the full moon in a cloudless sky also reduces the efficiency of attraction to a great extent.

The optimum efficiency of artificial light is different for different species, e.g. light optimum is higher for anchovy, pilchard, and mackerel than for horse mackerel.

Many species do not approach a powerful source of light closely but keep at some distance from it. This distance increases with the increase in the intensity of light and vice versa.

A more thorough investigation into the behavior of fish under the influence of electric light, electrical current, and sound is one of the main tasks before our fishery research insitutes.

The development of and improvements in physical methods of influencing the fish will completely solve the problem of netless fishing.

* * * * *

NEW FACTORYSHIP OPERATIONS DESCRIBED: The official Russian fishery paper Rybnoje Chosatswo published a detailed account of the first practical experiences with the factory trawlers built some time ago in Germany, according to a report in Fiskets Gang (August 23, 1956), a Norwegian fishery periodical. Maximum production per factory vessel is stated as 600 metric tons at the greatest action radius of 3,000-3,500 nautical miles without taking on new supplies. This is the equivalent of 60 to 70 days at sea. All the deck machinery is driven electrically. There are two 2-ton cargo booms and winches forward and two 5-tons winches aft, an anchor winch for two anchors, and a trawl winch driven by a 130-hp. electric motor with a towing power of 9 tons.

For fish processing there is a fully mechanized installation and a fillet plant with partial manual operation. Fish which are 50 cm. (about 20 inches) long and over are handled in the fully-mechanized plant. This includes a beheading machine driven by a $1\frac{1}{2}$ hp. motor with a capacity of 22 to 24 fish a minute. The manual operation consists of three belt conveyors, a skinning machine, and a beheading machine for fish under about 20 inches with a capacity of 40 fish a minute. The cold-storage space on the port and starboard sides can store about 300 metric tons from the daily fillet production of 7 to $7\frac{1}{2}$ tons. Fish blocks are glazed and packed in cartons holding 9 blocks. Each block weighs about 3.5 kilograms (7.7 lbs.). The cartons measure 80 x 7.5 x 7 cm. (about 31.5 x 3.0 x 2.8 inches). Freezing the fillets and bringing their temperature to about -18° C. (0° F.) takes $3\frac{1}{2}$ to 4 hours.

The processing waste is collected in a tank (which holds three tons) from which it is conveyed to 2 vacuum dryers. The vacuum-dried material is then pressed in a press which is hydraulically operated. The fish-meal installation can handle 23

tons a day. The yield for the waste is about 22-percent fish meal with a water content of about 10 percent. The drying process requires about 4.5 hours in both dryers. The oil yield is about one percent. To dry one kilogram (2.2 lbs.) of waste requires about 2 kilograms (4.4 lbs.) of steam. Two liver-oil boilers, each of which holds 350 kilos (771 lbs.) of fish livers can be emptied about hourly and give a liver-oil yield of about 35 percent.

The experiences with the first two German-built trawlers of this class--Pusjkin and Gogol--in the summer of 1955 gave the results per trip shown in the table.

	Pusjkin	Gogol
Length of trip, days	63	65.5
At sea, days	49.1	54.5
On grounds, days	46.0	51.7
Gross catch, metric tons	1,088	1,227
Net catch, metric tons	636	712
Trawling hours a day	10.7	11.4
Gross catch a day, metric tons	11.8	11.9
Gross catch a trawling hour, pounds	2,400	2,300

While the Pusjkin required 1 hr. 45 min. to set and take in its stern trawl, the Gogol recorded times of only 38 minutes. Since experience should speed up the trawling operation it is hoped in the near future to attain a daily catch of 50 gross tons.

The procedures which had been developed for handling the trawl have been shown to be substantially correct. Taking the trawl in over the stern on the upper deck permits close examination and the discovery of defective portions after each haul; also, it is possible to make minor repairs at once. Since processing of the catch is done on another deck, it can take place independently of the trawling, which is not the case for other types of trawlers. It was stated that the crew did not, at all times, have adequate knowledge of the new vessels, and also certain unsatisfactory conditions had to be overcome. For example, the types of trawls were the same as used on the regular vessels, but the engines on the new vessels had double the power of the regular vessels. Larger and stronger gear must be used and a simplification of the arrangement on the stern for taking up the catch.

The fear that the hauling up of the trawl would be difficult and that in a strong sea there would be a continual danger of tearing the trawl has been shown to be unfounded. On the contrary, in heavy weather when the older-type trawlers had to cease fishing, the new vessels continue to fish. It is desirable to build larger trawlers of this type with the intention of expanding the factory installations to handle small fish (haddock) for canning, etc. At present these fish are utilized by the fish-meal plant.

With respect to the operating areas of the new large trawlers, it was stated that Russian research vessels had worked on the Newfoundland banks, and that when the catches were low in the Barents Sea, which is the normal operating area for trawlers from Murmansk, there were the following alternatives: Bear Island from November to February and from April to July; in the area West of Spitsbergen from August to October; off the Norwegian Coast from January to May; off Iceland from May to July; off West Greenland from July to February; and on the Newfoundland banks from February to July. The assumption was that the operations of the trawler fleets fishing these areas would be significantly improved, especially the new trawlers. More important, the fish in these latter areas, on the average, were much larger than those in the Barents Sea. It seems that Russian fishery circles are breaking away from the earlier "conventional" trawlers in the area around Murmansk to take part, to a greater degree, in the fisheries in international waters.

United Kingdom

BRITISH-ICELANDIC FISHERIES DISPUTE SETTLED: The settlement of the Anglo-Icelandic Fisheries Dispute, negotiated by the industries of both countries, and agreed to in April 1956, was signed in Paris on November 14, by the President of the British Trawlers' Federation and by the President of the Icelandic Trawler Owners' Union. The agreement was reached under the auspices of the Office of European Economic Cooperation, states The Fishing News of November 23, 1956.

The agreement provides for three main points: regulated landings of Icelandic-caught fish; a standstill on Iceland's present four-mile point-to-point territorial waters limit; and the appointment of a special conciliation group to deal with matters under dispute. The Icelanders have also agreed to allow British trawlers to run for shelter inside their fishing limits without stowing their gear.

The agreement, which will last for ten years and subject to reviews after two years, limits imports of Icelandic-caught fresh fish on ice to an annual total of £1,800,000 (US$5,040,000). This total is separated into four quarterly periods: January-March, April-June, July-September, October-December. Fish to the first hand value of £450,000 (US$1,260,000) can be imported during each of these periods.

Within any single month the imports shall not exceed two-fifths of the allowed value of the quarter. In an effort to avoid market gluts, expecially of single varieties, in no month or quarter shall the total value of haddock and flat fish exceed 40 percent of the total. Also during the same period the total value of cod and all other varieties shall not exceed 60 percent of the total.

Iceland has agreed to take no further action on the question of territorial limits while the whole Law of the High Seas is being discussed at the present General Assembly of the United Nations. The British Government, noting the Icelanders' declaration, states that this does not imply Britain's recognition of the validity of the present Icelandic limits.

The agreement gives Iceland the opportunity of resuming fish landings in Britain at a slightly higher rate than existed in the years before the dispute. The total amount of £1,800,000, means that Iceland can now supply about 8 percent of the total fish landed by British distant-water vessels. In the years prior to 1952, when the dispute began, Icelandic vessels landed 6.3 percent of the total.

Iceland has agreed to take no further action on the question of territorial limits while the whole Law of the High Seas is being discussed at the present General Assembly of the United Nations. The British Government, noting the Icelanders' declaration, states that this does not imply Britain's recognition of the validity of the present Icelandic limits.

The agreement gives Iceland the opportunity of resuming fish landings in Britain at a slightly higher rate than existed in the years before the dispute. The total amount of £1,800,000, means that Iceland can now supply about 8 percent of the total fish landed by British distant-water vessels. In the years prior to 1952, when the dispute began, Icelandic vessels landed 6.3 percent of the total.

* * * * *

FIRST DIESEL-ELECTRIC TRAWLER "PORTIA" IS HULL'S FASTEST SHIP: The new British Diesel-electric trawler Portia during speed trials over a measured mile averaged a speed of 15.8 knots in very heavy weather. The vessel cost £250,000 (US$700,000), states the November 1956 issue of The Fishing News. This was almost

two knots more than the average attained by the latest steam trawler under calm conditions and makes her the fastest vessel in the Hull fishing fleet.

When fishing the distant grounds the vessel will be able to save 15 hours on the homeward trip from Iceland and cut the sailing time from Bear Island by 19 hours.

After her acceptance trials on the Tees, the Portia left Middlesbrough for Hull. En route the vessel tested her trawling gear and caught 1,400 pounds of fish including 700 pounds of haddock. Offered at the wholesale market in Hull, this North Sea fish realized US$473 ex-vessel.

* * * * *

NEW TIDE INDICATOR DEVELOPED: A new eight-inch tide indicator, designed to show the actual state of the tide at any particular hour and to be used in any port, has been invented by a British Central Electricity Authority engineer at East Yelland.

The great advantage of this new indicator is its size--it resembles a slide rule. By simple calculation the tide state can be worked out in a matter of seconds.

The indicator also gives the depth of water at dock gates and cuts down the use of nautical almanacs.

The device is undergoing certain corrections before being rigorously tested and submitted to the National Physical Laboratory of the Liverpool Observatory and Tidal Institute for their opinion (The Fishing News, September 21).

* * * * *

NEW WAGE AGREEMENT REACHED AT GRIMSBY FOR FISH PROCESSING WORKERS: The Grimsby Fish Merchants' Association and fish processing workers unions reached an agreement on wages and other conditions late in October 1956. The new rates were effective with the week beginning October 29, according to The Fishing News of November 2, 1956.

Under the agreement male splitters and filleters will now receive a minimum of 180s. (US$25.20) a week at 20 years of age; at the age of 15, 60s. ($8.40), rising by annual increments to 150s. ($21.00) at age 20. Female splitters and filleters will receive 110s. ($15.40) weekly at the age of 20 and other age classes will rise from 51s. ($14.21) at the age of 20. All rates are based on a 5½-day 45-hour week.

Where incentive or bonus rates are in operation, lower rates may be paid provided the guaranteed minimum earnings for a 45-hour week are not less than those provided in the agreement. Overtime and holiday pay are calculated at a rate not less than the appropriate minimum rates.

* * * * *

1957 INTERNATIONAL FISHERIES EXHIBITION AT LOWESTOFT: The International Fisheries Exhibition to be held at Lowestoft from October 21-26, 1957, will be the first of its kind in Great Britain. Representation has already been promised from firms in several overseas countries. Lowestoft is a progressive fishing port with excellent facilities for an exhibition, both on land and on water, points out a November 20, 1956, dispatch from the United States Embassy in London.

The Exhibition will cover all aspects of the commercial fishing industry--shipbuilding, engines, catching, processing, packaging and distribution, and all the equipment necessary for those operations. It has been granted the backing of both the White Fish Authority and the Herring Industry Board.

The Exhibition will be staged in two halls. The Pavilion will show sea-going equipment (shipbuilding, engines, navigational instruments, nets and ropes, life-saving equipment, etc.), and at the Palais will be products normally used on land (processing machinery, freezers, refrigeration, boxes, transports, foods, etc.). In addition to the two halls, the organizers have been granted the use of the Yacht Basin which adjoins the Pavilion. Modern trawlers and other fishing craft will be open for inspection, and the basin will also be made available for those firms with suitable vessels or products for demonstration.

HALIBUT ONE-DISH MEAL

Halibut is the largest of the flatfishes and is found in the cold waters of the North Pacific, the Arctic, and the North Atlantic oceans. Commercially, halibut range in size from 5 to more than 80 pounds, but a few as large as 400 pounds have been reported.

Even though the greatest proportion of halibut comes from the Pacific Northwest, halibut is available in all parts of the United States, mainly as frozen steaks. Steaks are the cross-section slices of dressed fish, each containing a short section of the backbone. Chunks and fillets are other forms in which halibut may be purchased.

Halibut is one of the most highly prized of all white-meated fish. This firm and flavorful fish is appreciated by all who are familiar with it. Halibut may be prepared by any of the basic cooking methods such as frying, baking, broiling, boiling, and steaming.

For your dinner menu, the home economists of the United States Fish and Wildlife Service are suggesting a one-dish meal, "Curried Halibut Casserole" which features boiled halibut in combination with noodles, asparagus, and cheese and flavored with curry.

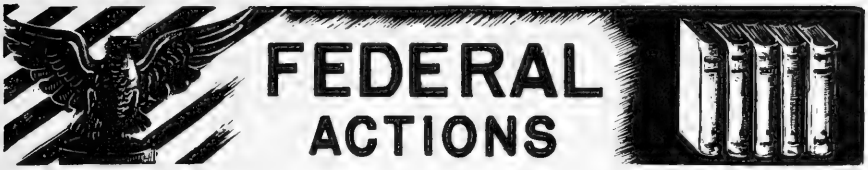
Other attractive and nutritious recipes are contained in the recipe booklet How to Cook Halibut, Test Kitches Series No. 9, which is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at a cost of 20 cents a copy.

CURRIED HALIBUT CASSEROLE

- 1 POUND HALIBUT STEAKS OR FILLETS, FRESH OR FROZEN
- 1 QUART BOILING WATER
- 1 TABLESPOON SALT
- 1 PACKAGE (8 OUNCES) NOODLES
- 1 1/2 TEASPOONS CURRY POWDER
- 2 TABLESPOONS BUTTER OR OTHER FAT, MELTED
- 1/2 CUP MILK
- 1 1/2 CAN (10 OUNCES) CREAM OF MUSHROOM SOUP
- 1 CAN (1 POUND 4 OUNCES) ASPARAGUS, DRAINED
- 1 1/2 CUP GRATED CHEESE

Place steaks in boiling salted water. Cover and return to boiling point; simmer for 10 minutes or until fish flakes easily when tested with a fork. Drain, remove skin and bones. Flake.

Cook noodles as directed on package; drain. Place in a well-greased 2 1/2-quart casserole. Cover with fish. Combine curry powder, butter, milk, and soup. Pour over fish and noodles. Arrange asparagus over casserole and sprinkle with cheese. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until brown. Serves six.



Federal Trade Commission

ORDER ISSUED AGAINST PRICE FIXING ON KING CRABS IN ALASKA:

The Federal Trade Commission on December 31, 1956, adopted the finding of a Commission hearing examiner that United Fishermen of Alaska, a Kodiak, Alaska, affiliate of the Seafarers International Union of North America (American Federation of Labor), has engaged in conspiracy and coercion to fix the prices of raw king crabs.

The Commission made final the examiner's order (Docket No. 6368, King Crabs) prohibiting the Union and an association of boat owners or captains from doing the following things:

> Fixing or attempting to fix any price at which king crab or crab meat is to be purchased or sold;
>
> Jointly or collectively negotiating as to any such price;
>
> Coercing or compelling purchasers or sellers of king crab or crab meat to adhere to any price;
>
> Preventing or attempting to prevent any person from accepting or retaining employment in a cannery or other establishment processing king crab, with the purpose or effect of causing the establishment to maintain any particular price.

The order, however, is not construed as preventing the following things:

> Any respondent, individually, from negotiating with any canner or processor;
>
> Any association of bona fide fishermen from acting in accordance with the Fishermen's Cooperative Marketing Act;
>
> Collective bargaining between the Union and any employer with respect to wages, hours, and working conditions of Union members.

The opinion of the examiner as adopted by the Commission held that since 1952 the Union, the boat owners' association, and three canners in the area have conspired to fix prices paid by these canners for live king crabs. In addition, the opinion stated, the Union and Association have used coercive methods against a fourth canner, who refused to pay these prices.

Two of the three canners named in the complaint, issued June 27, 1955, agreed to accept a consent order, which was approved by the Commission May 3. The third company was in default, and the examiner issued an order against it. The Commission affirmed this order on December 31.

According to the examiner, since 1952 negotiations among the parties have resulted in a fixed price paid for crabs. In 1954 and 1955 this price was $9\frac{1}{2}$ cents a pound.

When one Alaska fisheries firm refused to pay more than 8 cents a pound, the examiner said, its officials were told, among other things, that it would not be allowed to operate, that it would get no crabs, and that it would get into difficulties and have trouble with its gear.

This was "in no sense a 'labor dispute' involving wages, hours, working conditions, etc.," the examiner said. Rather, he continued, here were attempts "to maintain and enforce (an illegal) combination through coercion."

The cease and desist order was published in the January 12, 1957, issue of the Federal Register.

Note: Also see Commercial Fisheries Review, October 1956, p. 103.

∝ ∝

Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

NO CHANGE IN REGIONAL PATTERN FOR SPORT FISHERIES AND WILDLIFE ADMINISTRATION:

No change will be made in the present regional pattern for the United States Fish and Wildlife Service sport fisheries and wildlife administration, it was announced January 14 by Ross L. Leffler, new Assistant Secretary for Fish and Wildlife of the Department of the Interior, at the first session of the annual winter meeting of the Service's regional directors.

There are presently five regions with headquarters at Atlanta, Ga.; Boston, Mass.; Minneapolis, Minn.; Albuquerque, New Mex.; and Portland, Ore.; in addition to an Alaskan administrative area.

A proposal for the future creation of four regions within the United States following the pattern of the four flyways for migratory waterfowl, which are the administrative responsibility of the Federal Government, was made in the first draft of the Fish and Wildlife Service reorganization plan which was revealed in November 1956.

This planning was set in motion by Public Law 1024 of the 84th Congress last summer. It was pointed out by Secretary of the Interior Fred A. Seaton at the time copies of the first plan were distributed to the staff and various national conservation organizations for study that it was not final. He said it was subject to review of Interior's new Fish and Wildlife officials as soon as appointed, and would be revised wherever necessary. A complete re-examination of the plan began immediately after Assistant Secretary Leffler's appointment, and his announcement followed.

Eighty-Fifth Congress (First Session)

Listed below are the public bills and resolutions and reports that directly or indirectly affect the fisheries and allied industries. Public bills and resolutions are shown when introduced; from month to month the more pertinent reports and hearings, or chamber actions on the bills shown are published; and if passed, the date when signed by the President.

OPENING OF THE FIRST SESSION: The first session of the 85th Congress convened on January 3, 1957.

ALASKA FISHERIES TRANSFER (ALASKA ORGANIC ACT): H. R. 2133 (Bartlett) introduced in the House on January 7, a bill to amend the Organic Act of Alaska and other purposes; to the Committee on Interior and Insular Affairs. Would amend the Alaska Legislative Assembly Act to transfer control of the fisheries and game resources from the Department of the Interior to Alaska, but excepts fur-seal or sea-otter fisheries and supervision or control of the Pribilof Islands; which shall remain under control of the Department of the Interior as heretofore.

ALASKA SALMON TRAP ELIMINATION: H. R. 3015 (Bartlett) introduced in the House January 16, a bill to provide for the gradual elimination of salmon traps in the waters of Alaska; to the Committee on Merchant Marine and Fisheries.

Also: introduced in the House January 28: H. R. 3761 (Dingell)--Similar to H. R. 3015.

ALASKA STATEHOOD: H. R. 340 (Mack of Illinois) introduced in the House January 3, a bill to enable the people of Alaska to form a constitution and State government and to be admitted to the Union on an equal footing with the original States; to the Committee on Interior and Insular Affairs.

Also: introduced January 3: H. R. 1242 (Saylor), H. R. 1243 (Saylor) for Hawaii and Alaska, S. 49 (Murray and 24 other senator--are similar to H. R. 340 and referred to the respective House and Senate Committee on Interior and Insular Affairs.

AID TO BUSINESS AND OTHERS INJURED BY TARIFF REDUCTIONS: H. R. 457 (Smith of Mississippi) introduced in the House January 3, a bill to provide Federal assistance to business enterprises, communities, and individuals injured by tariff reductions; to the Commitee on Ways and Means. This bill, called the "Federal Tariff Reduction Adjustment Act," sets up a Trade Adjustment Board unaffiliated with any agency or department of the Federal Government. The Board shall receive and consider any application for adjustment assistance under this Act which is filed by a business enterprise, or by the community in which such enterprise is located, or

by the employees of such enterprise, alleging that the applicant is being injured or threatened with injury as a result of tariff reductions by the United States. Adjustment assistance will be provided by grants-in-aid to States and will include funds for (1) retraining of employees; (2) loans to assist in the rehabilitation of communities which have been injured by tariff reductions; (3) loans to communities for development of new employment opportunities; (4) extension of 90 days during which unemployment insurance may be paid to employees displaced from their employment by reason of tariff reductions. In addition the bill provides for loans to business enterprises injured by tariff reductions for diversifying production, modernizing plant and production facilities, and moving to more favorable producing areas. Also accelerated amortization of certain facilities.

CHEMICAL ADDITIVES IN FOOD: H. R. 4432 (Sullivan) introduced in the House February 5, a bill to protect the public health by amending the Federal Food, Drug, and Cosmetic Act so as to provide for the safety of chemical additives in food; to the Committee on Interstate and Foreign Commerce. Provides that no person shall introduce or deliver for introduction any chemical additive, unless the use of such chemical additive has been approved by the Secretary of Health, Education, and Welfare. Sets up an Advisory Committee for determining whether or not "chemical additives" are harmful to the consuming public when deemed advisable by the Secretary or upon notification from the applicant. The advisory Committee will report, after independent study of the proposal, to the Secretary. If the Secretary and his advisory Committee have refused to approve the application, the applicant may file objections thereto and request a public hearing.

DEPLETION ALLOWANCE FOR TRANSPORTATION OF MOLLUSK SHELLS: H. R. 484 (Thompson of Louisiana) introduced in the House January 3, a bill to provide that the transportation of mollusk shells (including clams and oyster shells) from the point of extraction to the dockside shall be taken into account in computing percentage depletion; to the Committee on Ways and Means.

Also: introduced in the House January 3: H. R. 1067 (Boggs); January 5: H. R. 2034 (Thompson of Texas)--similar to H. R. 484.

DISTRICT OF COLUMBIA FISH AND GAME LAWS: S. 532 S. 532 (Beall) introduced in the Senate January 10, a bill to revise and modernize the fish and game laws of the District of Columbia, and for other purposes; to the Committee on the District of Columbia.

Also: introduced January 10; H. R. 2454 (Hyde)-- similar to S. 532.

DUMPING PROHIBITED IN COASTAL WATERS: H. R. 5046 (Dorn) introduced in the House on February 19, a bill to aid naviagation and protect the fishing industry in the waters adjacent to New York City by prohibiting the dumping of certain materials in said waters; to the Committee on Public Works.

EQUAL PAY FOR WOMEN: S. 817 (Smith of New Jersey and others) introduced in the Senate January 25, a bill to prohibit discrimination on account of sex in the payment of wages in commerce or in the production of goods for commerce, and to provide procedures for assisting employees in collecting wages lost by any such discrimination; to the Committee on Labor and Public Welfare.

Also: introduced in the House January 3: H. R. 651 (Green of Oregon), H. R. 715 (Kelly), H. R. 840 (Multer); February 6: H. R. 449 (Addonzio); February 14: H. R. 4825 (Roosevelt)--are similar to H. R. 715.

FAIR LABOR STANDARDS ACT INCREASED COVERAGE: H. R. 4697 (Roosevelt), introduced in the House on February 11, a bill to amend the Fair Labor Standards Act of 1938, as amended, to provide coverage for employees of employers who are engaged in activities affecting interstate commerce, to eliminate certain exemptions, and for other purposes; to the Committee on Education and Labor. Continues the exemption for any employee employed in catching, taking, harvesting, cultivationg, or farming of any kind of fish, shellfish, crustacea, sponges, seaweeds, or other forms of animal or vegetable life.

Also: introduced in the House February 11: H. R. 4708 (Thompson of New Jersey); February 14: H. R. 4844 (Wier). Introduced in the Senate February 18: S. 1267 (Morse, Murray, Needy, and McNamara); February 19: S. 1273 (McNamara, Murray, and Morse). Introduced in the House February 19: H. R. 5018 (Holland); February 20: H. R. 5119 (Forand)--All similar to H. R. 4697, but wording varies in some bills; all House bills referred to the Committee on Education and Labor and Senate bills to the Committee on Labor and Public Welfare.

FISH AND WILDLIFE SERVICE POSITIONS: H. R. 3650 (Reuss) introduced in the House January 24, a bill relating to positions in the United States Fish and Wildlife Service; to the Committee on Merchant Marine and Fisheries. Provides for restoring the competitive merit system to the Fish and Wildlife Service by limiting the number of appointments under Schedule C, or noncompetitive positions, to the Assistant Secretary of Interior for Fish and Wildlife and the Commissioner of Fish and Wildlife.

NATIONAL POLICY: H. R. 612 (Donohue) introduced in the House January 3; a bill to establish a sound and comprehensive national policy with respect to fisheries; to create and prescribe the functions of the United States Fish Commission; to strengthen the fisheries segment of the national economy; and for other purposes; to the Committee on Merchant Marine and Fisheries. Similar to numerous bills introduced in the 84th Congress (Second Session). See Commercial Fisheries Review, January 1956, p. 64.

FISHING FLEET MAINTENANCE: H. R. 3059 (King) introduced in the House January 16, a bill to amend Title V of the Merchant Marine Act of 1936, as amended, to promote the maintenance of the American fishing fleet under competitive conditions and in the interest of sustained fish food supplies in case of emergency and for other purposes; to the Committee on Merchant Marine and Fisheries. A new section to Title V of the act provides that:

"

"Sec. 512. (a) Any qualified fisherman who is a citizen of the United States, or any corporation of the United States engaged in fishing, may make application to the Federal Maritime Board for construction-differential subsidy to aid in the construction of a new fishing vessel or vessels.

"(b) No such application shall be approved by the Board until it determines (1) that the applicant will aid in the development of the fishery trade and will declare his or its readiness, respectively, to use the vessel or vessels for either intensified fish food supplies or for military or naval purposes in time of war or national emergency, (2) that the applicant possesses the ability, experience and other qualifi-

cations necessary to enable it to operate and maintain the proposed new vessel or vessels, and (3) that the granting of the aid applied for is reasonably calculated to replace worn out or obsolete tonnage with a new or modern vessel or vessels.

"(c) No subsidy shall be awarded pursuant to this section if the applicant does not show sufficiently that the fish or fishery products he or it is producing or intends to produce suffer from foreign competition and that the subsidy is needed to keep the American fishing fleet in such status of efficiency as is necessary to meet the foreign competition.

"(d) The Board shall adopt appropriate rules and prescribe for the administration of the provisions of this section."

FISH HATCHERIES: H. R. 662 (Gavin) introduced January 3; a bill to provide for the establishment of a fish hatchery in the Northwestern part of Pennsylvania.

H. R. 3647 (Reuss) introduced in the House January 24, a bill to provide for the establishment of a fish hatchery in the State of Wisconsin.

H. R. 3970 (Dingell) introduced in the House January 29, a bill to provide for the establishment of a fish hatchery in the State of Michigan.

Also: H. R. 4268 (Dingell) introduced in the House February 4 similar to H. R. 3970. All the above referred to the Committee on Merchant Marine and Fisheries.

HAWAII STATEHOOD: H. R. 339 (Mack of Illinois), a bill to enable the people of Hawaii to form a constitution and State government and to be admitted to the Union on an equal footing with the original States; to the Committee on Interior and Insular Affairs.

Also: introduced in the House January 3: H. R. 628 (Engle); H. R. 848 (O'Brien of New York); H. R. 1243 (Saylor); Hawaii and Alaska: H. R. 1246 (Saylor); introduced in the Senate January 7: S. 50 (Murray); All referred to the Senate Committee on Interior and Insular Affairs. All similar to H. R. 339.

IMPORT QUOTAS: H. R. 300 (Lane), introduced in the House January 3, a bill to regulate the foreign commerce of the United States by establishing import quotas under specified conditions, and for other purposes; to the Committee on Ways and Means. Authorizes the adjustment of duty rates on imports, the establishment of import quotas, to stabilize imports under conditions of fair competition, and to establish the basis for an expanding foreign trade of the United without creating hardship for domestic industry, agriculture, and labor. The industries producing articles or merchandise for shipment to the United States from other countries, under this Act, will be classified with respect to wage payments in seven groups ranging between 15 and 75 percent or more of the domestic rate.

Also: introduced in the House January 10: H. R. 2566 (Patterson); January 14: H. R. 2776 (Bailey), H. R. 2821 (Mason), H. R. 2836 (Seeley-Brown); January 17: H. R. 3214 (Davis of Georgia); February 11: H. R. 4670 (Tollefson)--all similar to H. R. 300.

IMPORTED FOOD PRODUCTS STANDARDS: H. R. 530 (Andresen) introduced in the House January 3, a bill to provide for standards to be prescribed by the Secretary of Agriculture governing imported agricultural products; to the Committee on Agriculture. Provides that United States regulations which prescribe standards or requirements for the labeling, packaging, quality, sanitation, or standards of identity, in respect to the production, manufacture, processing, packaging, distribution, or handling of any product of plant or animal life used or intended to be used as food for human and animal consumption in the United States, the Secretary of Agriculture shall prescribe like standards and requirements for similar products imported into the United States from foreign countries.

Also: introduced in the House January 3: H. R. 1080 (Byrnes, similar to H. R. 530.

INCOME TAX LAW REVISION IN FAVOR OF FISHERMEN: H. R. 3061 (King) introduced in the House January 16, a bill to extend to fishermen the same treatment accorded to farmers in relation to estimated income tax; to the Committee on Ways and Means.

Also: introduced in the House February 6: H. R. 4521 (Kelly)--Similar to H. R. 3061.

INSECTICIDES, STUDY OF EFFECT UPON FISH AND WILDLIFE: H. R. 783 (Metcalf) introduced in the House on January 3; a bill to authorize and direct the Secretary of the Interior to undertake continuing studies of effects of insecticides, herbicides, and fungicides upon fish and wildlife for the purpose of preventing losses of those invaluable natural resources following spraying, and to provide basic data on the various chemical controls so that forests, crops, and marshes can be sprayed with minimum losses of fish and wildlife; to the Committee on Merchant Marine and Fisheries.

LOAN INCREASE FOR SMALL BUSINESS: S. 637 (Clark) introduced in the Senate January 3, a bill to amend the Small Business Act of 1953 to increase the amount available thereunder for business loans; to the Senate Committee on Banking and Currency.

Reported favorably without amendment (Report No. 12) on January 25. Passed by the Senate without amendment on January 29. Provides for increase of $65 million in the amount available for small business.

H. R. 3109 (Spence) similar bill introduced in the House January 3; reported with amendments on January 28 and referred to the Committee of the Whole House of the Union (Report No. 3).

H. R. 3109 (Spence) was passed by the House on January 31 and subsequently vacated in favor of S. 637 (Clark). S. 637 was passed, with amendments, to include the House approved language.

S. 637 (Clark), as amended by the House, was passed by the Senate on February 1 and the bill was cleared for the President. The bill provides for an increase of $80 million in the amount available for small business loans, or from $375 million to $455 million. Th limitation on the amount of small-business loans outstanding at any one time is also increased from $150 million to $230 million.

S. 637 was signed by the President on February 11, 1957 (Public Law 85-4).

LOBSTER INTERSTATE TRANSPORTATION: S. 237 (Payne) introduced in the Senate on January 7; a bill to regulate the interstate transportation of lobsters; and to define the term "lobster" for the purpose of the Federal

Food, Drug, and Cosmetic Act; to the Committee on Interstate and Foreign Commerce. The purpose of this bill is to impose a minimum size on lobsters which may be shipped in interstate commerce or imported into the United States from foreign countries and define the word "lobster" for purposes of the Federal Food and Drug Act. It is designed to assist the states in enforcing their own laws relating to lobster fishing. The justification for regulating the minimum size of lobsters stems from both conservation and economic factors. If there is no state law governing the size of lobsters the bill would establish a minimum size of $3\frac{1}{16}$ inches measured along the center of the body shell (carapace). The measure would also make illegal the importing from a foreign nation of lobsters that would be illegal under the laws of the state into which they are imported, or in the absence of state laws lobsters less than the minimum size established by the bill could not be brought into the state. The bill is patterned after the Black Bass Act which has been in effect for several years and which prohibits the shipment in interstate commerce of fish which are illegal under the laws of the state in which the shipment originates. This bill differs from the Black Bass Act in two significant respects. The first is that this bill is somewhat broader in that in addition to barring shipments in interstate commerce it prohibits imports of lobsters that are illegal under the laws of the state involved or under the terms of this bill if there is no state law. The second difference from the Black Bass Act is that the bill defines the meaning of the word "lobster" for purposes of the Federal Food and Drug Act. Among other things the Federal Food and Drug Act prohibits the shipment in interstate commerce of food that is misbranded. With regard to lobster there has never been any adequate definition of just what species of shellfish were included under the term. As a result many crustaceans that are not really lobsters at all are shipped under the label of lobster. Such products as African rock lobster (an entirely different species than the lobster of the North Atlantic waters of the United States and Canada), crawfish, and many other species are commonly shipped and sold bearing only the label of "lobster." The bill would provide that the word lobster could be used as a label only on the species Homarus americanus, which is the lobster common to the Atlantic coastal waters of the United States northward from Cape Hatteras into Canada.

Also: introduced in the House January 10: H. R. 2445 (Hale), H. R. 2464 (McIntire), January 16: H. R. 3023 (Colfin)--All similar to S. 237, and all referred to the House Committee on Interstate and Foreign Commerce.

MARINE LABORATORY IN FLORIDA: S. 897 (Holland) introduced in the Senate January 29, a bill to provide for the construction of a fish and wildlife marine laboratory and experiment station in the Gulf Coast area of Florida; to the Committee on Interstate and Foreign Commerce.

Also: introduced in the House January 29: H. R. 3998 (Rogers of Florida) February 4: H. R. 4263 (Creamer)--referred to the House Committee on Merchant Marine and Fisheries, and similar to S. 897.

MARKETING FACILITIES IMPROVEMENT ACT: H. R. 4504 (Cooley) introduced in the House on February 6, a bill to encourage the improvement and development of marketing facilities for the wholesale handling of fresh fruits and vegetables, poultry, eggs, dairy products, and other perishable agricultural commodities and sea food as will be conducive to orderly and efficient distribution, increased consumption, and a reduction in the spread between prices paid by consumers and those received by farmers. Loans to States, public agencies, municipalities, public corporations, and private enterprise, or a combination of these, can be made up to 85 percent of the total cost of the market facility. Mortgages outstanding under the Act would be limited to $100 million.

MINIMUM HOURLY WAGE: H. R. 299 (Lane), a bill to amend the Fair Labor Standards Act of 1938 to establish a $1.25 minimum hourly wage, and for other purposes; to the Committee on Education and Labor.

Also: Introduced in the House January 3: H. R. 385 (Rodino), H. R. 556 (Barrett) $1 to $1.50 an hour, H. R. 584 (Celler), $0.75-$1.25 an hour, H. R. 617 (Doyle), H. R. 714 (Kelly), H. R. 839 (Multer), $0.75-$1.25 an hour as prescribed by section 6 (a) (1) of F. L. S. Act of 1930, H. R. 1040 (Zelenka), H. R. 1233 (Rooney); January 5: H. R. 1922 (Rodino); January 10: H. R. 2466 (McCormack) ($0.75 to $1.25 an hour); January 14: H. R. 2881 (Multer); January 16: H. R. 3087 (Santangelo); January 17: H. R. 3219 (Dingell), H. R. 3221 (Dollinger), H. R. 3230 (Green) $1.00-1.50 an hour; January 28: H. R. 3794 (Vanik), H. R. 3846 (McCormack); January 28: H. R. 3968 (Diggs), H. R. 3999 (Roosevelt); February 7: H. R. 4563 (Chycloff), $1.00-$1.35 an hour; February 11: H. R. 4694 (Roosevelt), H. R. 4706 (Shelly), H. R. 4707 (Thompson of New Jersey); February 14: H. R. 4743 (Bennett of Michigan); February 18: H. R. 4899 (Addonizio); February 19: H. R. 5019 (Holland); February 20: H. R. 5118 (Forand)--all similar, except for amount of minimum hourly wage, to H. R. 299.

NATURAL RESOURCES COMMISSION: S. 1019 (Carlson) introduced in the Senate February 1, a bill to establish a Commission on Renewable Natural Resources; referred to the Committee on Interior and Insular Affairs. The Commission would be directed to study the present condition of the renewable natural resources and the probable future demands and to formulate a program for carrying out the declared policy of Congress that "the conservation, orderly development, and sustained use of the renewable natural resources of the United States is the joint responsibility of the Federal Government, the states, the various subdivisions of government and the people thereof..." The Commission should complete its work and submit a final report to the President for transmittal to Congress not later than June 30, 1958.

NORTHWEST ATLANTIC FISHERIES COMMISSION: Protocol to the International Convention for the Northwest Atlantic Fisheries Commission, signed at Washington February 8, 1949, which protocol was signed at Washington June 25, 1956, for the United States and nine other governments (Exec. F. 85th Congress, 1st Session), was received by Senate on February 18th and referred to the Committee on Foreign Relations.

SALMON FISHERIES CONVENTION: Senate on February 11 received Protocol between the United States and Canada to the convention for the protection, preservation, and extension of sockeye salmon fisheries in the Fraser River system, signed at Washington on May 26, 1930, which protocol was signed at Ottawa on December 28, 1956 (Exec. C, 85th Cong., 1st Session); referred to the Committee on Foreign Relations.

SCHOOL LUNCH ACT TO BE EXTENDED: H. R. 3248 (Rhodes), introduced in the House January 17, a bill to amend the National School Lunch Act to permit junior colleges to participate therein; to the Committee on Education and Labor.

SHELLFISH LABORATORY IN CHESAPEAKE BAY AREA: S. 1087 (Butler and Byrd) introduced in the Senate

February 7, a bill to authorize the construction of a shellfish laboratory and experiment station in the Chesapeake Bay area, to the Committee on Interstate and Foreign Commerce.

SHRIMP IMPORT DUTIES: H. R. 475 (Thompson of Louisiana) introduced in the House January 3, a bill to provide for an ad valorem duty on the importation of shrimp; to the Committee on Ways and Means.

The bill provides that paragraph 721 (b) of the Tariff Act of 1930 (U. S. C. title 19, sec. 1001) be amended by inserting after the word "containers" the following: "shrimps, shrimp tails, and shrimp meat, fresh or frozen (whether or not packed in ice), or prepared, canned, or preserved in any manner, 35 per centum ad valorem".

SEC. 2. Paragraph 1761 of said Act (U. S. C., title 19, sec. 1201) be amended by striking out the word "shrimps" so that the paragraph will read:

"Par. 1761. Lobsters and other shellfish, fresh, or frozen (whether or not packed in ice), or prepared or preserved in any manner (including pastes and sauces), and not specially provided for."

Also: introduced in the House January 3: H. R. 1274 (Willis); January 10: H. R. 2415 (Colmer)-- both similar to H. R. 475 (Thompson of Louisiana).

SMALL BUSINESS: House Report No. 2970, Final Report of the Select Committee on Small Business, House of Representatives, Eighty-Fourth Congress, Pursuant to H. Res. 114 (A resolution creating a select committee to conduct a study and investigation of the problems of small business), 199 pp., printed. 84th Congress, 2d Session. Submitted on January 3, 1957, to the Committee of the Whole House on the State of the Union and ordered to be printed. Presents data on the position of small business in the United States economy; increasing prices and the small-business credit squeeze; toward taxation for free enterprise; breakdown of small-business "Magna Carta"; the Small Business Administration loan program; Government subsidies for research and industrial advancement; Government procurement; an appraisal of the Small Business Administration's contribution to small business; work of the committee; and the Committee's recommendations. An appendix contains a number of tables and also minority views.

SMALL BUSINESS CREDIT ACT OF 1957: S. 720 (Sparkman and others) introduced in the Senate on January 3, a bill to make credit more readily available for financing small business by insuring loans made to small business enterprises; to the Committee on Banking and Currency. The bill is designed to foster the development and growth of independent small-business enterprises; to make credit more readily available in adequate amounts on reasonable terms, and to encourage private financial institutions and investors in financing these interprises by insuring loans made to small business. The aggregate principal amount of loans with respect to which insurance may be granted shall not exceed $250,000,000 outstanding at any one time, except that after July 1, 1956, the President may increase this limit to not more than $750,000,000. A premium charge not to exceed 1½ percent a year for the insurance, payable in advance, will be charged on loans which are limited to $250,000 or loans whose maturity is in excess of five years and 32 days. A sum of $10,000,000 will be set up for an initial revolving fund and further sums may be added when needed.

SMALL BUSINESS PROBLEMS STUDY: H. Res. 166 (Thompson of New Jersey), a resolution to authorize the Select Committee on Small Business to investigate and study the problems of small business with respect to basic and applied scientific research and development work; to the Committee on Rules.

TARIFF ACT OF 1930 AMENDMENTS PROPOSED: S. S. 28 (Malone) introduced in the Senate January 7, a bill to amend the Tariff Act of 1930, and for other purposes; to the Committee on Finance.

Also: introduced in the House January 5: H. R. 1956 (Matthews), similar to S. 28, referred to the Committee on Ways and Means.

TRADE AGREEMENTS PROGRAM REPORT: H. Doc. 93, the first annual report by the President of the United States on the operations of the Trade Agreement Program: referred to the House Committee on Ways and Means, and on February 11 ordered to be printed.

UNEMPLOYMENT RELIEF IN DEPRESSED AREAS: H. R. 1087 (Celler) introduced in the House on January 3, a a bill to establish an effective program to alleviate conditions of excessive unemployment in certain economically depressed areas; to the Committee on Ways and Means. Provides for the establishment of a Depressed Areas Administration. Areas within the United States determined to have existing unemployment of not less than (1) 9 percent of the labor force for at least 18 months, or (2) 6 percent of the labor force for at least three years immediately prior to the date on which application for assistance is made under the act, shall be designated as "depressed areas."

WEATHER STATION IN GULF: H. R. 478 (Thompson of Louisiana) introduced in the House January 3, a bill to provide that one floating station shall be maintained at all times in the Gulf of Mexico to provide storm warnings for States bordering on the Gulf of Mexico; to the Committee on Merchant Marine and Fisheries.

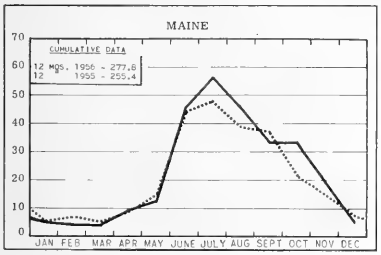
Also: introduced in the House January 10: H. R. 2419 (Colman), similar to H. R. 478.

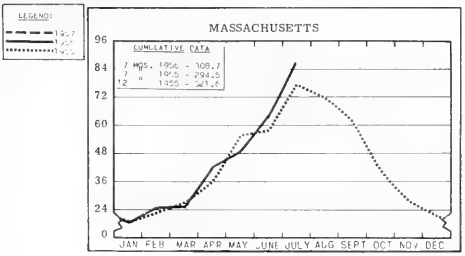
WORK WEEK: H. R. 4696 (Roosevelt) introduced in the House on February 11 a bill to reduce the maximum work week under the Fair Labor Standards Act of 1938, as amended, to 35 hours, and for other purposes; to the Committee on Education and Labor.

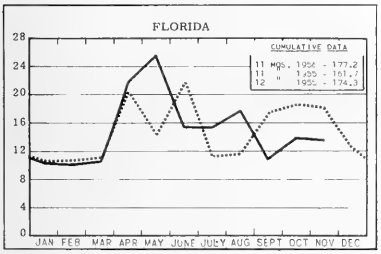
Also: introduced in the House February 11: H. R. 4705 (Shelly), February 19: H. R. 5020 (Holland), February 20: H. R. 5121 (Forand); introduced in the Senate February 14: S. 1217 (McNamara)--all similar to H. R. 4696; House bills referred to Committee on Education and Labor and Senate bill to Committee on Labor and Public Welfare.

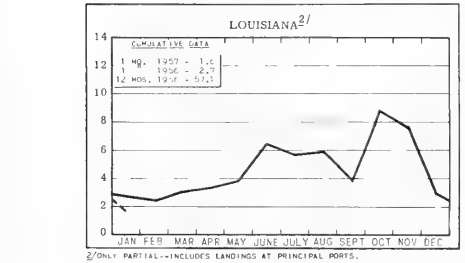
CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

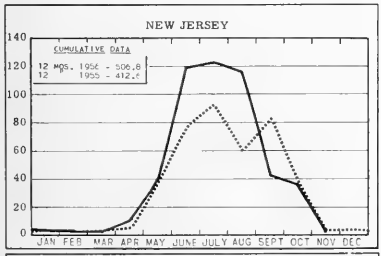


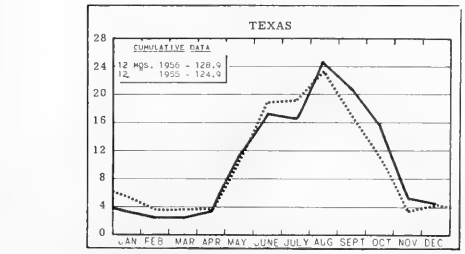


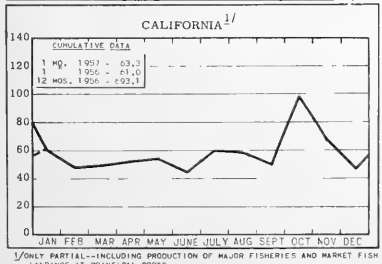




2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.







1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

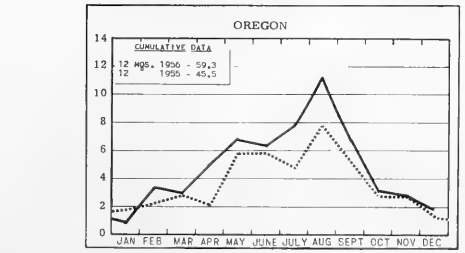
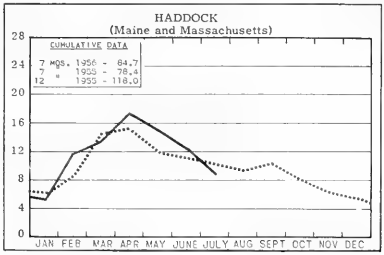
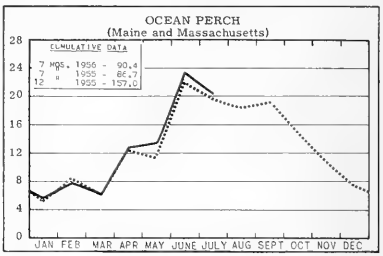


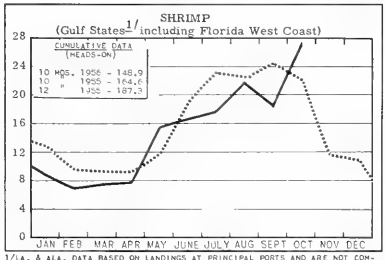
CHART 2 - LANDINGS for SELECTED FISHERIES

In Millions of Pounds

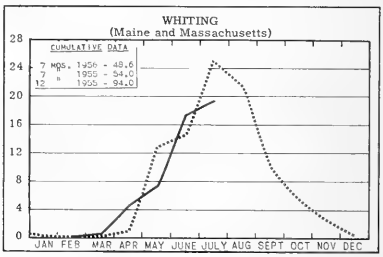




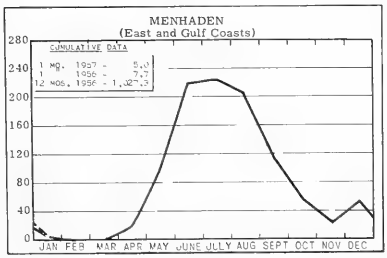
In Millions of Pounds

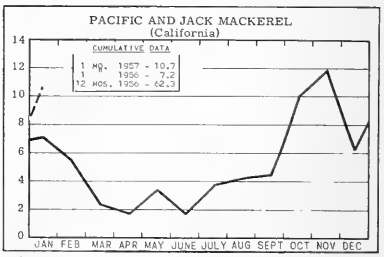


1/LA., & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

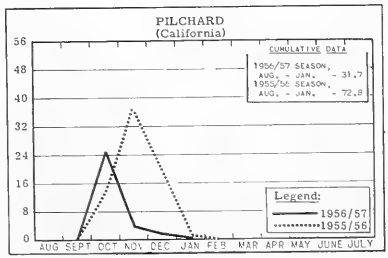


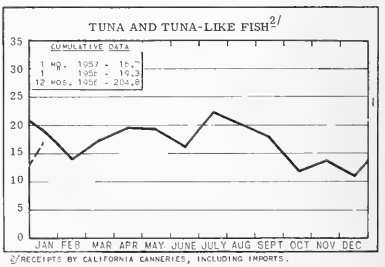
In Thousands of Tons





In Thousands of Tons

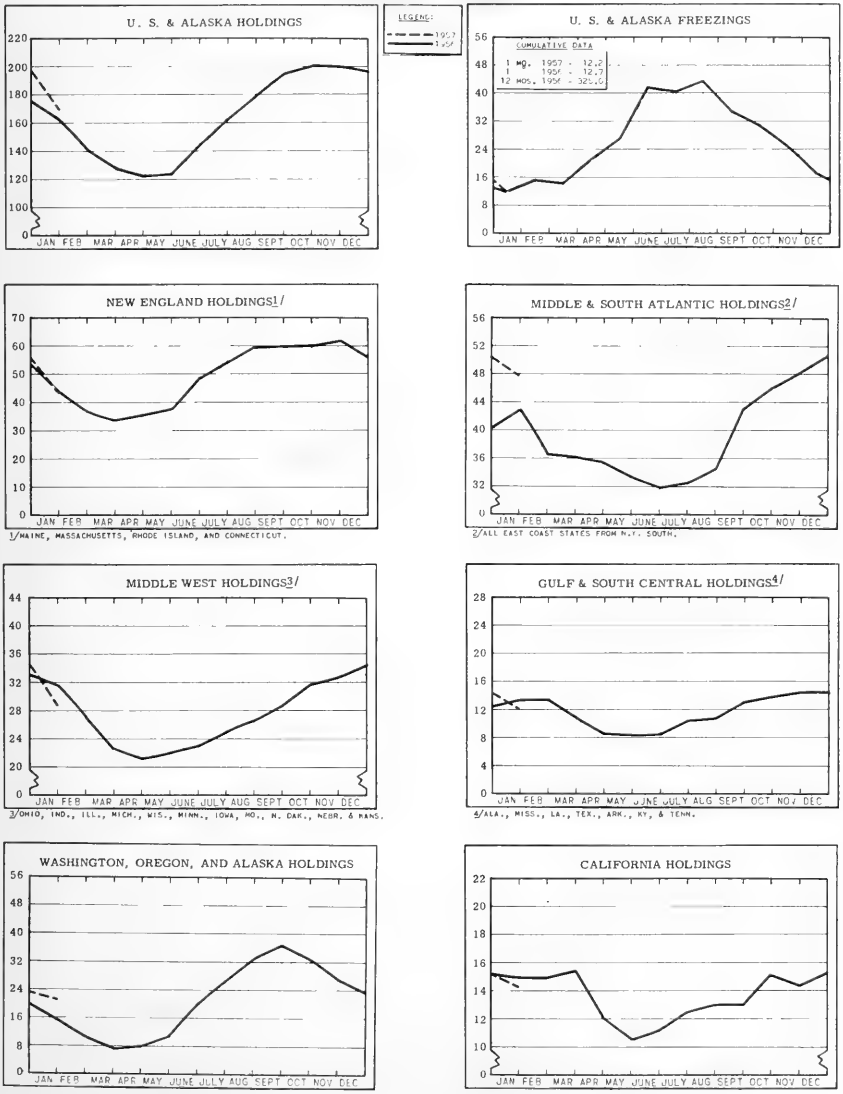




2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

In Millions of Pounds



1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.

4/ALA., MISS., LA., TEX., ARK., KY, & TENN.

*Excludes salted, cured, and smoked products.

CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pounds

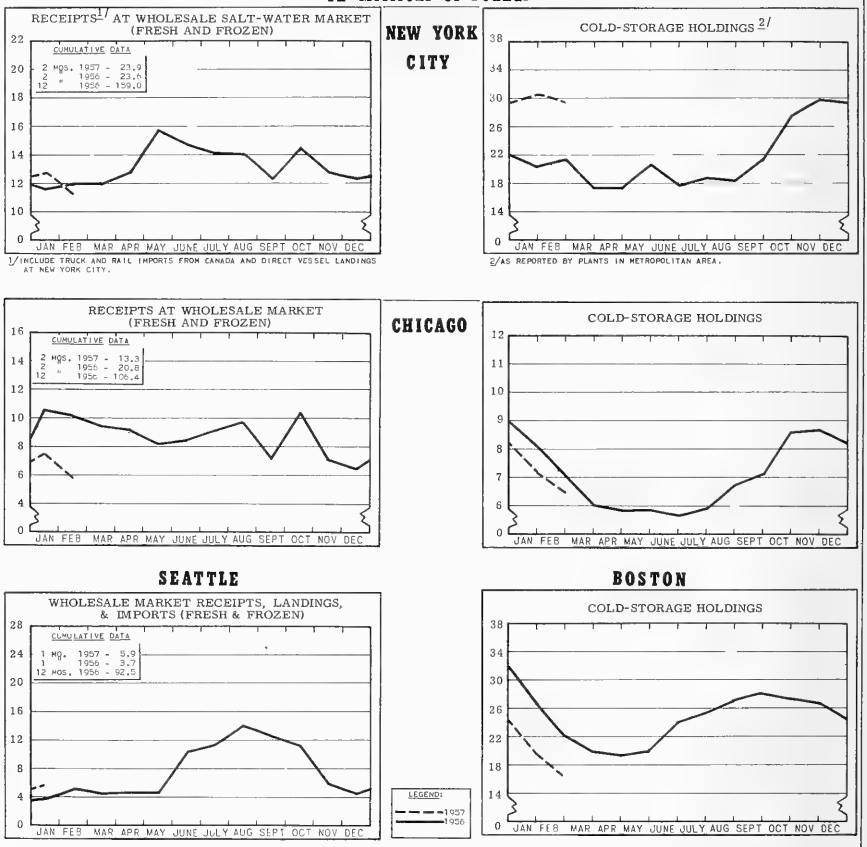


CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA

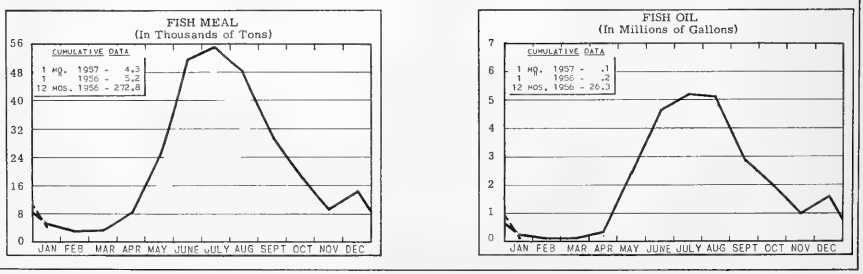
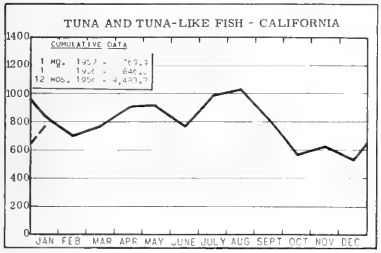
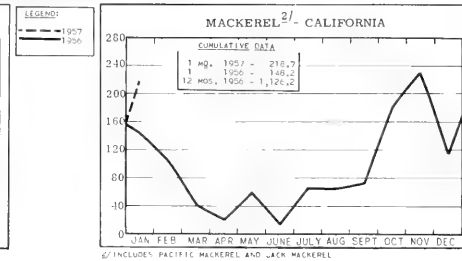


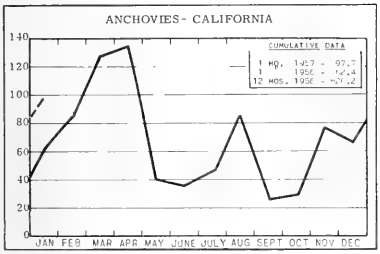
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

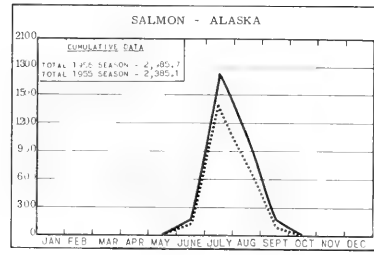
In Thousands of Standard Cases

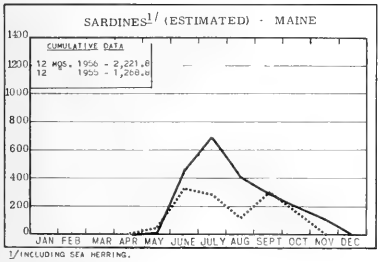




2/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL



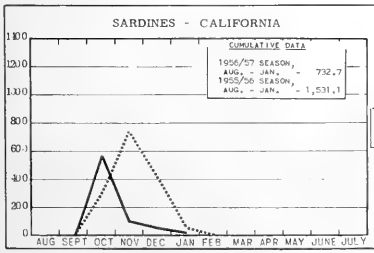


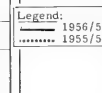


1/ INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	¼ drawn	3¼ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. ½ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	½ lb.	8 oz.





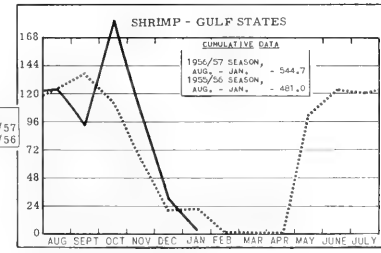
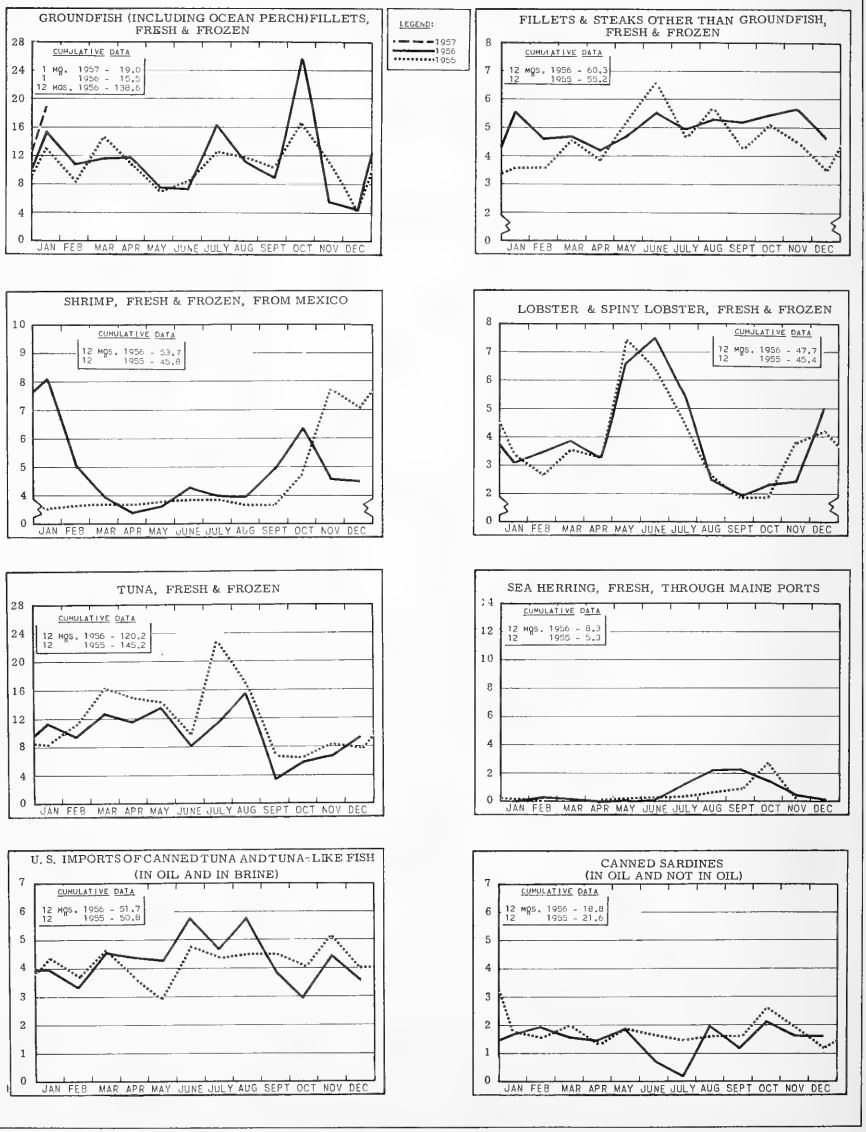


CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

In Millions of Pounds



FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
SL - STATISTICAL SECTION LISTS OF DEALERS IN AND PRODUCERS OF FISHERY PRODUCTS AND BYPRODUCTS.
FL - FISHERY LEAFLETS.
SSR - FISH. - SPECIAL SCIENTIFIC REPORTS--FISHERIES (LIMITED DISTRIBUTION).
SEP. - SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1442 - Massachusetts Landings, July 1956, 4 pp.
CFS-1451 - Frozen Fish Report, November 1956, 7 pp.
CFS-1457 - Rhode Island Landings, August 1956, 2 pp.
CFS-1458 - Maine Landings, October 1956, 3 pp.
CFS-1459 - Ohio Landings, November 1956, 1 pp.
CFS-1462 - North Carolina Landings, November 1956, 2 pp.

Wholesale Dealers in Fishery Products (Revised):
SL- 7 - New Jersey, 1956, 4 pp.
SL-22 - Oregon, 1956, 4 pp.
SL-23 - Washington, 1956, 7 pp.
SL-24 - Minnesota, Lakes Area, 1956, 1 p.
SL-28 - Michigan, 1956, 4 pp.
SL-34 - Wisconsin, Mississippi River and Tributaries Area, 1956, 2 pp.
SL-36 - Iowa, Mississippi River and Tributaries Area, 1956, 2 pp.
SL-39 - Tennessee, 1956, 1 p.
SL-40 - Oklahoma, 1956, 1 p.
SL-41 - Arkansas, 1956, 1 p.
SL-43 - Alabama, Mississippi River and Tributaries Area, 1956, 1 p.

FL -437 - Assembly Methods for Otter-Trawl Nets, 29 pp., December 1956.
FL -438 - Fishery Motion Pictures, 16 pp., 1956.

SSR-Fish. No. 186 - Sardine Eggs and Larvae and Other Fish Larvae, Pacific Coast, 1954, by Elbert H. Ahlstrom and David Kramer, 79 pp., processed, November 1956.

SSR-Fish. No. 188 - Relative Areal Zooplankton Abundance off the Pacific Coast, by James R. Thrailkill, 87 pp., illus., processed, November 1956.

Sep. No. 464 - Development of "Honeycombing" in Hawaiian Skipjack Tuna.
Sep. No. 465 - Shrimp Explorations Off the Washington Coast, Fall 1955 and Spring 1956.
Sep. No. 466 - Chemical Compounds Formed During the Spoilage of Fish.
Sep. No. 467 - Technical Note No. 36 - Determining Fish Content of Frozen Fried Fish Sticks.

THE FOLLOWING SERVICE PUBLICATIONS ARE FOR SALE AND ARE AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D. C.

"Fish Foods Purchased for Federal Hatcheries in 1955, Compared with 1945 and 1949," by William Hagen, Jr., article, The Progressive Fish-Culturist, vol. 19, no. 1, January 1957, pp. 32-39, processed, single copy 25 cents. Statistics are given on the quantity and cost of the various kinds of fish food purchased for Federal hatcheries in 1955, compared with 1945 and 1949. The constantly increasing requirement for catchable-size trout for the stocking of Federal waters and the expansion of the salmon program to meet the threat of dams on the west coast were responsible for the greatly increased production. The expansion of existing facilities and the erection of a few new hatcheries provided the space for additional production. Also to be considered is the dietary improvement that resulted in a more favorable conversion of food to fish, as well as the ability to produce more pounds of fish per cubic foot of rearing space, and per gallon of water inflow, with more modern methods.

"Production During Intensive Carp Culture in Japan," by N. Y. Kawamoto, article, The Progressive Fish-Culturist, vol. 19, no. 1, January 1957, pp. 26-31, illus., processed, single copy 25 cents. Describes a study of the relation between the productive capacity and the various conditions of a farm or pond in Japan, famous for intensive carp culture. Various conditions of an intensively managed carp farm were studied, and its productivity was considered from the physiological point of view. The rate of production of carp was higher in this farm than in any other farm in Japan. There was much more oxygen in the water entering the ponds than was needed by the carp. The author states that, "Because of the high values of pH in the water, it is believed that in these ponds carbon dioxide did not affect the carp. The rate of production in the ponds may have been affected by the pres-

ence of substances excreted by the carp. It is believed that, for increased production of carp, removal of excretory substances is more important than factors such as oxygen or carbon dioxide in the water."

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Gulf Monthly Landings, Production, and Shipments of Fishery Products, December 1956, 5 pp. (Market News Service, U.S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf States shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

(New York) Monthly Summary-October 1956--Receipts of Fishery Products at the New York City Wholesale Salt-Water Market, 4 pp.; Monthly Summary-November 1956--Receipts of Fishery Products at the New York City Wholesale Salt-Water Market, 4 pp.; Monthly Summary-December 1956--Receipts of Fishery Products at the New York City Wholesale Salt-Water Market, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 155 John St., New York 38, N.Y.) Receipts in the salt-water section of the Fulton Fish Market by species and by states and provinces for the months indicated.

Monthly Summary of Fishery Products Production in Selected Areas of Virginia, North Carolina, and Maryland, December 1956, 4 pp. (Market News Service, U. S. Fish and Wildlife Service, 18 So. King St., Hampton, Va.) Fishery production for the Virginia areas of Hampton Roads, Lower Northern Neck, and Eastern Shore; the Maryland areas of Crisfield, Ocean City, and Cambridge; and the North Carolina areas of Atlantic, Beaufort, and Morehead City; together with cumulative and comparative data; for the month indicated.

(Chicago) October 1956 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp.; November 1956 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, 565 W. Washington St., Chicago 6, Ill.) Receipts at Chicago by species and by states and provinces; freshwater fish, shrimp, and frozen fillet wholesale market prices for the months indicated.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

ANTIBIOTICS:

International Conference on the Use of Antibiotics in Agriculture, 1st, 1955, National Research Council Publication 397, 278 pp., illus., printed. National Acadamy of Sciences, National Research Council, Washington, D.C., 1956.

AUSTRALIA:

"A Critical Survey of the Marine Algae of Southern Australia. I. Chlorophyta," by H. B. S. Womersley, article, Australian Journal of Marine and Freshwater Research, vol. 7, no. 3, October 1956, pp. 343-383, printed. Commonwealth Scientific and Industrial Research Organization, 314 Albert St., East Melbourne, C.2, Victoria, Australia. This paper is a survey of all the known marine Chlorophyta of southern Australia, from the southwest corner of Western Australia to about the Victoria-New South Wales border, and including Tasmania. Full references to each species are given, all established synonomy, the type of locality of each species and where the type specimen is deposited, and a summary of the known distribution. Critical notes on many species are given also.

BROWN TROUT:

"Spawning Habits of Brown Trout," newspaper article, The Times, October 26, 1956, 1 p., The Times, London, England. Briefly describes research with brown trout which will lead to accurate predictions of fish spawning sites in streams and elimination of harmful gravels at those sites.

CANNING:

Current Technological Problems in Fish Canning, by Dr. Ernest Hess, 20 pp., printed. (Pre-printed from FAO Fisheries Bulletin, vol. IX, no. 4, October-December 1956.) Food and Agriculture Organization of the United Nations, Rome, Italy. Discusses specific problems characteristic of the fish canning industry. Deals primarily with the quality, handling, and preparation of the raw fish, mollusks, and crustaceans; relationships of container to contents; fish canning operations; and the effect of heat processing and storage on the quality of canned fishery products.

DISEASES OF FISH:

Diseases of Fishes of the Western North Atlantic (IV. Fungus Disease and Resultant Mortalities of Herring in the Gulf of Saint Lawrence in 1955), by Carl J. Sindermann, Research Bulletin No. 25, 23 pp., illus., printed. Department of Sea and Shore Fisheries, Vickery-Hill Bldg., Augusta, Maine.

FISHING EFFORT:

On the Fishing Effort in English Demersal Fisheries, by J. A. Gulland, Ministry of Agriculture, Fisheries and Food Fishery Investigations, Series II, vol. XX, no. 5, 45 pp., illus., printed, 7s. 6d. (US$1.05). Her Majesty's Stationery Office, York House, Kingsway, London W.C.2, England, 1956. The author states that, "In the study of an exploited fish population a most important factor is the fishing effort expended. Together with a knowledge of the commercial catch, the effort may be used to calculate the catch-per-unit-effort, which provides one of the most useful and widely applied indices of abundance of the exploited stock. A knowledge of the effort is even more important when assessing the relations between

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

the activities of the commercial fleet and the mortality observed in the fish stock, and hence in evaluating the possibility of overfishing and the effects of any conservation measures." The opinions of other investigators of fishing effort and fishing power are defined in the introduction of this paper, followed by chapters on calculation of fishing power; the relation of fishing power of trawlers to vessel characteristics; the fishing power of seiners; the fishing power of parejas; the relation of fishing power and performance; comparison with other results; the measurement of fishing time; and the effort and catch per unit of effort off Iceland.

FLORIDA:

Florida, Fresh-Water Fish and Fishing, 1 v., printed. Game and Fresh Water Fish Commission, Tallahassee, Fla.

Quarterly Report on Fisheries Research, September 1956, no. 56-25, 16 pp., processed. The Marine Laboratory, University of Miami, Coral Gables, Fla. Statistics are given on landings of some major species of fish and shellfish for the first six months of 1956 and 1955. Contains a brief summary of the mullet marketing study and recommendations for the minimum size of mesh in shrimp trawls. The use of sodium bisulfite to control shrimp black spot, and fish rancidity and pigmentation studies are described. Also, describes progress in the game-fish and spear-fishing surveys and other projects.

GAME FISH:

Saltwater Game Fish Research Newsletter, #8, edited by Robert W. Ellis, 8 pp., processed. The Marine Laboratory, University of Miami, Coral Gables 34, Fla., Oct. 1956. Features brief progress reports on game-fish research projects being conducted at the Marine Laboratory and topics of general interest to anglers.

GEAR:

The Effect of Electric Fields on Marine Fishes, by B. McK. Bary, Scottish Home Department Series No. 1, 32 pp., illus., printed. H. M. S. O., York House, Kingsway, London W. C. 2, England.

"How to Tan Nets, Sails, and Lines," H. Van Pel, article, SPC Quarterly Bulletin, vol. 6, no. 3, July 1956, p. 33, illus., printed. South Pacific Commission, Noumea, New Caledonia. The life of fishing nets, sails, and lines can be greatly prolonged by tanning. This article explains a simple way of carrying out this process, using a tanning solution made from the bark of the mangrove tree, found on most islands of the South Pacific.

"Purse Seining for Pilchards in Brittany," by C. M. Good, article, World Fishing, vol. 5, no. 11, November 1956, pp. 30-32, illus., printed. John Trundell Ltd., Temple Avenue, London E. C. 4, England. Describes in detail the purse seine used by the French pilchard fishermen. A sketch of the gear illustrates the construction of the net and another drawing illustrates the method of pursing used on French pilchard fishing vessels. The "chumming" techniques, using a mixture of Norwegian salt cod roe and peanut meal; the method of setting the gear; and the method of handling the catch are also described.

GENERAL:

(Atlantic States Marine Fisheries Commission) Minutes of the 15th Annual Meeting (September 21-22, 1956, Atlantic City, New Jersey), 205 pp., processed. Atlantic States Marine Fisheries Commission, 22 West First St., Mount Vernon, N. Y. Presents the minutes of the 15th annual meeting of the Commission with details of attendance, the first general session, and section and joint meetings of the North Atlantic-Middle Atlantic Sections and the Chesapeake Bay-South Atlantic Sections.

Anuario de las Industrias Pesqueras del Peru, Año 1951 (Annual Report of Peruvian Fishing Industries for 1951), 80 pp., illus., printed in Spanish. Comite de Pesca de la Sociedad Nacional de Industrias, Lima, Peru.

How the Department of Justice Helps Small Business, Small Marketers Aids No. 17, 4 pp., processed. Small Business Administration, Washington 25, D. C., November 1956.

International Commission for the Northwest Atlantic Fisheries, Annual Proceedings for the Year 1955-56, vol. 6, 74 pp., illus., printed. International Commission for the Northwest Atlantic Fisheries, Halifax, N. S., Canada, 1956. This bulletin presents the administrative report of the Commission for the year ending June 30, 1956, including financial statements; a report of the Sixth Annual Meeting of the Commission, June 11-15, 1956; summaries of research during 1955 broken down by country; and a compilation of research reports by subareas for 1955.

(International Cooperation Administration) Operations Report, Data as of June 30, 1956, FY 1956, Issue No. 4, 90 pp., illus., processed. Office of Statistics and Reports, International Cooperation Administration, Washington, D. C.

Man and the Underwater World, by Pierre de Latil and Jean Rivoire (translated from the French by Edward Fitzgerald), 400 pp., illus., printed. Jarrolds Publishers Ltd., 178-202 Great Portland St., London, England. This generously illustrated book traces the history of man's relationship to the sea from the dawn of civilization to the present. It endeavors to summarize broadly the past efforts to probe the mysteries of the underwater world which led to the eventual development of the diving equipment of today. The first six chapters dwell mostly on mythology, fables, legends, and observations of the sea from ancient times to the Renaissance. The succeeding chapters discuss: diving inventions of the Middle Ages; development of the diving-suit; beginnings of the science of oceanography; history of pearl diving; underwater explorations with spherelike diving chambers; invention of the aqualung; limits, dangers, and many advantages of skin diving; results of trawling in depths over 33,000 feet; depth ships; and speculations about underwater tourism and other such activities in future.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

A New Method for Long Term Preservation of Wood by Chemical Modification, by F.G. Walton Smith, Robert R. Bottoms, Edward Abrams, and Sigmund M. Miller, no. 1025, 6 pp., illus., printed. (Reprinted from Forest Products Journal, vol. VI, no. 9, September 1956, pp. 340-345.) Forest Products Research Society, P.O. Box 2010, University Station, Madison 5, Wisc.

Yachting World Annual 1957, 192 pp. (incl. 82 photos and 155 text illus.), $10. Philosophical Library, 15 E. 40th St., New York, N.Y., 1956. This book will interest all who have an interest in the sea. It contains articles on sailing and motor-boating. Developments in the small boat class are discussed. One article deals with the science of yacht design, and other articles cover the use of plastics for boats. In addition, the principal events of the year and reviews of yachting are covered. A design section contains plans and photographs of more than 50 yachts of all types designed by leading designers. Some of the chapters of interest to fishing interests are on science and the sailing yacht, plastics, small boats, ocean cruising, and dinghies.

GERMANY:

Jahresbericht über die Duetsche Fischerei 1955 (Annual Report of the German Fisheries 1955), 279 pp., illus., printed in German with summaries in English, DM 20 (US$4.80). Bundesministerium fur Ernahrung, Landwirtschaft und Forsten, in cooperation with Mitwirkung des Statisticschen Bendesamtes, Neuerwall 72, Hamburg 36, Germany (Publisher: Mann Bros., Berlin, Germany), October 1956. Presents 1955 statistics for fishery landings and imports in considerable detail as well as the number of vessels, new building, personnel employed, etc. In the section devoted to the main fishing ports of Bremerhaven, Cuxhaven, Hamburg-Altona, and Kiel, details are given of the firms operating trawlers, together with the number operated and the type.

GOLD COAST:

"Marine Fish Fauna of the Gold Coast," by Dr. E.A. Salzen, article, Nature, vol. 178, no. 4542, November 17, 1956, pp. 1105-1106, printed. Macmillan & Co., Ltd., St. Martin's St., London W.C.2, England. Part of the work of the West African Fisheries Research Institute is to explore the whole of the West African continental shelf for potential trawling grounds, and to determine the nature and extent of such grounds for possible future exploitation. A recent survey, described in this article, gave results which are of considerable interest because of their similarity with those obtained off French Guinea. A brief description of the results of the survey, which covered the whole of the shelf for 20 miles on either side of the port of Tema, is presented with a list of the species of fish of economic importance in this area.

HALIBUT:

The Incidental Capture of Halibut by Various Types of Fishing Gear, by F. Heward Bell, Report of the International Pacific Halibut Commission, No. 23, 28 pp., illus., printed. International Pacific Halibut Commission, Seattle, Wash., 1956. Deals with conservation and regulatory problems associated with the incidental catching of halibut by vessels primarily engaged in fishing for other species. Reviews the terms under which vessels using set-line gear have been permitted to retain halibut caught incidentally to other fishing in areas closed to regular halibut fishing. Also records and evaluates the facts that have been gradually accumulated by and available to the Commission in considering the regulation of the capture of halibut caught incidentally by vessels using set-line, troll, and bottom trawl net gear while fishing for other species.

Regulation and Investigation of the Pacific Halibut Fishery in 1955, Report of the International Pacific Halibut Commission No. 24, 15 pp., illus., printed. International Pacific Halibut Commission, Seattle, Wash., 1956. A brief report of activities of the Commission during 1955 which discusses the historical background of the Commission, 1955 regulations, statistics of the fishery, multiple open seasons, catch per unit of fishing effort, composition of catches, subcommercial size halibut, and tagging experiments.

HERRING:

Herring Tagging Techniques and Results, Rapports et Proces-Verbaux des Reunions (Reports and Verbal Proceedings of Meetings), vol. 140, part II, 54 pp., illus., printed in French and English, Kr 15 (US$2.90). Conseil Permanent International pour l'Exploration de la Mer (International Council for Exploration of the Sea), Charlottenlund Slot, Denmark, December 1955.

JAPAN:

Annual Report of Catch Statistics on Fishery and Aquiculture, 1955, Agriculture, Forestry and Fishery Statistics Bulletin 31-9, 281 pp., illus., printed in Japanese and English. Association of Agriculture-Forestry Statistics, No. 4, 1-chome, Onden, Shibuya-ku, Tokyo, Japan, September 1956. This report contains production statistics of fisheries, aquiculture, and processing of aquatic products for 1955. A general description of the survey methods and explanation of each statistical table is presented. Statistics given are: fish species and prefecture; type of fishery and prefecture; type of fishery and fish species; type of fishery, stratum, and prefecture; and monthly statistics by fish species, type of fishery, and prefecture. Appendices cover pelagic fishery on the high seas; domestic marine fishery; inland water fishery; aquiculture in shallow sea and in inland water; and statistics of processing. Illustrations and names of principal species of fish in Japan are also included.

KENYA:

Review of Kenya Fisheries, 1955, by Hugh Copley, 47 pp., illus., printed. The Government Printer, Nairobi, Kenya, 1956. Reviews the Kenya fisheries for 1955, with special reference to the river fisheries, hatchery work, fish-culture farm, and marine fisheries. The report on the marine fisheries discusses production, marketing, and exploratory and experimental work.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

It also describes the turtle fishery, processing of some shark products, application of synthetic nets and twines to fisheries, and whether or not the use of powered craft would be of economic advantage to the existing inshore fishery.

MANAGEMENT:

Managing Our Fish and Wildlife Resources (Institute), Jan. 19-20, 1956, Minneapolis Center for Continuation Study, 74 pp., illus., printed. University of Minnesota, Minneapolis, Minn., 1956.

MUSSELS:

The Great Spatfall of Mussels (MYTILUS EDULIS L.) in the River Conway Estuary in Spring 1940, by R.E. Savage, Ministry of Agriculture, Fisheries and Food Fishery Investigations, Series II, vol. XX, no. 7, 27 pp., illus., printed, 5 s. (70 U.S. cents). Her Majesty's Stationery Office, York House, Kingsway, London W.C.2, England, 1956.

A Simplified System of Mussel Purification, by Nial Reynolds, Ministry of Agriculture, Fisheries and Food Fishery Investigations, Series II, vol. XX, no. 8, 22 pp., illus., printed, 5 s. (70 U.S. cents). Her Majesty's Stationery Office, York House, Kingsway, London W.C.2, England, 1956.

NEW ZEALAND:

Fisheries, 38 pp., printed. (Extract from Parliamentary Paper H.15, 1956.) Marine Department, Wellington, New Zealand, 1956. A report on the fisheries of New Zealand which discusses spiny lobster or crayfish, fishing vessels and personnel, fish landings, methods of capture, landings at ports, ports in review, exports and imports, big-game fishing, fish liver oil, oysters, toheroa, whitebait, mussels, fresh-water fisheries and research, marine research, and legislation. Included also are statistical tables of detailed data on fisheries.

OYSTERS:

The Growth of Oysters Parasitized by the Fungus DERMOCYSTIDIUM MARINUM and by the Trematode BUCEPHALUS CUCULUS, by R. Winston Menzel and Sewell H. Hopkins, 10 pp., illus., printed. (Reprinted from The Journal of Parasitology, vol. 41, no. 4, August 1955, pp. 333-342.) Department of Biology, A. & M. College of Texas, College Station, Tex.

OYSTER PESTS:

"Oyster Pests of Past Ages," by Percy Viosca, Jr., article, Louisiana Conservationist, vol. 8, no.12, November 1956, pp. 6-9, illus., printed. Louisiana Wild Life and Fisheries Commission, 126 Civil Courts Bldg., New Orleans, La.

PORTUGAL:

Gremio dos Armadores da Pesca de Arrastro, Relatorio e Contas do Exercicio de 1955 e Orcamento para 1956 (Trawler Owners' Guild, Statement of Operations for 1955 and Budget for 1956), 48 pp., printed in Portuguese. A Comissao Revisora de Contas, Lisbon, Portugal.

PRESERVATION:

Der Fisch vom Fang bizum Verbrauch (The Fish from Catch to Consumption), by W. Ludorff and R. Kreuzer, 98 pp., illus., printed in German. Carl Th. Görg Verlag, Bremerhaven, West Germany, 1956.

Smoke Flavor and Ascorbic Acid as Preservatives for Fatty Fish, by Anna Marie Erdman, Betty M. Watts, and Loretta C. Ellias, 4 pp., printed. (Reprinted from Food Technology, vol. VIII, no. 7, 1954, pp. 320-323.) Oceanographic Institute, Florida State University, Tallahassee, Fla. Results of tests of smoke flavors to determine their preservative effect on fatty fish are reported. The fish were lightly salted and kept under refrigeration. The smoke flavors were tested alone and also in combination with ascorbic acid. Observations on the bacteriostatic effect of the smoke flavor on several typical organisms are also reported.

REFRIGERATION AND FREEZING:

Le Poisson Congele. Qualite et Emballage, Facteurs du Developpement du Marche et de la Consommation (Frozen Fish. Quality and Wrapping, Factors of Market and Consumption Development), 171 pp., illus., printed. Agence Europeenne de Productivite de l'O.E.C.E., 2, rue Andre-Pascal, Paris (16e), France. A report of the working session devoted to the improvement of quality and packaging of frozen fish. This session was held in Kiel, Germany, on March 14-19, 1955, and was sponsored by the European Productivity Agency. The first part of the report is a survey of the frozen fish industry in the various participating countries. In the second part, the full text of the papers read at the meetings and a summary of the discussions are given. The papers discussed were: handling and processing of fish for freezing; technical problems in the freezing of fish; technical problems in the packaging and storage of frozen fish; practical problems in the preservation of the quality of frozen fish during storage; transport and delivery of frozen fish; marketing and economic problems related to the production and delivery of frozen fish; and inspection of the quality of fish and fish products in Denmark, particularly in regard to frozen fish.

EL SALVADOR:

Sea Fishing and Hunting Act, Food and Agricultural Legislation XVI.3/55.1, vol. V, no. 1, 1956, 7 pp., printed, single copy $1. Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.

SHRIMP:

Deteriorative Changes in Frozen Shrimp and Their Inhibition, by Marian B. Faulkner and Betty M. Watts, 4 pp., printed. (Reprinted from Food Technology, vol. IX, no. 12, 1955, pp. 632-635.) Department of Food and Nutrition, Florida State University, Tallahassee, Fla. Describes briefly the changes which take place in shrimp during freezer storage and a method of restraining loss of color, odor, and flavor by use of ascorbic acid.

Enzymatic Darkening of Shrimp, by Marian B. Faulkner, Betty M. Watts, and Harold J. Humm, 9 pp., printed. Department of Food and Nutrition, Oceanographic Institute, Florida State

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

University, Tallahassee, Fla. Briefly reports evidence of the cause of "black spot" and discusses methods of bleaching and controlling blackening of fresh shrimp.

The Texas Shrimp Fishery, by William C. Guest, Bulletin No. 36, Series No. V, Marine Laboratory, 23 pp., illus., printed. Texas Game and Fish Commission, Austin, Texas, 1956. A summary of the information available on the many phases of shrimp biology and the commercial fishery in Texas. Describes and illustrates the different types of shrimp that occur in the Gulf of Mexico and in Texas bays and gives the distinguishing characteristics of the commercial shrimp. Also describes briefly the life histories of the commercial shrimp; the commercial shrimp fishery; shrimp operations; shrimp trawl, webbing, construction, and measurement; and the bait shrimp fishery.

TARIFFS AND TRADE:

General Agreement on Tariffs and Trade--Third Protocol of Supplementary Concessions, Treaties and Other International Acts Series 3629, 14 pp., processed, 10 cents. Department of State, Washington, D.C., 1956. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.)

General Agreement on Tariffs and Trade--Fourth Protocol of Supplementary Concessions, Treaties and Other International Acts Series 3630, 13 pp., processed, 10 cents. Department of State, Washington, D.C., 1956. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.)

TERRITORIAL WATERS:

(International Law Commission) Report of the International Law Commission on the Work of its Eighth Session, A/C.6/L.378, October 25, 1956, 248 pp., processed. United Nations, International Law Commission, New York, N.Y. A reference guide to the articles concerning the Law of the Sea adopted by the International Law Commission at its eighth session.

TRANSPORTATION:

Food Transportation and What It Costs Us, Miscellaneous Publication No. 738, 23 pp., illus., printed, 15 cents. Marketing Research Division, Agricultural Marketing Service, U.S. Department of Agriculture, Washington, D.C., November 1956. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.) Describes the different methods of food transportation, the proportion of the food dollar that goes to pay for transportation, transportation costs to consumers, the share charged for supplemental services, and recent trends in transportation charges.

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Alma Greene, Helen Joswick, and Helen Turner

* * * * *

Photograph Credits: Page by page, the following list gives the source or photographer for each photograph in this issue. Photographs on pages not mentioned were obtained from the Service's file and the photographers are unknown.

Cover--The Great Atlantic and Pacific Tea Company; p. 4, fig. 6--Simonds Saw and Steel Company, Fitchburg, Mass.; pp. 16, 17, 18, and 19--F. Bruce Sanford.

INT.-DUP. SEC., WASH., D.C13800

CONTENTS (CONTINUED)

KNOT

"Knot" is a unit of velocity equal to one nautical mile (about 6,080 feet) an hour. The term was used in former times when a knotted line and old-fashioned sand glass were the equipment used to estimate the speed of a vessel.

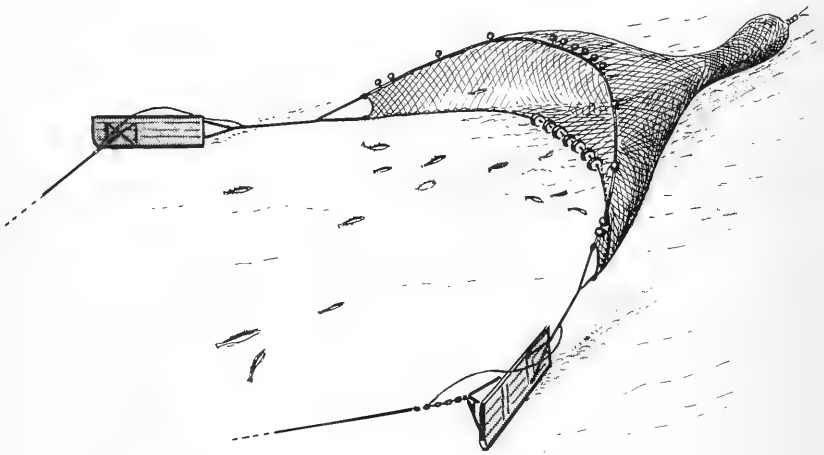
The sand glasses used were similar to those sometimes employed nowadays for timing the boiling of an egg, in which the proper time for cooking was measured by the time taken for sand to run down from one end of a two-bulbed glass to the other. A common sand glass used at sea had sufficient sand to require 28 seconds to run down.

The line had a zero mark and at intervals of about 47 feet was knotted with pieces of string or rag. One end of the line, with a chip of wood attached, was thrown overboard. As the zero mark passed the rail the glass was inverted and the number of knots that ran out were counted during the time taken for the sand to run down. Since the distance between knots was the same proportion to a nautical miles as 28 seconds to an hour, the number of knots was equal to the speed of the ship in nautical miles per hour. Thus the number of nautical miles an hour is designated as the number of knots, and it is incorrect to say "knots per hour."

--Sea Secrets, The Marine Laboratory, University of Miami, Coral Gables, Fla.

ASSEMBLY METHODS FOR OTTER-TRAWL NETS

Fishery Leaflet 437 (Assembly Methods for Otter-Trawl Nets) describes with a minimum of text and many illustrations the type and assembly of standard trawl nets. "The proper assembly of the otter trawl is one of the most difficult problems faced by trawler fishermen," points out the author. Improper hanging of the otter trawl net reduces the efficiency of the otter trawl considerably. Efficient fishing performance of the trawl net is contingent upon proper and precise assembly of web sections and net rigging. Correctly rigged, the doors of the otter trawl keep the mouth of the net open by operating at an outward angle from the direction of the towed trawl. This angle varies between 30° and 40°.

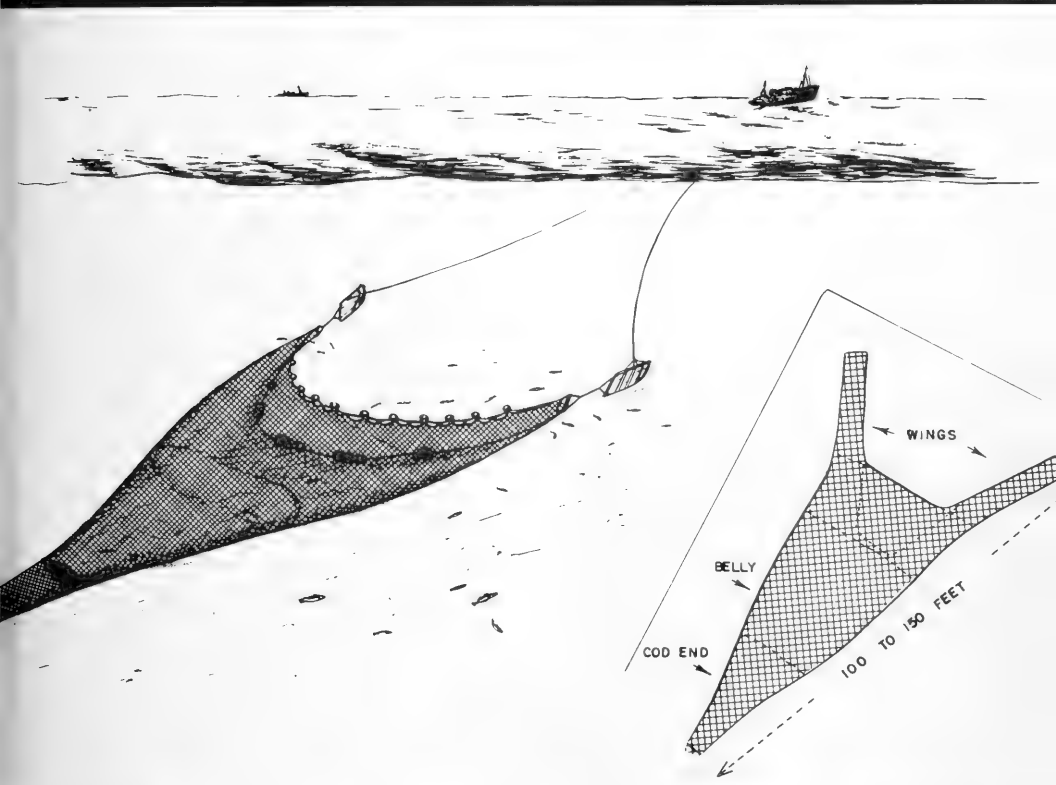


Methods of lacing two parts of webbing are described. In addition, assembling an Iceland trawl net and bending the trawl net are also described. In the discussion on bending the trawl net, the author illustrates attaching the head rope, floats, attaching the foot rope, belly lines, door ends, quarter ropes, footrope rollers, the splitting strap, and the cod-end rope.

Three tables are included giving specifications of cotton, manila, and synthetic twines.

Free copies of FL 437 may be obtained from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C.

COMMERCIAL FISHERIES REVIEW



Vol. 19, No. 3 MARCH 1957

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor
J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Type of bottom net used by many vessels fishing for groundfish on northwest Atlantic fishing banks.

Contents Continued p. 81

COMMERCIAL FISHERIES REVIEW

March 1957 Washington 25, D.C. Vol. 19, No. 3

BOTTOM TRAWLING EXPLORATION IN THE STRAIT OF JUAN DE FUCA--FEBRUARY TO MARCH 1956

By Melvin R. Greenwood*

SUMMARY

Bottom fish exploration in the Strait of Juan de Fuca was carried out during February and March 1956 by the U. S. Fish and Wildlife Service's exploratory fishing vessel John N. Cobb. The rough bottom of the Strait caused considerable gear damage, especially in the western part, but some clear trawling areas were found. Results were generally poor from a commercial fishing standpoint with noncommercial fish, mostly dogfish and ratfish, dominating the catches in all areas. Some fair showings of lingcod and true cod were found, with smaller catches of rockfish and flatfish. Four species of commercial shrimp were caught over a large area in beam trawls, but only in small quantities. Winter weather conditions did not seriously interfere with the fishing operations.

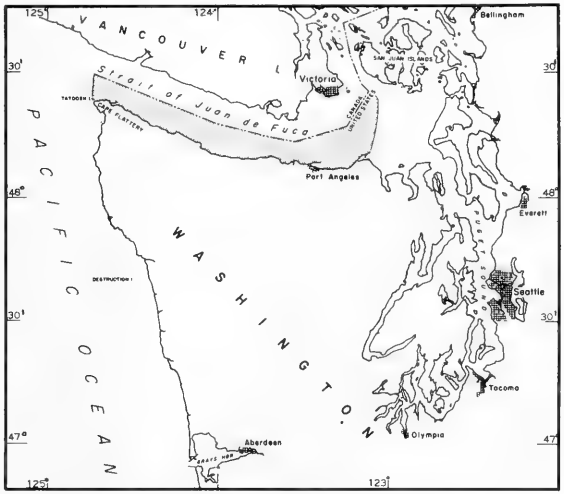


FIG. 1 - NORTHERN COAST OF WASHINGTON. SHADED AREA IN THE STRAIT OF JUAN DE FUCA WAS EXPLORED BY THE JOHN N. COBB.

INTRODUCTION

The Service's exploratory fishing vessel John N. Cobb explored with bottom trawls the United States side of the Strait of Juan de Fuca, from February 15 to March 9, 1956. Objectives were to determine the trawlability of the bottom and to determine species and quantities of bottom fish available to commercial fishing methods at that time of year.

Limited trawling had been carried out in certain parts of the Strait in the past, but this was the first attempt at systematic coverage. Past experience of commercial fishermen indicated that the Strait was generally hazardous for trawling, especially in the western reaches; however, the exact extent of trawlable bottom was not known. If some productive trawling ground was found in the Strait it could be used, especially by the smaller vessels, during periods of bad weather on the offshore grounds or to "top off" a trip on the way home.

* FISHERY METHODS AND EQUIPMENT SPECIALIST, EXPLORATORY FISHING AND GEAR DEVELOPMENT SECTION, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

GEAR USED

A standard 400-mesh western otter trawl with a $4\frac{1}{2}$-inch stretched-mesh cod end was used on all drags for bottom fish. (Specifications for this trawl are described by Alverson 1951.)

A 20-foot beam trawl with bags of 36-thread $1\frac{1}{2}$-inch mesh and 15-thread $1\frac{1}{4}$-inch mesh cotton webbing, 150 meshes deep, was used for shrimp. (Details of the beam trawl are described by Ellson and Livingstone 1952.)

FIG. 2 - MENDING THE OTTER TRAWL ABOARD THE JOHN N. COBB WAS A FREQUENT CHORE, RESULTING FROM THE ROUGH BOTTOM IN MUCH OF THE STRAIT.

TRAWLING BOTTOM

The Strait of Juan de Fuca spans some 70 miles from end to end, and the United States side varies in width from 4.5 to 8 miles, except the eastern part which spreads out into Haro Strait and Admiralty Inlet. The bottom cross-sectional profile is roughly U-shaped with the slope usually dropping off rather abruptly to 50 or 60 fathoms (100 fathoms in the western end) and then more gradually to the greatest depths. As a result, nearly all drags were made in water over 50 fathoms deep. The greatest depths in the strait range from about 155 fathoms at the western end to about 70 fathoms north of Green Point. North of Dungeness Spit the water again deepens to about 95 fathoms.

The bottom of the well-traveled Strait was found to be strewn with debris. Among items commonly picked up in the otter trawl were clinkers, old tires, discarded vessel fittings, and pieces of water-soaked wood of various sizes. Bottom samples taken with a snapper-type sampler in connection with the fishing operations showed considerable variation in bottom types, even within relatively contained areas. Mud, sand, gravel, shell, stone and rocky bottom areas were widespread.

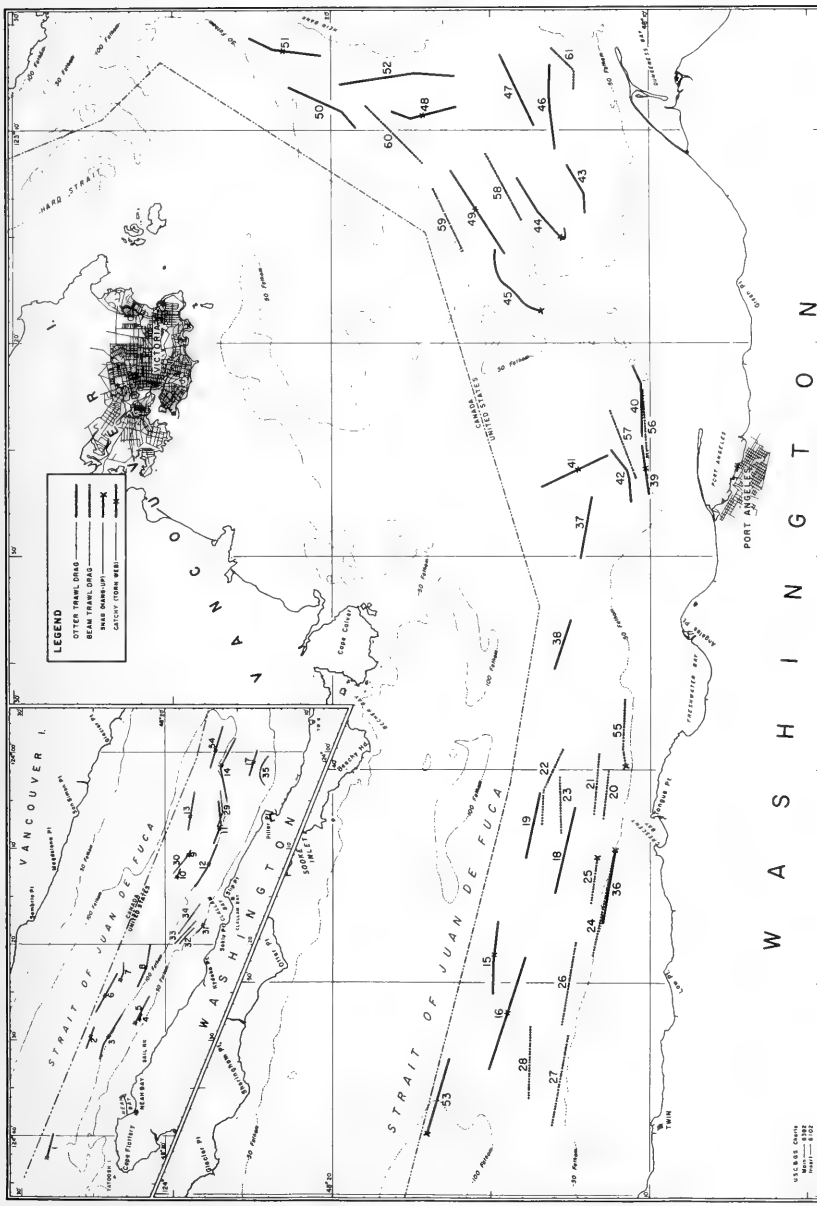


FIG. 3 - LOCATION OF OTTER-TRAWL DRAGS AND BEAM-TRAWL DRAGS IN THE STRAIT OF JUAN DE FUCA.

Most mud bottom was found on drags made in the central part of the Strait from Kydaka Point to Port Angeles. Sand and gravel bottom was not uncommon west of Kydaka Point, but the bottom here was generally harder with considerable outcroppings of rock and boulders on the steep side slopes. The bottom on drags in the extreme eastern end of the Strait was found to be quite hard with only a few samples showing sand, gravel, shell and stones.

Although a number of likely-looking trawling areas were located on navigational charts, subsequent examination with the aid of a recording depth sounder revealed the majority to be unsuitable for otter-trawl gear. Even after careful analysis of charts and depth-sounding records, out of 38 otter-trawl drags only 12 came through absolutely clear. On the remainder some damage to the net occurred.

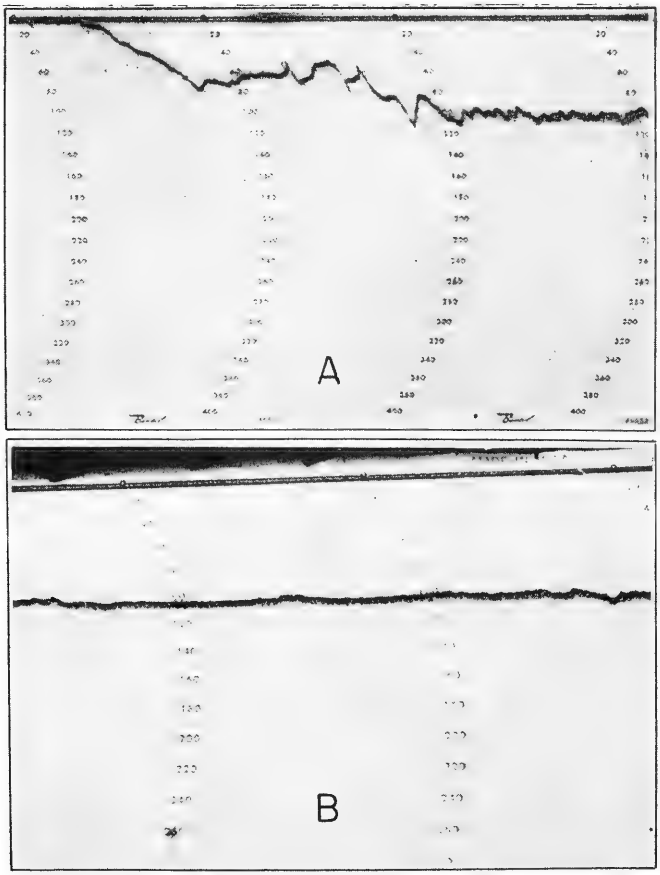


FIG. 4 - FATHOGRAMS OF THE BOTTOM IN THE STRAIT OF JUAN DE FUCA.
A. CROSS-SECTION OF BOTTOM BETWEEN NEAH BAY AND CAPE FLATTERY.
B. BOTTOM ON DRAG NO. 3, IN WHICH THE NET WAS BADLY TORN.

Drag number 8 made in 112 to 118 fathoms north of Kydaka Point was the only otter-trawl drag out of 16 made west of Twin to come through completely clear. However, five of the drags made from Slip Point to Pillar Point in 54 to 96 fathoms came through with relatively minor damage to the net (see fig. 3 and table 1).

East of Twin, 4 out of 22 otter-trawl drags resulted in severe damage to the net. Seven others tore-up slightly, and 11 came through clear. While no particular section in this area can be declared absolutely free from snags and obstructions, the safest part appears to be from Twin to Port Angeles, where six drags made in 72 to 91 fathoms and four drags made in 44 to 74 fathoms suffered little or no gear damage. The "pocket" lying between Green Point, Dungeness Spit, and Hein Bank is relatively free from serious obstacles except near the end of the submarine ridge that extends north from Green Point where two drags hung up.

FIG. 5 - EMPTYING THE COD END ON DECK OF THE JOHN N. COBB. MOSTLY BOTTOM DEBRIS AND NONCOMMERCIAL FISH WERE TAKEN IN THIS DRAG.

A total of 23 beam-trawl drags made at depths from 49 to 118 fathoms from Kydaka Point to Hein Bank indicate that much of the bottom is satisfactory for this type of gear. The only two drags that resulted in considerable damage to the beam trawl were made within the 57- to 68-fathom depth range a short distance off Tongue Point.

FISHING RESULTS

In general, from a commercial fisheries viewpoint, fishing results were poor. Although several species of fish having commercial value were taken throughout the area, noncommercial fish (including ratfish, dogfish, skates, and arrow-toothed flounder or turbot) dominated the otter-trawl catches. Shrimp were present, but were not found in commercial quantities. Detailed results of otter-trawl and beam-trawl drags are tabulated in tables 1 and 2.

The fact that some clear trawling bottom was found in various parts of the Strait and that several kinds of marketable trawl fish were present could mean that at

other times of the year profitable fishing might be found there. This is true of other trawling grounds where the abundance of the fish varies seasonally.

NONCOMMERCIAL FISH: Noncommercial fish were taken in amounts from 150 to to 4,390 pounds per one-hour drag 1/ and the majority of drags took over 950 pounds each. The largest catch included 2,300 pounds of ratfish and 2,000 pounds of dogfish taken in drag number 18 off Crescent Bay in 76 to 81 fathoms. The largest

FIG. 6 - NONCOMMERCIAL FISH DOMINATED MOST OF THE CATCHES. THIS CATCH WAS PREDOMINANTLY DOGFISH, RATFISH, AND SKATES.

catch of turbot or arrow-toothed flounder (500 pounds) was taken in drag number 37 off Port Angeles in 72 to 76 fathoms, and the best catch of skate (600 pounds) was in drag number 40 in 44 to 51 fathoms also off Port Angeles.

FOOD FISH: Lingcod and true cod were caught in many of the drags and were the dominant food fish taken throughout the entire area. Except for these and rockfish, no other species of food fish was taken in amounts greater than 35 pounds per drag.

Lingcod: The best catch of lingcod, 335 pounds, was taken in drag number 8 off Kydaka Point in 112 to 118 fathoms. The next largest catch, 248 pounds, was in drag number 50 off Hein Bank in 56 to 66 fathoms. Two other drags caught 75 pounds of lingcod off Sail Rock in 101 to 109 fathoms and off Hein Bank in 70 to 79 fathoms. Lingcod were taken in 17 other drags in amounts of 45 pounds or less.

True cod: The best catch of true cod, 400 pounds, was made in drag number 37 off Port Angeles in 72 to 76 fathoms; 60 to 70 pounds of marketable size true cod were taken in four other drags off Sail Rock, off Slip Point and off Port Angeles.

Flatfish: Several species of flatfish were found distributed throughout the Strait, but they were caught only in small numbers. No single species, except halibut, was taken in amounts greater than 7 pounds per drag. Miscellaneous flatfish caught included Dover sole, English sole, petrale sole, flathead sole, rex sole, rock sole, and sand sole.

1/ DRAGS SUSTAINING SERIOUS GEAR DAMAGE NOT INCLUDED.

Rockfish: A total of 150 pounds of black rockfish were taken in drag number 3 off Sail Rock in 101 to 109 fathoms. The second best catch, 100 pounds, was in drag number 15 off Low Point in 81 to 85 fathoms. Pacific ocean perch were present in 10 drags in amounts of 15 pounds or less, and in two drags in amounts of 25 pounds and 70 pounds. Other species of red rockfish were taken in small numbers.

Shrimp: Four species of commercial shrimp were caught in small quantities with the beam trawl. Up to 30 pounds of 132-count 2/ pink shrimp, 7 pounds of 40-count side-stripe shrimp, $2\frac{1}{2}$ pounds of 46-count spot shrimp, and trace amounts of coon-stripe shrimp were taken per one-hour beam-trawl drag. All four species were found in all areas covered between Kydaka Point and Hein Bank. The best catch of pink and side-stripe shrimp were made between Twin and Freshwater Bay at depths from 57 to 76 fathoms where the bottom consists generally of mud, sand, and gravel.

FIG. 7 - A BEAM-TRAWL CATCH OF SIDE-STRIPE SHRIMP IS WEIGHED AND COUNTED. ALTHOUGH SHRIMP WERE WIDESPREAD, THEY WERE TAKEN ONLY IN SMALL QUANTITIES.

WEATHER CONDITIONS

This survey was carried out during the winter, and the weather conditions were about normal for the season. Air temperatures recorded at the start of each drag ranged from 28° F. to 47° F. and averaged 39° F. Wind velocities as high as 40 knots and precipitation in the form of rain, snow, and sleet were experienced during actual dragging operations. With the exception of the last day of fishing, however, the seas were calm to moderate. The wind, even though strong at times, changed direction frequently which did not give the seas time to build up. Fishing activities were halted on only one day when gusts of wind up to 55 knots swept the strait.

LIST OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHRIMP CAUGHT DURING BOTTOM TRAWLING EXPLORATION IN THE STRAIT OF JUAN DE FUCA--1956

FLAT FISH:	
SOLE:	
DOVER	MICROSTOMUS PACIFICUS
ENGLISH	PAROPHRYS VETULUS
FLATHEAD	HIPPOGLOSSOIDES ELASSODON
PETRALE	EOPSETTA JORDANI
REX	GLYPTOCEPHALUS ZACHIRUS
ROCK	LEPIDOPSETTA BILINEATA
SAND	PSETTICHTHYS MELANOSTICTUS
HALIBUT	HIPPOGLOSSUS STENOLEPIS
ARROW-TOOTHED FLOUNDER (TURBOT)	ATHERESTHES STOMIAS
ROUND FISH:	
HAKE	MERLUCCIUS PRODUCTUS
LINGCOD	OPHIODON ELONGATUS
POLLOCK	THERAGRA CHALCOGRAMMA
SABLEFISH (BLACK COD)	ANOPLOPOMA FIMBRIA
TRUE COD (GREY COD)	GADUS MACROCEPHALUS

ROCKFISH:	
BLACK: ORANGE-SPOTTED	SEBASTODES MALIGER
YELLOW-TAILED	SEBASTODES FLAVIDUS
PACIFIC OCEAN PERCH	SEBASTODES ALUTUS
RED: BLACK-MOUTHED	SEBASTODES CRAMERI
GREEN-STRIPED	SEBASTODES ELONGATUS
ORANGE	SEBASTODES PINNIGER
OTHER:	
DOGFISH	SQUALUS SUCKLEYI
RATFISH	HYDROLAGUS COLLIEI
SKATE: BIG	RAJA BINOCULATA
LONG-NOSED	RAJA RHINA
PRICKLY	RAJA STELLULATA
SHRIMP:	
COON-STRIPE	PANDALUS HYPSINOTUS
PINK	PANDALUS JORDANI
SIDE-STRIPE	PANDALOPSIS DISPAR
SPORT	PANDALUS PLATYCEROS

2/NUMBER OF HEADS-ON SHRIMP PER POUND.

TABLE 1 - OTTER TRAWL FISHING LOG--M/V JOHN N. COBB--CRUISE 25--STRAIT OF JUAN DE FUCA (FEBRUARY-MARCH 1956)

Area	Tatoosh Island to Sydaka Point								Sydaka Point to Twin							
Drag Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Date	2/16/56	2/16/56	2/17/56	2/17/56	2/17/56	2/18/56	2/18/56	2/18/56	2/19/56	2/19/56	2/19/56	2/19/56	2/20/56	2/20/56	2/21/56	3/6/56
Latitude N. Longitude W.	48°27.8' 124°39.8'	48°25.5' 124°30.8'	48°23.0' 124°27.3'	48°21.7' 124°27.2'	48°21.1' 124°25.3'	48°23.3' 124°23.0'	48°20.9' 124°21.9'	48°21.1' 124°20.0'	48°18.2' 124°10.2'	48°10.9' 124°12.2'	48°16.3' 124°05.1'	48°16.3' 124°09.6'	48°17.9' 124°04.2'	48°15.1' 123°58.6'	48°13.5' 123°59.7'	48°16.0' 123°57.3'
Course, magnetic 1/ Depth range in fathoms Type of bottom Trawling bottom Time on bottom in minutes	260° 130-118 G. & Brd. Snag 30	060° 124-131 --- Snag 30	271° 101-109 S. & rky. Catchy 60	270° 68-99 rky. Snag 8	275° 62-68 --- Snag 2/	276° 119-127 Blds. Catchy 60	256° 124-129 --- Snag 17	284° 112-118 Gr. W. Clear 60	270° 109-110 sn.M.S.& St. Snag 5	270° 114-115 St. Snag 8	252° 100-104 St. & M. Catchy 60	274° 97-101 --- Catchy 60	266° 102-105 --- Catchy 60	256° 96-99 M.S.& G. Catchy 60	270° 57-62 --- Catchy 30	264° 98-102 gn.S. & Sh. Catchy 60
Remarks	Bad tear	Slight tear	Bad tear	Broke D.G.	Broke D.G.	Bad tear	Bad tear	---	Mud, tear	Bad tear	Slight tear	Slight tear	Bad tear	Slight tear	Slight tear	Slight tear
Estimated total catch in pounds	500	75	1500	30	1000	1350	120	2200	60	70	1250	1100	1050	990	700	1500
Catch in pounds (% marketable): Flat Fish																
Dover	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Trace
English	Trace 2/	---	---	---	---	---	---	---	---	---	Trace	---	---	---	---	---
Flathead	---	---	Trace	---	---	---	---	---	---	---	Trace	---	---	---	---	---
Halibut	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Petrale	---	---	---	---	Trace	---	---	---	---	---	---	---	---	---	Trace	---
Rex	---	---	---	---	---	---	---	---	---	---	Trace	Trace	Trace	Trace	---	Trace
Rock	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Sand	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Turbot	30	Trace	20	Trace	Trace	50	Trace	50	Trace	Trace	80	130	70	55	30	250
Round Fish																
Hake	---	---	---	---	---	---	---	Trace	---	---	---	Trace	---	---	---	---
Lingcod	Trace	Trace	75(100%)	---	20(100%)	20(80%)	---	335(98%)	---	---	---	20(100%)	20(80%)	Trace	---	---
Pollock	Trace	Trace	---	Trace	Trace	---	---	20	Trace	Trace	Trace	30	Trace	Trace	---	60
Sablefish	---	---	---	---	---	Trace	---	---	---	---	---	---	Trace	Trace	---	Trace
True cod	Trace	---	100(70%)	Trace	30(50%)	Trace	---	40(50%)	---	---	50(50%)	125(70%)	Trace	70(56%)	Trace	75(75%)
Rock Fish																
Black	---	---	150(100%)	---	---	Trace	---	---	---	---	80(100%)	60(100%)	---	---	Trace	---
Pacific ocean perch	Trace	---	---	---	---	25(100%)	---	Trace	---	Trace	Trace	70(100%)	Trace	---	---	Trace
Red	Trace	Trace	Trace	Trace	25(80%)	Trace	---	25(100%)	---	---	20(100%)	Trace	20(100%)	---	Trace	Trace
Other																
Dogfish	20	---	500	Trace	325	400	60	300	Trace	Trace	450	600	165	350	30	485
Ratfish	200	35	600	Trace	570	800	50	1070	40	50	400	100	650	450	600	525
Skate	---	Trace	30	---	20	Trace	---	350	Trace	Trace	20	---	30	35	Trace	40

Area	Twin to Freshwater Bay						Freshwater Bay to Green Point						Green Point-Dungeness Spit to Main Bank							
Drag Number	15	16	18	19	35	53	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Date	2/21/56	2/21/56	2/22/56	2/22/56	2/28/56	3/6/56	2/28/56	2/29/56	2/29/56	2/29/56	3/1/56	3/1/56	3/1/56	3/2/56	3/2/56	3/3/56	3/3/56	3/3/56	3/3/56	3/5/56	3/5/56	3/6/56
Latitude N. Longitude W.	48°15.3' 123°47.1'	48°13.9' 123°48.8'	48°12.4' 123°51.8'	48°13.9' 123°47.1'	48°11.5' 123°47.2'	48°16.3' 123°53.6'	48°11.9' 123°27.2'	48°13.0' 123°25.3'	48°10.1' 123°27.1'	48°10.5' 123°21.1'	48°13.4' 123°26.7'	48°11.3' 123°25.1'	48°12.6' 123°11.6'	48°14.2' 123°12.2'	48°14.8' 123°15.7'	48°13.1' 123°06.9'	48°13.6' 123°09.8'	48°16.1' 123°08.9'	48°16.2' 123°11.8'	48°19.2' 123°09.9'	48°20.3' 123°06.5'	48°19.7' 123°07.8'
Course, magnetic 1/ Depth range in fathoms Type of bottom Trawling bottom Time on bottom in minutes	251° 81-85 --- Catchy 60	266° 88-90 M. Catchy 60	260° 76-81 M.S.& G. Clear 60	079° 81-91 S. Clear 60	077° 46-50 Brd.& St. Snag 60	265° 92-101 gn.S.& St. Snag 60	257° 72-76 gr.M.& St. Clear 60	085° 71-80 --- Clear 60	058° 46-52 gr.W.G.& Sh. Catchy 60	239° 48-51 S.G.& Sh. Clear 60	131° 46-74 St.Sh.& Brd. Clear 60	226° 59-62 gn.S.& Sh. Clear 60	225° 74-78 Brd. Clear 60	203° 70-90 Brd.& G. Snag 87 3/	208° 62-73 Brd.& G. Snag 45	212° 68-79 Brd. Clear 60	042° 82-88 Brd.& G. Clear 60	332° 60-64 Brd. Catchy 60	213° 71-74 Brd.St.& Sh. Catchy 60	007° 56-66 Brd. Clear 60	350° 70-79 gn.S.St.s.&Sh. Catchy 60	162° 54-60 Brd. Clear 60
Remarks	Slight tear	Slight tear	---	---	Bad tear	Bad tear	---	---	Slight tear	---	Slight tear	---	---	Bad tear	Bad tear	---	---	Slight tear	Slight tear	---	Slight tear	---
Estimated total catch in pounds Catch in pounds(% marketable): Flat Fish	890	900	4500	1140	600	300	2000	250	350	1800	400	600	450	300	550	2500	800	250	1300	1300	2700	750
Dover	Trace	---	Trace	Trace	Trace	---	---	---	---	---	Trace	---	---	---	---	Trace	---	---	---	Trace	---	---
English	---	---	---	---	---	---	---	---	---	Trace	---	---	---	---	---	Trace	---	---	---	---	---	---
Flathead	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Halibut	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	35(100%)	---	---	---	---	---
Petrale	Trace	Trace	Trace	---	---	---	---	---	---	---	Trace	---	---	---	---	---	---	---	---	Trace	---	---
Rex	---	---	Trace	---	---	---	---	---	---	---	---	---	---	Trace	---	Trace	Trace	---	Trace	Trace	Trace	Trace
Rock	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Trace	---	Trace
Sand	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Trace	---	---
Turbot	Trace	25	70	25	Trace	135	500	---	70	200	85	25	90	30	Trace	Trace	60	20	70	125	150	75
Round Fish																						
Hake	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lingcod	45(95%)	35(100%)	Trace	---	---	---	40(100%)	Trace	---	20(100%)	Trace	25(100%)	---	Trace	---	---	---	---	Trace	25(95%)	75(100%)	---
Pollock	---	---	Trace	---	---	Trace	20	---	Trace	---	30	---	---	---	---	25	---	---	40	20	180	25
Sablefish	---	---	Trace	---	---	---	Trace	20(50%)	---	---	Trace	---	Trace	Trace	---	---	---	---	Trace	---	---	---
True cod	50(20%)	25(40%)	70(40%)	40(50%)	30(50%)	Trace	400(25%)	35(70%)	45(65%)	100(60%)	30(30%)	80(75%)	75(20%)	---	40(75%)	40(60%)	55(25%)	---	35(30%)	35(100%)	265(20%)	35(20%)
Rock Fish																						
Black	100(100%)	210(100%)	40(100%)	Trace	Trace	---	---	---	20(100%)	35(100%)	---	---	---	---	---	Trace	---	---	---	---	---	---
Pacific ocean perch	Trace	Trace	Trace	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Red	---	---	---	---	---	---	---	Trace	Trace	---	Trace	---	---	---	---	---	---	---	---	---	---	---
Other																						
Dogfish	60	320	2000	950	120	100	900	100	90	300	80	25	150	125	400	1100	350	65	230	80	810	135
Ratfish	600	450	2300	100	400	25	---	Trace	---	400	80	100	100	80	60	1300	320	80	760	730	1700	410
Skate	Trace	Trace	20	20	25	---	20	40	125	600	125	300	---	30	25	---	Trace	70	140	25	50	60

1/ Course given is between starting point and end point.
2/ "Trace"-less than 20 pounds of fish.
3/ "D.G." - dandyline gear.
4/ Winch broke down when snag was hit.

G. = gravel Blds. = boulders St. = stones
Brd. = hard gr.W. = gray mud Sh. = shell
rky. = rocky gn. S. = green sand

TABLE 2 - BEAM TRAWL FISHING LOG--M/V JOHN N. COBB--CRUISE 25--STRAIT OF JUAN DE FUCA (FEBRUARY-MARCH 1956).

Area	Kydaka Point to Twin							Twin to Freshwater Bay				
Drag Number	29	30	31	32	33	34	35	20	21	22	23	24
Date	2/25/56	2/25/56	2/25/56	2/25/56	2/25/56	2/26/56	2/26/56	2/23/56	2/23/56	2/23/56	2/23/56	2/23/56
Latitude N. Longitude W.	48°16.2' 124°04.0'	48°18.4' 124°10.8'	48°17.2' 124°17.5'	48°17.9' 124°18.3'	48°17.8' 124°17.5'	48°17.6' 124°15.8'	48°12.8' 124°00.5'	48°11.3' 123°40.1'	48°11.8' 123°42.1'	48°12.8' 123°40.9'	48°12.8' 123°43.0'	48°11.1' 123°43.8'
Course, magnetic 1/ Depth range in fathoms Type of bottom Trawling bottom Time on bottom in minutes	251° 100-102 G. Clear 60	287° 112-118 gn. S. Clear 60	285° 49-52 S.G.& Sh. Catchy 60	288° 59-66 S.G.& Sh. Clear 60	290° 73-77 S. & G. Clear 60	282° 84-88 M. & S. Clear 60	251° 71-83 S. & G. Clear 60	253° 63-71 M.S.& G. Clear 60	072° 68-75 S. & G. Clear 60	262° 83-90. M.S.& G. Clear 60	065° 80-86 M. & S. Clear 60	250° 48-53 M. & S. Clear 60
Shrimp catch in pounds (whole shrimp per pound): Pink Side-stripe Coon-stripe Spot	Trace Trace - -	Trace Trace Trace Trace	Trace 3(38) Trace Trace	Trace 2½(38) Trace Trace	Trace 1(45) Trace 2½(46)	1½(110) Trace Trace Trace	Trace 1½(37) - -	9½(125) 1 3/4 (41) Trace -	12(107) 6(47) Trace -	Trace 3¼(43) Trace -	Trace 1(52) Trace -	1½(103) 1(52) - -
Total Shrimp catch in pounds	1	Trace	3½	3½	4	2½	1½	11¼	18	4	2	2½
Remarks	-	-	Slight tear	-	-	-	-	-	-	-	-	-

Area	Twin to Freshwater Bay (contd.)					Freshwater Bay to Green Point		Green Point-Dungeness Spit to Hein Bank				
Drag Number	25	26	27	28	55	56	57	58	59	60	61	
Date	2/24/56	2/24/56	2/24/56	2/24/56	3/7/56	3/8/56	3/8/56	3/8/56	3/8/56	3/8/56	3/8/56	
Latitude N. Longitude W.	48°11.9' 123°46.3'	48°12.8' 123°51.9'	48°13.1' 123°56.7'	48°13.7' 123°52.0'	48°10.8' 123°36.7'	48°10.3' 123°22.2'	48°11.2' 123°23.2'	48°15.1' 123°11.1'	48°16.8' 123°12.7'	48°13.9' 123°08.8'	48°13.2' 123°06.0'	
Course, magnetic 1/ Depth range in fathoms Type of bottom Trawling bottom Time on bottom in minutes	079° 57-65 M.S.& G. Snag 56	076° 66-76 M.S.& G. Clear 60	076° 58-65 M.S.& Sh. Clear 60	218° 87-89 S. & G. Clear 60	216° 62-68 gn.M.& St. Snag 60	243° 48-52 gn.S.G.& Sh. Clear 60	226° 57-61 gn.S.& Sh. Clear 60	218° 77-84 gn.S.&St. Clear 60	221° 56-68 gn.S.St.& Sh. Clear 60	202° 61-63 gn.S.St.& Sh. Clear 60	217° 57-76 gn.S. & Hrd. Clear 45 3/	
Shrimp catch in pounds (whole shrimp per pound): Pink Side-stripe Coon-stripe Spot	10½(125) 7(40) Trace Trace	21½(150) 2 3/4(50) Trace Trace	30(132) 1½(31) Trace Trace	Trace 1 3/4(49) Trace Trace	Trace 1½(54) - Trace	Trace Trace - Trace	Trace Trace Trace -	Trace Trace Trace Trace	5(171) 1½(31) - Trace	1½(166) 1¼(48) Trace Trace	Trace Trace - Trace	
Total Shrimp catch in pounds	18½	21½	32	2	2½	Trace	Trace	Trace	7	3	1	
Remarks	Hung up	-	-	-	Broke beam	-	-	-	-	-	-	

1/ Course given is between starting point and end point.
2/ "Trace" - less than 1 pound of shrimp.
3/ Hauled trawl in before hour was up because unexpected steep slope appeared on depth sounder.

G. = gravel
gn.S. = green sand
Sh. = shell
M. = mud
St. = stones
Hrd. = hard

LITERATURE CITED

ALVERSON, DAYTON L.
1951. DEEP-WATER TRAWLING SURVEY OFF THE COAST OF WASHINGTON (AUGUST 27-OCTOBER 19, 1951). COMMERCIAL FISHERIES REVIEW, VOL. 13, NO. 11 (NOVEMBER), PP. 1-16 (ALSO SEPARATE NO. 292).

ELLSON, J. G., AND ROBERT LIVINGSTONE, JR.
1952. THE JOHN N. COBB'S SHELLFISH EXPLORATIONS IN CERTAIN SOUTHEASTERN ALASKAN WATERS, SPRING 1951. COMMERCIAL FISHERIES REVIEW, VOL. 14, NO. 4 (APRIL), PP. 1-20 (ALSO SEPARATE NO. 311).

HADDOCK FILLETS ARE NUTRITIOUS

Easy to handle and quick to cook, haddock fillets are a good choice for the protein part of any meal, according to the U. S. Fish and Wildlife Service. They are versatile enough for company dinners or the simplest family fare.

Cooked without the addition of fat, haddock fillets are an excellent choice for weight-conscious persons as they are a low-calorie high-protein food. When prepared with fat or served with a rich sauce, haddock fillets are equally as good in a weight-increasing diet. Haddock fillets are also a reliable source of the important B-complex vitamins--thiamine, niacin, and riboflavin as well as the important minerals--calcium, iron and iodine.

To retain the nutrients as well as insure maximum juiciness, tenderness, and general eating qualities, avoid overcooking haddock fillets. A good rule to follow is to cook only until the fish flakes easily when tested with a fork.

For a nutritious family dinner, the home economists of the U. S. Fish and Wildlife Service recommend "Haddock Fillets with Bread Stuffing."

HADDOCK FILLETS WITH BREAD STUFFING

2 pounds haddock fillets	$1\frac{1}{4}$ quarts soft bread cubes
$1\frac{1}{2}$ cups chopped celery	2 tablespoons milk
$\frac{1}{3}$ cup chopped onion	1 egg, beaten
$\frac{1}{4}$ cup butter or other fat, melted	2 tablespoons butter or other fat, melted
$\frac{1}{2}$ teaspoon salt	$\frac{1}{2}$ teaspoon paprika
$\frac{1}{2}$ teaspoon poultry seasoning	$\frac{1}{2}$ teaspoon salt

Thaw frozen fillets. Cut into serving-size portions. Cook celery and onion in butter until tender. Sprinkle salt and poultry seasoning throughout the bread cubes. Add to celery-onion mixture. Combine milk and eggs. Pour over bread cubes and mix well. Spread stuffing in a shallow, well-greased baking pan. Place fish in a single layer on stuffing. Mix butter, paprika, and salt. Cover fish with the sauce. Bake in a moderate oven, 350° F., for 30 minutes or until fish flakes easily when tested with a fork. Serve 6.

FLUORESCENCE NOT A QUALITY INDEX OF OCEAN PERCH OR HADDOCK

Fluorescence of the eyes or of the other parts of ocean perch and of haddock have, contrary to popular opinion, little, if any, relationship to the freshness of these fish, according to studies conducted at the Service's Boston Technological Laboratory.

In the studies on the ocean perch, whole fish were stored in a chilled room at 40° to 45° F. and examined regularly under ultraviolet light for fluorescence. Fifty percent of the ocean perch--while still of marketable quality--developed bright yellow fluorescence of the eyes. The eyes of the remaining ocean perch did not fluoresce, even after becoming putrid. No other signs of fluorescence that could be related to quality were detected. Thus the presence or absence of fluorescence is not a reliable index of the quality of ocean perch.

In the studies on the haddock, the fish were eviserated, stored well iced in boxes in a chilled room at 35° to 37° F., and examined frequently for fluorescence. At the initial examination, 12 percent of the haddock showed a slight yellow fluorescence of one eye. After 5 days on ice three fish were still of good quality, but the eyes of all of them were fluorescent, and about 30 percent of the eyes fluoresced very strongly. On the thirteenth day of iced storage, at which time the haddock were of borderline quality, 90 percent of the eyes fluoresced strongly. The ventral fins of more than 50 percent of the haddock developed fluorescence during storage, but the intensity of fluorescence was not marked.

At each examination, two haddock were filleted. Those of fair quality developed a bright yellow fluorescence on one or two of the four fillets examined. Fluorescence, however, was not found on all of the fillets even after they had become inedible.

The results of these tests show that fluorescence is not a reliable index of the quality of either ocean perch or haddock.

GLAZING SHRIMP

Shrimp submerged in a solution of equal parts of salt and dextrose before quick freezing have an excellent glaze, look fresh when thawed, and do not adhere to each other when frozen.

Food Field Reporter, Oct. 3, 1955.

TRENDS AND DEVELOPMENTS

California

DUNGENESS CRAB FISHERY: The crab traps were ready and final overhauls of the vessels completed by mid-November-December in preparation for the opening of the commercial dungeness crab fishery along California's north coast. Prospects were good for another successful season to match the previous year's, the best since 1951/52. In fact, it was so good that most of the Eureka and Crescent City crabbers brought in their gear with two months of the season still remaining, because some of the markets had become saturated.

A SEVEN-INCH MALE MARKET CRAB, THE HIGHLY-PRIZED DELICACY SOUGHT BY COMMERCIAL FISHING FLEETS OPERATING MOSTLY OUT OF EUREKA, CRESCENT CITY AND SAN FRANCISCO.

Landings in the San Francisco area during the 1955/56 season were above average and rocketed upwards at the Eureka-Crescent City ports. Nearly 10 million pounds of the white-meated crabs were caught in California annually during the last 10 years, bringing an income of $1.5 million per season to the vessels and fishermen alone, and providing employment for many others in allied industries.

The prime target for all this attention is the market crab, also known as the dungeness, commercial, or white crab. Only the mature males are legally caught, and along the Central California coast it usually takes 3 or 4 years to attain the legal seven-inch breadth. In a few close-to-shore areas in northern waters the crab may be taken, noncommercially only, when he reaches a width of 6.5 inches.

California crab laws and regulations apply only to this species and not to the various "rock crabs" taken in limited quantity by commercial and sport fishermen.

The introduction of more efficient crab traps (the principal means of catching the crab) and the addition of more and better-equipped fishing vessels in recent years, together with an abundant resource, are the main reasons for the continued good fishing under increasing commercial activity. But a resource that is harvested so intensively needs sound protective regulations. For 60 years the female crab has been completely protected and since 1911 it has been unlawful to take males less than seven inches in width.

In 1955 the Legislature shortened the season by two months to protect crabs during the molting season, early in the summer. The larval crabs (only as big as a grain of sand) hatch from December through March and are swept away by the ocean currents. Later they settle to the bottom and spend the rest of their lives there. During their first year they grow fast, shedding their shells from 8 to 10 times and reaching a width of 3 to 4 inches. Because the shell encases the crab tightly, it cannot grow until it sheds or molts; a crab gains from 10 to 40 percent in size during a single molt.

In 1956 the California Legislature's new regulation went into effect making it mandatory for each crab trap to have a circular escape opening at least four inches in diameter so that most females and small males can escape. This will enable them to avoid being caught and injured by handling several times each season. Such a conservation measure will help to assure a constant replenishment of the fishery, for it is only because of compliance with regulations based on sound principles of conservation that our crab resource has survived.

To learn more about crab movements, shellfish biologists have tagged several hundred of them. Most of those recovered to date have moved only a few miles from the point of release, but there were a few restless ones, too. One traveled 28 miles in a month from the mouth of the Russian River in 90 feet of water to a spot off Point Reyes in water 204 feet deep.

Another crawled 35 miles from Point Reyes to just south of San Francisco in 10 weeks. En route both were successful in eluding their principal enemy, the octopus, which finds crabmeat one of its favorite meals. Against most other marine life, the crab's powerful claws and hard shell are ample protection.

Commercial crab fishing in California is carried on from Point Conception northward, but principally off Eureka, Crescent City, and San Francisco. Other centers are in the Fort Bragg, Bodega Bay, Monterey, and Avila-Morro Bay areas. During the season the traps set from 25-300 feet deep and marked by a line of buoys, may extend for miles off these fishing sites. The traps are circular, three feet in diameter and 18 inches high, made of reinforcing steel rods covered with stainless steel wire mesh. There are two entrance tunnels opposite each other and a hinged lid over half the top. A jar containing bait, such as squid, clams or fish waste, is hung between the entrance tunnels. The traps are fished at intervals of 1 to 10 days, depending on the season and the weather.

To keep abreast of developments in the industry and effects on the crab resource, California Marine Fisheries biologists are conducting extensive research into habits, numbers, and growth of the market crab. Samples of catches are taken aboard ship, measurements are taken, and laboratory tests made. Tests are in progress also of devices to permit the escape of legal-size crabs when storms carry away the traps, so as to prevent waste.

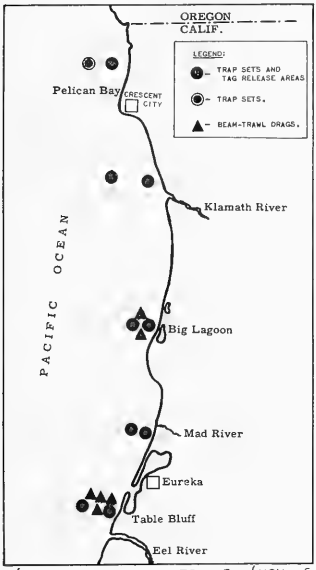
Through such methods the scientists hope to be able to predict well in advance the cycles of good and poor fishing success and to amass enough accurate evidence to make sound recommendations for protective regulations whenever needed. (Outdoor California, November 1956.)

* * * * *

DUNGENESS CRABS STUDIED OFF CENTRAL AND NORTHERN CALIFORNIA (M/V Nautilus Cruise 56-N-3): A study of dungeness or market crab (Cancer magister) off Central California in the San Francisco area and off Northern California in the Eureka and Crescent City areas (see chart) was continued from November 6-25, 1956, by biologists aboard California's Department of Fish and Game M/V Nautilus. The objectives of the cruise were to study the abundance and condtion of the

dungeness crab; the sizes of the preseason crabs; tag legal-size crabs; and sample juvenile crabs by beam trawling.

Forty crab traps were used in the San Francisco area. Ten traps were set in each of the four areas fished. These traps were set and pulled after fishing approximately four hours.



M/V NAUTILUS CRUISE 56-N-3, (NOV. 6-25, 1956)

Off Eureka and Crescent City traps were set in the Table Bluff, Mad River, Big Lagoon, Klamath River, and Pelican Bay areas. Depths fished ranged from 60 feet to 180 feet. For shallow and deep-water fishing in each area the traps were set in two separate strings. Seventeen traps were lost due to rough weather from November 12 to 14 off Table Bluff.

An eight-foot beam trawl with a 1-inch mesh net was used to catch juvenile crabs and to supplement trap catches for tagging legal crabs.

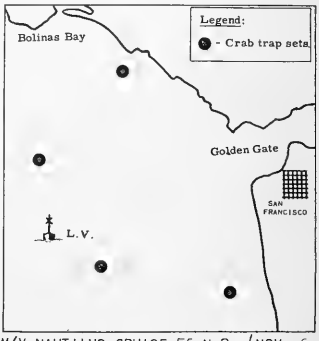
San Francisco: A total of 232 market crabs were caught in areas off San Francisco. Of these 170 (73.3 percent) were legal (7-inch males), 58 (25.0 percent) were sublegal males, and 4 (1.7 percent) were females. The number of legals averaged slightly over 4 per trap. The percentage of soft legals was 2.9 percent (5 out of 170 crabs).

Eureka-Crescent City: A total of 224 trap sets were made in the Northern California areas. These sets yielded 833 market crabs. Of these 693 (83.2 percent) were legal, 124 (15.0 percent) were sublegal males, 2 (0.2 percent) were females, and 14 (1.6 percent) were juvenile crabs. The percentage of legals per trap ranged from a low of 62.2 percent at Table Bluff to a high of 100 percent off Big Lagoon.

The soft condition of legal crabs ranged from none soft off the Klamath River to a high of 18.8 percent soft for Table Bluff Light Station.

Measurement of Crabs: Shoulder-width measurements were made on all adult crabs caught by the traps and beam trawl. A shoulder-width measurement is made just in front of the last anterolateral spine. At least 50 juvenile crabs from each beam trawl sample were measured and the remainder counted. These data with previously collected information will be used in studies of the composition of the crab resource.

Tagging: A total of 230 crabs were tagged with Peterson disks attached by nickel pins run through the carapace. An electric drill was used in making the holes through the lateral portion of the shell.



M/V NAUTILUS CRUISE 56-N-3, (NOV. 6-25, 1956)

A total of 235 crabs were tagged with stainless carapace strap tags. These tags were type 316 stainless steel and of 0.008 x 0.5 x 2.0 inch dimension. These tags were applied by wire looped on the last antero-lateral spines. Type 302 stainless 0.025-inch diameter wire was used.

A total of 239 crabs were double-tagged, using both the disk and strap tags.

Tagged crabs were released in 9 locations from Eureka to Crescent City.

Beam Trawling: A total of 6 drags were made with the beam trawl. These drags were of 15- to 30-minute duration. Market crabs were taken in 5 out of the 6 drags and included several year-classes. As many as 720 juvenile crabs of an average shoulder width of 1 inch (25.2 mm.) were caught in one 30-minute tow off Table Bluff in 15-20 fathoms of water.

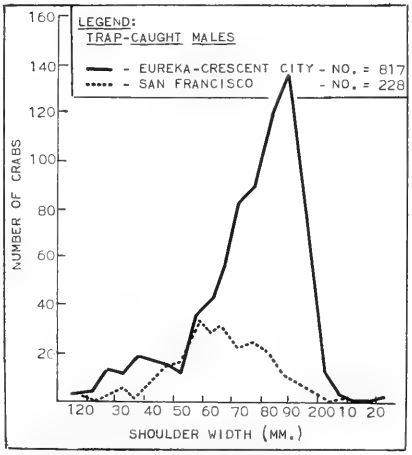
Location	Depth In Feet	Legal Crabs Caught	Tagged	Average Shoulder Width for Legals	Percentage of Legals
	Feet	(No.)		Millimeters	%
San Francisco	60 & 102	170	0	173.1	2.9
Table Bluff	180	44	41	185.3	18.8
Table Bluff	100	149	129	179.3	17.9
Mad River	168	93	89	183.6	12.9
Mad River	84	50	48	181.7	14.0
Big Lagoon	72 & 84	110	110	181.9	4.7
Big Lagoon	180	90	90	184.4	2.2
Klamath River	96	6	6	189.3	0
Klamath River	180	3	3	191.7	0
Pelican Bay	150	0	0	0	0
Pelican Bay	96	188	188	179.0	15.4

Juvenile crabs caught off Big Lagoon were of an average shoulder width of $1\frac{1}{4}$ inches (31.5 mm.). Approximately equal numbers of male and female juvenile crabs were taken by the beam trawl.

Legal Crab Summary: The above table summarizes the trap catch of legal-size male crabs taken during the cruise.

* * * * *

POPULATIONS OF SARDINES, JACK AND PACIFIC MACKEREL, AND ANCHOVIES SURVEYED BY M/V "N. B. SCOFIELD" (Cruise 56-5-8): To census the populations of sardines, northern anchovies, and Pacific and jack mackerel north of Pt. Conception and to collect rockfish were the objectives of this cruise (November 23-December 13, 1956). The California Department of Fish and Game research vessel N. B. Scofield operated off the coast of California from Bodega Bay to Point Dume, including Cordell Bank, the Farallone Islands, and the island groups just south of Pt. Conception (see chart).

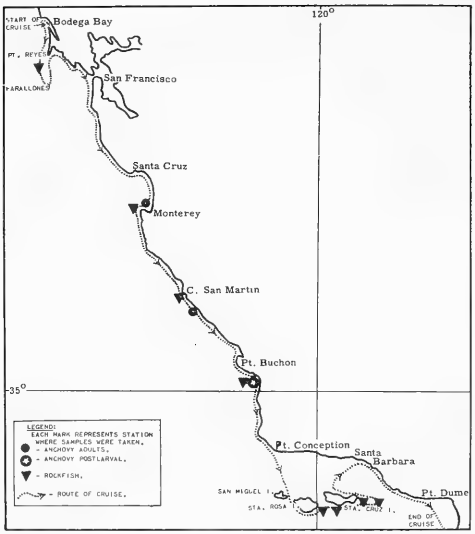


WIDTH FREQUENCIES--DUNGENESS CRAB, NOV. 1956 (M/V NAUTILUS CRUISE 56-N-3).

A total of 65 light stations were occupied between Bodega Bay and Pt. Conception. Adult northern anchovies were taken at one station and postlarval anchovies at three stations. No sardines, Pacific mackerel, or jack mackerel were observed at light stations or while scouting.

The N. B. Scofield traveled a total of 299 miles while scouting between stations: 3 schools of anchovies, 20 schools of sauries, and a few small groups of jack smelt were observed.

Seven species of rockfish were taken on hook and line during daylight fishing at four stations north of Pt. Conception and four stations at the Channel Islands. These will be used for later study of the characteristics of the genera Sebastodes.



M/V SCOFIELD CRUISE 56-5-8 (NOV. 23-DEC. 13, 1956).

Two species of Coelenterate medusae were observed in very great numbers for approximately 50 miles along the coast south of Bolsa Pt. In addition, tunicates of the genus Pyrosoma and Salpa were observed in large numbers at various points along the route.

Sea surface temperatures ranged from 10.60° C. (51.08° F.) at Pt. Lobos to 13.90° C. (57.02° F.) at China Harbor near Morro Bay. Bathythermograph casts which were made to a depth of 450 feet revealed no definite thermocline. In the coastal areas surveyed, uniformly cold water prevailed with little or no decrease in temperature from the surface to the bottom. The depth at various stations ranged from 6 to 210 fathoms.

The scarcity of sardines and mackerel observed on this cruise closely parallels the conditions found in this northern area on the November 1955 survey cruise. In 1955 only a single sample of both sardines and jack mackerel were taken north of Pt. Conception. These few fish were taken in the harbor of Avila. The rest of the coast north to Bodega Bay was relatively barren during both years.

Cans--Shipments for Fishery Products, January-November 1956

Total shipments of metal cans during January-November amounted to 106,619 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 97,596 tons in the same period of 1955. During the month of November the packing of fishery products was confined largely to shrimp, sardines, and tuna.

NOTE: STATISTICS COVER ALL COMMERCIAL AND CAPTIVE PLANTS KNOWN TO BE PRODUCING METAL CANS. REPORTED IN BASE BOXES OF STEEL CONSUMED IN THE MANUFACTURE OF CANS, THE DATA FOR FISHERY PRODUCTS ARE CONVERTED TO TONS OF STEEL BY USING THE FACTOR: 23.0 BASE BOXES OF STEEL EQUAL ONE SHORT TON OF STEEL.

Canned Fish Production Higher in 1956

Increases in the packs of tuna, Alaska salmon, Maine sardines, and Pacific mackerel are largely responsible for the 10-percent increase in the 1956 production of fish canned for human food in the United States and its Territories. In 1956 the pack of fish and shellfish for human food amounted to 650 million pounds as compared with 588 million pounds in 1955.

The tuna pack of 227 million pounds in 1956 set a new record, beating the 1955 pack by 31 million pounds. The Alaska salmon pack was 144 million pounds, 30 million pounds higher than in 1955, but the Puget Sound salmon pack of 23 million pounds was 20 million pounds less than in the previous year.

A larger run of red salmon in western and central Alaska and a better-than-usual run of chum salmon in central and southeastern Alaska were responsible for the gains made in the 1956 Alaska salmon pack. The Puget Sound area experienced its usual "even-year absence" of pink salmon which, because of their two-year cycle, historically have large runs on odd-numbered years and almost no fish on even ones.

Pacific Coast firms engaged in canning Pacific and jack mackerel packed 50 million pounds in 1956, twice the 1955 pack. This heavy pack was due to a great extent to the extremely low sardine catch, and the canners turned to mackerel as an alternative. The Pacific sardine pack of 32 million pounds was just half what it was in 1955. The Maine sardine canners, which had a much better year in 1956, packed 45 million pounds, an increase of 19 million pounds over 1955.

The South Atlantic and Gulf oyster pack of 4.3 million pounds was down considerably below the 1955 pack of 5.3 million pounds. Shrimp canners, with a pack of 13.8 million pounds in 1956, were slightly ahead of the previous year.

Byproducts Production in 1956

The production of fish meal in the United States and Alaska set a new record--the 296,000 ton produced in 1956 exceeded the 264,000 tons produced in 1955, which in turn had broken all previous marks. Approximately 70 percent of the 1956 production of 208,000 tons of fish meal was from menhaden--a record for menhaden meal.

There were 26,500,000 gallons of fish oil produced, seven percent more than in 1955 but considerably less than the 1936 pack of 39,900,000 gallons.

Federal Purchases of Fishery Products

CANNED FISHERY PRODUCTS PURCHASED BY DEPARTMENT OF DEFENSE, 1956: Canned tuna, salmon, and sardine purchases in 1956 for the use of the United States Armed Forces by the Military Subsistence Market Centers were substantially higher than for any year since 1953. Although canned tuna purchases in 1956 were somewhat lower than in 1954, canned salmon and sardine purchases, on the other hand, were substantially higher.

Table 1 - Canned Fishery Products Purchased Through Military Subsistence Market Centers, 1953-56

Canned Product	1956	1955	1954	1953
	.... (1,000 Pounds)			
Tuna	3,334	2,206	3,779	1,298
Salmon	2,798	2,785	471	766
Sardines	236	143	450	1,899

A total of 1,107,000 pounds of canned tuna, 2,197,000 pounds of canned salmon, and 5,000 pounds of canned sardines were purchased October-December 1956 for the use of the United States Armed Forces by the Military Subsistence Market Centers. This was substantially more than was purchased during any other quarter in 1956.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, DECEMBER 1956, P. 37.

* * * * *

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY THE DEPARTMENT OF DEFENSE: December 1956: The U. S. Military Subsistence Market Centers in December 1956 purchased 2,030,698 pounds (value $1,092,627) of fresh and frozen fishery products for the use of the Armed Forces. This was about 6.1 percent less in quantity and 2.3 percent less in value than the purchases in November 1956. When compared with December 1955, purchases in December 1956 were higher by 13.6 percent in quantity and 21.7 percent in value.

Prices paid for these fishery products by the Department of Defense in December 1956 averaged 53.8 cents a pound as compared with 51.7 cents a pound in November and 50.2 cents a pound in December 1955.

In addition to the purchases of fresh and frozen fishery products reported, the Armed Forces make some local purchases which are not included above. Therefore, actual purchases are higher than indicated, but it is not possible to obtain data on the local purchases by military installations throughout the country.

Year 1956: Purchases of fishery products for the 12 months of 1956 totaled 26,610,267 pounds, valued at $13,413,350--6.5 percent more in quantity and 22.7 percent more in value than the purchases made during the 12 months in 1955.

The over-all average price for fishery products purchased was 50.4 cents a pound in 1956, 43.7 cents in 1955, and 41.1 cents in 1954. The general increase in the average price is due principally to purchases of more expensive fish and shellfish items like shrimp, scallops, and oysters rather than a general price increase.

Purchases of Fresh and Frozen Fishery Products by Department of Defense (December and 12 Months 1956 With Comparisons)

QUANTITY					VALUE				
December		Total			December		Total		
1956	1955	1956	1955	1954	1956	1955	1956	1955	1954
(1,000 Lbs.)					($1,000)				
2,031	1,787	26,610	24,989	25,290	1,093	897	13,413	10,929	10,395

Fish-Cookery Demonstrations for First Half of 1957

A total of 91 fish-cookery demonstrations for the first half of 1957 have been arranged by the Bureau of Commercial Fisheries of the United States Fish and Wildlife Service. Additional projects are being scheduled.

The fish-cookery demonstrations are presented to the schools in connection with the school-lunch program, and to home extension agents, restaurant personnel, home economic classes, and cookery specialists for private firms.

This year's program to date includes 72 school-lunch demonstrations and 19 appearances at other groups. Since the program started in 1946, the Fish and Wildlife Service has given 1,544 demonstrations of which 1,234 were for school-lunch personnel.

School-lunch demonstrations thus far scheduled are as follows: Mississippi, 32; Georgia, 12; Texas, 9; Maine, 8; Virginia, 4; New York, 3; Maryland, 2; and one each for Tennessee and Massachusetts. Special demonstrations for institutional and extension personnel will be given in Colorado, Idaho, Indiana, Maryland, Michigan, Oregon, Washington, and Alaska.

Trained home economists explain the proper preparation of appetizing, economical, nutritious, and easy-to-prepare dishes. Fishery marketing specialists give necessary information on supplies and marketing conditions and often have arranged for fish distributors to expand their market to meet the potential developed by the demonstrations.

The fish featured in each of these projects are available in each area in good supply and are in the low-cost field. They include frozen fillets or portion fish such as cod, haddock, and ocean perch; canned fish such as tuna, flake fish, and mackerel; and precooked fish.

Special attention is given in the school-lunch programs to recipes which provide the two ounces of cooked protein to meet the Type A school-lunch requirements. The recipes used were developed at the Fish and Wildlife Service test kitchens at College Park, Md., and Seattle, Wash.

Fisheries Loan Fund

LOANS APPROVED: Thirty-five loans, totaling $1,196,330, have been approved under the fishery loan fund program up to February 4, 1957, the Secretary of the Interior announced on February 12.

More than 125 applications have been received, five of which were rejected. Other requests for loans for purposes not covered by the provisions of the law have been returned to the applicants.

Of the 35 applications approved, 18 were from the New England area, 7 from the Pacific Coast, 1 from the South Atlantic Coast, 1 from the Gulf of Mexico, 1 from the Great Lakes, and 7 from Alaska.

The largest loan to date is for $250,000 to the Delta Towing and Transportation Company, Incorporated, of Pascagoula, Miss., for repairs, modernization, and refinancing of menhaden vessels. The smallest is to William Estrada of Juneau, Alaska, who will receive $1,500 for vessel replacement.

Fishermen of Gloucester, Mass., had 15 loans approved for refinancing, gear replacement, operating expenses, and vessel repairs; and two firms in Boston had loans authorized. One Newport, R. I., fisherman will receive a loan.

The loans approved for Gloucester are as follows: Joseph Parisi, $23,785; Maristella, Inc., $49,500; Mrs. Rose P. Bertolino, $25,500; Twin Sisters, Inc., $19,550; Matthew Parisi, $35,000; Jerome Palazola, $10,000; North Atlantic Trawling Co., $49,875; Mrs. Ray Adams Pine, $22,084; Mrs. Margaret Sinagra, $6,632; Salvatore Frontiero, $39,323; Schooner Thomas J. Carroll, Inc., $60,000; Wild Duck, Inc. $59,000; Andrea G. Corporation, $20,131; Schooner Raymonde, Inc., $36,325 (refinancing only); and Clarence Leveille, $3,362.

In Boston, Trawler Four, Inc., will receive $65,000 for refinancing and vessel repairs; Trawler Cormorant, Inc., has been authorized to receive $60,000 for refinancing; and Leo E. Destremps, of Newport, R. I., will receive $7,540 for the same purposes.

In the South Atlantic there is one recipient, A. M. Acuff, Inc., of Eastville, Va., who will get $8,800 for vessel and gear replacement.

Loans approved for Pacific Coast applicants are: California:--Gestur R. Armann, Costa Mesa, $6,000 for repairs and refinancing; Dorothy and Russell Farnell, Westminister, $20,000 for repairs and refinancing; John E. Leanders, San Diego, $79,900 for refinancing; M. Machado Medina, San Diego, $155,000 for refinancing; Katherine Tierheimer, Torrance, $3,850 for vessel improvement; Joe E. Penacho, San Diego, $45,000 for refinancing; Washington:--Woodrow E. Anderson, Bellingham, $8,873 for refinancing.

In the Great Lakes area, a loan of $5,500 was approved for Richter Fisheries of South Haven, Mich., for vessel repairs, gear replacement, and refinancing.

Approval or rejection of the loans is the responsibility of the Department of the Interior. The disbursement of the funds and servicing of the loans is handled by the Small Business Administration under an agreement with the Department of the Interior.

Florida

FISHERIES RESEARCH, OCTOBER-DECEMBER 1956: The following are some excerpts from the Quarterly Report on Fisheries Research, December 1956, of the Marine Laboratory of the University of Miami.

Small Shrimp Studies: The analysis of the data collected during the mesh experiments on the M/V Manboy is continuing. The variation about the average escapement of each size of shrimp through the various mesh sizes has been computed as a means of showing the escapement of small shrimp through each net. The amount and type of trash present in these hauls is being compared with the total escapement and the escapement of the various sizes of shrimp. The size distributions of shrimp taken in both the cod end and the cover bag plotted throughout the year suggest that two groups of small shrimp may enter the fishery--one in October and November and one March through May--and that they can be traced for several months. These groups may result from two separate spawning peaks, and that they appear to increase in an orderly manner is suggestive of growth.

Black Spot Control in Shrimp: Further experiments concerning the use (and possible misuses) of sodium bisulfite to retard the development of black spot in shrimp, were carried out. Results from these tests indicate that the quality of the shrimp is not adversely affected, and in certain cases may be slightly improved. Bacterial counts of the treated and nontreated samples showed no significant differences up until about the 15th day of iced storage.

Frozen Foods

ILLINOIS AND INDIANA LEGISLATURES CONSIDER CONTROLS: Frozen food controls have been incorporated in bills introduced in the legislatures of Illinois and Indiana. Indiana's House Bill 166 provides for licensing frozen food processing plants and in some 49 sections provides rules to cover temperature control, personal hygiene, operational practices, penalties, etc.

It is interesting to note that the Association of Food and Drug Officials of the United States last year adopted a resolution requesting all state regulatory officials to withhold such legislation until a model code is established to serve the best interests of the industry, the regulatory officials, and the public.

Great Lakes Fishery Investigations

SURVEY OF SAGINAW BAY COMPLETED FOR 1956 SEASON (M/V Cisco Cruise 9): This cruise, the last of the season, was planned to learn something of the factors influencing the spawning run of the lake herring (Leucichthys artedi) in Saginaw Bay. Gangs of nylon gill nets were set at several locations in Saginaw Bay, and night trawling was done in one area. A gang of gill nets (300 feet each of

$2\frac{1}{4}$-, $2\frac{1}{2}$-, $2\frac{3}{4}$-, 3-, and 4-inch mesh) set overnight in 3-4 fathoms north of Charity Island took 56 herring, 1 sauger (Stizostedion canadense), and 1 gizzard shad (Dorosoma cepedianum) indicating a fair number of herring in the area. Three days later, considerable night trawling in the same area resulted in a catch of only one herring, and the depth-recorder tracings indicated few fish. A few small smelt (Osmerus mordax) and alewives (Pomolobus pseudoharengus) were taken. Very heavy seas the day before the trawling operation may have affected the abundance of the herring in this shallow-water area. An oblique net was set in $6\frac{1}{2}$ fathoms NW. of Charity Island, on the same date as the above gang, and took 2 herring, both near the bottom.

A bull net (300 feet long, 120 meshes deep, $2\frac{1}{2}$-inch mesh) set in 13 fathoms off East Tawas with the float line on the surface took only 9 herring while a similar net set nearby with the float line 20 feet beneath the surface caught 36 herring and 1 smelt. An oblique net in this area took 9 herring at the 20- to 40- foot level and 2 herring at the 40- to 60- foot level. Eight herring were caught in another oblique net set over 26 fathoms off East Tawas. They were scattered from surface to bottom. Also taken in this net were 3 smelt, one alewife, one sauger, and 12 Leucichthys kiyi. The latter were in spawning condition.

The same bottom gang of gill nets mentioned above was set in 3 to 4 fathoms off Sand Point, and a bull net was set on the bottom in the same area. Although none of the herring caught had spawned, they were very numerous at this station and some were ripe. The bull net took 1,632 herring (804 pounds), and 1,790 herring (958 pounds) were taken in the regular bottom gang of gill nets. The herring in any given mesh size were fairly constant in size, and the size of the fish increased with the mesh size. One very large herring weighing 2 pounds 9 ounces was taken in the 3-inch mesh.

A gang of gill nets consisting of 300 feet each of $2\frac{1}{2}$-, $2\frac{3}{4}$-, 3-, and 4-inch mesh was set northeast of Bay City in $3\frac{1}{2}$ fathoms. Only 31 herring were caught here. Other species included 33 perch (Perca flavescens), 31 white suckers (Catostomus commersoni), 2 smelt, 2 carp (Cyprinus carpio), 1 gizzard shad, 1 northern pike (Esox lucius), 2 saugers, and 1 walleye. The walleye was tagged and released.

A hydrographic transect was run from Bay City to East Tawas. Surface temperatures were recorded at all times the boat was under way. Water temperatures are generally about 2° C. cooler in the Bay than they are near the mouth of the Bay, where Lake Huron water predominates. Surface water temperatures ranged from 4.5° C. (40.1° F.) in the shallow water to 8.6° C. (47.5° F.) in the deeper areas, with no thermal stratification remaining in any area covered.

Gulf Exploratory Fishery Program

FISH SCHOOL SAMPLING AND SCALLOP EXPLORATIONS OFF ALABAMA AND FLORIDA (M/V Oregon Cruise 43): Sampling of fish schools and explorations for scallops along the Alabama and Florida coasts were the objectives of the Service's exploratory vessel Oregon during a 17-day cruise completed on February 21. A total of 31 fish-trawl and 54 scallop-dredge stations were made during the trip.

South of Mobile Bay 21 drags were made in 19 to 30 fathoms, using a 52-foot New England otter trawl, rigged with rollers and with a $\frac{3}{4}$-inch cod-end liner. Most of the schools were found to be rough scad (Decapturus), chub mackerel (Pneumatophorus), and sardine (Sardinella). Large amounts of noncommercial or scrap fish (2,000 to 5,000 pounds a drag) were caught, consisting mostly of long-spined porgies (Stenotomus caprinus) and croakers. Red snapper, varying in weight from under 1 to over 30 pounds each, were caught in most tows. The best snapper catch was 200 pounds of mixed sizes, from 19 fathoms.

From off Cedar Keys to Tampa Bay, 10 fish-trawl drags were made in depths of 7 to 16 fathoms. Croaker, spot, grunts, pinfish, grouper, and snapper were caught in mixed quantities of from 500 to 1,500 pounds per one-hour tow. Small numbers of rough scad and round herring (Etrumeus) were caught in several drags. There were no depth-recorder indications of school fish in this area.

From south of Mobile to Cape St. George, Fla., 54 scallop-dredge stations were made in 9 to 27 fathoms. Catches of live scallops were small, although dead shells were very abundant. The best drag yielded 225 2- to $2\frac{1}{2}$-inch Pecten gibbus. Meat yield averaged about 140 "eyes" a quart.

Maine Sardines

ADVERTISING CAMPAIGN IN SOUTHERN STATES LAUNCHED: A spot radio campaign, utilizing more than 100 stations in ten southern states, will feature the Maine Sardine Council's promotional activities during the mid-winter Lenten period, a January 25 news release announces. The spots were scheduled to go on the air about February 4 and were to continue for 13 weeks at the rate of from 12 to 20 a week per station.

The area selected for coverage includes the states of Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Texas, Louisiana, Mississippi, and Tennessee. The Council's over-all program would also include merchandising activity and special promotions in the South as well as other sections of the country.

The advertising theme will be based on "Sardines from Maine in the familiar flat can that you and your folks know so well." Both live and recorded commercials will tell the story.

"Maine sardines are in good supply and we expect our campaign to further stimulate demand in the southern states which is our best sales area," the Executive Secretary of the Maine Sardine Industry stated.

The Maine Sardine Council is a department of the State of Maine financed by a 25-cent a case tax imposed on the canners, at their request, for an industry development program. During the 1956 season the industry packed 2,221,000 cases of Maine sardines.

* * * * *

INDUSTRY LAUNCHES NEW PRODUCT DEVELOPMENT PROGRAM: A program of new product development was announced by the Maine Sardine Council on January 30, 1957. The developmental program will be conducted at its recently-established and well-equipped Bangor Research and Quality Control Laboratory.

The Executive Secretary said that a full-time expert would be engaged to experiment on different flavors, oils, and sauces for the existing types of sardine pack, as well as to develop entirely new sardine products.

"Our industry is entering this important field of research as it realizes the necessity of keeping abreast of the rapidly changing conditions in the food business," he stated.

The Council believes that there are many wide-open avenues for such research and that improved sardines and sardine products would be the eventual result.

Marketing Prospects for Edible Fishery Products, January-March 1957

United States civilian consumption of fishery products in the next few months is expected to average a little higher than a year earlier. Stocks of both canned and frozen products on January 1 were somewhat larger than on the same date last year. Imports through about mid-spring probably will not differ substantially from those in the closing part of 1956. Retail prices of fishery products during the next few months will likely be close to the record levels of a year earlier, reflecting continued strong demand.

Per capita consumption of fishery products in 1956 was up a little from the 1955 rate. Smaller increases occurred for both canned and frozen commodities, but the rate for the fresh items was about unchanged. Retail prices for fishery products as a group, judging from the wholesale prices, were the highest in recent years.

Commercial landings of edible fish and shellfish were about 4 percent higher in 1956 than a year earlier. Increases were the largest for the species used mainly for canning, and this was reflected in heavier packs of canned salmon, Maine sardines, tuna, and mackerel. The 1956 catch and the canned pack of California sardines was substantially lower than in 1955. The pack of canned tuna last year was a record one. A much greater proportion of the pack in 1956 was from tuna landed by American fisheries. In recent years a sizable part of the canned pack has been from frozen tuna imported from Japan, but the 1956 catch of tuna by Japanese vessels was smaller than in 1955.

The volume of fish and shellfish frozen commercially in the continental United States in 1956 was down from the preceding year. Stocks of frozen products at the end of the year totaled somewhat larger than a year earlier. The increase in stocks reflects mainly the much heavier imports of frozen fish fillets and shrimp in 1956.

Imports of fresh and processed fishery products in 1956 were noticeably higher than in 1955, but exports were a little lower. Canned salmon exports were reduced heavily.

This analysis appeared in a report prepared by the Agricultural Marketing Service, U. S. Department of Agriculture, in cooperation with the Fish and Wildlife Service, and published in the former agency's February 22 release of The National Food Situation (NFS-79).

NOTE: SEE COMMERCIAL FISHERIES REVIEW, DECEMBER 1956, P. 40.

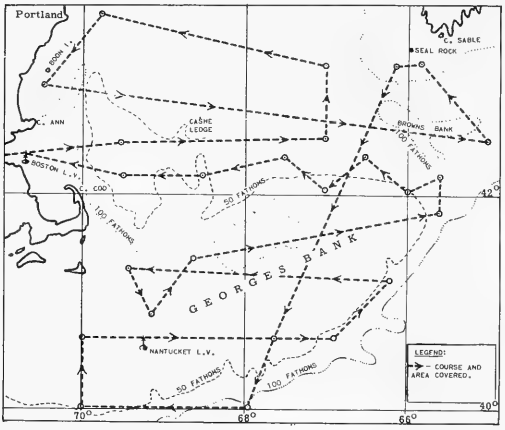
North Atlantic Fisheries Exploration and Gear Research

ABUNDANCE AND DISTRIBUTION OF HERRING LARVAE MEASURED (M/V Delaware Cruise 57-1) In order to measure the abundance and distribution of herring larvae and to record water temperatures over the Gulf of Maine and the Georges Bank area, over 2,000 miles were covered by the Service's exploratory fishing vessel Delaware on a 10-day cruise which ended February 5. A total of 51 one-meter plankton net tows and 172 bathythermograph casts were made.

The offshore plankton survey was conducted in cooperation with the Service's Atlantic Herring Investigation, Boothbay Harbor, Maine.

Continuous plankton tows were made at the surface and at 10 meters with the automatic Hardy Plankton Sampler. Six hundred and thirty-six drift bottles were

released at 53 stations in the offshore area to obtain information on the circulation pattern during this period of the year.

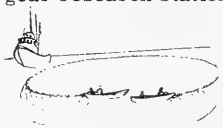


M/V DELAWARE CRUISE 1-57 (JANUARY 25-FEBRUARY 5, 1957).

The Delaware was scheduled to depart from East Boston on February 12, to conduct midwater trawl experiments and obtain material for technological studies.

A large Canadian-type 35-foot nylon herring midwater trawl was to be used in waters off the New England coast if sufficient concentrations of fish could be located with the electronic fish-indicating equipment installed aboard the Delaware. The first major objective was to locate concentrations of fish in midwater, for experience indicates that unless fish in concentrations are located in midwater with electronic equipment, chances for successful midwater tows are remote.

Two new instruments were to be used during the cruise; one, a newly-developed cable meter for $\frac{3}{4}$- to 1-inch wire and, the second, an air-pressure depth indicator recently-developed by the Service's exploratory fishing and gear research station at Boothbay Harbor, Me.



North Atlantic Fisheries Investigations

UNDERWATER TELEVISION EQUIPMENT TESTED (M/V Albatross III Cruise 85): Underwater television equipment was tested in 40-60 feet of water in the vicinity of Woods Hole, Mass., during the daylight hours of December 19 and 20 by the Service's fisheries research vessel Albatross III. Comparative tests were made of the Scottish Marine Biological Association's CPS Emitron and the United States Fish and Wildlife Service's Image Orthicon. The two underwater television bottom-viewing cameras were lashed together within the SMBA lighting gantry and lowered to or near the bottom.

Tests were made to examine both the picture quality and relative performance of the auxiliary equipment by both natural and artificial light. Bottom organisms and bottom types were clearly seen, but turbidity limited viewing to within five feet of the bottom.

North Pacific Exploratory Fishery Program

EXPERIMENTAL MIDWATER TRAWLING OFF WASHINGTON-BRITISH COLUMBIA: Experimental midwater trawling will be the objective of a 7-week cruise by the Service's exploratory fishing vessel John N. Cobb, which was scheduled to

leave Seattle on February 25. The experimental fishing will be conducted off the coasts of Washington and British Columbia.

This is the first in a series of midwater trawling cruises scheduled during 1957 to determine the practicability of a commercial midwater fishery for such food fishes as Pacific ocean perch, cod, ling cod, and other species which are known to spend at least part of their time off the bottom. If a successful midwater trawling method can be developed, it will open up vast new areas for commercial fishing, especially over rough and rocky bottom where the bottom trawlers cannot now operate.

First trials will be conducted using a 50-foot square-opening nylon midwater trawl designed and tested at the Service's gear research station at Coral Gables, Fla. An acoustic depth telemeter was to be employed to accurately determine and control the depth of the net at all times. A recording "Sea Scanar" was to be the principal instrument used for locating midwater schools of fish.

A previous test of this equipment during a cruise last year produced promising results. Catches of rockfish and hake were taken in midwater in quantities up to 5,000 pounds per 20-minute tow. Improvements in the fishing gear and electronic equipment have been made, which should increase their effectiveness. Considerable time will be spent during this cruise in studying the movements of fish in midwater and in learning to recognize different species on the echo-recording equipment, as well as in testing and improving the fishing gear itself.

Oregon

DUNGENESS CRAB STUDY IN YAQUINA BAY: In a project beginning in January 1957, biologists of the Oregon Fish Commission will attempt to determine the movement of dungeness crabs in Yaquina Bay, Ore.

The primary interest of the biologists is discovery of a suitable pattern for release of tagged crabs that can be applied to provide more extensive information in future larger-scale crab studies. To accomplish this objective, crabs tagged through the right corner of the upper shell with plastic Peterson discs were released at ten different locations in Yaquina Bay.

During the January-May 1957 period the investigators will be setting experimental crab pots at various points in the bay to trace the movements of the tagged crustaceans released in January. Should a large number of crabs move out of the bay and into the ocean, their departure is likely to be detected by a sudden scarcity of tagged individuals in the experimental crab pots.

The biologists claim that it may be possible to estimate the total number of crabs in Yaquina Bay with the type of information the experiment is expected to furnish. In addition, the study may also give some indication of what happens to crabs after increased flows of fresh water into bays during freshets. On several occasions in the past, crabs have been scarce in Yaquina Bay following freshets. It may be that during influxes of fresh water crabs burrow into mud on the bay bottom where salinities are more to their liking.

* * * * *

PLANS FOR NEW SALMON HATCHERY COMPLETED: Final plans have been completed for construction of the Cascade Salmon Hatchery on Eagle Creek, Columbia River Tributary just above Bonneville Dam, the Oregon Fish Commission announced February 16.

The supervising engineer in charge of Columbia River development projects for the Oregon Fish Commission said the new fish plant will have facilities for raising $11\frac{1}{4}$ million salmon annually. Fall chinook salmon will be the primary species propagated, but production of approximately one million chum and silver salmon each year is anticipated.

Cascade Hatchery will be the second new salmon propagating station constructed by the Commission under the federally-financed Columbia River Development program. Four other Fish Commission hatcheries have been completely renovated and enlarged under the program.

"One of the main considerations in selection of the Cascade site is the ample supply of satisfactory water in Eagle Creek," the engineer stated. The supply is not likely to change drastically in the foreseeable future because the Eagle Creek watershed lies entirely within Mt. Hood National Forest. More than 3,000 feet of 36-inch pipe will be used to supply water for operation of the hatchery.

A special use permit to operate the hatchery has been granted to the Fish Commission by the U. S. Forest Service, since the Cascade site is located on the Eagle Creek forest camp and picnic area.

Among the primary features of the new station will be 30 concrete rearing ponds, an adult holding pond which mature fish will reach via a fishway connecting to Eagle Creek, and two modern residences for hatchery personnel.

Salmon eggs will be hatched in a large hatching house with 7,200 square feet of floor space. Included in the hatching house will be a 100-ton capacity cold-storage room for holding fish food, a food preparation room, and an office for the hatchery superintendent. Another large building will house a workshop, vehicles, and other equipment.

Native runs of fall Chinook salmon now existing in Eagle Creek will be the main source of eggs for operating the Cascade Hatchery. Chum and silver salmon are not known to spawn in Eagle Creek at the present time, but stocks will be introduced from other streams in an attempt to establish regular sources of eggs from these two species for the hatchery.

* * * * *

SALMON CONSERVATION PROGRAM TO CONTINUE: A program of salmon conservation will be continued in Oregon coastal streams by the Fish Commission of Oregon provided there is no cut in appropriations for coastal salmon work by the legislature.

This view was expressed by the Commission at its monthly meeting in Portland in November 1956. The Commission Chairman said recent voter approval of a measure closing streams south of the Columbia River to commercial fishing for salmon has resulted in several inquiries as to whether or not the Commission intends to disband its present coastal salmon management work. The program includes fish propagation at five hatcheries, construction of fishways, removal of log jams and other barriers to migration, and biological studies to determine the factors affecting salmon production in the streams.

"By law, the Fish Commission is charged with maintaining the food fishery resources of Oregon," the Chairman stated. "Prohibition of commercial fishing in the coastal streams does not alter the Commission's delegated responsibility for safeguarding and conserving salmon and other food fish resources in these areas."

Salmon runs in Oregon coastal streams must still be considered food fish resources, the Commission pointed out, because the offshore troll salmon fishery depends upon fish produced in the streams. The Commission further stated that a biologically-sound program of fisheries management is still necessary to maintain stocks of salmon in the coastal streams, a November 27, 1956, news release from the Commission announces.

Pacific Oceanic Fishery Investigations

ALBACORE TUNA DISTRIBUTION BOUNDARIES FOUND IN PACIFIC: Although albacore tuna--the source of choice white-meat tuna--probably does not realize it, it is actually fenced in by an "isotherm," a "thermocline," and a food boundary. So report the two Fish and Wildlife Service research vessels--the John R. Manning and the Charles H. Gilbert--which have completed fall surveys in the broad Pacific, verifying data which had previously been assembled.

It seems that water colder than 57° F. has no appeal to the albacore. In hundreds of miles of experimental fishing, temperature-taking and water sampling, the crews of these vessels could find no albacore on the cold side of the "isotherm"--the meandering unstable line along which the temperature is 57° F.

Likewise, the researchers verified information that the albacore stays above the "thermocline," an imaginary sheet which separates the warm waters of the surface from the very cold waters below. The thermocline is sometimes only a few feet down and sometimes 200 feet or more below the surface.

The third limit to the distribution of albacore--the "food boundary"--is the barren water where few of the microscopic animals which are the basis for fish food exist. This boundary can sometimes be recognized by the color of the water and sometimes only by scrutinizing samples of the water with a microscope.

All of this may seem relatively unimportant to the landsman, but to the men in the boats--the men who help feed America by bringing in the fish--such findings are important. Showing these fishermen where not to look can make the difference between well-utilized hours and a lot of wasted time--for much of the albacore fisherman's time is spent in seeking fish.

Nor is the albacore the only fish limited by such things as isotherms, thermoclines, and food supplies. Each species of fish, like every other animal, has its habitat--conditions under which it can live and conditions under which it can't. There are some 200 kinds of fishes in the ocean which are currently being used for food. As the ocean is a restless mass, these various boundaries with their high sounding names continually change.

Correctly reading the pattern of the distribution of fishes in the wide waters of the ocean leads to more efficient and economical fishing operations, hence the value of research.

NOTE: SEE COMMERCIAL FISHERIES REVIEW, FEBRUARY 1957, PP. 25-27.

* * * * *

LIVE-BAIT TILAPIA CULTURE EXPERIMENTS: In an effort to find ways of supplementing the live-bait supply in Hawaiian waters, POFI is investigating the feasibility of culturing tilapia in tanks. During six weeks (December 1956-1957) 32 females in one of the tanks produced approximately 4,500 young. In a second tank, located in the shade and with water temperatures 1°-2° F. lower, no young were produced during the same period.

In studying tne suitability of these fish for chum to be used during live-bait fishing, it was discovered that bait-size tilapia (less than 3 inches) may be transferred directly from salt to fresh water without any mortality. On the other hand, they must be gradually acclimatized, during a 12-hour period, when transferred from fresh to sea water.

* * * * *

TAGGED YELLOWFIN TUNA HINTS VERTICAL MIGRATION PATTERN: In at least one instance a yellowfin tuna--normally found near the surface--has taken to deep-water swimming in the open sea, United States Fish and Wildlife Service fishery research has disclosed.

Late in 1955, a Fish and Wildlife Service research vessel tagged and released a troll-caught yellowfin tuna near Christmas Island in the mid-Pacific. Thirteen months later the same fish was recaptured by a Japanese fishing boat some 700 miles to the east and deep down in the ocean. This is the first time a "surface-schooling" yellowfin has been known to have been taken as a deep-swimming fish in the open sea. The fish had grown considerably in the 13-month interval--from 55 pounds to 95 pounds.

The finding of this one yellowfin as a deep swimmer is not a conclusive item, fishery biologists say, but it does indicate a "vertical pattern of migration" not hitherto demonstrated.

Data relative to horizontal migration habits of the various tuna varieties is being slowly accumulated. Last year, an albacore was taken--15 months after tagging--2,670 miles away. It had gained 40 pounds in weight. Another one traveled more than 2,000 miles. Big-eyed tuna have been known to migrate as much as 800 miles. Still another variety, the skipjack, has a much less pretentious travel record--one was caught only 30 miles away after 252 days; another went 40 miles in six days; others just "hung around" and were taken weeks later near the point of tagging.

Man's knowledge of sea dwellers is far short of his knowledge of land animals. For many reasons the migration patterns of fish are important not only to the biologist but to the fishing industry. But getting the migration pattern has been, and still is, a monumental task. In the first place it took a long time to develop tagging techniques which were not fatal to a high percentage of the fish tagged. It also took time to develop the type of tags which would withstand the rigors of many months in the ocean water. Then, too, the ocean is wide and fish are numbered by the millions, and the odds of recapturing a tagged fish are not too high.

Tags and tagging techniques are improving and as more fish are tagged the odds of retaking some of them are better. Thus, little by little, fishery biologists are learning more about the ocean and the fish that dwell in it--and the recapturing of the surface-schooling yellowfin as a deep-swimming fish is another bit to be added to the information about the species, information which will be of value to those who seek these fish for the American table.

Reclamation Fish Screen to Save Young Fish on Delta-Mendota Canal, California, Tested

The Tracy Fish Screen, built by the U. S. Bureau of Reclamation, was tested in February 1957 when the Bureau turned on all six pumps of the mammoth Tracy Pumping Plant on the Delta-Mendota Canal in Central California for the first time.

While the test was designed as a "shakedown" for the huge pumps, and not as a test for the screen, it did afford fish biologists an opportunity to observe the effectiveness of the screen.

The biologists estimated "several hundred thousand" small striped bass, shad, and smelt were screened away from the big pumps and into four collection tanks. This rough figure was considered significant because the test was made at a time when it was estimated there were very few fish in the stream and the downstream migration of small salmon had not started.

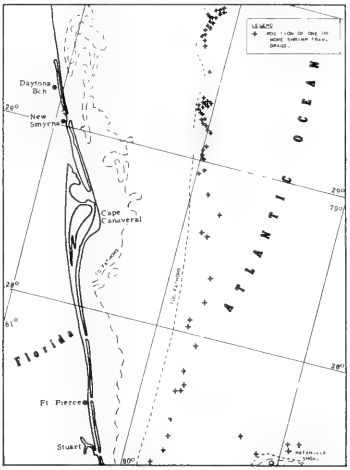
The rescued fish were trucked beyond the pump area and replanted in waters of the Sacramento-San Joaquin delta, points out the California Department of Fish and Game in a February 22 news release.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, NOVEMBER 1956, P. 49.

South Atlantic Exploratory Fishery Program

FLORIDA EAST COAST DEEP-WATER SHRIMP SURVEY (M/V Combat Cruise 7): Deep-water shrimp trawling activities along the Florida east coast between St. Augustine and Stuart, and along the northern side of Little Bahama Bank were continued by the U. S. Fish and Wildlife Service-chartered shrimp trawler Combat from January 8 to February 6, 1957. In depths of 160-250 fathoms, 56 drags were made using 40-foot and 56-foot flat trawls.

From January 8 to 16, the Combat fished the area from off St. Augustine to New Smyrna Beach. Successful 3-hour drags north of N. latitude 29°40' caught royal-red shrimp (Hymenopenaeus robustus) at rates of 178 pounds, heads-on weight (75 percent 21-30 count; 25 percent 50 or more count, headed). South of 29°30' N. latitude, drags averaged 330 pounds of heads-on shrimp (57 percent 21-30 count; 43 percent 40 or more count, headed). The best single catch yielded a total of 650 pounds of heads-on shrimp.



M/V COMBAT CRUISE 7 (JAN. 8-FEB. 6, 1957).

From January 28 to February 6, trawling was carried out from off New Smyrna Beach to Stuart. At this time, catches in the New Smyrna area averaged 249 pounds of heads-on shrimp a drag (60 percent 21-30 count; 40 percent or more count, headed). South of 29° N. latitude, catches averaged about 30 pounds of shrimp (81 percent 21-30 count; 19 percent 35 or more count, headed). The highest catch south of Cape Canaveral contained 105 pounds of royal-red shrimp.

Highest concentrations during this period centered in the Daytona Beach to New Smyrna area. Six 3-hour drags on February 4-5 caught 1,470 pounds of heads-on royal-red shrimp.

Five drags were made in depths of 180-230 fathoms off the northwestern edge of Little Bahama Bank (Matanilla Shoal). No royal-red shrimp were caught in any of these drags.

* * * * *

SHRIMP-TRAWLING GEAR STUDIES: Systematic studies of shrimp-trawling gear will be a major activity at the Service's Gear Research and Development station located at Miami, Fla., during 1957.

The Service's gear research vessel the George M. Bowers will be used to conduct experimental fishing operations in Florida and Gulf of Mexico waters, with underwater television and divers with camera gear to observe and record the operational characteristics of representative types of commercial shrimp-trawling gear in use in the Southeastern shrimp industry. Studies will be made of the behavior of the nets, trawl doors, towing cables, floats, and other accessory gear under various towing speeds and fishing conditions. Attempts will be made to record the reaction of shrimp and fish to capture by the trawls.

Reports on the progress of the work will be issued periodically. A moving picture film of shrimp trawling gear in operation will also be produced.

United States Fishing Fleet[1/] Additions

JANUARY 1957: A total of 26 vessels, of 5 net tons and over, received first documents as fishing craft during January 1957--9 more than in January 1956. The

Table 1 - Vessels Issued First Documents as Fishing Craft, By Areas, January 1957

Area	January		Total
	1957	1956	1956
	..... (Number)		
New England	1	1	15
Middle Atlantic	2	2	26
Chesapeake	8	5	138
South Atlantic	8	4	119
Gulf	1	3	100
Pacific	2	1	76
Great Lakes	-	-	6
Alaska	4	1	40
Hawaii	-	-	1
Total	26	17	521

NOTE: VESSELS ASSIGNED TO THE VARIOUS SECTIONS ON THE BASIS OF THEIR HOME PORT.

Table 2 - Vessels Issued First Documents As Fishing Craft, By Tonnage, January 1957

Net Tons	Number
5 to 9	13
10 to 19	4
20 to 29	1
30 to 39	7
40 to 49	1

Chesapeake and South Atlantic areas led with 8 vessels each, followed by Alaska with 4, the Middle Atlantic and Pacific areas 2 each, and the Gulf and New England area 1 each.

1/ INCLUDES BOTH COMMERCIAL AND SPORT FISHING CRAFT.

United States and Alaska Fisheries Landings, 1956

TREND IN FOOD FISH LANDINGS IS DOWNWARD: Although the commercial food fish and shellfish landings in 1956 were 100 million pounds more than in 1955, they were still about 12 percent below the 1947-1950 average. Food fish taken

in 1956 totaled 2.8 billion pounds. This is 400 million pounds below the 1947-50 average.

Had the 1947-1950 rate of food fish landings been maintained in 1956, the landings would have totaled close to 3.6 billion pounds or 30 percent more than the actual landings, the U. S. Fish and Wildlife Service estimated.

United States and Alaska commercial landings of both food and industrial fish and shellfish in 1956 amounted 5.2 billion pounds--an all-time record. The previous record was 4.9 billion pounds in 1951. The 1955 landings totaled 4.8 billion pounds. In 1956, the landings consisted of 2.8 billion pounds of food fish and shellfish and 2.4 billion pounds of industrial fish.

The big catch of menhaden (an industrial fish used for manufacturing fish meal, oil, and solubles) in the Atlantic ocean and in the Gulf of Mexico was a principal factor in the 1956 record harvest. The menhaden landings totaled more than 2.0 billion pounds. This was the first time landings of two billion pounds were reported for any one variety in the United States. The menhaden landings in 1956 were up 200 million pounds over those for 1955 and marked the sixth consecutive year that the menhaden landings have broken the record set the previous year.

Analysis of the annual landings over the past several years indicates a sharp increase in the amount of industrial fish being taken by United States fishermen--one billion pounds in ten years--but a decline in the amount of fish harvested for human food--a 400-million-pound drop from the 1947-50 average.

Segments of the fishing industry, particularly the New England groundfish and the Pacific Coast tuna producers, point out that the food fish landings are far below the production capabilities of the United States and Alaska fishing fleets. Tie-up of fishing craft in some areas for as high as 90 days because of lack of markets is cited as evidence of this. The tuna fleet, which once numbered 214 large clippers, now numbers only 153 because of these long periods of inactivity.

Other species taken in considerably greater quantity in 1956 than in the previous year were tuna, 330 million pounds (271 million pounds in 1955); Pacific and jack mackerel 124 million pounds (59 million pounds in 1955); Alaska herring 103 million pounds (64 million pounds in 1955); and Maine herring 133 million pounds (99 million pounds in 1955). The landings of salmon amounted to 331 million pounds, up 21 million pounds from the low 1955 landings. Haddock landings likewise increased, amounting to 150 million pounds as compared with 135 pounds in 1955.

Landings of a number of important species were down sharply in 1956; Pacific sardines amounted to only 66 million pounds compared with 146 million pounds the previous year; shrimp (heads on) amounted to only about 220 million pounds compared with 236 million pounds the previous year; ocean perch totaled 151 million pounds, down 5 million pounds compared with 1955.

CONSUMPTION: Despite the decline in the catch of food fish during recent years, the per capita consumption of fish has remained fairly constant at 10-11 pounds edible weight, but has not increased principally because since 1950 the United States population increased by about 20 million. Large increases in imports which have displaced domestically-caught fish made this possible.

IMPORTS: During the years 1947-1950, imports of edible fish and shellfish averaged 860 million pounds (round-weight basis). In 1956 these imports totaled about 1.5 billion pounds. Imports supplied about 35 percent of the domestic supply of edible fishery products in 1956, compared with an average of 21 percent during the years from 1947 to 1950.

Imports received in considerably greater volume in 1956 were frozen groundfish fillets, canned salmon, and fresh and frozen shrimp. Receipts of fresh and frozen tuna were below the record 145 million pounds received in 1955.

TOTAL UTILIZATION: Total utilization of fish for all purposes--human food and industrial--in 1956 was 7.6 billion pounds round weight, of which more than a third, or 2.4 billion pounds (round weight), were imports.

EX-VESSEL VALUE: The 1956 record commercial fish and shellfish landings for both food and industrial use were worth $363 million ex-dock or ex-vessel. This compares with $338 million in 1955.

LANDINGS FOR LEADING PORTS: San Pedro, Calif., which has been the leading food and industrial fish landing port in the United States for many years, again captured that honor in 1956. Landings in San Pedro in 1956 (largely tuna, mackerel, and sardines) totaled 383 million pounds. The value of the catch ex-dock or ex-vessel was $29 million.

Gloucester, Mass., led other food fish ports with receipts of 250 million pounds, worth $7,600,000 ex-vessel. Gloucester landings were mainly ocean perch and whiting.

Boston, Mass., the Nation's principal port for the food fish such as haddock, cod, and pollock reported landings of 147 million pounds, worth $10 million to the fishing vessels.

San Diego, Calif., largely a tuna port, trailed Boston in poundage landed but surpassed the eastern city in the ex-vessel value of the landings. Landings at San Diego amounted to 135 million pounds, with a value of almost $19 million ex-vessel. New Bedford, Mass., famous for the scallop and flounder landed there, has 88 million pounds of fish and shellfish, valued at $12 million ex-vessel. Portland, Me., largely an ocean perch port, followed with landings of 58 million pounds, valued at almost $2 million ex-vessel.

NOTES: 1. STATISTICS ON UNITED STATES FISH AND SHELLFISH LANDINGS AND IMPORTS AS GIVEN IN THIS ARTICLE ARE BASED ON ROUND WEIGHT OR WEIGHT AS CAUGHT FOR FISH AND CRUSTACEANS AND WEIGHT OF THE MEATS FOR MOLLUSKS. IMPORT DATA WERE CONVERTED TO ROUND WEIGHT FOR FISH AND CRUSTACEANS AND WEIGHT OF THE MEATS FOR MOLLUSKS.

2. SEE COMMERCIAL FISHERIES REVIEW, DECEMBER 1956, P. 51.

U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, NOVEMBER 1956: Imports of edible fresh, frozen, and processed fish and shellfish in November decreased 37 percent in quantity and 36 percent in value as compared with October 1956. Compared with November

Table 1 - United States Foreign Trade in Edible Fishery Products, November 1956 With Comparisons

Item	Quantity			Value		
	Nov.		Year	Nov.		Year
	1956	1955	1955	1956	1955	1955
	(Millions of Lbs.)			(Millions of $)		
Imports:						
Fish and shellfish:						
Fresh, frozen & processed 1/	57.3	73.2	769.5	16.5	21.2	206.4
Exports:						
Fish and shellfish:						
Processed 1/ only (excluding fresh & frozen)	9.1	14.3	88.3	2.3	3.3	21.6

1/ INCLUDES PASTES, SAUCES, CLAM CHOWDER AND JUICE, AND OTHER SPECIALTIES.

1955 the imports for November 1956 were lower by 22 percent in both quantity and value. November 1956 imports averaged 28.8 cents a pound as compared with 29.0

cents a pound for the same month in 1955. Groundfish fillet (including ocean perch) imports in November 1956 were down sharply from the record high level of October 1956 and were also lower by about 50 percent from November 1955.

Exports of processed fish and shellfish in November 1956 declined about 23 percent in quantity as compared with the previous month, and were 37 percent below November 1955. The November 1956 value of these exports was 21 percent lower than the previous month, and down about 30 percent from the same month a year earlier. Exports of California sardines in November 1955 were close to double the total for November 1956.

* * * * *

GROUNDFISH FILLET IMPORTS HIGHER IN JANUARY 1957: Imports of groundfish (including ocean perch) fillets and fish blocks during January 1957 amounted to 19.0 million pounds, an increase of 23 percent over the 15.4 million pounds reported for the same month in 1956.

The increase was primarily due to more imports from Canada (up 2.6 million pounds) and Iceland (up 887 thousand pounds). Imports from Norway, Denmark, the United Kingdom, and France also were somewhat larger while receipts from the Netherlands and West Germany were less than in January 1956. Canada and Iceland accounted for 92 percent of the total January imports.

NOTE: SEE CHART 7 IN THIS ISSUE. ALSO, SEE P. 57 OF THIS ISSUE.

Virginia

NEW FISHERIES RESEARCH VESSEL: With the launching of the Pathfinder, the research vessel which is to be used to investigate problems relating to Virginia's

THE PATHFINDER, A NEW VIRGINIA STATE FISHERIES RESEARCH VESSEL, WAS LAUNCHED IN MARCH AT A SHIPYARD IN WEST NORFOLK, VA.

multimillion dollar sea-food industry, State scientists at the Gloucester Point Laboratory look to a new day in fisheries research. This is the first boat specifically designed for marine research in the Chesapeake Bay estuarine and coastal waters.

"The Pathfinder will be a floating marine laboratory to further our knowledge of the sea and its myriad forms of life," the Director of the Virginia Fisheries Laboratory declared.

The pioneering nature of the research program at the Laboratory is suggested by the name of the new vessel. The Pathfinder will enable scientists to continue their work under conditions which could not be weathered by the present vessel, the Virginia Lee. The new vessel will be equipped with winches for hauling dredges and trawl nets. A depth recorder will make tracings of the contours of the floor of the ocean and Bay. A quick-freeze box will preserve specimens until they can be carefully examined by scientists. Live tanks, properly aerated, will hold fish and other marine forms for delivery to the Gloucester Point Laboratory. A chemical laboratory for analysis of seawater is an integral part of the new vessel.

The keel for the Pathfinder was laid at a shipyard at West Norfolk in April 1956. She is 55 feet long, 16.5 feet in beam, and will be driven with a 120 horsepower Diesel engine. The steering devices are so arranged that the boat may be handled either from the pilothouse or from the flying bridge on top of the deckhouse. Installation of the engine, rigging, and other machinery will be completed after the new vessel is afloat.

Wholesale Prices, January 1957

United States fishing fleets resumed normal activities after the usual lay-ups during the year-end holidays, but many inland and coastal areas were hit by gales, snow, and ice. The January 1957 wholesale price index (121.8 of the 1947-49 average) for all edible fish and shellfish (fresh, frozen, and canned) was higher by 4.8 percent when compared with the previous month, but was slightly below (0.4 percent) the January 1956 index.

The drawn, dressed, and whole finfish subgroup index for January increased 13.1 percent as compared with December due to the usual price increases that follow periods of bad weather and a pick-up in demand when the New Year starts. January 1957 prices for the items in this subgroup did not go up as much as a year earlier and consequently were 6.6 percent lower as compared to January 1956. Prices for large drawn haddock, Lake superior whitefish, and domestic lake trout were lower by 11-31 percent, but halibut, salmon, and yellow pike were up 6-21 percent as compared with the same month in 1956.

The price changes in the fresh processed fish and shellfish subgroup from December to January were slight (up 4.2 percent). Fresh haddock fillets were up rather sharply at Boston and fresh shucked oysters were slightly higher at Norfolk. Compared with January 1956, this subgroup index for January 1957 was higher by 4.9 percent with the lower haddock fillet price more than offset by higher fresh shrimp and oyster prices. Fresh shrimp prices at New York during the month were higher by 8.7 percent as compared with January 1956.

The January 1957 subgroup index for frozen processed fish and shellfish was up 3.8 percent from December and 4.3 percent from the same month in 1956 Frozen haddock fillets were higher by 7 percent this January as compared with

December and about 2 percent higher than in January 1956. Frozen ocean perch fillet prices also increased this January by 3.6 percent over December, but were unchanged from January a year ago. Frozen shrimp prices at Chicago continued to be firm with a 3.2-percent increase over December and were 7.3 percent above the same month in 1956.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, January 1957

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices1/ ($)		Indexes (1947-49=100)			
			Jan. 1957	Dec. 1956	Jan. 1957	Dec. 1956	Nov. 1956	Jan. 1956
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					121.8	116.1	118.4	122.
Fresh & Frozen Fishery Products:					136.2	126.6	130.9	136.5
Drawn, Dressed, or Whole Finfish:					134.1	118.6	128.0	143.5
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.14	.09	143.6	92.7	122.1	208.2
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.35	.35	108.3	108.3	112.9	89.2
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.64	.64	143.8	143.8	144.9	135.4
Whitefish,L. Superior, drawn, fresh	Chicago	lb.	.59	.61	146.3	151.2	146.3	171.0
Whitefish,L. Erie pound or gill net, rnd., fresh	New York	lb.	.70	.71	141.5	143.6	149.6	141.5
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.57	.71	116.8	145.4	143.4	131.1
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.60	.36	140.7	84.4	80.3	117.3
Processed, Fresh (Fish & Shellfish):					140.3	134.7	135.5	133.7
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.46	.30	158.2	103.8	117.4	217.7
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.82	.82	128.8	129.6	128.8	118.5
Oysters, shucked, standards	Norfolk	gal.	6.12	6.00	151.6	148.5	148.5	136.1
Processed, Frozen (Fish & Shellfish):					122.7	118.2	118.6	117.6
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.40	.40	103.4	103.4	103.4	104.7
Haddock, sml.,skins on, 1-lb. pkg.	Boston	lb.	.30	.28	94.2	87.9	87.9	92.6
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.28	.28	114.8	110.8	108.8	114.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.84	.82	130.0	126.0	127.3	121.1
Canned Fishery Products:					101.5	101.2	100.6	102.2
Salmon, pink, No.1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	22.65	22.65	120.0	120.0	120.0	120.0
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.20	11.20	80.8	80.8	80.8	85.1
Sardines, Calif., tom. pack,No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	9.00	9.00	105.0	105.0	97.4	81.7
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	7.95	7.70	84.6	81.9	81.9	89.9

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.

The market for canned fishery products was firm in January 1957 with prices unchanged from the previous month, except for an increase of 25 cents a case for Maine sardines. The index for this subgroup for January 1957 was less than 1 percent below January 1956. The California sardine canning season ended January 31 with a poor pack. The only extensive fish canning in January 1957 was by the California canners.

International

INTERNATIONAL PACIFIC HALIBUT COMMISSION

HALIBUT SEASON FOR 1957: The International Pacific Halibut Commission announced February 1, 1957, that:

(1) The opening date for the 1957 Pacific Halibut season shall be May 1, in all areas.

(2) There shall be one fishing season in Areas 1A and 3B extending from May 1 to October 15, without catch limits.

(3) There shall be two fishing seasons in Area 2 as in 1956. The catch in the first season shall be limited to 26.5 million pounds. The second fishing season in Area 2 shall begin on July 29, for a period of at least 7 days with no catch limit. In the event there is a significant deficiency in the catch limit taken during the first season in Area 2, the Commission may increase the length of the second season by announcement prior to the second opening.

(4) Area 1B shall have two fishing seasons, identical to those in Area 2 and without catch limits.

(5) There shall be one fishing season in Area 3A, with a catch limit of 30 million pounds. With this limit the stocks in this area can be fully utilized in this single season under the present plan of fleet operation, and the fleet will be thus afforded opportunity to fish in Area 3B.

(6) The fishing areas shall be the same as in 1956. These are as follows:

Area 1A - South of Heceta Head, Ore.

Area 1B - Between Heceta Head and Willapa Bay, Wash.

Area 2 - Between Willapa Bay and Cape Spencer, Alaska.

Area 3A - Between Cape Spencer and a line running southeast one-half east from Kupreanof Point, near Shumigan Islands.

Area 3B - All waters west of Area 3A including Bering Sea.

JAPANESE-RUSSIAN NORTH PACIFIC FISH COMMISSION MEETING

The date of the meeting between delegates to the Japanese-Russian Fish Commission, scheduled to meet in Tokyo on December 30, 1956, was advanced to the latter part of January 1957. The Soviet delegation will be headed by A. M. Kutareff, an official of the Ministry of Fisheries, and not by A. A. Ishkov, Minister of Fisheries, as originally planned. Other Soviet delegates to the meeting will include 3 commissioners and 8 advisors. The head of the Japanese delegation will be Ishitaru Ide, the new Japanese Minister of Agriculture and Forestry.

The Japanese were disappointed by the postponement in the date of the meeting and also by the change in the chief of the Soviet delegation. Several months are required to make plans for the Japanese North Pacific salmon fishery and any delays on the part of the Russians are apt to be costly.

The most important of the decisions to be arrived at during the conferences is the salmon quota for the 1957 fishing season in the Northwest Pacific Convention area. The Japanese are hoping for a minimum quota of 150,000 metric tons.

NORWAY-CZECHOSLOVAK TRADE AGREEMENT FOR 1957 INCLUDES FISHERY PRODUCTS

A Protocol to the March 20, 1947, trade agreement between Norway and Czechoslovakia was signed in Oslo on November 29, 1956, for the calendar year 1957. Exports from Norway to Czechoslovakia will include the following fishery products: fish oils, refined and for technical purposes, 4,400 metric tons; medicinal cod-liver oil, 600 tons; fresh, frozen, and salted herring, 15,000 tons; fish fillets, 2,500 tons; various fish, including mackerel and tuna 2,500 tons; canned fish, 500,000 kroner (US$70,000); fish meal 1,000 tons; and pearl essence, 100,000 kroner (US$14,000).

SPECIAL COMMITTEE ON OCEANIC RESEARCH

At the international conference of oceanographers held in Gothenburg January 15-18, 1957, an organization (Special Committee on Oceanic Research) was established to conduct joint international oceanographic research.

The new organization will be directly interested in oceanic research from all scientific points of view, including geological, geographical, biological, and physical aspects. The members will be very carefully selected. During the discussions it was emphasized that the organization will need scientists combining the necessary scientific qualifications with a great amount of initiative. The members should also be able to raise the money needed to carry through the program.

An American scientist, Dr. R. Revelle, has been named president of the new organization, and the vice presidents are Dr. M. N. Hill, England, and Professor L. Zenkevitj, Soviet Union. On September 3-14, 1957, the oceanographers will again convene (in Toronto) in conjunction with a meeting of the International Union for Geodesy and Physics, a January 21 dispatch from the United States Embassy at Gothenburg points out.

In a press interview, L. Zenkevitj, the leader of the Soviet delegation, stated that Soviet oceanographers have made extensive preparations for their participation in the geophysical year. Some 15 vessels, he said, are being equipped and will serve as a permanent fleet for research in the Atlantic, Pacific, and Indian Oceans and in the north and south polar regions. The Soviet, he said, are very much interested in carrying out biological research and he recommended that expert biologists be attached to the expeditions for the purpose of studying plankton samples and bird and mammal life at sea. He stressed, however, that he was not referring principally to the cultivation of algae and plankton, but rather to increasing the yield of food products obtained from the sea, mainly by intensified fishing. There are, he pointed out, enormous areas, particularly in the southern hemisphere, where there is no fishing at all.

A number of the delegates to the Conference met on two additional days at the request of an American delegate, Dr. Roger Revelle, head of the Scripp's Institute of Oceanography in California, who stated that at the request of the United Nations he wished to convene the delegates for a discussion of oceanographic and marine biological viewpoints on radioactive waste in oceans with special emphasis on the influence of radioactive particles on commercial fishing.

Also, special attention was given by the conference to research work during the geophysical year when the Indian Ocean will be studied most thoroughly.

WORLD PRODUCTION OF MARINE OILS

World production of marine oils in 1956 was estimated to have increased from 1955 along with the other four categories of fats and oils. World production of all fats, oils, and oil-bearing materials in calendar year 1956 was estimated at 30.5 million short tons, oil equivalent, reports the January 28 issue of Foreign Crops and Markets of the U. S. Department of Agriculture.

Marine Oils: Estimated World Production, Averages 1935-39 and 1945-49, Annual 1950-56

Commodity	1956 1/	1955	1954	1953	1952	1951	1950	Average 1945-49	Average 1935-39
	(1,000 Short Tons)								
Whale	425	420	455	420	460	435	425	280	545
Sperm whale	110	100	75	55	85	120	55	40	30
Fish (incl. liver)	520	515	525	455	450	474	375	275	480
Total	1,055	1,035	1,055	930	995	1,029	855	595	1,055

1/ PRELIMINARY.

Output of marine oils in 1956 increased from 1955 by an estimated 2 percent, reaching 1,055,000 short tons, the same as production in 1954 and in the prewar period. Whale oil output increased slightly with a somewhat larger production from the whale catch in the Antarctic during the 1955/56 season. The sperm whale oil outturn increased an estimated 10 percent with the most pronounced expansion accounted for by Japan. Indications are that production of fish oils in 1956 also was slightly larger than in 1955 due principally to increases in Norway and the United States, the two major producers.

Aden

FISHERY RESOURCES: The sea along the South Arabian coast is considered to be a rich fishing ground, but the antiquated methods and equipment of the local fishermen limit the catch. A small program of assistance to the Eastern Aden Protectorate fishermen was inaugurated last year with the appointment of a fisheries officer.

The principal catches are tuna, which is canned by a small factory in Mukalla and exported to the hinterland and (via Aden) to Italy, and sardines which are used as camel fodder and fertilizer for tobacco crops. Fish oil and dried fish are also exported, and fish is an important source of food for the coastal villages, points out a January 28 dispatch from the United States Consulate at the city of Aden.

Angola

NEW FISHERY BYPRODUCTS PLANT: A new firm has been formed at Porto Alexandre, Angola, reportedly to erect a fish oil and fish meal factory in the locality known as Santo Antonio. Preliminary work has started and the pier for loading and unloading has already been constructed. Machinery is being installed to process 150 metric tons of fresh fish daily. Centrifuges will be installed to concentrate the stickwater. The cost of this factory, including installations for personnel, will be between 13,000-14,000 contos (US$450,000-487,000), a January 7 dispatch from the United States Consulate at Luanda states.

Australia

1956/57 SPINY LOBSTER SEASON IN WEST AUSTRALIA OPENED IN NOVEMBER: When the 1956/57 spiny lobster fishing season opened on November 15 in West Australia, an estimated 150 fishing boats put to sea to catch the white spiny lobsters which abound on the sandy ocean bottom during the first two weeks of the season. As the white ones disappear, the fishermen shift their pots to the reefs and rocky bottoms where red ones may be caught during the balance of the season.

The number of boats in the fleet is up about 25 from last year. This has caused new worries among conservationists that the grounds may be fished out. In an experimental move to protect the younger spiny lobsters in shallow coastal waters, the State Government will ban the catching of spiny lobster, whether by professional fishermen or amateur skin divers, in waters within one mile of a 150-mile strip of coast north from the vicinity of Perth, during the period from January 15 to November 15, 1957.

West Australian exports during the 1955/56 season, as reported by the Commonwealth Government, totaled 3.6 million pounds, over 75 percent of the Australian total. The United States was the principal purchaser, and higher wholesale prices approaching $1 a pound late in the year improved total earnings despite lower production.

British Guiana

SHRIMP EXPLORATIONS OFF COAST: A United States firm is reported to be searching for shrimp in the coastal waters of British Guiana, according to Foreign Trade, January 19, 1957, published by the Canadian Department of Trade and Commerce.

The United States firm's fleet of three fishing vessels and a mothership for processing and storing the catch is operating out of Georgetown. Although shrimp have been caught in many areas, the catches so far have not been large enough for a profitable large-scale shrimp fishery.

Brazil

RECIFE AREA TO HAVE NEW FISHING COMPANY: A new fishing company will be established at Recife in January 1957, according to newspaper reports transmitted in dispatches dated January 2 and 8 by the United States Consul at Recife. It is expected that the new firm will assure an adequate supply of fish for Recife and other cities in Northeastern Brazil.

The firm will have a capital of Cr.$10 million (about US$153,000) and two fishing vessels. It will process, distribute, and also can the surplus. It is believed that the Japanese vessel Kaiko Maru, which has been supplying fish to Recife for about five months, will be sold to the new firm.

Due to the efforts of Japanese fishing vessels operating in northeastern Brazil waters, Recife has enjoyed a plentiful supply of tuna at reasonable prices.

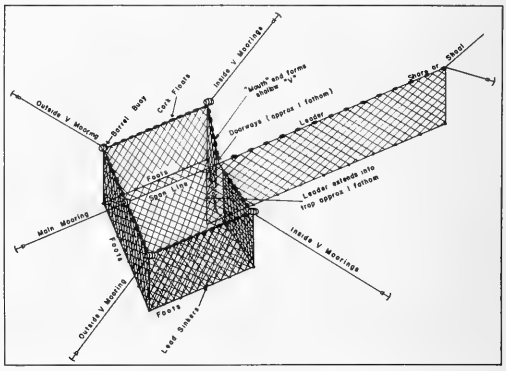
Canada

NEWFOUNDLAND COD TRAP: The boxlike trap, developed some 90 years ago by a Newfoundland fisherman operating at Bonne Esperance in the Strait of Belle Isle, annually accounts for a large proportion of the landings of cod by Newfoundland fishermen, particularly on the east coast.

Although all cod traps are basically the same in type of construction, they vary widely in size, ranging from as small as 35 fathoms on the round to extra large ones of 84 fathoms.

Traps are set out in the inshore waters with the leader end moored close to the shore or a reef. Cod swimming by thus are diverted into the door of the trap. Once inside the cod are still free to leave by the doorway, but they are discouraged from doing this by the "lay" of the front walls which slant inwards to the doorways.

In setting out the cod trap, the fishermen first place the framework of ropes with the anchors and buoys in position and attach the mesh sides and floor afterwards. In hauling them the mesh is pulled in so that the fish are "dried up" at the back of the trap or in one of the back corners, depending on the tide.



NEWFOUNDLAND COD TRAP IN FISHING ORDER.

Although other, more mechanized methods are gradually achieving a measure of popularity throughout Newfoundland, the cod trap continues to be a prolific producer during the summer season when vast shoals of cod swarm into Newfoundland's close inshore waters.

Costs of traps show a considerable variation, depending on the size, where they are made, the length of the leader, etc. A typical 60-fathom trap ranges from about $1,400 to $1,800, and those around 84 fathoms may cost as high as $3,000.

An important feature of the cod trap is that it is movable. Thus, if fishing proves to be unproductive in one spot the fisherman can shift it to another berth (Trade News, December 1956, a publication of Canada's Department of Fisheries).

* * * * *

SASKATCHEWAN COMPLETES FILLETING AND FREEZING PLANT: In order to enable the fishermen of Saskatchewan's Wollaston Lake to take advantage of the full fish resources of the lake, the Province's Department of Natural Resources completed a $75,000 fish filleting and freezing plant in the fall of 1956. Wollaston Lake is in the Northeast corner of Saskatchewan.

The new plant has a storage capacity of 150,000 pounds of frozen fish, a freezing capacity of 600 pounds an hour, and can manufacture 5 tons of flake ice in 24 hours. The fishermen on the Lake are expected to double their present catch to reach the full annual limit of about 825,000 pounds (Saskatchewan News, issued bimonthly by the Saskatchewan Provincial Government).

* * * * *

CONSTRUCTION SUBSIDY EXTENDED TO LARGER VESSELS: The Canadian program for financial assistance in the construction of fishing draggers and trawlers, previously limited to boats under 65 feet in length, was extended to the larger vessels of the Atlantic Maritime provinces effective January 1, 1957, according to an announcement by the Canadian Minister of Public Works on December 3, 1956.

Cuba

CANNED MACKEREL MARKET: No canned mackerel is produced in Cuba and there is very little demand for this product, a January 24 dispatch from the United States Embassy in Havana states.

The current consumption trend is static, with only an occasional lot of mackerel imported from the United States. In 1955 mackerel imports totaled 2,515 cases (valued at $17,795).

A few importers maintain a small inventory of canned mackerel as an accommodation for customers. Several Havana area grocery stores, of the type generally patronized by the local population, were visited and none carried canned mackerel in stock. Some were wholly unfamiliar with the product and others indicated that they either never maintained or had discontinued the item because of lack of demand.

While unwilling to give encouragement that a significant market can be developed, trade sources indicated a preference for 15-ounce ovals packed in tomato sauce. These sources reported that current imports are almost completely in 15-ounce cans and natural medium, and that there is about equal division between tall and oval cans. Retail prices for the 15-ounce cans range from 25-35 U.S. cents a can.

Authoritative sources are uniformally pessimistic about developing a significant market for canned mackerel in Cuba. The principal reasons cited are the long well-established preference for sardines and other fishery products generally accepted in Cuba, together with a dislike of the taste and texture qualities of mackerel.

On the basis of the current situation, it seems clear that significant expansion of the Cuban market for canned mackerel would require: the development of interest on the part of distribution outlets that could be induced to conduct aggressive promotion campaigns and sales efforts; the ability to price canned mackerel so that it would be distinctly advantageous in relation to other low-priced fish and meat products; and the use of a tomato or other acceptable tasteful packing medium.

* * * * *

NEW FISHING REGULATIONS: New regulations governing the fishing industry of Cuba published in Official Gazette No. 206 of October 23, 1956, as Decree No. 2724 of October 5, 1956, supersede those contained in Decree No. 973 of May 8, 1939, and conflicting provisions of subsequent decrees. The new regulations made necessary by the establishment of the National Fisheries Institute under Law-Decree 1891 of January 11, 1955, do not make any significant change in the regulations and practices of the Cuban fishing industry.

The provisions are based upon State ownership of the marine resources, and the reservation of rights, except for sport fishing, to Cuban citizens. All persons engaged in the fishing trade must be registered in a General Registry of Fishermen to be maintained by the National Fisheries Institute. The Institute also is to main-

tain a General Registry of Fishing Vessels. License fees prescribed for commercial fishermen, fishing vessels, merchants, and processors are payable to the Institute for general use in accordance with its broad authorities. No fees or licenses are required for sports fishing, although vessels must be registered and such fishing must be in accordance with the general regulations.

The regulations also cover in detail such aspects as open and closed seasons, size and quantity limitations, legal and prohibited equipment and methods, sale and transportation, conservation and propagation, enforcement authorities, and other subjects. Full reports including statistics on catch are to be furnished after each fishing trip before a vessel may be cleared for a subsequent trip.

Ecuador

CANNED MACKEREL MARKET: No present opportunity exists for imports of canned mackerel into Ecuador, states a January 8 dispatch from the United States Embassy at Quito. The principal obstacle is the high tariff of 18 sucres (slightly less than US$1.00) per kilo (about 45 U.S. cents a pound), plus 20 percent ad valorem. When the various taxes on imports and the usual dealer markups are added to this, the result would be a retail price for canned mackerel beyond the reach of all but a tiny fragment of the population.

There is no domestic production of canned mackerel in Ecuador. Statistics on imports are not readily available, but it is believed that they have been negligible or nonexistent. Canned fish imports generally have had little success in Ecuador, with the exception of sardines and to a lesser extent salmon, shrimp, and tuna, states a January 8, 1957, dispatch from the United States Embassy in Quito.

* * * * *

FISH FREEZING AND REDUCTION PLANT COMPLETED: A small pilot plant for freezing fish and manufacturing fish meal was completed at Manta, Ecuador, under the direction of a Food and Agriculture Organization technician, a December 19, 1956, dispatch from the United States Embassy in Quito reports.

El Salvador

CANNED MACKEREL MARKET: There is a good market in El Salvador for canned mackerel, according to a dispatch (January 23, 1957) from the United States Embassy at San Salvador. That portion of the population which can afford to purchase canned mackerel finds it an inexpensive food, attractive to its taste.

There is no production of canned mackerel in El Salvador. There is a good demand for this product because of its modest price and high protein content. The demand is fairly stable throughout the year, possibly reaching a high point during the Easter season, which is traditionally a highly festive one.

The most popular size can is the 15-oz. oval, which is estimated to account for 85 percent of the importations. About 10 percent of the pack is in the natural state, and 90 percent is in tomato sauce.

Current retail prices for canned mackerel in San Salvador are as follows: 15-oz. oval and tall, 30 U.S. cents; 8-oz. square, 20 cents; and 6-oz. tall, 12 cents.

All kinds of fish are grouped together in the import statistics; therefore, it is possible only to estimate what proportion may be canned mackerel. On the basis of trade comment, it is estimated that about 1,247,467 pounds of canned mackerel were imported in El Salvador in 1955 as compared with 1,403,320 pounds in 1954. Of this total 1,240,054 pounds were imported from the United States in 1955 and 1,381,984 pounds in 1954.

The United States enjoys a tariff preferential under the terms of the trade agreement of 1937, which specifically lists canned mackerel (and salmon) at US$5 per 100 kilograms (2¼ U.S. cents a pound), compared to the regular rate of US$29 per 100 kilograms (13 U.S. cents a pound). The preferential rate, however, is enjoyed by a number of other countries as well, so that the large importation of United States mackerel cannot be ascribed to the tariff preferential alone.

It is believed that there is a good prospect for continued importations of United States canned mackerel and possibly an opportunity for expanding sales still further.

France

FISHING FLEET: In 1953 France's fishing fleet was already beginning to discard its very old vessels.

The wooden fleet of fishing boats in 1953 showed a uniform increase in boats of higher tonnage and a steady disappearance of boats of lower tonnage.

In 1953, France's fishing fleet numbered some 1,504 units of 25 tons and over with a total tonnage of 159,937 tons. However, 306 of these vessels were over 20 years old. In July 1956 the fishing fleet consisted only of 1,274 units with a tonnage of 154,952 tons. But only 140 of the vessels were more than 20 years old.

France's Fishing Fleet by Tonnage, 1953 and 1956

Year	25 to 50 Tons		50 to 75 Tons		75 to 100 Tons		Over 100 Tons		Total	
	No.	Tonnage	No.	Tonnage	No.	Tonnage	No.	Tonnage	No.	Tonnage
1956	630	22,022	253	15,612	101	6,723	290	110,595	1,274	154,952
1953	839	30,114	300	18,068	82	6,850	283	104,905	1,504	159,937

Thus from January 1953 to July 1956, France's "deep-sea" fishing fleet while losing 15.3 percent of its units, lost only 3 percent of its tonnage (see table). Also, the percentage of old boats fell from 21 percent to 11 percent.

The number of vessels of less than 25 tons each in the fleet significantly declined, mainly through the loss of boats over 20 years old. Port by port, the rapid disappearance of boats over 20 years old took place largely in the ports with numerous sail-bearing tuna boats. Thus Concarneau, Lorient, Groix, Etel, and La Rochelle lost a total of 169 units. On the other hand, an increase was noticeable in those ports where little drag-net fishing is carried on such as the Bigoudene peninsula and Sables-d'Olonne. An increase also took place at Saint-Jean-de-Luz where the small sardine boat is being replaced by the small tuna boat. At Camaret there was a decrease due, no doubt, to the disappearance of lobsters in the nearby waters.

The 50- to 75-ton category was relatively stable. Although the number of vessels increased in Concarneau, in Groix, and at l'Ile d'Yeu, the number declined in Lorient and La Rochelle.

An increase in the 75- to 100-ton category took place, but there was stability in the category of vessels over 100 tons. There were only 7 more such units in

1956 than in 1953, but the total tonnage increased. In 1953, the metal vessels of over 100 tons comprised 239 units with a total tonnage of 98,334. The wooden vessels of over 100 tons comprised 44 units with a total tonnage of 6,571 tons. In July 1956 there were 50 wooden vessels of more than 100 tons each.

To the 100-ton and over category, 64 new boats have been added since 1953; to the 75- to 100-ton category, 32; to the 50- to 75-ton category, 61; to the 25- to 50-ton category, 195. These new units add up to 352.

Trawlers: "True" trawlers comprise alone nearly half of France's deep-sea fleet--628 units with a total tonnage of 123,129 tons. Of the trawlers, 29 displace over 1,000 tons and 12 displace between 500 and 1,000 tons. These vessels are all of the standard single-purpose type, except for two which are dual-purpose refrigerated-salting vessels.

Trawlers between 250 and 500 tons number 87 units with a tonnage of 31,058 tons. This is a "young" fleet. Only 7 of the vessels are over 20 years old and, of course, even a twenty-year old trawler is still very valuable if it has been kept in good condition.

Trawlers between 100 and 250 tons total 135 units with a tonnage of 22,587 tons. This fleet has been largely rejuvenated--only 30 of the vessels are more than 20 years old and 21 new units have been added. The boats of near 250 tons are being equipped with more and more powerful motors so that they may trawl to greater and greater depths. No doubt wooden boats will continue to enter the fleet, but this is becoming rarer; steel boats, which are more readily insurable, are taking over.

Trawlers between 75 and 100 tons, entirely wooden, number 88 units with a total tonnage of 7,550 tons. It is classed as a semideep-sea fleet and continues to be very valuable. These vessels, around the year 1934, brought a new approach to trawling. The present fleet has five units of over 20 years which may, incidentally, be definitely considered as average--a wooden vessel over 20 years old in full operation is a doubtful asset. But on the other hand, the fleet has received 23 new units over a period of 5 years.

Trawlers of 50-75 tons comprise 93 units, all wooden, with a total tonnage of 5,954 tons. The category is popular among ship owners in small ports and has received 21 units in the last five years.

Trawlers between 25 and 50 tons (this category has the greatest number of units) total 184 units with a tonnage of 6,402 tons. It has been heavily reinforced (56 new units in the last five years) and has been the target of violent criticism.

Trawler-Tuna Vessels: There has been added to the fleet of "true" trawlers, a fleet of trawler-tuna vessels (the conversion of tuna boats into trawlers). The fleet numbers 327 units with a total tonnage of 13,628 tons. It may be divided into the following categories; 25 to 50 tons, 248 units (tonnage 8,309); 50 to 75 tons, 69 units (tonnage 4,291); 75 to 100 tons, 7 units (tonnage 685); more than 100 tons, 3 units (tonnage 343).

Of these 327 units, 97 are less than 5 years old. This type of vessel is very popular in France. This fleet has 29 vessels equipped with live-bait wells.

Tuna Vessels: "True" tuna vessels theoretically number 193 units with a tonnage of 9,290 tons. The name, however, is somewhat arbitrary, for many of the units fish other species, too, such as mackerel, etc.

Actually the fleet consists of 58 "true" tuna boats using live bait, 6 of which are more than 100 tons, and 22 sail boats which have been condemned and will soon disappear from the fleet. Besides 58 "true" tuna boats and 22 sail boats, there are 113 "multi-purpose" boats of which 13 are equipped with bait wells.

The success of the vessels working with live bait will no doubt cause several dozen boats from among those which are not too old or too small to be equipped in this manner ("multi-purpose").

Lobster Boats: France's lobster fleet of over 25 tons is made up of 84 units with a total tonnage of 2,929 tons. Of the total, 17 fall between 50 and 75 tons and 52 between 25 and 50 tons. The tendency of units of less than 5 years is unmistakeably in the direction of high individual tonnage which increases the vessel's range of operations.

Mackerel-Sardine Vessels: This fleet consists of an equal number of mackerel vessels and an equal number of herring vessels with a total of 43 units: 37 units, 25-50 tons; 13 units, less than 5 years old; 29 units between 5 and 20 years old.

There is little probability that this type of vessel will increase in number in the future in view of the difficulty in working them--even though their cost is not too high.

New Vessels: Plans, orders, and vessels under construction with a tonnage of 50 tons and over call for 173 units whose total tonnage is 30,342 tons. These consist of 113 trawlers (tonnage 23,000 tons), 32 trawler-tuna vessels (tonnage 3,110 tons), 21 tuna vessels (3,376 tons), and 7 lobster boats (855 tons).

NOTE: ABSTRACTED FROM THREE ARTICLES WHICH APPEARED IN THE WEEKLY FRENCH PERIODICAL LE MARIN OF NOVEMBER 2, NOVEMBER 23, AND DECEMBER 7, 1956. TRANSLATED BY R. DUCKWORTH.

* * * * *

1956 SARDINE LANDINGS AT RECORD HIGH: The French sardine fishermen in 1956 were expected to land more than 40,000 metric tons. By November 13, 1956, a total of 38,250 tons had been recorded in Atlantic port landings and 2,500 tons in Mediterranean port landings.

Thus the previous record, established in 1934, was broken. In that year some 25,000 tons of sardines were landed between Camaret and St. Jean-de-Luz.

The canning plants processed a total of 33,000 metric tons thus also exceeding their former records for the amount processed. From the standpoint of trade outlook, there seems to be no reason to fear an oversupply of the market, the French periodical Le Marin of November 23, 1956, stated.

But offsetting the increase in sardine landings, was a decrease in mackerel and herring landings.

Tuna landings in 1956 reached 16,150 tons.

Guatemala

SHRIMP RESOURCES UNEXPLORED: Regarding the existence of shrimp resources off the coasts of Guatemala, the Hunting and Fishing Section of that country's Ministry of Agriculture points out that to date no technically-directed exploration has taken place by any institutions, private or governmental, for the purpose of establishing the location of shrimp beds or other marine resources of commercial importance. A few sporadic catches, have been the basis for the opinion that marine fishery resources do exist. Very few scientific investigations have been made regarding the life history of the predominant species and the extent of ex-exploitable resources.

Notwithstanding such a scarcity of data, according to license applications processed by the Section of Hunting and Fishing, various persons, acting individually or in groups, have planned to establish shrimp fishing companies on one or both coasts. According to the Ministry, however, none have actually been established, a January 30 dispatch from the United States Embassy in Guatemala announces.

The Section of Hunting and Fishing states that one factor which had probably impeded the growth of the shrimp fishing industry in Guatemala was the complete absence of boat shelters along Guatemala's Pacific coast.

The firm view was expressed that the shrimp beds do exist along the Guatemalan shores. One report indicated that sometime ago a fleet of Mexican shrimp boats caught substantial quantities of shrimp in a five-day period from beds along the Guatemalan Pacific coast near the El Salvador border. The shrimp in this area were said to be blue shrimp, running about 8 or 9 to the pound heads on.

Guatemalan fishermen generally do not engage in shrimp fishing, but they might very well turn their attention to this resource if a good market for it developed.

Anyone desiring to organize a fishing company should request the Ministry of Agriculture for permission to undertake marine explorations in Guatemalan littoral waters. This request may be granted with the proviso that, if the results demonstrate possibilities for investing necessary capital, the Government will exempt the company from paying duties, assessments, contributions, and excise taxes during a period agreeable to both parties. In case the results are negative, the Government will agree to pay part of the expense incurred, on the understanding that such explorations should be undertaken by a qualified person or entity, that it should operate under the control of Inspectors paid by the Ministry of Agriculture, and that the data obtained, in any case, will be placed at the disposition of the Government. In case there is interest in obtaining information officially, a request should be made in writing to the Ministry of Agriculture of the Government of Guatemala.

Hong Kong

SHRIMP CATCHES DECLINE: The greatly expanded fleet of motor shrimp trawlers fishing for shrimp out of Hong Kong has resulted in depletion on the known shrimp grounds. The fishing areas have been extended, both east and west, but the catches per boat have been low. Many of the larger shrimp trawlers either turned to pair fishing for finfish, hauled out in September and prepared for the gillnetting season for yellow croakers, or turned to trawling for bottom fish (United States Consulate in Hong Kong, January 3 dispatch).

India

TERRITORIAL WATERS LIMIT ESTABLISHED: In a proclamation by the President of India (Territorial Sea Belt), dated March 22, 1956, and published in the Gazette of India, the territorial waters of India are established at six nautical miles measured from the appropriate base line.

The proclamation states that due to the lack of uniformity in international practice regarding extent of the sea belt known as territorial waters of the State, a declaration is necessary to establish the extent of the territorial waters of India.

Japan

FISHERIES REPRESENTATIVES TO VISIT RUSSIA: The National Fisherman's Council, a private organization of independent fishermen, is organizing a team of representatives from the Japanese fishing industry to visit Russia in the spring of 1957 in response to an invitation received in October 1956 from the Central Council of the Soviet Food and Industry Union. The team, numbering 7 or 8, is expected to be named late in January and will probably include representatives from the processing and marketing ends of the industry as well as fishermen. Present plans for the visit include (1) a survey of fish conservation facilities, (2) a study of Soviet fishing methods, and (3) an exchange of technical information. The group will spend two months inspecting fishing installations and studying methods in Kamchatka, Sakhalin, and the coastal areas of Siberia, and another month in Moscow, a United States Embassy dispatch (January 11) from Tokyo states.

The Japanese fishing industry is very anxious to establish friendlier relations with the Soviet Union on fisheries matters in the hope that some of the unpleasant and costly incidents of the past can be avoided in the future. Furthermore, the Japanese are handicapped in their relations on fisheries matters with the Soviet Union by a lack of information on the Soviet fishing industry and the extent of conservation being undertaken, especially in relation to salmon fishing. It is expected that the Japanese will extend an invitation to a similar Soviet group to visit Japan.

* * * * *

INVESTMENT IN UNITED STATES TUNA SPECIALTY FIRM: One of the big five Japanese fishing companies will invest up to US$1 million in a tuna specialty plant located in Boston, Mass. The Boston firm, which was reported negotiating the purchase of additional facilities in Boston, will manufacture and market various newly-developed tuna products, such as "loaf" and "sausage" and other luncheon meats. It was expected that all legal matters pertaining to the establishment of the firm would be completed by mid-February and the Japanese Government has authorized the necessary foreign exchange.

The Managing Director of the Japanese firm investing in the tuna specialty firm points out that "we are merely investing 'up to $1,000,000' in an American corporation which has the patent rights and special industry 'know-how' for some new tuna products. We shall have the right of voice in the direction of the firm in question but American interests will be predominant therein."

It was also pointed out by the Director of the Japanese firm that the investment in the Boston firm grew out of the need for new markets for tuna and similar fish. He expressed confidence that a market for new tuna products could be developed in the United States and indicated that American tuna firms might eventually participate in the new venture.

* * * * *

TUNA INDUSTRY PROBLEMS: Since the Japanese have long been aware of the sensitivity of the United States tuna market, the Japanese industry in 1954 imposed voluntary quotas on frozen tuna exports to the United States. At the same time the Japanese Government established check prices on exports to the United States. The check price for albacore from October 1954 through May 1955 was US$300 a short ton f.o.b. Japanese port. From June 1955 to date, the check price for albacore has been $270 a short ton f.o.b. Japanese port. The Japanese contend that the check price had to be reduced because of a heavy catch and a sluggishness in the market. At the current check price, Japanese albacore at a cannery in the United States sells for $315 a short ton, according to the Japanese industry. They state also that American-caught fish is selling at the cannery at $300 a short ton.

The Japanese industry established a voluntary quota of 28,000 short tons for the period April 1, 1956, through March 31, 1957. This is a reduction of 4,000 short tons from the quota originally established for this period. Japanese exports to the United States of frozen albacore and other tuna and tunalike fish are shown in table 1.

Table 1 - Japanese Tuna and Tunalike Fish Exports to the United States, 1952-56 1/

Year	Albacore	Yellowfin	Skipjack	Big-eyed	Total
	(Short Tons)				
1956 (Jan.-Nov.)	20,284	26,870	-	509	47,663
1955	31,574	23,903	60	1,143	56,680
1954	30,537	18,915	2,995	1,404	53,851
1953	31,609	6,273	606	388	38,876
1952	19,840	3,491	692	-	24,023

1/ Same as in Table 2.

A tuna boat association has filed a brief with the U. S. Treasury Department alleging that Japanese albacore was dumped on the United States market during the latter part of 1956. The Treasury Department is now investigating these allegations. In connection with the dumping charge, the Japanese Government has prepared detailed cost figures and other statistics which have been submitted to the U. S. Treasury Department. The Treasury Department announced that pending a finding in the case, appraisement will be suspended on all frozen tuna from Japan.

Table 2 - Japanese Canned Tuna in Brine Exports to United States, 1953-56 1/

Year	Standard Cases
1956 (est.)	1,663,000
1955	1,516,000
1954	1,406,000
1953	1,518,000

1/ Japanese export figures will vary somewhat from United States import records due to differences in rate of export from Japan and time of arrival in United States.

In addition to frozen tuna, the Japanese export canned tuna in brine to the United States but limit shipments in any one year to 17-18 percent of the total United States pack during the previous year. By limiting the quantities exported to less than 20 percent of United States production, Japanese canned tuna in brine enjoys the minimum duty. The duty increases from $12\frac{1}{2}$ percent to 25 percent when imported quantities exceed 20 percent of the previous year's United States pack. Table 2 shows exports to the United States of Japanese canned tuna in brine for the years 1953 through 1956.

* * * * *

SURVEY SHIP FINDS RICH FISHING GROUNDS OFF BRAZIL: The Japanese survey ship Toku Maru (left Japan on October 20, 1956, to survey the fisheries resources off the coast of Brazil) was reported to have discovered rich fishing grounds at 22° S. lat. and 18° W. long. (about 1,300 miles east of Brazil). Tuna, marlin, and other species were reported to have been found in large numbers, a January 4, 1957, dispatch from the United States Embassy in Tokyo reports.

The Toko Maru is scheduled to continue surveying the areas off the coasts of South and Central America and if results are favorable the Japanese Fisheries Agency is hopeful that joint fishing arrangements can be worked out with Brazil, Argentina, Chile, Dominican Republic, and Mexico. Recently, however, Mexico rejected a request to send Japanese fishing vessels into Mexican territorial waters.

Japanese fishing firms during the past several months have entered into joint fishing ventures with foreign firms in Burma, Ceylon, India, Vietnam, Philippines, Brazil, China, and other countries. The Japanese Fisheries Agency has encouraged Japanese firms to seek new fishing grounds and has sent survey ships to Southeast Asia and South America to explore fishing possibilities.

Republic of Korea

NETTING INDUSTRY EXPANDING WITH UNKRA-IMPORTED MACHINES: With net-making machines imported by the United Nations Korean Reconstruction Agency now in operation, Korean fishermen will be able to spend less time in mending old fish nets and more in fishing. The acute shortage of nets, first caused by the intensive war damage suffered in Korean ports, has been increased in the last few years by UNKRA's program of aid for the fishing industry.

Under UNKRA projects the fishing fleet has been restored and expanded; private firms have been given loans to help them to build more boats; and ice plants, canneries, and fish markets have been reconditioned or constructed to handle the catch.

However, net manufacturers, with only 50 percent of the machinery they needed, were unable to keep up with the revitalized industry. Consequently, fishermen still had to patch and sew to hold together the remnants of their nets, and their catch was limited by the inadequacy of their equipment.

To meet part of the immediate requirements UNKRA brought in 330,287 pounds of trap, shore-drag, anchovy, gill, mackerel, purse-seine and shrimp-trawl nets valued at US$284,548.

This aid was followed by machinery imports to help the net-manufacturing companies to step up production to a level consistent with the development of the industry they supply.

Under this $100,000 program, eight companies operating in the fishing centers of Chung Moo City, Samchon Po, Pusan, Samchock, Changhang, and Seoul have received and put into operation 36 net-making machines and 10 winders, and Korean fishermen can once more buy Korean nets.

Mexico

FISHERY COOPERATIVES ELIGIBLE FOR LOANS: During 1957 about 9 million pesos (US$720,000) will be made available through the National Cooperative Development Bank of Mexico for loans to fishery cooperatives. In addition, the fishery cooperatives will be permitted to borrow for the first time from private banks. The loans will be for the purchase of boats and gear.

The 147 Mexican fishery cooperatives with 15,000 members have the exclusive right to fish for shrimp, abalone, lobsters, oysters, totoaba, cabrilla, and pismo clams (U.S. Embassy in Mexico City, dispatch dated January 22).

* * * * *

LARGEST FISH CANNERY DESTROYED BY FIRE: The El Sauzal fish cannery and reduction plant near Ensenada, Baja Calif., was destroyed by fire on December 3, 1956. It is reported that the establishment was completely razed with the exception of the landing pier. The loss is estimated to be between 15-20 million pesos (US$1,200,000 to $1,600,000). Of the 46,000 cases of canned fish (mostly California sardines) damaged, probably 10,000 cases can be salvaged.

The cannery, the largest fish cannery in Mexico, was one of four plants in or near Ensenada packing sardines and mackerel principally for consumption within Mexico. It is not anticipated that the destruction of the plant will cause a shortage

of canned sardines in Mexico, the United States Embassy in Mexico City reports in a dispatch dated December 7, 1956. The 1956 season has been a good one for sardines and canned supplies are plentiful. It is understood that reconstruction will begin immediately and will require 4 or 5 months to complete. The first 5 months of the year generally are not particularly good for sardines. While the new plant is under construction, the canning facilities of another cannery in Ensenada will be used.

* * * * *

PLANES FOR COASTAL PATROL PURCHASED: The purchase of five Catalina flying float planes for fishery patrol on both the east and west coast of Mexico was announced by Mexico's Minister of Marine. Two planes will be assigned to the coastal area of the Gulf of Mexico and three to the Pacific Coast for border to border patrol, states a December 13, 1956, dispatch from the United States Embassy in Mexico City.

* * * * *

SHRIMP CATCH DOWN IN JANUARY 1957: The catch of shrimp by Mexican fishermen during January 1957 was estimated to be only about half that produced in January 1956. The catch on the east coast or Gulf of Mexico area was higher, but the west coast catch was much lower, states a February 13 dispatch from the United States Embassy in Mexico.

Shrimp vessels fishing out of Guaymas were reported to be having difficulty catching from 1 to $1\frac{1}{2}$ metric tons a trip. The fleet out of Mazatlan had better luck, but the catch was running to small brown shrimp (40 or more to the pound). At the end of January some of the Mazatlan shrimp vessels were fishing in depths as deep as 80 fathoms for the so-called brown shrimp (actually the pink shrimp, Penaeus brevirostris).

At the end of the month, about 50 trawlers and 2 freezerships from Guaymas and Mazatlan were en route or about to leave for Salina Cruz on the Gulf of Tehuantepec.

New Zealand

CANNED MACKEREL MARKET: Canned mackerel are not produced in New Zealand and no statistics are available on consumption of this product, reports a United States Embassy dispatch (January 15, 1957) from Wellington. Retailers and importers in Wellington indicate, however, that while a small amount of canned mackerel has been marketed in the past, especially during periods when supplies of other types of fish were short, the product at present has practically disappeared from the market.

New Zealand consumers tend to regard canned mackerel as a coarse and inferior product in comparison with, for example, herring. At present canned mackerel would stand in relation to canned herring about as margarine (in New Zealand) stands in relation to butter. This is quite a strong statement since margarine has won practically no consumer acceptance in New Zealand. Earlier attempts to introduce canned mackerel in New Zealand have failed, and it is believed in the trade that future attempts would also fail unless an attractive price were combined with a very considerable amount of advertising to overcome consumer resistance.

All types of canned fish are free of import licensing control from all sources, including the dollar area. Accordingly, governmental regulations would be no bar to the development of the market. The tariff rate applicable to canned fish when imported from the United States, or any other most favored Nation, is 2.5 pence (2.9 U.S. cents) a pound.

New Zealand is a relatively small market (slightly over 2 million population as of the April 1956 census), but the country has a high standard of living. Important amounts of canned fish are imported--a record 7 million pounds entered in 1955. Imports were at a lower level in the first part of 1956 than in the previous year, but totals for the year will probably go well over 5 million pounds. Supplies have been sufficient to satisfy demand recently, and competition in this market would be severe for a product with low consumer appeal such as canned mackerel.

Although the possibilities of marketing canned mackerel in New Zealand are not encouraging, the situation should not be regarded as hopeless. The price of US$5 a case (48-1 lb. cans) f.o.b. Los Angeles or San Francisco would be considered very reasonable. Competing canned fishery products are currently being offered to New Zealand importers at much higher prices.

Anyone wishing to sound out the marketing possibilities will not find the distributive system for such products in New Zealand discouraging. Trade sources stated that three wholesale chains handle a considerable proportion of the foodstuffs retailed. Furthermore, a number of experienced and reliable "indent agents" are available who are willing to handle any attractive lines of United States foodstuffs. These agents act as salesmen in New Zealand for United States firms, selling on a commission basis, or perhaps purchasing direct from United States firms for resale here.

Norway

FISHERIES TRENDS, 1956: Norway's total catch of all fish set an all-time record in 1956 when close to 2.0 million tons were landed, compared with 1.6 million tons during 1955. The ex-vessel value increased from 609.7 million kroner (US$85.4 million) in 1955 to 691.5 million kroner (US$96.8 million) in 1956. Herring accounted for over half of the total catch.

Because of the poor brisling catch, the canning of this fish dropped in 1956 to 197,500 cases from 247,000 cases in 1955. A normal year's pack is 500,000 cases. The decline in the canning of brisling was largely offset by an increase in the canning of herring and shellfish. As a result, exports of all canned fish during January-November 1956 dropped only slightly below the corresponding period of 1955.

Fish industry sources contend that rising costs are leaving the fishermen with less money despite the record year. As a consequence, the price equalization fund is being heavily taxed to make up the difference between fixed minimum landed prices and the lower world market prices at which the fish must be sold.

Close to 30,000 men are expected to participate in the 1957 herring fishing which began in mid-January. In the 1956 season 24,857 men participated. Given good weather, the outlook is an increase over last year's record catch. Capacity has been expanded in the fishing fleet as well as in the handling equipment on shore. Large herring shoals are reported off the Norwegian coast, according to recent United States dispatches from Oslo.

* * * * *

NORWEGIAN-SOVIET SUPPLEMENTARY TRADE AGREEMENT INCLUDES FISH: Under a supplementary trade agreement signed on February 5, 1957, Norway and the Soviet Russia will exchange during 1957 supplementary deliveries worth about 30 million kroner (US$4.2 million) over the annual delivery total of 105 million kroner (US$14.7 million) fixed in the three-year (1956-58) agreement. Included in the supplementary agreement among other products will be frozen fish fillets.

Negotiations between Norway and the Soviet on the price of 50,000 tons of salt herring to be delivered annually to Soviet Russia under the three-year agreement were still unsettled as of February 8, according to a dispatch from the United States Embassy in Oslo.

Sweden

FISH EXPORT CONTRACTS UNDER SWEDISH-EAST GERMAN TRADE EXCHANGE AGREEMENT: Swedish fish export contracts totaling Sw.Kr.22.5 million (US$4.3 million) for 1957 under the new merchandise exchange agreement reached between Sweden and East Germany have been negotiated and signed and shipments have commenced, according to the Swedish West Coast Fishermen's Central Association.

The share of the West Coast fishermen in the total export of fish amounts to approximately Sw.Kr.16,000,000 (US$3.1 million). The West Coast contract includes considerable quantities of fresh and frozen winter herring and Fladen herring as well as salted Fladen herring. Fish fillets are for the first time included in the contract and will comprise fillets of cod, haddock, and saithe (pollock).

The current contracts also provide for certain price increases in comparison with last year, motivated by higher prices of fishing gear and higher costs of living for the fishermen.

Shipments from the South Coast will consist of cod and fillets, a February 15 dispatch from the United States Consul General at Goteborg states.

NOTE: VALUES CONVERTED AT THE RATE OF SW.KR.5.16 EQUAL US$1.

Taiwan (Formosa)

FISHERIES LANDINGS IN 1956 AGAIN BROKE PREVIOUS RECORDS: The 1956 fish production in Taiwan reached 193,410 metric tons. This shattered the record of 180,618 metric tons in 1955 and exceeded the target set in the Four-Year Production Plan by 23,410 metric tons. The catch by categories as compared with the 1955 catch is shown in the table.

Formosa's Fisheries Landings, 1955-56

Type of Fishing	1956	1955
	(Metric Tons)	
Deep-sea	43,988	36,413
Inshore	63,683	51,334
Coastal	43,259	47,175
Fish culture	42,480	45,696
Total	193,410	180,618

Among the four categories of fisheries, deep-sea fishing had, for the first time since 1945, jumped from last place to second place. Increased catches from deep-sea and inshore fishing was the result of (1) a larger number and tonnage of boats, (2) more trips, and (3) a larger catch per trip by some vessels. The poor catch from coastal fishing was caused by the scarcity of sardines (caught by torch fishing) and bonito (caught by set nets). The decrease of

production from fish culture was caused by loss of fish from flooding of fish ponds during three successive typhoons.

The target for fish catches in 1957, the first year of the Second Four-Year Production Plan, has been set at 205,000 tons.

WHALING REVIVED: As part of the Sino-Japanese whaling enterprise, a shore station has been set up at Hengchun near the southern tip of the Taiwan Island. A Japanese catcher of 185 tons will arrive in the middle of February and start operations immediately. A shore station was in operation when the Japanese were in Taiwan, but it was abandoned during World War II.

--T. P. Chen, Fisheries Specialist, J.C.R.R., Taipei, Taiwan.

Union of South Africa

NOW AMONG FIRST TEN FISHING NATIONS: With a total catch of more than 570,000 metric tons in 1955, the Union of South Africa now ranks among the ten largest fishing nations of the world, according to a statement by South Africa's Director of Fisheries. More than 95 percent of the catch is made on South Africa's west coast, states a December 20, 1956, dispatch from the United States Consul in Cape Town.

The fishing fleet consists of 48 trawlers, 220 motor boats in the St. Helena area, and another 100 in the Walvis Bay area. There are 21 processing plants on the West Coast, many of which are equipped with reduction plants as well as canning lines. The plants have a capacity of 500 tons of raw fish an hour for canning, fish meal, and oil. A good part of the fish meal is exported; the remainder consumed in South Africa.

The spiny lobster caught by the South African fishermen is a very good source of dollar earnings, according to the Director. The United States is the best market for frozen spiny lobster tails.

U. S. S. R.

FREEZER SHIPS BUILT FOR PACIFIC FISHING GROUNDS: A number of refrigerated ships are being built in Russian shipyards for the Far East fishing grounds. The first of these, the Aktiubinsk, has recently been completed at the Leningrad shipyard. She is powered by four 1,800 hp. engines, and is fitted with a modern all-electric plant.

It is understood that the first series will comprise four ships, all to be based at Vladivostok, the December 1956 World Fishing reports.

United Kingdom

FIRM HAS LARGE FROZEN FISH ORDER FROM UNITED STATES: A United States order for quick-frozen fish worth $300,000 has been obtained by a British fish-processing firm in the face of competition from Iceland, Scandinavia, and the Continent.

The Chairman of the fish-processing firm states: "We have just opened the most modern fish-processing plant in the world at Hull to cope with a flood of overseas orders. We are already exporting to 64 countries and we believe this United States order marks a real achievement for the British Fishing Industry. The Americans have very high food standards and, in the case of the fish we export, every piece must be individually tested for quality. . . ."

The new fish plant owned by the firm cost £150,000 (US$420,000) to build and incorporates revolutionary features in its design and operation. The plant, employing 150 people, is fully automatic and tiled throughout. At the end of every day it is steam-sterilized from top to bottom. Production is now running at the rate of 35,000 pounds of quick-frozen fish fillets daily. The cold storage capacity is 500 tons.

"The demand for quick-frozen fish is increasing daily," said the Chairman. "This fish, which retains its natural sea-fresh taste, is especially popular in Australia, the Far East, and other countries where the supply of fresh fish is limited. What is more it helps to earn dollars and scarce foreign currency."

The new firm is fulfilling, as well as its export orders, contracts for the War Office, the U. S. Army, U. S. Air Force, the School Meals Services, and Hospitals (Fishing News, December 21, 1956).

* * * * *

MINIMUM PORT PRICES INCREASED: The British Trawlers' Federation, composed of boat owners in Hull, Grimsby, and Fleetwood, increased their minimum landed fresh-fish prices about 58 U.S. cents a hundred pounds effective January 1, 1957. A spokesman for the Federation stated that "the decision to increase the minimum port prices follows greatly increased trawler operating costs since the last price adjustment in September 1954."

The new dockside prices will increase the minimum price on drawn haddock from about US$4.75 to $5.00, cod from US$4.75 to $5.30, and plaice from US$5.50 to $7.00 a 100 pounds (The Fishing News, November 30, 1956).

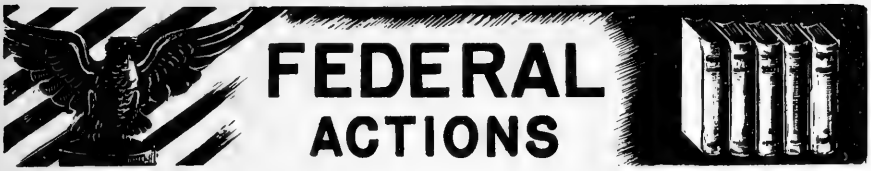
* * * * *

TRAINING COURSES FOR FISHERMEN: Training courses for new recruits to the fishing industry in the United Kingdom have been organized at Hull, Grimsby, Lowestoft, Plymouth, and in Scotland. Additional courses to enable those already in the industry to improve their positions have also been organized at Grimsby, Hull, Fleetwood, Lowestoft, Milford Haven, and in Scotland. The courses are under the direction of the local educational authorities with the federal White Fish Authority donating maintenance grants and allowances, reports the December 1956 Trade News of the Department of Fisheries of Canada.

* * * * *

TWO MORE FACTORY TRAWLERS OF "FAIRTRY" TYPE ON ORDER: The owners of the fish-factoryship Fairtry have placed an order with a British shipbuilding firm for two more fish-factory trawlers, each 235 feet in length and 47 feet in breadth.

Propulsion will be by Diesel engines and another firm has received an order for two 2,000 shaft horse power Diesel electric motors, one for each vessel. The horsepower is unusually high for Diesel electric equipment sets in that country, and is understood to be somewhat more powerful than that used in the factory-trawler Fairtry.



Committee for Reciprocity Information

CONSULTATIONS WITH COUNTRIES IMPOSING RESTRICTIONS ON IMPORTS FOR BALANCE-OF-PAYMENTS REASONS UNDER GATT:

The Committee for Reciprocity Information issued notice on February 12 that the views of interested parties are requested in connection with the forthcoming consultations with certain countries parties to the General Agreement on Tariffs and Trade (GATT) which maintain restrictions on imports for balance-of-payments reasons.

The consultations under Article XII of the Agreement (61 Stat. (pt. 5) A34) will afford an opportunity to review with each consulting country its financial situation and discuss the possibilities for further relaxation of the level of import restrictions and practices that have proved especially burdensome for United States exporters. These restrictions must be progressively relaxed as conditions improve and eliminated when conditions no longer justify their use.

The consultations will begin in Geneva in June with the following countries: Sweden, Denmark, Italy, The Netherlands, Norway, Greece, Austria, Germany, and France, and in October with these countries: Turkey, Finland, Brazil, Australia, Union of South Africa, Japan, United Kingdom, Rhodesia and Nyasaland, Ceylon, Pakistan, and New Zealand.

United States firms and organizations having an interest in the export trade may have pertinent information on the restrictions and their effects that will be useful to the United States Government in these consultations. The following types of information are sought:

1. Information indicating discrimination in the treatment of goods available from the United States as compared with the treatment afforded similar goods from other countries with convertible currencies;

2. Information indicating that trade is being restrained by complex or arbitrary licensing procedures or lack of adequate information available to traders regarding import regulations;

3. Information indicating that reasonable access to a traditional foreign market has not been restored for a particular commodity even though the country concerned has substantially relaxed its restrictions on imports in general;

4. Information indicating that the long-standing application of import restrictions by a country on a particular product has been accompanied by the growth of uneconomic output of that product within the country;

5. Information indicating that loss of foreign markets as a result of import restrictions has been responsible for a contraction of production or employment in an industry in the United States.

The Committee for Reciprocity Information is an interagency group within the United States Government which collects the views of interested persons regarding trade agreement matters. The Committee consists of representatives from the Departments of State, Treasury, Defense, Agriculture, Commerce, Labor, Interior, and the United States Tariff Commission.

Written statements were to be submitted no later than March 29, 1957, concerning those countries consulting in June and no later than July 31 for those consulting in October.

Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

BUREAU OF SPORT FISHERIES AND WILDLIFE APPOINTMENTS:

The promotion of Daniel H. Janzen, A Regional Director of the U. S. Fish and Wildlife Service, to the post of Director of the Service's new Bureau of Sport Fisheries and Wildlife, was announced on February 8 by Secretary of the Interior Fred A. Seaton.

Janzen will replace John L. Farley, Acting Director, whose resignation was accepted by Secretary Seaton. Janzen began his new duties immediately. Secretary Seaton said an announcement will be made shortly on the appointment of a director for the separate Bureau of Commercial Fisheries. Both Bureau Chiefs will act under the direction of Ross L. Leffler, recently named as Assistant Secretary for Fish and Wildlife.

Janzen has been with the Federal Government since 1929, when he joined the staff of the United States Bureau of Biological Survey. When the Biological Survey and the Bureau of Fisheries were consolidated in 1940 to form the Fish and Wildlife Service, Janzen continued with the Service. He became Assistant Regional Director of Region 3 in 1940 and in July of 1946 he was named head of that Region. Headquarters for Region 3 are in Minneapolis, Minn.

"Career personel are being selected to head this new organization and will be relied upon to carry out the dynamic new national fish and wildlife conservation program which is now being developed," Secretary Seaton said, "to meet the future's challenging needs."

The promotion of additional career employees to key posts in the Bureau of Sport Fisheries and Wildlife was announced February 12, by Assistant Secretary for Fish and Wildlife, Ross L. Leffler of the Department of the Interior.

Abram V. Tunison, Chief of the Branch of Game-Fish and Hatcheries, was named Assistant Director for Fisheries, and Lansing A. Parker, Assistant Chief of the Branch of Federal Aid, Assistant Director for Wildlife.

Staff appointments in the Office of the Commissioner of Fish and Wildlife were also announced by Secretary Leffler. Dr. O. Lloyd Meehean, who has been Assistant to the Director, Technical Staff Services, was named Director of the Office of Program Review, and Robert A. Wells, also Assistant to the Director, was named Director of the Office of Information.

All of these appointments are effective on March 1.

From 1932 to 1944, Tunison was employed by the New York State Conservation Department as a junior aquatic biologist at Cortland, N. Y., conducting research into trout nutrition and "in-service" training for fish culturists and hatchery superintendents. He transferred to the employ of the U. S. Fish and Wildlife Service in 1944 as a fish management technician at the same station which is cooperatively operated by the Service, New York, and Cornell. On December 3, 1945, he was promoted to Assistant Chief of the Branch of Game-Fish and Hatcheries and transferred to the central office. He was promoted to Chief of the Branch in 1954.

Parker from 1940 to 1943 was with the Minnesota Division of Fish and Game, first directing game research and then coordinating the Federal Aid program. He was with the Rubber Development Corporation of the R. F. C. in Brazil during 1943-1944 and then after six more months with the Minnesota Division of Fish and Game, handling the Federal Aid program, he joined the Fish and Wildlife Service staff as a land acquisition and development specialist in the Federal Aid Branch. He was promoted to Assistant Chief of the Branch in 1948.

Meehean joined the staff of the old Bureau of Fisheries as a biologist in 1930. Stationed mostly in southern States, he conducted research into pond-fish propagation, lake management, and ecology of waters until he was transferred to the central office, then in Chicago, as Assistant Chief of the Division of Fish Culture, later the Branch of Game-Fish and Hatcheries, of which he became Chief in 1945. In 1954, he was promoted to the position of Assistant to the Director, Technical Staff Services.

Wells, a newspaperman and conservation columnist with the Watertown (New York) Times, joined the staff of the State of New York Conservation Department, of which he was Secretary from 1946 to 1955. For more than 20 years active in conservation in New York, he was one of the organizers of the Northeastern Waterfowl Association and the Joint Waterfowl Committee of the Atlantic Flyway. He was formerly vice chairman of the National Waterfowl Council. He joined the staff of the Fish and Wildlife Service as an Assistant to the Director in 1955.

Department of the Treasury

BUREAU OF CUSTOMS

CUSTOMS INSTRUCTED TO APPRAISE ENTRIES OF FROZEN TUNA:

The Treasury Department has instructed Bureau of Customs field officers to appraise entries of Japanese frozen tuna without regard to any question of dumping, according to a March 1 news release from that Agency. These instructions were issued after a determination under the Antidumping Act that sales of tuna in the United States had not been made and were not likely to be made at less than fair value.

Early in December the Treasury Department had instructed Customs field officers to withhold appraisement of entries of frozen whole albacore tuna from Japan pending investigation to determine whether the tuna was being sold in the United States at less than fair value.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, JANUARY 1957, P. 88.

* * * * *

GROUNDFISH FILLET IMPORT TARIFF-RATE QUOTA FOR 1957:

The reduced-tariff-rate import quota on fresh and frozen groundfish (cod, haddock, hake, pollock, cusk, and ocean perch) fillets and steaks for calendar year 1957 is 37,375,636 pounds, the Bureau of Customs announced in the February 16 Federal Register. Divided into quarterly quotas this means that 9,343,909 pounds of groundfish fillets during each quarter may be imported at the $1\frac{7}{8}$ cents-per-pound rate of duty, and any imports over the quarterly quota will be dutiable at the rate of $2\frac{1}{2}$ cents a pound.

Table 1 - Reduced-Tariff-Rate Import Quota for Fresh and Frozen Groundfish Fillets and Steaks, 1951-57

1957	1956	1955	1954	1953	1952	1951
(Million Pounds)						
37.4	35.2	35.4	34.0	33.9	31.5	29.3

The reduced-rate import quota for 1957 is 6.2 percent higher than the 1956 quota of 35,196,575 pounds. From 1951 to 1957, the quantity of fresh and frozen groundfish fillets permitted to enter the United States at the reduced rate of duty of $1\frac{7}{8}$ cents a pound has increased 27.6 percent.

Average aggregate apparent annual consumption in the United States of fresh and frozen groundfish fillets and steaks (including the fillet blocks and slabs used in the manufacture of fish sticks) for the three years (1954-1956) preceding 1957 was 249,170,904 pounds, calculated in accordance with the proviso to item 717 (b) of Part I, Schedule XX, of

Table 2 - United States Aggregate Apparent Annual Consumption of Fresh and Frozen Groundfish Fillets and Steaks

3-Year Period	Quantity
	(Million Lbs.)
1954-56	249.2
1953-55	234.6
1952-54	236.2
1951-53	226.3

the General Agreement on Tariffs and Trade (T. D. 51802). The proviso states that the import quota for any current calendar year shall be 15,000,000 pounds or 15 percent of the average aggregate apparent consumption in the three years preceding the current year, whichever is greater. The tariff item in summarized form is: "Fish, fresh, or frozen (whether or not packed in ice), filleted, skinned, boned, sliced, or divided into portions, not specially provided for: Cod, haddock, pollock, cusk, and rosefish (ocean perch)." Fillet blocks and slabs for making fish sticks are also included under this category.

Average aggregate apparent annual consumption in the United States of fresh and frozen groundfish fillets and steaks for the three-year period of 1953-55 was 234,643,830 pounds, substantially less than the average annual consumption of 249,170,904 pounds for the three-year period of 1954-56.

* * * * *

UNITED STATES CANNED IN BRINE TUNA IMPORTS IN 1957 UNDER QUOTA PROVISO:

The quantity of tuna canned in brine which may be imported into the United States during the calendar year 1957 at the 12½-percent rate of duty is limited to 45,460,000 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem. The quota is based on preliminary data and is subject to possible change on the basis of complete data.

Any tuna classifiable under Tariff Act paragraph 718 (b)--"fish, prepared or preserved in any manner, when packed in airtight containers. . .(except fish packed in oil or in oil or other substances; . . . .)--which is entered or withdrawn, for consumption during 1957 is included.

A proclamation (No. 3128), issued by the President on March 16, 1956, gave effect to an exchange of notes with the Government of Iceland to withdraw tuna canned in brine from the 1943 trade agreement and invoked the right to increase the duty reserved by the United States in negotiations with Japan and other countries under the General Agreement on Tariffs and Trade. The quota is based on 20 percent of the previous year's United States pack of canned tuna.

The notice as published in the February 8, 1957, Federal Register follows:

DEPARTMENT OF THE TREASURY

Bureau of Customs

[T. D. 54299]

TUNA FISH

TARIFF RATE QUOTA

FEBRUARY 4, 1957.

Pursuant to the President's Proclamation No. 3128 of March 16, 1956 (T. D. 54051), it has been determined that 45,460,000 pounds of tuna may be entered for consumption or withdrawn from warehouse for consumption during the calendar year 1957 at the rate of 12½ per centum ad valorem under paragraph 718 (b), Tariff Act of 1930, as modified. Any tuna classifiable under paragraph 718 (b) of the tariff act which is entered, or withdrawn, for consumption during the current calendar year in excess of this quota will be dutiable at the full rate of 25 per centum ad valorem.

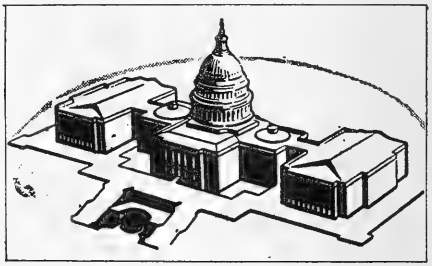
The above quota is based on the indicated United States pack of canned tuna for the calendar year 1956 as reported by the United States Fish and Wildlife Service on the basis of preliminary data assembled by that Service. It is subject to possible change on the basis of complete data.

[SEAL] RALPH KELLY,
Commissioner of Customs.

NOTE: SEE COMMERCIAL FISHERIES REVIEW, MAY 1956, P. 67.

Eighty-Fifth Congress (First Session)

Listed below are public bills and resolutions introduced and referred to committees or passed by the Eighty-Fifth Congress (First Session) and signed by the



President that directly or indirectly affect the fisheries and allied industries. Public bills and resolutions are shown in this section when introduced and, if passed, when signed by the President; but also shown from month to month are the more pertinent reports, hearings, or chamber actions on some bills.

AID FOR DEPRESSED AREAS: S. 1433 (Martin and others) introduced in the Senate February 28, a bill to assist areas to develop and maintain stable and diversified economics by a program of financial and technical assistance and otherwise, and for other purposes; to the Senate Committee on Banking and Currency. This bill to be known as the "Administration's Area Assistance Act of 1957" provides for assistance to localities within states where there are more workers than there

is work, and in places where there is need of Industry. Also H. R. 5459 (Carrigg) and H. R. 5500 (Van Zandt) introduced in the House February 28 and similar to S. 1433 (Martin and others); referred to the House Committee on Banking and Currency.

ANTIDUMPING ACT OF 1921: H. R. 5120 (Forand), H. R. 5138 (Mack of Washington), and H. R. 5139 (Mason) introduced in the House February 20, bills to amend the Antidumping Act of 1921, and for other purposes; to the Committee on Ways and Means. This bill provides for amendments to various sections of the Antidumping Act of 1921, among which are: a "special dumping duty" if the purchase price or the exporter's sale price is less than the foreign market value; spells out methods of determining "purchase price," "exporter's sales price," "foreign market value," and "cost of production."

FISHING VESSEL RIGHTS ON THE HIGH SEAS: H. R. 5526 (Bonner) introduced in the House on March 4, a bill to amend the Act of August 24, 1954 (68 Stat. 883), relating to the rights of vessels of the United States on the high seas and in the territorial waters of foreign countries; referred to the Committee on Interstate and Foreign Commerce. This bill proposes to amend the Fishermen's Protective Act, which provides that the U. S. Government shall reimburse vessel owners for any fine paid in order to secure the prompt release of a vessel and its crew seized by a foreign country on the basis of rights or claims in territorial waters or the high seas which are not recognized by the United States. This bill would amend the Act so as to extend the obligation of the Government to reimburse the owners, not only for fines paid, but for all expenses incurred by reason of seizure, where the seizure took place beyond the limits recognized by the United States. Claims for injuries arising from such seizures shall be paid and upon the death of a seaman the Secretary of the Treasury shall pay $10,000 to dependents. Also S. 1483 (Magnuson) introduced in the Senate March 5; referred to Committee on Interstate and Foreign Commerce.

IMPORT AGREEMENTS: H. R. 5666 (Hemphill) introduced in the House on March 6, a bill to require that all agreements and understandings respecting the importation of foreign goods, entered into with foreign countries or their citizens, shall be reduced to writing and made public; to the Committee on Ways and Means. Provides that from and after the date of the enactment of this Act, every import agreement entered into by a department, agency, or independent establishment of the United States shall be reduced to writing, signed by a responsible office or officers of the department, agency, or establishment and by a responsible office or officers of the government of the foreign country involved and any other citizen or resident directly concerned with importation to the United States of the goods covered by the agreement, and published in the Federal Register. The bill is designed to prevent any officers or agencies of the United States from entering into informal unwritten agreements and understandings with foreign countries.

IMPORT QUOTAS: H. R. 5691 (Whitener) introduced in the House on March 6, a bill to regulate the foreign commerce of the United States by establishing import quotas under specified conditions, and for other purposes. Similar to seven or more other bills previously introduced (see Commercial Fisheries Review, February 1957 p. 64). Also referred to the Committee on Ways and Means.

INCREASED COVERAGE UNDER FAIR LABOR STANDARDS ACT: H. R. 5389 (Lane) and H. R. 5394 (Powell) introduced in the House February 27, bills to amend the Fair Labor Standards Act of 1937, as amended, to provide coverage for employees of employers who are engaged in activities affecting interstate commerce, to eliminate certain exemptions, and for other purposes. Also H. R. 5770 (Rodino), H. R. 5773 (Staggers) introduced in the House March 7., and similar to H. R. 5389 (Lane) plus 8 or more other bills previously announced (see Commercial Fisheries Review, February 1957, p. 64). All referred to the Committee on Education and Labor. Various bills have been introduced this session to increase the minimum wage, broaden coverage, and eliminate existing exemptions in the Fair Labor Standards Act.

INTERIOR DEPARTMENT APPROPRIATIONS: H. R. 5189 (Kirwan) introduced in the House February 21, a bill making appropriations for the Department of the Interior and related agencies (including the United States Fish and Wildlife Service) for the fiscal year ending June 30, 1958, and for other purposes; to the Committee on Appropriations.

Committee on Appropriations reported the bill to the House on February 21 (Rept. No. 145), and referred it to the Committee of the Whole House on the State of the Union.

Passed the House without further amendments on February 26. The bill provides the Bureau of Commercial Fisheries with $6,000,000 for Management and Investigation of Resources in fiscal year 1958, an increase of $1,328,800 over the amount appropriated for fiscal year 1957. The additional funds include (1) $379,375 to offset the $12\frac{1}{2}$ percent of the receipts from the sale of Pribilof Island sealskins allotted to the Bureau of Sport Fisheries and Wildlife (original budget estimates had allotted the entire 25 percent to the Bureau of Commercial Fisheries); (2) $350,000 to initiate education and training grants authorized by the Act of August 8, 1956 (Public Law No. 1027)--this was less than the $583,000 proposed in the budget. Additional increases provide $182,500 for retirement costs, and $416,925 primarily for research on fish migrations over dams and administration of Alaska fisheries. Funds for construction ($700,000) provide $400,000 for construction of a fishery research laboratory at Juneau, Alaska, and $300,000 for the fishery technology laboratory at Gloucester, Mass. The Fisheries Loan Fund was allowed an administrative expense limitation of $313,000 as recommended in the budget. This is an increase of $63,000 over the limitation for the fiscal year 1957.

The bill recommends $12,000,000 for management and investigation of resources in the Bureau of Sport Fisheries and Wildlife. This is $380,000 less than requested in budget estimates and will be compensated for by making available $12\frac{1}{2}$ percent of the receipts from Alaska sealskins. The appro-

priation as approved, provides for an increase of $479,200 for retirement costs and $713,400 for operation and maintenance of the fish culture facilities, fishery and wildlife research, soil and moisture conservation, and river basin studies. The budget construction estimate of $5,332,000 was allowed for construction of fish hatchery, game management, and wildlife refuge facilities. This is an increase of $2,731,000 over the appropriation for fiscal year 1957.

Under the appropriation for the Fish and Wildlife Service as distinguished from the separate Bureau, all funds for administration expenses were denied. Funds for "General Administration" will be provided after further study and review to determine the minimum overhead staffing required to assume efficient operation. However, $94,000 is provided under the "Salaries and Expenses" item for the Office of the Secretary of Interior to establish the Office of the Assistant Secretary for Fisheries and Wildlife.

House Report No. 145, Department of the Interior and Related Agencies Appropriation Bill, 1958 (February 21, 1957, 85th Congress, 1st Session) to accompany H. R. 5189, 30 pp., printed. Summarizes the bill and gives details on actions by the Committee agency by agency; presents a comparative statement of the approriations for 1957 and estimates for 1958.

INVESTIGATION OF FISH IMPORTS: H. Res. 164 (Mack) introduced in the House February 11, a resolution requesting an investigation of imports; referred to the Committee on Ways and Means. The Resolution directs the United States Tariff Commission pursuant to section 332 of the Tariff Act of 1930, as amended, to make a thorough investigation of the domestic crab meat, oyster, salmon, tuna, and other fishery products industry, including the effect of imports of fisheries products on the livelihood of American workers, and to report the results to the Committee on Ways and Means.

Such investigation shall be made after due notice and opportunity for hearing is given all interested parties. The report of the Commission shall set forth the facts so determined relative to production, trade, imports, and consumption in the United States and shall take into account all revelant factors affecting the domestic economy, including the interests of consumers, processors, and producers, and a comparison of wage rates in the United States and abroad, costs of transportation to the principal consuming centers, and other factors bearing on cost of production and distribution. Such report shall contain a statement of findings as to the effect upon the competitive position of the domestic fisheries industry of the present tariff status of imported crab meat, oysters, salmon, tuna, and other fisheries products, so as to assist the Congress in determining what changes, if any, should be made in such tariff status, based upon the principle of fair and reasonable competition. Also H. Res. 180 (Scudder) introduced February 27, similar to H. Res. 164 (Mack).

LOANS TO NONPROFIT ORGANIZATIONS: H. R. 5693 (Coffin) introduced in the House on March 6, a bill to amend the Small Business Act of 1953 to authorize the Small Business Administration to make loans to local private nonprofit organizations formed to assist, develop, and expand the economy of the area; to the Committee on Banking and Currency. The bill empowers the Small Business Administration to make loans (either directly or in cooperation with banks or other leading institutions through agreements to participate on an immediate or deferred basis) to local private nonprofit organizations (including industrial foundations, development credit corporations or similar groups) formed to assist, develop, and expand the economy of the area. Limits loans to 20 years or less.

SMALL BUSINESS: Senate Report No. 12, Increased Loan Authority for Small Business Administration (January 25, 1957, 85th Congress, 1st Session) to accompany S. 637, 3 pp., printed. Discusses the purpose, justification, changes in existing law, and the Small Business Act of 1953 in conjunction with S. 637, a bill to increase the business loan authorization of the Small Business Administration.

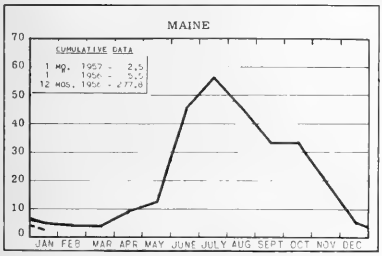
Senate Report No. 46, Seventh Annual Report of the Select Committee on Small Business (February 1, 1957, 85th Congress, 1st Session), 156 pp., printed. Among other subjects, discusses the Small Business Administration and financial problems of small business.

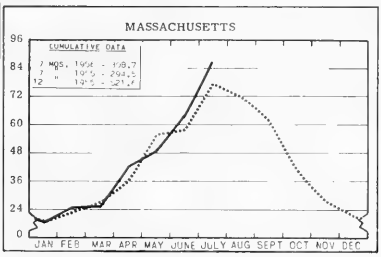
TARIFFS AND QUOTAS URGED BY THE STATE OF MASSACHUSETTS: The General Court of Massachusetts has forwarded to Congress a memorial urging increased tariffs and quotas on imported fishery products and textiles. The memorial (Martin) was referred to the Committee on Ways and Means.

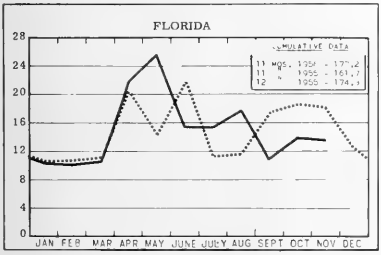
TRADE AGREEMENTS: House Document No. 93, First Annual Report on the Operation of the Trade Agreements Program (February 11, 1957, 85th Congress, 1st. Session), message from the President of the United States, 252 pp., printed. Discusses the gains made under the Trade Agreements Program; tariff negotiations to remove barriers to trade and adjustments in existing concessions; reducing and removing quantitative barriers to trade; special legislative provisions: "Escape Clause" and "National Security," and development under bilateral agreements. A number of appendixes contain the various reports to the Secretary of State by the Chairman of the various United States delegations to the various sessions held at Geneva (Eighth Session, September 17 to October 24, 1953; Ninth Session, October 28, 1954-March 7, 1955; Tenth Session, October 27 to December 3, 1955; Eleventh Session, October 11 to November 17, 1956) of the Contracting Parties to the General Agreement on Tariffs and Trade.

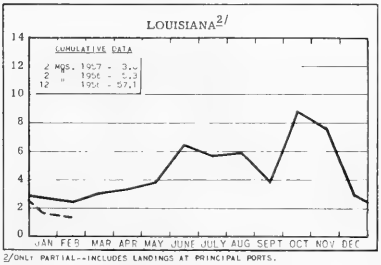
CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

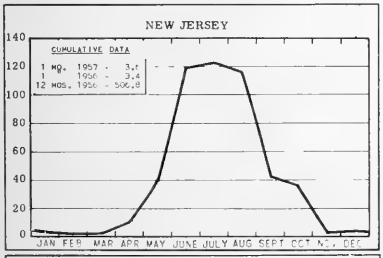


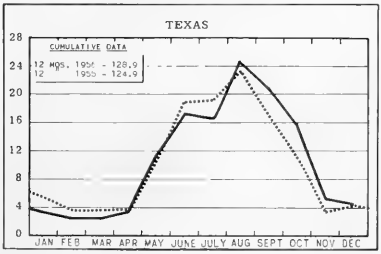


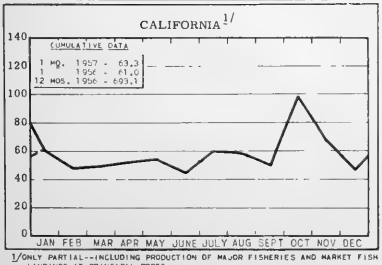




2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.







1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

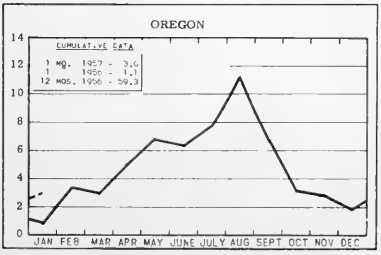
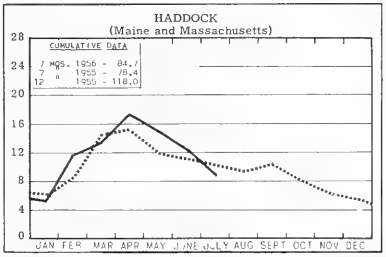
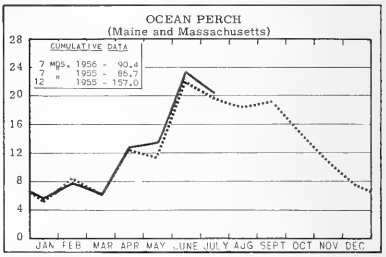


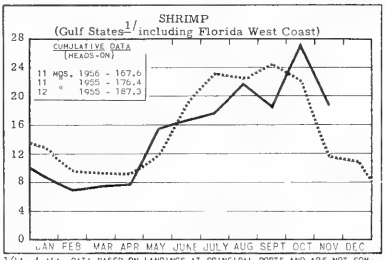
CHART 2 - LANDINGS for SELECTED FISHERIES

In Millions of Pounds

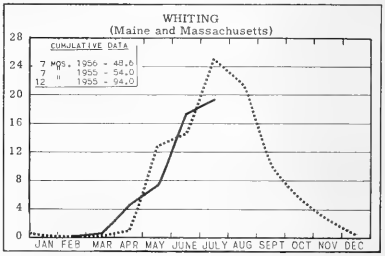




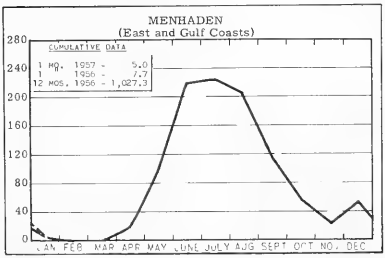
In Millions of Pounds

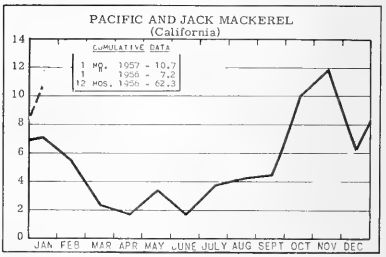


1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

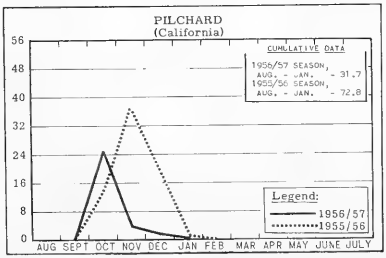


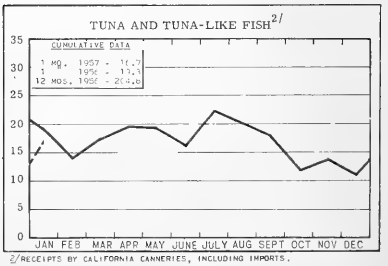
In Thousands of Tons





In Thousands of Tons

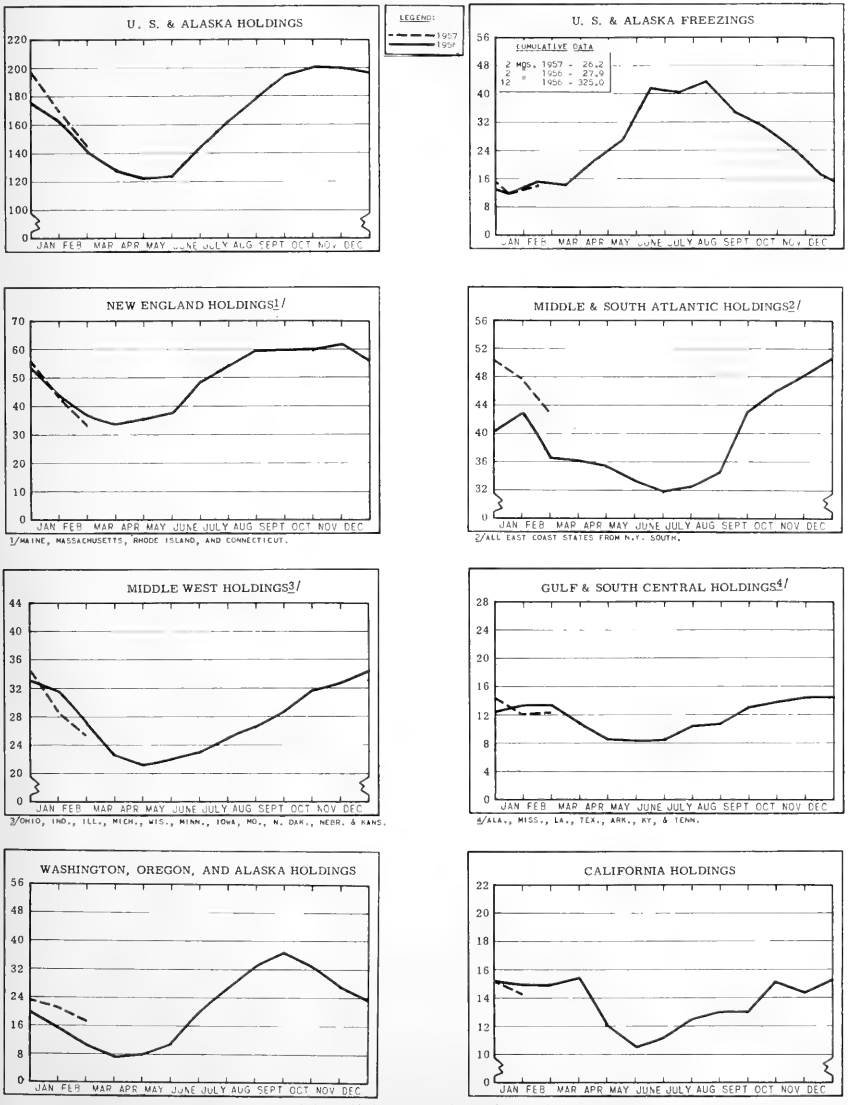




2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

In Millions of Pounds



1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.

4/ALA., MISS., LA., TEX., ARK., KY, & TENN.

*Excludes salted, cured, and smoked products.

CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pounds

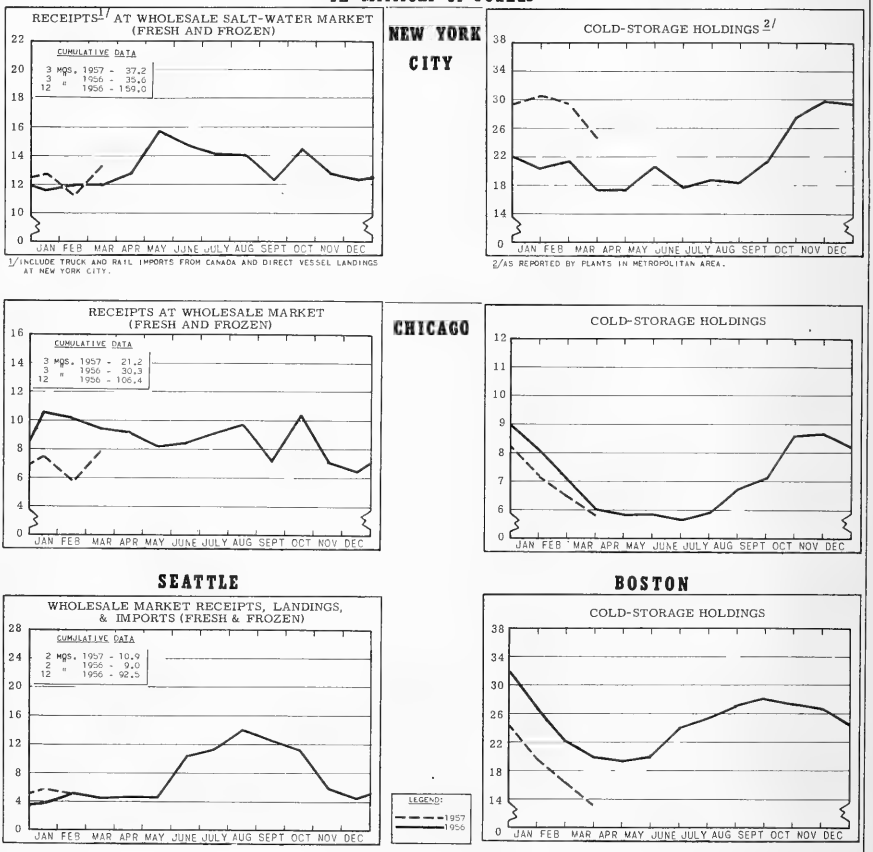


CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA

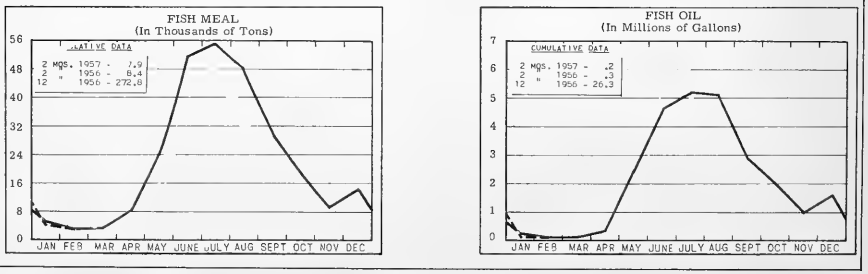
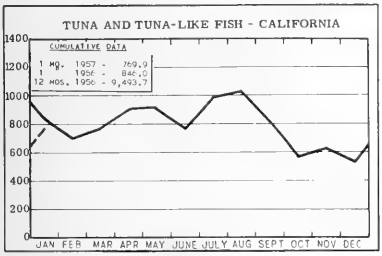
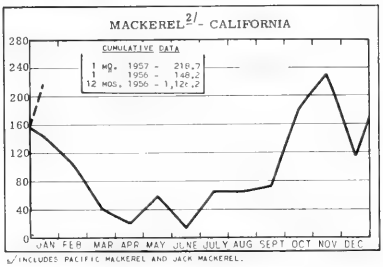


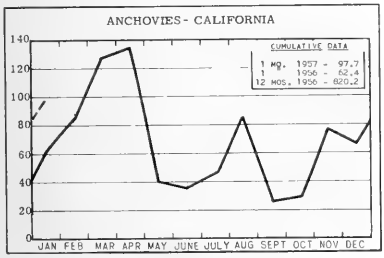
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

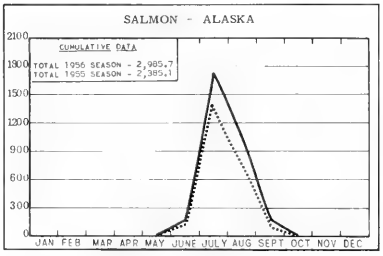
In Thousands of Standard Cases

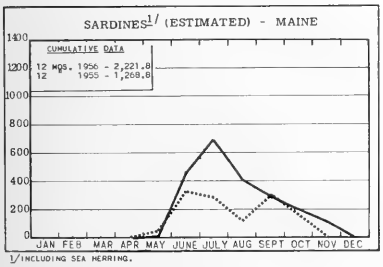




2/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



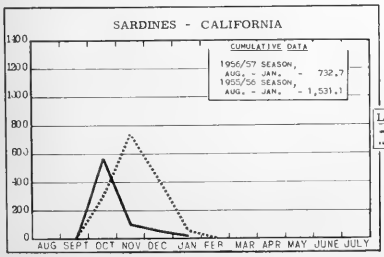




1/ INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	¼ drawn	3¼ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. ½ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	½ lb.	8 oz.



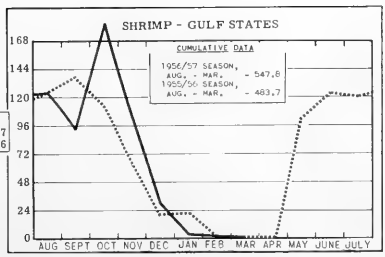
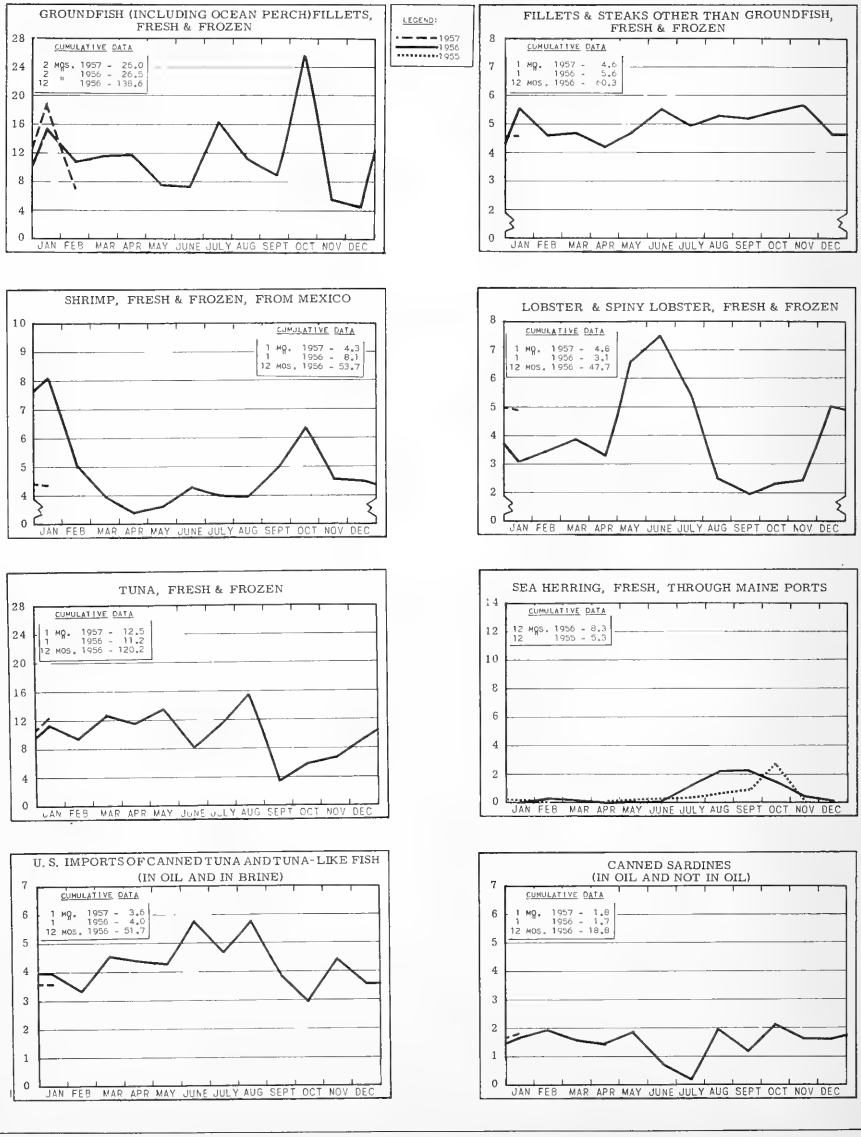


CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

In Millions of Pounds



FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
SSR.- FISH.- SPECIAL SCIENTIFIC REPORTS - FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1460 - Florida Landings, October 1956, 6 pp.
CFS-1461 - Mississippi Landings, September 1956, 2 pp.
CFS-1463 - Mississippi Landings, October 1956, 2 pp.
CFS-1464 - Georgia Landings, November 1956, 2 pp.
CFS-1465 - Fish Meal and Oil, November 1956, 2 pp.
CFS-1466 - Texas Landings, November 1956, 3 pp.
CFS-1467 - Frozen Fish Report, December 1956, 8 pp.
CFS-1468 - New Jersey Landings, November 1956, 4 pp.
CFS-1469 - Rhode Island Landings, September 1956, 3 pp.
CFS-1470 - Fish Stick Report, 1956 Annual Summary, 2 pp.
CFS-1471 - California Landings, September 1956, 4 pp.
CFS-1472 - Alabama Landings, October 1956, 2 pp.
CFS-1473 - New York Landings, November 1956, 4 pp.
CFS-1474 - Maine Landings, November 1956, 3 pp.
CFS-1475 - Mississippi Landings, November 1956, 2 pp.
CFS-1476 - Rhode Island Landings, October 1956, 4 pp.
CFS-1477 - Ohio Landings, December 1956, 2 pp.
CFS-1478 - Texas Landings, December 1956, 3 pp.
CFS-1479 - Fish Meal and Oil, December 1956, 2 pp.
CFS-1480 - New England Fisheries, 1955 Annual Summary, 7 pp.
CFS-1481 - North Carolina Landings, December 1956, 2 pp.
CFS-1482 - Georgia Landings, December 1956, 2 pp.
CFS-1483 - Florida Landings, November 1956, 6 pp.
CFS-1484 - Alabama Landings, November 1956, 2 pp.
CFS-1485 - Rhode Island Landings, November 1956, 2 pp.
CFS-1486 - New Jersey Landings, December 1956, 4 pp.
CFS-1488 - Shrimp Landings, October 1956, 4 pp.
CFS-1490 - Rhode Island Landings, December 1956, 3 pp.
CFS-1491 - Maine Landings, December 1956, 4 pp.
CFS-1492 - North Carolina Landings, 1956 Annual Summary, 5 pp.

SSR-Fish. No. 187 - Commercial and Sport Shad Fisheries of the Edisto River, South Carolina, 1955, by Charles H. Walburg, 13 pp., illus., processed, October 1956. Gives results of an investigation of the shad fishery of the Edisto River, South Carolina, to determine fishing effort, fishing rate, total catch, size of run, and spawning escapement for 1955. The commercial fishery catch-and-effort data were obtained from logbooks kept by each fisherman. The total catch made by sport fishing was determined by a post-card survey. The catch-and-effort data were combined with a tagging and recovery program, and it was estimated that the fishing rate was approximately 20 percent, the total catch was 11,000 shad, and the size of the run was 56,000 shad (fiducial limits 28,000 to 100,000). Unfortunately, catch-and-effort records for previous years were not available for this stream; therefore, sizes of former runs and escapements could not be determined.

SSR-Fish. No. 193 - Underwater Television Vehicle for Use in Fisheries Research, by R. F. Sand and R. L. McNeely, 19 pp., illus., processed, December 1956. Describes the prototype underwater television vehicle, and reviews its demonstrated utility as a practical research tool in fisheries and related marine investigations. Contains a general description of the underwater television vehicle which was designed by the authors. Construction details of the two sealed pressure vessels are given. The upper double chamber housed the vertical and horizontal control mechanism, and the lower cylindrical chamber housed the television camera. Also describes the control construction, television equipment, power supply, and use of the vehicle in undersea research.

SSR-Fish. No. 195 - Stream Surveys of the Sheepscot and Ducktrap River Systems in Maine, by Floyd G. Bryant, 23 pp., illus., processed, December 1956.

Sep. No. 468 - Some Factors Affecting "Sawdust" Losses During the Cutting of Fish Sticks.

Sep. No. 469 - Iron Sulfide Discoloration of Tuna Cans, No. 4 - Effect of Salt, Oil, and Miscellaneous Additives.

Sep. No. 470 - Research in Service Laboratories (February 1957): Contains these articles--

"Cold-Storage Life of Frozen Fish Improved by Better Handling Practices," "Identification of Tuna Pigments," "Revised Federal Specifications for Breaded Shrimp Proposed," "Use of X-Ray Fluoroscopy for Fish Bone Detection Show Promise."

Sep. No. 471 - Fish Hatchery Food from Anchovies Caught Near Santa Barbara, Calif.

Technical Supplement to National Survey of Fishing and Hunting (A Report on the First Nationwide Economic Survey of Sport Fishing and Hunting in the United States during the Calendar Year 1955), Circular 44-Supp., 98 pp., processed. This supplement contains detailed information on the sampling plan and other survey techniques used by the firm of Crossley, S-D Surveys, Inc., in conducting the fishing and hunting survey under contract with the Fish and Wildlife Service. It discusses the technique of the survey; the sample (condensed description); sample design for national study of hunting and fishing; general instructions; sampling procedure; and contains samples of questionnaires, memory aids, and other materials used in the survey.

THE FOLLOWING SERVICE PUBLICATIONS ARE FOR SALE AND ARE AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D. C.

Life History of Lake Herring of Green Bay, Lake Michigan, by Stanford H. Smith, Fishery Bulletin 109 (from Fishery Bulletin of the Fish and Wildlife Service, vol. 57, pp. 87-138), 55 pp., illus., printed, 35 cents, 1956.

Shrimp Tips from New Orleans, Circular No. 41, 17 pp., illus. in color, printed, 15 cents. A beautifully-illustrated shrimp recipe book in color with 18 different ways of preparing shrimp. Ingredients of all of the recipes such as those for Shrimp Amandine, Remoulade, Creole of Jambalaya, are available at any market and are usually already in the home kitchen.

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Boston Fishery Products Monthly Summary, December 1956, 15 pp.; Boston Fishery Products Monthly Summary, January 1957, 15 pp. (Market News Service, U.S. Fish and Wildlife Service, 10 Commonwealth Pier, Boston 10, Mass.) Landings and ex-vessel prices by species for fares landed at the Boston Fish Pier and sold through the New England Fish Exchange; and Boston frozen fishery products prices to primary wholesalers; for the months indicated.

Gulf Monthly Landings, Production and Shipments of Fishery Products, January 1957, 5 pp. (Market News Service, U.S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf States shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

(Seattle) Monthly Summary - Fishery Products, January 1957, 6 pp. (Market News Service, U.S. Fish and Wildlife Service, 421 Bell St. Terminal, Seattle 1, Wash.) Includes landings and local receipts, with ex-vessel and wholesale prices in some instances, as reported by Seattle and Astoria (Oregon) wholesale dealers; also Northwest Pacific halibut landings; for the month indicated.

California Fishery Products Monthly Summary, December 1956, 10 pp.; California Fishery Products Monthly Summary, January 1957, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, Post Office Bldg., San Pedro, Calif.) California cannery receipts of raw tuna and tuna-like fish, herring, mackerel, anchovies, and squid; pack of canned tuna, mackerel, herring, anchovies, and squid; market fish receipts at San Pedro, Santa Monica, San Diego, and Eureka areas; California imports; canned fish and frozen shrimp prices; for the months indicated.

Monthly Summary of Fishery Products Production in Selected Areas of Virginia, North Carolina, and Maryland, January 1957, 4 pp.; Monthly Summary of Fishery Products Production in Selected Areas of Virginia, North Carolina, and Maryland, February 1957, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 18 S. King St., Hampton, Va.) Fishery production for the Virginia areas of Hampton Roads, Lower Northern Neck, and Eastern Shore; the Maryland areas of Crisfield, Ocean City, and Cambridge; and the North Carolina areas of Atlantic, Beaufort, and Morehead City; together with cumulative and comparative data; for the months indicated.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

ALASKA:

1955 Annual Report, Report No. 7, 152 pp., illus., printed. Alaska Department of Fisheries, 229 Alaska Office Bldg., Juneau, Alaska. Summarizes the activities of the Alaska Fisheries Board and the Alaska Department of Fisheries for 1955. The statistical tables cover the preceding 10-year period while the financial statement covers the fiscal year from April 1, 1955, to March 31, 1956. The 1955 research program of the Division of Biological Research was divided into three main projects. Research on the early life history of red salmon was carried out at Kitoi Bay. Taku River studies on the population dynamics of king salmon and catch and escapement indices of red, pink, chum, and silver salmon were continued. The study of the king crab at Kodiak was also continued. Also describes the inspection, predator control, sport fish, and watershed management programs. The statistical part of the report contains data on the value of the canned salmon by species, 1946-55; number of canneries and the salmon pack, 1946-55; salmon catch by gear, species, and districts, 1955; quantity and value of Alaska fisheries

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

landings, 1946-55; and quantity and value of Alaska fisheries products prepared for market, 1946-55. In addition to a financial statement, the report concludes with a discussion of future plans of the Department.

BAIT FISH AND FISHING:

Contribution to the Problems of Bait Fish Capture and Mortality Together with Experiments in the Use of Tilapia as Live Bait, by Vernon E. Brock and Michio Takata, Industrial Advisory Council Grant No. 49, Final Report, 39 pp., illus., processed. Division of Fish and Game, Board of Agriculture and Forestry, Honolulu, Hawaii, January 1955.

BRAZIL:

Estatistica Brasileira da Pesca, 1950/1954 (Brazilian Fishery Statistics) 23 pp. tables, processed in Portuguese. Ministerio de Agriculture, Servicio de Estatistica da Producao, Rio de Janeiro, Brazil.

BYPRODUCTS:

"Condensed Fish Solubles in Turkey Rations," by R. D. Carter and J. W. Wyne, article, Feedstuffs, vol. 29, no. 2, January 12, 1957, pp. 10-11, printed, single copy 20 cents. Feedstuffs, Box 67, Minneapolis 1, Minn.

"Processing of Cod and Haddock Viscera: 1. Laboratory Experiments," by H. C. Freeman and P. L. Hoogland, article, Journal of the Fisheries Research Board of Canada, vol. 13, no. 6, November 1956, pp. 869-877, illus., printed. Queen's Printer, Ottawa, Canada. Annually, large amounts of cod and haddock viscera (minus livers) are discarded by the fishing industry. The chemical composition of this offal makes it a possible raw material for production of additives to animal feeds. Various processes that would lead to a method of production of such preparations were investigated and are reported in the present paper. Autolysis of fresh viscera in the presence of sodium nitrite as a preservative was found most attractive. Optimum conditions for this process were established and various methods of drying these autolysates were investigated.

CALIFORNIA:

California Cooperative Oceanic Fisheries Investigations, Progress Report, 1 April 1955 to 30 June 1956, 44 pp., illus., printed. State Fisheries Laboratory, California Department of Fish and Game, Terminal Island, Calif. A report on the progress of the California Cooperative Oceanic Fisheries Investigations for the period 1 April 1955 to 30 June 1956. In this report, the research agencies have reviewed their activities during the reporting period and have presented the following articles summarizing the status of their knowledge of three important marine fisheries: (1) "Anchovy," by Daniel J. Miller; (2) "Jack Mackerel," by John E. Fitch; (3) "Pacific Mackerel," by John E. Fitch; and (4) "Eggs and Larvae of Anchovy, Jack Mackerel," by Elbert H. Ahlstrom. Included in the report is an annotated list of publications which have arisen from research conducted under the investigations during the period 1 January 1955-30 June 1956.

CANADA:

(British Columbia) Provincial Department of Fisheries Report (with appendices) for the Year Ended December 31st, 1955, 134 pp., illus., printed. Provincial Department of Fisheries, Victoria, B. C., 1956. The first part of this report is devoted to an analysis of British Columbia's 1955 production and value of fishery products, the canned salmon pack, and a review of the salmon canning industry. Also discussed are the other canning industries (herring, tuna, and shellfish), the production of processed fish (mild-cured salmon, dry-salted salmon, and dry-salted herring), the halibut fishery, fish oil and fish meal, net fishing in nontidal waters, condition of British Columbia's salmon-spawning grounds, value of Canadian fisheries and the standing of the provinces for 1954, and species and value of fish caught in British Columbia. A report on the herring investigation and the 1955 report of the biologist on the oyster and clam investigations are included. The second section consists of the following articles: "Contributions to the Life History of the Sockeye Salmon (No. 41)," by D. R. Foskett; "The Status of the Major Herring Stocks in British Columbia in 1955-56," by F. H. C. Taylor, A. S. Hourston, and D. N. Outram; "Phytoplankton and Physical Conditions in Ladysmith Harbour," by C. D. McAllister; "The British Columbia Shipworm;" "Report of the International Pacific Salmon Fisheries Commission, 1955;" "Report of the International Pacific Halibut Commission, 1955;" and "Salmon-Spawning Report, British Columbia, 1955." The report concludes with detailed statistical tables on the British Columbia fisheries.

Journal of the Fisheries Research Board of Canada, vol. 13, no. 5, October 1956, pp. 599-758, illus., printed. Fisheries Research Board of Canada, Ottawa, Canada. Contains, among others, the following articles: "The Choice and Solution of Mathematical Models for Predicting and Maximizing the Yield of a Fishery," by Kenneth E. F. Watt; "Factors Influencing the Survival of the Lemon Sole (Parophrys vetulus) in Hecate Strait, British Columbia," by K. S. Ketchen; "On the Distribution of Young Sockeye Salmon (Oncorhynchus nerka) in Babine and Nilkitkwa Lakes, B. C.," by W. E. Johnson; and "The Oceanography of Hebron Fjord, Labrador," by David C. Nutt and Lawrence K. Coachman.

The First Ten Years of Commercial Fishing on Great Slave Lake, by Dr. W. A. Kennedy, Fisheries Research Board of Canada Bulletin 107, printed, 50 Canadian cents. The Queen's Printer, Ottawa, Canada. This bulletin is divided into two parts. The first part gives background information on the fishery of Great Slave Lake such as the physical and biological characteristics of the lake, the fish it contains, and the history and operational method of the fishery. The second part covers the scientific study that has been carried out prior to and since the inception of the fishery.

Progress Reports of the Pacific Coast Stations, no. 107, 32 pp., illus., printed. Fisheries Research Board of Canada, Ottawa, Canada,

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

November 1956. Among the articles included are: "The Raft Culture of the Pacific Oyster in British Columbia," by D. B. Quayle; "The Effectiveness of Various Preservatives on Plywood in Preventing Attack by Shipworms and Gribbles," by F. H. C. Taylor; "Further Results from Tagging Experiments on Lingcod," by B. M. Chatwin; "The Distribution and Abundance of Early Post-Larval Stages of the British Columbia Commercial Crab," by T. H. Butler; and "Pacific Salmon Water?" by John P. Tully and A. J. Dodimead.

CANNING:

España Pesquera (Fishing Spain), vol. 1, no. 9, October 1956, 32 pp., illus., printed in Spanish. Sindicato Nacional de Pesca, Paseo del Prado, 20, sexta planta, Madrid, Spain. Contains, among others, the following articles: "Meeting of the Third Universal Congress of Canning Held in Rome;" "Speech Delivered by the President of the Congress;" "Summary of Some of the Reports of the Committees;" "The 11th International Fair of Canned and Packaged Goods held at Parma;" "Interviews with: M. Rene Manaut, President of the Permanent Committee of Canning; don Antonio Alfageme del Busto, President of the National Group; and don Jose Royo Iranzo, Pharmaceutical Chemist and Researcher;" and "Studies and Investigations of Canning Production in Morocco."

CARIBBEAN:

"Fisheries," article, The Caribbean, vol. 10, no. 4, November 1956, pp. 91-94, illus., printed. The University of Florida Press, Gainesville, Fla. Describes the progress made in the fisheries of the Caribbean area for the past ten years. During the period under review, attention was paid to the development of the fishing industry in the Caribbean area as a means of local food production, as an exporting industry, and as a means of providing employment. Between 1946 and 1956, legislation to protect, promote, and properly organize the fishing industry was passed in various countries. Describes development in the cultivation of fish; marketing, distribution, and storage of fish; fish processing; manufacture of fish meal; new methods of fishing; crawfish and lobster industries; formation of cooperatives; marine surveys and exploration; and the establishment of research stations throughout the Caribbean area.

CHILE:

Summary of Investigations on the Pelagic Fish Survey of Chilean Waters with Special Reference to the Swordfish, Marlins, and Tunas, by John A. Manning, No. 57-4, 14 pp., processed. The Marine Laboratory, University of Miami, Coral Gables, Fla.

COMMERCIAL FISHERIES:

Problems of the Commercial Fisheries Conservation, Technology, Economics, Contribution No. 19, 15 pp., printed. (Reprinted from Transactions of the American Fisheries Society, vol. 84, 1955, pp. 299-313.) University of Washington, School of Fisheries, Seattle, Wash.

COMMISSIONS:

(International North Pacific Fisheries Commission) Annual Report for the Year 1955, 72 pp., illus., printed. International North Pacific Fisheries Commission, 209 Wesbrook Bldg., University of British Columbia, Vancouver 8, B. C., Canada, 1956. The Commission was established by Convention between Canada, Japan, and the United States for the conservation of the fisheries resources of the North Pacific Ocean on June 12, 1953. The present report contains a summary of action by the Commission at its 1955 annual meeting, which began on October 31 in Tokyo, a summary of administrative activities for the year, and progress reports on research conducted by the member governments under the Commission's program. The research program undertaken by the Commission is at present concentrated on determining the continental origin of stocks of salmon on the high seas and on determining whether there is a need for joint conservation measures for the king crab stock of the eastern Bering Sea. Canada's part in the program of research included: (1) a study of the skeletal anatomy of salmon, to seek structural differences which could be used to distinguish stocks of various origins; (2) an attempt to find parasites which can be used as indicators of the origin of salmon occurring on the high seas; (3) an attempt to catch and tag small sockeye, pink, and chum salmon to indicate migrations away from rivers of origin and the fisheries to which various stocks contribute; and (4) cooperation in a study of the oceanography of the North Pacific, to provide background for understanding salmon distribution and movements. Progress in all these fields was made in 1955 and is summarized in the present report. Japan's report summarizes operations of the mothership-type salmon fisheries in the Aleutian area during 1955 and presents data regarding salmon sampled aboard the motherships and data collected by the government research vessel, No. 1 Tsukiyama Maru, during the 1955 season. A summary of king crab research conducted by Japan in the eastern Bering Sea in 1955 is also included. The United States report discusses the offshore distribution of salmon, identification of stocks, study of movements by tagging, and oceanography; records of the commercial catch of king crabs, distribution and abundance of king crabs, relation of currents to distribution of young crabs, identification of stocks, growth and age determination, study of movements of crabs by tagging, and observations on the mortality of king crabs released from a trawl fishery.

CRABS:

Observations on the Life Histories and the Distribution of the Xanthidae (Mud Crabs) of Chesapeake Bay, by Edward Parsons Ryan, Contribution no. 104, 25 pp., illus., printed. (Reprinted from The American Midland Naturalist, vol. 56, no. 1, July 1956, pp. 138-162.) Chesapeake Biological Laboratory, Maryland Department of Research and Education, Solomons, Md.

CRAYFISH:

An Injection Method for Marking Crayfish, by Keith V. Slack, Contribution No. 564, 3 pp., printed. (Reprinted from Department of Zoology, 1955, pp. 36-38.) Indiana University, Department of Zoology, Bloomington, Ind.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

CUBA:

Cordel y Anzuelo (Line and Hook), by Adolfo Narangjo Betancourt, 252 pp., illus., printed in Spanish with a Spanish-English fish glossary. Banco de Fomento y Agricola e Industrial de Cuba, Seccion de Asuntos Pesqueros, Havana, Cuba, 1956. Discusses fisheries in Cuba and presents detailed descriptions of the 77 most important fishes found in Cuban waters. A picture of each fish is shown and also given are: its family name; species name in Latin; common Cuban name; type of fishery--whether commercial, sport, or both; places in Cuba where fished; outstanding characteristics; size--minimum, average, and maximum; what it feeds on; bait used and description of strike; season when most prevalent; spawning season; quality of its meat; commercial importance; and methods used for fishing. The book also has sections on the habitat of Cuban fish; markets; lists of fish family names and member species with equivalent common names; importance of the sardine; causes of death of live bait; the relationship of the geographic location of Cuba to its oceanography; importance of spiny lobster; facts about ambergris; the sponge industry; eels; oysters; bull frogs; fish hatcheries, crustaceans, turtles, and sponges; crab; statistical review of Cuban fishery during 1952; and a list of Cuban fish names mentioned and their English equivalents.

ELECTRICAL FISHING:

Die Electrofischerei (Electrofishing), by H. W. Denzer, Handbuch der Binnenfischerei Mitteleuropas, Band 5, Lieferung 3, 233 pp., 127 illus. and 49 tables, printed. E. Schweitzerbart'sche Verlagsbuchhandlung, Stuttgart, Germany, 1956. A clear and understandable handbook on the theoretical and practical problems of electrofishing. In addition to presenting stimulating suggestions for the future development of this type of fishing technique, the author has reviewed the historical development of electrofishing. There is also a detailed description of the requirements for the use of this method of capture, as well as descriptions of the physiological effects of electrical current and the factors that regulate the responses of the fish in an electrical field. The limitations of electrofishing are emphasized; and considerable space is allotted to the use of electrofishing equipment, including descriptions of a variety of European units. The author has outlined the methods and procedures of electrofishing as they apply to practical problems.

The Elementary Practice of Electrical Fishing in Fresh Water, Fisheries Notice 36, 15 pp., illus., printed. Ministry of Agriculture, Fisheries and Food, Whitehall Place, London, S. W. 1, England, August 1956. This leaflet was written to satisfy a demand for a simple, practical guide for those who are not electricians, but who propose to use an electrical method for purposes of fish conservation. Discusses the applicability, safety, and legality of electrical methods of fishing in fresh water; the electric field in water; action of electricity on fish; apparatus used in electric fishing; and electrode switch control. Also discusses fishing methods with alternating current and with direct current; practical considerations affecting the fishing; interrupted currents; and methods of production. A list of other papers on electrical fishing is included.

FISHERIES AGREEMENTS:

"Fish Can Be International," by Edwr Allen, article, United States Naval Institute Proceedings, October 1956, printed, 50 cents. United States Naval Institute, Annapolis, Md. Reviews the background of the various international fisheries agreements, beginning with the North Pacific Halibut Treaty--the first instance of international fishery management through a joint commission.

FISH PROTEINS:

"Fish Proteins and Their Utilization," article, Journal of Scientific and Industrial Research (India), vol. 14A, no. 9, p. 453, printed. Council of Scientific and Industrial Research, Delhi, India, 1955. The Department of Biochemistry, Institute of Science, Bombay, India, has been experimenting for the last four years on the preparation and utilization of proteins from fish, particularly from the waste muscle of shark, skate, ray, fish meal, etc. Considerable progress has been made in the preparation of edible proteins devoid of fishy smell. The fish proteins are easily digestible and contain all the essential amino acids in a fairly good proportion. The fish proteins have been prepared by a simple method similar to that described for the manufacture of Wiking Eiweiss--a German fish protein product. In vitro digestion with proteolytic enzymes and microbiological assay of the protein hydrolyzates for amino acids revealed that the fish proteins compare favorably with casein. The high concentrations of lysine, cystine, and other amino acids in fish proteins make it a valuable supplement to diets composed mainly of cereals, pulses, and vegetables. The fish proteins may find application in various industries like textiles, leather, dyes, confectionery, plastics, synthetic resins, and pharmaceuticals.

FLORIDA:

Papers from the Oceanographic Institute No. 2, Florida State University Studies Number Twenty-Two, 161 pp., illus., printed, $1. The Florida State University, Tallahassee, Fla., 1956. Contains, among others, the following papers: "The Demand for Florida Mullet," by William S. Engelson and Marshall R. Coldberg; and "The Fishes of Alligator Harbor, Florida, with Notes on Their Natural History," by Edwin B. Joseph and Ralph W. Yerger.

Quarterly Report on Fisheries Research, December 1956, No. 57-5, 8 pp., processed. The Marine Laboratory, University of Miami, Coral Gables, Fla. A report to the Florida State Board of Conservation on fisheries research covering small shrimp, spotted weakfish, snook, tarpon, sailfish, and gamefish. Studies were continued using the antioxidant sodium bisulfite to retard the development of black spot in shrimp. Samples of fresh frozen mackerel, treated with the antioxidant Ionol and tested over a period of one year, showed considerably less rancidity than did the nontreated samples.

Annotated Check-List of the Marine Fauna and Flora of the St. George's Sound--Apalachee Bay Region, Florida Gulf Coast, Contribution No. 61, 85 pp., processed. The Oceanographic

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Institute, Florida State University, Tallahassee, Fla., October 1956.

FLUKE:

"Long Island's Fluke (A Million Dollar Fishery)," by John C. Poole and Irwin M. Alperin, article, The New York State Conservationist, vol. 11, no. 3, December-January 1956-1957, pp. 16-17, illus., printed, single copy 50 cents. The Conservationist, Room 515, Arcade Bldg., Albany 1, N. Y. Describes some features of the early life history of the fluke or summer flounder and value to sports fishermen and commercial fishermen of Long Island, N. Y. It estimates conservatively that sport fishermen take about 2,000,000 pounds of fluke from Great South Bay and adjacent bays in an average season. The fluke catch per unit-of-effort in Great South Bay for 1938, 1955, and 1956 is shown by type of sport-fishing craft.

FOOD AND AGRICULTURE ORGANIZATION:

The Work of FAO, 1954-55 (Report of the Director-General), 130 pp., printed. Food and Agriculture Organization of the United Nations, Rome, Italy, 1955. While no year can be picked out of its context in the history and development of FAO, this report concentrates upon problems met and work accomplished since the last report to the council in 1954. Without detail, it relates to each Regular Program line of activity the pertinent projects under the Expanded Technical Assistance Program, thus reflecting the real and growing integration of direct technical advisory services to the continuing fundamental program. The chapter on fisheries shows an increase during the past year in the work of the Fisheries Division under both the Regular and the Expanded Technical Assistance Programs, and discusses its accomplishments. Work on the survey of living aquatic resources of the world was pressed forward and so was the task of bringing about international improvements in the standards of methods of fishery statistics. Developments during the year in fisheries biology, fisheries technology, fishery economics and statistics, and regional activities are discussed in detail.

***

The Food and Agriculture Organization has published reports describing that Agency's activities under the Expanded Technical Assistance Program for developing the fisheries of many countries. These reports have not been published on a sales basis, but have been processed only for limited distribution to governments, libraries, and universities. Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome, Italy.

Report to the Government of Chile on Increasing Fish Consumption (based on the work of John Fridthjof), FAO Rpt. No. 271, 53 pp., processed, April 1954.

Informe sobre la Langosta Migratoria de la America Central y Mexico (Report on the Migratory Spiny Lobster of Central America and Mexico), FAO Rpt. No. 287, 23 pp., processed in Spanish, August 1954.

Informe al Gobierno del Ecuador sobre Fomento de la Pesca Maritima (Report to the Government of Ecuador on the Development of Maritime Fishery), FAO Rpt. No. 325, 25 pp., processed in Spanish, January 1955.

Report to the Government of Liberia on Fishing Boats, Gear and Methods, by Hubertus van Pel, FAO Rpt. 322, 36 pp., illus., processed, November 1954. Discusses a survey to improve the fishing methods in Liberia. The first two phases of the program covered preparatory work ashore, including the training of Liberian assistants in net making and the erection of certain shore installations. The third phase consisted of the main project, the demonstration of, and training in, improved fishing methods from small mechanized boats.

Informe al Gobierno de la Republica de Panama sobre Investigacion de los Recursos Camaroneros, Octubre 1952-Octubre 1953 (Report to the Government of Panama on the Shrimp Resources, October 1952-October 1953), by Leslie Scattergood, FAO Rpt. No. 326, 76 pp., illus., processed in Spanish, March 1955.

Informe al Gobierno de la Republica Dominicana sobre Piscicultura (Report to the Government of the Dominican Republic on Fish Culture), by S. Y. Lin, FAO Rpt. No. 346, 17 pp., illus., printed in Spanish, December 1954.

Report to the Government of India on Development of the Sundarbans Fisheries in West Bengal, FAO Rpt. No. 347, 24 pp., illus., processed, December 1954. A report on the development of a program for increasing fish production in the brackish waters of the State of West Bengal through the introduction of suitable foreign gear and craft; improvement of existing indigenous gear and craft; improvement of the present water transport system for carrying fish; and training local fishermen to organize and operate fishing ventures in brackish waters.

Report on the Indo-Pacific Fisheries Statistics Training Center held in Bangkok, Thailand, 19 June to 31 July, 1952, by G. L. Kesteven, FAO Rpt. No. 357, 59 pp., processed, February 1955. The principal aim of the Center was to give practical instruction in statistical work for fisheries to officers of governments of the region, to equip them better to undertake the statistical program for these industries. The organization of the Center in Bangkok, work of the Center, and results achieved are discussed.

Report to the Government of Turkey on Fishery Biology, FAO Rpt. No. 391, 25 pp., processed, July 1955. This report deals with the work on fishery biology conducted by Dr. G. A. Rounsefell who was on loan to FAO from his position with the Fish and Wildlife Service to assist the Government of Turkey in promoting fishery development.

FOOD CONSUMPTION:

Food Consumption of Households in the United States, Household Food Consumption Survey 1955 Report No. 1, 196 pp., processed, $1.25. U. S. Department of Agriculture, Washington, D. C., December 1956. (For sale by the Superintendent of Documents, U. S. Government

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Printing Office, Washington 25, D. C.) This report contains a portion of the data from the U. S. Department of Agriculture's nationwide Survey of Household Food Consumption made in the spring of 1955. The survey was part of the Department's broad program of research on the marketing and utilization of farm products and on family dietary levels. The 6,060 households included in the survey were from all over the country, in urban, in rural nonfarm and farm areas. These households represent all income classes. The report gives information on patterns of consumption and money value for over 200 food items, including fish and shellfish. The information will be useful to many kinds of food businesses and to others in determining the demand for the major types of foods.

FROZEN FISH:

Frozen Fish (Improved Quality and Packing as a Way to Improved Marketing and Consumption), Project No. 325, 160 pp., illus., printed, US$1.25. O. E. E. C. Mission, Suite 61, 2002 P St., N. W., Washington 6, D. C. Following a recomendation of the O. E. E. C. Sub-Committee on Fisheries, a training course on "The Improved Quality and Packing of Frozen Fish" was held at Kiel, Germany, from March 14-19, 1955. This training course, which is the subject of the present publication, was attended by some 50 delegates from 14 member countries of O. E. E. C. The report was compiled by the course organizers and includes the country statements presented at the training course, the technical papers read, and a summary of the conclusions and recommendations reached by the participants during their discussions. The purpose of the workshop was to provide the participants with a comprehensive survey of recent developments in the fish-freezing industry and allow for detailed discussions not only on technical questions, but also on economic problems, ranging from the condition of the raw material and the various methods of deep-freezing down to the particularly interesting methods of transport and distribution. It was one of the main objects of the workshops that every participant should acquire practical knowledge from the papers and group discussions for application in his home country. The workshop, therefore, was not limited to theoretical discussions, but gave prominence to methods of immediate practical application throughout the fish industry. But first of all, it was the object to demonstrate how important the deep-freezing of fish is to promote an increase in the consumption of this commodity. Part I of the present report describes the fish-freezing industry in the participating countries. Part II gives the full text of the technical papers delivered at the training course and summaries of discussions. The program and itinerary of the workshop and a list of the participants are also included.

GEAR:

"A Comparison of Mesh-Measuring Methods," by B. B. Parrish, R. Jones, and J. A. Pope, article, Journal du Conseil, vol. XXI, no. 3, June 1956, pp. 310-318, illus., printed, single copy Kr. 12 (US$1.74). Messrs. Andr. Fred. Høst & Søn, Bredgade, Copenhagen, Denmark.

"On the Selection of Hake and Whiting by the Mesh of Trawls," by J. A. Gulland, article, Journal du Conseil, vol. XXI, no. 3, June 1956, pp. 296-309, illus., printed, single copy Kr. 12 (US$1.74). Messrs. Andr. Fred. Høst & Søn, Bredgade, Copenhagen, Denmark.

GENERAL:

1954 Census of Manufacturers, Advance Report (Canning, Preserving, and Freezing), Series MC-20-3, 16 pp., processed, 10 cents. Bureau of the Census, U. S. Department of Commerce, Washington 25, D. C. This advance report includes selected preliminary statistics from the 1954 Census of Manufacturers for the canning, preserving, and freezing group of industries. Among the individual industries included in this report are the following: Canned Seafood Industry (S. I. C. Code 2031)--represents manufacturing establishments primarily engaged in cooking and canning fish, shrimp, oysters, clams, crabs, and other fishery products; Cured Fish Industry (S. I. C. Code 2032)--represents manufacturing establishments primarily engaged in smoking, salting, drying, or otherwise curing fish for the trade; and Packaged Seafood Industry (S. I. C. Code 2036)--represents manufacturing establishments primarily engaged in preparing fresh or frozen packaged fish or other fishery products; and also includes establishments primarily engaged in the shucking and packing of fresh oysters in nonsealed containers. This advance report gives general statistics (employment, payrolls, cost of materials, value of shipments, etc.) for 1954 and 1947 by regions and states, and the quantity and value of fishery products shipped by all manufacturing establishments for the United States.

Diseases of Fishes, by C. Van Duijn, Jr., 187 pp., illus., printed. Water Life, Dorset House, Stamford St., London, S. E. 1, England. A comprehensive and well illustrated book dealing with fish diseases and their treatment. The introduction discusses the sources of infection, general indications of good and ill-health, diagnosis of disease, and anatomy of fish. There are eight chapters dealing with skin parasites and infections; diseases of the gills; diseases caused by sporozoans; diseases caused by bacteria and viruses; diseases of the eye; diseases of the internal organs; miscellaneous complaints; and the medicine chest. Not only will the most modern and effective cures be found here but also methods of treatment which have been advocated in the past and must now be considered obsolete, the reasons being given why they can no longer be recommended. In this way the material, as it is presented, may be considered comprehensive, combining information from British, American, and Continental sources with the writer's personal experiences. The details should be comprehensible to aquarists in different parts of the world as prescriptions are given not only in British units but in American and metric units as well.

Economic Report of the President (Transmitted to the Congress, January 23, 1957), House Document No. 29, 85th Congress, 1st Session, 210 pp.,

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

illus., printed. United States Government Printing Office, Washington 25, D.C., 1957.

Fishes: A Guide to Fresh- and Salt-Water Species, by Herbert S. Zim and Hurst H. Shoemaker, A Golden Nature Guide, 160 pp., illus., printed, $1. Simon and Schuster, Inc., 630 Fifth Ave., New York 20, N.Y. A general guide for identifying fish on a fishing trip or in an aquarium.

(Interstate Commerce Commission) 70th Annual Report, November 1, 1956, House Document No. 12, 85th Congress, 1st Session, 240 pp., illus., printed. U.S. Government Printing Office, Washington 25, D.C., 1957. The purpose of this report is to give an account of the Interstate Commerce Commission's activities for the period extending from November 1, 1955 to October 31, 1956, and to inform the Congress of problems and conditions in transportation which require its early consideration. These problems are discussed, and where legislation is deemed necessary, specific recommendations are made in the final chapter.

Limnology and Oceanography, vol. 1, no. 1, January 1956, printed (subscription rate for libraries and non-members of the Society, $10 per year). American Society of Limnology and Oceanography, Woods Hole Oceanographic Institution, Woods Hole, Mass. A new serial publication for those concerned with aquatic sciences and to provide a common medium for technical papers on the varied specialties which unite to increase an understanding of the aquatic environment. The first volume includes the following papers: "Environmental Factors Affecting Growth in Venus mercenaria," by D. M. Pratt and D. A. Campbell; "Algal Indicators of Trophic Lake Types," by D. S. Rawson; "Population Dynamics of the Marine Clam, Mya arenaria," by J. C. Ayers; "Deep Standing Internal Waves in California Basins," by K. O. Emery; "The Stress-Drop Jet in Lake Mendota," by R. A. Bryson and W. W. Bunge, Jr.; "Artificial Eutrophication of Lake Washington," by W. T. Edmondson, G. C. Anderson, and D. R. Peterson; "Observations on Dinoflagellate Blooms," by L. R. Pomeroy, H. H. Haskin, and R. A. Ragotzkie; and "Photosynthesis in the Ocean as a Function of Light Intensity," by J. H. Ryther.

The Use of Copper Sulphate to Increase Fyke Net Catches, by William A. Tompkins and Colton Bridges, 12 pp., illus., processed. Division of Fisheries and Game, Department of Natural Resources, 15 Ashburton Place, Boston 8, Mass.

The World of Water, by George G. Harrap and Co, printed, 13s. 1d. (about US$1.85). Piscatorial Press, Ltd., 110 Fleet St., London, E.C. 4, England. Tells of the many types of marine life under the sea, their weapons of defense against enemies and the struggles between sea animals for survival.

HAWAII:

Konohiki Fishing Rights, by Richard H. Kosaki, Report No. 1, 41 pp., illus., processed. Legislative Reference Bureau, University of Hawaii, Honolulu, Hawaii, 1954. Discusses arguments for and against condemnation of the ancient Hawaiian Konohiki fishing rights--private ownership rights over ocean fisheries--which are recognized as property rights by the United States Supreme Court.

HYDROGRAPHY:

"The Influence of Hydrographic Conditions on the Behavior of Fish," compiled by Richard H. Fleming, article, FAO Fisheries Bulletin, vol. IX, no. 4, October-December 1956, pp. 181-196, illus., printed, single copy 30 cents. Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y. In the introduction of this preliminary literature survey, the author states that, "A commercial fishery will be profitable only if a high concentration of fish may be found in a restricted locality. In order to be able to predict the locality and time of aggregation of commercial fish, the factors determining such aggregations must be identified and measured. Furthermore, the factors which determine successful propagation of the fish stock, its size, and survival rate must be found and identified too, in order to be able to take proper steps in management and fish conservation." The notes that follow discuss organic production in the open oceans, food chains in the ocean, temperature changes, salinity of the water, other physical and chemical environmental factors, currents, and food and feeding habits.

IDAHO:

Statewide Fishing Harvest Survey, 1955 (Annual Progress Report for Investigations Projects), by Forrest R. Hauck, Federal Aid to Fisheries Project 18-R2, 10 pp., illus., printed. Fish and Game Department, Boise, Idaho, 1956.

INDIANA:

Fish and Fishing in Spear Lake, Indiana, by W. E. Ricker, Contribution No. 588, 45 pp., illus., printed. (Reprinted from Department of Zoology, 1955, pp. 117-161.) Indiana University, Department of Zoology, Bloomington, Ind.

IOWA:

Quarterly Biology Reports, vol. VIII, no. 3, July-August-September 1956, 44 pp., processed. State Conservation Commission, East 7th and Court St., Des Moines, Iowa. Contains the following articles: "Summary of the Cooperative Exploratory Fishing Operations in the Wisconsin-Illinois-Iowa Sections of the Mississippi River, 1956," by R. E. Cleary; "An Experimental Treatment of a Segment of the Des Moines River in Iowa to Increase Desirable Fish by Suppressing Undesirable Forms," by Harry M. Harrison; "Selective Poisoning of Gizzard Shad in Storm Lake--Preliminary Report," by Earl Rose; "Results of Early Summer Creel Census of Five Northern Iowa Lakes, 1956," by Tom Moen; and "The 1956 Artificial Lakes and Reservoir Fisheries Survey," by Jim Mayhew.

JAPAN:

The Tohuku Journal of Agricultural Research, vol. VI, no. 4, pp. 285-392, illus., printed, March 1956. Faculty of Agriculture, Tohuku University, Sendai, Japan. Contains, among others, the following articles: "Biological Studies on the

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Population of the Saury, Cololabis saira (Brevoort). Part 2--Habits and Migrations," by M. Hatanaka; and "Comparative Biochemical Studies on Aquatic Animals. I.--Calcium Turnover of the Freshwater Fish and Shellfish," by Motokazu Asano, Masao Ito, and Toshio Kumagai.

REPUBLIC OF KOREA:

Rehabilitation & Reconstruction Program on Marine Affairs, 1957-1961, 92 pp., illus., printed. Office of Marine Affairs, Seoul, Republic of Korea, 1956. A detailed report on Korea's rehabilitation and reconstruction program. Part I describes the following projects: (1) oyster cultivation which will replace laver (a species of seaweed) culture; (2) replacement of existing old and unseaworthy vessels; and (3) completion of the second tidal basin work at Inch'on. Part II covers a 5-year plan on fisheries rehabilitation; shipbuilding; modernization of stevedoring facilities; and harbor rehabilitation.

MAINE:

Alewife Management in Maine, by Frederick T. Baird, Fisheries Circular No. 18, 7 pp., processed. Department of Sea and Shore Fisheries, State House, Augusta, Maine, November 1956. A report on the alewife management program in Maine, presenting biological information which might serve to change to some degree the recommendations for the management of the fishery. The recommendations made in 1953 remain basically unchanged and are as follows: (1) all areas should be carefully checked for their production capacity and the possibility of even greater production either by opening more of the watershed or more efficient use of that portion which is available; (2) more rapid development of potential areas should be encouraged; (3) a careful check of fishway construction and maintenance should be carried on; and (4) where new runs are being developed, plans should be made for the planting of adults as required. The author concludes that (1) under present conditions, alewife production can be increased by (a) the improvement of existing runs, and (b) the rehabilitation of runs which are no longer commercially productive; (2) existing markets are capable of absorbing additional production; and (3) it is now feasible to develop small producing areas which are closely joined geographically to form a single development and marketing unit.

The Maine Department of Inland Fisheries and Game, by Ron Speers, Information and Education Division Pamphlet No. 4, 14 pp., illus., printed. Department of Inland Fisheries and Game, Augusta, Maine, 1956.

MALAYA:

Report of the Fisheries Division, 1955, Ministry of Commerce and Industry, 27 pp., printed. Ministry of Commerce and Industry, Singapore, Malaya. Includes a general review of the fishing industry of the Federation of Malaya, availability of fresh fish, prices of fresh fish, trade in dried salt fish and certain marine products, and cost of fishing materials.

MARINE LIFE:

The Underwater Guide to Marine Life, by Carleton Ray and Elgin Ciampi, 338 pp., illustrated by Teiji Takai, printed, $8.75. A. S. Barnes and Company, 232 Madison Avenue, New York 16, N. Y., 1956. As suggested by the title, this is specifically a book for the large and growing group who have discovered the fascinating world under water and who insist upon diving to explore it with or without special breathing apparatus. The authors have included introductory chapters on marine biology and oceanography which are readable and interesting condensations of those phases of the subjects most important to an understanding of the varied and colorful life described in the remaining pages. The general accuracy is high. The illustrations are excellent and the photographs and color plates are not only original but good. The importance of conservation of natural conditions and life on accessible reef areas is stressed and the well rounded synoptic treatment of marine plants and both marine invertebrates and vertebrates should make the book a useful reference work for fishermen and adventurers as well as to those of us who merely wish that we had the time and energy to look under the sea for ourselves.

--Stewart Springer

MARYLAND:

Annual Report, 1954, by R. V. Truitt, Educational Series No. 39, 32 pp., illus., printed. (Reprinted from Eleventh Annual Report, Maryland Board of Natural Resources, 1954.) Chesapeake Biological Laboratory, Maryland Department of Research and Information, Solomons, Md., August 1955. Reports on Maryland's natural resources and includes discussions on oyster and clam investigations, fish and fisheries problems, crabs, marine borers, fish conservation projects, Chincoteague Bay studies, and hydrography.

Annual Report, 1955, by L. Eugene Cronin, 33 pp., illus., printed. (Reprinted from Twelfth Annual Report, Maryland Board of Natural Resources.) Maryland Department of Research and Education, Chesapeake Biological Laboratory, Solomons, Md., August 1956. Reports on Maryland's most important natural resources and primarily discusses shellfish, crabs, fish and fisheries, and hydrography of the Chesapeake Bay regions; Chincoteague Bay studies; and inland fish investigations.

MOLLUSKS:

Freshwater Mollusks of Alabama, Georgia, and Florida from the Escambia to the Suwannee River, by William J. Clench and Ruth D. Turner, Bulletin of Biological Sciences, vol. 1, no. 3, 1956, 239 pp., illus., printed, $1.80. University of Florida, State Museum, Gainesville, Fla.

NORWAY:

Konkylien (The Shell), vol. 1, no. 1, December 1956, 30 pp., illus., printed in Norwegian with summary in English. Stord Marin Industri A/S, Bergen, Norway. The first issue of a technical publication which will be published 3 or 4 times a year and will include news regarding fishing and the fish meal industries. It is intended to give up-to-date information about matters directly connected with the activities of the Stord

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Marin Industri A/S and S. Bartz-Johannessen and associated companies, together with news of production and sales of herring meal and oil, fish meal, solubles, and seaweed meal. There will be included details of new plants, the sale and deliveries of industrial equipment and apparatus, the planning of factory plants, etc., both in Norway and abroad. Summaries in English are given of the following articles: "The Rotadisc Steam-Heated Drier (Of Novel Construction and Greatly Reduced Dimensions);" "Tobis, a Raw Material for Fish Meal Plants;" and "Caplin, for Food and Industrial Purposes."

Norges Fiskerier, 1953 (Fishery Statistics of Norway), Norges Offisielle Statistikk Series XI, no. 237, 113 pp., illus., printed in Norwegian with foreword, table of contents, and summary in English. Director of Fisheries of Norway, Bergen, Norway, 1956. A detailed statistical report on the fisheries of Norway with discussions of the number of fishermen, craft, processing plants, gear; quantity and value of total landings; herring, sprat, cod, mackerel, tuna, dogfish, and caplin fisheries; fisheries in distant waters; and catch of small whales and sealing. Statistics are given on quantity, value, and average prices of all species of fish caught commercially. The following new tables have been included: trawl fishing in West Greenland waters; long-lining in West Greenland waters; Icelandic herring fisheries; participation, duration of trips and landings, by tonnage groups and type of fishing gear; landings from distant waters, by counties; and catch of fat and small herring by months for each county. Also contains a list of scientific and common names, in four different languages, of fish, crustaceans, mollusks, and other aquatic organisms in Norwegian waters; drawings of the principal species of fish, mollusks, and crustaceans; and drawings of the different types of fishing gear.

OREGON:

Oregon's Warm-Water Game Fish, Informational Leaflet No. 9, 4 pp., illus., printed. Department of Information and Education, Game Commission, Portland, Ore.

OYSTERS:

"Deterioration of Cooked Southern Oysters," by Elizabeth Ann Gardner and Betty M. Watts, article, Food Technology, vol. 11, no. 1, January 1957, pp. 6-11, printed, single copy: domestic, $1.50; foreign, $1.75. The Garrard Press, 119 West Park Ave., Champaign, Ill. Describes a study of the rate and type of spoilage which occurs in cooked oysters. Raw southern oysters were found to give an exceptionally strong qualitative test for the enzyme catalase with 3-percent hydrogen peroxide. This test was used to indicate inactivation of this enzyme by heat treatment. Spoilage which took place in oysters cooked enough to inactivate catalase and subsequently frozen or refrigerated appeared to be of an oxidative type, characterized by a rancid fish odor. By adding various antioxidants to the cooking water, this type of spoilage was retarded. Weight losses during cooking were influenced more by length of cooking time than by type of cooking method. Further losses of liquid took place upon refrigerated storage of the cooked oysters.

Distribution of Oyster Larvae and Spat in Relation to Some Environmental Factors in a Tidal Estuary, by Joseph H. Manning and H. H. Whaley, Contribution no. 105, 10 pp., illus., processed. (Reprinted from the Proceedings of the National Shellfisheries Association, vol. 45, August 1954, pp. 56-65.) Maryland Department of Research and Education, Chesapeake Biological Laboratory, Solomons, Md.

Oyster Culture in South Africa, by Dr. P. Korringa, Investigational Report No. 20, 86 pp., illus., printed. (Reprinted from Commerce and Industry, March 1956.) Department of Commerce and Industries, Division of Fisheries, Pretoria, Union of South Africa, 1956.

Various Aspects of Oyster Setting in Maryland, by G. Francis Beaven, Resource Study Report No. 8, 9 pp., illus., processed. (Reprinted from the Proceedings of the National Shellfisheries Association, vol. 45, August 1954, pp. 29-37.) Maryland Department of Research and Education, Chesapeake Biological Laboratory, Solomons, Md.

PAKISTAN:

Marine Fishes of Karachi and the Coasts of Sind and Makran, 80 pp., illus., printed. Government of Pakistan, Ministry of Food and Agriculture, Central Fisheries Department, Karachi, Pakistan, 1955.

PRESERVATION:

"Characteristics of Electron-Irradiated Meats Stored at Refrigerator Temperatures," by J. F. Kirn, W. M. Urbain, and H. J. Czarnecki, article, Food Technology, vol. 10, no. 12, December 1956, pp. 601-603, printed, single copy $1.50. (Published by the Institute of Food Technologists.) The Garrard Press, 119 West Park Ave., Champaign, Ill.

QUALITY:

"A Rapid Vacuum Distillation Procedure for the Determination of Volatile Acids and Volatile Bases in Fish Flesh," by Tetuo Tomiyama, Antonio A. da Costa, and Joseph A. Stern, article, Food Technology, vol. 10, no. 12, December 1956, pp. 614-617, illus., printed, single copy $1.50. (Published by the Institute of Food Technologists.) The Garrard Press, 119 West Park Ave., Champaign, Ill.

REFRIGERATION AND FREEZING:

"Zur Frage des Fischgefrierens auf See (The Problem of Freezing Fish at Sea)," by Dr. J. Kuprianoff, article, Kaltetechnik, vol. 8, no. 4, April 1956, pp. 114-121, illus., printed in German. Deutschen Kaltetechnischen Vereins, Karlsruhe, Germany. Surveys the economic aspects of the problem, quality of the fish when landed, current interest in freezing fish at sea, and operational experience gained by British, German, and Soviet freezing trawlers. The form in which fish is frozen has an essential bearing on the freezing procedure and type of refrigeration plant. Freezing of whole fish is simpler and does not involve much space or costly investment, but freezing of filleted fish is expensive since it involves additional operations such as sorting, washing, heading, filleting, and packaging. Fillets and

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

steaks are frozen in metal molds but use of plastic sheets is recommended to prevent undesirable complications which may result from contact and sticking to the metal. Freezing fish at sea presents no fundamental technical difficulties and the problems are regarded as chiefly of an economic nature.

SEA LAMPREY:

"The Questionable Sea Lamprey," by Justin W. Leonard, article, Michigan Conservation, vol. XXVI, no. 1, January-February 1957, pp. 19-21, illus., printed. Michigan Department of Conservation, Lansing, Mich.

SALMON:

Aroostook River Salmon Restoration and Fisheries Management, by Kendall Warner, Fishery Research Bulletin No. 4, 66 pp., illus., printed. (Published jointly by Maine Department of Inland Fisheries and Game and Atlantic Salmon Commission.) Department of Inland Fisheries and Game, Augusta, Maine, 1956.

Babine River Salmon after Removal of the Rock Slide, by H. Godfrey, W. R. Hourston, and F. C. Withler, printed, 50 cents. Fisheries Research Board of Canada, Ottawa, Canada.

Conference on Pink Salmon of the Fraser River Area Between the United States of America and Canada (Proceedings of Plenary Sessions and Precis of Committee Meetings), 70 pp., processed. Conference on Pink Salmon of the Fraser River Area, Room 118, House of Commons, Ottawa, Canada, October 22-25, 1956.

King Salmon and the Ocean Troll Fishery of Southeastern Alaska, by Robert A. Parker and Walter Kirkness, Research Report No. 1, printed. Alaska Department of Fisheries, Juneau, Alaska. Gives the statistical history of the troll salmon catch in Southeastern Alaska.

Machias River Salmon Restoration, by James S. Fletcher, 25 pp., illus., printed. Atlantic Salmon Commission, Augusta, Maine, 1955.

SEA SCALLOP:

The Maine Sea Scallop Fishery, by Robert L. Dow, Fisheries Circular 19, 9 pp., illus., processed. Department of Sea and Shore Fisheries, State House, Augusta, Maine, December 1956. The sea scallop, Pecten magellanicus, is Maine's fifth most valuable fishery. This paper discusses the commercial history of the sea scallop fishery and includes statistics on the production and value of the fishery for the period 1942-55. Also describes biological research, management recommendations, offshore fishery, winter fishery, extent of inshore scallop fishing operations, fishing efficiency, demand and abundance, mortalities, and future development of the inshore fishery.

SEAWEED:

Seaweed Prospects, 30 pp., illus., printed. Institute of Seaweed Research, Inveresk, Midlothian, Scotland, March 1956. Describes the commercial exploitation and use of seaweed in the chemical, pharmaceutical, textile, food, and fertilizer industries. A summary of the Institute's technical findings, which should be of value to firms engaged or interested in seaweed utilization, covers the supply position of brown seaweed and red seaweed, development of harvesting machinery, value of seaweed in animal feedstuffs and as fertilizer in the soil, seaweed chemicals, and the development of commercial outlets for seaweed and seaweed chemicals. Data sheets are appended which give summarized details of the preparation, properties, derivatives, and uses of ascophyllum meal, laminaria meal, alginic acid and the alginates, d-mannitol, laminarin, fucoidin, fucosterol, agar, and carrageenin.

SHRIMP:

"Chemical Ices for Shrimp Preservation," by E. A. Fieger, M. E. Bailey, and A. F. Novak; and "Factors Influencing the Sporadic Development of Discoloration in Canned Wet Pack Shrimp," by R. G. Landgraf, Jr., articles, Food Technology, vol. 10, no. 12, December 1956, pp. 578-583 and 607-610, respectively, illus., printed, single copy $1.50. (Published by the Institute of Food Technologists.) The Garrard Press, 119 West Park Ave., Champaign, Ill.

SOUTH CAROLINA:

Annual Report, 1955-1956, Contribution No. 24, 19 pp., illus., printed. (Reprinted from Report of South Carolina Wildlife Resources Department, Fiscal Year July 1, 1955-June 30, 1956.) Bears Bluff Laboratories, Wadmalaw Island, S. C., January 1957. A detailed description of the activities of Bears Bluff Laboratories for the period under review, covering the study of oysters, shrimp, crabs, finfish, and salt-water ponds. Also describes offshore explorations with Bears Bluff's deep-sea research vessel, the 65-foot T-19.

STRIPED BASS:

Recaptures of Tagged Striped Bass, ROCCUS Saxatilis (Walbaum), Caught in Deep Water of Chesapeake Bay, Maryland, by Romeo Mansueti, Resource Study Report No. 10, 9 pp., illus., processed, October 1956. Maryland Department of Research and Education, Chesapeake Biological Laboratory, Solomons, Md.

SWEDEN:

Swedish Investigations on Ling (MOLVA VULGARIS Fleming), by Arvid R. Molander, Series Biology, Report No. 6, 39 pp., illus., printed. Institute of Marine Research, Fishery Board of Sweden, Lysekil, Sweden, 1956.

TAGGING:

Notes on Marking Live Fish with Biological Stains, by Arnold Dunn and Coit M. Coker, Contribution no. 86, 4 pp., illus., printed. (Reprinted from Copeia, no. 1, March 21, 1951, pp. 28-31.) Chesapeake Biological Laboratory, Maryland Department of Research and Education, Solomons, Md.

TENNESSEE VALLEY AUTHORITY:

Annual Report for 1956 (A Record of Activities and Accomplishments for the Fiscal Year Ending June 30, 1956), Report No. 216-56, 56 pp., illus., processed. Division of Forestry Relations, Tennessee Valley Authority, Norris, Tenn. Includes,

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

among others, a chapter on fish and game investigations which describes fish population studies, fish creel census, harvesting studies, the Norris Reservoir netting study, fish stocking in TVA reservoirs, commercial fishing, and the mussel industry. Statistics are also presented on the quantity and value of the commercial species of fish taken in the Guntersville, Wheeler, Wilson, and Pickwick Reservoirs, and the mussel shell harvest of the Lower Mainstream Reservoirs.

TROUT:

An Evaluation of Massachusetts' Trout Stream Fishery, by James W. Mullan, 11 pp., processed. Division of Fisheries and Game, Upton, Mass.

TURKEY:

"Turk Balikci Tekneleri" (On the Turkish Fishing Boats), by H. I. Chapelle and M. N. Ozerdem, article, Balik ve Balikcilik (Fish and Fishery), vol. V, no. 1, January 1957, pp. 14-18, illus., printed in Turkish. Et ve Balik Kurumu, Istanbul, Turkey.

UNTED KINGDOM:

Herring Industry Accounts, 1955-56, 7 pp., printed. Her Majesty's Stationery Office, London, England. Shows the sums received and paid out of the Herring Marketing Fund for the purpose of making loans in connection with export, or for undertaking operations involving the outlay of working capital (chiefly in connection with the Herring Industry Board's herring meal and oil schemes). Also shows receipts from repayments of the principal of such advances, and receipts and advances connected with the acquisition of new fishing vessels and of new engines for vessels belonging to working fishermen. Advances from the Fund during the year ended March 31, 1956, were to provide working capital. No advances were made during the year in respect to schemes connected with export. Loans connected with export made in earlier years have been repaid in full.

Sea Fisheries, Their Investigation in the United Kingdom, edited by Michael Graham, 487 pp., illus., printed. Edward Arnold (Publishers) Ltd., London, England, 1956. A generously illustrated book that discusses past and present main findings of fisheries laboratories in the United Kingdom. Presents detailed reports on the following subjects: origin of fishery science in the United Kingdom; general knowledge of demersal and pelagic fisheries of the United Kingdom and development of fishery statistics; plankton; benthos and shellfish; the pelagic phase; biology, fishery, and economic importance of cod, haddock, hake, and plaice; and the theory of fishing. Also has an excellent bibliography.

VESSELS:

"Operations of Modern Fishing Craft," article, Trade News, vol. 9, no. 5, November 1956, pp. 3-7, illus., printed. Director of Information and Educational Service, Department of Fisheries, Ottawa, Canada. Reviews the 1955 report of a study conducted by the Department of Fisheries of Canada on the economics of modern fishing-craft operations in the Atlantic Coast area. Includes tables and excerpts from the report's summary of analysis of findings; descriptive material with respect to fishing boats; gear, and operational methods; categories of capital cost; problems of financing and related topics; and details of 1955 accounts.

VIRGINIA:

(Commission of Game and Inland Fisheries) Annual Report for the Fiscal Year Ending June 30, 1955, 41 pp., printed. Division of Purchase and Print, Commission of Game and Inland Fisheries, Richmond, Va., 1956.

YEARBOOKS AND DIRECTORIES:

Fisheries Yearbook and Directory, 1956, edited by Harry F. Tysser, 462 pp., illus., printed. British-Continental Trade Press Ltd., 222 Strand St., London W. C. 2, England. An international reference book and directory of the fishing and fish-processing industries. It covers the world's fish catches, curing, canning, quick-freezing, consumption, imports and exports, technological progress, and other items of importance. The book contains two parts, the first of which is composed of the following articles: "The British Fishing Industry;" "English Fishery Research in 1955," by Michael Graham; "Denmark's Fishing Industry," by Chr. Christiansen; "The Fishing Industry of the Federal Republic of Germany," by Dr. G. Meseck; "Around the World," a report on the fishing industries and fishery activities of Argentina, Australia, Belgium, Canada, Formosa, East Zone of Germany, Japan, Netherlands, Norway, Poland, South Africa, United States, U. S. S. R., and Yugoslavia; "Preservation of Fish," by K. Beck-Slinn; "Fish Processing Equipment;" "Practical Guide to Fish Products and Treatment," by Eric Hardy; "How to Plan a Fish Meal Plant," by Olaf Braten; "Organization and Trade Associations;" "Trade Journals of Interest to the Fishing Industry;" "Fish Suppliers Calendar;" "Dictionary of Fish Names;" "Fishing Vessel Construction and Equipment;" "Recent Shipbuilding and Engineering Developments;" "Progress in Quick-Freezing;" and "Icelandic Fisheries and Exports." The second part of the book is a directory section which contains the following ten parts: (1) exporters, curers, quick-freezers, trawler owners; (2) importers and wholesalers; (3) fish canners and preservers; (4) machinery and equipment for fish processing and refrigeration; (5) packing machinery, materials, etc.; (6) supplies for fisheries; (7) fishery byproducts; (8) cold-storage and transport; (9) list of trade marks and names; and (10) buyer's guide and classified list of advertisers. The wide scope and detailed subject matter covered make this book valuable as a guide to the world's fisheries.

Statistical Year Book, 1956, International Tin Study Group, 284 pp., printed, $5.60. International Tin Study Group, 7 Carel van Bylandtlaan, The Hague, Netherlands. A yearbook presenting statistics and general reports of the tin-producing and tin-consuming industries of the world. The book has two parts, the first of which deals with tin and tinplate. The second part of the book deals with the canning industry and presents, among others, a brief report of production of canned fish by countries throughout the world.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

The second part also contains sections on Africa, North America, Central America, and the West Indies, South America, Asia, Europe, and Oceania, and presents, among other products, detailed reports and statistics of fish canning for each general area and each country within the areas.

WASHINGTON:
Washington State Department of Fisheries, 65th Annual Report, 1955, 64 pp., illus., printed. Washington State Department of Fisheries, Seattle, Wash., December 1956. Discusses the activities and objectives of the Department of Fisheries for the year 1955, with a review of fisheries progress. The Department's program of research and management of marine fish and shellfish is discussed in considerable detail and covers research at power dams, salmon culture, marine and stream research, shellfish research, the salmon fishery, stream improvement and salmon restoration, and cooperative research and management programs. Also includes sections on fisheries patrol, legislation, fisheries news log, 1955 regulation changes, escapement counts of sockeye and silver salmon at Baker River Dam, and White River escapement counts of silver and chinook salmon at Mud Mountain trap.

WHALES:
The Scientific Reports of the Whales Research Institute, No. 11, 218 pp., illus., printed, June 1956. The Whales Research Institute, No. 4, 12 Chome, Nishigashidori Tsukishima, Chuo-ku, Tokyo, Japan.

FISHERY MOTION PICTURE

The following motion picture is available only from the source given in the listing.

SHRIMP STUFFED EGGPLANT

Shrimp Tips from New Orleans, a 16 mm. color film, produced and distributed by the U. S. Fish and Wildlife Service, especially designed for color or black-and-white television use, in which time-tested shrimp recipes are featured. The film, with its New Orleans setting, authentically portrays the culture, architecture, art, and music of that famous city, the strains of French cafe and modern Dixieland music lending additional atmosphere to the scenes. Preparation and serving of six recipes is woven colorfully into the 14-minute film. To borrow this film or obtain information about the sale of prints, write to the U. S. Fish and Wildlife Service, Washington 25, D. C.

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Alma Greene, Helen Joswick, and Helen Turner

* * * * *

Photograph Credits: Photographs on pages not mentioned were obtained from the Service's file and the photographers are unknown. Pages 2, 4, 5, 6, and 7--Staff of Seattle Exploratory Fishing and Gear Development field office; page 33--Virginia Fisheries Laboratory, Gloucester Point, Va.; page 80--C. Brockway & E. P. Haddon. Outside back cover--Quincy Market Cold Storage Warehouse Co.

FISH AND WILDLIFE SERVICE HATCHERIES INCREASE TROUT PRODUCTION

Research and improved management techniques are paying big dividends in the production of trout at U. S. Fish and Wildlife Service hatcheries.

The 1955 output at all Fish and Wildlife Service hatcheries producing trout was 1,244,000 pounds, compared with 473,000 pounds in 1951. The Service operates 24 hatcheries which produce trout only and another 19 at which some trout are produced in addition to either salmon or warm-water fish. There are additional hatcheries for salmon only and others for warm-water fish only.

While some of the increase in trout poundage is due to enlarged facilities, rigid application of improved hatchery management techniques developed by research is the principal contributing factor. These research findings include knowledge of trout metabolism and improved diet and feeding practices developed at Fish and Wildlife Service laboratories. The full utilization of rearing space and the development and use of improved hatchery equipment also have been responsible for some of the gains.

FIG. 1 - WARM WATER HATCHERY, HEBRON, OHIO.

At one hatchery there were two other factors which contributed to the tremendous increase in poundage. One of these is a heater which holds the hatchery water at the proper temperature during the winter months and makes it possible to transfer fingerlings instead of fry to the rearing ponds and lakes in the spring. The other is the utilization of the small natural lakes for rearing.

Heating units are now installed in two other hatcheries. The first such Fish and Wildlife Service project for artificially warming the hatchery water was at Spearfish, S. Dak. One of the objectives of trout propagation is to have the fish well into the fingerling stage by the time they are taken from the hatchery and placed in the rearing ponds. This gives them a chance to develop rapidly during the summer months, when water temperature is most suitable for rapid growth.

Trout eggs hatch and the young fish grow best in water between 50° and 60° F. The rule of thumb in trout propagation in relation to hatching time is "50 days at 50 degrees." In colder waters the hatching time is extended considerably.

Only a few years ago it was hoped that the average hatchery could produce one pound of trout per cubic foot of water. Now many Service hatcheries produce from 2 to 6 pounds per cubic foot of water. Some years ago it took 5 pounds of feed to produce a pound of trout. Now it takes 3.5 pounds, and in some instances less to produce a pound of trout. Per-man-production now may be as high as 15,000 or 18,000 pounds in one year at individual hatcheries, considerably higher than it was some years ago, but the average is about one-third of this.

FIG. 2 - TROUT PONDS AND HATCHERY BUILDINGS AT FISH CULTURAL STATION. THE PONDS ARE BEING CLEANED.

Larger hatcheries have proved to be more efficient than smaller ones. Many factors control the size of the hatchery, most important of which is the quality and quantity of the available water supply. While 50-degree water is ideal for trout hatching, the spawners do better in water somewhat cooler than that.

Trout hatcheries may be equipped with troughs or tanks for hatching and early rearing, and either ponds, concrete raceways, or small lakes for summer growth. Cold-storage space for about one-half of the year's supply of meats and other perishables and a fish-food preparation room equipped with proper slicers, grinders, and mixers are all part of a well-established hatchery.

CONTENTS (CONTINUED)

INT.-DUP. SEC., WASH., D.C. 15290

COLD STORAGE DESIGN AND REFRIGERATION EQUIPMENT

Fishery Leaflet 427 (Refrigeration of Fish - Part 1, "Cold Storage Design and Refrigeration Equipment") is one of a series of five leaflets on the refrigeration of fish recently released by the U. S. Fish and Wildlife Service.

The first section of this leaflet is concerned with design and construction of single and multistory cold-storage warehouses, the economics governing the type of construction and design selected, and that amount of technical data required for guidance of the processor in his choice.

PRODUCT STORAGE ON THE MEZZANINE FLOOR OF A REFRIGERATED WAREHOUSE. NOTE THE LOW PILING HEIGHTS.

The second section is concerned with refrigeration equipment. A resume of the equipment available and the respective advantages and disadvantages for specific tasks is given.

The third section develops the refrigeration requirement as affected by the type of load; the various freezing methods presently in use are then described and evaluated. Information on particular illustrative systems of freezing and of their respective freezing rates is presented.

In addition to this leaflet (Part 1), also available are Part 3, "Factors to be Considered in the Freezing and Cold Storage of Fishery Products"--Fishery Leaflet 429; Part 4, "Preparation, Freezing and Cold Storage of Fish, Shellfish, and Precooked Fishery Products"--Fishery Leaflet 430. Part 2, "Handling Fresh Fish"--Fishery Leaflet 428; and Part 5, "Distribution and Marketing of Fishery Products"--Fishery Leaflet 431. Copies of any or all of the leaflets issued in this series are obtainable free from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C.

COMMERCIAL FISHERIES REVIEW

Vol. 19, No. 4 APRIL 1957

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor
J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Gill-netting for shad in the lower part of the Hudson River, N. Y. The shad appear at the mouth of the Hudson River during the latter part of March and the run continues into May, but the peak catches usually occur between April 15 and the first week in May.

Contents Continued Page 85.

COMMERCIAL FISHERIES REVIEW

April 1957 Washington 25, D.C. Vol. 19, No. 4

IRON SULFIDE DISCOLORATION OF TUNA CANS[1/]

No. 6 - Experiments to Elucidate Mechanism of the Reaction

By George M. Pigott* and M. E. Stansby**

ABSTRACT

Experiments which were conducted to elucidate and render inoperative the mechanism whereby tuna cans are discolored by iron sulfide formation were partially successful. The catalytic factor was found to be heat-stable and present in the meat of certain batches of tuna. Repacking of the tuna from discolored cans into new cans with a second retorting did not prevent discoloration. Neither oil nor brine from such cans, when repacked, caused discoloration. Headspace gases did not show any significant differences between control and discolored packs. Acids were found not to be the cause of the discoloration though they did cause corrosion of the cans. Inversion of the cans soon after retorting prevented the formation of iron sulfide. Discoloration does not occur in cans containing no free liquid.

BACKGROUND

Certain batches of tuna fish, when canned, cause an iron sulfide discoloration in the can area adjacent to the headspace. The present investigation has been a study of iron sulfide formation and the variables that affect it (Pigott and Stansby 1955).

The five preceding papers in this series of articles designed to report the work of the project have dealt with the effect of processing variables on can discoloration. The objective of this paper, the last in the series, is to discuss various experiments that were carried out to elucidate the mechanism of the reaction causing the iron sulfide discoloration.

EXPERIMENTAL WORK

GENERAL: Previous work in this investigation has shown that the iron sulfide discoloration is formed from hydrogen sulfide that is produced by tuna meat during retorting, and iron in the tin can that has been converted to the ferrous state. The solution to the problem now lies in determining the mechanism whereby iron is converted to the ferrous form by a substance present only in certain batches of tuna. A series of experiments were carried out to study the mechanism of this reaction.

REPACKING CANNED TUNA: A repacking experiment was undertaken in an effort to determine if the factor causing discoloration was in the meat or in the liquid. The experiment was as follows: After cans of discolored and normal tuna were opened, the oil was drained, and the meat was repacked into new single-enamel cans. The drained oil from both the discolored and the normal packs was added to a freshly precooked albacore pack that had never caused can discoloration. Results of this work are shown in table 1.

* Formerly Chemical Engineer, Continental Can Company, Seattle, Wash.

** Chief, Pacific Coast and Alaska Technological Research, Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

1/ This investigation, which was carried out at the Seattle Technological Laboratory, U. S. Fish and Wildlife Service, was jointly sponsored by the Continental Can Company and the U. S. Fish and Wildlife Service.

Table 1 - Effect of Repacking and Reprocessing Tuna Upon Can Discoloration

Species of Tuna	Original Pack[1]		First Repack of Original Fish[1]		Second Repack of Original Fish[1]	
	Additive	Degree of Discoloration	Additive	Degree of Discoloration	Additive	Degree of Discoloration
Yellowfin	Oil, salt	Medium	Soya oil	Medium	Soya oil	Light
	Oil, salt	Medium	Brine	Medium	Brine	Light
Albacore	Oil, salt	None	Soya oil	None	Soya oil	None[2]
	Brine	None	Soya oil	None	Soya oil	None[2]
	Brine	Medium	Brine	Medium	Brine	Light
	Oil, salt	Medium	Soya oil	Medium	Soya oil	None[3]
	Oil, salt	None	Soya oil from discolored pack	None	Soya oil from discolored pack	None
	Oil, salt (flake pack)	None	Soya oil	None	-	-

1/ SOLID PACK UNLESS OTHERWISE STATED.
2/ THIS PACK SHOWED MEDIUM DISCOLORATION WHEN THE SECOND REPACK WAS INCUBATED AT 37° C. FOR 14 DAYS.
3/ THIS PACK SHOWED LIGHT DISCOLORATION WHEN SECOND REPACK WAS INCUBATED AT 37° C. FOR 14 DAYS.

The tuna that caused discoloration in the original packs again caused discoloration when repacked into a new can. The oil that was drained from the original discolored packs did not cause discoloration in the albacore packs. Brine packs gave the same results, when repacked, as did oil packs. Thus, the factor favoring discoloration seems to be present in the tuna meat, since the factor causing can discoloration is carried by the previously processed tuna meat into a new can even when the oil or brine from the preceding stage is removed and fresh oil or brine is added.

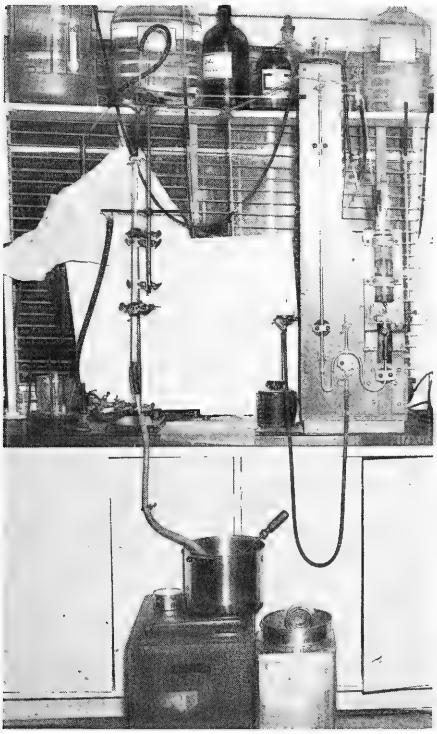


Fig. 1 - Apparatus used in determination of quantity and chemical composition of head-space gases in canned tuna.

COMPOSITION OF HEADSPACE GASES: Headspace gases in various experimental and commercial solid packs of tuna were analyzed for volatile acids, volatile bases, oxygen, and hydrogen to see if a difference in composition between normal and discolored packs could be detected (table 2). In general, no significant differences were detected between the various packs. The variation in composition for the constituents measured was just as great in cans from the same pack as it was between different packs, normal or discolored.

EFFECT OF pH: With the exception of one discolored commercial albacore pack that had a pH of 5.6, all of the packs inspected in this investigation ranged from a pH of 5.85 to 6.1. The acid content of experimental packs was varied to determine the effect of pH of the meat on can discoloration. Both acetic and hydrochloric acids were used to adjust the pH of the can contents just before sealing and retorting.

At pH values of 5 or above no can discoloration was produced in experimen-

tal packs of albacore that normally did not cause can discoloration. When the pH was adjusted below 5, the cans were attacked, but the corrosion was not of the same type as that found in cans discolored under normal processing conditions. Futhermore, owing to the buffering capacity of the tuna meat, such a large amount of acid had to be added that the meat became inedible.

Table 2 - Composition of Headspace Gases in Solid-Pack Tuna

Constituent	Volume of Gas[2/]	
	Range	Average
	(Cubic Centimeters)	
Total headspace gas[1/]	6.75-27.5	15.0
Volatile acid	0.23- 2.28	0.72
Volatile base	0.23- 1.42	0.72
Oxygen	0- 0.45	0.18
Hydrogen	3/	0

1/THE INERT GAS (MOSTLY NITROGEN) DETERMINED BY DIFFERENCE WAS 80 TO 95 PERCENT BY VOLUME.
2/70° F., ATMOSPHERIC PRESSURE.
3/FOUND IN MINUTE QUANTITIES IN FOUR CANS ONLY.

EFFECT OF FREE LIQUID: Discoloration reported in commercial packs occurs in solid-pack tuna but not in flake packs. The two main differences between solid packs and flake packs are the particle size and the amount of free liquid that is in the can. The flake pack absorbs much more oil than does the solid pack so that commercially-canned flake tuna has no free oil in the can. The effect of having free oil or brine in flake packs was thoroughly investigated using albacore and yellowfin tuna that normally cause can discoloration in solid packs.

It was found that normal flake packs will not cause can discoloration when the amount of oil that is normally used is present. However, if enough excess oil is added so that free oil is present in the can, the same amount of discoloration is found in flake packs from lots of tuna causing discoloration as is found in solid packs from the same lots of tuna. The presence of free brine in brine flake packs from the same lots of tuna also produced sulfide discoloration. A slight amount of can discoloration was found in some flake packs not containing free liquid when canned. This was due to free liquid being cooked from the brine packs during retorting. Thus, these results indicate that there is a substance in some tuna that will cause can discoloration if a medium such as oil or brine is free to wash over the can surface during retorting. Results of this work are shown in table 3. In these experiments it was again found that salt must be present if discoloration is to take place.

Table 3 - Effect of Type of Pack[1/] and Additives on Discoloration of Tuna Cans

Type of Pack[2/]	Additives			Discoloration
	Soya Oil	Saturated Brine	Salt	
	(Ounces)			Degree
Solid	1½	0	⅛	Medium
	1½	0	0	None
Flake	1½	0	⅛	None
	3[3/]	0	⅛	Medium
Solid	0	1½	0	Heavy
	0	0	0	None[4/]
Flake	0	1½	0	None[4/]
	0	3[3/]	0	Medium

1/THESE PACKS WERE MADE FROM LOTS OF TUNA THAT HAD A RECORD OF CAUSING CAN DISCOLORATION.
2/ALL PACKS WERE PROCESSED 75 MINUTES AT 240° F.
3/APPROXIMATELY 3 OUNCES OF OIL OR BRINE WERE ADDED TO THESE PACKS TO INSURE COMPLETE COVERAGE OF THE MEAT. THEREFORE, FREE LIQUID WAS PRESENT IN THE CAN.
4/IF THE PRECOOKED FISH WAS MOIST ENOUGH SO THAT FREE LIQUID WAS COOKED OUT OF THE FISH DURING RETORTING, CAN DISCOLORATION WAS FOUND.

These results were followed by experiments to determine whether or not can discoloration would occur if the free liquid were kept from contacting the surface of the lid during retorting. When the tuna and liquid that ordinarily caused discoloration were placed in sausage skins and then canned and processed, can discoloration was prevented.

INVERTING CANS AFTER RETORTING: Iron sulfide discoloration never occurs where meat or liquid is in contact with the can during the cooling period after retorting. Tin sulfide frequently forms in this area in both normal and discolored packs. Since cans that will be discolored apparently have ferrous iron being formed in the headspace during the cooling period, it seemed that ferrous sulfide might be prevented if the cans were inverted during cooling, just before the deposit occurred. At this time, enough of the liquid might adhere to the bottom, so that when the can was inverted, stannous ions would continue to form in the new headspace. Also, the original top end would be covered with the liquid that prevents ferrous ions from being formed.

Packs of yellowfin and albacore that ordinarily produce can discoloration were retorted for 75 minutes at 240° F. Cans from the packs were then inverted at intervals from 0 to 60 minutes after retorting. Cans that were inverted between 5 and 20 minutes after retorting showed no discoloration on the top or bottom, whereas the tops of control cans (not inverted) were discolored. After the cooling period, the cans could be turned right-side up for labeling and handling.

In a very few tuna canneries, the cans are placed in orderly fashion on trays and retorted. The cans on these trays could readily be inverted after removal from the retort. However, in the vast majority of tuna canneries, the cans are placed in baskets in a jumbled fashion, with most cans standing on edge. In such plants it would be quite impossible to invert cans after they are retorted as a method of preventing can discoloration.

CONCLUSIONS

1. The factor that caused can discoloration was relatively heat stable and was present in the meat of certain batches of tuna.

2. No significant differences in the gross headspace gas composition of normal and discolored tuna were detected.

3. The pH of the tuna was not found to be an important factor in determining the extent of can discoloration.

4. Discoloration did not occur in canned tuna unless free liquid (oil or brine) was present in the can. This accounts for the fact that flake packs, which absorb the amount of oil normally added commercially, do not show can discoloration.

5. Discoloration did not occur where meat or liquid was in contact with the can during cooling.

RECAPITULATION OF ENTIRE INVESTIGATION

The object of this entire investigation was to study the reaction mechanism whereby iron sulfide is formed during the canning of some batches of tuna. Of course, the ultimate aim of any such project is to supply information that will lead to a commercially-feasible solution of the problem. The most important conclusions that have been reached during this investigation and reported in this series of papers are as follows:

1. Formation of black iron sulfide in canned tuna depends upon the presence of ferrous iron.

2. All cans of tuna contain sufficient hydrogen sulfide to give can discoloration if any exposed iron in the can is in the ferrous state.

3. Sulfide discoloration occurs only in cans that have free liquid in the can.

4. Sulfide discoloration occurs after the cans are retorted, during the cooling period.

5. Increasing the length of time the fish are in cold storage prior to canning increases the tendency for tuna to cause can discoloration.

6. Sulfide discoloration is much worse in cans of tuna that are allowed to remain at elevated temperatures after the retorting period.

7. The factor that causes iron in the can to be converted to the ferrous state in certain batches of canned tuna is present in the meat of the fish.

Currently, the senior author is undertaking an investigation[2/] of the tin-iron couple in tuna cans during processing and cooling. It is hoped that the factor that causes ferrous ions to be present in the can area adjacent to the headspace in certain batches of tuna can be found by this approach. If this factor can be defined, a long step will have been taken toward the control of iron sulfide discoloration of tuna cans.

LITERATURE CITED

Pigott, George M., and Stansby, Maurice E.

1955. Iron Sulfide Discoloration of Tuna Cans. No. 1 - Theory of Iron Sulfide Formation in Cans. Commercial Fisheries Review, vol. 17, no. 10, pp. 34-39 (also Separate No. 418).

1956. Iron Sulfide Discoloration of Tuna Cans. No. 2 - Analytical Methods. Commercial Fisheries Review, vol. 18, no. 2, pp. 5-9 (also Separate No. 429).

1956. Iron Sulfide Discoloration of Tuna Cans. No. 3 - Effect of Variables Introduced by the Fish. Commercial Fisheries Review, vol. 18, no. 6, pp. 8-12 (also Separate No. 439).

1956. Iron Sulfide Discoloration of Tuna Cans. No. 4 - Effect of Retorting and Cooling of Canned Fish. Commercial Fisheries Review, vol. 18, no. 12, pp. 13-16 (also Separate No. 461).

1957. Iron Sulfide Discoloration of Tuna Cans. No. 5 - Effect of Salt, Oil, and Miscellaneous Additives. Commercial Fisheries Review, vol 19, no. 2, pp. 7-9 (also Separate No. 469).

2/ This investigation is being carried out in the Department of Chemical Engineering, University of Washington, Seattle, Wash., as the basis for a Ph. D. thesis.

TUNA FOR BREAKFAST

"Eat a Better Breakfast"--the slogan of National Better Breakfast Month in September--was intended to point up the need for improving breakfast eating habits.

Various government, medical, and nutritional leaders have stated that from many standpoints breakfast is the most important meal of the day. Yet, in many households it is the "neglected meal."

Surveys show that a consistent feeling of well-being is maintained after eating a high-protein breakfast. This maintains the proper blood sugar level and increases the physical and mental efficiency of the young and old alike.

Canned tuna with its high-quality protein is a natural ingredient for a breakfast "delight" made by combining tuna with scrambled eggs. Served with a fruit, toast, and a beverage, you have a perfect start for a busy day.

Join the bandwagon for a better breakfast by serving "Tuna and Egg Scramble" as recommended by the home economists of the U. S. Fish and Wildlife Service.

TUNA AND EGG SCRAMBLE

1 CAN (6 OR 7 OUNCES) TUNA	1 TABLESPOON LEMON JUICE
½ CUP CHOPPED ONION	1 TEASPOON WORCESTERSHIRE SAUCE
3 TABLESPOONS BUTTER OR OTHER FAT, MELTED	½ TEASPOON SALT
	DASH CAYENNE PEPPER
7 EGGS, BEATEN	CHOPPED PARSLEY
⅓ CUP MILK	TOAST POINTS

Drain tuna. Flake. Cook onion in butter until tender. Combine eggs, milk, lemon juice, seasonings, and tuna. Add to onion mixture and cook until eggs are firm, stirring occasionally. Garnish with parsley sprinkled over the top. Serve on toast points. Serves 6.

AN EXPERIMENTAL AIR-PRESSURE DEPTH-METER FOR USE WITH MIDWATER TRAWLS

By Keith A. Smith*

While conducting experimental midwater trawling for herring in the Gulf of Maine during the spring and summer of 1956, an experimental air-pressure depth-meter was developed by the Service's Maine Herring Exploratory Fishing and Gear Research Station at Boothbay Harbor, Maine. This instrument was specifically designed to meet the program's need for a shallow-water net depth indicator. Compared

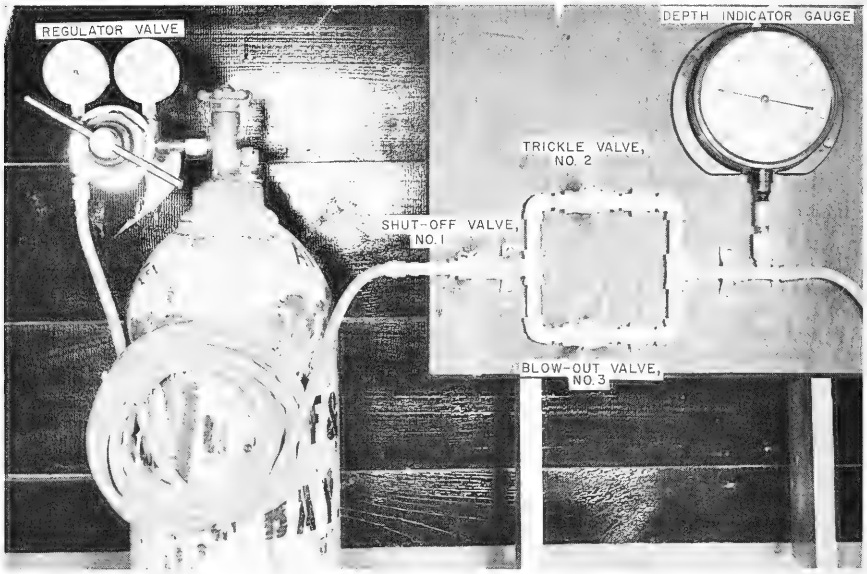


FIG. 1 - AIR SUPPLY, REGULATOR GAUGE, CONTROL VALVES AND DEPTH-PRESSURE INDICATOR GAUGE ASSEMBLED TO INDICATE DEPTH.

to existing electronic devices for this purpose, it is simple and inexpensive to construct. The method of operation involves towing one end of an air-pressure tube at the same depth as the net. When used for the deeper tows the tube is cumbersome, but it is expected that this device will fill a transient need until a simple electronic depth meter can be developed.

Necessity for a depth-meter became apparent during the early midwater trawl tests and fishing trials, because fishing success depends upon knowledge of the exact fishing depth of the net. A midwater trawl is towed neither at the surface of the water nor on the sea's bottom but somewhere between these two extremes, and it is not possible to know by direct observation through what stratum of water the trawl is moving. Measurement of depression angles of the towing warp gives an approximate net depth, but when great lengths of towing warp are out and thin schools of fish are detected, this method of determining depth is not sufficiently accurate.

* FISHERY METHODS AND EQUIPMENT SPECIALIST, EXPLORATORY FISHING AND GEAR DEVELOPMENT SECTION, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, BOOTHBAY HARBOR, ME.

To meet the practical need for midwater trawling, an experimental depth-meter was built that would meet the following conditions:

1. It must be dependable and accurate within narrow limits.
2. The design and operation of the instrument must be simple and easy to understand.
3. Construction of all components of the equipment must be rugged and resistant to breakage to insure trouble-free operation.
4. The complete unit should be of low cost and made of materials readily available.

It is known that the pressure in a body of water varies directly with the increase in depth. Determination of the pressure at any certain point in an open body of sea water of a given density is tantamount to knowing the depth at that point. This direct proportion seemed to offer the best basis for an indicator of the depth of a trawl in midwater.

FIG. 2 - 100 FATHOMS OF PRESSURE HOSE. IN ORDER TO SUPPORT THE PRESSURE HOSE WITHOUT CONSTRICTING IT, A $\frac{3}{8}$" DIAMETER NYLON ROPE WAS FASTENED TO THE HOSE WITH PLASTIC ELECTRICIAN'S TAPE AT SPACES OF APPROXIMATELY 18 INCHES. THE BATHYTHERMOGRAPH WAS USED FOR CHECKING DEPTH READINGS.

If a continuous and unobstructed column of air confined inside a tube could be maintained from the foot rope of the trawl to the deck of the fishing vessel, the air pressure at the top of the tube must equal the pressure at the bottom of the tube (minus the negligible weight of the air in the tube). If such a tube were open to the water at the bottom end, the pressure throughout the tube must then be equal to the water pressure at the depth of the bottom end of the tube, provided sufficient air remained in the tube at all times to prevent any water from entering the tube. It was decided that the best method of insuring that such a tube remained clear of water would be to add air continuously at the top of the tube, forcing a small amount of air out of the tube at the open bottom end.

This method of determining depth seemed to offer the best solution to the problem encountered. After several preliminary tests, the following gear components were assembled:

1. A source of compressed air. (A standard compressed air cylinder containing 300 cubic feet of air at a maximum pressure of approximately 2,000 pounds per square inch (p.s.i.) was used. A regulator valve was added to give a reduced and constant pressure.)
2. A group of three needle valves to control the flow of air into the pressure tube.

3. A simple air pressure gauge. (The gauge originally used was calibrated in five p.s.i. steps, but it was found that a more sensitive gauge with finer graduations was needed. For best results, the gauge should be graduated in steps no greater than two p.s.i.

4. 100 fathoms of $\frac{3}{16}$" inside diameter reinforced rubber hose designed for a maximum working pressure of 300 p.s.i.

5. 100 fathoms of $\frac{3}{8}$" diameter rope to support the hose.

This gear was assembled as shown in figures 1 and 2.

The gear is operated in the following sequence:

1. All valves are closed at the start.

2. The air tank valve is opened and the pressure regulator valve set to deliver air at 200 p.s.i. pressure.

3. The open end of the hose is put into a bucket of water, Valve No. 1 (fig. 1) is opened wide and Valve No. 2 is opened very slightly until a very thin stream of air bubbles comes out the open end of the hose. The opening of Valve No. 2 is adjusted carefully at this point so that although some air is flowing through the hose, the back pressure showing on the depth-indicator gauge is very close to zero. The pressure reading obtained at this point is due to air friction within the tube and must be subtracted from the reading later when the gauge is indicating depth. After the setting of Valve No. 2 is made it should not be disturbed throughout the tow.

4. The open end of the hose is attached to the midwater trawl or other object on which depth data is desired and then lowered into the water. As the open end of the hose is lowered, air pressure builds up until it approximately equals the water pressure at the hose opening. This pressure will show on the indicator gauge and will not be exceeded because the open end will allow any excess air to exhaust out into the water.

5. When the net has been lowered to the approximate working depth, Valve No. 3 is opened momentarily allowing a strong flow of air to bypass Valve No. 2. The purpose of this is to blow an excess of air through the hose to insure that the hose is free of any water that may have entered it as it was lowered. The reading on the indicator valve rises considerably during the operation and does not indicate depth. After the hose is "blown out," Valve No. 3 is closed and the pointer of the depth-indicator gauge settles back and stops at the value of water pressure at the end of the hose, plus the very small reading obtained in step 3 which should be subtracted to obtain the actual water pressure. The pressure thus obtained, divided by 2.66 gives the depth at the hose end in fathoms.

0.43 = lbs./sq. in. pressure per foot depth of pure water

1.025 = density standard sea water

6 ft. = 1 fathom

(0.433 (1.025) (6)= 2.66 pounds of pressure per square inch per fathom depth.

6. Valve No. 1 may be closed after the towing depth has become stable, i.e. the net has settled at a certain depth. The pointer of the indicator gauge should then settle back a pound or two and indicate the exact water pressure at the open end of the hose since no air is moving and air friction inside the hose is not involved. The initial reading in step 3 should be disregarded when taking this reading. After a reading is obtained, Valve No. 1 should be opened allowing a trickle of air to pass through Valve No. 2 again into the hose to insure that no water enters the hose should the net sink deeper. Valve No. 2 should not be disturbed after the initial setting is made in step 3.

Two types of tests have been made on this equipment. They are (1) vertical lowerings on a measured line, and (2) towing tests, using a 0-200' bathythermograph as a testing standard.

Results of the first type of test are shown in tables 2 and 3. Note that a positive error is shown in each test. These errors are apparently due to air friction inside the hose caused by the flow of air. The error was greater in test 1, probably due to the trickle valve being opened slightly more in this test. It was not possible to evaluate this error at the start of the tests because the gauge used shows no reading until a pressure of five p.s.i. is reached. Since these tests were made, a larger more finely calibrated gauge has been employed (fig. 1) and has been found to operate more satisfactorily.

Table 1 - Pressure in Pounds Per Square Inch (Considering Surface 000; 1 Atmosphere = 14.7)

Depth	Pressure	Depth	Pressure
Fathoms	Lbs./Sq. Inch	Fathoms	Lbs./Sq. Inch
1	2.7	26	69.2
2	5.3	27	71.9
3	8.0	28	74.6
4	10.7	29	77.2
5	13.3	30	79.9
6	16.0	31	82.6
7	18.6	32	85.2
8	21.3	33	87.9
9	24.0	34	90.5
10	26.6	35	93.2
11	29.3	36	95.9
12	32.0	37	98.5
13	34.6	38	101.2
14	37.3	39	103.9
15	40.0	40	106.5
16	42.6	41	109.2
17	45.3	42	111.8
18	47.9	43	114.5
19	50.6	44	117.2
20	53.3	45	119.8
21	55.9	46	122.5
22	58.6	47	125.2
23	61.2	48	127.8
24	63.9	49	130.5
25	66.6	50	133.1

A towing test was made to check the accuracy of the device while moving through the water. In this test, a towline and the pressure hose along with its supporting line were let out 100 fathoms to a skiff that was towed behind the testing vessel. The open end of the pressure hose with a bathythermograph and depressor attached were lowered from the skiff on a $\frac{5}{32}$" wire rope to various depths while the skiff was being towed. Results of this test are tabulated in table 4. Note that a positive error also resulted in this test. Since this error is consistently present and always positive, two pounds pressure representing approximately $\frac{3}{4}$ fathom should be subtracted from the gauge reading. The reading thus obtained in all tests is accurate within less than one fathom.

The above-described equipment might find practical application where underwater fishing or sampling devices are used on which depth data is required. Within close limits,

Table 2 - Depth-Indicator Test (Vertical suspension test starting at 2 fathoms and lowering to 29 fathoms)

Line Out	Pressure	Pressure Depth Indicated	Error
Fathoms	Lbs./Sq. Inch	..... (Fathoms)	
1	-	-	-
2	8.0	3.0	+1.0
3	11.5	4.3	+1.3
4	14.5	5.5	+1.5
5	17.0	6.4	+1.4
6	19.5	7.3	+1.3
7	22.0	8.3	+1.3
8	24.5	9.2	+1.2
9	27.0	10.1	+1.1
10	29.5	11.1	+1.1
11	32.0	12.0	+1.0
12	35.5	13.3	+1.3
13	38.0	14.3	+1.3
14	41.0	15.4	+1.4
15	44.0	16.5	+1.5
16	46.5	17.5	+1.5
17	49.0	18.4	+1.4
18	51.0	19.2	+1.2
19	54.0	20.3	+1.3
20	56.5	21.2	+1.2
21	59.0	22.2	+1.2
22	61.5	23.1	+1.1
23	64.0	24.1	+1.1
24	67.0	25.2	+1.2
25	70.0	26.3	+1.3
26	73.0	27.4	+1.4
27	75.5	28.4	+1.4
28	78.0	29.3	+1.3
29	80.5	30.2	+1.2
30	-	-	-
	Average error = +1.27 fathom		

Table 3 - Depth-Indicator Test (Vertical suspension test starting at 33 fathoms and raising)

Line Out	Pressure	Pressure Depth Indicated	Error
Fathoms	Lbs./Sq. Inch	..... (Fathoms)	
33	90	33.8	+0.8
32	88	33.0	+1.0
31	85	31.9	+0.9
30	82	30.8	+0.8
29	79	29.7	+0.7
28	77	28.9	+0.9
27	75	28.2	+1.2
26	73	27.4	+1.4
25	70	26.3	+1.3
24	68	25.6	+1.6
23	65	24.4	+1.4
22	62	23.3	+1.3
21	59	22.1	+1.1
20	55	20.7	+0.7
19	51	29.2	+0.2
18	49	18.4	+0.4
17	46	17.3	+0.3
16	44	16.5	+0.5
15	41	15.4	+0.4
14	38	14.3	+0.3
13	35	13.2	+0.2
12	33	12.4	+0.4
11	30	11.3	+0.3
10	27	10.2	+0.2
9	24	9.0	+0.0
8	22	8.3	+0.3
7	19	7.1	+0.1
6	17	6.4	+0.4
5	14	5.4	+0.4
4	11	4.1	+0.1
3	8	3.0	+0.0
2	6	2.3	+0.3
	Average error = +0.62		

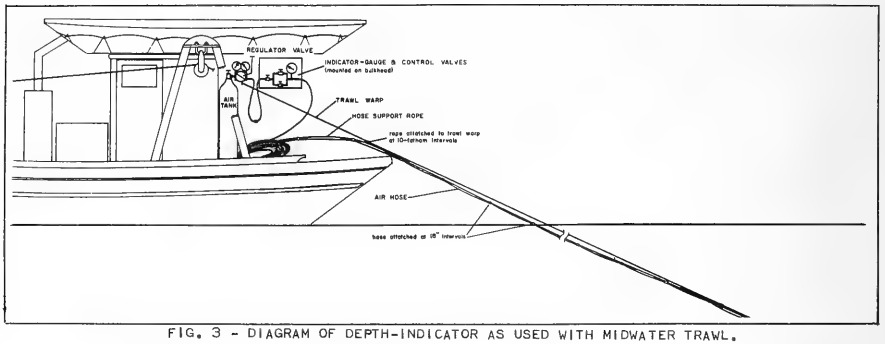


FIG. 3 - DIAGRAM OF DEPTH-INDICATOR AS USED WITH MIDWATER TRAWL.

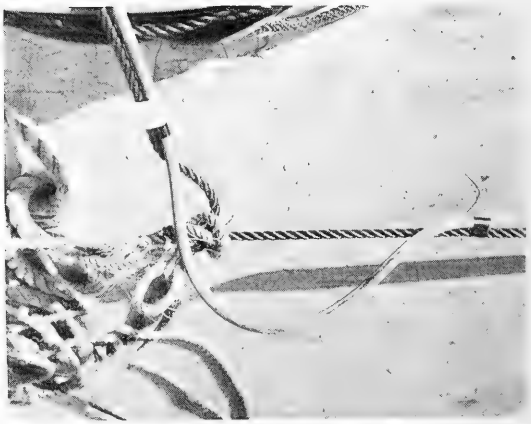
Table 4 - Depth-Indicator Test
(Towing test using bathythermograph as standard depth-indicator)

BT Reading	Pressure	Pressure Depth Indicated	Error
Fathoms	Lbs./Sq. Inch	..... (Fathoms)	
5.7	18	6.8	+1.1
10.7	31	11.6	+0.9
15.5	42	15.8	+0.3
20.2	56.5	20.8	+0.6
25.0	70	26.3	+1.3
30.0	82	30.8	+0.8
		Average error = +0.8 fathoms	

the depth indicator is accurate and dependable. It is of simple design, easy to operate, and trouble free. Compared to some other types of depth-telemetering equipment, the cost is low. The prices of the components of gear assembled are:

Air cylinder	$ 60.00
Regulator valve	42.50
300 cubic feet of air	4.00
$\frac{3}{8}$ in. needle valves 3 @ $2.26 ea.	6.78
Pressure gauge	6.38
100 fathoms $\frac{3}{16}$ in. hose 300 p.s.i. cap.	82.61
100 fathoms $\frac{3}{8}$ in. nylon rope	86.50
Total	$295.77

FIG. 4 - A $\frac{3}{8}$ IN. NYLON ROPE WAS USED TO SUPPORT THE PRESSURE HOSE. THIS PROVIDES A MEANS OF ATTACHING THE HOSE TO THE TRAWL WARP ALONG ITS ENTIRE LENGTH. ALTHOUGH CONSIDERABLE TENSION IS APPLIED TO THE ROPE, NO CONSTRICTION OR BINDING OF THE HOSE IS EFFECTED. A SUPPORT ROPE IS NECESSARY FOR PROPER OPERATION OF THIS GEAR.



This equipment is limited to a maximum depth of 113 fathoms by the pressure capacity of 300 p.s.i. of the hose used. When used with a 0 to 200 p.s.i. pressure gauge the maximum depth limitation is 75 fathoms. While these depths are sufficient for the specific use for which this equipment was designed, greater depth capacity may be attained by using a hose and gauge of greater pressure capacity.

FEEDING STUDY WITH MENHADEN PRESS CAKE

In order to obtain information on the nutritive value of menhaden press cake, five successive filial generations of albino rats have been fed (free-choice) menhaden press cake, fresh cabbage, and a high-calorie diet composed of starch, vegetable shortening, and cod-liver oil in the proportion of 80, 16, and 4 parts, by weight, respectively.

The results and the conclusions from the feeding study for the first four generations, as well as the preparation and composition of press cake, have previously been reported (Nilson and Snyder 1955). These results showed that all the litters that were raised grew satisfactorily without abnormal mortality and were generally very healthy. None of the rats died from mechanical obstruction by bones. Two male rats of the third generation had seizures apparently of nervous origin, but it was not known whether these were due to a deficiency of the diet or were of genetic origin. It was concluded that press cake seemed to be a satisfactory source of protein and possibly some vitamins for normal growth and reproduction. This is a report on the continuation and conclusion of the feeding study.

All the six first-generation rats, originally allotted to the experiment during September 1953, had died from natural causes by December 1955. The rats lived more than 2 years, which is a normal span of life for the breeding rats of the stock colony in the Service's College Park Fishery Technological Laboratory. At that time two cages containing mixed litters of fourth-generation rats, two males and two females in each cage, were kept for continuation of the experiment while the rest of the rats--second, third, and fourth generations--were sacrificed as surplus.

Two litters were born to these fourth-generation rats during February 1956, but both of these litters were found dead within 3 days following birth. Two litters were also born during March. The first was found dead the day following birth, and the second was lost when the mother died during parturition. A litter of four rats, three males and one female, was born during April. This fifth filial generation grew normally and was sleek and healthy looking. No more litters were born to the fourth generation rats during the remaining 9 months the experiment was continued.

Three litters of three rats each were born during August, September, and October 1956, to the fifth-generation rats. All litters were found dead within 3 days following their birth. In November, a litter of two was born, but these young were found dead within 2 days following their birth. No more litters were born to the fifth-generation rats, and on February 2, 1957, the feeding study was concluded.

The death of the young soon after birth and the reduced number of litters from the fourth-generation rats, as well as from the preceeding generations, probably indicates that the diet did not supply sufficient amounts of accessory food factors needed by the rats for maximum breeding and maternal care. Some lack of maternal care is experienced with the breeding rats of the stock colony in the Laboratory, but the incidence is not as great as was noted with these experimental animals. No accessory food factors alone or feeds that contain large concentrations of these fac-

tors that could be responsible for this lack of maternal care and reduced number of litters were added to the press cake, cabbage, and hig-calorie diet, so this might be expected. The diet must contain a limited supply of these factors, however, since some litters were successfully raised. Those litters that were raised in all cases grew normally and were healthy.

SUMMARY

Menhaden press cake, a high-calorie diet, and fresh cabbage have been fed free-choice to five successive filial generations of albino rats for nearly $3\frac{1}{2}$ years. No difficulty has been experienced due to palatability or the numerous bones in the press cake. The rats have been generally very healthy, with the exception of two male third-generation rats that apparently had nervous seizures of unknown origin. The press cake seems to be a satisfactory source of protein for growth and maintenance, and possibly a limited source of some accessory food factors for reproduction and maternal care.

--BY HUGO W. NILSON, CHEMIST,
DONALD S. SNYDER, BIOCHEMIST,
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE,
COLLEGE PARK, MD.

LITERATURE CITED

Nilson, Hugo W., and Snyder, Donald G.
1955. Feeding Studies with Menhaden Press Cake. Commercial Fisheries Review, vol. 17, no. 11, pp. 17-18 (also Separate No. 421).

Note: Acknowledgment is made for the assistance of Robert R. Kifer in so carefully taking care of the animals.

CAUSE OF KING CRAB MEAT SPOILAGE INDICATED

Studies on the protein and nonprotein nitrogen fractions as well as on the proximate composition of king crab meat, now under way at the Service's Fishery Products Laboratory, Ketchikan, Alaska, have yielded information that may be directly related to the short iced storage life and to the comparatively high rate of spoilage of this product. Confirmatory experimentation is being conducted.

Samples of raw frozen king crab have been separated into their component physical parts, and the meat in these parts has been subjected to proximate analyses. In addition, preliminary studies have been carried out in an attempt to partition the total nitrogen of king crab meat into its various protein and nonprotein fractions. It was observed that in king crab meat, the nonprotein nitrogen fraction was more abundant than in any known species of commercially-edible fish. This observation suggests that there is a high free-amino-acid content in king crab meat, which could help to explain the high rate of spoilage that generally occurs in crab meat. This unexpected finding, illustrating the value of fundamental studies, is of tremendous interest to the crab meat industry because, if substantiated by further research, it makes possible application of preventive measures.

OIL CONTENT OF FISH VARIES

The oil content of many species of fish can vary tremendously, depending upon many factors such as the area of capture and the season. A striking example of this variation is shown by the work of the Service's Seattle Technological Laboratory in their studies on the composition of sheepshead, a common species of fresh-water

fish. In a sample of 16 sheepshead from Clearwater Lake, Minn., the oil content ranged from 0.7 to 1.7 percent and averaged 1.0 percent. In a sample from Kegonsa, Wis., the oil content ranged from 2.0 to 8.8 percent and averaged 4.9 percent. And in a sample from the Mississippi River, the oil content ranged from 3.6 to 14.2 percent and averaged 8.8 percent. Thus, depending upon where the sample was taken, sheepshead would be considered as a non-oily fish, an intermediately oily fish, or as an oily fish. Accurate knowledge of the oil content of fish is vital in certain fields, such as medicine, where patients may require a rigidly specified diet. By proper choice of fish, a diet with any desired level of oil content can be obtained.

METHODS USED TO HARVEST SEAWEEDS

Many different methods are employed in collecting the various seaweeds, each species presenting specific problems. Although few seaweeds are cultivated for harvest this is true for species of Porphyra in Japan. The Japanese provide surface attachment for the Porphyra spores. The method is to place bamboo rush or rope nets tied to stakes in the water about mid-September. They harvest this crop as growth permits, from November through April.

Gloiopeltis furcata, a red alga also found in Japan, grows on rocks in shallow water. Collection is either by long-handled rakes, or divers gather the seaweed by hand.

Along our North Atlantic shores gathering of the Irish Moss, Chondrus crispus, is also accomplished by rakes. The men go out before low tide and usually return to port on the flood tide. From their boats they manipulate special rakes to wedge bunches of moss between the tines and tear the plants from the rocks.

In certain countries of Europe the fucoids are systematically harvested twice a year. They are found above the low-tide marks which makes cutting easier than for the lamenaria which grow at greater depth. Here long-handled sickles and reaping hooks are employed with the problem of finding more efficient methods of collection rendered difficult where the sea bed is irregular.

However, along the California coast the giant kelp, Macrocystis pyrifera, is harvested by means of underwater mowing machines and chain conveyors which carry the seaweed onto a barge. Only the tips of the plants are harvested, and these soon grow back again.

In North Carolina and Florida, where we formally had a seaweed industry, collecting is simpler. The commercial species accumulate in masses on shallow flats where they may be raked into a skiff at low tide. Where the currents are strong and deeper waters prevent this method of collection, a net may be set to accomplish the task. The seaweed is then removed before each change of tide.

These and other likely methods employing grapples, tubes and pumps, and other devices are being used or considered for this job.

--"Sea Secrets, August 21, 1956,
The Marine Laboratory,
University of Miami,
Coral Gables, Fla.

California

SHRIMP FISHERY MAKES STEADY GROWTH: After five years of slow but steady growth, the commercial shrimp fishery of California looks as though it's here to stay.

Almost daily deliveries are made to processors at Crescent City and Bodega Bay. The only shrimp beds in use at present are located off these widely-separated ports because facilities for processing are limited.

The catch in 1952, the first year commercial permits were issued, totaled 206,000 pounds and gradually climbed to 1,150,000 pounds in 1956. As ocean industries go, this one still is a baby, for there were only eight boats, employing 25 fishermen, active in 1956. Another 350 persons on shore derived incomes from processing the product, most of it going into vacuum-packed cans or frozen food packages.

Actually the shrimp in question is a small prawn, but is termed "ocean shrimp" to distinguish it from the smaller "bay shrimp" of San Francisco Bay. The latter is a true shrimp. The prawn being harvested off Crescent City and Bodega Bay is known scientifically as Pandalus jordani and in other circles is also called pink shrimp or cocktail shrimp. The ocean shrimp usually taken for the market is 3-4 inches long, with less than half of this being edible. (Outdoor California, February 1957, a monthly periodical of the California Department of Fish and Game.)

Going back to how it all started, small quantities of these shrimp, mixed with the catches of bottom fish taken by the trawl fleet, had been noted for years. Then, in 1950, 1951, and 1953 Department of Fish and Game marine biologists working from the research vessel N. B. Scofield charted beds of shrimp along the coast from Santa Monica to the Oregon border.

Annual catch quotas were established for each area, based on how large the beds were and how many shrimp they contained. No more beds have since been found by the industry.

Note: Also see Commercial Fisheries Review, September 1956, p. 1.

Cans--Shipments for Fishery Products, 1956

Total shipments of metal cans during 1956 amounted to 112,532 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 110,188 tons in 1955. During December fish canning was largely confined to the West Coast packs of tuna, sardines, and mackerel. The total pack of all fish and shellfish in 1956 was about 10 percent above the 1955 pack. The December pack of California sardines was much lower than for the same month in 1955.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.

Federal Purchases of Fishery Products

DEPARTMENT OF DEFENSE PURCHASES, JANUARY-FEBRUARY 1957: Fresh and Frozen Fishery Products: For the use of the Armed Forces under the Department of Defense, 2.2 million pounds of fresh and frozen fishery products were purchased in January and 1,678,000 pounds during February by the Military Subsistence Market Centers. Beginning with January 1, 1957, a change was instituted in reporting the amount purchased. Instead of reporting deliveries as in the past, the Military Subsistence Supply Agency is reporting what was ordered. Therefore, this year's purchases are not directly comparable with previous years.

Table 1 - Fresh and Frozen Fishery Products Purchases by Military Subsistence Market Centers, January and February 1957 with Comparisons

QUANTITY						VALUE					
January		February		Jan.-Feb.		January		February		Jan.-Feb.	
1957	1956	1957	1956	1957	1956	1957	1956	1957	1956	1957	1956
(1,000 Pounds)						($1,000)					
2,212	1,086	1,678	1,659	3,890	2,745	1,169	746	808	850	1,977	1,596

Assuming that purchases for the first two months of this year as compared with the same months in 1956 are roughly comparable, purchases were higher by about 42 percent for the first two months of 1957.

Canned Fishery Products: Salmon and tuna were the principal canned fishery products purchased for use of the Armed Forces during January and February 1957.

Table 2 - Canned Fishery Products Purchases by Military Subsistence Market Centers, January-February 1957

Month	QUANTITY			
	Tuna	Salmon	Sardines	Total
	(1,000 Pounds)			
January	-	992	1	993
February	268	-	10	277

In addition to the purchases made under contract, the Armed Forces generally make some local purchases which are not included in the data given. Therefore, actual purchases are higher than indicated, but it is not possible to obtain the local purchases made by military installations throughout the country.

Films

FISH AND WILDLIFE SERVICE FISHERY FILM RECEIVES CERTIFICATE FOR EDINBURGH FESTIVAL SHOWING: The Department of the Interior received certificates from the British Government for having three motion pictures (one of which was a fishery film) selected for showing during the 1956 International Festival of Music and Drama at Edinburgh, Scotland. The films were produced by two Department agencies in cooperation with private industry sponsors.

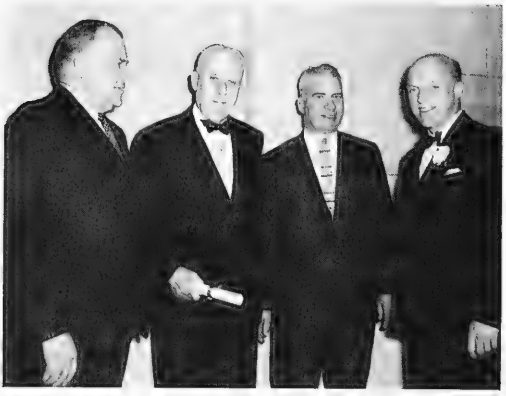
Among all motion pictures submitted by United States Government agencies during 1956, only the five were chosen for showing at the Edinburgh Festival.

The Department of the Interior was represented at the festival by one film supervised by the Fish and Wildlife Service and two produced under the supervision of the Bureau of Mines. All three half-hour films, in 16 mm. color and sound, were financed by private industry sponsors.

The three Department of the Interior films and their private industry sponsors are:

Outboard Fisherman, U. S. A. was financed by the Outboard Marine Corporation, formerly known as the Outboard, Marine and Manufacturing Company, and was produced by MPO Productions, Inc., under the supervision of the Fish and Wildlife Service. The film shows how the small independent commercial fishermen, using outboard motors, contribute to the national economy. Scenes from 10 areas in the United States and Alaska depict the catching of 10 different species of fish and shellfish, using various colorful fishing techniques.

The Petrified River--The Story of Uranium was sponsored by the Union Carbide and Carbon Corporation in cooperation with the Bureau of Mines. Produced by MPO Productions, Inc., it tells the story of the greatest metal hunt in the history of America when thousands combed the Colorado Plateau for the source material for atomic energy. The film depicts the geology of the plateau area, the search for and the drilling, mining, and milling of uranium ore. Emphasis is placed on peacetime uses of uranium in atomic energy for electric power, and the use of radioisotopes in medicine, agriculture and biologic research.



Present at the award of the Edinburgh Film Festival Certificate for the fishery film "Outboard Fisherman, U. S. A." were (left to right): Arnie J. Suomela, Commissioner, U. S. Fish and Wildlife Service; Ross Leffler, Assistant Secretary of the Interior for Fish and Wildlife; Howard Larsen, representing the Outboard Marine Corp; and the British Ambassador to the United States.

Arizona and Its Natural Resources is the other Bureau of Mines film, this one financed by the Phelps-Dodge Corporation and produced by Frederick K. Rockett Company. It depicts the natural resources of Arizona and their development and utilization for the benefit of the State's people. This motion picture shows how the great natural resources of the Southwestern United States lay untouched and unused for centuries while aborigines, early Indians, Spanish conquistadors, and Mexican colonists overlooked their value. It remained for modern man, with ingenuity and imagination, to develop these resources and to produce a rich economy in a progressive State.

Fisheries Loan Fund

LOAN APPLICATIONS TOTAL $6.3 MILLION: Applications for fishery loans as of March 18 totaled $6,335,000 or nearly two-thirds of the $10 million made available for this purpose by the U. S. Fish and Wildlife Act of 1956, Assistant Secretary of the Interior Ross L. Leffler stated on March 29, 1957. Loans amounting to $1,854,940 already have been approved.

Of the 163 applications accepted for processing, 66 are from New England for a total of $2,207,000, 64 from Pacific Coast States for $3,218,000, and the balance from other sections of the country and from Hawaii and Alaska.

There have been 61 applications approved since the program began last October. Of these, 25 totaling $861,789 were to fishermen in New England; 16 totaling $572,631 to fishermen in the Pacific Coast States; 5 totaling $323,050 to those in the South Atlantic and Gulf States; 4 totaling $29,220 to fresh-water fishermen; and 11 totaling $68,250 to Alaska fishermen. Twelve loan applications for $161,500 have been declined during the same period.

The following loans not reported earlier have been approved for New England: Estrela Corporation, Gloucester, Mass., $57,677 for refinancing and operating expenses; Roland B. Stimpson, Pleasant Point, Me., $2,000 to replace vessel and gear; Schooner Corporation, Boston, Mass., $58,700, refinancing and repairs; Mrs. Tripolina Bramante, Gloucester, Mass., $56,800, for refinancing; Dimar, Incorporated,

Gloucester, Mass., $21,506, refinancing; United Fisheries Vessels, Gloucester, Mass., $31,400 refinancing and operating expenses; and Philip Bodoni, $41,099 for refinancing.

On the Pacific Coast, the following loans were approved: California--Donald Hobbs, San Diego, $126,837 for refinancing and repairs; Edward P. Silva, San Diego, $56,000 for refinancing. Washington--Curtis Kirkendall, $3,000 to repair vessel and replace gear; Lawrence P. Ollsen, $17,200 for vessel and gear replacement; and Angus and Stella McKay, $10,000 for refinancing and installation; Karl Kaldestad, $10,000 for vessel improvements; Jacobson Brothers, $22,250, for basic research; and John McDermott, $3,221 for refinancing and repairs. All of these are residents of Seattle, Wash. Frank O. Renlie, of Bellingham, received approval of a loan of $5,500 for refinancing.

The Dixie Fisheries of Yorktown, Va., had a loan for $8,500 for rebuilding a vessel and replacing gear approved; and the Whorton Crab Factory of New Bern, N. C., received approval for a loan of $35,500 for vessel replacement and gear. A loan of $20,250 was approved for E. Wallace and A. Neuman, Empire, La., for refinancing and replacement of gear.

In the Great Lakes area, a loan of $3,920 was approved for Ernest King, Sr., Naubinway, Mich., for refinancing; the Drayton Fish Company, $8,000 for gear replacement; and the B & L Fish Company, Port Huron, Mich., $11,800 for refinancing and repairs.

The Alaska loans were: William A. Grenier, Sr., Petersburg, $7,500 for refinancing and repairs; Alfred J. Steear, Ketchikan, $20,100 to rebuild and repair a vessel; Fred E. Brandes, Jr., Ketchikan, $14,850 for refinancing and engine replacement; Adron F. Ward, Ketchikan, $5,000 for vessel improvement and repairs.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, MARCH 1957, P. 19.

Fish Flour--A Weapon Against Protein Malnutrition

Because fish meal can be processed in such a way as to remove the "fishy" taste and odor, it can become an important weapon against protein malnutrition in the vast underdeveloped areas of the world, Dr. James M. Hundley, nutrition adviser to the United Nations' International Children's Emergency Fund, declared in February 1957. Hundley reported that several processes have been developed by which either fresh fish or dehydrated fish meal can be defatted, deodorized, and finished as an almost tasteless, odorless, nearly white flour.

Speaking before the Conference on Protein Nutrition in New York, under the joint sponsorship of the New York Academy of Sciences and E. I. duPont de Nemours & Co., Hundley said that such flour contains 70 to 80 percent protein and relatively small amounts are needed to supplement bread and other cereal products. Estimates are that only about one-fourth cent a day would be required to supplement a child's diet effectively with fish flour.

Florida

RED TIDE RESEARCH IN GULF OF MEXICO: The research vessel Gerda of the Marine Laboratory of the University of Miami returned to Miami early in January after a 1,000-mile trip in connection with Red Tide research in the Gulf of Mexico. It was the sixth such trip made during the past 18 months.

Operations started off Key West, Fla., and a zigzag course was followed up the west coast of Florida north to John's Pass off St. Petersburg. Measurements of currents were taken electronically, water and biological samples also were taken. The water samples were analyzed for nitrite, nitrate, phosphorus, and salinity, along with biological content. Water temperatures were recorded from surface to bottom.

Water samples were analyzed to determine their potential in supporting any type of biological activity. This is necessary to ascertain the density of biological life that may be supported by the amount of chemicals in the water. To date it has been found by scientists of the Marine Laboratory that the waters of the Gulf of Mexico are capable of supporting the Red Tide organisms at any time.

However, while this is true, and the Red Tide organisms are always present in the water, it is not until these organisms increase to large numbers that a so-called Red Tide is formed, killing fish and other marine life.

It has been ascertained that the outflow of the principal rivers on Florida's west coast may, under certain conditions, cause harmful Red Tides. These waters mixing with each other in the Gulf of Mexico in relation to amounts, timing, weather, and current speeds create an optimal condition in which Red Tides flourish. Scientists at the Marine Laboratory base their predictions on this hypothesis.

Through the use of this method, which was formulated by an assistant professor at the Marine Laboratory, the Red Tide outlook for the year from October 1955 to September 1956 was successfully predicted, even though the scientist looks upon the method as a tentative one subject to improvement as the research work continues.

The prediction from October 1956 to September 1957 indicates there will be small likelihood of any major Red Tide outbreak.

Maine

GOVERNOR PROCLAIMS APRIL 11 AS SARDINE DAY: Complimenting the Maine sardine canners on their efforts to "improve and enlarge an industry which gives employment to thousands of our citizens," Governor Edmund S. Muskie proclaimed April 11 as Maine Sardine Day.

He said that the opening of the industry's modern research and quality control laboratory in Bangor on that date prompted him to "give this deserved recognition of cooperative action by the canners to meet changing conditions in the food business." Simultaneously he signed into law legislation to strengthen State sardine inspection and quality control.

For the past six years the industry has operated a 25-cents-a-case State tax-financed development program under the direction of the Maine Sardine Council.

In signing the proclamation on April 6, the Governor suggested to the people of Maine that they serve "this good seafood product on Maine Sardine Day to also show their appreciation of the vital role the industry has played in Maine's economy for seventy-five years."

Maine Sardines

INCLUDED IN NATIONAL SCOUT JAMBOREE MENU: Maine sardines have been selected as one of the major sandwich fillers for serving to the more than 50,000 young men who will attend the National Boy Scout, Jamboree to be held at Valley Forge, Pa., in July 1957. The Executive Secretary of the Maine Sardine Council said that the selection had been made by National Scout Headquarters after exhaustive tests and that his organization was cooperating to the fullest extent.

Sardine sandwiches made from oil and mustard packs will be served to the 1,300 troops of 40 scouts each as a quick-lunch item, both upon arrival and departure and this will require about 500 cases (100-cans each) of canned Maine sardines.

The Jamboree menu will be used as a model for camping trips and outings by the several hundred Scout organizations in the country for the next two years. This is the first time that canned sardines have been included in a Jamboree menu.

Market Outlook for Fishery Products

APRIL-JUNE 1957: Fresh fish of practically every variety will be available in quantity during the April-June quarter as production climbs to peak levels for many sections of the industry, according to the Commercial Fisheries Outlook, April-June 1957 published by the United States Fish and Wildlife Service.

Oyster production will cease during the quarter, and the northern Atlantic lobster catch will be at a seasonal low. Production of other shellfish, shrimp, sea scallops, hard and soft crabs, and soft and surf clams, will increase. However, dungeness crab production on the Pacific Coast will hit a peak early in the quarter and then decline as the effort switches to other fisheries.

Salmon trolling in the Canada-Pacific Coast area is being delayed until April 15, by agreement. The halibut season opening date this year is May 1.

The New England landings will follow the general big season pattern. Haddock and ocean perch, followed by flounders, sole, and cod will dominate.

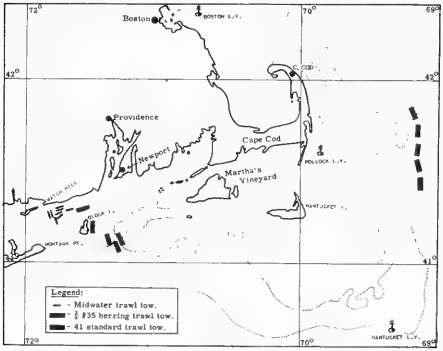
Domestic landings of fresh-water fish will also reach a seasonal peak. Receipts at Chicago should approximate 15 million pounds for the quarter.

The pack of canned sardines in Maine will be lower if the usual pattern of lighter packs in odd-numbered years repeats. Last year the pack was good but it was not as high as in some previous years. The Pacific mackerel pack is usually low during this second quarter. In the tuna fishery, its usual pattern calls for increased landings and pack. Salmon canning will not get under way until the end of the quarter with the new supplies reaching the market in the fall.

North Atlantic Fisheries Exploration and Gear Research

MIDWATER TRAWL GEAR TESTS IN BLOCK ISLAND SOUND AREA (M/V Delaware Cruise 57-2): In the Block Island Sound area midwater trawl gear tests were conducted by the Service's exploratory fishing vessel Delaware, February 12-22.

Light concentrations of fish were located with the aid of echo-sounding equipment and experimental tows were made on these concentrations with a standard Canadian nylon midwater trawl (approximately 35-foot square-mouth opening, 5" mesh taper to $1\frac{3}{4}$" mesh). Only a small number of alewifes (Pomolebus pseudoharengus) and two whiting (Marluccius bilinearis) were taken during the experimental tows. From all measurable indications the gear was fishing properly. Handling the midwater trawl and spreader doors attached to five-fathom pendant lines presented no special problem in setting and hauling back.



M/V Delaware Cruise 57-2 (Feb. 12-22, 1957).

An air-pressure depth meter was tested during midwater trials and this device allowed positioning of the net at any desired depth.

Eight tows were made with No. 35 small-mesh Canadian herring otter trawl (headrope 36 feet, footrope 51 feet, 2" mesh). Over 6,200 pounds of herring (Clupea harengus) and alewifes were brine-frozen for use as tuna long-line bait during the next cruise. Small numbers of shad (Alosa sapidissima) were also taken in the bottom trawl. Five tows with the standard No. 41 otter trawl (headrope 79 feet, footrope 110 feet, $4\frac{1}{2}$" mesh) with a full set of rollers in the South Channel area yielded 700 pounds of haddock (Melanogrammus aeglefinus) and 1,300 pounds of pollock (Pollachius virens) for technological tests.

The Delaware was scheduled to depart from East Boston on March 12 for a five-week exploratory cruise in the offshore Atlantic. This is the first of several cruises planned in that area. The vast areas of the NW. central Atlantic were to be fished with commercial-style long-line gear to explore the potential of its subsurface fishery resources. The major objective of the exploration was to obtain additional information on the distribution of stocks of the several species of tuna and tunalike fishes and the winter habits of the schooling bluefin tuna (Thunnus thynnus) common to New England waters during the summer months.

Pacific Coast Fishing Ports

BAY CITY, ORE.: Bay City is a small fishing community located on Tillemook Bay in northern Oregon. This article, which is one in a series of photographic reports on the fishing centers of the United States and its territories, shows the activities in Bay City in September 1956.

Fig. 1 - Fish- and oyster-processing plants at Bay City.

Fig. 2 - A fish and crab company. This building is the one seen on the left, on the end of the peninsula, in fig. 1. The boat shown here is a double-ended, 26-foot, Columbia River-type gill net boat.

Fig. 3 - Fisherman repairing gill net used to catch chinook and silver salmon in the waters of Tillamook Bay near Bay City. The net is made of 6¾-inch-mesh netting and is 140 fathoms long and 30 meshes deep. Sets are made 3 hours before low water. Depending upon the season, this fisherman also fishes on the Columbia River and in Bristol Bay, Alaska. He thus is able to work as a fisherman substantially the year around.

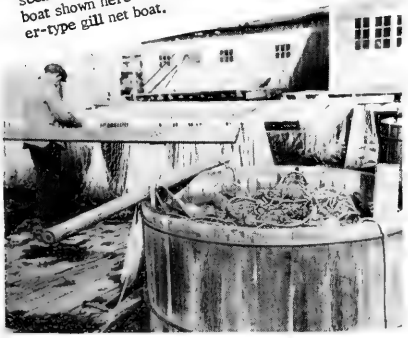


Fig. 4 - Net in a solution of bluestone (copper sulfate). Ten pounds of bluestone are used per net per week. The nets are left in the solution for 2 to 3 hours and then are placed on the racks to dry.

Fig. 6 - View taken from end of peninsula on opposite side of that shown in fig. 1. The building on the left houses another fish company which sells principally fresh salmon. The center building in the right foreground is that of the Oregon Fish Commission. The end building on the right is a landing dock for the fish and crab company shown in fig. 2.

Fig. 5 - End of the dock of the fish and crab company shown in fig. 2. The principal products of this company are chinook, silver, and chum salmon and fresh crab and crab meat.

Fig. 7 - Mending a gill net

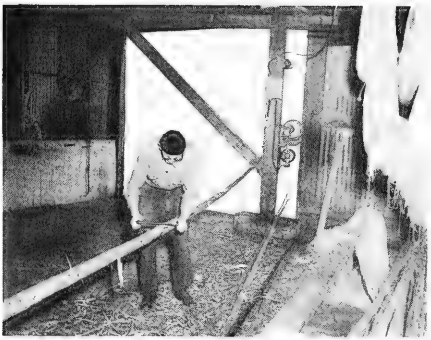


Fig. 8 - Preparing set-net stakes for stationary gill nets. These stakes must be peeled and sanded. Otherwise the nets will catch on the bark and tear in the swells. The stakes are about 35 feet long and are made from hemlock poles obtained at Sand Lake, which is 18 miles from Bay City. The building shown here is the end building on the right in fig. 6.

Fig. 9 - Set-net stakes for stationary gill net. The stationary gill nets catch chum salmon principally.

Fig. 10 - Field laboratory of the Oregon Fish Commission. Some years ago, this building, which is the center one in in the right foreground of fig. 6, was used in a fresh-crab operation.

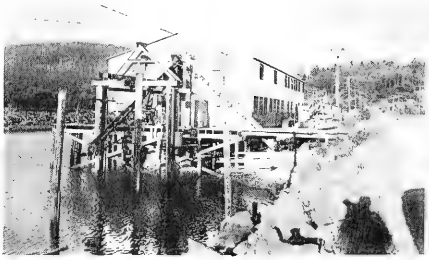


Fig. 11 - An oyster company. The products are fresh oysters and oyster stew. This building is the one shown on the extreme right in fig. 1.

Fig. 12 - Handling trays of canned oyster stew at retort inside company shown in fig. 11.

Fig. 13 - Labeling cans of oyster stew inside company shown in fig. 11.

Note: The author gratefully acknowledges the aid of Fred C. Cleaver, Supervisory Fishery Research Biologist, U. S. Fish and Wildlife Service (formerly Assistant State Fisheries Director, Oregon Fish Commission).

--BY F. BRUCE SANFORD, CHEMIST
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

Pacific Oceanic Fishery Investigations

SUMMER TUNA FISHERY AND BAIT POTENTIALITIES OF MARQUESAS AND TUAMOTU ISLANDS: The summer tuna fishery and bait potentialities of the Marquesas and Tuamotu islands were being investigated early in 1957 by all three of the Service's Pacific Oceanic Fishery Investigations research vessels. In this "task force" approach to fishery biology, the Hugh M. Smith was studying the oceanic circulation of the area; the John R. Manning was sampling the deep-swimming tunas by long-line fishing; while the Charles H. Gilbert was live-bait fishing and assessing the available natural bait supplies in those islands of French Oceania.

John R. Manning, using 60 11-hook baskets a day, as of the end of February had fished a total of 33 days and reported a catch of 322 yellowfin, 35 skipjack, 48 bigeyed, 24 albacore tuna, 165 shark, and 56 miscellaneous fish such as marlin, swordfish, etc. Of the total yellowfin caught, 210 were taken at stations near the Marquesas, with the best day's catch yielding 54 yellowfin, 2 albacore, 16 shark, and 3 miscellaneous fish.

The Charles H. Gilbert, which arrived in the Marquesas on January 24, reported sighting a total of 263 surface schools: 30 yellowfin, 128 skipjack, and 105 unidentified. Using principally the local Marquesan sardines as bait, 104 of the schools were chummed and of those fished, a total of 2,829 skipjack and 81 yellowfin were caught. A total of 769 of the skipjack were tagged with the new POFI dart tag and released. In the Marquesas area, 718 skipjack were taken from one school, 311 from another. In the Tuamotus, one of the schools yielded 506 skipjack and another

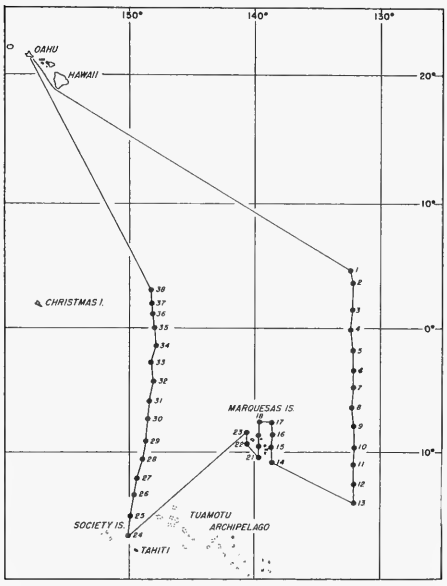
455. The schools, in general, were wild and fast moving. On some days, several schools were sighted and chummed but the fish would not bite.

The concentrations of bait varied from island to island. In one report from the Marquesas, 6,000 buckets were sighted near Taio Hae and, in another, 1,500 at Nuku Hiva. In other bays, varying amounts were observed, some with negligible quantities. However, particularly when compared with the quantities observed during the Marquesas winter, bait supplies were abundant.

The Hugh M. Smith, which proceeded south along 130° W. longitude, suffered a breakdown of the main drive shaft near 13° S. With the assistance of the U. S. Coast Guard, repairs were effected and the vessel proceeded with the oceanographic survey.

* * * * *

DEEP-SWIMMING YELLOWFIN TUNA SAMPLED BY LONG-LINING IN MARQUESAS AREA (M/V John R. Manning Cruise 34): Sampling the abundance and distribution of large deep-swimming yellowfin and albacore tuna by long-lining in the eastern Pacific was the principal purpose of the Service's fisheries research vessel John R. Manning's cruise 34 (January 4-March 12, 1957). Long-lining in the Marquesas and Society islands area (a potential fishing ground for the United States tuna fleet) yielded 23 tons of yellowfin tuna in 38 fishing days. Smaller quantities of albacore, big-eyed, and skipjack, tuna were also caught. Simultaneously with the John R. Manning, two other Honolulu-based Service vessels studied the live-bait and surface tuna resources and the oceanic environment of the region.



John R. Manning Cruise 34 (Jan.-Mar. 1957).

John R. Manning fished one series of long-line stations southward across the equator to a position southeast of the Marquesas Island group, another series among the islands, and after refueling at Tahiti, a third line of stations was fished northward across the equator on the longitude of 148° W. Although the abundance of deep-swimming yellowfin tuna was generally low on the two longitudinal sections, some excellent long-line fishing was experienced in the Marquesas, particularly in the southwestern part of the archipelago. Yellowfin tuna catch rates there were as high as 8 fish per 100 hooks per day, and the tuna were large, averaging 139 pounds each.

Fishing 60 baskets of longline (660 hooks) at 38 stations produced a catch of 355 yellowfin tuna (approximately 23 tons), 51 big-eyed, 24 albacore, 36 skipjack, 44 spearfish, 6 wahoo, 5 barracuda, and 333 shark. Results on both longitudinal sections across the equatorial zone indicated low levels of yellowfin abundance. On 132° W., between 4°30' N. and 14° S., only 4 out of 13 stations had yellowfin catch rates of more than 1 fish per 100 hooks.

Only the station at 3°30' S. produced even moderately good fishing, with 4 yellowfin per 100 hooks. For the 15 stations on the 148° W. section, between 16°30' S.

and 3° N., the best catch rate was 1.5 yellowfin at station 35, on the equator, and only 1 other station had a catch rate of over 1. A considerably greater abundance of deep-swimming yellowfin was shown by the 10 stations fished among the Marquesas Islands. There the catch rate averaged 3.45 fish per 100 hooks, only 2 stations produced less than 1 yellowfin per 100 hooks, and 2 stations, 20 and 33, south of Nuku Hiva Island had the excellent catch rates of 7.58 and 8.18, respectively. Yellowfin weight averaged 134 pounds each, on 132° W., 139 pounds in the Marquesas area, and 131 pounds on 148° W. Shark damage to yellowfin varied greatly from one station to another, but amounted to about 21 percent for the whole cruise.

Albacore were not taken north of 11° S. on 132° W. nor north of 7°25' S. on 148° W., and 4 was the greatest number taken at any station. They ranged from 35 to 50 each, averaging 40 pounds. The fact that most of the albacore were caught on the deepest parts of the set indicates that the long line may not have been fishing deep enough to sample this species adequately.

Trolling for 779 line-hours between stations and along the long-line sets produced a total catch of 7 skipjack, 2 yellowfin, 2 big-eyed, 12 dolphin, 2 wahoo, and 1 sea snake snagged on a jig. The wheel watch routinely recorded surface tuna schools, bird flocks, and other marine life observed while underway.

Biological data on food and reproductive condition were recorded for all fish taken, and frequent measurements of surface and subsurface water temperatures provided information on the environment in which the tuna were found. Fifteen extra-large yellowfin tuna were filleted and frozen for use in processing experiments designed to improve the commercial acceptability of the big tuna which form a large part of long-line catches.

Sport Fishing and Hunting License Holders Highest on Record

Once again a record has been set in the number of license holders for sport fishing and wild-game hunting in the United States, the Secretary of the Interior reported on February 10. California replaced Minnesota as top-ranking State in fishing licenses but Michigan, the only State to record more than a million hunting license sales, retained its lead in hunting.

U. S. Fish and Wildlife Service compilations show that during the fiscal year ending June 30, 1956, there were 33,163,831 hunting and fishing license holders in this country, an increase of 117,470 over the previous record set in the fiscal year ending June 30, 1955.

An increase of 270,296 hunting license holders is responsible for the new record. Fishing li-

FISHERMAN IN LARGE SPRING NEAR PAGE DAM.

State Fishing Licenses Issued in the United States, July 1, 1955 to June 30, 1956

State	Paid Fishing License Holders			Total Cost[1/] to Anglers for All Licenses, Permits Stamps, etc.
	Resident	Non-Resident	Total	
Alabama	435,596	24,649	460,245	$ 730,446
Arizona	97,943	62,878	160,821	420,119
Arkansas	274,912	135,346	410,258	766,447
California	1,303,256	15,934	1,319,190	3,902,898
Colorado	237,524	107,728	345,252	242,002
Connecticut	99,808	3,757	103,565	367,928
Delaware	6,835	885	7,720	16,400
Florida	275,802	178,728	454,530	936,134
Georgia	337,620	7,754	345,374	461,266
Idaho	140,712	52,360	193,072	606,269
Illinois	720,842	18,959	739,801	864,210
Indiana	805,277	38,835	844,112	927,464
Iowa	364,807	16,235	381,042	546,240
Kansas	217,202	5,850	223,052	456,299
Kentucky	335,435	77,793	413,228	878,299
Louisiana	187,466	33,369	220,835	295,955
Maine	129,075	72,046	201,121	744,706
Maryland	107,837	23,051	130,888	238,406
Massachusetts	202,506	4,793	207,299	608,968
Michigan	876,670	273,992	1,150,662	4,770,121
Minnesota	935,802	296,845	1,232,647	2,353,972
Mississippi	131,631	34,160	165,791	378,798
Missouri	509,483	55,606	565,089	1,432,718
Montana	192,353	43,097	235,450	839,828
Nebraska	205,770	9,860	215,630	352,701
Nevada	28,195	23,556	51,751	182,038
New Hampshire	74,901	44,996	118,997	396,699
New Jersey	143,136	10,081	153,217	605,859
New Mexico	65,878	31,583	97,461	366,603
New York	677,353	42,427	719,780	1,628,456
North Carolina	332,648	32,461	365,109	663,439
North Dakota	72,438	1,918	74,356	78,602
Ohio	838,898	41,177	880,075	1,766,917
Oklahoma	364,968	71,804	436,772	948,542
Oregon	300,929	29,488	330,417	1,212,920
Pennsylvania	692,516	27,199	719,715	1,835,567
Rhode Island	17,925	542	18,467	42,942
South Carolina	250,962	13,948	264,910	452,351
South Dakota	98,659	41,972	140,631	275,774
Tennessee	562,062	166,367	728,429	860,936
Texas	467,551	9,893	477,444	736,276
Utah	117,110	8,800	125,910	379,842
Vermont	72,466	34,287	106,753	249,838
Virginia	359,521	13,031	372,552	573,843
Washington	389,275	21,497	410,772	1,496,482
West Virginia	183,791	8,841	192,632	382,091
Wisconsin	680,590	331,245	1,011,835	2,270,264
Wyoming	116,840	60,484	177,324	607,781
TOTALS	16,039,876	2,662,107	18,701,983	$42,149,674

1/ This is the gross cost to the fishermen for various types and categories of licenses issued by the respective states for the privilege of fishing and/or possessing fishes.

censes decreased by 152,826. In spite of the drop in fishing and the gain in hunting licenses, fishing is still the more popular sport. A total of 18,701,983 licenses were sold for angling compared with 14,461,848 for hunting. Conversely, the hunters paid the greater amount for their licenses, tags, permits, and stamps--$46,638,220 compared with $42,149,674 for fishing licenses, permits, and stamps. During the year previous, the total cost to hunters for all licenses was $42,790,687 and to fishermen $39,501,838.

There were 14,088,608 resident-hunting license holders and 373,240 nonresident; those holding resident fishing licenses total 16,039,876 and the nonresidents total 2,662,107.

Under the Federal aid formulas for the distribution of Pittman-Robertson funds for the restoration of game and the Dingell-Johnson funds for the restoration of fish, the number of license holders (not the amount paid for licenses) is one factor considered.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, APRIL 1956, P. 24.

United States Fishing Fleet[1/] Additions

FEBRUARY 1957: A total of 31 fishing vessels of 5 net tons and over were issued first documents as fishing craft during February 1957, according to the U. S. Bureau of Customs. This was 5 vessels more than the number reported for the same month last year.

Table 1 - U. S. Vessels Issued First Documents as Fishing Craft, by Areas, February 1957 with Comparisons

Area	February		Jan.-Feb.		Total
	1957	1956	1957	1956	1956
	(Number)				
New England	2	3	3	4	15
Middle Atlantic	3	3	5	5	26
Chesapeake	9	3	17	8	138
South Atlantic	3	6	11	10	119
Gulf	9	7	10	10	100
Pacific	3	2	5	3	76
Great Lakes	-	-	-	-	6
Alaska	2	1	6	2	40
Hawaii	-	1	-	1	1
Total	31	26	57	43	521

Note: Vessels assigned to the various sections on the basis of their home port.

Table 2 - Vessels Issued First Documents as Fishing Craft, by Tonnage, February 1957

Net Tons	Number
5 to 9	12
10 to 19	6
20 to 29	3
30 to 39	6
40 to 49	1
50 to 59	1
180 to 189	1
360 to 369	1
Total	31

The Chesapeake and Gulf areas led with 9 newly-documented vessels each, followed by the Middle Atlantic, the South Atlantic, and the Pacific areas with 3 each. New England and Alaska had 2 newly documented vessels each.

1/ Includes both commercial and sport fishing craft.

A total of 57 fishing vessels was documented for the first time during the first two months of 1957--an increase of 14 craft, or 33 percent, compared with the corresponding period last year. During the two-month period of 1957, the Chesapeake led all other areas with 17 newly-documented vessels, followed by the South Atlantic with 11, and by the Gulf with 10.

U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, DECEMBER 1956: United States imports of of edible fresh, frozen, and processed fish and shellfish in December 1956 were 1.6 percent less in quantity, but up 5.5 percent in value as compared with the previous month. Compared with December 1955, the imports for December 1956 were almost the same in quantity, but 1.2 percent more in value. December 1956 imports averaged 30.9 cents a pound as compared with 30.5 cents a pound for the same month in 1955. A comparison of the December 1956 imports of leading edible fishery products with those for December 1955 shows that the drop in groundfish fillets, frozen, and canned salmon, canned crab meat and lobster meat, and canned tuna was more than offset by increases in fillets other than groundfish, canned sardines, frozen spiny lobsters, and frozen tuna.

United States Foreign Trade in Edible Fishery Products, December 1956 With Comparisons

Item	Quantity			Value		
	Dec.		Year	Dec.		Year
	1956	1955	1955	1956	1955	1955
	(Millions of Lbs.)			(Millions of $)		
Imports:						
Fish and shellfish: Fresh, frozen & processed 1/	56.4	56.4	769.5	17.4	17.2	206.4
Exports:						
Fish & shellfish: Processed 1/ only (excluding fresh & frozen)	7.9	9.9	88.3	1.6	2.0	21.6

1/ Includes pastes, sauces, clam chowder and juice, and other specialties.

Exports of processed edible fish and shellfish in December 1956 declined about 13 percent in quantity as compared with the previous month and were 20 percent below December 1955. The December 1956 value of these exports was 43 percent lower than the previous month, and down about 20 percent from the same month a year earlier.

Because of the very poor sardine season on the Pacific Coast this past season, canned sardine exports in December 1956 were only one-fourth of those for the same month in 1955, which accounts for part of the decline in the exports of fish and shellfish.

* * * * *

GROUNDFISH FILLET IMPORTS LOWER IN FEBRUARY 1957: Imports of groundfish (including ocean perch) fillets and blocks during February 1957 totaled 7.0 million pounds as compared with 11.0 million pounds imported during the same month of 1956--a decrease of 36 percent. The decrease was primarily due to reduced imports from Canada, and no imports from Iceland.

Total groundfish and ocean perch fillet imports into the United States during the first two months of 1957 amounted to 26.0 million pounds as compared with 26.5 million pounds during the same period of 1956. Canada with 18.6 million pounds led all other countries exporting fillets to the United States during the first two months of 1956, followed by Iceland (5.1 million pounds) and Norway (1.9 million pounds). These three countries accounted for 98 percent of the total imports for the first two months of 1957.

NOTE: SEE CHART 7 IN THIS ISSUE.

* * * * *

IMPORTS AND EXPORTS OF SELECTED FISHERY PRODUCTS, JANUARY 1957: Imports: GROUNDFISH: Fillets imported during January 1957 totaled 11.7 million pounds, a decline of 5 percent from the same month a year ago. Cod and haddock fillets declined by 17 percent, while ocean perch fillets increased by 63 percent.

Blocks and slabs imported in January totaled 6.6 million pounds, an increase of 133 percent from the same month of 1956.

FROZEN TUNA: Imports of 12.5 million pounds in January were 11 percent more than January 1956. Albacore imports declined 61 percent, but other frozen tuna showed a gain of 63 percent.

CANNED TUNA: January imports of almost 2 million pounds were down 16 percent from a year ago.

CANNED BONITO: Imports of 1.6 million pounds were only slightly below a year ago.

CANNED SALMON: Imports of 4.5 million pounds during January were almost double those in the same month of 1956. Imports were all from Japan.

CANNED SARDINES: A total of 1.8 million pounds were imported during January, a gain of 7 percent from a year ago.

SWORDFISH: January imports of 1.4 million pounds declined by 14 percent from a year ago.

SHRIMP: Total imports in January were 5.7 million pounds--a decline of 35 percent from a year earlier due to smaller receipts from Mexico.

LOBSTERS AND LOBSTER TAILS: Fresh and frozen lobster and lobster tail imports this January of 4.8 million pounds were 51 percent above those for January 1956.

CANNED CRABMEAT: Imports during January amounted to 305,000 pounds, a decline of 29 percent from same month of 1956.

FISH MEAL: Imports of 4,219 tons were 62 percent less than during January 1956.

Exports: CANNED SARDINES: Exports of 2.6 million pounds of canned sardines during January 1957 were 69 percent less than in same month of a year ago.

CANNED MACKEREL AND JACK MACKEREL: Exports of 2 million pounds represented large gains over a year ago as a result of large shipments to the Philippines.

FISH OIL: January exports totaled 16.6 million pounds, up 28 percent from those of the same month a year earlier.

* * * * *

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA PROVISO: The quantity of tuna canned in brine which may be imported into the United States during the calendar year 1957 at the 12½-percent rate of duty is limited to 44,528,533 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem.

Imports under the quota from January 1-March 2, 1957, amounted to 3,726,080 pounds, according to data compiled by the Bureau of the Customs. This leaves a balance of 40,802,453 pounds of the quota which may be imported during the balance of 1957 at the 12½-percent rate of duty.

* * * * *

UNITED STATES FISH OIL EXPORTS DECLINE IN 1956; Fish oil exports from the United States in 1956 totaled 70,402 short tons, slightly less than the record 71,336 tons exported in 1955.

United States Fish Oil Exports by Country of Destination, Average 1935-39, Annual 1952-56

Country of Destination	1956 1/	1955 1/	1954	1953	1952	Average 1935-39
			(Short Tons)			
NORTH AMERICA:						
Canada	1,603	11,251	7,511	2,108	488	458
Cuba	85	83	126	87	100	155
Mexico	66	81	118	114	122	45
Other	28	1	-	1	3	71
Total	1,782	11,416	7,755	2,310	713	729
SOUTH AMERICA	62	56	148	63	38	96
EUROPE:						
Belgium-Luxembourg	750	1,098	-	764	8	8
Denmark	866	-	-	-	-	-
France	13	9	-	7	149	19
Western Germany	32,490	10,503	10,481	36,155	6,232	126
Italy	60	106	85	28	220	15
Netherlands	24,075	39,642	43,692	8,913	11,967	15
Norway	6,251	6,758	1,102	1,606	-	10
Sweden	2,646	-	-	-	-	7
Switzerland	367	646	5,797	3,115	3,140	15
United Kingdom	920	881	1,376	299	-	77
Other	-	23	27	23	43	8
Total	68,438	59,666	62,560	50,910	21,759	300
ASIA:						
Philippines, Republic of	4	-	233	860	546	66
Other	5	55	51	37	20	24
Total	9	55	284	897	566	90
AFRICA	25	68	70	53	3	19
Grand Total	3/ 70,402	2/ 71,336	70,817	54,233	23,079	1,234

1/ Preliminary.
2/ Includes 75 tons whose destination is not indicated.
3/ Includes 86 tons whose destination is not indicated.

Western Europe again was the major market, taking 97 percent of the total or almost 9,000 tons more than in the previous year. West Germany and the Netherlands continued to be the principal buyers of United States fish oil. Exports to West Germany in 1956 were almost 3 times the 1955 tonnage, while exports to the Netherlands declined about 40 percent from the previous year. Exports to Canada dropped to less than 2,000 tons as compared with over 11,000 in 1955.

Wholesale Prices, February 1957

Most of the major United States fisheries active during February experienced a normal month with weather conditions, on the average, much improved over the previous month.

In February 1957, the over-all edible fish and shellfish (fresh, frozen, and canned) wholesale price index (115.3 percent of the 1947-49 average) dropped 5.3 percent below that for January, but was slightly higher (1.4 percent) than that for February 1956. Except for a substantial drop in the prices for fresh drawn haddock and fresh haddock fillets at Boston in February, changes in the wholesale prices for the other individual items in the index were slight.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, February 1957 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ ($)		Indexes (1947-49=100)			
			Feb. 1957	Jan. 1957	Feb. 1957	Jan. 1957	Dec. 1956	Feb. 1956
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					115.3	121.8	116.1	113.7
Fresh & Frozen Fishery Products:					124.9	136.2	126.6	121.7
Drawn, Dressed, or Whole Finfish:					113.0	134.1	118.6	114.1
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.06	.14	60.7	143.6	92.7	86.9
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.34	.35	105.2	108.3	108.3	97.5
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.64	.64	142.7	143.8	143.8	134.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.69	.59	171.1	146.3	151.2	181.0
Whitefish, L. Erie pound or gill net, rnd., fresh	New York	lb.	.75	.70	151.7	141.5	143.6	131.4
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.70	.57	143.4	116.8	145.4	150.6
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.65	.60	152.4	140.7	84.4	129.0
Processed, Fresh (Fish & Shellfish):					132.6	140.3	134.7	127.6
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.26	.46	88.5	158.2	103.8	110.6
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.83	.82	130.4	128.8	129.6	121.7
Oysters, shucked, standards	Norfolk	gal.	5.875	6.12	145.4	151.6	148.5	139.2
Processed, Frozen (Fish & Shellfish):					124.4	122.7	118.2	116.5
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.40	.40	103.4	103.4	103.4	102.1
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.31	.30	97.3	87.9	87.9	92.6
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.29	.28	114.8	114.8	110.8	114.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.85	.84	131.2	130.0	126.0	119.6
Canned Fishery Products:					101.5	101.5	101.2	102.4
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	22.65	22.65	120.0	120.0	120.0	120.0
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.20	11.20	80.8	80.8	80.8	85.1
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	9.00	9.00	105.0	105.0	105.0	83.2
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	7.95	7.95	84.6	84.6	81.9	89.9

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.

A sharp drop (down 57.7 percent) in prices for fresh large drawn haddock from January to February was responsible for the 15.7 percent decline in the index for the drawn, dressed, or whole finfish subgroup. As a rule, heavy landings of groundfish (chiefly haddock) from the Northwest Atlantic fishing banks at Boston on any one day will cause prices to drop precipitously if the supply exceeds the immediate fresh and frozen trade needs. Pacific halibut wholesale prices at New York also showed signs of weakness in February. The four fresh-water items in the subgroup were priced higher in February. Supplies of Great Lakes whitefish, lake trout, and yellow pike were quite light in February, and as a result prices rose. When com-

pared with February 1956, the drawn, dressed, or whole finfish subgroup index for this February was down only by about one percent in spite of substantially lower haddock prices. Higher wholesale prices for the other subgroup items this February as compared with February 1956 just about compensated for the lower drawn haddock prices.

The fresh processed fish and shellfish subgroup index in February 1957 was lower by 5.5 percent when compared with the previous month, but was higher by 3.9 percent as compared with the same month in 1956. Lower fresh haddock fillet prices (down 44.1 percent) this February and shucked oyster prices (down 4.1 percent) from January were only partially offset by slightly higher prices for fresh shrimp (up 1.2 percent). On the other hand, lower fresh haddock fillet prices in February 1957 were more than offset by higher shrimp (up 7.1 percent) and oyster (up 4.5 percent) prices when compared with February 1956.

Changes between January and February 1957 in the frozen processed fish and shellfish subgroup prices were slight--the index for the subgroup went up only 1.4 percent from January to February but rose 6.8 percent when compared with February 1956. Frozen haddock fillets went up about 3.3 percent and frozen shrimp prices went up 1.0 percent from January to February. All the items in this subgroup were priced higher in February 1957 than for the same month in 1956, except for frozen ocean perch fillet prices which remained unchanged. Frozen shrimp prices at Chicago increased 9.7 percent from February 1956 to February 1957.

The canned fishery products subgroup index in February 1957 was unchanged from the previous month and lower by less than one percent as compared with February 1956. The market for canned fish was steady with stocks of California sardines and salmon quite light at the packers' level. Maine sardine supplies were light to moderate and canned tuna plentiful.

PREDICTING COLOR OF CANNED SALMON

A practical test to predict the color of canned salmon is reported. Sample slices of fresh salmon flesh are dipped into glycerine at 435° F. (224° C.) and the resulting color change is similar to that produced on canning the product. This technique is expected to be of value in the sorting of salmon on a color basis prior to canning, an operation which at the present time is not always successful because color of the fresh meat in certain species does not have consistent relation to the color of the canned product.

Experiments on the elimination of curd in canned salmon have shown that although dipping of the fish in phosphoric acid gave the best appearing product, the tartaric acid-treated product was better in flavor.

--Annual Report of the Pacific Fisheries Experimental Station, Fisheries Research Board of Canada.

International

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

MEETING HELD IN TOKYO MARCH 1957: Important fisheries meetings in Tokyo during March 1957 were attended by a number of Canadian, American, and Japanese delegates. The meetings were held by the International North Pacific Fisheries Commission, which was formed by a tripartite Treaty between Canada, Japan, and the United States in 1953 for the conservation of stocks of fish on the high seas of the North Pacific Ocean. The treaty covers an ocean area of 32 million square miles. Approximately one-third of the world's supply of fish is taken in the area by the nations signatory to the tripartite Treaty and other bordering nations, including China and the U.S.S.R.

During 1955 and 1956 the Commission has undertaken a research program of record size in the area extending northward from the latitude of San Francisco to near the Bering Strait at the entrance to the Arctic Ocean and across to the Asiatic shores. Twenty ocean-going research vessels occupied stations throughout this vast and stormy expanse in 1956.

Principle subject of research at present is a determination of whether or not salmon from Asian streams mingle in the sea with salmon from the streams of North America. If the Commission finds that salmon from the two continents mix on common feeding grounds in mid-ocean, it must draw dividing lines based on scientific research which will most equitably divide the stocks.

The Tokyo meetings were divided into two series. During the week beginning on March 11 representatives of the three countries discussed the status of the salmon, herring, and halibut fisheries along the Pacific coast of Alaska, British Columbia, and the United States. Japan has agreed in the Treaty to abstain from fishing these stocks, on the condition that the United States and Canada maintain a maximum sustainable annual harvest from them, coupled with a full research program and adequate enforcement of conservation measures. The committee studied reports dealing with this complex and important question and advised the Commission on the need for further studies. Beginning in 1958 the Commission must decide annually if stocks of fish protected under the abstention clause of the Treaty continue to qualify, or if the abstention should be lifted.

During the week of March 18, the Commission's Committee on Biology and Research met to plan and coordinate details of the 1957 research program. Oceanographic research vessels connected with this program have departed for North Pacific waters. They will be followed by vessels studying distribution of salmon throughout their range and later by other vessels engaged in mid-ocean tagging of salmon, for later recovery in their home areas.

NORTH SEA FISHING CONVENTION

SWEDISH ASSOCIATION COMMENTS: The editor of The Swedish West Coast Fisherman, the organ of the Swedish West Coast Fishermen's Central Association, writing in the association's journal, states that at the time the North Sea

Convention became effective on April 5, 1954, it was considered a good method to protect the growth of fish in the North Sea and other affected waters. Several other plans, he says, had been tested and abandoned before this convention, prescribing minimum sizes of fish and meshes, was agreed upon. A summary of the article supplied by the United States Consulate at Goteborg in a January 29 dispatch follows:

It was soon found that the convention "had many and great weaknesses." The size of mesh suitable for the catching--and protection--of cod, haddock, coalfish, plaice, etc., was not suitable for catching herring, mackerel, prawns, crayfish, etc. For the latter species exceptions had to be made with regard to the size of the mesh, and these exceptions made it possible to continue catching small fish of all categories. All of these small fish, however, could not be used and sold, but they were caught and killed. The result has been that "today all countries concerned are agreed that the purpose of the convention has not been fulfilled."

The Permanent Commission for the North Sea Convention has therefore taken up for consideration certain amendments or additions, and in September 1955 a special committee was appointed to examine the question scientifically.

In order to facilitate the work, the member countries were requested to answer certain questions. One of these was whether any additional types of fish should be added to the list of protected fish or whether any kind of fish now protected should be removed from the list.

Replies have been received from all participating countries with the exception of Iceland. It was found that most of the countries concerned, including Sweden, Norway, and Great Britain, did not want any changes at the present time in the list of protected and unprotected fish. France considered that whiting should be removed from the list of protected fish because "there is no evidence of excess fishing of this kind." Denmark suggested that both whiting and sand dab be taken off the list" as it is not known that minimum sizes for these kinds of fish are suitable for fishing on the whole." It was also pointed out, that small whiting are valuable for fishing in some countries and that the sand dab is a serious food competitor of some of the more valuable fish types, for example plaice. The Netherlands, on the other hand takes a long-range view and considers that fish protection should be increased because many species of fish that have no commercial value at present may be of value in the future.

Swedish fishermen are probably generally of the opinion that whiting in particular needs all the protection it can get if it is not to be exterminated. There has been a marked reduction of whiting catches in the North Sea as well as the Skagerack and the Kattegat during the last few years, and at present whiting is very scarce.

According to the editor, the executives of the Swedish West Coast Fishermen's Central Association met some time ago and unanimously recommended that at the impending meeting of the Permanent Commission the Swedish delegates should resist emphatically any weakening of the protection afforded whiting and sand dab.

NORTH PACIFIC FUR SEAL COMMISSION

FUR SEAL CONSERVATION CONVENTION SIGNED: The North Pacific Fur Seal Conference came to a successful close on February 9 in Washington with the signing of the Interim Convention for the Conservation of North Pacific Fur Seal Herds. The Convention is the result of extensive negotiations by delegations of Canada, Japan, the Union of Soviet Socialist Republics, and the United States of America, which began discussions on November 28, 1955.

There are about 1,600,000 fur seals in the North Pacific Ocean. Indiscriminate killing of seals would soon reduce their numbers sharply and perhaps jeopardize their existence. This was demonstrated in the late nineteenth century when the herds, whose numbers in the 1860's had reached almost 2,000,000, fell to about 200,000 head in 1911 due to indiscriminate slaughter. Under the four-power Fur Seal Convention of 1911, Canada, Japan, Russia, and the United States prohibited their nationals from hunting the seals at sea. As a result, the populations rose to 1,600,000 by 1941 when the 1911 Convention was terminated. Meanwhile, during this 30-year period over a million skins were harvested on the breeding islands by the Governments having control of them. The present convention will reinstitute multilateral conservation by the four North Pacific powers.

The fur seal spends nine months each year at sea, three months on land. Migrating each winter to waters as far south as the latitude of San Francisco and Tokyo, the herds beginning in June return to three island groups in the far north--the Pribilof Islands off Alaska and the Commander Islands and Robben Island off the Asian Coast. Here they remain for three months on the shingle beaches while the pups are born and are prepared for life at sea, even having to learn to swim during this time. In September the seals begin to leave for their nine-month journey southward.

The seal is a polygamous creature. One bull may have a harem of as many as 50 females. For the needs of the fur industry the practice has, therefore, been to take the surplus males. Usually three-year old males are taken, the pellage being then at its prime. The killing is done on the Asian islands by the Government of the U.S.S.R. and on the Pribilof Islands by the United States Government.

The Convention provides among other things for:

1. the establishment of a North Pacific Fur Seal Commission of four members, one from each of the Signatories;
2. a six-year cooperative research program;
3. the prohibition of pelagic sealing (seal hunting at sea), except to a specified extent for research purposes;
4. boarding and search of vessels at sea in suspicious circumstances and arrest of vessels and crews upon reasonable belief of seal hunting with trial in the country of the flag of the vessel.
5. the enactment and enforcement by the Parties of such legislation and the application of such measures as may be necessary to guarantee the observance of the Convention; and

6. a sharing of the land kill so that Canada and Japan receive each year from the U.S.S.R. and the U.S.A. 15 percent of the sealskins taken on the islands by the latter two Governments.

The Convention will enter into effect upon the deposit of ratifications in Washington by the four Signatories. It will continue in effect for six years although in certain circumstances the term may vary from six years. The Parties agree to hold a meeting toward the close of the research program to determine what more permanent arrangements may be necessary for the conservation of the herds.

The text of the convention follows:

INTERIM CONVENTION ON CONSERVATION OF NORTH PACIFIC FUR SEALS

The Governments of Canada, Japan, the Union of Soviet Socialist Republics, and the United States of America,

Desiring to take effective measures towards achieving the maximum sustainable productivity of the fur seal resources of the North Pacific Ocean so that the fur seal populations can be brought to and maintained at the levels which will provide the greatest harvest year after year, with due regard to their relation to the productivity of other living marine resources of the area,

Recognizing that in order to determine such measures it is necessary to conduct adequate scientific research on the said resources, and

Desiring to provide for international cooperation in achieving these objectives,

Agree as follows:

Article I

1. The term "pelagic sealing" is hereby defined for the purposes of this Convention as meaning the killing, taking, or hunting in any manner whatsoever of fur seals at sea.

2. The words "each year", "annual" and "annually" as used hereinafter refer to Convention year, that is, the year beginning on the date of entry into force of the Convention.

3. Nothing in this Convention shall be deemed to affect in any way the position of the Parties in regard to the limits of territorial waters or to the jurisdiction over fisheries.

Article II

1. In order to realize the objectives of this Convention, the Parties agree to coordinate necessary scientific research programs and to cooperate in investigating the fur seal resources of the North Pacific Ocean to determine:

(a) what measures may be necessary to make possible the maximum sustainable productivity of the fur seal resources so that the fur seal populations can be brought to and maintained at the levels which will provide the greatest harvest year after year; and

(b) what the relationship is between fur seals and other living marine resources and whether fur seals have detrimental effects on other living marine resources substantially exploited by any of the Parties and, if so, to what extent.

2. The research referred to in the preceding paragraph shall include studies of the following subjects:

(a) size of each fur seal herd and its age and sex composition;

(b) natural mortality of the different age groups and recruitment of young to each age or size class at present and subsequent population levels;

(c) with regard to each of the herds, the effect upon the magnitude of recruitment of variations in the size and the age and sex composition of the annual kill;

(d) migration routes of fur seals and their wintering areas;

(e) numbers of seals from each herd found on the migration routes and in wintering areas and their ages and sexes;

(f) extent to which the food habits of fur seals affect commercial fish catches and the damage fur seals inflict on fishing gear; and

(g) other subjects involved in achieving the objectives of the Convention, as determined by the Commission established under Article V, paragraph 1.

3. In furtherance of the research referred to in this Article, each of the Parties agrees to carry out, each year after the entry into force of the Convention, the programs set forth in the Schedule annexed to the Convention with any modifications thereof made pursuant to Article V, paragraph 3. The said Schedule, together with any such modifications, shall be considered an integral part of this Convention.

4. Each Party agrees to provide the Commission annually with information on:

(a) number of black pups tagged for each breeding area;

(b) number of fur seals, by sex and estimated age, taken at sea and on each breeding area; and

(c) tagged seals recovered on land and at sea; and, so far as is practicable, other information pertinent to scientific research which the Commission may request.

5. The Parties further agree to provide for the exchange of scientific personnel; each such exchange shall be subject to mutual consent of the Parties directly concerned.

6. The Parties agree to use for the scientific pelagic research provided for in this Article only government-owned or government-chartered vessels operating under strict control of their respective authorities. Each Party shall communicate to the other Parties the names and descriptions of vessels which are to be used for pelagic research.

Article III

In order to realize the purposes of the Convention, including the carrying out of the coordinated and cooperative research, each Party agrees to prohibit pelagic sealing, except as provided in Article II, paragraph 3 and the Schedule, in the Pacific Ocean north of the 30th parallel

of north latitude including the seas of Bering, Okhotsk, and Japan by any person or vessel subject to its jurisdiction.

ARTICLE IV

1. Each Party shall bear the expense of its own research. Title to sealskins taken during the research shall vest in the Party conducting such research.

2. If the total number of seals of the Commander Islands breeding grounds decreases and falls below 50,000 head, according to data in official records, then commercial killing of seals and apportionment of skins may be suspended by the Union of Soviet Socialist Republics until the number of seals exceeds 50,000 head. This provision also applies to the fur seal herd of Robben Island, if the population of that herd becomes less than 50,000 head.

3. The Government of the Union of Soviet Socialist Republics upon suspending such sealing shall so inform the other Parties. In this case the Commission shall determine whether or not to reduce the level of or to suspend completely the pelagic sealing for scientific purposes in the Western Pacific Ocean during the period of the said suspension.

4. The Commission may, subsequent to the second year of operation of the Convention, modify the floor figure set forth in paragraph 2 of this Article in accordance with its findings based upon scientific data received by it; and if any such modifications are made, paragraph 2 of this Article shall be considered amended accordingly. The Commission shall notify each Party of every such amendment and of the effective date thereof.

ARTICLE V

1. The Parties agree to establish the North Pacific Fur Seal Commission to be composed of one member from each Party.

2. The duties of the Commission shall be to:

(a) formulate and coordinate research programs designed to achieve the objectives set forth in Article II, paragraph 1;

(b) recommend these coordinated research programs to the respective Parties for implementation;

(c) study the data obtained from the implementation of such coordinated research programs;

(d) recommend appropriate measures to the Parties on the basis of the findings obtained from the implementation of such coordinated research programs, including measures regarding the size and the sex and age composition of the seasonal commercial kill from a herd; and

(e) recommend to the Parties at the end of the fifth year after entry into force of this Convention and, if the Convention is continued under the provisions of Article XIII, paragraph 4, at a later year, the methods of sealing best suited to achieve the objectives of this Convention; the above-mentioned later year shall be fixed by the Parties at the meeting early in the sixth year provided for in Article XI.

ARTICLE VI

In order to implement the provisions of Article III, the Parties agree as follows:

1. When a duly authorized official of any of the Parties has reasonable cause to believe that any vessel outfitted for the harvesting of living marine resources and subject to the jurisdiction of any of the Parties is offending against the prohibition of pelagic sealing as provided for by Article III, he may, except within the territorial waters of another State, board and search such vessel. Such official shall carry a special certificate issued by the competent authorities of his Government and drawn up in the English, Japanese, and Russian languages which shall be exhibited to the master of the vessel upon request.

2. When the official after searching a vessel continues to have reasonable cause to believe that the vessel or any person on board thereof is offending against the prohibition, he may seize or arrest such vessel or person. In that case, the Party to which the official belongs shall as soon as possible notify the Party having jurisdiction over the vessel or person of such arrest or seizure and shall deliver the vessel or person as promptly as practicable to the authorized officials of the Party having jurisdiction over the vessel or person at a place to be agreed upon by both Parties; provided, however, that when the Party receiving notification cannot immediately accept delivery of the vessel or person, the Party which gives such notification may, upon request of the other Party, keep the vessel or person under surveillance within its own territory, under the conditions agreed upon by both Parties.

3. The authorities of the Party to which such person or vessel belongs alone shall have jurisdiction to try any case arising under Article III and this Article and to impose penalties in connection therewith.

4. The witnesses or their testimony and other proofs necessary to establish the offense, so far as they are under the control of any of the Parties, shall be furnished with all reasonable promptness to the authorities of the Party having jurisdiction to try the case.

5. Sealskins discovered on seized vessels shall be subject to confiscation on the decision of the court or other authorities of the Party under whose jurisdiction the trial of a case takes place.

6. Full details of punitive measures applied to offenders against the prohibition shall be communicated to the other Parties not later than three months after the application of the penalty.

ARTICLE VII

The provisions of this Convention shall not apply to Indians, Ainos, Aleuts, or Eskimos dwelling on the coast of the waters mentioned in Article III, who carry on pelagic sealing in canoes not transported by or used in connection with other vessels, and propelled entirely by oars, paddles, or sails, and manned by not more than five persons each, in the way hitherto practiced and without the use of firearms; provided that such hunters are not in the employment of other persons or under contract to deliver the skins to any person.

ARTICLE VIII

1. Each Party agrees that no person or vessel shall be permitted to use any of its ports or harbors or any part of its territory for any purpose designed to violate the prohibition set forth in Article III.

2. Each Party also agrees to prohibit the importation and delivery into and the traffic within its territories of skins of fur seals taken in the area of the North Pacific Ocean mentioned in Article III, except only those taken by the Union of Soviet Socialist Republics or the United States of America on rookeries, those taken at sea for research purposes in accordance with the Schedule, those taken under the provisions of Article VII, those confiscated under the provisions of Article VI, paragraph 5, and those inadvertently captured which are taken possession of by a Party; provided, however, that all such excepted skins shall be officially marked and duly certified by the authorities of the Party concerned.

ARTICLE IX

1. The respective Parties agree that, of the total number of sealskins taken commercially each season on land, there shall at the end of the season be delivered a percentage of the gross in number and value thereof as follows:

By the Union of Soviet Socialist Republics	to Canada	15 per cent
	to Japan	15 per cent
By the United States of America	to Canada	15 per cent
	to Japan	15 per cent

2. Each Party agrees to deliver such sealskins to an authorized agent of the recipient Party at the place of taking, or at some other place mutually agreed upon by such Parties.

3. In order more equitably to divide the direct and indirect costs of pelagic research in the Western Pacific Ocean, it is agreed:

(a) that in any year in which commercial killing is carried out for both the Commander and Robben Islands herds and pelagic research in that area is carried on at a level of 2,000 or more seals:

(1) Canada and Japan will forego the delivery of the sealskins by the Union of Soviet Socialist Republics as set forth in paragraph 1 of this Article; and

(2) the United States of America will increase its delivery to Canada and Japan as set forth in paragraph 1 of this Article by a total of 375 sealskins to each of these Parties;

(b) that in any year in which commercial killing is carried out for one only of the Commander or Robben Islands herds and pelagic research in that area is carried on at a level of 1,000 or more seals:

(1) Canada and Japan will forego the delivery of the sealskins by the Union of Soviet Socialist Republics as set forth in paragraph 1 of this Article; and

(2) the United States of America will increase its delivery to Canada and Japan as set forth in paragraph 1 of this Article by a total of 188 sealskins to each of these Parties.

ARTICLE X

1. Each Party agrees to enact and enforce such legislation as may be necessary to guarantee the observance of this Convention and to make effective its provisions with appropriate penalties for violation thereof.

2. The Parties further agree to cooperate with each other in taking such measures as may be appropriate to carry out the purposes of this Convention, including the prohibition of pelagic sealing as provided for by Article III.

3. The Commission may, subsequent to the first year of operation of the Convention, modify in accordance with its scientific findings the research programs set forth in the Schedule and, if any such modifications are made, the Schedule shall be considered amended accordingly. The Commission shall notify each Party of every such amendment and of the effective date thereof.

4. Each Party shall have one vote. Decisions and recommendations shall be made by unanimous vote. With respect to any recommendations regarding the size and the sex and age composition of the seasonal commercial kill from a herd, only those Parties sharing in the sealskins from that herd under the provisions of Article IX, paragraph 1 shall vote.

5. The Commission shall elect from its members a Chairman and other necessary officials and shall adopt rules of procedure for the conduct of its work.

6. The Commission shall hold an annual meeting at such time and place as it may decide. Additional meetings shall be held when requested by two or more members of the Commission. The time and place of the first meeting shall be determined by agreement among the Parties.

7. The expenses of each member of the Commission shall be paid by his own Government. Such joint expenses as may be incurred by the Commission shall be defrayed by the Parties by equal contributions. Each Party shall also contribute to the Commission annually an amount equivalent to the value of the sealskins it confiscates under the provisions of Article VI, paragraph 5.

8. The Commission shall submit an annual report of its activities to the Parties.

9. The Commission may from time to time make recommendations to the Parties on any matter which relates to the fur seal resources or to the administration of the Commission.

ARTICLE XI

The Parties agree to meet early in the sixth year of this Convention and, if the Convention is continued under the provisions of Article XIII, paragraph 4, to meet again at a later year, to consider the recommendations of the Commission made in accordance with Article V, paragraph 2 (e) and to determine what further agreements may be desirable in order to achieve the maximum sustainable productivity of the North Pacific fur seal herds. The above-mentioned later year shall be fixed by the Parties at the meeting early in the sixth year.

ARTICLE XII

Should any Party consider that the obligations of Article II, paragraphs 3, 4, or 5 or any other obligation undertaken by the Parties is not being carried out and notify the other Parties to that effect, all the Parties shall, within three months of the receipt of such notification, meet to consult together on the need for and nature of remedial measures. In the event that such consultation shall not lead to agreement as to the need for and nature of remedial measures, any Party may give written notice to the other Parties of intention to terminate the Convention and, notwithstanding the provisions of Article XIII, paragraph 4, the Convention shall thereupon terminate as to all the Parties nine months from the date of such notice.

ARTICLE XIII

1. This Convention shall be ratified and the instruments of ratification deposited with the Government of the United States of America as soon as practicable.

2. The Government of the United States of America shall notify the other signatory Governments of ratifications deposited.

3. This Convention shall enter into force on the date of the deposit of the fourth instrument of ratification, and upon such entry into force Article IX, paragraphs 1 and 2, shall be deemed to have been operative from June 1, 1956, provided that the Parties shall have, from the date of signing, maintained under their internal law the prohibition and effective prevention of pelagic sealing by all persons and vessels subject to their respective jurisdictions.

4. The present Convention shall continue in force for six years and thereafter until the entry into force of a new or revised fur seal convention between the Parties, or until the expiration of one year after such period of six years, whichever may be the earlier; provided, however, that it may continue in force for a further period if the Parties so decide at the meeting early in the sixth year provided for in Article XI.

5. The original of this Convention shall be deposited with the Government of the United States of America, which shall communicate certified copies thereof to each of the Governments signatory to the Convention.

IN WITNESS WHEREOF the undersigned, being duly authorized by their respective Governments, have signed this Convention.

DONE in Washington this ninth day of February 1957, in the English, Japanese, and Russian languages, each text equally authentic.

For the Government of Canada:
A. D. P. HEENEY
G. R. CLARK
For the Government of Japan:
MASAYUKI TANI
For the Government of the Union of Soviet Socialist Republics:
G ZAROUBIN
For the Government of the United States of America:
WM C. HERRINGTON
ARNIE J. SUOMELA

SCHEDULE

1. The United States of America each year during the first four years shall tag 50,000 black pups on the Pribilof Islands.

2. The Union of Soviet Socialist Republics each year during the first four years shall tag 25 per cent of the black pups on the Commander Islands and 25 per cent of the black pups on Robben Island.

3. In the event that pelagic sealing should be suspended for one or more years under the provisions of Article IV, paragraph 3, the tagging of black pups shall continue at the mentioned rates for a comparable number of years.

4. The United States of America each year shall take at sea for research purposes in the Eastern Pacific Ocean between 1,250 and 1,750 seals.

5. Canada each year shall take at sea for research purposes in the Eastern Pacific Ocean between 500 and 750 seals.

6. Japan shall take at sea in the Western Pacific Ocean:

(a) annually in the first and second years of pelagic research between 2,750 and 3,250 seals;

(b) annually during the remaining four years of pelagic research between 1,400 and 1,600 seals.

7. The Union of Soviet Socialist Republics shall take at sea in the Western Pacific Ocean:

(a) annually in the first and second years of pelagic research between 750 and 1,250 seals;

(b) annually during the remaining four years of pelagic research between 400 and 600 seals.

TRADE AGREEMENTS

AUSTRALIA AND JAPAN SIGN TRADE AGREEMENT WHICH INCLUDES CANNED FISH: A trade agreement between Australia and Japan was signed early in February 1957, states a February 27, 1957, dispatch from the United States Embassy in London. The agreement will run for five years from November 9, 1956. Among the commodities for which quotas were increased is canned salmon to be imported by Australia from Japan. It was also reported that the new agreement provided for substantial exports from Japan to Australia of canned tuna.

UNITED NATIONS

EXPERTS MEET TO PREPARE FOR CONFERENCE ON LAW OF THE SEA: A group of 10 experts appointed to advise on the preparation of an international conference on the law of the sea completed on March 6 its first series of meetings with the United Nations Secretariat, held since February 25. A second series will be held at the beginning of October 1957.

The conference will be held in March and April 1958 in accordance with a resolution adopted by the General Assembly at its current session. It will examine the law of the sea on the basis of draft articles adopted by the United Nations International Law Commission at its eighth session, and it will embody the results of its work in one or more international conventions or other appropriate instruments. The conference will also study the question of free access of landlocked countries to the sea.

The experts discussed the draft agenda and the draft rules of procedure of the conference, plans for the organization of its work, measures to invite governments to make further provisional comments on the International Law Commission's report and related matters, and the preparation of working documents of a legal, technical, scientific, or economic nature in order to facilitate the work of the conference.

Argentine Republic

WHALING FIRM CEASES OPERATIONS: The only Antarctic whaling firm operated by Argentine interests was expected to go out of business. The Argentine firm will terminate its lease on the factory site (owned by Great Britain) on South Georgia Island. The installations will be sold or abandoned. The President of the Argentine company reports that the company could not operate at a profit due to exchange difficulties (The Fishing News, January 4, 1957).

Austria

CANNED MACKEREL MARKET: The quantity of canned mackerel consumed in Austria is equal to the quantity imported, since no domestic production exists, reports a dispatch (January 22) from the United States Embassy at Vienna.

Annual imports of mackerel from Yugoslavia (50 percent), Denmark (40 percent), and Portugal (10 percent) may be estimated at 170 metric tons.

Although Portugese brands are most popular because they are packed in olive oil, a high customs duty of 85 gold crowns per 100 kilograms (about 10 U. S. cents a pound) keeps imports from that country at a low level. The customs duty on imports from Yugoslavia and Denmark amounts only to 15 percent ad valorem.

In order to find a ready market in Austria, mackerel must be packed in oil, preferably olive oil, or tomato sauce with oil added. The type of can most popular in Austria is the $\frac{1}{4}$ club, 30 millimeter, Portugese style. Retail prices for these $4\frac{1}{4}$-oz. cans range from 4.50-6.00 schillings (17-23 U. S. cents) a can.

Yugoslavia, Denmark, and Portugal, the countries exporting mackerel to Austria, maintain their export trade by catering to local taste with respect to flavor, packing medium, and size of cans.

Austria is not a fish-eating country, and meat is generally preferred. Fish consumption consists largely of cod fillets, fresh-water fish, such as carp, pike, and trout, and canned fish such as sardines, tuna, and anchovies.

United States exports of canned mackerel to Austria could only be effected if concessions were made by producers with respect to flavor, packing medium, and size of cans.

Even though canned mackerel in 8-ounce cans in natural brine of Japanese origin costs not more than mackerel of European origin in $4\frac{1}{4}$-oz. cans, Austrian

importers refuse to import them because they feel that they cannot be sold. The reasons for this refusal are that they are (a) boiled, and (b) packed in natural brine.

NOTE: VALUES CONVERTED AT THE RATE OF 26 AUSTRIAN SCHILLINGS EQUAL US$1 AND ONE GOLD CROWN EQUALS 6.96 SCHILLINGS.

Bolivia

CANNED MACKEREL MARKET: No canned fish of any type is produced in Bolivia, states a January 23 dispatch from the United States Embassy at La Paz.

Canned fish (primarily sardines and salmon) are consumed to a great extent in Bolivia's mine commissaries. As with all imported food products, the consumption outside of the subsidized commissaries is restricted to the very small high and middle-class income groups. Consumers prefer canned fish (principally salmon, but including mackerel and other fish) packed in brine. The retail price of the 15-oz. tall can, the most populat size, amount to about Bs.4,000 (52 U. S. cents) a can.

While Bolivia does have barter agreements with some neighboring countries, none of these has had more than a negligible share of the canned fish imports. Canada and the United States have been the principal suppliers of canned fish (mostly salmon). In 1955, Bolivia imported 1,222,951 pounds of canned fish (valued at US$336,591) from the United States as compared with 35,057 pounds (valued at US$9,331) for 1954. Imports from Canada in 1955 amounted to 46,279 pounds (valued at US$12,501) as compared with 180,506 pounds (valued at US$41,893) in 1954.

The majority of canned fish purchases have been for supplying the subsidized mine commissaries, and it is expected that with the new stabilization program put into effect in late December 1956 that the landed cost in Bolivia of such items will be beyond the purchasing power of mine laborers as a whole. It is anticipated that a severe reduction in canned fish and other imported foodstuffs will be experienced in the future. In view of the free trade provisions it is expected that all purchases will be strictly on a price basis and that superior quality will not be a prime factor.

Under the present difficult financial condition of Bolivia there does not appear to be any specific trading scheme which would lead to increased United States export except that of competitive prices. The market for canned fish, as has been previously explained, will probably be reduced even from its present low value in the coming year as the purchasing power of all but a very small segment of Bolivia's population is so low that imported canned foodstuffs will be beyond their reach. United States firms interested in the Bolivian market should refer to the trade list Foods, Importers, and Wholesalers and endeavor to obtain an agent or distributor to represent them in La Paz when the major purchases of foodstuffs are made for the mine commissaries.

Brazil

TUNA LANDED BY JAPANESE FISHING VESSEL: The Japanese fishing vessel Sagami Maru unloaded 100 metric tons of fresh fish of the "tuna family" at Salvador City, Bahia, Brazil, on January 16. The fish was sold at CR$25.00-30.00 a kilogram (20-25 U. S. cents a pound).

This delivery of fish is the result of an agreement made between the Brazilian Ministry of Agriculture, the Bahia Agricultural Department, and the local price control board.

It is also reported that a privately-owned cold-storage plant for preserving perishable commodities, including fish, is under construction at "Calcada" in Salvador City. Its installations, including buildings, will cost about CR$50 million (US$900,000).

Canada

THE FISHING INDUSTRY'S FUTURE: The preliminary report of the Royal Commission on Canada's Economic Prospects (Gordon Commission) predicts that the fishing industry will share, to a modest extent, in the increasing prosperity of Canada during the next 25 years. It emphasizes, however, that the fishing industry must receive the continuing attention of government, and perhaps receive increased assistance. The report recognizes that the United States tariff policies on fish are all important to the Canadian industry. The Commission advocates an adjustment in the Canadian doctrine of territorial waters, according to a February 13 dispatch from the United States Embassy at Ottawa.

The Gordon Commission preliminary report on "The Fishing Industry" characterizes the industry as one with special problems and with an importance exceeding its size. It points out that it is a dominant industry in areas where alternative cash income is not available, and that it is unique in that the resources on which it is based are located largely outside the limits of Canada.

The Commission recommends that Canada should (1) take every opportunity to negotiate the removal of barriers restricting international trade in fish, (2) re-examine Canada's doctrine of territorial waters, and (3) determine at a later date the requirement for government assistance for capital investment in larger fishing vessels and more modern processing plants. By implication a recommendation is made to (4) remove the discrimination against fishing vessels of over 65 feet in length.

It is the view of the Commission that during the next 25 years there will be (1) increased domestic demand for fish and that the United States will continue to be the most important export market. In this connection it considers any increase in the United States tariff would have a direct and adverse effect on the Canadian industry. (2) Continued biological and technical research are advocated which in turn will lead to a requirement for larger vessels and more costly processing plants requiring larger capital investment. (3) The fishing population of Canada will become smaller by one-sixth and concentrated in fewer centers. (4) There will be an industry production increase of approximately 60 percent due to rising productivity. (5) Incomes in the fishing industry in 1980 will be substantially higher than those of today.

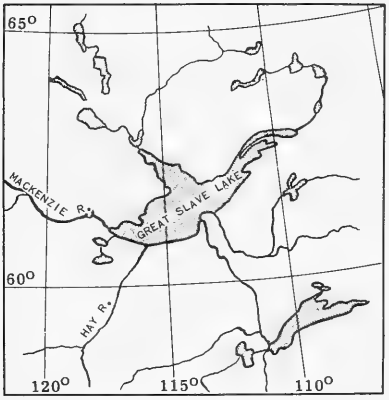
* * * * *

GREAT SLAVE LAKE FISHERY: The Great Slave Lake fishery of Canada has a summer and winter commercial fishing season, reports the November 1956 Trade News of the Department of Fisheries of Canada. The combined whitefish and lake trout fishery of the Great Slave Lake is the largest of its kind in the world.

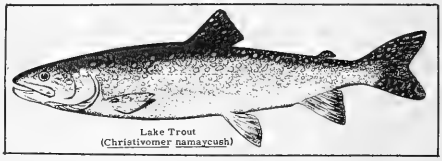
The story of the Great Slave Lake fishery is dramatically told in the film, "Fisheries of the Great Slave." It is the newest addition to the growing file of moving films on Canada's fisheries being compiled by the Department of Fisheries of Canada as a means of portraying the far-reaching influence of this oldest of industries on Canada's social and economic structure.

The film vividly traces the evolution of the fishery from the time that scientists first undertook studies to assess the potentialities of the lake as a producer of fish on a commercial scale, to its present day stage of development.

The lake is fished by nine independent companies, each with its own base camp and fleet of boats. Since the lake is navigable only from June to October, the camps



GREAT SLAVE LAKE DISTRICT


Lake Trout
(Christivomer namaycush)

are set up every summer, and closed at the end of the season. So the fishermen themselves are migrants. A daily trip to the fishing grounds is made. Two-men crews are the general rule for most boats, though some are manned by three and four. Every crew uses personal marker flags to identify its nets.

A gillnet is set in a straight line, usually on or near the bottom, in 30 to 250 feet of water. This net has a $5\frac{1}{2}$-inch mesh, which will allow all small fish to swim through unharmed, thus helping to conserve the species. Occasionally 200 fish are hauled aboard in one net; 2 to 3 pounds is about the average size for whitefish and the lake trout on record for these waters weighed over 60 pounds. As soon as the net has been lifted the fishermen set it back in approximately the same place before moving on to lift another.

Each fisherman is licensed to operate 10 nets. Often they are set as much as half a day's run from the camp. As a result, some boats may be gone from camp almost from one day's end to the next. When they return it may be any time of the day or night. Back at the camp the boats unload onto a barge, a sort of floating factory, moored to the shore, where the fish are cleaned and dressed. The lake trout and whitefish are sorted into separate boxes as they come out of the ice-packed hold. They have been packed in ice since the moment they were taken from the water.

An average day's catch for two men would amount to about 3,000 pounds. More than 4 million pounds have been taken from the lake in one summer. As soon as they have been cleaned, the fish are once more packed in ice, this time in shipping boxes in preparation for a journey that may take them across the continent of North America. The journey begins as the boxes are lowered into the refrigerated hold of a freighter that will carry them a hundred or more miles across the lake, an all night voyage over a lake bigger and more treacherous than Lake Erie and in some places deeper than Lake Superior. Eventually the freighter reaches the southern shore and the town of Hay River, where the highway meets the lake. There the boxes of ice-packed fish start on the second stage of their journey. They are loaded from the freighter into refrigerator trucks. Canada's Department of Fisheries keeps records of every shipment.

Table 1 - Great Slave Lake Catches for Past Two Fishing Seasons

Species	Winter 1955/56		Summer 1956	
	Landings	Value	Landings	Value
	1,000 Lbs.	C$1,000	1,000 Lbs.	C$1,000
Whitefish	1,830	275	2,245	146
Lake trout	487	68	2,161	159
Other (Inconnu, pike, pickerel)	187	9	107	8
Total	2,504	352	4,513	313

Off down the Mackenzie Highway, the fish of Great Slave Lake still have 3,000 miles to go. By road the boxes of fish reach Grimshaw, Alta. By train they cross

the continent to Chicago, Detroit, and New York--3,000 miles from the chill waters of the Great Slave.

By November the clear blue summer skies are forgotten in the darkening north.

The snowmobile has made commercial fishing on Great Slave Lake a year-round trade. It is equally at home on land and on the frozen lake. Use of the snowmobile and a thorough knowledge of the geography of the lake enables the fishermen to pick a good site.

First of all a hole must be dug through the ice. When the four feet of ice are finally penetrated, the water comes to the fishermen's assistance by carrying the ice chips to the surface where they are easily shovelled off. The next step involves the use of the jigger. This device has the mission of pulling the first line under the ice. While one man jerks on the line to propel the jigger, the other follows the jigger by listening from the surface.

When the jigger has travelled a hundred yards and the fisherman is quite sure that he knows exactly where it is, he digs a second hole through the ice and brings the jigger up. The rope remains stretched under the ice between the two holes, and is then used to pull the net itself under. The net finally comes to rest between the two holes anchored at top and bottom and in that position the men leave it for the span of a day. The next day when the fishermen come back to lift the net the water in the hole has usually frozen over to a depth of four or five inches.

When the fish come out of the water into the extreme cold of the winter air, they would soon freeze if the fishermen do not act quickly. Fresh fish commands a better price than frozen fish. Just as fast as they can be cleaned the fish are loaded into the heated snowmobile for the journey to market.

* * * * *

MIDWATER TRAWL IMPROVED: New improvements have been made in the midwater trawl, adapted for the herring fishery off British Columbia by the Fisheries Research Board of Canada under the Industrial Development Service of the Department of Fisheries.

Two new advantages are claimed for the modified gear. Developments in gear design permit the net to be operated from single-gear trawlers, putting it within the economic range of relatively small-type vessels. A new type of otter board permits trawling both in midwater and on the bottom without damage to the gear.

The Fisheries Research Board said that recent fishing from the chartered boat Phyllis Carlyle, has proved successful in taking herring from midwater depths down to within two fathoms of the sea floor. The man in charge of fishing operations on the Phyllis Carlyle said tests were hampered by an unusual delay in the appearance of herring in the Strait of Georgia in 1956, but that sufficient evidence has been gathered to show that the net can be operated efficiently.

The new midwater trawl is a four-sided net, having an opening of 30 feet at its front end. A combination of aluminum alloy trawl plane floats and newly developed hydroplane floats keeps the net from touching bottom, thus preventing damage from fouling on the sea floor. The new otter doors are also made of aluminum and can operate efficiently both in midwater and for bottom trawling, according to Trade News (December 1956) of the Department of Fisheries of Canada.

* * * * *

NORTHWEST ATLANTIC TRAWL-NET MESH REGULATIONS: Regulations prescribing minimum mesh sizes in the Canadian Northwest Atlantic trawl nets were expected to go into effect when the required Order-in-Council was published in the Canada Gazette about February 13. The regulations apply to nets being used to fish ocean perch exclusively.

The regulations prescribe a minimum mesh size for all parts of the trawl. The parts mainly affected are the cod end, lengthening piece, and the aft part of the belly. Other parts of the trawl usually have larger meshes than those prescribed as a minimum. Mesh regulations are already in effect for subarea 5 (Georges Bank and adjacent waters). The regions affected by the new regulations are subareas 3 and 4. Subarea 4 includes the Bay of Fundy, Nova Scotian waters, and the Gulf of St. Lawrence. Subarea 3 includes the Newfoundland fishing banks.

The minimum mesh size prescribed for subarea 4 is the same as that for subarea 5. For subarea 4, manila netting used in otter trawls must have a mesh size larger than $4\frac{1}{2}$ inches, internal measure, measured wet after use. For subarea 3, the minimum mesh size for manila netting is 4 inches, measured in a like manner. Other materials shrink and stretch to a different degree than manila. They may also allow the escape of different sizes of fish than manila through the same size mesh opening. The necessary equivalents for other materials are thus included in tables, which have been circulated in the industry. Also included in these tables are the recommended mesh sizes of new netting which should meet the minimum mesh size specified (Fisheries Council of Canada Bulletin, January 18, 1957).

* * * * *

USE OF AUREOMYACIN FOR FISH PRESERVATION HELD UP: In October 1956 when the Canadian Department of National Health and Welfare approved the use of an aureomyacin derivative as an aid in the preservation of fish, it was believed that it would delay spoilage and make for a fresher product in the markets. However, since the United States Food and Drug Administration has not approved the use of aureomyacin for fish and shellfish, Canadian fishermen have not found it practical to maintain two separate icing procedures: one portion of the catch being iced with aureomyacin-treated ice products and the other portion being iced with the non-treated ice. Therefore, these circumstances are retarding the use of aureomyacin derivatives to preserve fish in Canada.

Although the Canadians have found that aureomyacin-treated ice was harmless when used to preserve fish, the United States authorities have found that fish preserved with treated ice retain residual traces of aureomyacin, even after packaging and final cooking.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, OCTOBER 1956, P. 59.

China (Communist)

FISHERIES PRODUCTION, 1956: Total fisheries production in Communist China in 1956 was 2.55 million metric tons, despite the hurricanes of last summer, the Chinese Minister of Aquatic Products announced on February 11. This was an increase of 30,000 tons over 1955.

A total of 62 modern trawlers were constructed in Communist China in 1956 as against only 20 in 1955. The construction of modern trawlers seems to presage a more active role in offshore fisheries.

Colombia

CANNED MACKEREL MARKET: No canned mackerel or jack mackerel are produced in Colombia, and in the past, only a small amount has been imported from California. The consumption of canned mackerel in Colombia is believed to be nil at the present time, because mackerel is reported to have a strong taste which does not appeal to many South Americans. Consumption in the past was believed to have been confined to foreigners, particularly Europeans, who have acquired a taste for this type of fish. The most popular size of can formerly used was the 15-oz. oval, packed in tomato sauce. The retail price for canned mackerel early in 1956 was Ps$2-2.50 (50-63 U. S. cents) a can.

The quantity and value of canned mackerel imported into Colombia is not available because official import statistics do not show a breakdown by types of fish. These statistics include sardines and other types of fish in "hermetically-sealed containers." The principal countries of origin for canned sardines and fish of all types were the United States, Portugal, Spain, Canada, Japan, and the United Kingdom.

By Decree No. 2643 of November 2, 1956, the Colombian Government placed all canned fish on the Prohibited List of Imports. Therefore, the exportation of this commodity to Colombia is not feasible at the present time, since no import licenses are issued for items on the Prohibited List. However, as the domestic production of canned fish is known to be inadequate to meet the demand of the Colombian market, it is believed that this commodity will shortly be taken off the Prohibited List and that a limited number of licenses will be issued to local importers, according to a January 31 dispatch from the United States Embassy at Bogota.

A strong advertising campaign, made through local newspapers and magazines, emphasizing the low cost and high protein content of canned mackerel, might lead to an increase of United States exports to Colombia. Also, considering that the local fish-canning industries have been given full Customs Tariff protection, United States trade sources might consider the possibility of establishing such canneries in Colombia, or, of making capital investments in the local canneries now in operation, in order to obtain a larger share of the Colombian market for canned fish.

Ecuador

SHRIMP FISHING AND PROCESSING INDUSTRY: Although the shrimp fishing industry of Ecuador is small, prospects for future expansion are good. The manager of the United States-owned shrimp fishing and processing company in that country estimates the catch at 1.8 million pounds of headless blue-white shrimp (8-15 count a pound heads-on) and about 400,000 pounds of heads-on sea bob (35-50 count heads-on) annually. The large blue-white shrimp are similar to the shrimp taken in the Gulf of Panama and off the west coast of Mexico. The sea bob shrimp is used locally, but most of the blue-white shrimp is processed, packed, and frozen for export to the United States.

Shrimp fishing craft early in 1956 included 20 modern-type shrimp trawlers and 6 smaller poorly-equipped vessels. Nets with 1.5-inch mesh or larger are used. About 100 fishermen are employed in the shrimp fishery. Processing facilities consist of a small freezer and cold-storage plant at Quayaquil, with a freezing capacity of 10,000 pounds a day and a storage capacity of about 40,000 pounds. A larger freezer with a 20,000-pound daily freezing capacity and a storage capacity of 125,000 pounds is in the planning stage. This project may also include a small cannery. In addition to the above facilities, a floating freezing plant with a freezing

capacity of 20,000 pounds a day and a storage capacity of 130,000 pounds was operating in the Esmeraldas and the Gulf of Quayaquil (the principal fishing ground). An additional shrimp freezership is reported to have entered the shrimp fishery about April 1956.

The shrimp fishing areas are located in the Gulf of Quayaquil, about 50 miles from the Quayaquil, and off the northern part of the Ecudoran coast between Esmeraldas and Cabo Manglares. The shrimp fishing seasons are not well defined, but the period between March and October is believed to be the most productive.

In order to increase the shrimp catch, additional capital is needed for fishing docks and machineshop facilities. Fresh-water supplies along the coast are limited and ice plants are not available within easy operating range of the shrimp vessels. Ice is plentiful in Quayaquil, about 50 miles from the Guayaquil Gulf fishing area. There are no docking facilities in the two fishing areas.

Prices are variable and are estimated to average about 45 U. S. cents a pound ex-vessel. Processing costs for washing, grading, packing, freezing, and storage average 13-15 U. S. cents a pound, and other charges for taxes and export duty about 2 cents a pound. The cost for ocean transport, insurance, customs clearances, and cartage into a United States warehouse is estimated at about 8 cents a pound. (United States Embassy dispatch from Quito, dated April 16, 1956.)

The imports of shrimp by the United States from Ecuador amounted to about 1.6 million pounds in 1955 and 3.0 million pounds in 1956. Comparing the imports with the average annual landings of 1.8 million pounds of blue-white shrimp leads to the conclusion that the shrimp fishery of Ecuador is expanding at a fairly rapid rate.

France

FISHING INDUSTRY DEVELOPMENTS: A special Committee has been set up by the French Government to study the structure of the whole fishing industry. It is hoped that some concrete suggestions will emerge including one concerning the vexing minimum net mesh question. The French want a much smaller mesh than other European countries.

The Central Fishing Committee has asked that not over 50 tons of Iceland fish a week should be sold at Boulogne. It is pointed out that the port has made tremendous efforts to refloat its industry which was almost destroyed during the war. While it has no objection to some imports, it is against uncontrolled imports from Iceland.

The French Government has agreed to make a grant of about US$1.4 million for the construction of a special research trawler to be placed at the disposal of the French Fishing Institute, the fishery periodical World Fishing of January 1957 states.

French West Africa

TUNA FISHING INDUSTRY: Number and Types of Vessels: During the tuna fishing season which started in the middle of November 1956 and will end probably in May 1957, 43 vessels were fishing, using Dakar harbor as their base. This fleet

is composed of 22 "baby clippers" from the St. Jean-de-Luz area (Basque coast of France), 19 trawlers adapted to tuna fishing from Brittany, and one large tuna clipper permanently based in Dakar harbor. This latter vessel, owned by a Frenchman, was brought to Dakar last year under the Honduran flag and has since been "naturalized" French. The owner of this tuna clipper is reported to have purchased a second such vessel from Peru and intends bringing it to Dakar. Fishing is done with rods, using live bait (sardinelle).

Landings: For the period of mid-November to December 31, 1956, approximately 2,000 metric tons of tuna were caught. Only one type of tuna is being fished, namely the albacore tuna or locally known as yellow-finned tuna (Neothunus albacora). The rather exceptionally cool weather conditions presently prevailing in the Dakar region have caused the tuna to swim further south than is normal in this season and also to swim deeper, thereby seriously affecting the fishermen's success, which was considered to be disappointing in comparison with last year.

Disposition of Catch: The whole catch is reserved for French Metropolitan canneries to which the fishing fleet and supporting vessels are chartered. With the exception of the one tuna clipper, the fishing vessels have no refrigerating equipment. As soon as they return to Dakar with their load they transfer it to a ship especially equipped for quick-freezing brought over from France under charter to French canneries. When the fish is frozen (whole), it is again transferred to one of four refrigerator ships (also operating under the same charter) for transport to France. The presence of such a ship equipped for quick-freezing was reportedly necessary since even the recently expanded refrigerating facilities at the port of Dakar were not considered sufficient during the fishing season.

Value of Catch: Since practically the whole catch is destined to Metropolitan France and since the season is not yet completed, it is difficult to determine exactly the value of the catch. The price delivered to Dakar is estimated at about US$264 a ton.

Future Plans: Although this season's catch has not yet appeared to meet the high expectations formulated last year, the general belief is that tuna fishing along the western coast of Africa would be a very worthwhile activity and that serious thought must be given to the establishment of a local cannery industry there. Two pilot plants are already functioning, but the decision to firmly establish a fish cannery industry depends on a number of important factors. (United States consular dispatch dated January 24 from Dakar.)

Iceland

FISHERIES TRENDS, DECEMBER 1956: The principal fishing season began early in December without delay, according to a dispatch (January 11, 1957) from the United States Embassy at Reykjavik. Sales of fresh fish on ice to the United Kingdom were encouraging.

The agreement on the production basis for the fisheries reached in December 1956 permitted the main fishing season for groundfish to get under way without delay and most of the trawlers and motorboats were active at that time. Because of the lifting of the British landing ban in the fall of 1956 and the continuation of the good Faxa Bay herring catches into December, there was almost no suspension of activity between the fall and winter seasons. Most trawlers and motorboats alike fished until the lay-up for Christmas or to refit for the January groundfish season.

The press and trawler owners continued to be optimistic over the progress of sales of fresh fish at good prices to England. The quota for landings at English ports in January was filled before the 11th of the month. Prices continue to range from 2-3 times those received in Iceland.

For the first time in some years the trawlers are having little difficulty in finding qualified seamen. The iced-fish trade mitigates the seaman's hard life considerably by permitting him either several days of shore leave in Iceland while the ship is making the trip to England or relatively easy shipboard duty during the voyage.

The motorboat fleet, on the contrary, still needs as many imported Faroese seamen as last year, and perhaps a few more. Two ships have already stopped at the Faeroes to pick up seamen and the total brought in is expected to be over 900.

Italy

CANNED TUNA IMPORTS, 1954-55: During 1954 and 1955, Italy's imports of canned tuna averaged about 7,736 metric tons, according to a December 20, 1956, dispatch from the United States Embassy in Rome.

Table 1 - Italy's Imports of Canned Tuna in 1954 and 1955 by Country of Origin

Country	1955	1954
	...(Metric Tons)...	
Portugal	2,459.5	3,550.9
Spain	1,742.6	1,256.6
Spanish Morocco	1,593.1	1,200.2
Libia	392.7	640.8
W. Equatorial Africa	-	-
Spanish Africa	461.0	548.6
United Kingdom	0.2	-
United States	-	0.1
Others	786.1	839.4
Total	7,435.2	8,036.6

Italian imports of canned tuna range from 7,000 to 8,000 metric tons a year (see table).

Tall cans of approximately 5 and 10 kilos (11-22 pounds) are the sizes most commonly used inasmuch as the tuna is chiefly sold in retail stores by "etti" (about 3.5 ounces), two etti or even one-half etto is the quantity generally requested by Italian consumers. Cans of 7-8 ounces are also available in the market but they are not preferred because of the expense and have, therefore, little importance in the over-all market.

In respect to the importation of fresh and frozen tuna, no official statistics are available. About 11,000 metric tons of canned tuna is estimated to have been produced in 1955 by the Italian canning industry, of which about 10,000 tons were obtained from 14,000 metric tons of imported frozen tuna and approximately 1,000 tons from the domestic catch.

There is very little interest about possible imports of canned tuna from the United States due to the present Italian import restrictions for this item from the dollar area.

Japan

BRITISH WHALING FLEET PURCHASE DISAPPROVED: The proposed purchase of the British whaling fleet (consisting of the Southern Venturer fleet) by a Japanese whaling firm has not been approved by the Japanese Fisheries Agency. The reason given for the refusal was reported to be due to possible adverse reactions by other whaling nations. The Japanese whaling fleets have been increased in the past year by the purchase of the Olympic Challenger fleet, formerly owned by a Greek shipowner, and the Abraham Larsen fleet, formerly owned by a firm in South Africa.

Another Japanese whaling firm has been negotiating for the purchase of whaling craft for sperm whaling in the Okhotsk Sea. This firm was reported to have entered into negotiations with a French firm for the purchase of a whaling factoryship registered in Panama. Later reports stated the negotiations had been fruitless and the firm is now considering purchasing a ship in Japan (United States Embassy dispatch from Tokyo).

* * * * *

CANNED CRAB MEAT PACK, 1956: The Japanese pack of king crab and kegani crab meat for 1956 (preliminary) amounted to 793,350 cases as compared with 767,906 cases (including king, hanasaki, red, kegani, and other crab meat) for 1955, according to a February 25, 1957, dispatch from the United States Embassy in Tokyo.

Exports of Japanese crab meat during 1956 (preliminary) totaled 574,000 cases as compared with 457,483 cases for 1955. Of these totals, 253,000 cases were shipped to the United States in 1956 and 230,824 cases in 1955.

There were no Government export check prices on crab meat during 1956. However, an organization established by crab meat producers, whose responsibility it is to sell all Japanese crab meat to exporters, established the following export prices for Japanese crab meat which were charged by exporters during 1956: king crab meat US$24.65 f.o.b. Japan a standard case; and kegani crab meat US$12.65 f.o.b. Japan a standard case.

Table 1 - Japanese Canned Crab Meat Pack

Product	1956	1955
	(Standard Cases[1])	
King crab meat:		
Eastern Bering Sea (Bristol Bay)	59,850	[2] 62,421
Western Bering Sea (Off Cape Olyutorskoe)	54,500	-
Okhotsk Sea	313,000	147,000
Off Hokkaido	70,000	124,603
Total	497,350	334,024
Kegani crab meat:		
Off Hokkaido	301,000	339,772
Other crab meat:		
Japan Sea	[3]	93,510
Grand Total	798,350	767,306

1/ STANDARD CASE CONSISTS OF 48 6½-OZ. CANS.
2/ INCLUDES 2,571 CASES OF RED CRAB MEAT.
3/ FIGURES NOT AVAILABLE.

Members of the crab meat industry in Japan are very guarded in their opinions concerning the outlook for 1957. Discussions between Japan and the Soviet Union concerning fishing operations in the area covered by the Soviet-Japanese Fisheries Convention are now under way and the outcome of these discussions may have an important bearing upon Japanese crabbing operations during 1957, since most of the Japanese crab catch is taken within the convention area. The Japanese do not expect a quota to be placed upon the crab in the convention area but there is a strong possibility that there will be some restrictions placed upon the type and amount of gear that can be used as well as a designation of the allowable female/male ratio per haul.

The Japanese industry expects to send one fleet to the Eastern Bering Sea (Bristol Bay) as usual and four fleets will probably be sent to the Okhotsk Sea as was done last year, if no catch restrictions are imposed as a result of the current Soviet-Japanese discussions. There is some speculation as to whether the fleet which operated in the Western Bering Sea, off Cape Olyutorskoe, will again operate in this area this year. Operators of the fleet complained that the catch last year, which was the first year of operation in this area, was very poor and that they would prefer to operate in the Okhotsk Sea during the coming season.

It is generally expected that if there are no restrictions on the catch and if the gear limitations are not excessively restrictive, the catch of king crab for 1957 will be approximately the same as during 1956. Of course if stringent restrictions are imposed upon Japanese operations, the catch will be smaller. Members of the industry expressed some pessimism over the 1957 kegani crab prospects and most observers agree that the catch will probably be below the 1956 level.

* * * * *

EXPORTS OF FISHERY PRODUCTS UP IN 1956: While the quantity of Japanese exports of fish and fish products rose 26.6 percent from 1955 to 1956, the value of those exports rose 59.5 percent. Total fish and fish products exports in 1956 amounted to 196,363 metric tons (valued at US$120.6 million) as compared with 155,108 metric tons (valued at US$75.6 million) in 1955, according to the Japanese Ministry of Finance and as reported by the United States Embassy in Tokyo in a February 12 dispatch.

Mexico

CANNED SARDINE MARKET: Four canneries, all located in or near Ensenada, Baja California, pack California sardines for consumption within Mexico. Estimated production runs about 250,000 cases annually. In addition, two small canneries in Veracruz pack Spanish mackerel and tarpon under the label of sardines, but this production is insignificant.

Local production accounts for almost all the sardines consumed within Mexico. Since 1951 exports of sardines from Mexico have been insignificant, averaging less than one-half ton a year.

Mexican consumption of sardines is estimated to be about 260,000 standard cases annually. Of this amount, about 95 percent is produced locally and 5 percent is imported. The imported pack is almost entirely from Europe and consists of sardines in olive oil. The local pack is divided about equally between tomato sauce and natural pack.

Current consumption is towards the locally-produced pack. Government policy encourages this trend. Imported sardines carry a duty of about 20 U. S. cents a pound. The Mexican pack, either natural or in tomato sauce, retails for about 2.70 pesos (22 U. S. cents) for a one-pound can. Imported $6\frac{1}{3}$-oz. Spanish sardines in olive oil retail at between 7.75-9.50 pesos (62-76 cents) a can, or approximately US$1.57-2.00 a pound.

It is not likely that any appreciable amounts of Maine sardines can be imported from the United States, a January 15, 1957, dispatch from the United States Embassy in Mexico City states. The Mexican import duty forces the retail price into the luxury category where historically the consumer preference has been for an olive-oil pack.

The Mexican pack is put up in four types of cans: one-pound oval and tall, one-half pound tall, and five-ounce tall. The imported pack is mostly $3\frac{1}{4}$ to 5 oz. flat with a small amount of $6\frac{1}{4}$ and 11 oz. flats.

Slightly more than one-half of the Mexican pack is put up in tomato sauce in one-pound ovals. The remainder of the Mexican pack is natural in five-ounce, eight-ounce, and one-pound tall cans. The imported pack is almost exclusively in olive oil, although very small amounts of sardines in mustard and tomato sauce are imported. The preference for style of pack is estimated to be: tomato sauce, 50 percent; natural, 45 percent; and olive oil, 5 percent.

The consumption of sardines in Mexico is limited practically to the middle and high income groups. Prices of canned goods, in general, are too high for the low income group. Estimates of sardine consumption by income groups are: high, 10 percent; middle, 89 percent; low, 1 percent.

The bulk of the Mexican sardine production is handled by two distributors in the Federal District who supply local retail stores and secondary distributors in the outlying territories. The sardines are customarily transported from Ensenada to Acapulco by boat and then by truck to Mexico City. Sardines are usually imported in relatively small amounts by a large number of distributors who sell either directly to retailers or to secondary distributors.

* * * * *

SHRIMP FISHERY TRENDS, FEBRUARY 1957: The Mexican shrimp catch during February is estimated to be down about 2 million pounds from the same month in 1956. The west coast catch is running about 50 percent of last year's catch and that from the east coast is higher than a year ago.

The closed season for shrimp fishing on the west coast from Mayarit north began on March 16 to last one or two months, depending on the spawning conditions of the shrimp. During this period Mexican west coast shrimp fishing will be confined to shrimp grounds off Salina Cruz in the Province of Oaxaca. The shrimp grounds off the east coast are open the year around.

There are about 60 shrimp trawlers under construction in shipyards on Mexico's east coast, states a March 11 dispatch from the U. S. Fisheries Regional Attache in Mexico.

Norway

1957 WINTER HERRING SEASON A FAILURE: The winter herring fisheries off Norway's west coast were a failure this year, especially when compared with the record catch in 1956. At the end of the season (mid-February) fishermen had landed only about 560,000 metric tons of mature herring, with a first-hand value of some Kr. 131.5 million (US$18.4 million). This season's catch was 300,000 tons less than last year, and the difference in first-hand value is estimated at Kr. 70 million (US$9.5 million), a heavy loss for the fishermen. The fleet this season suffered heavy losses of gear as a result of strong winds on the fishing grounds.

The spring herring fisheries season which officially opened February 15, is also off to a poor start, despite rather fair weather conditions. During the first five days, only 50,000 tons were landed. On top of the poor catch, fishermen get lower prices for spring herring. After the spawning is over in mid-February, the herring become leaner and less desirable than before.

The failure of the winter herring fisheries cut deliveries to reduction plants to 390,000 tons, as against 800,000 tons in 1956. The salted herring production is also substantially below the 1956 figure. The herring transport fleet, too, has been hard hit. Many vessels stayed in port 5-6 weeks without getting a single cargo.

The main fishing season for large herring ends about the middle of February.

Pakistan

NYLON NETS HELP FISHERMEN: Nylon yarn supplied to West Pakistan fishermen by the Pakistan Central Fisheries Department for knitting nets has helped to increase their fish catch. The fishermen became aware of the value of nylon netting during World War II when surplus parachute nylon fiber was used in nets. Some excellent hauls by Karachi fishermen has aroused considerable enthusiasm on the part of the fishermen for nylon nets.

With the help of the commodity aid agreement between Pakistan and the United States, officials of the Pakistan Central Fisheries Department distributed US$100,000 worth of nylon to the fishermen in 1956. Under the agreement, the United States undertook to supply the necessary foreign exchange which was lacking, for importing consumer goods or industrial raw materials, which included nylon for fishing purposes. Government officials estimate that about 1,000 fishermen have benefited from the sale of nylon. Since the supply was limited, distribution was restricted to the most deserving fishermen.

The fishermen have learned that while cotton nets last only about six months, nylon nets are good for at least three years. In addition, nylon nets are tougher and can handle bulky catches without breaking. Therefore, nylon netting in spite of the higher cost a square yard is really more economical in the long run.

As part of the commodity aid agreement between the United States and Pakistan, the nylon netting was sold to the fishermen at cost and is to be repaid in long-term installments. The money realized from the sale of the netting is to be placed in a special fund to be used for furthering the development program of Pakistan. (Pakistan Affairs, September 16, 1956.)

Portugal

CANNED FISH TRENDS, JUNE-DECEMBER 1956: Fish canning in northern Portugal improved toward the end of 1956 when catches were more abundant.

Early in the 1956 fish packing season, due to a scarcity of fish, prospects were far from bright; but from September onwards, catches became more abundant, the plants were fully occupied, and an easy outlet at remunerative prices was invariably found.

According to published statistics, canned fish exports for the first eleven months of 1956 declined by about 20 percent in quantity but only by about 8 percent in value. The natural inference is that although prices increased, industrial activity must have suffered considerably. The latter aspect, however, will probably show up differently when figures for the complete year are obtainable. Sardine canning is a seasonal occupation, which roughly coincides with the second half of the year. The principal decline in exports took place in the early part of 1956, during the "close"

of the season, owing to the low stocks left over from the 1955 packing season. At present, stocks held by packers are only moderate and prices remain firm, reports a February 12 dispatch from the United States Embassy in Lisbon.

The industry appears to be in fair financial condition, and 1956 may well rank as one of its good trading years.

* * * * *

CANNED FISH EXPORTS, JANUARY-SEPTEMBER 1956: For the first nine months of 1956, canned fish exports amounted to 29,255 tons (1,539,300 cases), valued at US$17.0 million, as compared with 42,769 tons, valued at $21.7 million, for the same period in 1955. Sardines in olive oil exported during the first nine months of 1956 were down 12,679 tons from the similar period in 1955.

Table 1 - Portuguese Canned Fish Exports, January-September 1956

Species	1956 January-September	
	Metric Tons	US$ 1,000
Sardines in olive oil	21,283	11,451
Sardinelike fish in olive oil	3,060	2,580
Sardines & sardinelike fish in brine	711	149
Tuna & tunalike in olive oil	1,373	1,111
Tuna & tunalike in brine	279	163
Mackerel in olive oil	2,173	1,331
Other fish	376	186
Total	29,255	16,971

For January-September 1956, the leading canned fish buyer was Germany with 4,734 tons (valued at US$2.6 million), followed by the United Kingdom with 4,241 tons (valued at US$2.3 million), Italy with 3,942 tons (valued at US$2.4 million), and the United States with 3,001 tons (valued at US$2.2). Exports to the United States consisted of 1,407 tons of sardines, 1,250 tons of anchovies, and 12 tons of tuna. (Conservas de Peixe, November 1956.)

* * * * *

CANNED FISH PACK, JANUARY-SEPTEMBER 1956: The total pack of canned fish for January-September 1956 amounted to 32,164 tons as compared with 26,198 tons in a similar period of 1955. Canned sardines in oil (13,748 tons) accounted for 43 percent of the January-September 1956 total canned fish pack, but in the same period in 1955 they accounted for 70 percent (18,214 tons). The pack of sardinelike fish in oil for the first nine months in 1956 of 10,495 tons is much higher than the 2,672 tons packed during the same period in 1955.

Table 1 - Canned Fish Pack, January-September 1956

Product	Net Weight	Canners' Value
	Metric Tons	US$ 1,000
In Olive Oil:		
Sardines	13,748	8,267
Sardinelike fish	10,495	5,353
Tuna	1,514	1,184
Other species (incl. shellfish)	555	374
In Brine:		
Sardinelike fish	4,414	1,116
Other species	1,438	262
Total	32,164	16,556

NOTE: VALUES CONVERTED TO US$ EQUIVALENT: 28.75 ESCUDOS EQUAL US$1.

The Portuguese pack of canned sardines in oil during the month of September 1956 (6,710 tons) was almost double the 3,511 tons packed during the previous month and higher by 1,913 tons than the 4,797 tons packed in September 1955. The pack of all canned fish in September 1956 amounted to 11,823 tons, the January 1957 Conservas de Peixe reports.

Prices to the canners for canned sardines in oil during January-September 1956 were higher by about 14 percent as compared with the similar period in 1955.

* * * * *

FISHERIES TRENDS, AUGUST-SEPTEMBER 1956: Sardine Fishing: The Portuguese sardine catch during September 1956 increased to 19,883 metric tons (ex-vessel value US$1,761,078), or 8,472 tons above the catch of 11,411 tons for the previous month. The September sardine catch was good and exceeded that for September 1955 by 3,907 tons. By the end of September the sardine fishery was beginning to improve as compared with the first eight months during which catches were well below the first eight months of 1955.

Sardines purchased by the packing centers during August amounted to 5,167 tons (value US$667,000), and 11,004 tons (value US$1,283,000) in September. During August 1955 the canners purchased 8,356 tons (valued at US$1,102,000), and 8,889 tons (valued at US$1,015,000) in September. The balance of the sardine catch in both months entered the fresh fish market.

The principal port of landing for sardines in August and September was Matosinhos with between 51-54 percent of the catch, followed by Setubel and Lisbon.

Other Fishing: The August 1956 landings of fish other than sardines totaled 11,790 metric tons (valued at US$1,221,627 ex-vessel) and consisted of 2,003 tons of tuna, 5,578 tons of mackerel, 4,140 tons of chinchard, 15 tons of bonito, and 54 tons of anchovy.

In September 1956, landings of fish other than sardines totaled 2,314 metric tons (valued at US$127,097 ex-vessel) and consisted of 2,254 tons of chinchard, and 60 tons of anchovy (Conservas de Peixe, October and November 1956).

Spain

VIGO FISHERIES TRENDS, NOVEMBER 1956: Fishing: Landings at Vigo during November 1956 totaled 10.9 million pounds valued at about US$963,970 ex-vessel. The November catches were about 29 percent lower than those of the previous month and about 12 percent below the November 1955 catches. However, November 1956 was considered a fair month by the fishing industry, states a December 6 dispatch from the United States Consul in Vigo.

An increase in average prices for fresh fish is one more indication of the higher cost of living. Operating expenses of the fishing fleets and distributors went up as the result of the new official wage rates. It is said that the new wage scales represent an increase of about 30 percent for the fishing industry.

Small and some medium-size sardines were the principal catches during November a total of 3.4 million pounds, followed by horse mackerel (Trachurus trachurus) with 1.9 million pounds. Albacore tuna catches were insignificant during November--as the season was over. One other species of commercial importance in November was the "castaneta" or dollarfish.

A number of fishing vessels operate out of small ports in the Province of Lugo, but part of the catches are landed at ports in Asturias, especially their albacore catches which amounted to 2.9 million pounds during the June to November season.

Fish Canning: The fish canneries in the Vigo area purchased 2.2 million pounds of fresh fish during the month as compared with 4.9 million pounds for the previous month and 3.7 million pounds in November 1955. Most canneries were operating during November 1956, but on a reduced scale as compared with the previous month.

Sardines and clams were the principal species available for packing. However, during the latter part of November, the canneries commenced to purchase a portion of the heavy catches of horse mackerel. Fishing interests feel certain that the sardine is returning to Spanish coastal waters due to the presence of small fish in the catches. The present sardine catches range from 14-18 fish to a pound as compared with 11-13 a pound for the large sardine taken in past years.

The fish canneries continue to be deeply concerned over the tinplate situation. Some of the leading canneries (about 14 in the Vigo area) make their own cans but have lighographing done outside. It is reported that the imports of tinplate amounted to 8,000 cases weighing approximately 1.7 million pounds during November. However, a portion of this quantity reached other parts of Spain, but a fair share was made available to the canneries in the Vigo area. The supply of tinplate is considered inadequate by the canneries.

Olive oil for fish packing is usually scarce and often difficult to obtain. Although the official price is 18.6 U. S. cents a pound, there is an open market and the canneries usually find it necessary to pay higher prices. It is the general opinion, however, that there will be no serious shortage of olive oil and the prospects are good for an adequate supply during 1957.

For some cannery workers, there is an increase of 100 percent in wages. Women packers formerly earning around US$0.51 a day are now being paid approximately US$1.03 a day. It is believed that the price of canned fish will be increased about 20 percent in some manner as the result of the new wage scales. Domestic sales have been fair but slowed up slightly around the end of November.

Exports of canned fish also slowed up, due to the price situation. The canneries now feel that the Spanish Government should allow a higher rate of exchange (presently 33,385 pesetas to the U. S. dollar) on exports or increase their percentage of foreign exchange (presently 20 percent) which is allowed for the payment of approved imports.

NOTE: VALUES CONVERTED TO US$ EQUIVALENT AT RATE OF 1 PESETA EQUALS US$0.0257.

Sweden

NEW REGULATIONS FOR BALTIC FISHING: Swedish government regulations (effective February 1, 1957) for the protection of certain species of fish in the Baltic have removed the prohibition concerning plaice fishing during February and March, states a January 29 dispatch from the United States Consul at Göteborg.

Under the new regulations the minimum sizes for plaice have been changed from 18-24 centimeters (7.1-9.4 inches) to 26 centimeters (10.2 inches) and for founders from 18-22 centimeters (7.1-8.7 inches) to 20 centimeters (7.9 inches). For cod there is a minimum size of 30 centimeters (11.8 inches) which is the same as is permitted in the North Sea and the Öresund.

The minimum size in the meshes of trawls, seines, and similar fishing equipment has been increased from 6.5 to 7.0 centimeters (from 2.6 to 2.8 inches) for the catching of mackerel, herring, eel, shrimp, and a few other types of fish, in the Baltic, the Öresund, and the Belts. The regulation on mesh size become effective

May 1, 1957. However, fishing gear now permitted may be used until January 1, 1958, provided the cod ends conform to the new regulations as to the mesh size.

Thailand

JOINT THAILAND-JAPANESE FISHING BASE PROPOSED: According to press reports from Thailand, a new fishing base will be constructed on Terutea Island, off the western coast of South Thailand, with the help of the Japanese Overseas Fishery Cooperative Association. A group of Japanese headed by the Chairman of the Cooperative Association were expected to meet with Thai Government officials in Bangkok on February 12. The group was to survey the possibilities of developing new fishery resources, construction of a fishing base to accommodate 100 fishing vessels, and facilities for cold storage, processing, and canning.

Turkey

CANNED MACKEREL MARKET: The pack of canned mackerel in Turkey is carried on in privately-owned factories located in Istanbul, Gelibolu, Ergli, Izmir, and Canakkale.

Consumption of both fresh and canned mackerel has been increasing steadily over the past ten years. Most of the pack is natural, but some also contains olive oil. Practically all of the cans used are oval. The retail price varies considerably depending upon the supplier, Based on a recent price survey, the price in Ankara varied from TL1.60 to TL2.50 (57-88 U. S. cents) for cans varying from 95-150 grams (3.4-5.3 ounces) net. The retail price of fresh mackerel varies with the season. Prices this winter in Istanbul varied from TL10.50 to TL16.50 per kilo (US$1.69-2.65 a pound).

There have been no imports of canned mackerel into Turkey.

Turkey exports fresh and salted mackerel to Greece, Italy, Bulgaria, the United States, and Yugoslavia. In 1954, the last year for which data are available, Turkey exported a total of 9,471,902 pounds of fresh and 4,149,552 pounds of salted mackerel.

Because of the shortage of foreign exchange, all imports into Turkey are under license. Only those commodities that are absolutely essential to the economy of the country are granted licenses. Because of the size of the domestic fishing industry and the low priority placed upon food items, there appears to be no potential market for canned mackerel in Turkey in the near future, states a January 16, 1957, dispatch from the United States Embassy in Ankara.

NOTE: VALUES CONVERTED AT THE RATE OF US$1 EQUALS 2.80 LIRAS.

U. S. S. R.

A MECHANICAL METHOD OF DRESSING COD ABOARD FISHING VESSELS: The cutting of cod by hand aboard fish vessels requires a great deal of room as well as labor and often consumes time that should be spent in fishing. Therefore, advantages of mechanization should be considered, points out an article in the November 1956 issue of the French periodical La Peche Maritime La Peche Fluviale, and La Pisciculture.

The method most commonly used at sea to dress fish for shipping as fresh or salted is shown in figure 1. The head is cut off with a special knife prior to gutting the fish In the second method, the muscles of the fish are cut parallel to the spinal column to the end of the first anal fin. Using this method, two-man teams can process 20 to 25 fish a minute When the catch is heavy, the entire crew may be commandeered for this operation and thus slow up or stop the setting of the net.

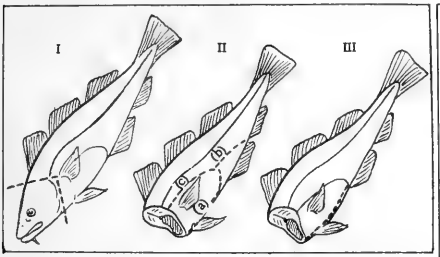


FIG. 1 - I. REMOVAL OF THE HEAD. II. CUTTING FOR SALTING: (A) THE STOMACH CUT EXTENDING TO THE ANAL ORIFICE; (B) THE MUSCLE CUT THE LENGTH OF THE FIRST ANAL FIN; (C) THE SWIM BLADDER CUT. III. CUTTING FOR DISTRIBUTION AS FRESH FISH.

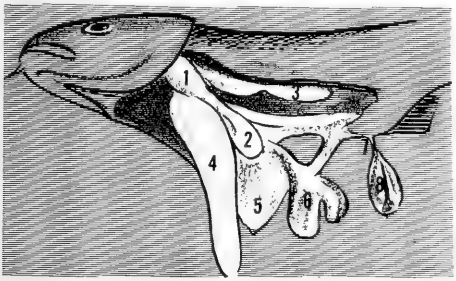


FIG. 2 - DISPOSITION OF THE INTERNAL ORGANS OF THE COD. 1. ESOPHAGUS, 2. STOMACH, 3. SWIM BLADDER, 4. LIVER, 5. PYLORUS, 6. INTESTINE, 7. ANAL ORIFICE, 8. ROE.

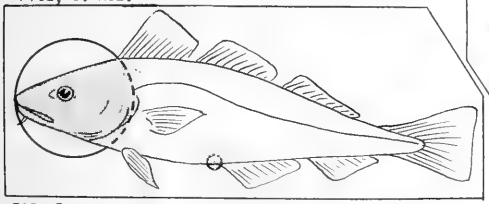


FIG. 3 - SCHEMATIC DIAGRAM SHOWING THE CUTTING OF COD BY THE NEW METHOD.

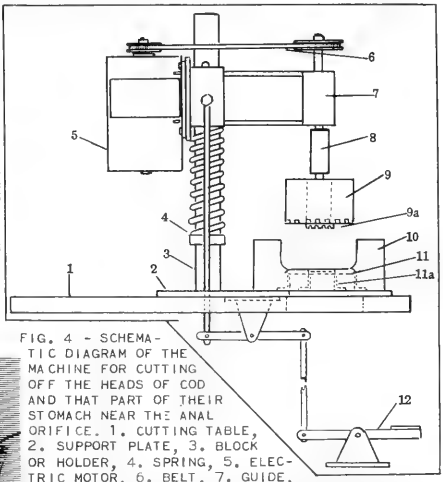


FIG. 4 - SCHEMATIC DIAGRAM OF THE MACHINE FOR CUTTING OFF THE HEADS OF COD AND THAT PART OF THEIR STOMACH NEAR THE ANAL ORIFICE. 1. CUTTING TABLE, 2. SUPPORT PLATE, 3. BLOCK OR HOLDER, 4. SPRING, 5. ELECTRIC MOTOR, 6. BELT, 7. GUIDE, 8. SHAFT, 9 & 9A. REMOVABLE CIRCULAR KNIVES FOR CUTTING THE HEAD OR STOMACH AROUND THE ANAL ORIFICE, 10. SUPPORT PLATE FOR FISH, 11 & 11A. FIXED KNIVES, 12. PEDAL.

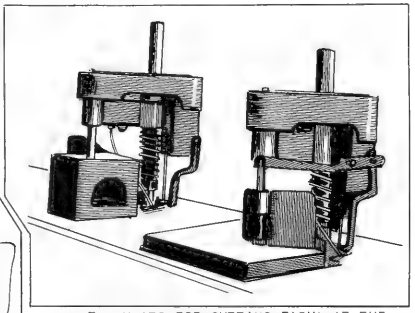


FIG. 5 - UNITS FOR CUTTING FISH: AT THE RIGHT THE MACHINE FOR CUTTING THE ANAL PORTION; AT THE LEFT, THE MACHINE FOR CUTTING THE HEAD.

A study of cod has shown that the viscera are attached at two points--near the head in the ventral cavity and near the anal orifice (figure 2). This anatomical knowledge has been utilized by the trawler Dniepr to improve the manual cutting of fish--the procedure developed was in fact the basis of the mechanical method

The device used for cutting cod is analogous to a boring machine where the bit has been replaced by a circular knife. There are two units; the first has a small-diameter knife and cuts the fish at the anal orifice. The second has a large-diameter knife and chops off the head and its connections. The viscera are of course now easily taken out. A schematic diagram of this mechanical cutting is shown in figure 3. One of the advantages of the system is that it does not depend on the size of the cod

With the devices described, a four-man team can process a vessel's fish, including liver sorting. After processing, the cod are washed and placed in a refrigerated hold of $+7^{\circ}$ C. (45° F.) and 40 percent ice. They are placed back up to prevent the accumulation of water in the ventral cavity.

After an examination of the results, the aforementioned method of cutting was recommended by the Fishing Regulation Board of Murmansk. Fish thus processed can be either smoked or salted

NOTE: TRANSLATED FROM FRENCH BY ROBERT DUCKWORTH.

United Kingdom

SILVER COD AWARD MADE FOR 1956: The British Trawlers' Federation "Silver Cod" was awarded on March 19 to the Captain and crew of the Hull deep-water trawler Lancella The award was first made in 1954 by the Trawler's Federation as a means of encouraging the Captains and crews to land more fish. The guest of honor at the dinner and presentation of the Silver Cod award was the Duke of Edinburgh.

SILVER COD TROPHY

To win the Silver Cod the Lancella landed 2,871 metric tons of fish made in 18 trips mostly to Bear Island Grounds, averaging 18 days per trip. The fish were sold ex-dock for close to 5d. (about 5.8 U. S. cents a pound). Second honors went to the Arctic Warrior with close to 2,832 tons.

The Silver Cod trophy has aroused great interest and caused strong competition among the Captains and crews of the British distant-water fleet. Previous winners were the Arctic Warrior in 1954, and the Kirkella in 1955. The winning Captain has his name inscribed on the trophy (Fishing News, February 15, 1957).

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, JULY 1956, P. 89.

Yugoslavia

CANNED MACKEREL AND PILCHARD MARKET: Landings of mackerel and pilchard in Yugoslavia totaled 8,802 metric tons during 1955, or about 65 percent of the total catch of sea fish (table 1). The pack of canned mackerel and pilchard amounted to 4,298 tons in 1955 as compared with 5,016 tons in 1954. Yugoslav exports a major part of its production of mackerel and pilchards.

Table 1 - Yugoslav's Landings and Pack of Mackerel and Pilchards, 1953-55

Landings			Pack		
1955	1954	1953	1955	1954	1953
(Metric Tons)					
8,802	10,928	13,623	4,298	5,016	4,542

Exports of canned mackerel during 1955 totaled approximately 2,063 tons (excluding tuna) as compared with 918 tons in 1954 (table 2). Exports of canned pilchards showed a considerable decrease in 1955 with a total of 1,645 tons as compared with 2,623 tons in 1954.

Table 2 - Yugoslav's Exports of Canned Mackerel and Pilchards, January-June 1956 and Years 1953-55

Product	January-June 1956	1955	1954	1953
	..... (Metric Tons)			
Mackerel 1/	347	2,427	1,080	605
Pilchards	1,694	1,645	2,623	1,635

1/ Almost 15 percent of mackerel exports is actually canned tins.

Marketing prospects for United States canned mackerel in Yugoslavia are not promising, states a dispatch (January 11) from the United States Embassy in Belgrade. Exports of canned fish are of considerable importance to the Yugoslav economy and exporters are doing their best to place more of the Yugoslav fish product on the world market. Furthermore, Yugoslavia is subject to a chronic dollar shortage and the majority of available dollar exchange is utilized for the purchase of machinery and other material essential to Yugoslav industry and for basic foodstuffs, such as wheat, which is the major commodity in the United States aid program to this country. There are no imports of canned mackerel or pilchards into Yugoslavia.

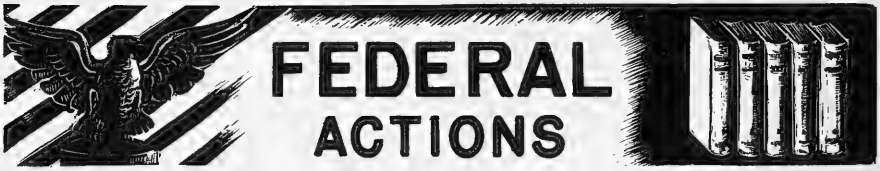
Table 3 - Retail Prices for Canned Mackerel and Pilchards in Yugoslavia

Size of Can	Price per Can	
	Dinars	U. S. Cents
3.5 ounces	80-130	13-21
7.0 ounces	180-220	28-35
8.8 ounces	250-280	40-44
17.6 ounces	420-500	66-79
2.2 pounds	800-900	$1.27-1.52

About 50 percent of the consumers prefer the 3.5-ounce can, 15 percent the 7-ounce can, 15 percent the 8.8-ounce can, 8 percent the 17.6-ounce can, and 12 percent the 2.2-pound can. About 35 percent of the consumers prefer pilchards and mackerel packed with olive oil, 50 percent with seed oil, 10 percent with tomato sauce, and 5 percent in brine.

NOTE: VALUES CONVERTED AT THE SETTLEMENT RATE OF 632 DINARS EQUAL US$1.

FISH CONSUMPTION: Fresh and canned fish consumption in Yugoslavia varied from 7,817 metric tons in 1955, to 8,386 tons in 1954, and 6,454 tons in 1953. In 1955 about 1,769 tons of the consumption consisted of canned, dried, and smoked fish. The average annual per capita consumption of canned fish in Yugoslavia was about 330 grams (11.6 pounds) in 1954/55 and 300 grams (10.6 pounds in 1953/54.)



Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

ALASKA'S COMMERCIAL FISHING REGULATIONS FOR 1957

Changes in the Alaska commercial fishing regulations to be effective during the 1957 season were made public March 6 by Assistant Secretary of the Interior Ross L. Leffler. These regulations are in effect 30 days after publication in the Federal Register.

The area registration provisions, instituted in 1956, which prohibited movement of salmon fishing boats and nets from one area to another, proved effective and will be continued under the new regulations.

Highlights of the regulations as considered by areas shows that the fishing-gear timetable of control used in Bristol Bay in 1956 will be continued and expanded. One new feature in Bristol Bay is that the picking of salmon from gill nets is deemed to be a part of the fishing operation and must be performed by the fisherman to whom the gear is legally registered.

In the Alaska Peninsula area, gear-timetable control will be applied in the Bear River district. Only the fishing time to be allowed at the opening of the season will be affected. Weekly adjustments are not provided for. A relaxation in the northeastern district will permit purse seines to be used as far east as the entrance to Port Heiden, after July 10. The July 10 date has been specified to insure that Bristol Bay red salmon runs will have passed that area before the season opens. On the south side of the Alaska Peninsula the pink salmon season will close August 2 because of anticipated smaller runs of pink salmon.

In the Chignik area the closed waters at the inner end of the lagoon have been increased to prevent overfishing there at low tide. To reduce the fishing effort further, all traps in the area have been closed for 1957, and the weekly closed period has been split so as to provide more even escapement of salmon to the spawning grounds.

The main change in the Kodiak area is the elimination of the midseason closure during the pink salmon season. This relaxation will be offset by an increase in the weekly closed periods, designed to provide more even distribution of escapements. Minor changes include the creation of the Olga-Moser Bay section of the Alitak district so that protection to the red runs there can be applied without affecting the pink salmon runs in Alitak Bay, and the creation of the Sturgeon River district to permit harvesting chum runs to the Sturgeon River without affecting the runs of red salmon to Red River.

In Cook Inlet, gear-timetable control during the red salmon season from July 1 to July 27 will be applied. It will be of the type designed for the Bear River district in the Alaska Peninsula. As in Bristol Bay, during the July 1-July 27 season gill nets will be required to be picked by the crews to whom registered. In addition, the regulations have been rewritten to close areas where set nets are now used in order to prevent any expansion in the use of that type of gear.

In Prince William Sound the season will not close until August 10. However, in order to limit the fishery, in view of the mediocre runs expected, fishing will be controlled by reductions in gear. Essentially, gear reduction in 1957 is to be accomplished by voluntary closure of all but 11 of the 42 traps; increases in closed

areas in a number of bays; and gear-timetable control of purse seines based on 135 seines. The closing date of the seasons will be advanced according to the timetable if there is any increase in seines above that number.

The only significant change for the Yakutat area is an increase in the weekly closed periods prior to August 11 to afford greater protection to the red salmon runs because of a continuing increase in the amount of gear in that area.

Southeastern Alaska will have essentially the same pink salmon conservation program which has been in effect since 1954 and has shown promising results.

Two major changes were made in the gill-net fisheries. The first is to provide for limited use of gill nets at Lake, Salmon, and Red Bays to harvest the red salmon runs which have not been tapped in recent years.

Burroughs Bay will be closed to fishing this year. This fishery has been criticized because king salmon taken there are consistently of poor quality and it is felt that these mature fish should be protected for escapement purposes. The waters of Portland Canal have been opened to the use of gill nets. The International Boundary between Alaska and Canada runs down the middle of Portland Canal and on the Canadian side of the line the use of gill nets is permitted. The regulations, as written, will now provide identical seasons on both sides.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, MAY 1956, P. 65.

Department of Health, Education, and Welfare

FOOD AND DRUG ADMINISTRATION

ORDER ON CANNED TUNA IDENTITY AND FILL-OF-CONTAINER STANDARD ISSUED:

An order acting on the proposal to adopt definition and standards of fill of container for canned tuna was published in the Federal Register of February 13, 1957, by the Food and Drug Administration of the U. S. Department of Health, Education, and Welfare.

The standard designates the various species of fish which may be called tuna; defines the styles of pack and requires uniform names for these, namely, "solid" or "solid pack," "chunks" or "chunk style," "flake" or "flakes," and "grated," and requires an accurate labeling statement as to the color of the tuna, and provides for differentiating between the shades of color by use of a special optical instrument so that there need be no reliance on opinion as to the color. Under the standard, tuna is to be labeled as "white," "light," "dark," and "blended."

The name of the packing medium is required to be shown on the label. The permitted liquids are vegetable oils, olive oil, and water. Optional use of seasoning ingredients with appropriate label declaration is permitted.

The standards spell out the fill of container for each size and for each type of canned tuna. Compliance with the requirements for fill of container are determined by removing the contents of a can, pressing out the oil and watery juices, and weighing the press cake consisting of cooked fish or relatively uniform composition.

The definition and standard of identity promulgated by this order shall become effective on February 13, 1958, and the standard of fill of container shall become effective 90 days after February 13, 1957, except in each case any provisions that may be stayed by the filing of exceptions thereto. Notice of the filing of objections, or lack thereof, will be announced by publication in the Federal Register.

In the meantime the Food and Drug Administration has received a request for a 60-day extension of time in which to file objections to the order promulgating a definition and standard of identity and standards of fill of container for canned tuna. The extension was granted by the Administration, and the March 7 Federal Register states that the time for filing objections is extended until May 13, 1957.

TITLE 21—FOOD AND DRUGS

Chapter I—Food and Drug Administration, Department of Health, Education, and Welfare

PART 37—FISH; DEFINITIONS AND STANDARDS OF IDENTITY; STANDARDS OF FILL OF CONTAINER

ORDER ACTING ON PROPOSAL TO ADOPT DEFINITION AND STANDARD OF IDENTITY AND STANDARDS OF FILL OF CONTAINER FOR CANNED TUNA FISH

In the matter of adopting a definition and standard of identity and standards of fill of container for canned tuna fish:

A notice of proposed rule making was published in the FEDERAL REGISTER of August 28, 1956 (21 F. R. 6492), setting forth a proposal to adopt a definition and standard of identity and standards of fill of container for canned tuna fish. Comments and suggestions were received from a number of interested persons. After due consideration of the comments and suggestions received, the information furnished by the petitioner, and other relevant and reliable information, it is concluded that it will promote honesty and fair dealing in the interest of consumers to adopt, with minor modifications, the proposed definitions and standards of identity and fill of container for canned tuna fish published in the FEDERAL REGISTER of August 28, 1956 (supra).

Therefore, pursuant to the authority vested in the Secretary of Health, Education, and Welfare by the Federal Food, Drug, and Cosmetic Act (secs. 401, 701, 52 Stat. 1046, 1055 as amended 70 Stat. 919; 21 U. S. C. 341, 371) and delegated to the Commissioner of Food and Drugs by the Secretary (20 F. R. 1996; 21 F. R. 6581): *It is ordered*, That the following new part be added to Chapter I.

Sec.

37.1 Canned tuna; definition and standard of identity; label statement of optional ingredients.

37.3 Canned tuna; fill of container; label statement of substandard fill.

AUTHORITY: §§ 37.1 and 37.3 issued under sec. 701, 52 Stat. 1055 as amended; 21 U. S. C. 371. Interpret or apply sec. 401, 52 Stat. 1046; 21 U. S. C. 341.

§ 37.1 *Canned tuna; definition and standard of identity; label statement of optional ingredients.* (a) Canned tuna is the food consisting of processed flesh of fish of the species enumerated in paragraph (b) of this section, prepared in one of the optional forms of pack specified in paragraph (c) of this section, conforming to one of the color designations specified in paragraph (d) of this section, in one of the optional packing media specified in paragraph (e) of this section, and may contain one or more of the seasonings and flavorings specified in paragraph (f) of this section. It is packed in hermetically sealed containers and so processed by heat as to prevent spoilage. It is labeled in accordance with the provisions of paragraph (h) of this section.

(b) The fish included in the class known as tuna fish are:

Thunnus thynnus	Bluefin tuna.[1]
Thunnus maccoyii	Southern bluefin tuna.[1]
Thunnus orientalis	Oriental tuna.[2]
Thunnus germo	Albacore.[3]
Parathunnus mebachi	Big-eyed tuna.[3]
Neothunnus macropterus.	Yellowfin tuna.[3]
Neothunnus rarus	Northern bluefin tuna.[3]
Katsuwonus pelamis	Skipjack.[3]
Euthynnus alletteratus	Little tunny.[3]
Euthynnus lineatus	Little tunny.[3]
Euthynnus yaito	Kawakawa.[4]

[1] "A Comparison of the Bluefin Tunas, Genus Thunnus, from New England, Australia, and California," by H. C. Godsil and Edwin K. Holmberg, State of California, Department of Natural Resources, Division of Fish and Game, Bureau of Marine Fisheries, Fish Bulletin No. 77 (1950).

[2] "Contributions to the Comparative Study of the So-called Scombroid Fishes," by Kamakichi Kishinouye, Journal of the College of Agriculture, Imperial University of Tokyo, Vol. VIII, No. 3 (1923).

[3] "A Systematic Study of the Pacific Tunas," by H. C. Godsil and Robert D. Byers, State of California, Department of Natural Resources, Division of Fish and Game, Bureau of Marine Fisheries, Fish Bulletin No. 60 (1944).

[4] "A Descriptive Study of Certain Tuna-Like Fishes," by H. C. Godsil, State of California, Department of Fish and Game, Fish Bulletin No. 97.

The description of each species will be found in the text to which reference is made.

(c) The optional forms of processed tuna consist of loins and other striated muscular tissue of the fish. The loin is the longitudinal quarter of the great lateral muscle freed from skin, scales, visible blood clots, bones, gills, viscera, and from the nonstriated part of such muscle, which part (known anatomically as the median superficial muscle), is highly vascular in structure, dark in color because of retained blood, and granular in form. Canned tuna is prepared in one of the following forms of pack, the identity of which is determined in accordance with the methods prescribed in § 37.3 (b).

(1) Solid or solid pack consists of loins freed from any surface tissue discolored by diffused hemolyzed blood, cut in transverse segments to which no free fragments are added. In containers of 1 pound or less of net contents, such segments are cut in lengths suitable for packing in one layer. In containers of more than 1 pound net contents, such segments may be cut in lengths suitable for packing in one or more layers of equal thickness. Segments are placed in the can with the planes of their transverse cut ends parallel to the ends of the can. A piece of a segment may be added if necessary to fill a container. The proportion of free flakes broken from loins in the canning operation shall not exceed 18 percent.

(2) Chunk, chunks, chunk style consists of a mixture of pieces of tuna in which the original muscle structure is retained. The pieces may vary in size, but not less than 50 percent of the weight of the pressed contents of a container is retained on a ½-inch-mesh screen.

(3) Flake or flakes consist of a mixture of pieces of tuna in which more than 50 percent of the weight of the pressed contents of the container will pass through a ½-inch-mesh screen, but in which the muscular structure of the flesh is retained.

(4) Grated consists of a mixture of particles of tuna that have been reduced to uniform size, that will pass through a ½-inch-mesh screen, and in which the particles are discrete and do not comprise a paste.

(5) Any of the specified forms of pack of canned tuna may be smoked. Canned smoked tuna shall be labeled in accordance with the provisions of paragraph (h) (5) of this section.

(d) Canned tuna, in any of the forms of pack specified in paragraph (c) of this section, falls within one of the following color designations, measured by visual comparison with matte surface neutral reflectance standards corresponding to the specified Munsell units of value, determined in accordance with paragraph (g) of this section.

(1) *White.* This color designation is limited to the species Thunnus germo (albacore), and is not darker than Munsell value 6.3.

(2) *Light.* This color designation includes any tuna not darker than Munsell value 5.3.

(3) *Dark.* This color designation includes all tuna darker than Munsell value 5.3.

(4) *Blended.* This color designation may be applied only to tuna flakes specified in paragraph (c) (3) of this section, consisting of a mixture of tuna flakes of which not less than 20 percent by weight meet the color standard for either white tuna or light tuna, and the remainder of which fall within the color standard for dark tuna. The color designation for blended tuna is determined in accordance with paragraph (g) of this section.

(e) Canned tuna is packed in one of the following optional packing media:

(1) Any edible vegetable oil other than olive oil, or any mixture of such oils not containing olive oil.

(2) Olive oil.

(3) Water.

(f) Canned tuna may be seasoned or flavored with one or more of the following:

(1) Salt.

(2) Purified monosodium glutamate.

(3) Hydrolyzed protein.

(4) Hydrolyzed protein with reduced monosodium glutamate content.

(5) Spices or spice oils or spice extracts.

(6) Vegetable broth in an amount not in excess of 5 percent of the volume capacity of the container, such broth to consist of a minimum of 0.5 percent by weight of vegetable extractives and to be prepared from two or more of the following vegetables: Beans, cabbage, carrots, celery, garlic, onions, parsley, peas, potatoes, green bell peppers, bell peppers, spinach, and tomatoes.

(7) Garlic.

(g) For determination of the color designations specified in paragraph (d) of this section, the following method shall be used: Recombine the separations of pressed cake resulting from the method prescribed in § 37.3 (b). Pass the combined portions through a sieve fitted with woven-wire cloth of ¼-inch mesh which complies with the specifications for such wire cloth set forth in "Standard Specifications for Sieves," published March 1, 1940, in L. C. 584 of the U. S. Department of Commerce, National Bureau of Standards. Mix the sieved material and place a sufficient quantity into a 307 x 113 size container (bearing a top seam and having a false bottom approximately ½-inch deep and painted flat black inside and outside)

so that after tamping and smoothing the surface of the sample the material will be 1/8-inch to 1/4-inch below the top of the container. Within 10 minutes after sieving through the 1/4-inch mesh woven-wire cloth, determine the Munsell value of sample surface.

(1) Determine the Munsell value of the sample surface so prepared. The following method may be used, employing an optical comparator, consisting of a lens and prism system which brings two beams of light, reflected from equal areas of sample surface and standard surface, respectively, together, within an eyepiece, so as to show an equally divided optical field. The scanned areas of sample and standard surface are not smaller than 2 square inches. Light reaching the eye is rendered sufficiently diffuse, by design of eyepiece and comparator, so that detail of the sample surface will remain undefined, to a degree such as to avoid visual confusion in observation of a match of over-all intensity of reflected light. The eyepiece contains a color filter centering at a wavelength between 550 mμ and 560 mμ. The filter does not pass appreciable visible radiation of wavelengths below 540 mμ or above 570 mμ. The passed wavelength band is of a monochromaticity sufficient to cause a sample and a neutral standard of equal reflectance to appear of the same hue. The comparator is rigidly mounted on a vertical stand attached to a base in which arrangement is provided for securely and accurately positioning two cans of size 307 x 113 in the two fields of view. Mounted on the base are two shaded lamps, which direct the center of their beams of light at about a 45° angle to the plane of the sample and standard surfaces. The lamps are so positioned that light from one bears mainly upon the sample surface and light from the other mainly on the standard surface, and are so placed in relation to sample and standard that no shadows, as from the can rims, appear in the fields of view. The lamps are strong enough to furnish adequate and convenient illumination through eyepiece and filter. Means is provided to alter the light intensity of one lamp in relation to the other, as may conveniently be achieved by using a 100-watt tungsten filament bulb in one lamp and using, in the other, a similar 150-watt bulb connected with the power source through a suitable rheostat. The stand is equipped with nonglossy black curtains on the side of the observer, to exclude variation in extraneous light reflected from the person of the observer.

(2) To adjust the comparator, place a pair of matte surface standards of Munsell value 5.3, mounted as described in subparagraph (4) of this paragraph, in position in the comparator base, and adjust the intensity of the variable lamp until the two halves of the optical field, viewed through the eyepiece, are of equal brightness. Then remove one of the standards and replace it with the prepared sample. Without altering any other adjustment, observe through the eyepiece whether the sample appears lighter or darker than the standard. In case of examination of albacore designated "white," conduct the procedure using standards of Munsell value 6.3.

(3) The standards with which comparisons are made are essentially neutral matte-finish standards, equivalent in luminous reflectance of light of 555 mμ wavelength to 33.7 percent of the luminous reflectance of magnesium oxide (for Munsell value 6.3) and 22.6 percent of the luminous reflectance of magnesium oxide (for Munsell value 5.3), as given by the relationship between Munsell value and luminous reflectance derived by a subcommittee of the Optical Society of America and published in the "Journal of the Optical Society of America," Volume 33, page 406 (1943).

(4) These standards shall be cut in circles 3 1/4 inches in diameter and shall be mounted in 307 x 113 size containers, bearing a top seam and painted flat black inside and outside, so that the surfaces of the standards are 3/16 inch below the top of the containers in which they are mounted.

(5) In the case of blended tuna, the foregoing method shall be varied by first separating the tuna flakes of the two different colors before passing them through the 1/4-inch mesh sieve, then proceeding with each portion separately for the determination of its color value, employing, if necessary, a sample container with false bottom greater than 1/2 inch deep.

(h) (1) The specified names of the canned tuna for which definitions and standards of identity are prescribed by this section, except where water is the packing medium or where the tuna is smoked, are formed by combining the designation of form of pack with the color designation of the tuna; for example, "Solid pack white tuna," "Grated dark tuna," etc. In the case of blended tuna, there shall be used both applicable color designations of the blended flakes, in precedence determined in accordance with the predominating portion found in the container; for example, "Blended white and dark tuna flakes," "Blended dark and light tuna flakes."

(2) The specified name of canned tuna when water is used as the packing medium is formed as described in subparagraph (1) of this paragraph, followed by the words "in water"; for example, "Grated light tuna in water."

(3) When the packing medium is vegetable oil or olive oil, the label shall bear the name of the optional packing medium used, as specified in paragraph (e) of this section, preceded by the word "in" or the words "packed in." In case of the optional ingredient specified in paragraph (e) (1) of this section, the name or names of the oil used may be stated, or the general term "vegetable oil" may be used.

(4) In case solid pack tuna is packed in olive oil, the designation "Tonno" may also appear.

(5) In case any of the specified forms of canned tuna are smoked, the word "smoked" shall appear as a part of the name on the label; for example, "Smoked light tuna flakes."

(6) Where the canned tuna contains one or more of the ingredients listed in paragraph (f) of this section, the label shall bear the statement "Seasoned with ----------," the blank being filled in with the name or names of the ingredient or ingredients used, except that if the ingredient designated in paragraph (f) (6) of this section is used the blank shall be filled with the term "vegetable broth"; and if the ingredient designated in paragraph (f) (5) of this section is used alone, the label may alternatively bear either the statement "spiced" or the statement "with added spice"; and if salt is the only seasoning ingredient used the label may alternatively bear any of the statements "salted," "with added salt," "salt added."

(7) Wherever the name of the food appears on the label so conspicuously as to be easily seen under customary conditions of purchase, the names of the optional ingredients used as specified by subparagraphs (3) and (6) of this paragraph shall immediately and conspicuously precede or follow such name without intervening written, printed, or graphic matter, except that the common name of the species of tuna fish used may so intervene, but the species name "albacore" may be employed only for canned tuna of that species which meets the color designation "white," as prescribed by paragraph (d) (1) of this section.

§ 37.3 *Canned tuna; fill of container; label statement of substandard fill.* (a) The standard of fill of container for canned tuna is a fill such that the average weight of the pressed cake from 24 cans, as determined by the method prescribed by paragraph (b) of this section, is not less than the minimum value specified for the corresponding can size and form of tuna ingredient in the following table:

I. Can size and form of tuna ingredient	II. Minimum value for weights of pressed cake (average of 24 cans)
211 x 109:	*Ounces*
Solid	2.25
Chunks	1.98
Flakes	1.98
Grated	2.00
307 x 113:	
Solid	4.47
Chunks	3.92
Flakes	3.92
Grated	3.96
401 x 206:	
Solid	8.76
Chunks	7.68
Flakes	7.68
Grated	7.76
603 x 408:	
Solid	43.2
Chunks	37.9
Flakes	37.9
Grated	38.3

If the can size in question is not listed, calculate the value for column II as follows: From the list select as the comparable can size that one having nearest the water capacity of the can size in question, multiply the value listed in column II for the same form of tuna ingredient by the water capacity of the can size in question and divide by the water capacity of the comparable can size. Water capacities are determined by the general method provided in § 10.2 (a) of this chapter. For the purposes of this section, cans of dimensions 211 x 109 shall be deemed to have a water capacity at 68° F. of 3.55 avoirdupois ounces of water; cans of dimensions 307 x 113, a water capacity of 7.05 avoirdupois ounces of water; cans of dimensions 401 x 206, a water capacity of 13.80 avoirdupois ounces of water; and cans of dimensions 603 x 408, a water capacity of 68.15 avoirdupois ounces of water.

(b) The methods referred to in paragraph (a) of this section for determining the weight of the pressed cake and referred to in § 37.1 (c) (1) for determining the percent of free flakes and the percent of pieces that pass through a ½-inch-mesh sieve are as follows:

(1) Have each of the 24 cans and contents at a temperature of 75° F. within ±5° F. Test each can in turn as follows:

(2) Cut out the top of the can (code end), using a can opener that does not remove nor distort the double seam.

(3) With the cut top held on the can contents, invert the can, and drain the free liquid by gentle finger pressure on the cut lid so that most of the free liquid drains from the can.

(4) With the cut lid still in place, cut out the bottom of the can with the can opener, then turn the can upright and remove the cut can top (code end). Scrape off any adhering tuna particles into the tuna mass in the can.

(5) Place the proper size of press cylinder as provided in paragraph (c) (1) of this section in a horizontal position on a table; then, using the cut bottom of the can as a pusher, gently force the can contents from the can into the cylinder so that the flat side of the can contents lies in contact with the bottom of the cylinder. Remove the bottom of the can that was used as the pusher and scrape any adhering particles from the can body and bottom of the can, and put them in the cylinder.

(6) Place the cylinder plunger on top of the can contents in the cylinder. Remove the eyebolt and put the cylinder and plunger in position on the press (paragraph (c) (3) of this section).

(7) Begin the operation of the press, and as soon as liquid is observed coming from the cylinder start timing the operation. Apply pressure to the plunger slowly and at a uniform rate, so that a full minute is used to reach a pressure of 384 pounds per square inch of plunger face in contact with the can contents. Hold this pressure for 1 additional minute and then release the pressure and disengage the plunger from the press shaft. Tip the press cylinder so that any free liquid is drained out.

(8) Remove press cylinder with plunger from the press, insert eyebolt in plunger and withdraw it from the cylinder. Loosen the pressed cake from the cylinder with a thin blade and remove the entire pressed cake as gently as possible, to keep the mass in a single cake during this operation. Place the pressed cake and any pieces that adhered to the plunger and cylinder in a tared receiving pan and determine the weight of the pressed material.

(9) For cans larger than 401 x 206, cut out the top of the can and drain off free liquid from the can contents as in operations described in subparagraphs (2) and (3) of this paragraph. Determine the gross weight of the can and remaining contents. Using a tared core cutter as provided for in paragraph (c) (2) of this section, cut vertically a core of the drained material in the can. Determine the weight of the core. With a thin spatula transfer the core to the pressing cylinder for 401 x 206 cans. Determine the weight of the pressed cake as in the operations described in subparagraphs (5) through (8) of this paragraph. Remove the remaining drained contents of the can, reserving the contents for the determination of free flakes (subparagraph (11) of this paragraph), weigh the empty can, and calculate the weight of the total drained material. Calculate the weight of pressed cake on the entire can basis by multiplying the weight of the pressed cake of the core by the ratio of the weight of the drained contents of the can to the weight of the core before pressing.

(10) Repeat the determination of weight of pressed cake on the remainder of the 24 cans and determine the average weight of pressed cake for the purpose of paragraph (a) of this section.

(11) Determination of free flakes: If the optional form of tuna ingredient is solid pack, determine the percent of free flakes. Any flakes resulting from the operations described in this subparagraph or in other parts of this paragraph are to be weighed as free flakes. Only fragments that were broken in the canning procedure are considered to be free flakes. If the can is of such size that its entire drained contents were pressed as described in subparagraphs (1) to (8), inclusive, of this paragraph, examine the pressed cake carefully for free flakes. Using a spatula, scrape free flakes gently from the outside of the cake. Weigh the aggregate free flakes that were broken from the loin segments in the canning procedure and calculate their percentage of the total weight of pressed cake. If the can is of such size that a core was cut for pressing as described in subparagraph (9) of this paragraph, make the examination for free flakes on a weighed portion of the drained material remaining after the core was removed. The weight of the portion examined should approximately equal the weight of the core before pressing. Calculate the weight of the free flakes that were broken from the loins in the canning procedure as a percentage of the weight of the portion examined.

(12) Determination of particle size: If the optional form of tuna ingredient is chunks, flakes, or grated, the press-cake resulting from the operations described in subparagraphs (1) to (9), inclusive, of this paragraph is gently separated by hand, care being taken to avoid breaking the pieces. The separated pieces are evenly distributed over the top sieve of the screen separation equipment described in paragraph (c) (4) of this section. Beginning with the top sieve, lift and drop each sieve by its open edge three times. Each time, the open edge of the sieve is lifted the full distance permitted by the device. Combine and weigh the material remaining on the three top sieves (1½-inch, 1-inch, ½-inch screens), and determine the combined percentage retention by weight in relation to the total weight of the pressed cake.

(c) (1) The press cylinder and plunger referred to in paragraph (b) of this section are made of stainless steel. The press cylinders are made with a lip to facilitate drainage of the liquid. Plungers have a threaded center hole, about half as deep as the thickness of the plunger, for receiving a ringbolt to assist in removing the plunger from the press cylinder. Dimensions for press cylinders and plungers are as follows:

For can size 211 x 109

Press cylinder:
Inside depth, approximately 3¾ inches.
Inside diameter, 2.593 inches.
Wall thickness, approximately ⅜ inch.
Plunger:
Thickness, approximately 1 inch.
Diameter, 2.568 inches.

For can size 307 x 113

Press cylinder:
Inside depth, approximately 4 inches.
Inside diameter, 3.344 inches.
Wall thickness, approximately ⅜ inch.
Plunger:
Thickness, approximately 1¼ inches.
Diameter, 3.319 inches.

For can size 401 x 206

Press cylinder:
Inside depth, approximately 4⅛ inches.
Inside diameter, 3.969 inches.
Wall thickness, approximately ½ inch.
Plunger:
Thickness, approximately 1¼ inches.
Diameter, 3.944 inches.

For can sizes where the diameter is greater than 401, the core cutter described in subparagraph (2) of this paragraph shall be used and the resulting core pressed in the press cylinder for can size 401 x 206. For can sizes differing from those specified in this subparagraph, special press cylinders and plungers may be used. Special press cylinders have inside diameters 1/10-inch less than the outside diameters, at the double seam, for the can sizes for which the cylinders are used; plunger diameters are 0.025-inch less than the inside diameters of the press cylinders.

(2) The core cutter referred to in paragraphs (b) (9) and (11) and subparagraph (1) of this paragraph is made from a previously sealed 300 x 407 can. The cover, including the top seam, is cut out. The edge is smoothed and sharpened. A small hole to permit passage of air is made in the bottom.

(3) The hydraulic press referred to in paragraph (b) (6) to (10), inclusive, of this section is made by so mounting a hydraulic jack in a strong frame that it will press horizontally against the center of the plunger in the press cylinder used. The frame is so braced that it does not change shape when pressure is applied. The gauge on the hydraulic jack is so calibrated that it will indicate, for the plunger being used, when the plunger is pressing against the contents of the press cylinder with a pressure of 384 pounds per square inch of plunger face.

(4) The sieving device referred to in paragraph (b) (12) of this section consists of three sieves, each approximately 1 foot square, loosely mounted, one above the other, in a metal frame. The mesh in the top sieve complies with the specifications for 1½-inch woven-wire cloth as set forth in "Standard Specifications for Sieves," as published March 1, 1940, in L. C. 584 of the U. S. Department of Commerce, National Bureau of Standards. The meshes in the sieves below comply with similar specifications for 1-inch and ½-inch woven-wire cloth as set forth in the same publication. The sides of each sieve are formed, in a raised rim, from ¾-inch x ⅛-inch

metal strap. The frame has tracks made of ⅜-inch angle metal to support each sieve under each side. The tracks are so positioned as to permit each sieve a free vertical travel of 1¾ inches.

(d) If canned tuna falls below the applicable standard of fill of container prescribed in paragraph (a) of this section, the label shall bear the general statement of substandard fill provided in § 10.3 (b) of this chapter, in the manner and form therein specified.

Any person who will be adversely affected by the foregoing order may at any time prior to the thirtieth day from the date of its publication in the FEDERAL REGISTER file with the Hearing Clerk, Department of Health, Education, and Welfare, Room 5440, 330 Independence Avenue SW., Washington 25, D. C., written objections thereto. Objections shall show wherein the person filing will be adversely affected by the order, shall specify with particularity the provisions of the order deemed objectionable and the grounds for the objections, and shall request a public hearing on the objections. Objections may be accompanied by a memorandum or brief in support thereof. All documents shall be filed in quintuplicate.

Effective date. The definition and standard of identity (§ 37.1) promulgated by this order shall become effective one year after its publication in the FEDERAL REGISTER, and the standard of fill of container (§ 37.3) promulgated by this order shall become effective 90 days after its publication in the FEDERAL REGISTER, except in each case any provisions that may be stayed by the filing of exceptions thereto. Notice of the filing of objections, or lack thereof, will be announced by publication in the FEDERAL REGISTER.

(Sec. 701, 52 Stat. 1055, as amended; 21 U. S. C. 371)

Dated: February 7, 1957.

[SEAL] JOHN L. HARVEY,
Deputy Commissioner of Food and Drugs.

TITLE 21—FOOD AND DRUGS

Chapter I—Food and Drug Administration, Department of Health, Education, and Welfare

PART 37—FISH; DEFINITIONS AND STANDARDS OF IDENTITY; STANDARDS OF FILL OF CONTAINER

ORDER ACTING ON PROPOSAL TO ADOPT DEFINITION AND STANDARD OF IDENTITY AND STANDARDS OF FILL OF CONTAINER FOR CANNED TUNA FISH

Correction

In F. R. Document 57-1079, of the issue for Wednesday, February 13, 1957, at page 892, make the following insertion in the last line of § 37.1 (f) (6): Preceding the words "bell peppers" insert the word "red".

Eighty-Fifth Congress (First Session)

Listed below and on the following pages are public bills and resolutions that directly or indirectly affect the fisheries and allied industries. Public bills and resolutions are shown when introduced; from month to month the more pertinent reports, hearings, or chamber actions on the bills shown are published; and if passed, they are shown when signed by the President.

ANTIDUMPING ACT OF 1921: H. R. 6006 (Cooper) and H. R. 6007 (Reed) introduced in the House March 14, bills to amend certain provisions of the Antidumping Act, 1921, to provide for greater certainty, speed, and efficiency in the enforcement thereof, and for other purposes; to the Committee on Ways and Means. Similar in purpose to H. R. 5120 (Forand), also: H. R. 5138 (Mack of Washington) and H. R. 5139 (Mason) all introduced in the House February 20. In the various bills there are some differences in the wording and methods suggested for determining the value of imports suspected of violating the Antidumping Act of 1921. See Commercial Fisheries Review March 1957, p. 59 for other bills on this subject.

COMMERCIAL PRODUCTION OF FISH ON RICE LANDS: S. 1552 (Fulbright) introduced in the Senate on March 12, a bill to authorize the Secretary of Agriculture to establish a program for the purpose of carrying on certain research and experimentation to develop methods for the commercial production of fish on flooded rice acreage in rotation with field rice crops, and for other purposes; to the Committee on Agriculture and Forestry. This bill authorizes the Secretary of Agriculture to contract with the University of Arkansas for the establishment of an experiment station or stations within the State of Arkansas for the purpose of carrying on a program of research and experimentation on the stocking, harvesting, and marketing of fish crops produced on rice acreage. The Secretary of Agriculture is authorized to request the assistance of the U. S. Fish and Wildlife Service in carrying out the provisions of the Act.

"EXEMPT TRUCK" TO BE LIMITED: H. R. 5823 (Harris) introduced in the House on March 11, a bill to amend section 203 (b) (6) of the Interstate Commerce Act, as amended; to the Committee on Interstate and Foreign Commerce. The section to be amended will read as follows: motor vehicles used in carrying property consisting of ordinary livestock, live poultry, fish (including shellfish), or agricultural (including horticultural) commodities (not including manufactured products thereof or frozen foods) from the point of production to a point where such commodities first pass out of the actual possession and control of the producer, if such motor vehicles are not at the same time used in carrying any other property, or passengers for compensation. The point of production for fish shall be deemed to be the wharf or other landing place at which the fisherman debarks his catch, and the point of production for agricultural commodities shall be the point at which grown, raised or produced, or the point at which the fish or agricultural commodities are gathered for shipment.

This bill, if passed, would limit the use of "exempt truck" to a few cases of fish and shellfish transportation from the producer to the first processor or handler. Fresh and frozen fish and shellfish reshipped by the first processors or

handlers would be excluded. Also: introduced March 21: S. 1669 (Magnuson); to the Committee on Finance and similar to H. R. 5823 (Harris).

FISH HATCHERIES: S. 1784 (Young) introduced in the Senate April 4, a bill to provide for the establishment of a fish hatchery in the State of North Dakota; to the Committee on Interstate and Foreign Commerce. Bill provides for the construction of a fish hatchery on the Missouri River below Garrison Dam.

FISHING VESSEL RIGHTS ON THE HIGH SEAS: H. R. 5886 Tollefson) and H. R. 5888 (Wilson), similar bills introduced in the House on March 12, to amend the Act of August 27, 1954 (68 Stat. 883), relating to the rights of vessels of the United States on the high seas and in the territorial waters of foreign countries; also H. R. 5943 (Magnuson) introduced in the House March 13; all referred to Committee on Merchant Marine and Fisheries (see also Commercial Fisheries Review, March 1957, p.59). Hearings on the House bills were scheduled to be held on April 17 before the House Subcommittee on Fisheries and Wildlife Conservation.

EQUAL PAY FOR WOMEN: H. R. 6318 (Harden) introduced in the House on March 25, a bill to prohibit discrimination on account of sex in the payment of wages by employers having employees engaged in commerce or in the production of goods for commerce, and to provide for assisting such employees in collecting wages lost by reason of any such discrimination; also: S. 1807 (Morse and others) introduced in the Senate April 4, and H. R. 6797 (Roosevelt) introduced in the House April 10 (see Commercial Fisheries Review, February 1957, p. 63 for list of other bills introduced on this subject); all House bills referred to the Committee on Education and Labor and the Senate bill to the Committee on Labor and Welfare.

IMPORT AGREEMENTS: H. R. 6123 (Ashmore), H. R. 6140 (McMillan), H. R. 6153 (Lanham), introduced in the House March 19, bills to require that all agreements and understandings respecting the importation of foreign goods, entered into with foreign countries or their citizens, shall be reduced to writing and made public; also: introduced in the House March 20, H. R. 6195 (Dorn of South Carolina); March 25, H. R. 6330 Riley); April 2, H. R. 6579 (Rivers). (See Commercial Fisheries Review, March 1957 p. 59 for additional bills); all the above bills referred to the Committee on Ways and Means.

IMPORT QUOTAS: H. R. 5828 (Hemphill) and H. R. 5829 (Hemphill) introduced in the House on March 11, bills to regulate the foreign commerce of the United States by establishing import quotas under specified conditions, and for other purposes; also: introduced in the House March 20, H. R. 6205 (Mack of Washington); March 25, H. R. 6425 (Moore); April 2, H. R. 6564 (Cederberg)--all referred to the Committee on Ways and Means. (See Commercial Fisheries Review, February 1957, p. 64, and March 1957, p. 59 for additional bills on the same subject.

INCOME TAX LAW REVISION IN FAVOR OF FISHERMEN: S. 1669 (Magnuson) introduced in the Senate of March 21, a bill to extend to fishermen the same treatment accorded to farmers in relation to estimated income tax; to the Committee on Finance. This bill proposes to amend Section 6073 (b) of the Internal Revenue Cod of 1954 (relating to time for filing declarations of estimated income tax by farmers) by inserting "or fishing" after "from farming (including oyster farming) wherever these words appear in the Code. The amendment, if made into law, will apply to taxable years after 1956. Also: introduced in the Senate on March 21, S. 1669 (Magnuson); to the Committee on Finance. See Commercial Fisheries Review, February 1957, p. 64, for additional bills on this subject.

MARINE LABORATORY IN FLORIDA: H. R. 6420 (Herlong) introduced in the House on March 27, a bill to provide for the construction of a fish and wildlife marine laboratory and experiment station in Brevard County, Fla.; to the Committee on Merchant Marine and Fisheries. (See Commercial Fisheries Review, February 1957, p. 65 for other bills on same subject.)

MINIMUM HOURLY WAGE: H. R. 6413 (Flood) introduced in the House March 27, a bill to amend the Fair Labor Standards Act of 1938 to fix the minimum wage at $1.25 an hour; to the Committee on Education and Labor. (See Commercial Fisheries Review, February 1957, p. 65 for additional bills on this subject.

SMALL BUSINESS ACT AMENDMENT: S. 1762 (Sparkman) introduced in the Senate on March 29, a bill to further amend the Small Business Act of 1953, as amended; to the Committee on Banking and Currency. This bill provides for the following: (1) the agency would be made permanent; (2) the Loan Policy Board would be abolished; (3) the Agency's procurement powers would be strengthened; (4) certain authority now confined to wartime would be extended to periods of peace; (5) maximum loan limit would be raised from $250,000 to $500,000; (6) an insured loan plan, to be administered by the Small Business Administration, is included as a separate title of the bill. See Commercial Fisheries Review, February 1957, p. 66 for related bill S. 720 (Sparkman and others). This bill differs in some respects from the Sparkman bill.

SMALL BUSINESS ADMINISTRATION PERMANENT STATUS: S. 1789 (Thye and others) introduced in the Senate on April 4, a bill to amend the Small Business Act of 1953 (Title II of Public Law 163, 83rd Congress, as amended); to the Committee on Banking and Currency. This bill proposes to rewrite the Small Business Act and establish the Small Business Administration as a permanent agency of the Government

SMALL BUSINESS INTERNAL REVENUE CODE: H. R. 5955 (Berry) introduced in the House on March 13, a bill to amend the Internal Revenue Code to assist small and independent business, and for other purposes; referred to the Committee on Ways and Means. Among other provisions, this bill provides for an election for filing income tax returns for small and independent business engaged in trade or commerce whether or not such business operate as individuals, partnerships, or corporations. Also provides for a normal tax rate of 20 percent for taxable years after March 31, 1957,

and to increase the surtax exemption, which will be increased from $25,000 to $150,000. Another provision which may be of value to the fishing industry is a 5-year depreciation allowance if the average taxable income for 5 preceding years does not exceed $50,000 per year. This provision would allow fishing vessel owners to depreciate vessels and vessel equipment much faster during periods of good profits.

SMALL BUSINESS LOANS FOR AREAS IN ECONOMIC DISTRESS: H. R. 6144 (Porter) introduced in the House March 19, a bill to amend the Small Business Act of 1953 to authorize loans by the Small Business Administration in areas of economic disaster, depression, or dislocation; to the Committee on Banking and Currency.

SMALL BUSINESS LOAN FOR NONPROFIT ORGANIZATIONS: H. R. 6148 (Porter) introduced in the House March 19, a bill to amend the Small Business Act of 1953 to authorize the Small Business Administration to make loans to local nonprofit organizations formed to assist, develop, and expand the economy of the area; to the Committee on Banking and Currency. See Commercial Fisheries Review, March 1957, p. 60 for similar bill H. R. 5693 (Coffin) introduced March 6.

SOCKEYE SALMON FISHERY ACT: H. R. 6587 (Tollefson) introduced in the House on April 2, a bill to amend the Sockeye Salmon Fishery Act of 1947; to the Committee on Merchant Marine and Fisheries. Also: introduced in the Senate April 4: S. 1806 (Magnuson and Jackson) and referred to Committee on Interstate and Foreign Commerce. The Senate and House bills are similar and propose to amend the convention between the United States and Canada for the protection, preservation, and extension of the sockeye salmon (Oncorhynchus nerka) of the Fraser River system, to include pink salmon (Oncorhynchus gorbuscha).

TAX RELIEF FOR SMALL BUSINESS: H. R. 6407 (Alger) introduced in the House March 27, a bill to provide a minimum initial program of tax relief for small business and for persons engaged in small business. Also: introduced in the House March 28: H. R. 6465 (Rhodes); introduced in the Senate April 8: S. 1820 (Potter). Both House bills to the Committee on Ways and Means and Senate bill to the Committee on Finance. Provides for amendment to Internal Revenue Code of 1954 for increased deduction for additional investment in depreciable assets and inventory. The deduction shall not exceed for any taxable year (whichever is lesser) $30,000 or an amount equal to 20 percent of the net income of a trade or business for the taxable year. Another amendment concerns tax-anticipation certificates for Federal estate tax.

TRADE AGREEMENTS EXTENSION ACT: S. 1796 (Watkins) introduced in the Senate April 4, a bill to amend the Trade Agreements Extension Act of 1951 with respect to escape clause procedure, and for other purposes; to the Committee on Finance. This bill proposes to assist some business industries, which have been adversely affected by heavy imports. The amendment would empower the President to limit imports of specific products if they became large enough to threaten an industry vital to the national security.

DRIP IN FROZEN FROG LEGS

The amount of free "drip" in frozen and subsequently thawed frogs is not proportional to the quantity of water which is imbibed by the muscle tissue before freezing. The amount of water imbibed by legs of bull frogs (Rana catesbeiana Shaw), from which the skin was removed immediately after killing, when soaked for 2, $4\frac{1}{2}$, and 24 hours in ice water before freezing, increased according to the length of the soaking time.

--Modern Refrigeration, August 1955
and Paper read at the Ninth International
Congress of Refrigeration, 1955.

CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

LEGEND:
- 1957
- 1956
- 1955

MAINE

CUMULATIVE DATA
2 mos. 1957 - 7.3
2 " 1956 - 10.4
12 " 1956 - 277.8

MASSACHUSETTS

CUMULATIVE DATA
8 mos. 1956 - 382.7
8 " 1955 - 363.7
12 " 1955 - 521.6

FLORIDA

CUMULATIVE DATA
1 mo. 1957 - 13.7
1 " 1956 - 10.7
12 mos. 1956 - 204.7

LOUISIANA[2/]

CUMULATIVE DATA
3 mos. 1957 - 4.4
3 " 1956 - 8.4
12 " 1956 - 57.1

2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.

NEW JERSEY

CUMULATIVE DATA
2 mos. 1957 - 7.3
2 " 1956 - 6.6
12 " 1956 - 506.8

TEXAS

CUMULATIVE DATA
2 mos. 1957 - 7.7
2 " 1956 - 6.1
12 " 1956 - 128.9

CALIFORNIA[1/]

CUMULATIVE DATA
2 mos. 1957 - 123.7
2 " 1956 - 109.0
12 " 1956 - 693.1

1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

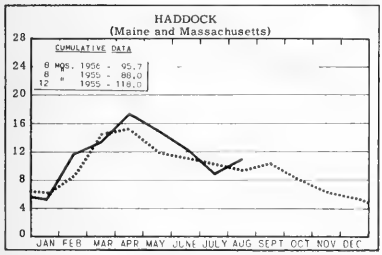
OREGON

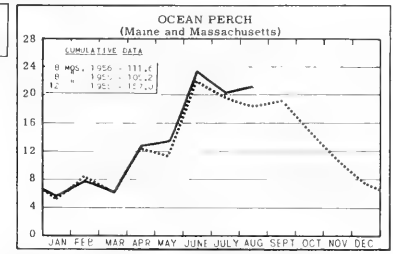
CUMULATIVE DATA
2 mos. 1957 - 5.2
2 " 1956 - 4.5
12 " 1956 - 59.3

JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

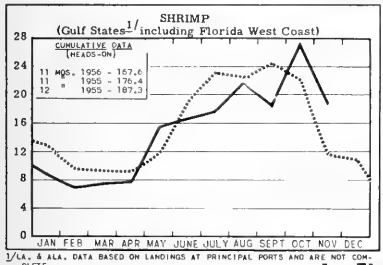
CHART 2 - LANDINGS for SELECTED FISHERIES

In Millions of Pounds

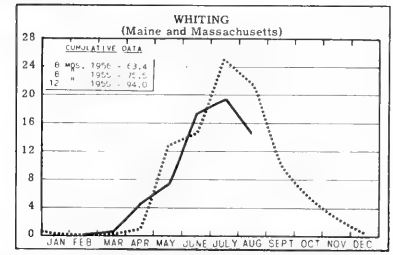




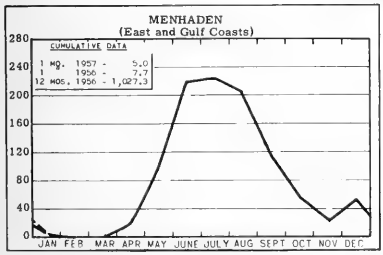
In Millions of Pounds

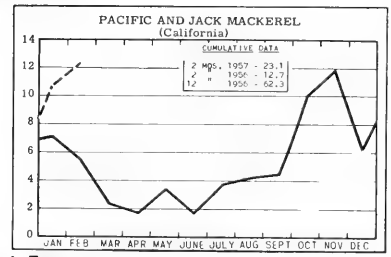


1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

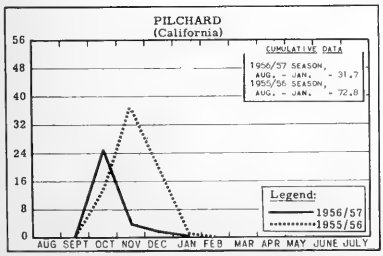


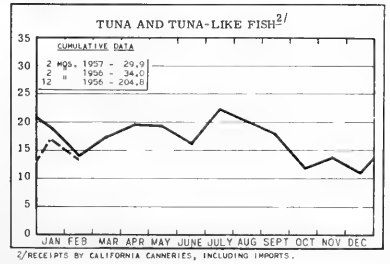
In Thousands of Tons





In Thousands of Tons

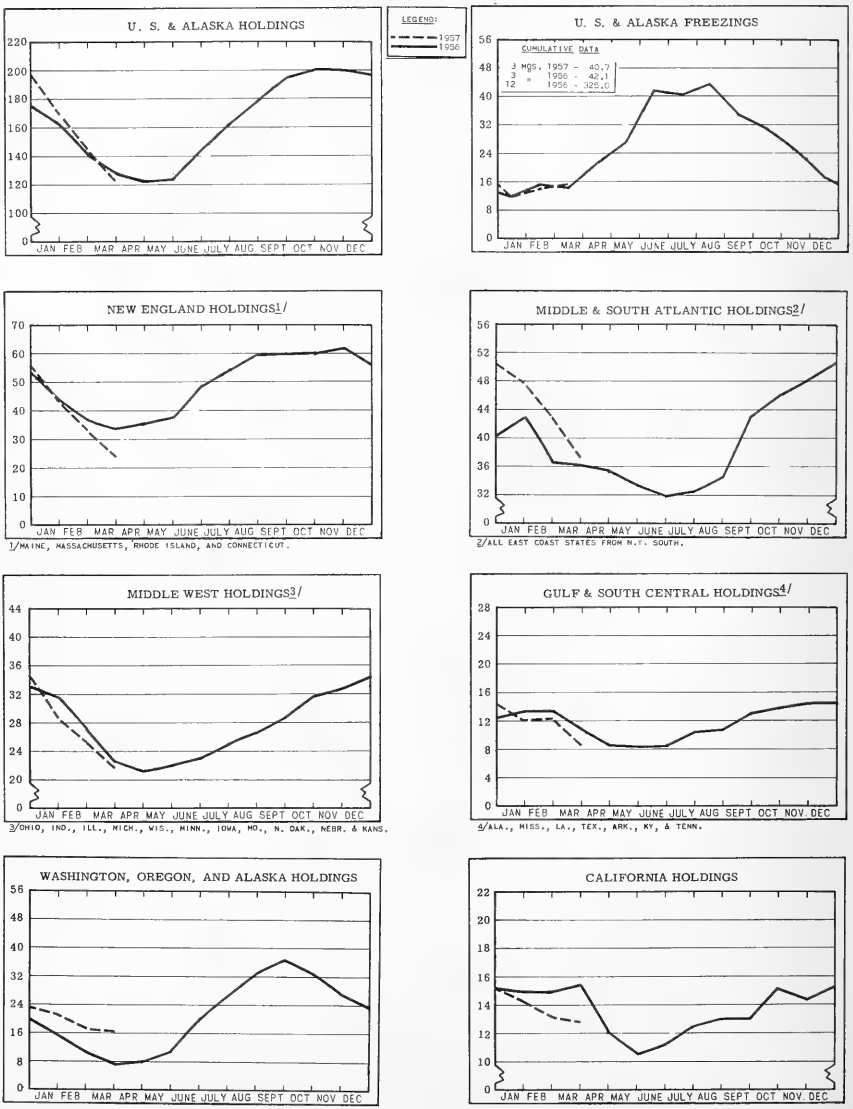




2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

In Millions of Pounds



1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.

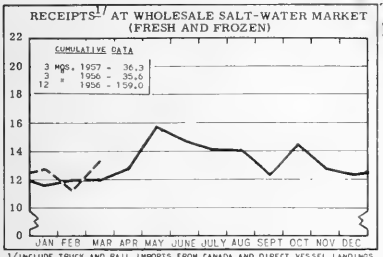
4/ALA., MISS., LA., TEX., ARK., KY, & TENN.

*Excludes salted, cured, and smoked products.

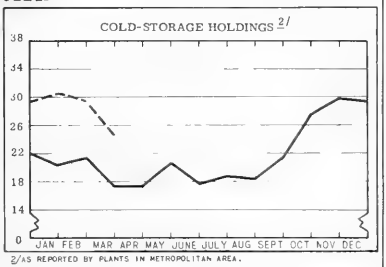
CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pounds

NEW YORK CITY

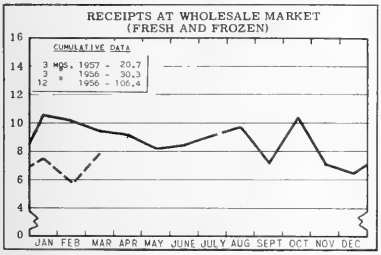


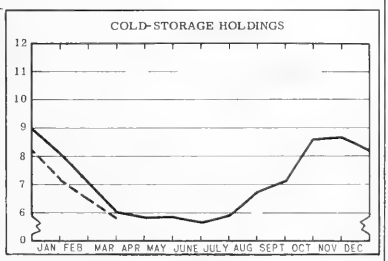
1/ INCLUDE TRUCK AND RAIL IMPORTS FROM CANADA AND DIRECT VESSEL LANDINGS AT NEW YORK CITY.



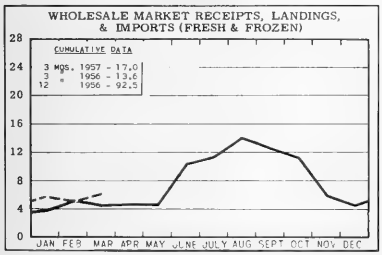
2/ AS REPORTED BY PLANTS IN METROPOLITAN AREA.

CHICAGO





SEATTLE



BOSTON

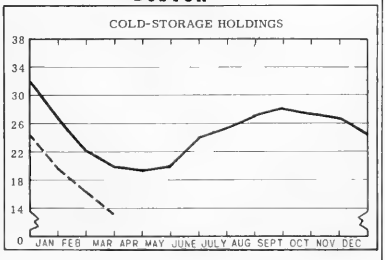
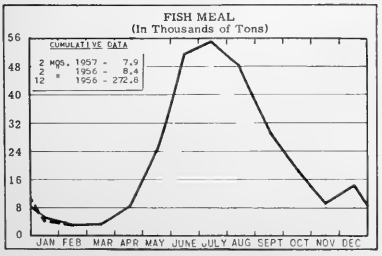


CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA



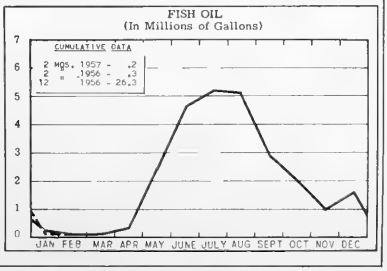
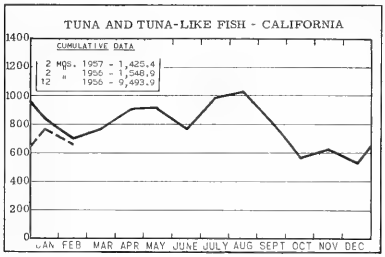
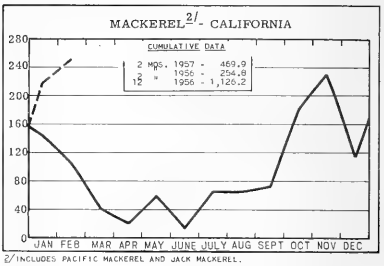


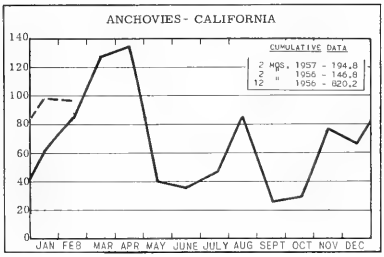
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

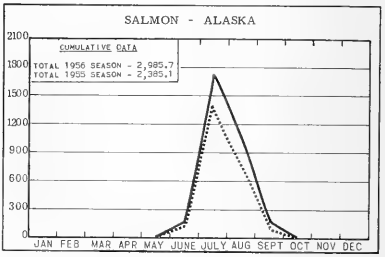
In Thousands of Standard Cases

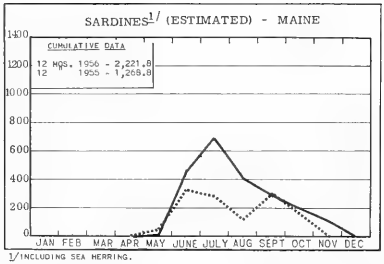




2/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



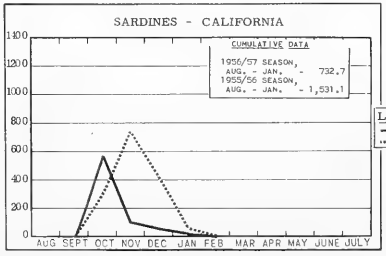


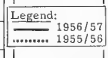


1/ INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	¼ drawn	3¾ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. ½ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	½ lb.	8 oz.





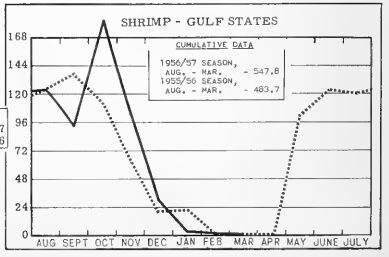
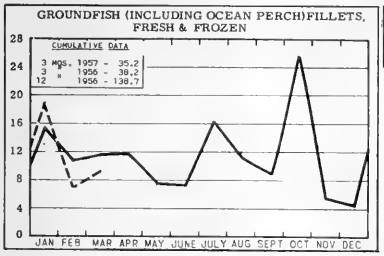
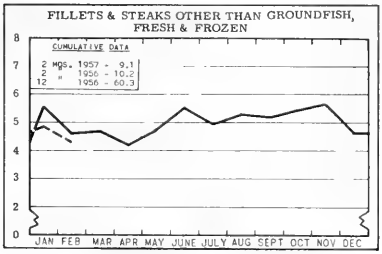
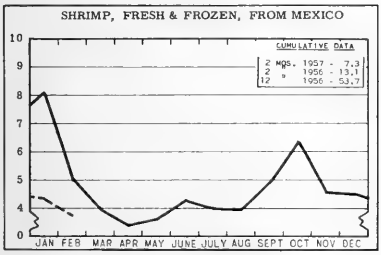


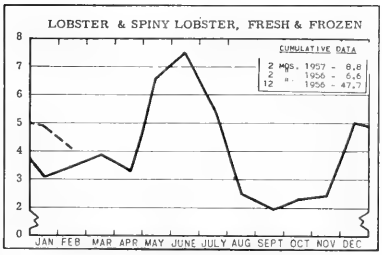
CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

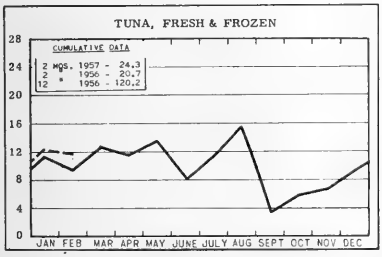
In Millions of Pounds

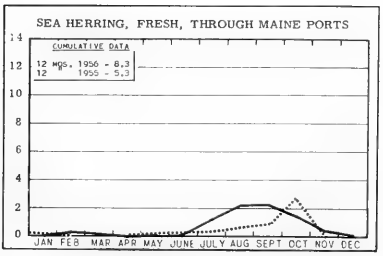


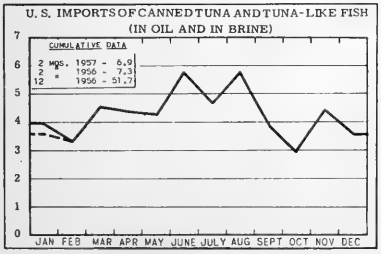


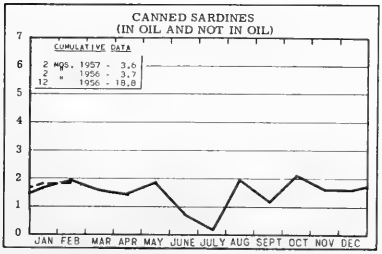












FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
FL - FISHERY LEAFLETS.
SSR.- FISH.- SPECIAL SCIENTIFIC REPORTS--FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1487 - Frozen Fish Report, January 1957, 8 pp.
CFS-1489 - New York Landings, December 1956, 4 pp.
CFS-1493 - Maine Landings, 1956 Annual Summary, 5 pp.
CFS-1494 - Rhode Island Landings, 1956 Annual Summary, 6 pp.
CFS-1497 - Maine Landings, 1956 Annual Summary, 11 pp.
CFS-1498 - Mississippi Landings, December 1956, 2 pp.
CFS-1501 - Fish Meal and Oil, January 1957, 2 pp.
CFS-1506 - Georgia Landings, January 1957, 2 pp.

FL - 195 - Partial List of Manufacturers of Fishing Gear and Accessories, 12 pp., revised September 1956.

FL - 254 - List of Fishery Associations in the United States, Alaska, and Hawaii, 12 pp., revised August 1956.

FL - 292 - List of Fishery Cooperatives in the United States and Alaska, 5 pp., revised August 1956.

FL - 336ee - Commercial Fisheries Outlook, January-March 1957, 41 pp., illus., January 1957.

FL - 428 - Refrigeration of Fish, Part 2--Handling Fresh Fish, by Charles Butler, John A. Dassow, C. J. Carlson, Joseph Carver, and Martin Heerdt, 84 pp., illus., December 1956.

FL - 431 - Distribution and Marketing of Frozen Fishery Products (Part V--Refrigeration of Fish), by Joseph W. Slavin and Martin Heerdt, 78 pp., illus., October 1956. Part V of a series of five leaflets on the refrigeration of fish. Deals with problems of transportation and marketing of frozen fish as well as the design of locker plants and home freezers for storage of the frozen product. Section 1, concerned with transportation, takes up railroad, truck and ship distribution practices as well as the different systems for maintenance of freezing temperatures that have been evolved for use in each practice. Section 2 takes up the quality problems at the retail level and offers methods of checking the prior history and consequently the quality level of the product at the point of sale. Section 3, dealing with locker plants and home-freezers, takes up the problems of design requirements as well as suggestions for good product handling practices that have been developed for both types of frozen storage equipment.

FL - 437 - Assembly Methods for Otter-Trawl Nets, by Boris O. Knake, 29 pp., illus., December 1956. Illustrates and describes in detail the assembly of standard trawl nets, methods of lacing, assembling of an Iceland trawl net, and the proper way of bending the trawl net. The proper assembly of the otter trawl is one of the most difficult problems faced by trawler fishermen. Correctly operated, the trawl is an extremely efficient fishing device; when improperly hung or operated, its efficiency is greatly reduced.

SSR-Fish. No. 192 - Three Russian Papers on Northwestern Pacific Plankton, translated by W. G. Van Campen, 24 pp., illus., October 1956. Contains the following articles: "On the Vertical Distribution of Copepods in the Northwestern Pacific Ocean," by K. A. Brodskii; "Some Essential Features of Zooplankton Distribution in the Northwestern Pacific Ocean," by V. G. Bogorov and M. E. Vinogradov; and "Plankton of the Northwestern Part of the Kuroshio and the Waters of the Pacific Ocean Adjacent to the Kurile Islands," by K. A. Brodskii.

SSR-Fish. No. 194 - Preparation of a Dry Product from Condensed Menhaden Solubles: Statistical Analysis of the Data (Supplement to the Fish and Wildlife Service Research Report 45), by C. F. Lee and R. J. Monroe, 23 pp., December 1956. Simple correlation studies show that 4 of 10 chemical and physical characteristics are important in preparing suitable dry condensed solubles. These are ammonia, corrected protein content, total ash, and water insoluble matter, and desirable limits are suggested for each. Multiple correlation studies of other selected data show that the specific gravity of condensed solubles is largely determined by its total ash and fat content. Dry solids content and the refractive index or specific gravity are not correlated either separately or in combination. The study indicates that the variability in com-

position of condensed solubles does not account for either the extreme variation in viscosity of the condensed solubles or for differences in moisture-absorptive characteristics of the related dry solubles. By means of an analysis of variance it was shown that the solubles produced by plants in the South Atlantic and Gulf of Mexico areas differed in composition from the product of plants in the Central Atlantic area. Otherwise, there were not sufficient data to permit determination of the effect of type of plant or of the month of production upon the properties of the condensed solubles.

SSR-Fish. No. 196 - Collections by the Oregon in the Gulf of Mexico, by Stewart Springer and Harvey R. Bullis, Jr., 137 pp., December 1956. A list of crustaceans, mollusks, and fishes identified from collections made by the exploratory fishing vessel Oregon in the Gulf of Mexico and adjacent seas from 1950 through 1955.

SSR-Fish. No. 200 - Canned Fish and Shellfish Preferences of Household Consumers, 1956, 332 pp., illus., February 1957. A report on a June 1956 nationwide survey pertaining to the use of canned fish and shellfish products by household consumers and their specific preferences, demands, likes, and dislikes affecting the actual and potential market for these products. The canned fish and shellfish industry is confronted with many economic and market problems. This survey was conducted to find the answers to some of these problems. Because of changes in income and standards of living among the masses of lower income consumers, many families are up-grading the types of fishery products they use. The competition of imported products and domestic oversupply are often depressing factors on canned fishery products markets. The industry is faced with a pressing need for expanding markets. At the same time, partly because of the fragmentation of the industry into many small firms which are unable to conduct any basic marketing research, it is handicapped by insufficient knowledge of consumer demand and buying practices. This survey was designed to provide information which will help the domestic fishing industry with its production and marketing problems. Survey results indicate that canned fish, or shellfish, is not directly competitive in any considerable degree with fresh or frozen fish or shellfish. While the use of canned fish or shellfish was quite stable, there existed a variation in relationship between fresh and frozen fish as influenced by geographic location and availability of fresh fish and other factors. Further results are discussed in a summary of major findings. Survey methods and tabulations of responses to questionnaires are included. A graphic version of some of the more important findings of the survey is presented in Circular 45, "Household Consumer Preferences for Canned Fishery Products, 1956."

Survey of Sport Fishery Projects, 1956, Circular 46, 165 pp., January 1957. This circular is the third catalog of sport-fishery programs in the United States. Its objective is to provide fishery administrators, teachers, research workers, and managers a means of keeping abreast of current work in fish conservation and restoration activities. The subjects covered are: acquisition of fishing waters; age and growth; aquatic vegetation control; creel census; dams and diversions; disease and parasites; distribution of fishes; economics of sport fishery; fertilization; fish culture; food studies; lake and pond construction; lake improvement; lake investigations; life history studies; marine investigations; movement and migration; pollution; pond investigations; population investigations; rehabilitation of lakes, ponds, reservoirs, and streams; reservoir investigations; rough fish control; stocking; stream investigations and improvements; surveys; techniques and equipment; and watershed management.

Sep. No. 472 - Bottom Trawling Exploration in the Strait of Juan de Fuca--February to March 1956.

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Landings and Prices of Fishery Products, Boston Fish Pier, 1956 (Includes "Trends in the Fishing Industry at Boston"), by John J. O'Brien, 25 pp., processed, 1957. (Available free from the Market News Service, U. S. Fish and Wildlife Service, 10 Commonwealth Pier, Boston 10, Mass.) Fish marketing trends and conditions in Boston for 1956 are discussed. Detailed data on landings and ex-vessel prices of fish and shellfish at the Boston Fish Pier during 1956 are presented. Statistics are given by months and species and by type of gear, together with comparative data for previous years.

Means to Restore and Increase the Runs of Kamchatka Salmon, translated by C. E. Atkinson, Translation Series No. 11, 8 pp., illus., processed. (Edited translation from Ichthyological Commission, Transactions of Conferences No. 4, 1954, pp. 10-13, Academy of Sciences, U. S. S. R., Moscow, Russia.) U. S. Fish and Wildlife Service Laboratory, Seattle, Wash., April 1956. Discusses the causes for the sharp decrease in the number of red salmon in the Kamchatka River and the decline in the size of the spawning runs of the Far Lake red salmon. Also discusses the Kamchatka salmon studies and plans to increase production.

POFI--Progress in 1956, by A. L. Tester and Staff, 33 pp., illus., processed. (Pacific Oceanic Fishery Investigations, U. S. Fish and Wildlife Service, Honolulu, Hawaii), February 18, 1957. The purpose of this report is to summarize for the benefit of POFI's Industry Advisors the accomplishments of the past year and to present and discuss new ideas and hypotheses regarding the tuna populations of the Pacific. Even though these ideas and hypotheses are in an undeveloped or formative stage, they serve as guidelines for future research. Results of POFI's work for 1956 are discussed under the following major headings: equatorial tuna investigations; Hawaiian skipjack investigations; albacore investigations; sea scanar; contract research; foreign literature; publications; and manuscripts completed.

(Chicago) December 1956 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp. (Market News Service, U. S. Fish and Wildlife Service, 565 W. Washington St., Chicago 6, Ill.) Receipts at Chicago by species and by states and provinces; fresh-water fish, shrimp,

and frozen fillet wholesale market prices; for the month indicated.

Gulf Monthly Landings, Production, and Shipments of Fishery Products, February 1957, 5 pp., (Market News Service, U. S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf states shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

(Seattle) Monthly Summary - Fishery Products, February 1957, 6 pp. (Market News Service, U.S. Fish and Wildlife Service, 421 Bell St. Terminal, Seattle 1, Wash.) Includes landings and local receipts, with ex-vessel and wholesale prices in some instances, as reported by Seattle and Astoria (Oregon) wholesale dealers; also Northwest Pacific halibut landings; for the month indicated.

THE FOLLOWING SERVICE PUBLICATIONS ARE FOR SALE AND ARE AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D. C.

How to Cook Crabs, by Dorothy M. Robey and Rose G. Kerr, Test Kitchen Series No. 10, 17 pp., illus., printed, 20 cents, 1956. This booklet contains 32 choice recipes which have been developed and kitchen-tested by the Service's staff of home economists. As the booklet explains, four principal kinds of crabs are taken from the marine waters of the United States and Alaska. From the Atlantic and Gulf coasts come blue crabs which compose three-fourths of all the crabs marketed in this country. Dungeness crabs are found on the Pacific coast from Alaska to Mexico. King crabs come from the North Pacific off Alaska. Rock crabs are taken on the New England and California coasts. Of local importance are stone crabs in Florida and tanner crabs in Alaska. The four principal kinds of crabs are pictured in the booklet and their approximate weights are listed. Complete, illustrated instructions are given for picking the meat from blue crabs. Some of the easy-to-prepare recipes included are: crab Louis, crab ravigote, crab newburg, deviled crab, imperial crab, avocados stuffed with crab meat, and barbecued crab sandwiches.

Observations on the Development of the Atlantic Sailfish ISTIOPHORUS AMERICANUS (Cuvier), with Notes on an Unidentified Species of Istiophorid, by Jack W. Gehringer, Fishery Bulletin 110 (From Fishery Bulletin of the Fish and Wildlife Service, vol. 57), 36 pp., illus., printed, 30 cents, 1956.

Tunas and Tuna Fisheries of the World: An Annotated Bibliography, 1930-53, by Wilvan G. Van Campen and Earl E. Hoven, Fishery Bulletin 111, 76 pp., printed, 45 cents. (Reprinted from Fishery Bulletin of the Fish and Wildlife Service, vol. 57, pp. 173-249.) A bibliography, with descriptive annotations and a subject index, which attempts to list important literature published between 1930 and 1953 dealing with tunas and their fisheries in all parts of the world. All aspects of the biology of the tunas are dealt with, as are descriptions and histories of all types of tuna fisheries, commercial and exploratory tuna fishing methods and results, fishing gear, catch statistics, and fishery management. Processing technology, economics and marketing, folklore, and purely literary references have been excluded.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

ARGENTINA:

Memoria y Balance (Report and Balance Sheet), 53rd Season ending June 30, 1956, 18 pp., printed in Spanish. Compañia Argentina de Pesca, S. A., 25 de Mayo 460, Buenos Aires, Argentina, December 27, 1956. Annual report of fishery developments, commercial prospects, and finances of the Argentine Fishery Co., Inc. for the period July 1, 1955 to June 30, 1956. Discusses, among other subjects, a proposal to abandon whaling because it has become unprofitable.

BELGIUM:

Moniteur du Poisson (The Fish Monitor), illus., printed. Redaction et Administration, Rue Verte 53, Anvers, Belgium. A monthly magazine printed in French and devoted to the fishing industry. This specialized magazine is something new, touching on everything and anything that concerns the fishing industry. The first issue (November 1956) presents a historical summary of the development of the canned fishery products industry in Portugal and includes statistics on exports of canned fishery products. The December issue was to be devoted entirely to the fishing industry of Denmark, and the January issue was to be compiled in close cooperation with the Bureau of Maritime Fishing for the Belgian Congo.

BIOCHEMISTRY:

"The Amino Acid Composition of Fish Collagen and Gelatin," by J. E. Eastoe, article, The Biochemical Journal, vol. 65, no. 2, February 1957, pp. 363-368, printed, single copy $4.25. Cambridge University Press, 32 East 57th St., New York 22, N. Y.

BRAZIL:

Producao de Conserva, Salga e Oleo de Peixe (Production of Canned Fish, Seasoned, and Fish Oil), 37 pp. of tables, processed in Portuguese. Servico de Estatistica da Producao, Ministerio da Agricultura, Rio de Janeiro, Brazil.

BYPRODUCTS:

Fabricacion de Harina de Pescado en Pequeña Escala (Manufacture of Fish Flour on a Small Scale), by Trygve Sparre, Technical Publication No. 2, 21 pp., illus., processed in Spanish. Ministerio de Agricultura, Direccion General de Pesca y Caza, Valparaiso, Chile, October 1956.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Plantas Reductoras de Desperdicios de Pescado (Machines for Reducing Fish Waste), by Einar Sola, Technical Publication No. 3, 48 pp., illus., processed in Spanish. Ministerio de Agricultura, Direccion General de Pesca y Caza, Valparaiso, Chile, 1956. Describes the machinery and process used in the manufacture of fish flour from fish waste.

CANADA:

British Columbia Catch Statistics, 1956 (By Area and Type of Gear), 155 pp., illus., processed. Department of Fisheries of Canada, 1110 West Georgia St., Vancouver 5, B. C., Canada, February 4, 1957. The sixth annual report of fish-catch statistics for British Columbia based on Departmental copies of sales slips that are completed by all commercial fish buyers operating within the Province. Statistics are presented by species, months, gear, and area. The report is intended as a factual statement of catch and no attempt is made except in a general way to explain the success or failure of fishing operations. However, certain economic, weather, and conservation factors that have a bearing on the catch are reviewed.

Fisheries Statistics of Canada (Nova Scotia), 1954, 93 pp., printed in French and English, 50 Canadian cents. Queen's Printer and Controller of Stationery, Ottawa, Canada, 1957. Consists of tables giving the quantity and value of fish and shellfish landed in Nova Scotia, 1951-1954, by species and by fisheries districts; quantity and value of manufactured fishery products and by-products for 1953-54; capital equipment in primary operations; and number of persons engaged in the primary operations.

"Fishing Industry Looks to Science," article, Trade News, vol. 9, no. 7, January 1957, pp. 3-8, illus., printed. Department of Fisheries, Ottawa, Canada. On January 7-9 the Fisheries Research Board of Canada held its annual meeting in Ottawa. This article describes the meetings and the reports from the directors of the Board's stations and those heading special units. Investigations carried out during the past year and programs planned for the year ahead showed that ashore and afloat the research conducted by the Atlantic, Pacific, Central, and Arctic regions had covered a wide range of biological, technological, and hydrological aspects of the fisheries. In this article it was possible to touch but lightly on the wide ramifications of the Research Board's work. Some aspects are capable of producing conclusions within a reasonably short period of time, others by reason of the complexities involved must extend over many years. In their laboratories and workshops and on ships at sea, Canada's fisheries scientists day by day are accumulating the knowledge that will not only give the nation's fishermen the adequate standard of living that their labors deserve but will also advance the welfare of peoples of other lands who are coming to depend more and more on the harvests of the sea. On pages 9-11 of this issue of Trade News is the full text of an address, "Expansion of Fisheries Research," given by Deputy Minister of Fisheries G. R. Clark at the annual meeting of the Board. Dr. Clark salutes the research staffs of the Board's various stations and discusses aid in industrial development, vessel and gear research, and pollution of waters.

Progress Reports of the Atlantic Coast Stations, no. 63, 23 pp., illus., printed in English and French. Queen's Printer, Ottawa, Canada, November 1955. Contains the following articles: "The Green Crab--A New Clam Enemy," by J. S. MacPhail, E. I. Lord, and L. M. Dickie; "Have Atlantic Salmon been Overfished?" by P. F. Elson; "Summer Surface Temperatures in the Canadian Atlantic," by W. B. Bailey; and "The Valleyfield-Badgers Quai Commercial Longlining Experiment, 1954," by H. D. Macpherson.

CLAMS:

The Maryland Soft Shell Clam Industry and Its Effects on Tidewater Resources, by J. H. Manning, Resource Study Report No. 11, 27 pp., illus., printed. Maryland Department of Research and Education, Chesapeake Biological Laboratory, Solomons, Md., January 1957. An interim report to the Maryland General Assembly including basic information concerning the soft shell clam, the industry it supports, the gear used in its exploitation, and the effects of that gear on tidewater resources. In addition, some of the proposals which have been made concerning the soft shell clam fishery are evaluated. All available evidence has been considered--statistical records, direct observations, and the results of the Department's and others' research. Much of the evidence is presumptive rather than conclusive, but sufficient to support certain estimates and reasoned judgments. The report is presented in 7 main divisions: (1) Design and operation of the hydraulic clam dredge; (2) Summary of knowledge of Maryland's soft shell clam resource; (3) Development and present status of the Maryland soft shell clam industry; (4) Potential value of the Maryland soft shell clam resource; (5) Effects of the hydraulic clam dredge on tidewater resources; (6) Evaluation of the effects of certain proposals concerning the soft shell clam industry; and (7) Summary.

CONSERVATION:

Fish Conservation Highlights of 1956, 178 pp., illus., printed. Sport Fishing Institute, Bond Bldg., Washington 5, D. C., 1957. A summary of accomplishments and important problems in fish conservation. The former established pattern of agency-by-agency narration of the year's work was abandoned in favor of summarizations organized by functions and kind of activity. Contains sections on the Dingell-Johnson program (Federal aid in fish restoration), resource development, special aspects of fish management, and management studies and basic research. Also contains the following articles: "The Fishery Biologist," by Charles C. Bowers, Jr.; "Boy Scouts in Fish Conservation," by Ted S. Pettit; and "Licensing Salt-Water Anglers," by Charles H. Callison and Richard H. Stroud.

CORSICA:

Problemes d'equipment de la peche en Corse (Problems of Equipment in Corsican Fishery),

by F. Doumenge, 19 pp., illus., printed in French. (Reprinted from Bulletin de la Societe Languedocienne de Geographie, vol. XXVII, no. 4.) Centre Regional de la Productivite et des Etudes Economiques, Rue de Verdun 22, Montpellier, France, 1956. Discusses traditions, problems, and possibilities for modernization of the fishery in Corsica.

DEPARTMENT OF THE INTERIOR:

1956 Annual Report of the Secretary of the Interior (For the Fiscal Year Ended June 30, 1956), 418 pp., illus., printed, $1.25 (paper). U. S. Department of the Interior, Washington, D. C. (For sale by the Superintendent of Documents, Washington 25, D. C.) This publication contains the annual reports of the various agencies of the Department of the Interior, including the Fish and Wildlife Service. Included under Fish and Wildlife Service are summaries of its various activities. Specifically discussed are assistance to the commercial fisheries (describes the activities of the Branch of Commercial Fisheries); conservation of Alaska commercial fisheries; Pribilof Islands fur-seal industry; research in fishery biology (coastal, inland, and marine fisheries); maintenance of inland fisheries; Federal aid to states for the restoration of fish and wildlife; river basin development and wildlife needs; international cooperation in conservation (international technical cooperation and conservation agreements); and other activities.

EAST AFRICA:

East African Fisheries Research Organization Annual Report, 1955/1956, 32 pp., printed. East African Fisheries Research Organization, P. O. Box 343, Jinja, Uganda, 1956. This report covers the period from July 1, 1955, to June 30, 1956, and contains a general account of the work of the Organization and a list of the publications by staff members and visiting scientists. The following papers are also presented: "The Efficient Utilisation of the Fisheries of Lake Victoria," by R. S. A. Beauchamp; "The Distribution of Sulphur in the Muds, Water and Vegetation of Lake Victoria and Its Fixation in the Bottom Deposits," by P. R. Hesse; "Some Observations on Seasonal and Diurnal Changes of Stratification in Lake Victoria," by J. F. Talling; "The Planktonic Crustacea of Lake Victoria," by J. Rzoska; "Effects of D. D. T. on the Feeding Habits of Insectivorous Fishes in the Victoria Nile," by P. S. Corbet; "Ring Formation in the Scales of Tilapia esculenta," by D. J. Garrod; "Preliminary Note on Investigations being Undertaken on the Physiology of Reproduction in Fishes," by A. J. Marshall; and "Results Obtained from a Spectographical Analysis of Bottom Deposits from Pilkington Bay," by C. T. Chamberlain.

LAMPREY:

"Artificial Propagation of the Sea Lamprey, Petromyzon marinus," by Robert E. Lennon, article, Copeia, no. 3, August 19, 1955, pp. 235-236, printed, single copy $2.00. American Society of Ichthyologists and Herpetologists, Mt. Royal and Guilford Aves., Baltimore 2, Md.

FOOD AND AGRICULTURE ORGANIZATION:

Conservation et Distribution des Produits de la Peche (Conservation and Distribution of Fishery Products), by Commandant Giorgio Ricci, FAO Technical Paper No. 43, 10 pp., processed in French. Food and Agriculture Organization of the United Nations, Rome, Italy, 1956. Recommends wider use of refrigerators and quick freezing since the use of ice is often insufficient to keep fish in good condition.

Transport of Fish for Short Trips by Sea at Medium Temperature, by Selim R. Suntur, FAO Technical Paper No. 47, 4 pp., processed. Food and Agriculture Organization of the United Nations, Rome, Italy, 1956.

***

The Food and Agriculture Organization has published reports describing that Agency's activities under the Expanded Technical Assistance Program for developing the fisheries of many countries. These reports have not been published on a sales basis, but have been processed only for limited distribution to governments, libraries, and universities. Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome, Italy.

Informe al Gobierno del Ecuador sobre Fomento de la Pesca Maritima (Report to the Government of Ecuador on Marine Fishery Projects), by Dr. Erwin A. Schweigger, FAO Rpt. No. 325, 23 pp., processed in Spanish, January 1955. Reports on the fishery resources of Ecuador; equipment; the social level of the fisherman; surface fishery; specific problems of tuna and cod fisheries, and need for conservation measures; and lists the scientific, English, and Ecuadoran names of fish in Ecuador.

Informe al Gobierno de la Republica de Panama sobre Investigacion de los Recursos Camaroneros, Octubre 1952-Octubre 1953 (Report to the Government of Panama on Investigations of the Shrimp Resources, October 1952-October 1953), by Leslie W. Scattergood, FAO Rpt. No. 326, 70 pp. and 6 plates of photographs, processed in Spanish, March 1955. Discusses the objective of study, fishery history, and importance of shrimp in Panama; the shrimp fleet; shrimp fishery zones and oceanography; and methods of identification and measurement, and observations and distribution of commercial species of shrimp.

Informe al Gobierno de la Republica Dominicana sobre Piscicultura (Report to the Government of the Dominican Republic on Fish Culture), by S. Y. Lin, FAO Rpt. No. 346, 11 pp. and 5 plates of plans and photographs, processed in Spanish, December 1954. Discusses proposed plans for establishing needed fish hatcheries throughout the Dominican Republic.

Report to the Government of India on the Development of the Sundarbans Fisheries in West Bengal, based on work done by W. F. L. van der Heyden, FAO Rpt. No. 347, 15 pp. and 10 drawings and photographs, processed, December 1954. Reports on fishing gear, methods, and craft used in Sundarbans fisheries; transport and marketing of fish; experimental fishing project; and floating ice plant and cold storage.

Report to the Government of Turkey on Fishery Biology, based on the work of Dr. G. A.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Rounsefell, FAO Rpt. No. 391, 23 pp., processed, July 1955. Discusses proposed research for development of fishery resources in Turkey.

Relatorio ao Governo do Brasil sobre Biologia da Pesca (Report to the Government of Brazil on Fishery Biology), FAO Rpt. No. 494, 40 pp., illus., processed in Portuguese, May 1956. A report on Brazil's fishery resources and oceanography, illustrated by 15 charts. Includes descriptions of the most important commercial species of fish and charts their oceanic distribution by species.

Report to the Government of Sudan on a Brief Survey of the Sudanese Red Sea Fisheries (July 1955), FAO Rpt. No. 510, 41 pp., illus., processed, June 1956. Describes a brief survey of the Sudanese marine fisheries. Discusses the present status of the sea fisheries, shell fishing, and the governmental development scheme, and makes recommendations for improvement of the fisheries.

Report to the Government of Syria on the Marine Fisheries, FAO Rpt. No. 516, 39 pp., illus., processed, August 1956. This is a report based on a survey of the Syrian sea fisheries. Although the Syrian waters are rather unproductive, as is the Eastern Mediterranean in general, it appears likely that a modest increase in the production of marine fish could be obtained through implementation of the recommendations contained in this report, which aim at gradual improvement of the craft, gear, and methods used for inshore fishing, pelagic fishing, trawling, sponge diving, as well as better practices in fish handling and distribution.

Report to the Government of Egypt on the Fishery Investigations on the Nozha Hydrodrome near Alexandria, Egypt, FAO Rpt. No. 543, 21 pp., processed, September 1956. A short review of the activities on the Hydrodrome project where fishery investigations are being conducted. Contains a brief review of the project, summary of accomplishments, and recommendations concerning the Hydrodrome project.

FOOD CONSUMPTION:

Food Consumption of Households in the Northeast, Household Food Consumption Survey 1955 Report No. 2, 197 pp., processed, $1; Food Consumption of Households in the North Central Region, Report No. 3, 197 pp., processed, $1; Food Consumption of Households in the South, Report No. 4, 197 pp., processed, $1; and Food Consumption of Households in the West, Report No. 5, 195 pp., processed, $1. U. S. Department of Agriculture, Washington, D.C., December 1956. (For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.) These reports contain portions of the data from the U. S. Department of Agriculture's nationwide survey of household food consumption made in the spring of 1955. The survey was part of the Department's broad program of research on the marketing and utilization of farm products and on family dietary levels. The basic data in this survey relate to quantities of food consumed, including fish and shellfish. The survey was based on a national probability sample of approximately 6,000 housekeeping households of one or more persons. These reports give current information on patterns of food consumption, expenditures, dietary levels, and household food practices. Many interesting facets of the nation's eating habits are presented.

FRESH-WATER FISH:

Freshwater Fishery Biology, Second Edition, by Karl F. Lagler, 434 pp., illus., printed, $6.75. Wm. C. Brown Company, 215 West Ninth, Dubuque, Iowa.

GENERAL:

Federal Aid in Fish and Wildlife Restoration (Annual Reports of the Dingell-Johnson and Pittman-Robertson Programs for the Fiscal Year Ending June 30, 1956), 105 pp., illus., printed. Wildlife Management Institute, Wire Bldg., Washington 5, D. C.

"Ionizing Radiations in the Processing of Plant and Animal Products," by John T. R. Nickerson, Bernard E. Proctor, and Samuel A. Goldblith, article, Food Technology, vol. 10, July 1956, pp. 305-311, printed, single copy $1.50. The Garrard Press, 119 West Park Ave., Champaign, Ill. This article is concerned with the effect of high voltage cathode rays on the organoleptic properties of fish cakes, halibut steaks, and scallops and the prevention of irradiation-induced changes under certain processing conditions.

The Open Sea: Its Natural History; The World of Plankton, by Alister C. Hardy, 335 pp., illus., printed, $6.50. Houghton Mifflin Co., 2 Park St., Boston 7, Mass. A nontechnical account for the general reader of the teeming world of plankton, and also a guide for the study of marine biology.

"QMC is Researching Convenience Foods," by Karl Robe, article, Food Processing, vol. 17, July 1956, pp. 21-23, illus., printed. Putman Publishing Company, 111 East Delaware Place, Chicago 11, Ill.

The Underwater World, by John Tassos, 242 pp., illus., printed, $4.95. Prentice-Hall, Inc., 70 Fifth Ave., New York, N. Y. A complete guide to diving, spearfishing, and other underwater secrets.

GREAT LAKES:

Annual Report to the Great Lakes Research Committee, 1955, by W. A. Kennedy, Section I, 76 pp., Section II, 20 pp., illus., processed. Federal-Provincial Great Lakes Fisheries Research Committee, Canada. Section I reports on lamprey control experiments and discusses the following: forecast of lake trout production in Lake Superior; biological program and check-weir operations on tributaries to Lake Superior; electrical lamprey barriers; studies on possibility that sea lamprey can spawn in lakes, specifically Lake Erie; and preliminary report on a new type of electrical barrier to sea lamprey. Section II outlines progress in constructing and maintaining barriers to

spawning lamprey and includes 14 pages of sketches and photographs of some of the lamprey barriers.

HERRING:

Prospects for the 1956-57 Herring Fishing Season, by F. H. C. Taylor, Circular No. 43, 9 pp., illus., processed. Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B. C., Canada, August 1956. The twelfth in an annual series of circulars dealing with the prospects of Canada's British Columbia fishery.

INDIA:

Agenda and Notes (All India Fisheries Conference, Madras, September 1956), 42 pp., printed. Government of India, Ministry of Food and Agriculture, Fisheries Division, Madras, India.

JAPAN:

Journal of the Tokyo University of Fisheries, vol. 42, no. 1, 102 pp., illus., printed. The Tokyo University of Fisheries, Shiba Kaigandori 6, Minato-ku, Tokyo, Japan, February 1956. Contains, among others, the following articles: "Determination Method of Freshness of Fish Muscle with Trimethylamine," by S. Horie and Y. Sekine; "Polarographic Studies on the Rancid Oil," by T. Kikuchi, I. Okada, I. Osakabe, and K. Fukushima; "Experiments on the Freezing of Fish by the Air-Blast Freezer," by J. Nagaoka, S. Takagi, and S. Hotani; "Refrigeration of Fish on Boats in Japan," by K. Tanaka; "Defrosting of Frozen Whale Meat," by K. Tanaka and T. Tanaka; "Biochemical Condition of Whalemeat Before or After Freezing and Cold Storage of Frozen Meat," by K. Tanaka and T. Tanaka; "Studies on the Quality Inspection of Frozen Tunny in Frozen State," by S. Hotani; and "A Coastal Survey of the Gulf of Mexico by Japanese Fishing Boats in 1936 and 1937," by H. Niino, N. Nasu, and R. H. Parker.

Journal of the Tokyo University of Fisheries, vol. 42, no. 2, 104 pp., illus., printed. The Tokyo University of Fisheries, Shiba Kaigandori 6, Minato-ku, Tokyo, Japan, March 1956. Contains, among others, the following articles: "Researches on the Fishing Grounds in Relation to the Scattering Layer of Supersonic Wave (Introductory Report)," by M. Uda; "Observations on the So-Called Deep Scattering Layer (DSL), with Special Reference to the Vertical Distribution of Plankton," by Y. Komaki and Y. Matsuye; "The Scattering Layer in Relation to Fishing," by K. Ozawa and J. Ihara; and "General Results of the Oceanographic Surveys (1952-1955) on the Fishing Grounds in Relation to the Scattering Layer," by M. Uda, N. Watanabe, and M. Ishino.

Second Fisheries Census as of January 1, 1954, Survey Result of Sea Fisheries, no. 47, 37 pp., mostly tables, printed in Japanese. Agriculture and Forestry Ministry, Tokyo, Japan. Presents statistical tables of the following: types of fishing done, types of vessels used, number of people engaged in fishing, number of fishing vessels used, and total catch by species; by individuals; by cooperative, production, and joint associations; by companies; and by government organizations. Also gives data on family income from fishery; number of families dependent on income from sources other than fishery; fishermen's source of income from the fisheries and other employment; number of individuals, industries, and others engaged in the various fisheries; and number of fishermen by districts.

MACKEREL:

"Utilization of Food by Mackerel, Pneumatophorus japonicus (Houttuyn)," by Masayoshi Hatanaka and Masao Takahashi, article, The Tohoku Journal of Agricultural Research, vol. VII, no. 1, September 1956, pp. 51-57, illus., printed. Faculty of Agriculture, Tohoku University, Sendai, Japan.

MARINE SCIENCE:

"Marine Science in the South-East Pacific Ocean," by G. E. R. Deacon, article, Nature, vol. 179, no. 4550, January 12, 1957, pp. 66-68, printed. MacMillan and Co., Ltd., St. Martin's St., London, W. C. 2, England. Following its policy of arranging discussions on marine science in areas where they are likely to attract new interest, the United Nations Educational, Scientific and Cultural Organization invited its Marine Sciences Advisory Committee and other specialists to meetings in Lima. The Committee met for the time during October 22-24, though the ground had been prepared by an interim committee in Tokyo, and by reports on the needs of marine science from national commissions and international organizations. The Committee considered a wide range of problems and recommended direct or indirect support for work that will cultivate interest in the oceans and understanding of their behaviour, especially in countries where little attention has been paid to them. It also urged support for organizations engaged in perfecting various aspects of the science to the point where they can become really effective in practical problems. In addition to the Committee's recommendations, this article discusses the work that has been done in the past on marine science in the south-east Pacific Ocean and the many problems that still have to be solved.

MIDWATER TRAWLING:

"Some Problems in Mid-Water Trawling," by I. D. Richardson, article, World Fishing, vol. 6, no. 2, February 1957, pp. 28-31, illus., printed. John Trundell (Publishers) Ltd., Temple Chambers, Temple Avenue, London E.C. 4, England. Describes in detail the problems confronting users of midwater trawls and discusses suggested methods for overcoming those problems. Specifications and methods of opening a midwater trawl are shown in diagrammatical form.

NEWFOUNDLAND:

The Bonavista Longlining Experiment, 1950-1953, by Wilfred Templeman and A. M. Fleming, Bulletin No. 109, 60 pp., illus., printed, 50 Canadian cents. Queen's Printer, Ottawa, Canada, 1956. Describes longlining experiments which were carried on from 1950-1953 at Bonavista, using Cape Island-type longliners from Nova Scotia. These boats were larger than those typically used in the trap, handline and inshore linetrawl fishery on the east coast of Newfoundland. In 1950 the operations were wide-ranging and

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

exploratory. In 1951, from early June to mid-December, a commercial fishing trial was carried out to compare the financial returns from a 42-foot boat with a 3-man crew, and a 51-foot boat with a 4-man crew. In 1953, two 55-foot longliners fished the offshore grounds in May. Their excellent catches demonstrated that longlining on a commercial basis could be successful throughout May and probably in April. Bonavista fishermen, stimulated by the successful fishing of the experimental longliners, began longlining either in converted boats or ones expressly built for long-line fishing. From three boats in 1951 the local fleet increased to 10 during 1952 and to 14 in 1953. Though there was considerable variation in the yearly total catch from long-line boats fishing mainly offshore, the yearly catch per unit of gear showed little variation from boat to boat, and those which fished 50 to 60 trips were financially successful. During June and July, when landings of cod from traps, handlines and linetrawls are at their peak, the proportion of the total catch attributable to longliners is small. Following this, the longliner proportion of the catch increases with advance of the season until toward the end longliners are landing the bulk of the cod. In many years longline boats could fish the deep water profitably in May and early June, and sometimes in April, while the large inshore codfishery by other methods usually begins late in June.

Danish-Seining Explorations in Newfoundland and Cape Breton Areas, by T. N. Stewart, Bulletin No. 108, 31 pp., illus., printed, 50 Canadian cents. Queen's Printer, Ottawa, Canada, 1956. The Danish seine can be operated only on a smooth sea bottom, and in 1952 the only known fishing ground suitable for it around Newfoundland was a small area in Fortune Bay, where Danish seining for the witch flounder or grey sole began in 1951. In 1953 and 1954 a survey of the coast of Newfoundland, the southwest edge of the Grand Bank of Newfoundland, and the area to the west of Cape Breton Island was made to locate additional grounds suitable for seining. A 56-foot wooden Danish seiner was used for these explorations. No new grounds were found close to the Newfoundland coast. The southwest edge of the Grand Bank could be fished by Danish seine, but a larger vessel would be required. The rather small size of the fish and the extra work in culling might make such a fishery uneconomic at 1955 prices. Excellent catches were obtained in the Gulf of St. Lawrence in North Bay near Cape Breton Island, and it is probable that a good Danish seine fishery could be developed there under present economic conditions.

OCEANOGRAPHY:

Data Collected by Scripps Institution Vessels on Eastropic Expedition, September-December 1955, SIO Reference 56-28, 156 pp., illus., processed. Scripps Institution of Oceanography, University of California, La Jolla, Calif., October 15, 1956.

Physical and Chemical Data, CCOFI Cruise 5205 (MLR 37), May 9-26, 1952, SIO Reference 56-24, 78 pp., illus., processed. Scripps Institution of Oceanography, University of California, La Jolla, Calif., August 17, 1956.

OHIO:

Summary of the Ohio Lake Erie Commercial Fish Catch, 1885-1955, no. 281-F, 60 pp., illus., processed. Division of Wildlife, Ohio Department of Natural Resources, 1500 Dublin Rd., Columbus 12, Ohio, 1956. A summary of available statistical information pertaining to the Ohio commercial fishery of Lake Erie dating from the first record in 1885 through the 1955 season. Catch statistics for 1954 are shown by species, seasons, months, gear, districts, counties, and major ports. Data on the trap-net catch, percent of total catch (all gear), and average pounds per lift are given for 1948-55. Total production of Ohio Lake Erie commercial fisheries is shown for 1935-55.

Summary of the Ohio Lake Erie Commercial Fisheries 1955, 18 pp., processed. Division of Wildlife, Ohio Department of Natural Resources, 1500 Dublin Rd., Columbus 12, Ohio. A statistical summary, compiled by the Department's Wildlife District One, Sandusky, pertaining to the Ohio commercial fisheries of Lake Erie for 1955. Catch statistics are shown by species, seasons, months, gear, districts, counties, and major ports. Data on the trap-net catch, percent of total catch (all gear), and average pounds per lift are given for 1955.

OREGON:

Biennial Report of the Fish Commission of the State of Oregon to the Governor and the Forty-Ninth Legislative Assembly, 1957, 28 pp., printed. Fish Commission of the State of Oregon, 307 State Office Bldg., Portland 1, Ore. A report of the operation of the Commission together with a financial statement for the biennial period July 1, 1954 to June 30, 1956. During this period, according to the report, the fisheries management and conservation program has reflected the rapid increase in the number of hydroelectric and water development projects within the State. These have imposed unprecedented demands for studies which will provide the basis for measures which will protect the fisheries values as they are affected by an expanding economy. This report includes a condensed resume of the work which has been carried on by the Division of Engineering, Division of Fish Culture, and Research Division of the Commission during the period under review. It also shows the pack of canned salmon on the Columbia River during the years 1928-1955.

Preliminary Report on Stream Surveys and Fish Relocation Feasibility Studies Made Necessary by the Construction of Mt. Sheep and Pleasant Valley Dams, 91 pp., illus., printed. Oregon Game Commission, Portland, Ore., 1956.

PORTUGAL:

IV Congresso Nacional de Pesca (Fourth National Fishery Congress), no. 28, 313 pp., illus., printed on Portuguese. Gabinete de Estudios das Pescas, Lisbon, Portugal, 1955. Gives brief summaries and conclusions derived from each of 108 reports presented to the Fourth National Fishery Congress held in Lisbon June 20 through 30, 1955.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

QUALITY:

Volatile Bases and Sensory Quality-Factors in Iced White Fish, by A. S. C. Ehrenberg and J. M. Shewan, DSIR Food Investigation Memoir No. 928, 11 pp., illus., printed. (Reprinted from Journal of the Science of Food and Agriculture, vol. 6, no. 4, 1955, pp. 207-217.) Department of Scientific and Industrial Research, London, England.

REFRIGERATION:

The Expressible Fluid of Fish Fillets: II. --Method of Determination, by A. Banks, 5 pp., illus., printed. (Reprinted from Journal of the Science of Food and Agriculture, vol. 6, no. 5, 1955, pp. 282-286.) Department of Scientific and Industrial Research, Torry Research Station, Aberdeen, Scotland. Describes a method for measurement of expressible fluid in whole fish fillets during cold storage.

Frozen Food Lockers--Highlights of a Survey, by P. C. Wilkins, L. B. Mann, and B. D. Miner, FCS Circular 17, 21 pp., illus., printed. Farmer Cooperative Service, U. S. Department of Agriculture, Washington 25, D. C., June 1956. This report is designed to provide a broad view of the frozen food locker industry. It describes the industry in terms of location, size, services, rates, patronage, and volume. The information was assembled from reports received from 6,390 locker operators and covers 1954 operations. Comparisons were made with information secured in earlier surveys, particularly surveys made in 1950 and 1946. To compare figures in this report with previous surveys, this publication shows the number and types of plants and patrons, number of lockers, and rates charged on January 1, 1955. Business volume figures for the plants cover the year 1954. The authors state that, "For the past 5 years and to some degree since the close of World War II, this industry has been adjusting its operations to take advantage of opportunities arising from the increasing use of home freezers. It has also been processing more locally-produced foods for sale, thereby improving operating efficiency. Thus the industry can compete more successfully with other segments in the food processing field. Indications are that future expansion in the frozen food locker industry will be in the field of processing and merchandising. While renting lockers will continue as an important phase of the business, revenue from this service will probably decline in relative importance."

SALMON:

"Salmon Stock Fluctuations in the Baltic Sea," by Gunnar Svardson, article, Annual Report for the Year 1954 and Short Papers, no. 36, pp. 225-262, printed. Institute of Freshwater Research, Fishery Board of Sweden, Stockholm, Sweden, 1955.

SALT FISH:

The Browning of Salt Cured White Fish, by J. M. Shewan, DSIR Food Investigation Memoir No. 927, 4 pp., illus., printed. (Reprinted from Food Manufacture, May 1955.) Torry Research Station, Food Investigation Organization, Department of Scientific and Industrial Research, London, England, 1955.

"Quemado" de las Salazones Secas de Pescado ("Sunburn" of Dried Salted Fish), by Dr. Victor H. Bertullo, Dr. Hugo Ferrando, and Emilio La Mata, 8 pp., illus., printed in Spanish with a brief summary in English. (Reprinted from Anales de la Facultad de Veterinaria del Uruguay, vol. VI, no. 3.) Contralor Sanitario del Servicio Oceanografico y de Pesca, Montevideo, Uruguay.

SPORENDONEMA EPIZOUM (Corda) Cif. y Red., Agente Productor de las "Pecas" o "Mosqueado," en el Pescado Salado, Seco (Sporendonema epizoum (Corda) Cif. and Red., the Cause of "Spots" on Dried Salted Fish), by Victor H. Bertullo, 7 pp., illus., printed in Spanish with a brief summary and bibliography in English. (Reprinted from Anales de la Facultad de Veterinaria del Uruguay, vol. VI, no. 3.) Contralor Sanitario del Servicio Oceanografico y de Pesca, Montevideo, Uruguay.

SAURY:

"Spawning Ground of the Saury, Cololabis saira (Breboort), in the Japan Sea," Masayoshi Hatanaka and Kiyonari Sekino, article, The Tohuku Journal of Agricultural Research, vol. VII, no. 1, September 1956, pp. 59-64, illus., printed. Faculty of Agriculture, Tohuku University, Sendai, Japan.

SCALLOPS:

Escallops (PECTEN MAXIMUS L.) in Irish Waters, by F. A. Gibson, 20 pp., illus., printed, 5s. (70 U. S. cents). (Reprinted from The Scientific Proceedings of the Royal Dublin Society, vol. 27, no. 8, October 12, 1956, pp. 253-271.) The Royal Dublin Society, Ball's Bridge, Dublin, Ireland, 1956.

SHAD:

"The Migratory Shad," by Bernard L. Gordon, article, The Fisherman, vol. VIII, no. 2, February 1957, pp. 14-16, 80, illus., printed, single copy 50 cents. Fisherman Press Inc., Oxford, Ohio. Describes the early colonial shad fishery on the Connecticut River. Also discusses the methods developed for transporting shad over the dam of the Holyoke (Massachusetts) Power Company and spawning and feeding habits and migratory routes of shad. Three photographs of the unique shad elevator at the Hadley Falls, Mass., dam are also included.

SHELLFISH CULTURE:

"On Utilization of Salt Water Ponds for Shellfish Culture," by Victor L. Loosanoff, article, Ecology, vol. 37, no. 3, July 1956, pp. 614-616, printed, single copy $2. Circulation Office, Duke University Press, Box 6697, College Station, Durham, N. C. Considerable interest has been displayed in the possibilities of cultivating the American oyster, Crassostrea virginica, and other molluscs in small, enclosed or semi-enclosed salt-water bodies, such as the numerous ponds that are found along the shoreline of a mainland and also on some large islands, such as Gardiners Island, New York; Martha's Vineyard, Mass.; and others. This interest is shown because the oyster beds in such large areas as Long Island Sound are severely damaged by frequent hurricanes and storms, and because the efficient control of oyster enemies there is extremely difficult. These disadvantages, however,

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

can be eliminated if oysters are grown in relatively small bodies of water that are well protected against the action of storms, and where the control of oyster enemies is more feasible. This article proposes the approaches for ascertaining the suitability of small, enclosed or semi-enclosed salt-water bodies for the propagation of oysters and other molluscs. It suggests the steps to be taken in studying the physiological, chemical, and biological characteristics of such ponds, and recommends certain devices and methods that should improve their conditions.

SMELT:

"Studies on Columbia River Smelt, Thaleichthys pacificus (Richardson)," by Wendell E. Smith and Robert W. Saalfeld, article, Fisheries Research Papers, vol. 1, no. 3, February 1955, pp. 3-26, printed. Department of Fisheries, Fishermen's Terminal, Salmon Bay, 4015 20th Ave., West, Seattle 99, Wash.

SOUTH CAROLINA:

(Bears Bluff Laboratories) Annual Report 1955-1956, Contribution No. 24, 19 pp., illus., printed. (Reprinted from Report of South Carolina Wildlife Resources Department, Fiscal Year July 1, 1955-June 30, 1956.) Bears Bluff Laboratories, Wadmalaw Island, S. C., January 1957. The activities of the Laboratories are described. Research was conducted on oysters, shrimp, crabs, finfish, and salt-water ponds.

SPAIN:

La Peche a Bermeo--Espagne (Fishery in Bermeo, Spain), by F. Doumenge, 19 pp., illus., printed in French. (Reprinted from Vie et Milieu, vol. VII, no. 3, 1956, pp. 307-325.) Centre Regional de la Productivite et des Etudes Economiques, Rue de Verdun 22, Montpellier, France. Discusses the economic importance of fishery at the port of Bermeo on the North Atlantic coast of Spain.

Sobre el fomento de la produccion pesquera de las aguas marinas y salobres confinadas; en el litoral de España y en el de sus Territorios de Soberania y de Protectorado (Concerning the Improvement of Fishery Production in Marine Waters and Confined Salt Waters of the Shores of Spain and Its Possessions and Protectorates), by Luis Lozano Rey, Boletin del Instituto Espanol de Oceanografia, no. 74, 83 pp., illus., printed in Spanish. Instituto Español de Oceanografia, Ministerio de Marina, Madrid, Spain, January 10, 1956. Presents a brief history of salt-water fisheries in Spain and Spain's possessions and protectorates. Discusses the possibilities of increasing fishery production by: intensifying the catch of fish that prey on other fish of commercial value; improving fishing methods and technology; augmenting research in fish species, fishery banks, and fishing industry, especially canning; cultivating and transplanting fish from other waters; and expanding fishery legislation. Also includes brief reports of the principal species of fish produced in specific regions of Spain and in the Baleares Islands, Morocco, Ifni, Spanish Sahara, and Spanish Guinea.

SPOILAGE:

"Spoilage of Fish in the Vessels at Sea: 5. Bilgy Fish," by Norma L. McLean and C. H. Castell, article, Journal of the Fisheries Research Board of Canada, vol. 13, no. 6, November 1956, pp. 861-868, illus., printed. Queen's Printer, Ottawa, Canada. A study of spoilage of fish in vessels at sea shows that offensive "bilgy" odors develop when fish are stored in contact with slime-soaked wooden surfaces. Anaerobic bacteria develop in the slime layer between the surfaces of the fish and the wood. The muscle of bilgy fish has a higher hydrogen sulphide and a lower mercaptan content than that of similar fish spoiling in ice but not in contact with wood. The trimethylamine and volatile acid values are usually, but not consistently, high in bilgy fish. In these experiments the bilgy odor became evident in the muscle of fish jammed up against heavily contaminated wood surfaces only when the hydrogen sulphide content reached approximately 0.05 mg. per 100 g. of fish.

TERRITORIAL WATERS:

"Comments by Certain Governments on the Provisional Articles Concerning the Regime of the High Seas and the Draft Articles on the Regime of the Territorial Sea Adopted by the United Nations International Law Commission at Its Seventh Session in 1955," article, The American Journal of International Law, vol. 50, no. 4, October 1956, pp. 992-1049, printed, single copy $2.50. The American Society of International Law, 1826 Jefferson Place, NW., Washington 6, D. C. Presents the comments of six governments--Sweden, Israel, United Kingdom, United States, Cambodia, and Iceland--on the texts of draft articles concerning the regime of the high seas, the regime of the territorial sea, and conservation of living resources of the sea. Comments from member nations were requested by the United Nations International Law Commission to help prepare the final report on the law of the sea at the Commission's eighth session.

"Continental Shelf and International Law: Confusion and Abuse," by Josef L. Kunz, article, The American Journal of International Law, vol. 50, no. 4, October 1956, pp. 828-853, printed, single copy $2.50. The American Society of International Law, 1826 Jefferson Place, NW., Washington 6, D. C. Discusses the great controversy of the doctrine of the continental shelf and its infringement upon the freedom of the high seas. Location of petroleum beneath the waters of the continental shelf has caused coastal nations to secure sovereignty over those waters. According to the author, such sovereignty should cover only petroleum and mineral rights but confusion of existing laws has arisen and the coastal states have also claimed sovereignty over fisheries, navigation, and other rights included in freedom of the high seas. The article stresses the need to strike a just balance between the legitimate interests of the coastal state and the high seas requirements of the international community.

(International Law Commission) Report of the International Law Commission on the Work of its Eighth Session: (a) Final Report on the Regime of the High Seas, the Regime of the Territorial Sea and Related Problems, A/C.6/L.387, November 28, 1956, 8 pp., processed. United Nations, International Law Commission, New York, N. Y.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

"Pan American Discussions on Offshore Claims," by Richard Young, editorial, The American Journal of International Law, vol. 50, no. 4, October 1956, pp. 909-916, printed, single copy $2.50. The American Society of International Law, 1826 Jefferson Place, NW., Washington 6, D. C. Briefly relates the evolution of the concept of the continental shelf from its origin in the Unites States Proclamation of September 28, 1945, to the present. Discusses the outcome of several inter-American conferences, especially the Ciudad Trujillo Conference of March 1956 held expressly for the purpose of solving some of the existing problems caused by over-extension of the doctrine of the continental shelf.

"United Nations Report of the International Law Commission Covering the Work of Its Eighth Session, April 23-July 4, 1956," article, The American Journal of International Law, vol. 51, no. 1, January 1957, pp. 154-256, printed, single copy $2.50. The American Society of International Law, 1826 Jefferson Place, NW., Washington 6, D. C. A report in four chapters. Chapter I covers the organization of the Commission's eighth session. Chapter II describes the accomplishments of the Commission, during past sessions, in regard to questions of high seas and the territorial sea; presents the text of the articles concerning the law of the sea; and includes a full commentary by the Commission on each of the articles of the law of the sea. Chapter III briefly covers progress on other subjects under study. Chapter IV reports on other decisions of the Commission.

TILAPIA:

The Breeding Behaviour of TILAPIA Species (Pisces; Cichlidae) in Natural Waters: Observations on T. KAROMO Poll and T. VARIABILIS Boulenger, by R. H. Lowe (McConnell), 24 pp., illus., printed. (Reprinted from Behaviour, vol. IX, 2-3.) East African Fisheries Research Organization, Jinja, Uganda, 1956.

Observations on the Biology of Tilapia (Pisces; Cichlidae) in Lake Victoria, East Africa, by Rosemary H. Lowe (McConnell), Supplementary Publication No. 1, 79 pp., illus., printed. East African Fisheries Research Organization, P.O. Box 343, Jinja, Uganda, 1956.

TRADE LIST:

The Office of Intelligence and Services, Bureau of Foreign Commerce, U. S. Department of Commerce, Washington 25, D.C., has published the following mimeographed trade list. Copies of this list may be obtained by firms in the United States from that office or from Department of Commerce field offices at $2 each.

Oils (Animal, Fish and Vegetable)--Importers, Dealers, Producers, Refiners, and Exporters--Portugal, 14 pp. (January 1957). Contains the names and addresses, size of firm, and type of product handled by each firm. The report is divided into four parts and includes the following: Part 1(c) - Producers of Fish and Animal Oils; Part 2(b) - Refiners of Cod Liver Oil; and Part 4 - Exporters of Fish and Animal Oils. Exports of marine animal oils totaled 8,376 metric tons in 1955. The United States imported about 27 percent of the 1,943 tons of cod liver oil exported from Portugal in 1955

TUNA:

"Observation of Schooling Juvenile Tuna, Euthynnus alleteratus, in the Gulf of Mexico," by Harvey R. Bullis, Jr., article, Copeia, no. 2, May 20, 1955, pp. 153, printed, single copy $2.00. American Society of Ichthyologists and Herpetologists, Mt. Royal and Guilford Aves., Baltimore, Md.

TURKEY:

"On the Turkish Fishing Boats," by H. I. Chapelle and M. N. Ozerdem, article, Balik ve Balikcilik (Fish and Fishery), vol. V, no. 1, January 1957, pp. 14-18, illus., printed in Turkish. Et ve Balik Kurumu, Istanbul, Turkey. A feature article giving the details of the Turkish type of fishing boats.

Some Observations on the Hydrography and Occurrence of Fish off the Turkish Black Sea Coast, October 11-November 1, 1954, by Olav Aasen and Ilham Artuz, Marine Research Series Report No. 1, 23 pp., illus., printed. Fishery Research Center of the Meat and Fish Office, Istanbul, Turkey, 1956.

URUGUAY:

Neoplasma de los Peces de las Costas Uruguayas (Neoplasm of Fish from Uruguayan Shores), by Victor H. Bertullo and Roberto M. Traibel, 5 pp., illus., printed in Spanish with a brief summary in English. (Reprinted from Anales de la Facultad de Veterinaria del Uruguay, vol. VI, no. 3.) Contralor Sanitario del Servicio Oceanografico y de Pesca, Montevideo, Uruguay.

VESSELS:

Analysis of the Fishing Operations of Small and Medium-Sized Modern Long-Liners and Draggers in the Atlantic Provinces, 1955, by John Proskie, Production Studies, vol. 5, Part 1, 47 pp., processed. Department of Fisheries of Canada, Markets and Economics Service, Ottawa, Canada, August 1956. A report, including many tables, of a 1955 study of performance of fishing boats of various sizes, gear and operational methods, capital cost, and problems of financing and related topics.

WHALES:

"Whale Off!" (The Story of American Shore Whaling), by Everett J. Edwards and Jeannette Edwards Rattray, 308 pp., illus., printed. Coward-McCann, Inc., New York, N. Y., 1956. A very interesting and well-written book on American shore whaling in general, and the small-boat whaling carried on off the eastern end of Long Island from 1640 to 1918, in particular--the first and last whaling of this sort done anywhere in America. It describes not only the thrills of the whale chase, but the everyday work and play of these shore-whalemen who were farmers and fishermen in the intervals between whales.

CONTENTS (CONTINUED)

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Alma Greene, Helen Joswick, and Helen Turner

* * * * *

Photograph Credits: Page by page, the following list gives the source or photographer for each photograph in this issue. Photographs on pages not mentioned were obtained from the Service's file and the photographers are unknown.

Front and outside back cover--Elliott A. Macklow; pp. 20, 21, 22, and 23--F. Bruce Sanford; p. 25--Ray C. Erickson.

INT.-DUP. SEC., WASH., D.C. 16372

FISHERY MOTION PICTURE

The following motion picture is available only from the source given in the listing.

Fresh Out of the Water, a 16 mm. 14-minute sound and color film produced and distributed by the U. S. Fish and Wildlife Service, highlights the fact that it is the dietitians, diet specialists, and the consuming public who "call the turn" on the fishing industry; that popular demand, competition with other protein foods, modern machinery, and processing, have resulted in fishery products which are truly "fresh out of the water" despite time and distance from lake and sea.

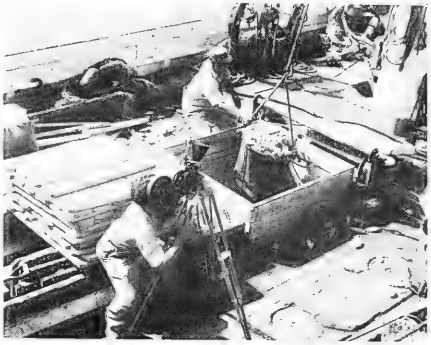


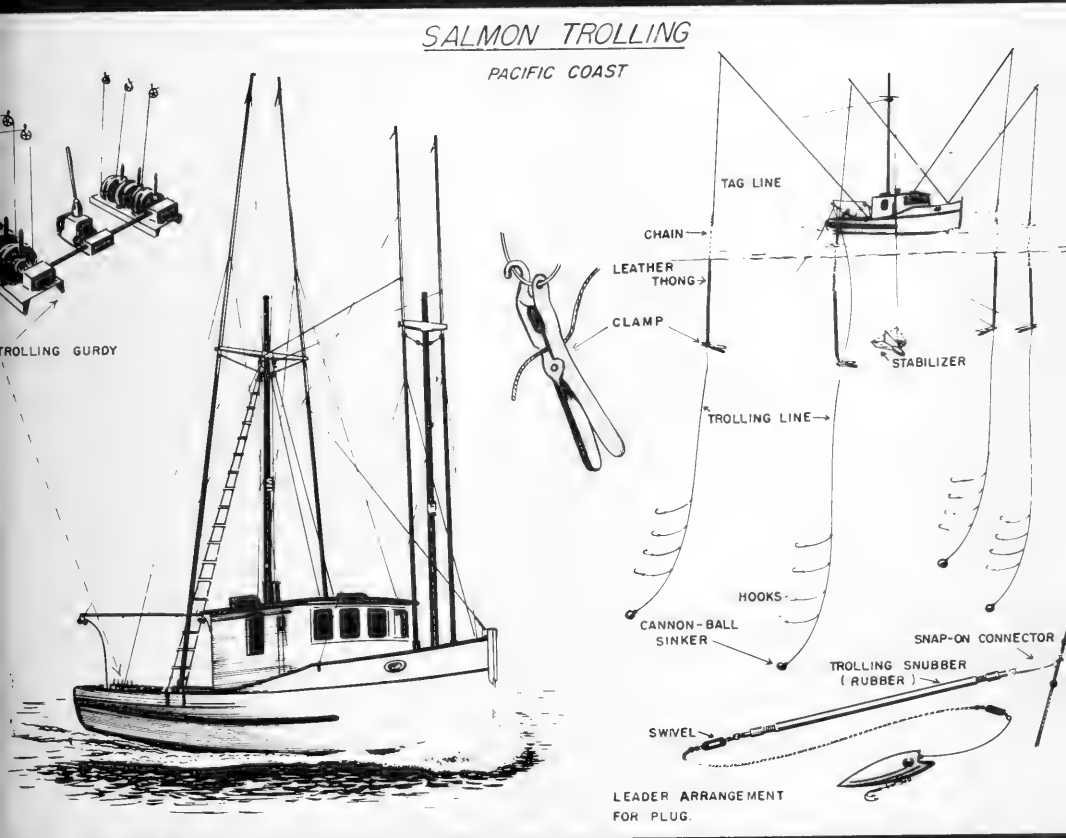
Fig. 1 - Cameraman filming the unloading of ocean perch at Gloucester, Mass.

Fig. 2 - U. S. Department of Agriculture Inspector grading fish sticks at Gloucester, Mass.

Beginning with an underwater sequence, the film first shows the catching of fish, emphasizing the cleanliness of the fishing boats and the extreme care which is given fish from the moment of taking. The film then moves into a brief but comprehensive picture of what takes place before fish reach the consumer--the icing, freezing, filleting, canning, and other processing, the transporting and the marketing. Then it shows two steps so important after the product is in the consumers' hands--the proper preparation of the food and, finally, serving it in an attractive manner.

The film was produced with funds provided by the Saltonstall-Kennedy Act of 1954. Copies of the film are available at 140 film libraries which distribute fishery films produced by the Bureau of Commercial Fisheries of the U. S. Fish and Wildlife Service. Further information relative to the picture may be obtained from the U. S. Fish and Wildlife Service, Washington 25, D. C.

COMMERCIAL FISHERIES REVIEW



Vol. 19, No. 5 MAY 1957

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor

J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Pacific Coast salmon troller and trolling gear.

Contents Continued Page 89.

COMMERCIAL FISHERIES REVIEW

May 1957 Washington 25, D.C. Vol. 19, No. 5

A PICTURE STUDY OF AN AMERICAN WHALING OPERATION

By F. Bruce Sanford*

The whaling industry, long a romantic tradition in America, still exists in this country. This paper presents a pictorial study of modern inshore whaling operations.

For some years, there was an American whaling station at Fields Landing near Eureka in Northern California. The station closed down, however, as the result of a fire in 1951. Since that time it has not been used for processing whales (fig. 1). At the time this article was written (September 1956), the only active whaling operation in the United States was centered at Point San Pablo in Richmond, Calif., on San Francisco Bay. The reduction plants at Point San Pablo form an isolated community that long has been devoted to the reduction of fish (fig. 2). The processing methods are, in general, similar to those presented in Fishery Leaflet 126 (Butler 1949).

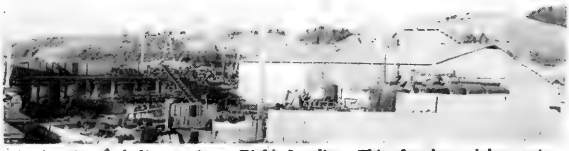


Fig. 1 - Site of whaling station at Fields Landing. This plant burned down twice, the last time in 1951. The building that was destroyed now has been replaced by one of metal construction, as is shown on the right. The plant is operated by the Hunter and Foland Company for the reduction of crab shells into meal and is not used presently for the reduction of whale.

The present whaling operation at Point San Pablo involves four separate organizations: the first catches and lands the whales; the second processes the whales into meat; the third distributes the meat to animal feeders; and the fourth renders into oil and meal the parts of the whale not used for animal food.

Fig. 2 - Point San Pablo at Richmond, Calif. View showing some of the plants, where large quantities of sardines formerly were processed. Owing to the decline in the sardine fishery, a number of the companies at Point San Pablo are no longer in operation. The machinery, for example, in the Red Rock Fisheries building shown in the foreground, is being removed, and the building is being converted into a warehouse. The whale processing plants are located at the far end of the road.

The whales caught for this operation are mostly humpback (Megaptera longimana or nodosa), with only a small number of sperm whales (Physeter catadon) being taken (5 percent).

The humpback whale grows to a length of about 50 feet. Those used in the operation at Point San Pablo

* Chemist, Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

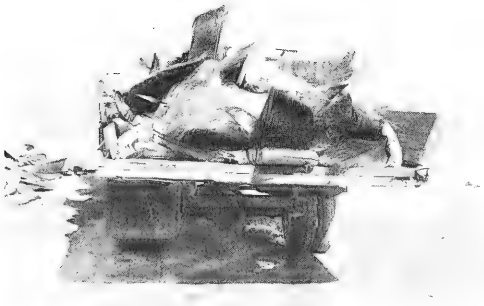


Fig. 3 - Truck with cut-up baleen.

are taken on the coastal banks around the Farallon Islands. Most of the humpback whales inhabit this area only in the summer, but some are found throughout the year. The humpback whale is a baleen whale: that is, it has horny plates of baleen, or whalebone, in the mouth where the upper teeth would be. These plates form a dense fibrous mat that acts like a large sieve through which the whale strains enormous quantities of small pelagic shrimp and schooling fish (fig. 3 and 4).

Sperm whales feed in deeper water and on larger animal life than the humpback whales. The main food of the sperm whale is large squid. In contrast to the humpback whale, the sperm whale has teeth (fig. 5). The male sperm whale attains a length of about 60 feet and the female attains a length of about 38 feet. Only male sperm whales are found in this region.

The whales, at present, are taken by two catcher boats, the Donna Mae and the Dennis Gayle (figs. 6 to 9). Each boat has

Fig. 4 - Close up view of baleen.

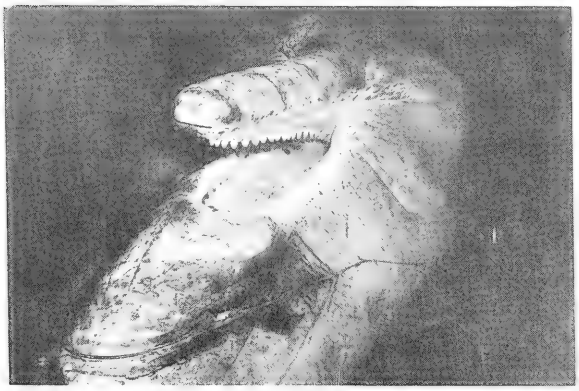


Fig. 5 - Mouth of a sperm whale. Note the teeth in contrast to the baleen in figures 3 and 4. Note also that there are teeth on the lower jaw only. The indentations in the upper jaw are tooth sockets into which fit the teeth on the lower jaw.

mounted on the bow a gun that shoots a heavy harpoon (figs. 10 to 14). The tip of the harpoon is armed with an explosive bomb, which usually kills the whale immediately (figs. 15 to 17).

Fig. 6 - Stern of the Dennis Gayle. Note that this vessel is also fitted for trawling.

Fig. 7 - Mounting of the harpoon gun on the Allen Cody.

Fig. 8 - Bow of the Dennis Gayle, showing the harpoon. This vessel, like the Donna Mae, is seldom in port, being at sea most of the time in search for whales.

Fig. 9 - The Allen Cody at Fields Landing. This catcher boat recently has been brought from Peru. It is not used presently in the Point San Pablo whaling operation, but may be used in the operation next year.

Fig. 10 - Mounting of the harpoon gun on the Dennis Gayle.

Fig. 11 - Views showing the bow of the Allen Cody. In the background is the Hunter and Folland Plant at Fields Landing, where bottom fish, crab, and shrimp are processed.

Fig. 12 - Gunner of the Dennis Gayle demonstrates the use of the harpoon gun. Note the sight bar.

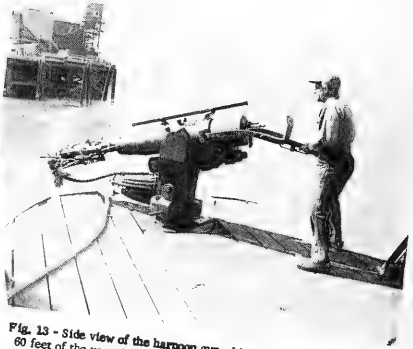


Fig. 13 - Side view of the harpoon gun. Most whales are shot within 60 feet of the vessel. The whale gun is a muzzle loader having a charge of about ½ pound of black powder.

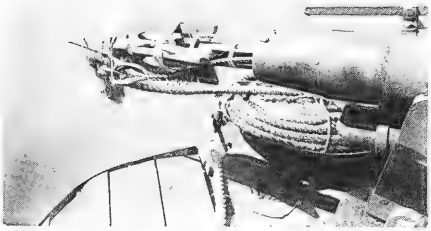


Fig. 14 - Harpoon in gun. When the harpoon enters the whale, the rope lashing is shoved off the claws, which open and securely fasten the harpoon. When the gun is fired, the light line that secures the foregoer and cable is broken. Occasionally, even the cable breaks under the tremendous force with which the harpoon is propelled.

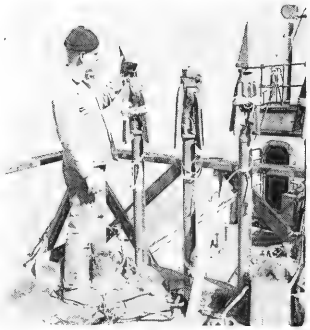


Fig. 15 - Engineer of the Dennis Gayle demonstrates how the bomb is screwed onto the harpoon. The harpoon in the center shows what is left after the bomb explodes in the whale.

Fig. 16 - Bomb. Note the threads and the empty shell, which, when ready for use, is filled with 1 to 1½ pounds of black powder.

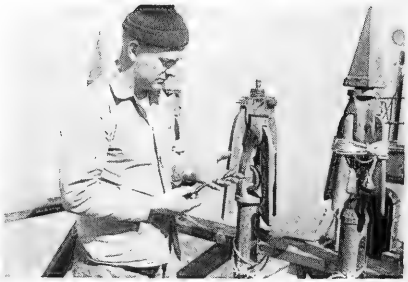


Fig. 17 - Parts of the fuse. The fuse has a plunger, which is the small part at the center of the engineer's hand. When the gun goes off, the jar knocks the plunger against a cap at the bottom of the cylinder (by the engineer's thumb of his right hand), which ignites the powder in the plunger and in the head of the fuse. This powder requires about 5 to 10 seconds to burn. It then ignites the powder in the bomb head, which explodes and kills the whale. Note the method of inserting the fuse on the harpoon in front of the engineer.

The dead whale is drawn by cable and winch to the vessel, where the body cavities are pumped with air to keep the whale afloat. It then is secured to the bow of the vessel by a chain around the flukes and is towed to the whaling station (figs. 18 and 19). Here it is drawn into the station tail first (figs. 18 to 21).

Fig. 18 - Del Monte Fishing Company, showing the Dennis Gayle with the sperm whale that it just has brought to port.

Fig. 19 - Sperm whale. Only a few sperm whales are processed here; most of the whales are of the humpback variety.

Fig. 20 - Making ready to pull the whale into the station. Note the cable in the foreground. The small rowboat is named the Moby Dick, Jr.

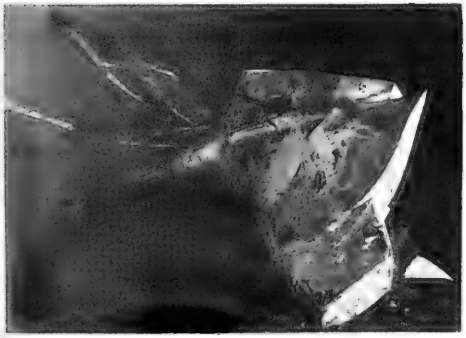


Fig. 21 - Tail of the sperm whale after a part has been removed. Note the incisions on the body of the whale. These incisions are for the removal of the blubber, as will be shown in later photographs.

The whale is cut up as follows:

1. Strip off the blubber from both sides of the whale with the aid of a winch (figs. 22 to 26).

2. Remove the jaw bone.

3. Remove, from one side, the long loin that runs from the shoulder to the tail and then turn the whale over so that it lies on its back.

4. Strip off the belly blubber.

5. Remove the head (fig. 27).

6. Remove the other long loin.

7. Remove a shoulder, exposing the belly cavity.

Fig. 22 - Making incision in the sperm whale preparatory to removing the blubber.

Fig. 23 - Cable-block. At the end of the cable in the worker's hand and hidden by the jaw of the whale is a block of wood. In removing a strip of the blubber, the worker chops a small hole in the end of the strip, which has been peeled from the whale for a short distance. The cable shown in the worker's hand is passed through this hole, and the block of wood at the end keeps the cable from going on through. The cable then is attached to a winch.

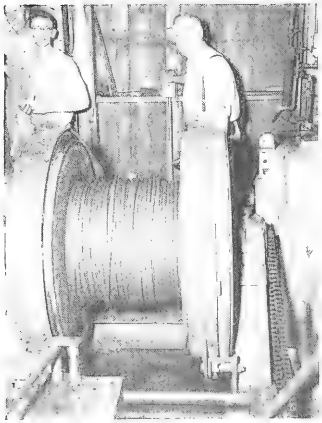


Fig. 24 - One of the winches employed in handling the whale. By use of this winch, the blubber is peeled from the whale like the skin from a banana.

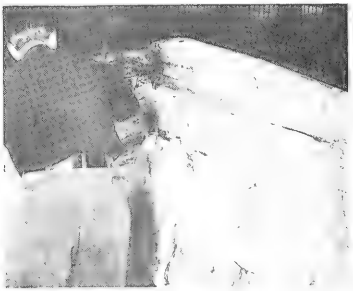


Fig. 25 - Removing blubber from the head end of the whale.

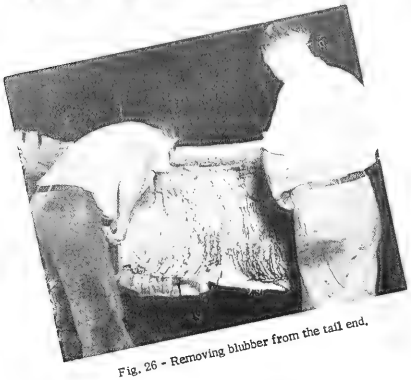


Fig. 26 - Removing blubber from the tail end.

Fig. 27 - Sawing the headbone of a humpback whale. The saw is similar to one employed with timber. A clipper chain is being used.

8. Remove the entrails (figs. 28 and 29).

9. Remove the two small loins that extend from the belly cavity to the tail (fig. 30).

10. Pull the vertebrae away from the other shoulder.

11. Remove the meat from the shoulders and the ribs (fig. 31).

12. Cut up the bones.

Fig. 29 - Cutting fat from the entrails.

Fig. 30 - Cutting meat from the small loin.

Fig. 28 - Taking meat from the vertebrae of a humpback whale preparatory to removing the entrails.

Fig. 31 - Cutting meat from the shoulders and the ribs.

The meat is made into animal food by cooling, grinding (figs. 32 and 33), bagging, and freezing; and the resulting product is sold to animal feeders. Parts of the whale not made into animal food are rendered into oil and meal in a dry-rendering process (fig. 34).

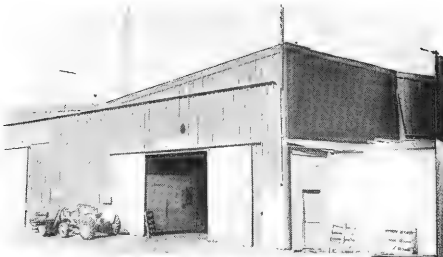


Fig. 32 - Tractor for moving parts of the cut-up whale.

Fig. 33 - Grinder. Chunks of whale meat are hoisted to the grinder by means of a conveyor. After the meat is ground, it is bagged and then is frozen.

Fig. 34 - Rendering plant, where parts of the whale not made into animal food are converted into oil and meal.

LITERATURE CITED

Bulter, Charles
1949. Fish Reduction Processes. U. S. Fish and Wildlife Service, Wahington 25, D. C., Fishery Leaflet 126, April, pp. 1-15.

Note: The author gratefully acknowledges the generous help of Anthony Caito, President of Del Monte Fishing Company; Gib Hunter of Hunter and Foland Company; Captain William Bartow of the Dennis Gayle; Peter Gray of the Independent Renderers, Inc.; Dr. Raymond M. Gilmore, Research Biologist for the U. S. Fish and Wildlife Service Whale Investigations; and Vernald F. Relitz of Parr Richmond Terminal Company.

BULK HANDLING OF ALASKA HERRING MEAL

By Robert M, Kyte*

ABSTRACT

Herring meal can be stored in bulk without subsequent spontaneous heating by allowing it to go through its initial heating under controlled conditions prior to bulk storage, the findings in this report indicate. The technology of bulk handling of herring meal was investigated by plant observations, plant tests, and laboratory experiments. The spontaneous heating of stored herring meal is a major problem in bulk handling. Plant tests indicated 0.01 percent of an oil antioxidant added to the dried scrap reduced the maximum temperature observed in bulk-stored meal but did not eliminate heating. Laboratory experiments indicated that herring oil which had once spontaneously heated then cooled did not again spontaneously heat in the period studied.

BACKGROUND

Herring meal is produced in reduction plants on Kodiak Island, in the Prince William Sound area, and in the Chatham Strait area of southeastern Alaska. These producing areas are 700 to 1,400 miles from Seattle, the port of entry to the United States for most of the herring meal from Alaska. At the present time, herring meal is sacked in burlap bags holding 100 to 120 pounds of meal and shipped on barges holding approximately 440 tons of meal (fig. 1). A large portion of the herring-meal production is purchased by poultry-feed formulators who buy herring meal by the carload lot and who have facilities for bulk handling grain and other ingredients used in the mixed feed.

Fig. 1 - A tug taking loaded barges of herring meal and oil from a herring reduction plant in Alaska.

Bulk handling the herring meal in place of sacking would offer savings to the manufacturer by eliminating the cost of sacks and the labor of sacking, and by reducing labor costs through simplification of warehousing and loading. But such savings would be offset by the capital expense of new equipment necessary for bulk handling. Cost of handling at the port of entry would also be reduced because the costs of unloading, when using modern bulk-handling equipment, would be significantly less than the costs of unloading sacked meal. But facilities different from those now being used for storing the meal at the port of entry would be required.

The purpose of this paper is to report findings made during an initial investigation of the technology of bulk handling of herring meal.

PLANT TESTS AND OBSERVATIONS

THE PROCESS: The method of producing herring meal in Alaska was similar in the six plants operating during the 1956 season. Essentially, the process consists of a cooker where the fish are cooked under 3 to 10 pounds steam pressure,

*Analytical Chemist, Fishery Products Laboratory, Ketchikan, Alaska.

a press where much of the oil and a portion of the water are pressed from the protein residue, and a direct-fired rotary drier where the press cake is dried.

HEATING OF SCRAP AND SACKED MEAL: Since heating was considered to be the major problem in bulk handling of herring meal, it was of interest to determine the temperature rise in sacked meal. This was done by measuring the temperature in the center of a sack of meal stored in a large warehouse, where the air temperature was 55° to 60° F. (fig. 2). It will be seen that the meal temperature rose rapidly the first 2 hours after sacking and continued to rise in some cases for 6 to 8 hours or more and to as high as 168° F. The temperature of the unground material (scrap) rose rapidly to levels of the order of 225° F. during the first few minutes after it came out of the drier (fig. 2). These temperatures were measured 6 inches below the surface of a 2-foot pile of scrap.

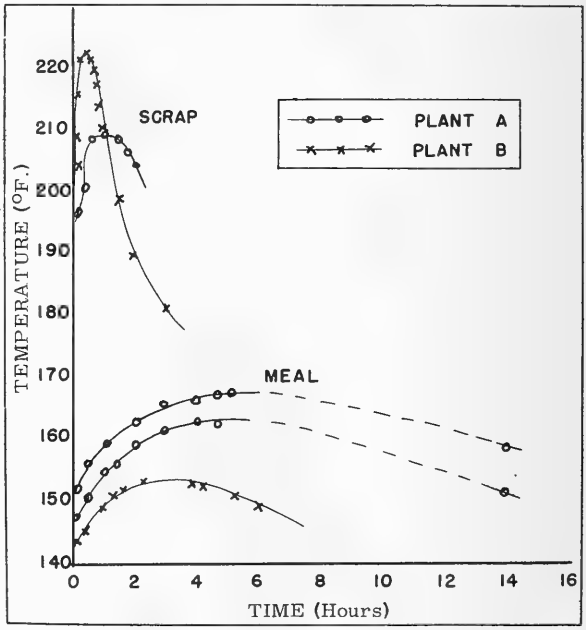


Fig. 2 - Rate and extent of heating observed in sacked herring meal and in herring scrap.

ANTIOXIDANT TESTS: It is believed that the primary cause of heating in bulk scrap and in sacked meal is the oxidation of the oil retained in the meal. Since it is feared that bulk-stored meal also will heat, owing to the same cause, a series of plant tests were conducted to determine the effectiveness of an oil antioxidant in preventing heating in bulk-stored herring meal.

Santoquin (6 ethoxy-1, 2-dihydro-2, 2,4-trimethylquinoline) was selected as the antioxidant to use in the plant test because of its effectiveness as an oil antioxidant. It is an oily substance and was used as an oil-in-water emulsion in order to spread the small amounts required over a large quantity of material. The Santoquin-water emulsion was applied by spraying it on the press cake, or on the meal passing in a conveyor (fig. 3). The antioxidant was added at two levels: 0.08 percent and 0.01 percent by weight of dried meal. Preliminary laboratory experiments indicated that these levels would bracket the desirable application rate if the use of antioxidants were accepted.

Intimate contact between the antioxidant and the oil on the meal is necessary for the antioxidant to become of maximum usefulness. The antioxidant, therefore, first was added as early in the process as possible--to the press cake--in order to achieve maximum mixing in existing plant equipment. Because the advantage gained by intimate mixing in the drier might be offset by destruction in the drier, a second test was made adding the antioxidant to the meal just after it was discharged from the drier. The only mixing that the antioxidant and meal received under the latter conditions was in the 50-foot conveyor and in the meal grinder.

The extent of the spontaneous heating of the herring meal and the effect of the antioxidant at different concentrations and when added at different stages in the process were measured by storing the meal in cubicle bins 4 feet on a side. The heating curves of the meal, treated with two concentrations of antioxidant added either to the press cake, or just after discharge from the drier, are presented in figure 4. The heating curves of untreated meal are presented in figure 5. The heating observed in the antioxidant-treated meal was less and reached a maximum sooner than in the untreated meal.

Fig. 3 - Adding oil antioxident to herring scrap leaving drier.

BULK DENSITY: Bulk density is an important factor in determining shipping costs because the density controls the amount of meal that a barge of given size can carry. It also was suspected that meals with a high bulk density--those that were tightly packed--would show different heating characteristics from meals with a low bulk density. To determine the effect of bulk density on heating, we poured normal production meal into two test bins. The meal in one bin, however, was tamped until it had a bulk density of 38 pounds per cubic foot. The loosely-filled bin had a bulk density of only 30 pounds per cubic foot. The heating curves of these meals are shown in figure 5. The lower-density meal heated slightly more rapidly than did the higher-density meal, but after 80 hours of storage, the temperatures in both bins were essentially the same.

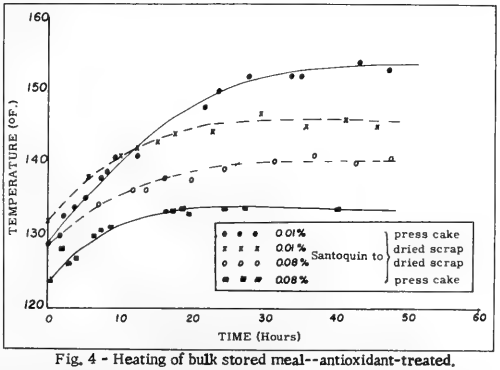


Fig. 4 - Heating of bulk stored meal--antioxidant-treated.

The bulk densities of unpacked herring meal observed at three different herring plants at one time during their operating season were 30.0, 32.5, and 34.2 pounds per cubic foot. The differences among the meals might be explained by differences in the moisture content of the meal and in the herring from which the meal was prepared. The density of the meal sacked in the hold of the barge was estimated to be 35 pounds per cubic foot. This is an estimated 5 to 10 percent less than the density of a sack of meal but 15 percent greater than loosely-filled bulk meal.

LABORATORY EXPERIMENTS

The plant-production variables of sacking temperature, moisture content, and bulk density of the meal seemed to affect the extent and the rate of heating of the herring meal. Laboratory experiments were set up to help explain the observed effects of these variables. In the laboratory experiments it was assumed that the major cause of heating was the oxidation of the oil.

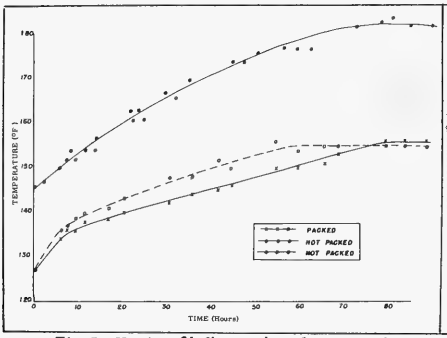


Fig. 5 - Heating of bulk-stored meal--untreated.

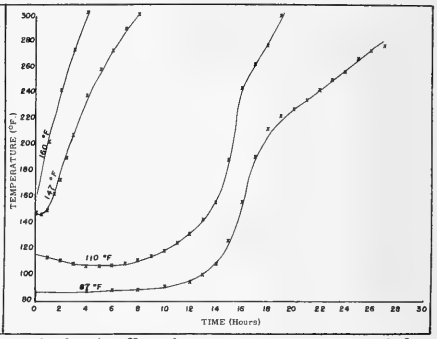


Fig. 6 - The effect of preheating on induction period of herring oil.

This oxidation was simulated in the laboratory by mixing herring oil with an inert support material that would expose a large surface of the oil to the air. The inert support used in the tests described here was composed of two parts by weight of silica gel and one part of the filter aid "Hyflow Super Cel." The oil was dissolved in four volumes of petroleum ether and then mixed so as to wet the support uniformly. The petroleum ether was removed by evaporation at room temperature (70° F.). Seventy-five milliliters of oil were used with 340 grams of the support. The oil-coated support was then placed in a vacuum flask and covered with a plug of glass wool, and the temperature in the center of the mixture was recorded.

At room temperature, spontaneous heating became apparent after an induction period of approximately 12 hours (fig. 6). Preheating the oil on the inert support reduced the induction period--the time before spontaneous heating becomes apparent--until, at approximately 160° F., spontaneous heating occurred at once. Oil that had gone through a period of spontaneous heating and had cooled did not heat again spontaneously even when preheated to 230° F.

The spontaneous-heating reaction was allowed to occur under controlled conditions by holding a sample of oil on the inert support at 180° F. for 4 hours. This sample was then cooled, and it showed (fig. 7) no further tendency to heat spontaneously.

RESULTS AND DISCUSSIONS

Spontaneous heating of herring meal occurs as soon as the meal leaves the drier (fig. 2) and probably is occurring in the last part of the drier where the moisture content of the scrap is almost as low as at the discharge. The spontaneous heating before sacking does not have an opportunity to cause a temperature rise in the meal because, under the procedures in herring plants, the heat is dissipated faster than it is formed. The spontaneous-heating reaction continues in the sacked meal where, because of the insulating characteristics of the meal, the temperature in the center of a sack of meal, under some conditions, rises to 170° F. or higher (fig. 2). Where the sacks are stored in small piles (four high) and in cool warehouses (50° to 60° F.), rapid dissipation of the heat occurs, and the spontaneous reaction is soon slowed to a rate that allows the heat to dissipate faster than it is formed.

Meal stored in bulk in test bins 4 feet on a side, however, dissipated heat more slowly and therefore exhibited a higher temperature than did sacked meal piled four sacks high (fig. 2 and 5). It is to be expected that the temperature of meal in the center of larger piles would rise to higher temperatures than those experienced in the test bins.

The addition of the antioxidant to herring meal did not reduce the initial rate of heat formation below that of the untreated meal. After the first 8 to 16 hours, however, the rate of heating of the antioxidant-treated samples fell much below that of the untreated meal, with one exception. This exception was the sample treated with 0.01 percent antioxidant added to the press cake. The fact that a large percentage of the very small amount of antioxidant added to this particular sample was undoubtedly destroyed in the drier may account for this difference in reaction. The maximum observed temperature of all the treated meals was less than that of any of the untreated meals. The difference in maximum temperatures was dependent on treatment of the meal, on its initial storage temperature, and undoubtedly also on other operating variables.

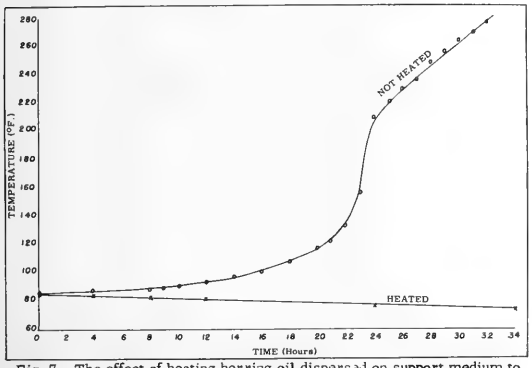


Fig. 7 - The effect of heating herring oil dispersed on support medium to 180° F. for 4 hours on subsequent spontaneous heating.

The antioxidant was effective in reducing both the maximum temperature rise of the bulk-stored meal and the time to reach maximum temperature. Its action appeared to be one of inhibiting or stopping further oxidation after the rapid initial heating had occurred. Although it is suspected that the first heating is caused by oxidation, perhaps by that oil not mixed with the antioxidant, it is possible that an entirely different reaction is taking place.

Antioxidant added at the 0.01-percent level to the scrap leaving the drier gave protection against spontaneous heating. It is thus possible that even lower rates of addition of antioxidant than 0.01 percent might give satisfactory protection. Santoquin is convenient to apply as an oil-in-water emulsion and, as such, can be applied by spraying the meal passing on a conveyor.

It is shown (fig. 6) that preheating the herring oil reduced the induction period (the time required for spontaneous heating to start). It is further established that spontaneous heating does not reoccur, within the limits investigated, in an oil-support mixture which has already undergone spontaneous heating. If the oil on the meal reacts in a manner similar to oil on an inert support medium, herring meal might be stored without the occurrence of spontaneous heating by allowing the meal to go through an initial heating before storage. It is possible that an additional processing unit might be installed to permit the rapid initial reaction to take place under controlled conditions before storage. An antioxidant might further reduce the possibility of subsequent heating.

The addition of antioxidants delays the formation, from the oil, of products not easily digestible. The nutritional value of a meal so treated might be significantly higher than that of untreated meal, particularly after prolonged storage. Samples

of the treated meals from these experiments have been sent to the University of California for evaluation in poultry nutrition to test the validity of these assumptions.

Because of the lower density of bulk herring meal, the barges now used to carry the meal from Alaska production points to such distribution points as Seattle, Wash., would hold about 15 percent less than when loaded with sacked meal, unless the meal were packed in the hold of the barge. This might be a significant factor in determining the economic desirability of bulk handling.

These observations and conclusions are based on limited tests during a short period in one operating season. Although it is believed that the data are representative, it is possible other variables not experienced might have an important effect on the results.

SUMMARY

Bulk handling of herring meal might offer significant savings to the Alaskan producer of herring meal. The primary problem in bulk handling is spontaneous heating. Spontaneous heating occurs from the time the meal leaves the drier and continues for 6 to 80 hours or more. The rate of heating is most rapid at the start. The addition of 0.01 percent of an antioxidant did not reduce this initial rate of heating significantly. It did, however, reduce the maximum temperature observed in bulk-stored meal and the time required to reach this maximum temperature.

Herring oil dispersed on an inert support and held at 180° F. in contact with air for 4 hours then cooled showed no further tendency toward spontaneous heating. If the oil in herring meal behaves in a similar manner, it is suggested that herring meal could be stored in bulk without subsequent spontaneous heating by allowing it to go through its intital heating under controlled conditions in the plant prior to storage.

ANTIBIOTIC ICE FOR FISH

"From what we hear on the scientific grapevine, antibiotic ice for fish may not be too far away," D. M. Haywood of Los Angeles, Calif., told delegates to the 12th annual convention of the National Fisheries Institute during the week of April 28 to May 1 in Chicago, Ill. "When we are permitted to use antibiotic ice," he went on to say, "a lot of our headaches will be behind us. Shipments of fresh fish from California to Maine will be commonplace."

Haywood, the first speaker of the Monday morning session of Customers Day, pointed out that "The very fresh fish we trade in, like all perishable commodities, makes us vulnerable." "We either keep up with modern trends and patterns, or else we don't stay in business very long. Our economy has changed from a 'need' economy to a 'want' economy. Fish sticks have given us a much-needed shot in the arm and--more important--have proved to us that the 'want' economy will work for fish as well as other products. Find out what the public wants, produce it, advertise it, and promote it."

RESEARCH IN SERVICE LABORATORIES

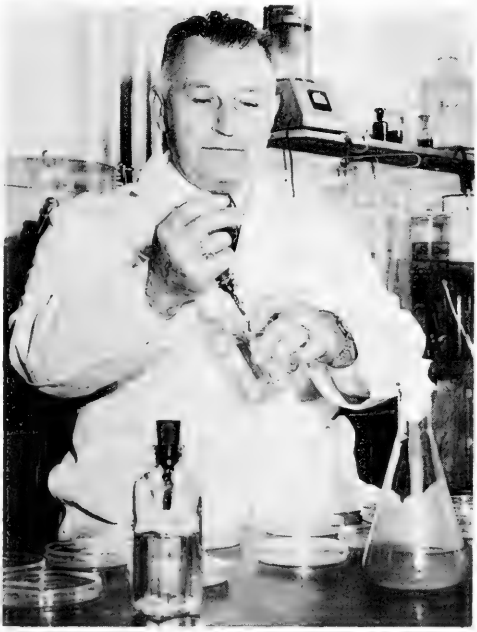
TECHNICAL NOTE NO. 37 - USE OF BACTERIAL CULTURE TO AID SEPARATION OF MENHADEN OIL IN GRAVITY TANKS

ABSTRACT

Use of a starter culture to speed "break-out" is recommended in the gravity separation of menhaden oil. The bacterium involved is probably a member of the genus Clostridium.

Microscopic examination of press liquor obtained in the processing of menhaden has indicated that certain types of bacteria must be present for the optimum separation of oil from stickwater in gravity separation. The hot liquor pressed from the cooked fish--a complex mixture of oil, water, soluble fish-tissue compounds, and fine material escaping the screening process--is transferred to large tanks of approximately 5,000-gallon capacity. The oil separates from the press liquor and rises to the surface, producing a barrier that prevents air from getting into the lower level.

Semi-anaerobic conditions are produced as a consequence of the initial temperature of the press liquor (approximately 70° C.), the subsequent release of some of the dissolved air from the lower level, and the lack of further extensive aeration. During the following 8 to 10 hours, a thick layer of foam is formed over the surface of the oil, indicating that a proper "break-out" of oil has occurred. Water is introduced into the bottom of the tank, which raises the layer of oil to a trough by which the oil is transferred to another tank.



TAKING OF DILUTION BOTTLE SAMPLE OF STICKWATER FOR PLATING OF BACTERIA.

Samples for bacterial study of the press liquor or stickwater were obtained from a tank at the completion of filling, 1 hour after filling, and at the completion of the process during the flooding operation. Large loopsfull were smeared on glass slides, air dried, and fixed by heating in a gas flame. The preparations were stained for 3 to 5 minutes with crystal-violet, blotted, and viewed

under the oil-immersion objective lens of the microscope. Duplicate smears were stained by the conventional Gram stain procedure.

Examination of the stain preparations revealed a relatively pure culture of large gram positive bacilli, occurring singly and containing a central oval spore located terminally. Distention of the cell around the spore was evident. Preliminary investigation indicates that the organism is a member of the genus Clostridium. The organism is probably a proteolytic species, since there is little carbohydrate available in menhaden press liquor. This inference is supported by the fact that ammonia, liberated during active protein degradation, is detected in the tanks. In addition, hydrogen sulfide, methane, hydrogen, and other gases resulting from the anaerobic decomposition of protein often are evolved.

In this gravity separation method, initial separation of oil from press liquor is accomplished by taking advantage of the differences in the specific gravities of the two fluids. Large quantities of oil are held in the aqueous layer, however, by particles of insoluble protein, by emulsion, and by other physical and physico-chemical activity and complete separation of the oil from the press liquor is not attained. The importance of the microbiological activity is clearly evident, since a complete break-out of the oil does not occur in the absence of the proteolytic decomposition.

Processing menhaden into meal, condensed solubles, and oil is always a rapid operation carried out for meal on a tonnage, and for oil and solubles on a tank-car scale. Any interruption in the smooth flow of materials through the plant immediately creates a serious problem. When a tank of press liquor fails properly to show the required activity and the emulsion accordingly does not break, the operator usually is forced to take what oil he can and to discard the remaining intractable emulsion. Failure to break the emulsion results therefore not only in a substantial financial loss but creates a further problem in how to dispose of the emulsion as well.

In such cases of delay, it is recommended that the operator add 200 and 300 gallons of press liquor from a tank that has undergone a typical proteolytic activity. This added liquor will serve as a starter culture to promote the desired break out of oil in the inactive tank.

CONCLUSIONS

1. The maximum release of menhaden oil during gravity separation processing is due largely to a bacterial decomposition of the suspended protein. The active microorganism is an anaerobe and probably a member of the genus Clostridium.

2. Proteolytic activities of the organism appear responsible for more complete release of oil from protein-oil emulsions and other non-specific complexes.

3. Use of starter cultures to insure typical effective "break-out" of oil is recommended.

--BY JEROME KERN, FORMERLY BACTERIOLOGIST,
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE,
COLLEGE PARK, MD.

PROGRESS ON FISH MEAL NUTRITIVE VALUE STUDIES

The term "fish meal" does not refer to a specific substance, for it applies to any dried material prepared from fish or from any parts of fish, such as fillet waste. When the different constituents of the fish--such as skin, muscle, bones, and organs, which may make up the raw material for fish meal--are considered, it can be seen that any one fish meal, by virtue of the raw material variability alone, is very complex. When this complexity of fish parts is compounded by the different species of fish used for fish meal being manufactured, the number of possibilities for variation becomes enormous. The amazing thing, therefore, is not that differences in nutritive value are found among the commercial fish meals, but rather that these differences are not larger than have been reported.

Since these differences do occur and since a standard product is desirable, it is important to learn the factors that affect the nutritive value of fish meal. The Technological Section of the Service's Branch of Commercial Fisheries, in cooperation with a number of collaborators, has undertaken such a study. This study is being made on the effects of (1) the raw material used and its condition; (2) processing conditions employed; (3) storage conditions for the meal; (4) amount and availability of protein and amino acids in the meal; and (5) type, amount, and degree of oxidation of the oil in the meal. These variables are being studied through use of chick-growth tests that measure the effects of these variables on the unknown growth factors and the protein quality of the meals, as they may relate to the nutritive value of these meals. This approach can best be illustrated by describing for one particular sample of menhaden meal the studies now being made. Work on this sample has not been completed, so results cannot be reported fully at this time, but enough has been accomplished to provide the desired example.

PREPARATION OF EXPERIMENTAL DIET TO STUDY PROTEIN QUALITY OF MENHADEN MEAL.

PREPARATION OF THE MEAL

PROCESSING: Menhaden press cake was obtained by staff members of the Technological Laboratory, College Park, Md., and shipped to Seattle, where the press cake was dried in a small steam-jacketed drier. In this work, press cake sufficient to supply 100 pounds of meal was dried in a single batch, ground, and thoroughly mixed. Part of the meal was then packed in nitrogen and sent to the various collaborators for animal-feeding and composition studies.

STORAGE CONDITIONS: The remainder of the meal was divided and stored both at room temperature and at -20° F. in atmospheres both of air and of nitrogen.[1/] These samples will be tested by the following procedures after storage periods of 6 months, 12 months, and longer--if little or no change occurs within the 12-month period.

1/ NITROGEN WAS PACKED WITH THE MEAL TO EXCLUDE AIR. THE NITROGEN IS INERT AND DOES NOT REACT CHEMICALLY, WHEREAS OXYGEN IN THE AIR DOES REACT, ESPECIALLY WITH THE OIL IN THE MEAL.

ANIMAL-FEEDING STUDIES

UNKNOWN GROWTH FACTORS: Dr. H. R. Bird, of the Poultry Husbandry Department at the University of Wisconsin, is testing the meal for effects of unknown growth factors, according to the method described by Barnett and Bird (1956). In this chick assay, the growth response induced by the sample under test is compared with that of a sample of fish solubles that serves as a reference standard. Tests on the freshly-prepared meal now have been completed. The tests show that the relative growth response of the chicks fed this meal is excellent.

PROTEIN EVALUATION: Dr. C. R. Grau, of the University of California at Davis, is evaluating the protein in the meal. The procedure used is that of Grau and Williams (1955) and modified as described by Grau, Barnes, Karrick, and McKee (1956). The values obtained by feeding the freshly prepared meal to chicks indicated that the protein was of good quality.

COMPOSITION STUDIES

PROTEIN, MOISTURE, AND ASH CONTENT: The composition of the meal was as follows: protein, 59.3 percent; moisture, 9.2 percent; and ash, 20.5 percent.

OIL CONTENT: The apparent oil content of the meal varied with the kind of solvent used to extract the oil. (This problem of oil extraction is being studied in connection with another project. In this other work, it has been found also that the amount of oil extracted decreases with the length of time the fish meal has been in storage.) The initial values obtained with the present menhaden meal sample were 9.5 percent oil extracted with ethyl ether and 12.7 percent oil extracted with acetone. The amount of oil measured by the use of these solvents will be determined periodically as the meal ages. Any changes in the solubility of the oil with increased age of the meal will be checked by comparison with chick-growth studies to find out whether such changes are reflected in the nutritive value of the meal.

AMINO ACID CONTENT: The amount and availability of amino acids in the meal undoubtedly affect the quality of the protein. The question is whether in vitro (test-tube) assays of the individual amino acids give results that can be correlated with those of in vivo (in living tissue) assays of the protein.

Microbiological assays (in vitro) for amino acids are being made at the Wisconsin Alumni Foundation. A sample of the freshly prepared meal was analyzed for the total amount of 13 amino acids and for the proportion of these that was available to micro-organisms. This analysis will be repeated if the stored meal shows a deterioration in the quality of the protein as measured by the chick-growth tests (in vivo).

--BY NEVA L. KARRICK, CHEMIST,
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE,
SEATTLE, WASH.

LITERATURE CITED

BARNETT, B. D., AND BIRD, H. R.:
1956. STANDARDIZATION OF ASSAY FOR UNIDENTIFIED GROWTH FACTORS. POULTRY SCIENCE, VOL. 35, NO. 3 (MAY), PP. 705-710.

GRAU, C. R., AND WILLIAMS, M. A.
1955. FISH MEAL AS AMINO ACID SOURCE IN CHICK RATIONS. POULTRY SCIENCE, VOL. 34, NO. 4 (JULY), PP. 810-817.

_____ ; BARNES, R. N.; KARRICK, N. L.; AND MCKEE, L. G.
1956. EFFECT OF RAW MATERIAL ON TUNA-MEAL QUALITY. COMMERCIAL FISHERIES REVIEW, VOL. 18, NO. 6 (JULY), PP. 18-20. (ALSO SEPARATE NO. 443.)

IRON SULFIDE DISCOLORATION OF TUNA CANS

Certain batches of tuna, when canned, cause an iron sulfide deposit to form on the can area adjacent to the headspace. The deposit is caused by a reaction between sulfide from the fish and iron in the can. In a study jointly sponsored by the Continental Can Company and the U. S. Fish and Wildlife Service, investigations were made on the effects of retorting and cooking on the formation of black ferrous sulfide discoloration in canned tuna. Free sulfide was not found in the unprocessed fish but appeared in all canned tuna after processing. The amount of free sulfide was found to increase with longer retorting periods. Free sulfide did not form a black precipitate of ferrous sulfide unless the free iron in the ferrous state was available. Discoloration occurred in the cans during the cooling period and was greater in cans held at elevated temperatures while being cooled. Thus, one of the important considerations in the prevention of iron sulfide discoloration of tuna cans is a quick cooling period.

BAKED SHAD FILLETS

The annual cherry blossom festival in the Nation's capital and the appearance of an abundance of shad on the market heralds spring.

Regular as a clock each spring the shad migrate from the ocean to our coastal rivers to spawn above tidewater. They are found in the Atlantic from Maine to Florida and and in the Pacific from Washington to California.

The shad range in size from $1\frac{1}{2}$ to 7 pounds and are most commonly sold as roe or buck shad. The meat from both is tender and white, with a distinctive flavor. The roe, from the roe shad, is considered a great delicacy.

Shad may be purchased whole, drawn, or as fillets. The fillets require no preparation for cooking as they are the sides of fish cut lengthwise away from the backbone. Shad fillets are delicious when prepared by any of the basic cooking methods such as baking, broiling, or frying. The home economists of the United States Fish and Wildlife Service suggest that you serve "Baked Shad Fillets" to your family to celebrate the arrival of spring.

BAKED SHAD FILLETS

2 POUNDS SHAD FILLETS
1 TEASPOON SALT
DASH PEPPER
1 TEASPOON PAPRIKA
2 TABLESPOONS LEMON JUICE
1 TEASPOON GRATED ONION
$\frac{1}{4}$ CUP BUTTER OR OTHER FAT, MELTED

Cut fillets into serving-size portions. Place in a single layer, skin side down, in a well-greased baking pan. Combine remaining ingredients and pour over fish. Bake in a moderate oven, 350° F., for 20 to 25 minutes or until fish flakes easily when tested with a fork. Serves 6.

Alaska

NO FEE IN 1957 FOR NEW SALMON NET FISHERMEN'S LICENSE: Although all salmon net fishermen in Alaska will be required to have a special commercial fishing license for the coming season, the prescribed fee of $5 for the license will not be charged in 1957, Assistant Secretary of the Interior Ross L. Leffler announced on April 11.

The new regulatory provision, the proposal of which was published in the Federal Register on March 6, 1957, separates the registration of boats and gear from the registration of fishermen. With the exception of gill nets in Bristol Bay and Cook Inlet, under this new Federal license a fishermen will not have to report a change from one boat to another or from one form of gear to another so long as he remains in the area for which he was licensed.

The license is required only of salmon net fishermen and not of trollers. This special Federal license will be necessary in addition to any license required by the Territory of Alaska.

Announcement was scheduled to be made soon by the Service in Alaska of public places where the license may be obtained.

California

LANDINGS, 1956: Landings of fish and shellfish at California ports in 1956 amounted to 663 million pounds (exclusive of imports), an increase of 64.9 million pounds over the 598.1 million pounds landed in 1955. In 1956 landings of Pacific and jack mackerel increased about 100 million pounds as compared with 1955. Lesser increases were made in 1956 in the landings of anchovies and tuna. The catch of California sardines declined sharply (55 percent) from the 144.9 million pounds landed in 1955.

San Pedro lead all other California ports with total landings of 383 million pounds, followed by San Diego with 135.3 million pounds; Monterey, 46.3 million pounds; Santa Barbara, 41.4 million pounds; Eureka, 31.6 million pounds; and San Francisco, 25.5 million pounds.

Tuna receipts by California canneries of 204,800 tons

California Domestic Caught Landings of Major Species, 1955-56

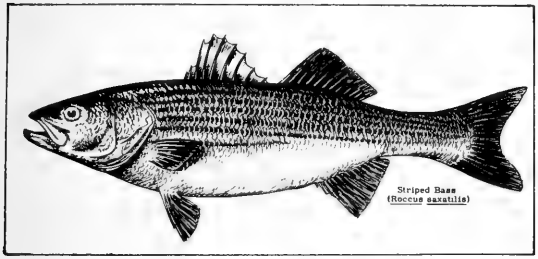
Species	1956	1955	Percentage Increase or Decrease from 1955
	.(In 1,000 Lbs.).		%
Anchovies	53,945	42,440	+ 27
Jack mackerel . .	83,504	34,514	+142
Pacific mackerel	71,630	20,608	+248
Sardines	65,306	144,916	- 55
Tuna:			
Albacore	34,998	24,466	+ 43
Bluefin	12,558	13,170	- 3
Skipjack	118,246	95,838	+ 23
Yellowfin	153,878	112,740	+ 36
Total for Major Species	594,065	488,692	+ 22

(domestic landings and imports) and the canned tuna pack of 9.5 million standard cases set new records in 1956. The previous record tuna pack of 9.3 million cases was set in 1954. During the past ten years the California tuna pack has increased steadily from 4.5 million cases in 1946 to the record pack of 1956.

* * * * *

SALMON AND STRIPED BASS GILL-NET RECOMMENDATIONS FOR SACRAMENTO RIVER: Three recommendations for minimizing striped bass destruction by commercial netters and materially increasing escapement of spawning salmon from nets in the Sacramento River were offered in a March 29 report of the California Department of Fish and Game.

At the same time the Department warned that emergency legislative action, as well as further restrictions by the Fish and Game Commission on sports fishermen, may be necessary in 1958 if the numbers of salmon spawners in the Sacramento does not approach ideal levels this fall.



The recommendations are contained in a study of commercial salmon and shad netting operations in the Sacramento River covering a two-year period.

The recommendations and the warning (a fourth "conditional" recommendation) are as follows:

"1. Eliminate gill nets from Grizzly and Honker Bay flats to effect maximum preservation of striped bass.

"2. Develop methods and gear for taking salmon and shad commercially which will not destroy striped bass.

"3. Eliminate all gill-netting in the river, except for spring shad and salmon seasons, adjusted to April 15 through May 31, and except for fall salmon season adjusted to August 10 through September 5 and September 20 through September 30. Weekend closures should be continued.

"4. If effective salmon spawning does not approach the level of 400,000 to 500,000 spawners in the fall of 1957, reduction of both commercial and sports salmon take in the ocean and further curtailment in the river should be effected by emergency action of the legislature in 1958 and by the Fish and Game Commission on sports fishing. If recovery of the salmon fishery isn't indicated in the 1958 fall salmon spawning run, still more drastic restrictions should be imposed on all segments of the fishery to preserve the species."

In the 33-page report, complete with statistical evidence supporting each finding and recommendation, the Department listed the problems of the Sacramento River migratory fisheries, summarized the facts relating to these fisheries (salmon and striped bass), drew conclusions, listed recommendations and alternate proposals, and summarized the reasons for the recommendations. The report and recommendations supersede and replace a preliminary report of the same studies issued in August, 1956. New material, not available in August, is contained in the new report and considered in the recommendations.

In order, the Department declared these are the problems of the fisheries:

1. While sports and commercial catches of salmon hit record highs, the 1956 spawning count dropped from a four-year average of about 500,000 fish to about 200,000.

2. Sacramento River and Delta striped bass are gradually declining in numbers while the sports fishing pressure increases.

3. The commercial shad gill-net catch has averaged about 670,000 pounds annually since 1945 and there appears to be a continuing abundance of this fish. . . but the present commercial methods of taking salmon and shad has a deleterious effect on striped bass.

4. Traditional conflict of interest between sportsmen and commercial gill-netters has intensified as a result of the declining numbers of stripers and spawning salmon passing upriver.

The Department says its records reveal that it requires between 400,000 and 500,000 spawners in the Sacramento River to sustain the California salmon fishery at a high level. The spawning count last year dropped under 200,000 fish and the Director warned in February that curtailment of fishing activity would be necessary if the 1957 fall count showed no substantial improvement.

Ocean and river salmon fisheries depend almost entirely on the same Sacramento River spawned fish. Since 1951, sports ocean trolling catches have increased annually from 100,000 to 200,000 fish while the commercial ocean troll fleet has increased its catch in the same period from 416,000 to 800,000 fish annually.

The Department's report says the commercial river gill-net fishery has averaged 60,000 fish annually for five years, but from 1954 to 1955 the river salmon gill-net take jumped 2.5 times to 200,000 fish. Sports salmon take in the river is estimated at 20,000 fish a year.

Most of the commercial river catch of salmon--97 percent--is taken during the August 10 to September 26 season, according to the Fish and Game report. Only 3 percent is taken during the winter and spring salmon gill-net season between November 15 and June 15.

The Department declared the destruction of striped bass by commercial fishermen netting salmon and shad is quite substantial. In 1955, the fall salmon gill nets, which took about 118,000 salmon (2,274,000 pounds) killed about 8,300 striped bass weighing 132,000 pounds.

In 1956, the spring shad gill nets took 430,372 pounds of shad and killed 13,500 striped bass weighing 117,000 pounds in doing it. Most of the striped bass were killed by nets placed in Grizzly and Honker Bay Flats. In these areas netters took their smallest amount of shad (only 81,097 pounds), but killed the most stripers--76,500 pounds.

The report declares the take of shad and salmon would not be severely curtailed by closing the flats. The flats produced about 20 percent of the total shad catch and 12 percent of the total fall river salmon catch. During the spring, there is sufficient open river area to accommodate the 15 boats of the 59-boat fleet which now fish for shad in the flats, the report said. Mortality of bass in shad gill nets on the flats is high, the Department claims, because nets go unchecked for from 12 to 24 hours. Mortality of bass would be reduced if nets were checked often and regularly to remove entrapped stripers, according to the report, which recommends that if the flats are not closed any nets used therein should be continually attached to a boat. The Department believes this would result in periodic checkups of the nets and a reduction in the number of striped bass killed.

The Department's report proposes that some form of pound-net or trap, which will catch shad and salmon economically without destroying striped bass, be substituted for gill nets. It believes it should be possible to develop such gear within three years.

The report recommends curtailing of both commercial shad and salmon seasons to reduce striped bass mortality and to enable more salmon to escape upstream to spawn. The Department admits the proposal to drop the first 10 days of the existing shad season would reduce the catch by about 6 percent, but also declares it can be made up during the remainder of the season. A two-week break (September 5-20) in the fall salmon season would permit a substantial part of the main run of Sacramento River fish to pass upstream, thus strengthening the most important segment of the resource, according to the Department. The report says the winter-spring salmon season (November 15-June 15) accounts for only 3 percent of the total river salmon catch, but believes there is a relatively large loss of striped bass to the nets during the same time.

In regard to its warning about the condition of the salmon fishery, the Department said the fishery will be in critical trouble if a second consecutive bad spawning year is recorded in the fall of 1957. Immediate protective action by the Legislature and the Commission will be necessary to protect the potential 1958 spawning class, prior to the 1958 season, the report said. The salmon fishery is based on a four-year life cycle of the fish.

Cans--Shipments for Fishery Products, January 1957

Total shipments of metal cans for fish and sea food during January 1957 amounted to 6,900 short tons of steel (based on the amount of steel consumed in the manufacture of cans), compared to 4,842 short tons in January 1956. Fish canning in January 1957 was largely confined to tuna and oysters.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.

Federal Purchases of Fishery Products

DEPARTMENT OF DEFENSE PURCHASES, MARCH 1957: Fresh and Frozen Fishery Products: A total of 1,640,000 pounds (valued at $885,000) of fresh and frozen fishery products for the use of the Armed Forces were purchased in March 1957 by the Military Subsistence Market Centers. This was a decrease of 2.3 percent in quantity, but the value was higher by 9.5 percent as compared with the previous month. For the first 3 months of 1957 purchases totaled 5,530,000 pounds, valued at $2,862,000--an increase of 11.9 percent in quantity and 5.9 percent in value as compared with the similar period in 1956. (Data are not strictly comparable due to a change in method of reporting. Comparisons on a 3-month basis are less subject to error than are monthly comparisons.)

Table 1 - Fresh and Frozen Fishery Products Purchases by Military Subsistence Market Centers, January-March 1957 with Comparisons

QUANTITY				VALUE			
March		Jan.-Mar.		March		Jan.-Mar.	
1957	1956	1957	1956	1957	1956	1957	1956
. . . . (1,000 Lbs.)				. . . . ($1,000)			
1,640	2,198	5,530	4,943	885	1,106	2,862	2,702

Average prices paid for fresh and frozen fishery products in March 1957 averaged 54.0 cents a pound, higher than the 48.2 cents paid the previous month, and the 50.3 cents paid in the same month of 1956.

Canned Fishery Products: Tuna was the principal canned fishery product purchased for the use of the Armed Forces during March 1957. During the first three months of 1957, purchases of canned tuna, salmon, and sardines were lower by about 7.4 percent as compared with the similar period in 1956.

Table 2 - Canned Fishery Products Purchased by Military Subsistence Market Centers, January-March 1957 with Comparisons

Canned Product	Quantity			
	March	[1/]	Jan.-Mar.	
	1957	1956	1957	1956
	. . . . (1,000 Lbs.)			
Tuna	573	-	841	1,396
Salmon . .	-	-	992	601
Sardines . .	8	-	19	8
Total . .	581	-	1,852	2,005

1/ Unavailable.

Note: In addition to the purchases of fresh and frozen fishery products reported, some local purchases are made which are not included. Therefore, actual purchases are higher than reported.

Gray Whale Herd Moves North to Bering Sea

The gray whale in the Pacific is now heading north to its summer feeding grounds in the Bering Sea in a migration that will get little public observation. This whale, a scenic attraction on its journey south close to shore during the winter months, makes its northward migration virtually unnoticed--the thousands of migrants being spread over too wide an area in the Pacific and usually too far from shore to attract attention. On its way southward it travels in a relatively narrow corridor seldom more than three miles from shore.

California Gray Whale
(Rhachianectes glaucus)

During the recent winter Fish and Wildlife observers at the La Jolla, Calif., station counted 1,782 of these animals migrating to their wintering grounds. In one period the whales were about five miles apart. Traveling at five miles an hour, that meant a whale an hour passed the observers.

Their wintering ground is along the Coast of Lower California, and some of the whales even round the tip of the long peninsula and feed not far from the main coast of Mexico.

Once plentiful, the gray whale was harvested to the point of near extinction. Now it is protected by international agreement. Presently it is estimated there are about 4,000 adult gray whales and 500 calves, although conditions make an accurate census difficult.

Fur-Seal Skins

PRICES DROP AT GOVERNMENT SPRING AUCTION: A decrease in prices of United States fur-seal skins marked the semiannual auction of Government-owned furs at St. Louis on April 12. The sale was well attended by United States, Canadian, and European buyers.

Alaska Fur-Seal.

A total of 27,819 skins, products of the sealing industry administered by the United States Fish and Wildlife Service on the Pribilof Islands, brought $2,547,182. This compares with 26,890 skins sold for $2,714,852 at the October 1956 sale. The grand average for all skins sold for the account of the United States Government was $91.56; at the October sale it was $100.96. The grand average at the April 1956 sale was $93.27.

Of the Alaska skins, 11,663 were dyed "Matara" (brown), 426 were "Safari" brown (a lighter brown), 10,154 were blacks, and 5,576 "Kitovi"-processed skins were offered for the first time. Kitovi has been characterized as "an exciting new shade of midnight gray with highlights of silver and an intriguing blue cast." It is the first new shade to be offered since Matara was introduced in 1939.

The Kitovi skins brought an average of $119.38. Matara skins sold for an average of $81.91, a decrease of 18.3 percent under the October auction. Safari skins brought an average of $68.97, a decrease of 10.4 percent. The black skins averaged $88.32, a downward change of 20.1 percent as compared to the October sale price of $109.38.

At the April sale, 117 dressed sea otter skins were sold for the account of the United States Government. These skins brought a total of $2,677.

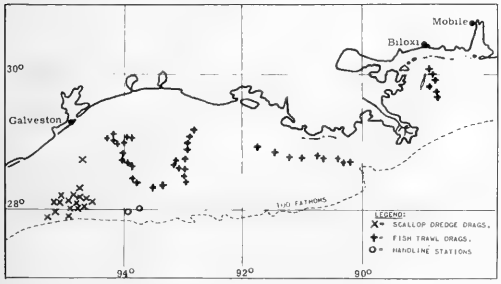
These sea otter pelts were accumulated as a result of salvage and other activities by the Fish and Wildlife Service on Amchitka Island, Alaska, in the Aleutian Islands National Wildlife Refuge, over the past several years. Interested bidders were advised that the Government is not considering lifting the present prohibition against the taking of sea otters.

In addition to the United States skins, 3,453 South Africa fur-seal skins were sold for the account of the Government of the Union of South Africa at an average of $36.35, a decrease of 0.6 percent from the last sale, and 350 Uruguay fur-seal skins were sold for the Government of Uruguay at an average of $31.04. The October 1956 average was $48.78.

The next auction is tentatively scheduled for October 18, 1957, in St. Louis.
Note: Also see Commercial Fisheries Review, November 1956, p. 37.

Gulf Exploratory Fishery Program

EXPLORATORY FISHING FOR SCALLOPS AND RED SNAPPER OFF TEXAS AND LOUISIANA COASTS (M/V Oregon Cruise 44): In an attempt to locate unexploited commercial stocks of scallops and red snapper in the Gulf of Mexico off the coasts of Louisiana and Texas, the Service's exploratory fishing vessel Oregon tested New England-type bottom fishing gear. Results from the experimental fishing from March 5 to 21 were poor.



M/V Oregon Cruise 44, March 5-21, 1957.

Scallop dragging, using a New England-type 8-foot scallop dredge, was carried out in an area extending from Chandeleur Island to Galveston in depths of 5 to 34 fathoms. Major attention was given to areas of predominantly sand bottom. A total of 44 one-hour drags yielded no living scallops, although large quantities of dead scallop shell (Pecten gibbus) were found in many areas.

March 13 through 17 was spent trawling off Galveston, using a New England-style otter trawl, in depths of 11 to 53 fathoms. The primary objective of this work was to trawl for red snapper in the area known as "Little Campeche." Strong winds and heavy seas during March 14-17 greatly hampered fishing operations and results were very poor. The best drag caught 118 pounds of red snapper, averaging about $1\frac{1}{2}$ to 2 pounds each. All catches were small, with porgies and croakers making up the bulk of the catch.

On March 13, approximately 30 miles south of Galveston, extensive schools of fish were observed during the late morning and early afternoon. Visual identifica-

tions were impossible but a short drag, using a large-mesh otter trawl, through one of the schools caught about 200 4- to 5-inch anchovies (Anchoa hepsetus).

Maine Sardines

NEW-QUALITY CONTROL AND RESEARCH LABORATORY OPENED: The formal opening of the Maine sardine industry's new and modern research and quality control laboratory at Bangor, Me., took place April 11. The new laboratory occupies a four-story building on Bangor's Exchange Street and will be fully equipped to handle a number of the industry's State tax-financed development program projects including grading, technological and biological research, new products, and quality control activities. Previously the industry had maintained research and grading facilities at the University of Maine.

* * * * *

SEASON LEGALLY OPENED APRIL 15: The 1957 Maine sardine canning season legally opened on April 15, but none of the 38 plants along the coast were in operation due to the lack of fish.

The Executive Secretary of the Maine Sardine Industry said that although fish could strike anytime, veteran canners did not predict any sizable production until late in May.

The prediction is based on the failure of a sizable early spring run of fish appearing during the past 10 years.

Canners held normal inventories from last year's pack of 2,250,000 cases, but these stocks should be well sold out by June 1, when heavy production usually gets under way.

Added emphasis on research and quality control will be stressed this season as a result of the opening of the industry's new laboratory in Bangor.

Mariners' Charts

COAST AND GEODETIC SURVEY TO CHECK DATA FOR CHARTS: A converted B-17 with cameras in its belly left Baltimore's Friendship International Airport early in April on a mission that will take it over much of the United States and as far as the Aleutian Islands.

On the mission, which may last through November, a party from the Coast and Geodetic Survey, Department of Commerce, will take aerial photographs of coastal lands to be used in compiling nautical charts.

The airplane and flight crew are supplied by the U. S. Coast Guard, Treasury Department, under a cooperative arrangement. The Coast and Geodetic Survey sends a photographic navigator, a photographer, and the cameras. When pictures are being made, the photographic navigator guides the plane with a Norden bombsight.

The principal camera is a giant nine-lens machine developed by the Coast and Geodetic Survey, which in one snap at 22,000 feet can picture 300 square miles.

It weighs almost 500 pounds and is moved around on a wheeled dolly until it is lifted into the B-17 by a crane.

The big camera is especially valuable in mapping inaccessible areas, to which it would be very costly to send ground parties of surveyors. On the present mission, pictures will be taken first along the Gulf Coast. By May 15, the mission was scheduled to arrive in the Aleutians. Here it will work between Adak Island, in the central Aleutians, and the Alaska mainland. The uncertain weather in the Aleutians makes exact scheduling impossible, but the mission will probably return to the United States early in July and set out for Alaska again in mid-August. In all, the B-17 may fly 75,000 miles.

Prints from the nine-lens aerial negatives are made in a special transforming printer that combines the nine separate views into one composite photograph about 35 inches square.

The single-lens camera that will be part of the mission's equipment shoots an area of four square miles at 7,000 feet. It is equipped to take infrared photographs, which are effective in showing shoal areas.

The Coast and Geodetic Survey publishes charts for the country's mariners and aviators. In its geodetic work it determines the basic points on which all American boundaries depend.

Most of the Survey's fleet also left various ports early in April for summer assignments along the country's coasts.

Shorelines change over the years, shoals develop, and recent wrecks threaten navigation. These changes, as well as new lights and buoys, must be noted on the Survey's charts as they are published.

Although the Survey has mapped more than 100,000 linear miles of coast since it was founded in 1807, some of the areas to be surveyed this summer in Alaska have never been charted in detail.

Norfolk, Va.: The Cowie has been assigned to Chesapeake Bay, and will survey from Pocomoke Bay southerly along the Eastern Shore and to mid-bay offshore. The Gilbert will survey the area along the easterly and southerly side of Nantucket Island, Mass. The Hydrographer, will go to Georges Bank in the Gulf of Maine for a complete resurvey, the first to be made of this important fishing area in 25 years.

The Hilgard and Wainwright, also at Norfolk, have been assigned to do "wire drag" operations near Swan Island, Me. A wire drag is a metal cable that, when pulled through the water at a predetermined depth by two vessels, detects uncharted rocks or wrecks that may be hazards.

Punta Gorda, Fla.: The Sosbee will continue the survey of Tampa Bay, which is to be completed within two years.

Tampa, Fla.: The Scott will make an inspection of the east coast in preparation for revision of the Coast Pilots. Coast Pilots are books that contain detailed information for which there is no room on the charts.

Honolulu, T. H.: The Pioneer is now making offshore surveys in the Hawaiian Islands.

Seattle, Wash.: The Lester Jones and the Hodgson will work in southeast Alaska. The Patton will make a hydrographic survey of the area north of the San Juan Archipelago in Haro Straight, Washington State.

Three other ships will leave Seattle April 15 for Alaska. One of them, the Explorer, will survey the area between Great Sitkin Island and Kasatochi Island in the Aleutians. She will also move easterly along the south side of Atka Island. Her sister ship, the Pathfinder, will concentrate on Patton Bay, Montague Island, Bechevin Bay, and Port Heiden along the north shore of the Alaska Peninsula. The third is the Bowie which will go to Prince William Sound and chart the area south of Chenega Island, including Nassau Fjord, Icy Bay, and Bainbridge Passage.

Coast and Geodetic Survey ships may be distinguished by the Bureau's service flag, which has a blue field carrying a white circle in which there is a red triangle. The vessels are all painted battleship gray. Each carries the name, but no number. The uniforms of officers and crew resemble those of the Navy and Coast Guard, but with Survey insignia.

The four largest of the Survey ships are the Pathfinder, Explorer, Pioneer, and Hydrographer,

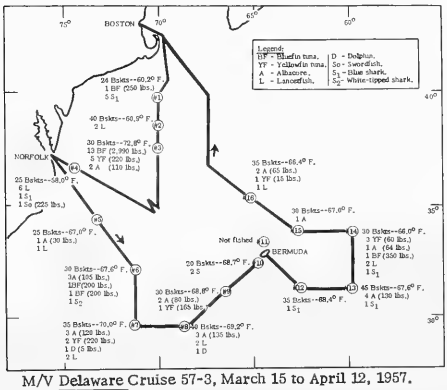
varying in size from 1,000 to 2,600 tons. A new modern ship is on the drawing boards.

The operations of the Survey fleet appear mysterious to some observers. The ships may be sending out boat parties, or pulling underwater wire drags, but sometimes there are no visible activities. An officer may be seen on deck taking a "sextant fix" to determine the ship's exact location. But more often this is done by electronic instruments, such as Shoran and the Electronic Position Indicator, which was developed by the Survey. Depth is determined by the "Fathometer," an electronic device that accurately measures the time it takes a sound wave to travel to the bottom and return as an echo.

North Atlantic Fisheries Exploration and Gear Research

EXCELLENT CATCH OF TUNA MADE SOUTH OF NANTUCKET (M/V Delaware Cruise 57-3): An excellent catch of tuna was made by the Service's exploratory fishing vessel Delaware with long-line gear south of Nantucket in the Gulf Stream during the recent four-week cruise (March 15 to April 12). The cruise, the first of its type, to explore the offshore Western Atlantic for possible latent fishery resources, has contributed to the knowledge of the Atlantic tunas as northern distribution records were noted for two of the tuna species--albacore (Thunnus alalunga) and yellowfin (Thunnus albacares)--for this season of the year.

The fishing gear used in this survey was all-nylon long-line gear of a type developed by the Service for use in the Gulf of Mexico. Each 10-hook section or "basket" of gear is 828 feet long, suspended in the water with buoys with lines of 10 or 15 fathoms in length. Hooks were baited with sea herring (Clupea harengus), alewives (Pomolobus pseudoharengus), and bluebacks (Pomolobus aestivalis).



M/V Delaware Cruise 57-3, March 15 to April 12, 1957.

The Service's research vessel, M/V Delaware.

First indications that bluefin (Thunnus thynnus) of a large size were to be found in the northern waters of the Western Atlantic during the winter season was during the first 24 basket set 60 miles SW. by S. of Nantucket Lightship, over the edge of the Continental Shelf. One 250-pound bluefin tuna and several blue sharks were caught at this station.

Station 3, located in the warmer waters of the Gulf Stream, yielded 3,320 pounds of tuna on a 29-basket set, with a catch rate of 7.1 fish per 100 hooks. Thirty baskets were set but one basket, heavy with fish, was lost due to parting of the mainline in rough seas. The catch consisted of 13 bluefin (average 230 pounds each), 5 yellowfin (1--50 pounds, 4--15-20 pounds), and 2 albacore (55 pounds each).

Stormy seas halted all fishing and after resumption of fishing operations in more southern waters, albacore were taken at almost every station with occasional catches of yellowfin and bluefin (see chart). Very rough seas prevented additional fishing near the Gulf Stream on the north leg of the cruise.

Surface temperature, bathythermograph casts, and night-light collections were made at all stations in cooperation with the Woods Hole Oceanographic Institution. Technological samples for freezing tests, morphometric measurements, and stomach content samples were also taken.

The Delaware was scheduled to leave on April 23 for three weeks of scallop exploratory fishing and gear performance tests, using conventional and modified 11-foot New Bedford scallop dredges, in the Georges Bank area. Technological problems in freezing scallops at sea were to be investigated utilizing the equipment now installed aboard the vessel.

North Atlantic Fisheries Investigations

TAGGING CRUISE BY M/V "ALBATROSS III" (Cruise 89): To test the efficacy of various tag combinations for haddock, to tag cod, and to make kinescope recordings of groundfish behavior with underwater television were the objectives of the Service's research vessel Albatross III during this cruise (March 21-April 5, 1957).

Tagging was conducted on Georges Bank mostly east of 67° and north of 41°40'; Browns Bank west of 65°50' and north of 42°41'. A total of 72 tows of 20 to 60 minutes duration were made in depths ranging between 24 and 56 fathoms. A standard #41 otter trawl with cod ends of $3\frac{1}{4}$-inch double manila and $4\frac{1}{2}$-inch dacron with a cover was used. Various combinations of tags were experimented with: Peterson Gill vs. plastic "spaghetti" dorsal loop; Peterson Gill vs. Peterson Gill with a "spaghetti" loop on gill cover; Peterson dorsal fastened with stainless steel wire; combination Lea Hydrostatic with internal anchor. A total of 2,117 haddock, 585 cod, and 80 halibut were tagged.

The television camera was rigged in a $7\frac{1}{2}$-inch cod end looking aft. Two 1,000-watt underwater lights were attached just forward of the camera housing. The behavior (including escapement) of haddock was televised and recorded in the vicinity of Cape Cod on Stellwagen Bank, and about 5 miles off Nauset Beach.

North Pacific Exploratory Fishery Program

MIDWATER TRAWL RESEARCH (M/V John N. Cobb Cruise 30): (1) Obtaining information on the performance of a 64-foot nylon midwater trawl and the acoustic depth telemeter, (2) perfecting midwater trawl handling techniques, and (3) search for fish at midwater depths were the principal objectives of a five-week cruise by the Service's exploratory fishing vessel John N. Cobb. The first two weeks were spent in the inside waters adjacent to the San Juan Islands. The mesh sizes of the new midwater trawl net range from 5-inch stretched mesh in the wings to 3-inch stretched mesh in the cod end. A liner of $1\frac{1}{4}$-inch stretched mesh was inserted in the cod end to sample species of small fish such as herring.

After completion of gear testing, the vessel returned to Seattle for installation of a "Sea Scanar" recorder and minor modifications of the midwater trawl gear prior to heading for the waters off the Washington coast on March 25 to search for fish at midwater depths.

Considerable sounding with the recording "Sea Scanar" and a recording depth sounder off the Washington coast from Swiftsure Lightship to off the Quillayute River at distances up to 40 miles offshore revealed only a few small and widely-separated schools of fish in midwater. Because of these conditions actual fishing operations with the midwater trawl were limited to four tows which were made to verify the identification of fish on the recorder tracings. Catches were small, with the best tow yielding 12 pounds of black rockfish, 6 pounds of herring, and 8 pounds of smelt. The "Sea Scanar" recorder and the depth telemeter worked satisfactorily.

Fig. 1 - Setting nylon mid-water trawl net from the M/V John N. Cobb in the Straits of Georgia.

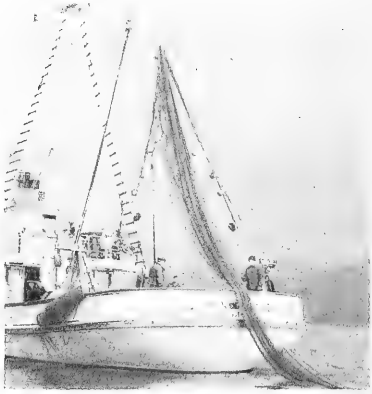


Fig. 2 - Picking up mid-water trawl aboard the M/V John N. Cobb.

This was the first in a series of midwater trawling cruises scheduled during 1957 to determine the practicability of a commercial midwater fishery for such food fishes as Pacific ocean perch, cod, and other species which are known to spend at least part of their time off the bottom. The cruise was originally scheduled to last seven weeks, but because of the necessity for emergency repairs to the main engine of the John N. Cobb, it was terminated one week ahead of schedule and the vessel returned to port on April 5.

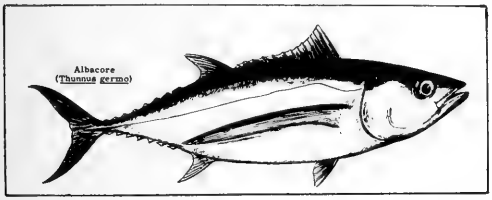
Fig. 3 - Floater of fish caught at mid-depths by the M/V John N. Cobb's mid-water trawl off the Coast of Washington in June 1956. Mostly hake were caught.

Fig. 4 - Emptying another cod end full of fish caught at mid-depths by the M/V John N. Cobb's mid-water trawl off the Washington coast in June 1956. Catch was mostly hake.

Oregon

ALBACORE TUNA LANDINGS, 1956: The return of albacore tuna in commercial quantities to waters off the Oregon coast in 1956 after an absence of four years resulted in landings of 3.5 million pounds of this species at Oregon ports, according to the Oregon Fish Commission (December 31, 1956).

Presence of albacore in offshore waters of the Northwest in 1956 was first confirmed by scattered catches of albacore by two research vessels, the John N. Cobb of the U. S. Fish and Wildlife Service and the Brown Bear of the University of Washington Department of Oceanography. The vessels were participating in an extensive search for tuna and were studying conditions that could possibly explain the sporadic appearance of albacore in the northeast Pacific Ocean.



Stimulated by the research vessel catches, commercial vessels joined in the search for fishable concentrations of albacore and in late August schools of albacore were located about 70 miles off Newport, Ore.

Heavy catches continued through September until a drop in price caused many boats to abandon albacore fishing. By early October, landings of locally-caught fish tapered off and the bonanza was over--at least for 1956.

The good albacore run in 1956 was no accident--daily catches per boat were higher than in 1944 when a peak catch of 22.5 million pounds was landed in the State. Had the fish appeared in July, as they formerly did, and had the market remained good throughout fall months, the 1956 catch might have been comparable to previous good years.

Whether or not albacore will return to Oregon offshore waters in 1957 is a question. Fisheries scientists who have worked on the mystery are reluctant to give explanations of the albacore's movements. There is some evidence that water temperature has an influence on albacore migration.

Some fishermen had predicted the return of albacore early last summer after observing an abundance of albacore food--principally small bait fishes--in the Northeast Pacific Ocean waters. This factor may also have a definite bearing on the appearance of albacore off the Oregon-Washington coast.

* * * * *

COMMERCIAL FISHING REGULATIONS REVISED: The Fish Commission of Oregon announced early in April 1957 that it has adopted more stringent regulations governing commercial trolling for salmon in State waters.

Effective April 5, use of sport gear (hook and line, rod and line, reel, or any combination thereof used in angling) for commercial fishing under provisions of an Oregon troll license is prohibited and declared unlawful. Further, possession or custody of such gear aboard any boat or vessel used or engaged in trolling under the troll license or while en route to or from fishing in waters of State jurisdiction is likewise prohibited.

The State Fisheries Director stated that the new orders have been enacted to curb the activities of individuals who have been using commercial troll licenses to exceed established angling bag limits on salmon in coastal waters. He also stated that there is no intent on the part of the Commission to interfere with bona fide commercial salmon trolling by adoption of the new rules.

The revised regulation also states that there is no intent to prohibit boats or vessels normally employed in trolling from being used for charter, hire, or use in guiding when such boats are not engaged in commercial trolling.

Another action of the Oregon Fish Commission, effective April 5, closes waters of the Columbia River to commercial salmon trolling. The State of Washington had previously taken such action.

Other regulations revised by the Fish Commission that will become effective April 5 pertain to shellfish and commercial fishing in coastal streams. Changes in shellfish regulations include elimination of the personal use daily bag limit of 60 crayfish per individual; an alteration of the closed period for commercial harvest of crayfish; and a clearer definition of the prescribed method of measuring crabs.

The crayfish limit was dropped because there was no apparent biological purpose for the restriction. The commercial closed season on crayfish will now extend from November 1 to March 31, to afford more protection for female crayfish while they are carrying eggs. Measurements of crabs are to be the shortest distance through the body from edge of shell to edge of shell, directly in front of the points or lateral spines.

The passage of an initiative measure prohibiting commercial fishing for salmon in coastal streams south of the Columbia River at the last general election necessitated revision of several regulations still applicable to the coastal streams. All references to lawful commercial salmon fishing in coastal streams have been removed from the old regulations. Former provisions permitting lawful harvest of shad, striped bass, and miscellaneous other fishes, where applicable, have been reenacted in the new order.

A continuous 30-day open season, November 1-30, for chum salmon in Tillamook Bay, as authorized in the coastal closure initiative, is also incorporated in the revised coastal order.

* * * * *

NEW HATCHERY FISH DIET USES UNUTILIZED MARINE FISH: Credit for developing a new hatchery fish diet using unutilized marine fish is shared jointly by the Oregon Fish Commission hatchery biology section and the Oregon State College Seafoods Laboratory at Astoria. The Seafoods Laboratory staff is searching for new uses of Oregon marine fishes not now being utilized. Fish hatchery diets offer a great potential. Some two million pounds of fish food are required annually for operation of Commission hatcheries alone.

It is planned to test the new diet on a hatcherywide basis at the Klaskanine Hatchery near Astoria. Results of this experiment will help to determine whether or not the new diet will be adopted for use at all 15 Commission salmon hatcheries.

Second phase testing of the experimental production diet for hatchery salmon was initiated the latter part of March at the Oregon Fish Commission's Sandy hatchery with the release of 32,000 "marked" silver salmon fingerlings into the Sandy River.

Prior to release, 16,000 of the young fish that had been fed a normal hatchery diet for almost a year were "marked" by excision of the adipose fin and a portion of

the left maxillary or upper jaw bone. The other 16,000 fingerlings had received the newly-developed experimental diet and were distinguished from the normal-diet fish by an adipose-right maxillary mark.

This phase of the testing is being conducted to determine if the experimental diet has any delayed influence on the survival of hatchery fish after they are liberated. The fish released won't be expected back to the Sandy River as adults until late 1958. Jacks will be due back this fall.

Results of the preceding 12-months feeding trial comparing the experimental production diet with the standard Sandy Hatchery diet indicate the new diet could cut fish food costs considerably at Oregon Fish Commission hatcheries. But before the new cost-cutting diet can be put into use at all Fish Commission hatcheries, it will have to undergo larger-scale testing, according to the State Fisheries Director.

The experimental diet being tested is fed in pellet form and is composed of 45 percent fish products and 55 percent meal consisting of a variety of components. Each component in the diet has been tested previously for fish-growing qualities.

Pacific Oceanic Fishery Investigations

ABUNDANCE OF SURFACE SCHOOLS OF TUNA BY LIVE-BAIT FISHING STUDIED (M/V Charles H. Gilbert Cruise 32): The abundance and distribution of surface schools of yellowfin and skipjack tuna by live-bait fishing and the availability of Marquesan sardines on the baiting grounds of all islands in the Marquesas group were studied by the Service's research vessel Charles H. Gilbert on a 70-day cruise (January 11-March 22, 1957). Abundant schools of skipjack or striped tuna (aku) and adequate supplies of live bait were reported found. The Marquesan area some 2,000 miles southeast of Hawaii is of interest as a potential new winter (Marquesan summer) fishing ground both for Hawaii-based boats and for the West Coast tuna fleet.

The Service's research vessel, Charles H. Gilbert.

In general, skipjack tuna (Katsuwonus pelamis) were very abundant around the Marquesas throughout the period of the cruise. Yellowfin tuna (Neothunnus macropterus) were not so abundant, however.

Two surveys were made of all the Marquesas Islands area during the cruise. On the first (January 25-31) the following tuna schools were sighted: skipjack, 40; yellowfin, 4; unidentified tuna, 32; mixed yellowfin and skipjack, 4; total schools sighted--80.

On the second survey (February 23-March 1), the following schools were sighted: skipjack, 21; yellowfin, 7; unidentified tuna, 61; mixed yellowfin and skipjack, 0; total schools sighted--89. (Unidentified schools are those where tuna are seen but not identified as to species.)

It is of interest to note that a similar survey made during August 1956 (Marquesas winter) resulted in the sighting of 33 schools.

In the Marquesas area, fishing trials were made with live bait on a total of 99 tuna schools. Fish from 36 of these schools responded to the point were a catch of one or more fish was made; fish from 12 schools "bit well," and 100 or more fish were caught.

Table 1 - Tuna Catches in the Marquesas Area

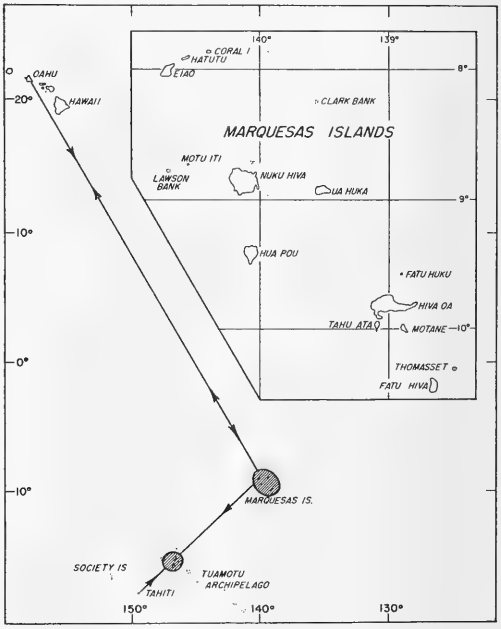
School Composition	Number of Trials	Catch of One or More Tuna	Catch of 100 or More Tuna
		(Schools)	
Skipjack	68	29	12
Yellowfin	18	2	0
Unidentified	7	0	0
Mixed species	5	4	0
Little tuna	1	1	0
Total	99	36	12

It will be noted from table 1 that only fish from skipjack schools can be considered to have "bitten well." Virtually all of the fish in schools identified as yellowfin were large--from 50 to 100 pounds, and they did not respond favorably to the live bait. The majority of the skipjack caught weighed from 4 to 10 pounds, with fish from a few schools weighing 15-20 pounds each.

As might be expected, fish from the schools chummed exhibited variation in favorable response to live bait. In general, the schools encountered during the first part of the cruise did not respond well. The best catches were made during the last six fishing days (March 4-9), when catches of 100 or more skipjack were made from six of the 14 schools chummed.

A total of 797 of the skipjack and 10 of the yellowfin tuna from the total catch of 4,838 skipjack and 53 yellowfin were tagged and released.

Two species of fish of a size suitable for live bait fishing were found in bays of the Marquesas Islands; the Marquesan sardine (Harengula vittata) and weke (Mulloidichthys sp.). The sardines schooled well around the boat when thrown as live bait, but the weke tended to scatter and dive, proving unsuitable for tuna.



Charles H. Gilbert Cruise 32 (January 11-March 22, 1957).

Surveys were made of 13 bays of the Marquesas Islands for sardines, and varying quantities were seen or caught in 10 of them. Most of the sardines were located over sandy bottom in sheltered bays (see table 2).

It was found that sardines of all sizes were attracted to a floodlight at night and on seven occasions successful sets were made with the night net alongside the vessel.

In all 1,678 buckets of sardines were caught in 59 day sets and seven night sets, each bucket containing an average of eight pounds of sardines. The sardines ranged from 3 to 5 inches in length, with most around $3\frac{1}{2}$ inches.

Sixty-four buckets of sardines (approximately 12,000 individuals) were released inside Pokai Bay, Oahu, on March 22, 1957, in an attempt at introduction of the species into Hawaiian waters.

Table 2 - Bait-Fish Productivity in Six Bays in Order of Decreasing Productivity

Locality	Remarks
1. Taio Hae Bay, Nuku Hiva I.	Most reliable bait source, 1,200 buckets seen, 1/24/57. Good protection from weather. Short tow to vessel.
2. Anaho Bay, Nuku Hiva I.	5,000 buckets seen, 1/31/57. Bad surge in NE. weather.
3. Taipi Vai, Nuku Hiva I.	100 buckets caught 2/4/57. Good protection from weather. Long tow to vessel.
4. Hakiheu, Nuku Hiva I.	130 buckets caught 3/5/57. Bad surge in NE. weather.
5. Taa Huku Bay, Hiva Oa I.	40 buckets caught, 1/27/57. None seen 2/27/57. Good protection from weather.
6. Hatiheu Bay, Nuku Hiva I.	50 buckets caught, 2/8/57. Bad surge in NE. weather.

Three days were spent in the Tuamotus in the vicinity of Ahi, Manihi, and Rahiroa atolls (table 3).

Table 3 - Tuna Schools in the Tuamotus

	Schools			
	Skipjack	Yellowfin	Mixed	Unidentified
	(Number of Fish)			
Sighted . .	5	1	2	21
Chummed	1	1	2	-
Catch . . .	237	17	-	-

A new type of plastic dart tag was used to tag skipjack and yellowfin tuna on this cruise. The fish were released alive in the hope that subsequent recaptures may shed some light on the migrations of these fish, at present almost completely unknown. The barbed head of the new tag is simply stabbed into the tissues of the fish, obviating the time-consuming knotting that was necessary with earlier types of plastic tags. Since tuna, and particularly skipjack, die very quickly out of the water, the speed and ease of attachment of the dart tag make it a very promising new tool for tuna research.

* * * * *

ALBACORE TUNA PROGRAM: Studies of the albacore catch data gathered by the Service's Pacific Oceanic Fishery Investigations research and exploratory vessels were completed during the first quarter of this year. An estimate of the catch per unit of effort of subsurface albacore by long-line and the troll catch per unit of effort was made for various temperatures.

An estimate of the catch per unit of effort at various temperatures was obtained for both fall and winter long-line catches by first computing the hook depths from the results of sounding tube studies and then using these depths to estimate the temperatures from the on-station bathythermograms. The winter estimate showed a peaking of the catch at about 56° F. to 58° F. with the majority of the catch being made between 55° F. and 63° F. Although the data are few, all sizes of albacore were taken over approximately the same range of temperature. The fall temperature ranges were too broad to provide a reliable estimate, but there did appear to be a peaking at 56° F. or at about the same temperature noted for the winter catch.

A plot of the number of troll-caught albacore versus temperature gave an extreme range of 52° F. to 66° F. The plot gave a jagged curve with a dominant peak

extending from 59° F. to 60.5° F., with a smaller peak at 63° F. and a smaller well-separated peak at 52° F. A breakdown of the data as to season (summer and fall) and area (eastern and central Pacific) showed two paramount features. First, the central Pacific albacore have the over-all temperature range described above while the eastern Pacific albacore are restricted to the center of the temperature range. Second, the peak observed at 63° F. was associated with the fall catches in the eastern Pacific.

In the field of oceanography, the processing and analysis of data collected on past oceanographic and fishing cruises have continued. Two trial plots of the surface temperature from ships' weather reports were made for the July 11-20 periods of 1955 and 1956. These trials show that there are now adequate data available for the preparation of synoptic charts over the entire northeast Pacific. The coverage is adequate to permit annual and seasonal fluctuations to be traced and the position and extent of the temperature front (Polar Front) north of Hawaii and areas of upwelling off the West Coast to be described.

The Japanese have two albacore tuna-tagging programs under way. The Kanagawa Prefecture Fishery Experiment Station is sponsoring a tagging program in the long-line albacore fishery. During the past winter about 800 tagged fish were released in the Pacific and Indian Oceans by the commercial long-line vessels. The Nankai Regional Fisheries Research Laboratory is making preparations to tag about 1,500 albacore in the summer live-bait fishery off Japan.

Plans were completed for an intensive survey of a band approximately 350 miles wide off the West Coast between Point Arguello, Calif., and Destruction Island, Wash. The plan is to have 10 commercial vessels make an intensive trolling survey of the area while two POFI vessels patrol the area collecting biological and oceanographic data. The commercial vessels will be selected on a competitive bid basis.

BAITFISH STUDIES: As previously reported, on October 12, 1956, adult tilapia were placed in redwood tanks at the Service's Pacific Oceanic Fishery Investiations laboratory in Honolulu, the purpose being to examine this rearing method as a means of producing young fish for tuna bait. The first young were observed on December 20, 1956. Since that date one tank has been in continuous production, with 64 females producing 14,000 young in about 100 days. In a second tank with slightly different temperature and light conditions, relatively few (2,600) young were produced.

We have learned that young tilapia can be reared to optimum bait size ($1\frac{1}{2}$ to $2\frac{1}{2}$ inches) for skipjack fishing in two months. We have also found that even the young fish are very cannibalistic, therefore the different size groups must be segregated.

A second meeting of the Baitfish Research Coordinating Committee was held and a plan adopted for POFI and Hawaiian Tuna Packers, Ltd. to collaborate in studying the production of bait-size tilapia in two large ponds near Honolulu. Intensive seining operations were carried out and large numbers of the adults in each pond were marked by fin clipping. The fish will be fed during the spring and summer and at regular intervals the ponds will be seined, the young fish removed for tuna bait, and from the recoveries of marked fish, the total population of the ponds will be estimated. From the information obtained by the end of the summer we will have a measure of the bait fish production from a known number of adult fish, with the feeding and harvesting costs; we can then evaluate this method of tilapia culture for producing bait fish. The bait produced will be used on POFI vessels and the commercial skipjack boats.

The largest introduction of Marquesan sardines to Hawaiian waters was effected in March when 12,000 were released along the south coast of Oahu. The fish were in fine condition. Within a week after the release two were taken by Oahu bait fishermen, one near Honolulu and the other on the north coast of the island.

BIG-EYED AND YELLOWFIN TUNA STUDIES: The big-eyed tuna catch data from the Hawaiian long-line fishery (1948 through 1955) were summarized and the analyses completed. The results gave firm evidence that the major part of the increase in big-eyed landings for the eight-year period under study was due to a shift in fishing grounds of the larger vessels from a general localized fishing effort around Oahu to an increased amount of effort being expended in the Hana, Maui, and Hilo, Hawaii, areas. These latter areas are considered to be good big-eyed fishing grounds.

The evidence supporting this conclusion is twofold. First, an analysis of the catch per unit of effort by size of vessel showed completely contrasting results. The big-eyed catch per trip of the smaller vessels (less than 45 feet registered length) was relatively constant over the entire period studied except for minor fluctuations. On the other hand, the catch per trip for the larger vessels showed a drastic increase from the 1948/49 season to the 1951/52 season with a relatively stable catch per trip thereafter. The second bit of evidence was obtained from a study of the area fished. The results showed that during the 1948/49 season only 44 percent of the total trips during the season were made into the Hilo-Hana areas. The effort into these areas increased during the subsequent years and leveled off during the last three years at about 90 percent.

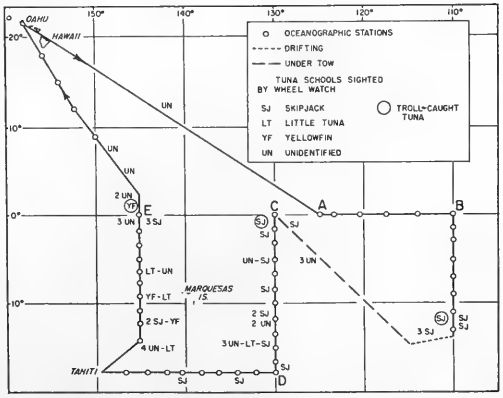
A cursory study of the yellowfin catches showed a rather constant yellowfin catch per trip for the small vessels with the only noticeable drop occurring during 1955. Contrasted to this the catch per effort of the larger vessels was uniform only up through 1952 and dropped to a lower level thereafter. A general consensus shared by fishermen is that the windward sides of the islands are better big-eyed tuna grounds than the lee, whereas for the yellowfin the reverse is true. If this can be accepted (the data does show some confirmation), then it is possible to explain the drop in yellowfin catch rate to a lower level by the shift in effort discussed above. Essentially the fleet moved from the lee of Oahu to the windward side of the islands of Maui and Hawaii.

These results are particularly interesting because earlier investigators had attributed the marked changes in Hawaiian landings to changes in the distribution and/or abundance of the fish themselves.

* * * * *

OCEANOGRAPHIC OBSERVATIONS ASSOCIATED WITH TUNA STUDIES IN CENTRAL PACIFIC (M/V Hugh M. Smith Cruise 38): Scientific observations associated with studies of the tuna resources of the south central Pacific Ocean were completed on March 26 on an 11-week cruise by the Service's research vessel Hugh M. Smith. The vessel sailed 10,000 miles gathering detailed physical, chemical, and biological oceanographic information from an area covering more than 2 million square miles of ocean.

The primary mission of the vessel was determination of areas of high fishery potential, but an engine breakdown 3,600 miles



Hugh M. Smith Cruise 38 (January 11-March 26, 1957).

southeast of Hawaii provided an unusual opportunity to study in detail a feature of the oceanic circulation known as the Southeastern Pacific gyral.

During a 2-week drift covering almost 300 miles, daily hydrographic casts were made to 4,000-foot depths in order to gather water samples for chemical and temperature analysis. Movements of ocean currents can be determined by this technique. While drifting, the vessel crew improvised long-line fishing gear, which they launched daily in an effort to catch subsurface tunas.

Following engine repairs at sea with parts brought from Honolulu by the Coast Guard buoy tender Balsam, the Hugh M. Smith resumed her scheduled program. This included the use of radioactive carbon to determine the primary productivity of the marine algae upon which the ocean food chain depends, net hauls to capture small marine animals known as zooplankton, and special plankton hauls to secure fish larvae to provide data on the distribution of young tuna.

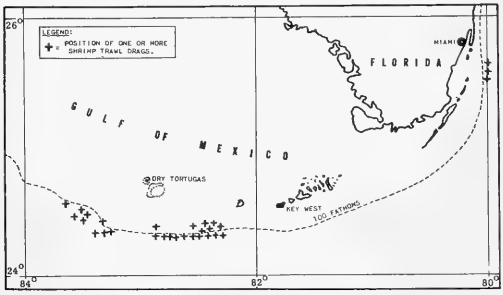
Some 2,400 miles southeast of Honolulu the vessel encountered large patches of yellow discolored water in an area about 10 miles in width. The patches were probably similar to the so-called "red tide," caused by a minute marine organism, which has occurred off California and Florida coasts. Samples of the discolored water were preserved for microscopic study at the Service's Honolulu Laboratory.

Other special water samples were taken just north of the equator at 145° W. longitude for a Norwegian marine biologist who is studying the phytoplankton (drifting marine algae) of the central Pacific.

A total of 48 tuna schools were sighted about 1,800 miles south of Hawaii--19 of the schools were skipjack (aku), 4 were little tunny (kawakawa), 2 were yellowfin (ahi), and 23 were unidentified.

South Atlantic Exploratory Fishery Program

SOUTHEASTERN FLORIDA COAST DEEP-WATER SHRIMP SURVEY (M/V Combat Cruise 8): Deep-water shrimp trawling activities in March along the southeastern Florida coast from off Miami to Dry Tortugas by the U. S. Fish and Wildlife Service-chartered shrimp trawler Combat revealed no bottom where consistently good catches of red shrimp (Hymenopenaeus robustus) could be made.



M/V Combat Cruise 8 (February 24-March 16, 1957).

Twenty-nine drags were made in the Key West-Dry Tortugas area in depths of 185 to 230 fathoms. Catch rates varied from 0 to 265 pounds of red shrimp per 3-hour drag. Various combinations of fishing gear were used, including 40-, 56-, and 100-foot flat trawls and an 80-foot balloon trawl. The 80- and 100-foot nets were fished with two warps, and the smaller nets were fished using a single warp and bridle.

The Combat attempted three drags east of Fowey Rocks Light (Miami). On two of these drags the gear became fouled and no catch was obtained. On the third drag the trawl, doors, bridle, and 100 fathoms of warp were lost when the trawl hit a bottom obstacle.

Considerable time was lost due to strong winds and mechanical difficulties.

South Carolina

FISHERIES BIOLOGICAL RESEARCH PROGRESS, JANUARY-MARCH 1957: Oyster Research: Two other companies have indicated interest in producing seed oysters for commercial export. Past experimental shipments indicated the possibility of exporting seed oysters from South Carolina to other waters, but final proof of the practicability would depend on successful export and successful growing of seed oysters on a much larger scale than our experimental plantings, Progress Report No. 31 (January-March 1957) of the Bears Bluff Laboratories points out.

Regular monthly studies on growth and mortality of individual oysters in trays at the Laboratory dock were begun again after a five-month recess due to a lack of personnel. Measurements and inspection of the individual oysters showed a 5.8-percent mortality of all oysters from July to January. Since January, the number of oysters dying has been very small and the percentage of mortality totaled only 1.4. Growth of oysters from January through the end of the first quarter has been about normal.

Shrimp Research: A total of 33 experimental drags off the southern part of South Carolina out to the 50-fathom curve were made during January, February, and March. Rock shrimp (Sicyonia) continued to be found in small amounts in from 20 to 40 fathoms of water. One trawl haul made in 20 fathoms at night on March 14 yielded 710 porgy in 30 minutes of dragging with a 20-foot net. However, all these fish were quite small, ranging from 5 to 6 inches only in length. Other fishes were not taken in commercial quantities.

In February the Laboratories' offshore research vessel served as a "quarter" boat for several days while shrimp fishing was carried on from an 18-foot launch in the shallow waters of Bull Bay. Trawling in Bull Bay yielded a few white shrimp (Penaeus setiferus), but only one spotted shrimp (Penaeus duorarum).

During the period covered by this report both research vessels kept tabs on the population of white shrimp which usually are found during the winter months from the beach out to about 4 fathoms. In January the relative abundance of white shrimp under the beach appeared to be slightly greater than usual for the past three years. Small white shrimp were also fairly numerous in this area in February but seemed appreciably less in March. No small white shrimp could be found more than three miles off the beach.

In late February and in March, exceptionally large concentrations of small white shrimp were located in the South Edisto River. These shrimp were concentrated in waters with a salinity range of from 14 to 18 p.p.t. In salinities below 14 p.p.t. the numbers diminished greatly. Similarly in waters above 18 p.p.t. the density of shrimp was markedly reduced. On March 2, the size of the majority of the shrimp was 130 count (heads off). By the third week in March the greater portion of the catch in this area had increased in weight so that the count now ran 80 shrimp to the pound (heads off). This represents a little better than a 38-percent increase in weight in three weeks. In the $4\frac{1}{2}$ years that the Laboratories have been continually carrying out experimental trawling, this is the first time that such a large concentration of small white shrimp has been observed in inland waters during the winter months.

Pond Research: The fresh-water lake at Bears Bluff had dried up due to the long extended drought. The lake was re-established by pumping fresh water from a deep well.

During the period covered by this report, a 535-foot six-inch well was drilled in the yard of the Laboratories and a deep-well jet pump was installed. In January the Department of Public Works of Charleston County removed more than 7,500

cubic yards of material from the lake bed and rebuilt and strengthened the dam separating the lake from one of the salt-water experimental ponds. At the end of March, the deep well supply, augmented by rainfall, has resulted in the accumulation of over a million gallons of fresh water. Within a short time it will be possible to pump from the fresh-water lake and "irrigate" one of the salt-water ponds. Thus one one-acre salt-water pond can be kept at high salinity while in the other one-acre experimental pond the salinity can be lowered to almost any desired amount, and thus the influence of salinity both high and low, on shrimp, crab, fish, and oysters can be studied without fear of interruption from further drought. The salinity conditions found in low country creeks and rivers in periods of heavy rainfall or drought can be simulated.

Note: Also see Commercial Fisheries Review, January 1957, p. 47.

U. S. Fish Stick Production

1956 PRODUCTION: The United States production of fish sticks amounted to 52.6 million pounds in 1956. This was a decrease of 20 percent as compared with the amount manufactured in 1955. Precooked fish sticks accounted for 87 percent

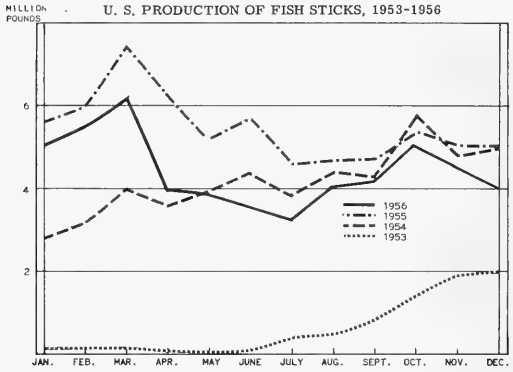


Table 1 - U. S. Production of Fish Sticks, 1953-56

Month	1956	1955	1954	1953
	(1,000 Lbs.)			
January	4,862	5,601	2,771	115
February	5,323	5,954	3,180	133
March	6,082	7,393	4,003	148
April	3,771	6,249	3,841	35
May	3,873	5,169	3,941	22
June	3,580	5,687	4,381	31
July	3,153	4,587	3,810	417
August	4,166	4,671	4,364	454
September	4,085	4,703	4,272	809
October	5,063	5,356	5,637	1,435
November	4,585	5,042	4,803	1,902
December	4,019	4,972	4,959	2,001
Total	52,562	65,384	49,962	7,502

of the 1956 total while the remaining 13 percent consisted of uncooked sticks. Plants located in the Atlantic Coast States produced 81 percent of the total. Firms in the interior of the country and in the Gulf States manufactured 12 percent while the remaining 7 percent was produced in the Pacific Coast States.

* * * * *

JANUARY-MARCH 1957: Preliminary statistical data indicate that the United States production of fish sticks during the first three months of 1957 amounted to 14.8 million pounds. This was a decrease of 11 percent as compared with the 16.6 million pounds produced during the first quarter of 1956.

Table 1 - U. S. Production of Fish Sticks, January-March 1957

Month	Cooked	Uncooked	Total
	(1,000 Lbs.)		
January	3,774	493	4,267
February	4,680	599	5,279
March	4,727	413	5,140
Total 1st. Quarter 1957	13,181	1,505	14,686
Total 1st. Quarter 1956	14,700	1,900	16,600
Total 1st. Quarter 1955	16,500	2,500	18,900

Production in the Atlantic Coast States accounted for 81 percent of the total followed by the

interior and Gulf States with 10 percent. The remaining 9 percent was manufactured in the Pacific Coast States.

Table 2 - U. S. Production of Fish Sticks by Areas, Jan.-Mar. 1956-57

Area	January-March			
	1957		1956	
	Number of Firms	Thousands of Pounds	Number of Firms	Thousands of Pounds
Atlantic Coast States	26	11,887	27	13,060
Interior and Gulf States	4	1,520	7	2,283
Pacific Coast States	11	1,279	10	1,259
Total	41	14,686	44	16,602

Precooked fish sticks (13.3 million pounds) accounted for 90 percent of the first-quarter total production while uncooked fish sticks accounted for 10 percent of the total.

Note: Also see Commercial Fisheries Review, Feb. 1956, p. 34; June 1956, p. 44; Aug. 1956, p. 50.

United States Fishing Fleet[1/] Additions

MARCH 1957: A total of 41 vessels of 5 net tons and over were issued first documents as fishing craft during March 1957--24 more than during the corresponding month of 1956. The Gulf area led all others with 12 vessels, followed by the Pacific Coast area with 9, the South Atlantic area 8, the Chesapeake and Middle Atlantic areas 5 each, and Alaska 2.

Table 1 - Vessels Issued First Documents as Fishing Craft, by Areas, March 1957 with Comparisons

Area	March		Jan.-Mar.		Total
	1957	1956	1957	1956	1956
	(Number)				
New England	-	1	3	5	15
Middle Atlantic	5	2	10	7	26
Chesapeake	5	4	22	12	138
South Atlantic	8	1	19	11	119
Gulf	12	5	22	15	100
Pacific	9	1	14	4	76
Great Lakes	-	2	-	2	6
Alaska	2	1	8	3	40
Hawaii	-	-	-	1	1
Total	41	17	98	60	521

Note: Vessels assigned to the various sections on the basis of their home port.

Table 2 - Vessels Issued First Documents as Fishing Craft, by Tonnage, March 1957

Net Tons	Number
5 to 9	17
10 to 19	7
20 to 29	3
30 to 39	10
40 to 49	2
120 to 129	1
130 to 139	1
Total	41

1/ Includes both commercial and sport fishing craft.

U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, JANUARY 1956: Imports of edible fresh, frozen, and processed fish and shellfish in January 1957 were higher by 29.5 percent in quantity and 18.4 percent in value as compared with the previous month. Compared with January 1956, the imports for January this year were up 0.4 percent in quantity and 4.0 percent in value. Imports for January 1957 averaged 28.2 cents a pound as compared with 27.2 cents a pound for the same month in 1956.

United States Foreign Trade in Edible Fishery Products, January 1957 with Comparisons

Item	Quantity			Value		
	Jan.		Year	Jan.		Year
	1957	1956	1956	1957	1956	1956
	(Millions of Lbs.)			(Millions of $)		
Imports:						
Fish and shellfish:						
Fresh, frozen & processed1/ . .	73.0	72.7	786.3	20.6	19.8	231.6
Exports:						
Fish and shellfish:						
processed1/ only (excluding fresh and frozen) . .	9.2	10.9	82.8	1.8	2.1	19.2

1/ Includes pastes, sauces, clam chowder and juice, and other specialties.

Exports of processed edible fish and shellfish in January 1957 increased about 17 percent in quantity as compared with the previous month, but were 15 percent below the same month in 1956. The January 1957 value of the exports was higher by 12.5 percent as compared with December 1956 but lower by 14.3 percent from the same month a year ago.

* * * * * *

GROUNDFISH FILLET IMPORTS, MARCH 1957: During March 1957, imports of groundfish (including ocean perch) fillets and blocks amounted to 9.2 million pounds. Compared with the 11.8 million pounds imported during the same month of 1956, this was a decrease of 2.5 million pounds or 22 percent. Reduced imports from Iceland and no imports from Norway, France, and West Germany were primarily responsible for the decrease in the total imports for March 1957.

Imports of groundfish fillets and blocks into the United States during the first three months of 1957 totaled 35.2 million pounds as compared with 38.1 million pounds during the same period of 1956. Canada led all other countries exporting fillets to this country with 24.9 million pounds, followed by Iceland with 7.6 million pounds, and Norway with 1.9 million pounds. These three countries accounted for 98 percent of the total imports for the first three months of 1957.

Note: See Chart 7 in this issue.

Wholesale Prices, March 1957

Catches of many of the major East Coast varieties were good and on the increase during March. Spring-run species moved inshore and the New England groundfish fishery was nearing its annual peak. Gulf shrimp fisheries were active, but catches were below normal. The Southern California tuna fishery was enjoying a healthy market, and the Great Lakes fisheries for whitefish and yellow pike were beginning to improve as the ice left the lakes.

In March 1957 the over-all edible fish and shellfish (fresh, frozen, and canned) wholesale price index (119.4 percent of the 1947-49 average) rose 3.6 percent over the previous month and 5.6 percent over the index for March 1956. Except for drawn large haddock, price changes at wholesale during March for all items were slight. The price trend was generally upward or unchanged as compared with February 1957 and March 1956.

The increase of 9.2 percent in the drawn, dressed, or whole finfish wholesale prices from February to March this year was due to higher prices for large drawn haddock at Boston and for the fresh-water species. Wholesale prices for halibut (down 8.5 percent) and salmon (down 2.4 percent) showed signs of weakness because of liberal stocks on hand, but after an initial price drop the market appeared to stabilize at the lower price level. The March 1957 drawn, dressed, and whole finfish subgroup index was 7.7 percent higher than in March 1956 due to a price increase of 28.0 percent for large drawn haddock and of 41 percent for yellow pike. On the other hand, frozen halibut and whitefish were 2 to 4 percent lower this March than in the same month last year.

The prices of the processed fresh fish and shellfish subgroup items in March 1957 increased by 7.6 percent as compared with the previous month and were higher by 12.8 percent than in March 1956. Higher fresh haddock fillet prices (up 32.6 percent) and fresh Florida shrimp prices (up 10.3 percent) were largely responsible for the increase between February and March this year. Both of these items sold higher this March (prices were up 15 percent for haddock fillets and 18.9 percent for shrimp) than in the same month in 1956.

Between February and March 1957 prices for the processed fish and shellfish subgroup decreased 3.5 percent due to a 10-percent drop in frozen haddock fillet prices at Boston and a decline of about 2 percent in frozen shrimp prices at Chicago. As compared with March 1956, the prices for the items in this subgroup in March 1957 were higher by 6.9 percent due almost entirely to higher frozen shrimp prices (up 14 percent).

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, March 1957

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices1/ ($)		Indexes (1947-49=100)			
			Mar. 1957	Feb. 1957	Mar. 1957	Feb. 1957	Jan. 1957	Mar. 1956
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					119.4	115.3	121.8	113.1
Fresh & Frozen Fishery Products:					132.0	124.9	136.2	120.6
Drawn, Dressed, or Whole Finfish:					123.4	113.0	134.1	114.6
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.10	.06	100.5	60.7	143.6	78.5
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.31	.34	95.9	105.2	108.3	98.0
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.62	.64	139.3	142.7	143.8	137.6
Whitefish,L. Superior, drawn, fresh	Chicago	lb.	.79	.69	195.8	171.1	146.3	204.5
Whitefish,L. Erie pound or gill net, rnd., fresh	New York	lb.	.90	.75	182.0	151.7	141.5	161.8
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.79	.70	161.8	143.4	116.8	168.0
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.74	.65	173.5	152.4	140.7	123.1
Processed,Fresh (Fish & Shellfish):					142.7	132.6	140.3	126.5
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.34	.26	117.4	88.5	158.2	102.1
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.91	.83	143.8	130.4	128.8	120.0
Oysters, shucked, standards	Norfolk	gal.	6.00	5.875	148.5	145.4	151.6	139.2
Processed, Frozen (Fish & Shellfish):					120.1	124.4	122.7	112.3
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.40	.40	103.4	103.4	103.4	102.1
Haddock, sml.,skins on, 1-lb. pkg.	Boston	lb.	.28	.31	87.9	97.3	94.2	91.0
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.29	.29	114.8	114.8	114.8	114.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.84	.85	128.9	131.2	130.0	113.0
Canned Fishery Products:					101.5	101.5	101.5	102.4
Salmon, pink, No.1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	22.65	22.65	120.0	120.0	120.0	120.0
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.20	11.20	80.8	80.8	80.8	85.1
Sardines, Calif., tom. pack,No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	9.00	9.00	105.0	105.0	105.0	83.2
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	7.95	7.95	84.6	84.6	84.6	89.9

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.

Wholesale prices for canned fish remained steady during March 1957 at February levels and were less than 1 percent below March 1956 levels. As compared with March 1956, lower wholesale prices this March for canned Maine sardines and canned tuna were just about offset by a 26-percent increase in California sardine prices.

International

CANADA AND UNITED STATES AGREE ON NORTHWEST PACIFIC FISHERY REGULATIONS

United States and Canadian conferees on March 1 recommended coordinated regulations in the oceanic salmon and certain other fisheries in the Northwest Pacific Ocean. Nets in offshore salmon fishing will not be permitted. The spring or chinook salmon troll fishing season will open not earlier than April 15 and will close October 31. The June 15 opening date on trolling for silvers or cohos will remain unchanged. Troll-caught chinook salmon will be required to be 26 inches minimum length or an equivalent minimum weight. In the petrale sole fishery, a uniform closed season from December 20 to April 15 will be established, according to a March 1 news release by the Washington State Department of Fisheries.

At present Canada does not have seasons for troll-caught chinook or a minimum length regulation, or a season on petrale sole. British Columbia for 1957 has set an April 15 opening date for troll-caught chinook, and closed the petrale sole fishery from February 1 through April 15. Some net fishing for salmon has been carried out on the high seas exterior to the Strait of Juan de Fuca. In 1955 a gill-net fishery in "outside" waters began to develop.

Washington, Oregon, and California are moving the needed laws through the current Legislatures. Canada can put into effect by administrative action such regulations as are necessary. It is planned that this coordinated system of regulations will take effect in the three states and Canada in time for the coming fishing seasons. Failure of action in any one of the four jurisdictions may jeopardize the entire program.

The meeting represents a long step forward in securing coordination of regulations to conserve Pacific Coast fisheries. Hitherto, the measures of Washington, Oregon, and California have been coordinated through the Pacific Marine Fisheries Commission. The recommendations of the conference when approved by the Legislatures and administrative action taken by Canada will mean that regulations along the entire Pacific Coast will be coordinated.

The meetings, which were held in the Salmon Bay Regional Office of the Washington Department of Fisheries, were attended by officials from the U. S. Fish and Wildlife Service, the Department of State, Canada, members of the Legislatures and officials of the Pacific Coast states, as well as commissioners of the Pacific Marine Fisheries Commission and advisors from industry.

The recent growth of the net salmon fishery threatened existing United States and Canadian salmon conservation programs. Such fishing already is forbidden in waters off the coast of Alaska by order of the Secretary of the Interior.

The conference also took note of a special problem which exists in the area adjacent to the Bonilla Point-Tatoosh Island line at the entrance to the Strait of Juan de Fuca, and agreed that mutual scientific studies would be inaugurated by Canada and the State of Washington in those waters.

Finally, arrangements on procedures for continued international review of coordinated regulations were reached.

FISHERY SCIENTISTS MEET IN LISBON

A joint scientific meeting of fishery scientists was scheduled by the International Commission for the Northwest Atlantic Fisheries, the International Council for the Exploration of the Sea, and the Food and Agriculture Organization (FAO) in Lisbon, May 27-June 3 this year.

It was expected that more than 50 scientific papers dealing with the effects of fishing, fishing effort, and selection in fishing were to be presented. Scientists from at least 15 different countries were to participate in the meeting.

General principles in connection with fish population dynamics were to be deduced from the papers, with particular relevance to the cod, haddock, hake, ocean perch, and halibut fisheries.

There were to be three working parties at the meeting. The discussion on the effects of fishing was to deal with the characteristics of fishing gear and methods, and the use of such gear, especially in connection with the magnitude and composition of catches. It was to be concerned with a diversity of activities, such as hydrographic and meteorological work and even with underwater observation of the behavior of fishing gear.

Papers on fishing effort were to deal with such items as single and mixed fishing methods, technical developments, and data at present available.

The working party dealing with selection was to consider detection and identification of selection processes.

Other items were to include measurement of selection, problems of experimental work, and techniques of analyzing and presenting data. For example, one item in the program was to be concerned with causes of variation. This was to include consideration of behavior patterns, abundance and shape of fish, mesh dimensions, materials used in making fishing gear, speed and length of tow, and so on.

It was hoped that the meeting would indicate what further research is needed in the North Atlantic.

WHALING

ANTARCTIC 1956/57 SEASON: The 1956/57 pelagic whaling in the Antarctic ended at midnight March 16, after the 20 participating expeditions had reached the over-all quota of 14,500 blue-whale units, as fixed by the International Whaling Commission. As the opening gun was fired January 7, the season lasted 69 days. The actual catch exceeded the quota by 234 units. Rough weather during the last two weeks of the season seriously hampered whaling operations. The limit for the 1955/56 season was 15,000 units and 15,500 units for 1954/55.

Norway: Final figures from the nine Norwegian expeditions which participated in this year's Antarctic whaling show a total production of 855,489 barrels of whale oil, or 200,641 barrels more than during the 1955/56 season. Sperm oil production was substantially smaller--97,784 barrels, as against 128,810 barrels during 1955/56. However, the combined whale and sperm oil production adds up to 953,273 barrels, which is 169,615 barrels more than in the preceding season.

Leading Norwegian whaling operators believe the voluntary reduction of catcher vessels has proved its value. An agreement to that effect was signed by the Norwegian, British, Dutch, Japanese, and South African whaling companies, all privately-owned. Only the Soviet Union failed to reduce the number of catcher vessels, points out the Norwegian Information Service in an April 4 news release.

By using fewer catcher vessels, Norwegian experts say, whaling expeditions can operate more economically. Besides requiring less investment, it also means substantial fuel savings.

Netherlands: This season's Antarctic whaling yielded 15,414 long tons of train oil and sperm oil as compared to 16,361 tons for the previous season for the Netherlands fleet. Practically no advance sales were made this year.

Russia: A Russian whaling fleet caught more whales--1,180 of them--than any other of the 20 fleets from 6 nations which took part in the 70-day Antarctic whaling season which ended March 16. Japan's Nishi Maru fleet was second with 987 whales.

* * * * *

ACCORD ON NEUTRAL WHALING OBSERVERS: An agreement concerning a special neutral observation service for pelagic whaling was drafted at a conference held in Oslo March 20-21, 1957, of representatives of 4 of the 5 countries which are engaged in pelagic whaling in the Antarctic. The draft agreement will be presented to the respective governments for consideration and signature.

Norway had called the conference several weeks before and had invited all countries engaged in Antarctic whaling to participate. Japan, the United Kingdom, and The Netherlands accepted. The U. S. S. R. declined.

Except for the important fact that the U. S. S. R. did not participate, the conference is regarded as successful by the Norwegian Foreign Ministry. Its object was to advance the long-sought aim of Norway, and that of many other countries interested in whaling, to have neutral observers on whaling expeditions in the Antarctic, a March 28 dispatch from the United States Embassy at Oslo states.

Signature of the draft agreement cannot be expected for several months at the earliest. Although the preliminary steps to be taken by the governments in the ratification process are not yet clear, some of them will have to present the draft to their legislatures. The Japanese Diet, for example, will not act on the draft until next winter.

Article VII of the Oslo draft agreement provides that the agreement shall cease to have effect as and when an agreement under the International Whaling Convention comes into effect. The draft agreement is open to accession by any country having whaling expeditions, or expeditions under its jurisdiction, operating in the Antarctic.

Paragraph 1 of Article II provides that the observers shall be of a nationality different from that of the governments which are parties to the agreement, unless the committee established by the contracting governments to administer the agreement, and consisting of a representative of each of the participating governments, shall unanimously agree otherwise.

These observers would not have to be technically specialized. They would have no executive functions and would only have to observe whether the expeditions started and ended on dates specified by the International Whaling Commission, whether certain types of whales were caught only in designated periods, and whether the whales caught met requirements for size, within reasonable conditions.

The Norwegian Foreign Office is currently preparing instructions to its missions abroad to inform those governments that are parties to the International Whaling Convention of the results of the Oslo Conference. Copies of the draft agreement will be transmitted to these governments at the the same time.

The desire to have neutral observers on board whale factoryships is a matter of urgency to the Norwegians in order to insure fair play under the rules of the International Whaling Convention. In the past opposition on the part of Soviet Russia has prevented the acceptance of a protocol to the Convention to permit neutral observers on Antarctic whale factoryships. The refusal on the part of Soviet Russia to attend the March 20 conference was not unexpected.

An example of why the Norwegians mistrust the observance of the rules of the International Whaling Commission was provided by a Norwegian captain who returned after a month in the Antarctic. This observer stated that the Russian whaling fleet arrived with 18 catcher boats as compared with 15 last season. The Norwegians, British, and South Africans had agreed among themselves to limit their fleets to 12 catcher boats each.

Angola

PILCHARD-MAASBANKER FISHERY: During a visit of an Angolan-Portuguese Government Mission to the Union of South Africa in October 1956, it was reported by the Mission that a record catch of 400,000 metric tons of fish, mostly pilchards and maasbanker, was made in 1956 by the 2,000 European and 10,000 African fishermen who fish off the 350-mile coast of Angola. About 200 motor fishing vessels and many motorless smaller vessels were engaged in the fisheries and landed at ports between the Cunene River to Lobito Bay. The same Benguela Current that helps to support the lucrative fisheries of the Union of South Africa's west coast and Walvis Bay contributes to Angola's fisheries.

The fishing industry of Angola is controlled by a semi-Government organization known as the "Gremio dos Industriais de Pesca." This organization handles all exports, controls quality, and supervises buying. It is an association of fishing companies organized into "Gremios" of the districts of Luanda, Benguela, and Mossemedes which are federated in the central "Gremio" named above.

A three-man Portuguese mission, which revealed this information, visited the Union of South Africa to study the fishing industries in South Africa and Walvis Bay in order to obtain ideas of how to modernize Angola's processing and catching activities. Although the Angolan fishermen have made excellent catches, their processing and catching methods have not kept pace with the rapid increase in catch. The fishing industry of Angola has developed very much as a family business, with many father and son combinations both catching the fish and salting and drying the catch ashore. As a result, no large fishing centers have developed along the 350-mile coastline of the Portuguese Province.

The output of many family units has grown with the addition of larger Diesel-powered vessels either built in Angola or brought in from Portugal, but ashore the small family units have continued the traditional methods of salting and drying fish for sale to native Angolans and for export to other nearby African countries.

Due to the interest shown by the Mission in the fisheries of the Union of South Africa and also the European fisheries (which were visited previously), it is predicted that the fishing industry of Angola will be substantially modernized in the next five years. Under present conditions the record catch of 400,000 tons of pil-

chards and maasbanker was estimated to yield 40,000 tons of fish meal, small quantities of fish oil, and little or no canned fish (South African Shipping News and Fishing Industry Review, December 1956).

Brazil

TUNA CANNING PROSPECTS EXPLORED BY U. S. FIRM: A representative of a west coast tuna cannery spent most of the month of February in the Recife area exploring the possibilities of organizing a joint Brazilian-United States company to produce and can albacore tuna. Several days were spent on Fernando de Noronha Island where he was cordially received by the Governor, states a March 12 dispatch from the United States Consulate at Recife.

British Honduras

EXPORTS OF FISHERY PRODUCTS, 1956: Exports of all fishery products from British Honduras during 1956 totaled 265,483 pounds (valued at US$100,528), an increase in quantity of 17.8 percent as compared with 1955 exports.

During 1956 the United States received 125,011 pounds of spiny lobster tails (value US$81,556) and 240 pounds of whole spiny lobsters (value US$52). In the same period of 1955, exports to the United States consisted of 22,431 pounds of whole spiny lobster (value US$5,889) and 79,885 pounds of spiny lobster tails (valued at US$51,471).

The quantity shipped to the United States during 1956 was 47.2 percent of the total exports of fishery products as compared with 45.4 percent in 1955. In terms of value, the United States share was close to 81 percent in 1956 and 77 percent in 1955.

Canada

INSPECTION REGULATIONS FOR IMPORTED CANNED FISH AND SHELLFISH: The Canada Gazette, Part II, Volume 91, dated February 13, 1957, contains an amendment (dated Jan. 24, 1957) to the Meat and Canned Foods Act Canned Fish and Shellfish and Cannery Inspection Regulations. Section 28 is revoked and a new section substituted which provides for inspection upon arrival of any canned fish or shellfish imported into Canada.

Section 40 of the same regulation is revoked and a new section provides that no certificate shall be issued for canned salmon or canned herring which does not meet the requirements of Section 39. Other minor amendments are made to various sections of the regulations, states a February 18 dispatch from the United States Embassy at Ottawa.

The following amendments have been made:

1. Section 28 of the Canned Fish and Shellfish and Cannery Inspection Regulations is revoked and the following substituted therefor:

> 28. (1) Any canned fish or shellfish imported into Canada shall be subject to such inspection as the Minister may deem necessary and any

canned fish or shellfish which is found by an inspector not to be sound, wholesome and fit for human food may be seized and forfeited to Her Majesty and disposed of as the Minister may direct.

(2) No person shall import or attempt to import any canned fish or shellfish unless all marks on the cans which identify the canner, the date of packing and the coding of the lot, are clearly stamped or stencilled on both ends of the cases or containers in which such cans are shipped.

2. Section 40 of the said Regulations is revoked and the following substituted therefor:

40. No certificate shall be issued for canned salmon or canned herring found by the laboratory to be sound, wholesome and fit for human food but which does not meet the requirements of section 39; such salmon or herring may be reconditioned and presented for re-examination not later than six months from the date it was first inspected.

3. Section 52 of the said Regulations is revoked and the following substituted therefor:

52. A fee at the rate of one-half cent per case of forty-eight one-pound cans, or the equivalent thereof, shall be charged for the inspection of each parcel of canned salmon or canned herring.

4. Sections 54, 55, and 56 of the said Regulations are revoked.

5. Section 57 of the said Regulations is revoked and the following substituted therefor:

57. Imported canned salmon found by the laboratory to be sound, firm, well packed and in good merchantable condition shall be approved.

6. Section 59 of the said Regulations is revoked and the following substituted therefor:

59. Imported canned salmon found by the laboratory not to be sound, wholesome and fit for human food shall not be cleared for importation but may be returned to the shipper.

7. Section 60 of the said Regulations is revoked and the following substituted therefor:

60. (1) If the laboratory decision regarding the quality of a parcel of imported canned salmon is challenged by an importer within six months from the date of the laboratory examination, the Minister may order a reinspection which shall be final; there shall be no appeal unless the Minister is satisfied that the identity of the parcel in question has been preserved.

(2) A fee of fifteen dollars ($15.00) shall be charged for each reinspection of imported canned salmon under appeal but this fee shall be returned to the importer if the original decision of the laboratory is not confirmed upon reinspection.

8. Section 62 of the said Regulations is revoked and the following substituted therefor:

62. A fee at the rate of one-half cent per case of forty-eight one-pound cans, or the equivalent thereof, shall be charged for the inspection of each parcel of imported canned salmon.

* * * * *

SALMON OFFSHORE NET FISHING IN PACIFIC BANNED: After May 1 British Columbia fishermen will not be permitted to fish for salmon with nets in the offshore waters of the North Pacific, the Canadian Fisheries Department announced on April 12. In order to put into effect the recommendations agreed upon by Canadian and United States fishery representatives at a conference in Seattle in February, the Department has amended the regulations.

Legislation with similar restrictions on United States fishermen has been passed by both Washington and Oregon and is expected to become law in the near future. California is expected to follow with similar legislation. The U. S. Department of the Interior has already issued regulations which prohibit salmon offshore net fishing by Alaska fishermen.

Chile

FISH MEAL AND CANNERY PLANT TO BE ESTABLISHED: An investment of about US$235,000 (10 million pesetas) in a fish meal plant and cannery to be located in Valparaiso was authorized by the Chilean Government by Decree No. 1096 of October 13, 1956. A firm from Vigo, Spain, will install the equipment in the new plant.

The new venture provides for investment in four 40- to 50-ton fishing vessels, a freezing plant, motor vehicles, fish meal and cannery equipment. The fish meal plant is to have a daily maximum capacity of 75 tons.

Colombia

CANNED SARDINE MARKET: There are two Colombia packing companies at the present time engaged in the production of canned sardines, shrimp, oysters, and clams. These companies operate on the north coast of Colombia and usually pack the two varieties of sardine available called "machuelo" and "lisa." The annual domestic production of sardines, estimated at 6,000 cases of 48 1-lb. oval cans, is considered to be inadequate to meet the demand of the Colombia market. Because of the limited quantity of sardines and the difficulty of obtaining cans from the United States, it is believed that domestic production is not very important and that Colombia will continue to depend to a large extent on imports to meet the requirements, states a December 14 dispatch from the United States Embassy at Bogota.

Approximately 40 percent of the total consumption of sardines is satisfied by domestic production. In view of the limited domestic production of canned sardines, and of the current unavailability and high cost of imported sardines (due to customs duties and other restrictions), consumption is believed to be declining at the present time.

Fifty percent of the consumers prefer the 1-lb. oval cans, while 35 percent use the $3\frac{1}{2}$ to 5 oz. flat can, and 15 percent the 8-oz. tall can. About 90 percent of the sardines consumed are packed in tomato sauce. The percentage of sardines consumed by the high, middle, and low income groups is estimated at 60, 35, and 5 percent, respectively. Retail market prices for the domestic 1-lb. ovals packed in tomato sauce range from Ps. 2.20-2.50 (31-36 U.S. cents) a can. The retail prices for the imported 1-lb. ovals range from Ps. 2.65-2.95 (38-42 cents); the $3\frac{1}{4}$ to 5-oz., Ps. 1.55-2.00 (22-29 cents); and the 8-oz. tall, Ps. 1.20-1.50 (17-21 cents).

By Decree No. 2643 of November 2, 1956, the Colombian Government placed canned sardines on the Prohibited List of Imports. Therefore, the exportation of this commodity to Colombia is not feasible at the present time, since no import licenses are issued for items on the Prohibited List.

Canned sardines, both domestic and imported, are usually distributed by importers (by direct importation and through sales agents) and retailers handling provisions of all kinds.

Note: Values converted at the rate of 7.00 pesos = US$1.

Cuba

CLOSED SEASONS FOR SPINY LOBSTER AND SPONGES: The Institute Nacional de Pesca, in accordance with its authority under Decree 2724 of October 5, 1956, has provided for the following closed seasons on certain marine species:

1. Starts the closed season on spiny lobster (Langosta) on March 10, 1957, to continue until otherwise ordered by another Resolution.

2. That the closed season on sponges start on March 10, 1957, to include breeding places and fisheries in the Eastern region as defined by Article 74 of the Regulations of the Fisheries Law, and to be effective this year also along the South Coast to the west of an imaginary line mentioned in said Article 74 from Batabano, in a westerly direction to Cape San Antonio.

The above actions were published as resolutions in the Official Gazette, No.42 of March 1, 1957 (U. S. Embassy in Habana dispatch, March 14, 1957).

Denmark

FILLET GRADING MACHINE DEVELOPED: New Danish automatic grading machines for fillets have been installed by British filleting firms at Hull, Fleetwood, and Grimsby. The model installed at Grimsby can grade 5,000-6,000 fillets an hour in 12 size grades.

Fillets are simply fed by one worker into the revolving turntable by hand, and each fillet is automatically graded and falls out into its appropriate container (The Fishing News, January 4, 1957).

The machine consists of 18 balanced sections, radially mounted on a powerful turning machine. A $\frac{3}{4}$ hp. electric motor of 1,400 r.p.m. operates the turning machine, and all moving parts are specially made for operation in damp atmospheres and protection against rusting.

Danish fillet grading machine. Diameter--6.2 feet; height--3.6 feet.

Balance sections consist of parallelogram balances mounted on oil-bath steering boxes. The frictionless bearings are of fine steel designed to "swim" for per-

fect adjustment. On one side of the balance is a tubular bowl which can be opened at the bottom. Ten weights are mounted on a plate on the other side and these decide the different weight intervals. They are released from the plate by means of organs, mounted on a shaft through the steering box. In the end of the shaft, under the bowl, a pawl wheel is mounted, and in the other end the above mentioned gear wheel.

The machine is used as follows: As the bowls are turned by the machine and pass underneath the machine, the shaft in the steering box will also turn round, and every time a bowl passes a pail, a weight will be released from the plate, and as soon as so many weights have been released from the plate (the bowl and its unit are only $\frac{1}{2}$ gram heavier), the bowl will bob down. As soon as the bowl has moved 1 mm., the pawl wheel will open the bottom of the bowl, and the fillet will slide down into the pail corresponding to its weight.

Ecuador

FOREIGN SHRIMP VESSELS EXCLUDED: An executive decree has been issued which prohibits shrimp fishing in Ecuadoran waters by foreign fishing vessels and vessels not built in Ecuador. National companies which now hire foreign flag shrimp vessels under Government permits may continue to use them provided the boats are nationalized when the permits expire.

Foreign shrimp vessels were already excluded from Ecuadoran continental waters unless contracted by national companies, and even in such case, the law already contemplated their ultimate nationalization. For some time shrimp vessels of good quality have been built in Ecuador. At least one United States-owned national company contracts exclusively for locally-built vessels.

A national fishing company owned by United States interests will be allowed to operate again provided it installs a freezing plant within 180 days and other installations within one year, according to a decree issued December 31, 1956.

The company's permit was withdrawn several months ago and a fine imposed for failure to set up an industrial establishment as provided in its contract, the United States Embassy pointed out in a dispatch (February 15).

Iceland

FROZEN FISH INDUSTRY: At the end of 1955 there were some 79 quick-freezing plants in operation in Iceland, either wholly or in part engaged in the preparation of frozen fish. In addition, two trawlers are fitted with small quick-freezing plants, each with a capacity of 2 tons of fish fillets in 24 hours. (Note: Another report recently received listed 81 shore plants and 4 freezer-equipped trawlers.) The maximum total capacity of all Icelandic freezing plants under ideal conditions is reckoned to be 1,100 metric tons of fish fillets in a working day of 16 hours. The storage capacity of these plants is close to 40,000 tons. It should be noted that included in this figure is storage room for 8,000 tons of frozen herring used as bait.

The total annual production of frozen fish fillets during the last two years has exceeded 50,000 tons. Until 1950 the largest part of the production consisted of cod fillets. In the same year the plants began to prepare and freeze ocean perch fillets, and since then this aspect of the operation has been steadily increasing.

In 1955 cod fillets made up 52 percent, ocean perch fillets 38 percent, and other types of fish 10 percent of total production.

The first freezing plants to be constructed in Iceland were in many respects primitive, and the same might be said of plants built during World War II, since at that time many essential materials were unobtainable. As a result it has proved necessary to rebuild many of the plants during the last few years; this extensive rebuilding program may be considered to be near completion. At the same time as the plant facilities were being renewed, the organization of production methods has been changed drastically and the mechanization of the operation has increased to a high degree. Machines for scaling and washing the fish are now to be found in almost every quick-freezing plant, and the same is true of conveyor belts for moving fish, fillets, and offal. In some cases the offal is moved by running water, but this is not a common arrangement. The work of filleting is still done by hand. Filleting machines manufactured abroad have been tried, but as of the end of 1955 no machines yet tested had given sufficiently good results. During the first part of 1956, a Danish and a German filleting machine were tested, but the results of these tests are not yet available. It looks, however, as if one of these machines will give satisfactory results. (Note: Large orders are now being filled in Germany for filleting machines.) Due to rising wages and shortages of qualified manpower, it has long been necessary to find means of mechanizing the filleting operation. At the same time it is obvious that the requirements for performance of filleting machines are much higher in this country than in most others due to the great variety of the raw material and the relatively fast tempo of the filleting and packing operation.

For some time skinning machines have been in operation in all of the larger freezing plants. Packing and weighing, on the other hand, is still an operation performed largely by hand.

In the quick-freezing of fish fillets, the most common practice now is to use ammonia piped directly into the freezing plates. Most of the frozen herring is frozen in plate freezers, both in the case of herring used for bait and frozen herring for export. A certain quantity of herring is put into trays and frozen in special chambers. The freezing of herring for bait by saturation or wet-freezing is unknown in this country, since experience has shown that bait herring treated in this fashion is not as good as dry-frozen herring.

In the older quick-freezing plants the storage rooms and their insulation were built to provide a storage temperature of -20° C. (-4° F.). Now all new storage rooms are constructed to provide storage temperature of -28° C. (-18.4° F.). Regulations of the Icelandic Fisheries Inspection still only require a maximum storage temperature of -20° C. (4° F.), and there are no provisions for the degree of temperature based upon the length of time for storage, which as a rule cannot be determined beforehand.

Until recently most of the fish received by the quick-freezing plants was caught by drifters going out for a day and night at a time, consequently the fish was usually handled by the plant a few hours after capture. As a result of the ban against the landing of Icelandic fish in Great Britain, the trawlers began in 1952 to bring their iced fish ashore in Iceland to an ever-increasing degree, for further handling ashore. The cod is cured as stockfish, while the ocean perch, which makes up the largest part of the catch in the summer and fall, is brought to the freezing plants, where it is filleted and frozen.

Since the freezing plants began to receive iced ocean perch in large quantities, the difficulties involved in preserving the quality of the raw material have increased. The attempt is made to overcome these added difficulties by strengthening the inspection and control of the quick-freezing process, both on the part of the official Fisheries Inspection and on the part of inspectors employed by the Freezing Plants Association.

As a part of the technical development which in the last number of years has been taking place within the quick-freezing industry, many of the freezing plants have installed self-regulating machines for the manufacture of ice. In most instances these machines have a capacity of 5 to 15 tons in 24 hours. Most common are machines manufacturing flake ice while machines turning out ice cubes are also known. Machinery for producing ice blocks has now been in operation for a number of years, and it seems that self-regulating machines will soon be exclusively in use. Recently the manufacture of machines for making flake ice was begun in this country.

In close connection with the manufacture of ice, experiments have been made with the use of a number of chemical preservative agents, which are mixed with the water before it is frozen, for the purpose of preserving the fish longer. Among the chemical agents which have been tried here is a German product named "Foromycin " and another American product. "Foromycin" is an aldehide solution, while the American product is a trade name for "Chlorteracycline," which is a chemical agent used for preservation of foodstuffs. The final results of these experiments are not yet available. It can still be safely said that the use of these chemical agents is likely to increase the time that iced fish can be kept in good condition, even though the preservative qualities of these chemicals under normal Icelandic conditions have not proved to be as great as one might expect from experiments in other countries. (Excerpt from a report by Thordur Thorbjarnarson, Director of the Experimental Laboratories of the Icelandic Fisheries Association, to a technical convention in Denmark and transmitted to the United States by the United States Embassy in Reykjavik, October 30, 1956).

Israel

RED SEA FISHERY PROSPECTS EXPLORED: Future prospects for the exploitation by Israel of the Red Sea fisheries are in the balance now that the United Nations are in control of the Gaza Strip. Plans for a fishery and a trade route in the the warm Gulf of Aqaba and on into the Red Sea are important to the future economy of Israel.

The plan is to develop a tuna fishery based at Eilat, an Israeli port at the north end of the Gulf off Aqaba directly connected with the Red Sea. An Italian fisheries report has been engaged and negotiations are in progress for a Japanese tuna-fishing experimental trip in the area.

In 1943 the British biologist Bertram made an extensive collection in the Gulf of Aqaba and in 1946 Haas, now professor of zoology at Jerusalem, made economic studies for Spinneys, the Palestine food distributors, who held a British Mandate concession to exploit the fishery.

Since then, the Israeli fishery scientists have made considerable study of the fish from Eilat. H. Stemitz, of Jerusalem University, and A. Ben-Tuya, of the Haifa Sea Fisheries' Research Station, have listed 183 species of fish from records made by various workers in the Gulf.

The Gulf of Aqaba list includes barracuda, garfish, sea eels, halfbeaks, one grey, and two red mullets, snappers, grunts, four scaly-finned butterfly fish, ten kinds of wrasse, four blennies, a parrotfish, a sand eel, a suckerfish, puffers, and globefish. Shoals of bonito (Katsuwonus pelamis) and lesser bonito, and some albacore (Neothunnus albacora) are potential food.

Like the rest of the Red Sea, the Gulf of Aqaba has hammerhead sharks and sting rays, but not electric and eagle rays. It has moonfish but no sunfish; the large wolf herring but no true herrings, sardinellas, or anchovies.

It differs further from the rest of the Red Sea in the absence of flounders, soles, tarpon, gurnards, filefish, whiting, perch (Sillagos), croakers, and dolphin, so far as is at present known. Several of the fish are local varieties of typical Indian and Pacific ocean species.

The work of Steinitz and Bentuva was handicapped because they could not get access through Arab "No Man's Land"to the Bertram collection in the old Hebrew University site on Mount Scopus.

In 1954, they listed an Indian Ocean sea perch (Anyperodon leucogrammicus) for the first time and a rare frogfish (Barchatus cirrhosus), only once previously known in the Gulf. Sometimes, as in 1954, shoals of Indo-Pacific milkfish (Chanos) visit the Gulf and in February shoals of flyingfish appear there (Fishing News, March 22, 1957).

Italy

CANNED MACKEREL AND JACK MACKEREL MARKET: Official Italian figures on imports, production, and consumption of canned mackerel (Italian name "sgombro") and jack mackerel ("sordello") are not available. However, a recent dispatch (March 6, 1957) from the United States Embassy at Rome reports that Italy's main supplier of jack mackerel is South Africa, while the leading suppliers of mackerel are Holland and Germany. The price of mackerel (48 1-lb. cans a case, c.i.f.) from Holland (3,460 lire or US$5.54) and from Germany (3,600 lire or US$5.76) is higher than jack mackerel from South Africa (3,190 lire or US$5.10), which is considered inferior in consumer appeal.

No import figures are available except that 1956 imports from South Africa are estimated at 1,200-1,300 metric tons valued at 160 million lire (US$256,000), against 300 metric tons valued at 47 million lire (US$75,200) in 1955.

The canned fish available in the local trade are almost all preserved natural, except for fillets originating in Morocco and Portugal which are preserved in olive oil and from Peru in fish oil.

Imports of canned fish from the United States are subject to ministerial license. The possibility of importing mackerel and jack mackerel from the United States was studied recently by Italian importers, but both prices and import restrictions discouraged Italian companies. Mackerel and jack mackerel are included in the item "others" (canned fish not included elsewhere) of the Italian tariff No. 159a (statistic No. 409). The Italian customs duty on canned mackerel and jack mackerel is 27 percent ad valorem, but the duty on mackerel is reduced to 22 percent for General Agreement on Tariff and Trade countries.

Note: Values converted at the rate of 625 lire equal US$1.

Japan

ALBACORE BUYING FOR EXPORT SLOW DUE TO HIGH EX-VESSEL PRICES: The tuna freezers have set their frozen albacore export quotas for the second half of 1957 at 12,000 short tons, but with the ex-vessel price at 340-350 yen a kan

(US$228-235 a ton) and the Joint Sales Company's export price at US$270 a ton, the freezers are refraining from buying, so it looks as if the quota may be left unfilled.

Calculating back from the Joint Sales Company's price of US$270 would give an ex-vessel price of about 310 yen a kan (US$208 a ton). Therefore, it is said that the highest price that can profitably be paid for first-class fish for export would be about 315 yen a kan (US$212 a ton). With the ex-vessel prices running 340-369 yen a kan (US$228-242 a ton) in the Shimizu-Yaizu area and 320-330 yen a kan (US$2.15-$2.22 a ton) at Tokyo and Misaki, the freezers are not actively buying.

The present high prices are thought to be caused by aggressive buying by Japanese canners. This factor has a particularly strong effect on ex-vessel prices in the Shimizu-Yaizu area. Since it appears that the canners intend to continue buying around May, it is thought that there is little chance of the price coming down to where the freezers can buy unless there is a very large catch, points out the Nippon Suisan Shimbun (February 25, 1957).

Note: Values converted at the rate of 360 yen = US$1. 1 kan = 8.267 pounds.

* * * * *

FIRST LANDINGS OF 1957 SUMMER ALBACORE REPORTED: Recently with regard to albacore for export to the United States, there has been a strong preference for the larger fish, and Japanese canners and freezers have been waiting impatiently for the changeover from the small winter albacore, which have a great deal of "green" meat, to the large summer fish. On March 20 the first landings of summer albacore were made at Shimizu, when the No. 8 Benten Maru brought in about 8 tons of pole-and-line caught fish, weighing 31-33 pounds each from the waters around Nishinoshima in the Bonin group. The fish were snapped up by canners at the excellent price of 385-400 yen per kan (US$262-272 a metric ton). About 200 vessels from Shizuoka ports are fishing in the area, and canners are busy with preparations to switch from oranges to tuna, the Nippon Suisan Shimbun of March 27 reports.

* * * * *

EXPORTS OF FISHERY AND ALLIED PRODUCTS, 1954-56: Japan's exports of fish and fish preparations (mostly canned and frozen fish and shellfish, but excluding agar-agar, fish and marine-animal oils, pearls, etc.) to all countries reached a record high of 196,489 metric tons, valued at US$120.6 million, in 1956. This was an increase in value of 59.5 percent as compared with 1955 (see table). Of these exports, 46.8 percent were shipped to the United States.

Japanese Fish and Fish Preparations1/ Exports, 1954-56

Destination and Type of Product	Quantity			Value		
	1956	1955	1954	1956	1955	1954
	(Metric Tons)			(US$1,000)		
Exports to United States:						
Tuna, frozen	44,217	258,457	48,870	13,603	18,377	19,369
Tuna, canned	12,929	9,449	6,738	11,648	8,880	7,672
Crab meat, canned	2,374	2,137	1,120	5,233	4,560	2,486
Other fishery products, canned	16,343	10,098	9,635	14,552	8,008	7,449
All other fishery products	15,996	4,120	4,984	8,867	3,325	2,896
Total to United States	91,859	84,261	69,347	53,903	43,150	39,872
Exports to all Countries	196,489	155,106	140,747	120,630	75,628	74,242
	(Percent)					
Percentage Exported to U. S.	46.8	54.3	49.3	44.7	57.1	53.7

1/ Exclusive of fish and marine animal oils, pearls, and agar-agar.

In addition to fish and fish preparations exports, Japan shipped to the United States 12,233 metric tons (valued at US$4.6 million) of fish and marine-animal oils

in 1956 as compared with 11,409 tons (valued at US$5.2 million) in 1955 and 4,584 tons (valued at US$3.2 million) in 1954. The value of worked natural and cultured pearls exported to the United States rose from US$3.6 million in 1954 to US$5.6 million in 1955 to US$6.8 million in 1956.

Japanese agar-agar exports to all countries dropped from 815 metric tons (valued at US$3.0 million) in 1955 to 698 tons (valued at US$2.1 million) in 1956. Exports of this product in 1954 amounted to 684 tons (valued at US$2.7 million).

The value of Japanese 1956 exports of only fish and fish preparations made up 4.8 percent of the total value of all Japanese exports.

* * * * *

FISH NET INDUSTRY PREDICTS DISAPPOINTING YEAR: Fish net manufacturers and exporters in Mie Prefecture of Japan are deeply disturbed over the slackened demand for fish netting and twine domestically and their inability to meet foreign demand due to the Ministry of International Trade and Industry (MITI) quota list. In previous years the busiest months for the industry have been January and February when orders from domestic and United States fishing companies reach their peak. This year, however, the combination of controls on exports to the United States and uncertainty over the Soviet position on Japanese fishing in the northern part of the Japan Sea threatens seriously to affect the industry in the coming year, a March 11 United States dispatch from Nagoya points out.

The Japan Textile Goods Exporters Association has announced that in 1956 Japan exported $5.4 million of fish netting ($3 million of cotton netting and $2.4 million of synthetic fiber netting) of which one half was manufactured in Mie Prefecture. According to a Mie Prefectural Government survey, Mie Prefecture produced 4,584,000 pounds of fish netting in 1956 valued at $8,481,111. This represents a 30 percent increase over 1955 and amounts to 30 percent of the national total.

The major domestic buyers of fish nets are the companies engaged in salmon and trout fishing in the northern Japan Sea. These companies normally purchase approximately $6.3 million of fish netting annually, but the manufacturers fear that if a satisfactory fisheries agreement with the Soviet Union is not reached in the near future, sales to those Japanese companies concerned could drop to one half of the 1956 total.

A further source of concern is that orders from the United States for sardine nets manufactured in the MITI Nagoya District (Aichi, Mie, Gifu, Nagoya, Shizuoka prefectures) far exceed the export quota for the area. The quota on exports to the United States for the period January through April 1957 was originally divided into three subquotas: 10,000 pounds for the MITI Tokyo District, 20,000 pounds for the MITI Osaka District, and 120,000 pounds for the MITI Nagoya District. Later 65,000 pounds was transferred from the Nagoya quota to the Osaka quota to alleviate the hardship that other cotton quotas were working on that area. As of February 10, 1957, orders had already amounted to approximately 35,000 pounds of the new 55,000-pound quota for the Nagoya area. Fish net manufacturers and exporters are now predicting that unless this district's quota is increased by 35,000 pounds they will be unable to meet their orders.

* * * * *

PEARL WASTE EXPORT TO RED CHINA: The Mie Branch of the Japan-China Friendship Society has received a letter from the Shanghai Office of the Red China Export Corporation expressing interest in importing "natural pearls" from Mie Prefecture on a barter basis in exchange for camphor oil.

The Mie "natural pearl" is a small irregular pearl formed by sand absorbed by pearl oysters before the nucleus is inserted. Except for a small quantity which is used in cosmetics, these pearls are regarded as unusable waste.

A Mie prefectural assemblyman took samples of the pearls to the Red China Sample Fair held in Shanghai in December 1956. The Red China Export Corporation referred to these samples in its letter and offered to make an initial purchase of ¥100 million($277,778). Such pearls are used in China as raw material for an "antifebrile" (presumably a drug to reduce fever), states a March 11 United States consular dispatch from Nagoya.

The Mie Prefectural Government is gathering information on the market for camphor oil in Japan and preparing a report on the natural pearl production capacity of Mie pearl farms.

Malaya

CANNED MACKEREL MARKET: There is no domestic production of canned mackerel in Malaya, and there is always a steady market for all varieties of canned fish in this territory, especially pilchards, sardines, and herring.

Statistics for canned mackerel are not available. However, it has been ascertained that imports have been negligible. The more popular sizes of cans used in Singapore are the 15-oz. tall (20 percent) and 15-oz. oval (80 percent); and in the Federation of Malaya, 15-oz. tall (80 percent) and 15-oz. oval (20 percent). All of the pack is in tomato sauce. Retail prices for canned sardines, pilchards, and herring range from 18-24 U. S. cents a can.

Canned fish of all varieties can be imported into Malaya. Although imports into Singapore are free of duty there is a duty of 25 percent ad valorem and a preferential duty of 10 percent ad valorem on imports into the Federation of Malaya.

South Africa has virtually the monopoly in this market as far as pilchards and sardines are concerned owing to: (1) preferential duty, (2) even flow of supplies throughout the year, (3) good representation, (4) good demand, and (5) competitive prices.

By conforming to the requirements of this market as regards size of can, packing, as well as very competitive price and attractive presentation, plus active promotion on the part of local distributors--not forgetting regular supplies--United States exports to this territory can be increased appreciably, states a February 15, 1957, dispatch from the United States Embassy at Singapore.

Mexico

SPINY LOBSTER EXPORT DUTY INCREASED: The export duty on fresh or refrigerated cooked Mexican spiny lobster, effective February 16, 1957 (Diario Oficial February 15, 1957), was increased 10.5 percent. The new rate is slightly over 3.28 U. S. cents per gross pound. The increase was effected by raising the official valuation from 11.00 to 12.00 pesos per gross kilogram.

The export of live spiny lobsters from Mexico has been prohibited for some time, points out a United States Embassy dispatch (February 15) from Mexico.

* * * * *

SHRIMP EXPORT DUTY INCREASED: Mexican export duties were increased about 10 percent for fresh, iced and frozen shrimp from the Gulf of Mexico and about 15 percent for shrimp from the West Coast, effective February 9, 1957 (Diario Oficial, February 8, 1957). Export duties are now about 16.35 U. S. cents a pound for fresh iced shrimp from the Gulf of Mexico and about 17.35 cents a pound for West Coast fresh iced shrimp. Frozen shrimp from the Gulf of Mexico, Salina Cruz, Oaxaca, and Santa Rosalia, Baja California, now are dutiable at about 2.34 cents a pound and those from the West Coast (other than Salina Cruz, Oaxaca, and Santa Rosalia) about 2.49 cents a pound. The increase was effected by raising the official prices, states a dispatch from the U. S. Regional Fishery Attache in Mexico.

Table 1 - Mexico's Official Prices and Export Duties for Frozen Shrimp

	Gulf of Mexico and Salina Cruz, Oaxaca, Santa Rosalia, Baja California		All Other Shipping Points	
	Peso	US$	Peso	US$
	(Per Metric Ton, Net)		(Per Metric Ton, Net)	
Official price	12,600.00	1,000.81	13,370.00	1,070.46
Specific duty	3.00	0.24	3.00	0.24
5 percent ad valorem	630.00	50.44	668.50	53.52
Subtotal	633.00	50.68	671.50	53.76
2 percent municipal	12.66	1.01	13.43	1.08
Total duty and tax	645.66	51.69	684.93	54.84

Table 2 - Mexico's Official Prices and Export Duties for Fresh Shrimp

	Gulf of Mexico		Pacific Coast	
	Peso	US$	Peso	US$
	(Per Metric Ton, Net)		(Per Metric Ton, Net)	
Official price	12,600.00	1,000.81	13,370.00	1,070.46
Specific duty	3.00	0.24	3.00	0.24
10 percent ad valorem	1,260.00	100.88	1,337.00	107.04
25 percent ad valorem	3,150.00	252.20	3,342.50	267.61
Subtotal	4,413.00	353.32	4,682.50	374.90
2 percent municipal tax	88.26	7.07	93.65	7.50
Total duty and tax	4,501.26	360.39	4,776.15	382.40

Note: Values converted at the rate of 12.49 pesos equal US$1.

Norway

COD FISHERIES TRENDS TO MID-FEBRUARY 1957: Norway's spawning cod fisheries improved as of February 9, according to Fiskets Gang (February 14, 1957), a Norwegian fishery trade periodical. Through the date indicated, 10,091 metric tons of cod were landed as against 21,665 tons for a similar period in 1956. Of this season's catch, 2,281 tons were sold for drying (unsalted), 4,732 tons for curing, and 3,077 tons for the fresh trade. In addition 340 tons of steam-refined cod-liver oil were extracted, 134 tons of cod roe were cured, and 215 tons of cod roe were canned and iced. During the week ending February 9 fishing improved in all districts, but at the Lofoten Islands the schools were thin and scattered.

* * * * *

EARNINGS FROM FISHERY PRODUCTS EXPORTS SET RECORD IN 1956: Norwegian earnings from fishery products exports reached a record of US$140 million in 1956, according to preliminary estimates (The Fishing News, January 4). These exports were also the largest on record in value. Dried fish exports were the largest since World War II and amounted to 30,000 metric tons. Exports of klipfish totaled 50,000 tons, about 10,000 tons more than in 1955. Frozen fillet exports of 16,000 tons were also up from the 14,000 tons exported in 1955. Exports of herring and herring meal were also exceptionally large.

* * * * *

FISH OIL PRODUCTION DOWN IN 1957: Preliminary estimates place the 1957 winter herring oil production in Norway at about 72,000 short tons. Herring oil output in 1956 was estimated at 115,000 short tons and meal production at 270,000 short tons. About 80 percent of the herring catch last year was processed by the meal and oil industry. In 1955 the industry produced about 80,000 short tons of herring oil and nearly 200,000 tons of herring meal.

Cold-cleared cod liver oil production in 1956 was estimated at 7,100 short tons, a sharp increase from the 4,100 tons produced in 1955, according to Foreign Crops and Markets, March 25, 1957, a publication of the U. S. Department of Commerce.

* * * * *

FISHERIES REVIEW, 1956: Fishing: Norway's fishermen landed a record-breaking catch of herring and other types of fish during 1956 that amounted to 1,960,000 metric tons. This total was 313,000 metric tons over 1955 and represented an increase of roughly 80 million kroner (US$11.2 million) in ex-vessel value. The total ex-vessel value of the landed catch amounted to 666 million kroner (US$93.2 million) versus 583 million kroner (US$81.6 million) in 1955.

The catch of winter herring in 1956 constituted a record; the cod fisheries also increased their output over 1955. By contrast, the brisling catch has been described as a failure; the catch of small herring was also disappointing.

Marketing: The year 1956 was marked by many difficulties as far as fish sales were concerned. Basically the problem stemmed from mounting costs of production in the face of a world demand that was at least leveling off with a consequent depressive effect on prices. A product of decades of hard experience, the fish marketing system in Norway today is highly regulated with the object of preventing cut-throat competition and of assuring a guaranteed minimum price to the fishermen. On the other hand, Norwegian fishery products are sold on the world market at prices determined primarily by supply and demand. The fishermen have tried to even out the ups and downs of world prices by establishing equalization funds that are built up from the profits of the good years for the purpose of making up deficits in bad years; the accumulated reserves are limited, however, and the sums paid out during 1956 on the fish catch were approaching the critical point by the end of the year. A direct consequence of this development was the stimulation of demands by fishing groups that somthing be done to reverse the trend. No generally acceptable solution has yet appeared.

Exports: Exports of Norwegian fish products increased considerably in 1956, reflecting the favorable catches in all but brisling and small herring. Exports of fish and herring, and herring livestock feeds, but excluding herring oil, rose to 991 million kroner (US$138.7 million), or by 13 percent.

Note: Also see Commercial Fisheries Review, March 1957, p. 51.

Panama

SHRIMP TO BE SHIPPED TO FLORIDA BY AIR: The largest producer and exporter of fresh and frozen shrimp in Panama has contracted for space with an operator of an international airline for shipments of frozen pink shrimp from Panama City to Miami, Fla. The firm requested guaranteed space, consisting of four planes a week, to transport 17,600 pounds of frozen shrimp per shipment for a period of approximately two months.

It is estimated that the shipping rate for shrimp from Panama to Miami is five cents a pound via air transport. The Panamanian shrimp will be trucked from Miami to Jacksonville at one cent a pound, according to a March 12 dispatch from the United States Embassy in Panama.

Peru

NEW FACTORYSHIP FOR FISH MEAL: A 2,500-ton vessel has recently been converted into a fish meal factoryship at a cost of US$100,000. The converted vessel, with a capacity of 20-30 tons of fish meal daily will operate off the Peruvian coast, using sardines and "conjinoua," states a February 26 dispatch from the United States Embassy in Lima.

Republic of the Philippines

IMPORTS OF FISH OILS, 1953-56: Included in the Philippine imports of fats and oils were small quantitites of cod-liver oil and other fish oils (see table), states a March 29, 1957, review of the Philippine fats and oils situation by the Foreign Agriculture Service of the U. S. Department of Agriculture.

Philippine Imports of Inedible Fish Oils, 1953-56

Item and Country of Origin	1956	1955	1954	1953
	(Long Tons)			
Cod-liver Oil:				
United States	9	29	19	23
Norway	5	12	80	32
Other Countries	13	7	-	2
Total	27	48	99	57
Other Fish Oils:				
United States	-	2	35	23
Other Countries	6	4	-	-
Total	6	6	35	23

Portugal

FROZEN FISH DISTRIBUTION SYSTEM ESTABLISHED: The arrival of 3,000 metric tons of frozen fish from Germany the latter part of December 1956 marks the first attempt on the part of Portuguese fish distributors to supply consumers in the interior with fish, other than dried or salted. The first delivery of 3,000 tons is part of a contract calling for a total of 20,000 tons. Imports of frozen fish are considered to be necessary until the distribution system is established, thereafter local catches are to supply the fish for freezing.

The new system of frozen fish distribution, established by a Lisbon firm, will supply frozen fish to eight districts in the interior of the country. Plans include the erection of modern refrigeration plants in 16 inland centers. The first refrigeration plant was opened in Guarda about December 20 and will serve as a pilot op-

eration for other installations. The new cold-storage warehouses will serve as centers for a network of sales outlets, states a December 20 dispatch from the United States Embassy in Lisbon.

The new distribution system should facilitate carrying out the intent of the decree-law of September 27, 1956, by diverting salted sardines from the interior markets and making them available to the canners.

Note: Also see Commercial Fisheries Review, December 1956, p. 77.

Spain

VIGO FISHERIES TRENDS, 1956: Fishing: Landings of fish at Vigo during 1956 amounted to 57,701 metric tons (127.2 million pounds) as compared with 60,700 tons (133.8 million pounds) in 1955. Catches were quite poor during the early months of the year, but picked up as the season advanced. The 1956 catch of albacore tuna was good and later in the year there were signs of small sardines returning to Spanish coastal fishing grounds.

An increase in average prices for fresh fish is one more indication of the higher cost of living. Operating expenses of the fishing fleets and distributors went up as the result of the new official wage rates. It is said that the new wage scales represent an increase of about 30 percent for the fishing industry.

Landings at Vigo during November 1956 totaled 10.9 million pounds valued at about US$963,970. The November catches were about 29 percent lower than those of the previous month and about 12 percent below the November 1955 catches. However, November 1956 was considered a fair month by the fishing industry.

Small and some medium-size sardines (3.4 million pounds) were the principal catches during November, followed by horse mackerel (Trachurus trachurus) with 1.9 million pounds. Albacore tuna catches were insignificant during November--as the season was over. One other species of commercial importance in November was the "castaneta" or dollarfish.

A number of fishing vessels operate out of small ports in the Province of Lugo, but part of the catches are landed at ports in Asturias, especially their albacore catches which amounted to 2.9 million pounds during the June to November season.

Canning: In 1956 the canneries in the Vigo area suffered from a chronic shortage of tinplate which was aggravated by the revaluation of the peseta from 357.7 to 715.0 paper pesetas per 100 gold pesetas in April. This had the effect of raising the import duty on tinplate. At the end of the year exports of canned fish were at a low level due to unfavorable exchange rates and uncertainty as to prices due to an estimated 30-percent increase in costs following wage and social security increases.

The fish canneries continue to be deeply concerned over the tinplate situation. Some of the leading canneries (about 14 in the Vigo area) make their own cans but have lithographing done outside. It is reported that the imports of tinplate amounted to 8,000 cases (approximately 1.7 million pounds) during November. However, a portion of this quantity reached other parts of Spain, but a fair share was made available to the canneries in the Vigo area. The supply of tinplate is considered inadequate by the canneries.

Olive oil for fish packing is usually scarce and often difficult to obtain. Although the official price is 18.6 U. S. cents a pound, there is an open market and the canneries usually find it necessary to pay higher prices. It is the general opinion, however, that there will be no serious shortage of olive oil and the prospects are good for an adequate supply during 1957.

For some cannery workers, there is an increase of 100 percent in wages. Women packers formerly earning around US$0.51 a day are now being paid approximately US$1.03 a day. It is believed that the price of canned fish will be increased about 20 percent in some manner as the result of the new wage scales. Domestic sales have been fair but slowed up slightly around the end of November.

Exports of canned fish also slowed up as of November, due to the price situation. The canneries now feel that the Spanish Government should allow a higher rate of exchange (presently 33,385 gold pesetas to the U. S. dollar) on exports or increase their percentage of foreign exchange (presently 20 percent) which is allowed for the payment of approved imports.

During December the canneries in the Vigo area purchased 1.9 million pounds of fresh fish at the local fish exchange as compared with 1.4 million pounds in December 1955.

December generally marks the beginning of a slow season for the canneries, due to the scarcity of suitable varieties of fresh fish during the winter months. Some canneries resort to anchovy packing, since anchovies can be purchased in brine.

The fish canneries in the Vigo area purchased 2.2 million pounds of fresh fish in November as compared with 4.9 million pounds for the previous month and 3.7 million pounds in November 1955. Most canneries were operating during November 1956, but on a reduced scale as compared with the previous month.

Small and medium-size sardines and clams were the principal species available for packing in November. However, during the latter part of November, the canneries commenced to purchase a portion of the heavy catches of horse mackerel. Fishing interests feel certain that the sardine is returning to Spanish coastal waters due to the presence of small fish in the catches. The present sardine catches range from 14-18 fish to a pound as compared with 11-13 a pound for the large sardine taken in past years.

Note: Values converted to US$ equivalent at rate of 1 peseta equals US$0.0257.

Sweden

FISHERIES LOAN FUND INCREASE REQUESTED: The Swedish Fishery Board has requested that the fund for loans to fishermen be increased from 2.6 million Swedish crowns (US$504,000) to 5.0 million crowns (US$969,000). The reason for this request is that for several years possibilities to obtain loans from the fund have been very limited. There are at present on hand applications for loans amounting to 6,302,675 crowns (US$1,221,000), which is more than double the amount that may be granted. This situation presents difficulties not only to the individual fishermen but also to the Swedish fishing industry.

The present value of the craft and gear used in the fishing industry amounts to about 175 million crowns (US$33,915,000) and in order to maintain the current value of the craft and gear, a minimum amount of 30 million crowns (US$5,814,000) a year is required.

Since fishing chiefly is carried on by persons with little surplus capital and whose position has been further weakened by reduced catches and loss of gear, difficulties have arisen which have been further aggravated by the credit restrictions.

In order to increase profits Swedish east coast fishermen are especially interested in increased credit and a considerable part of the loan applications come from this district. Another factor accounting for the large amounts requested by fishermen in the east coast area is the large loss of gear that has taken place in the southern part of this district. This gear must be replaced if fishing is to continue on the same scale in this area.

The increased request for loans has resulted in reduced loans and 20 percent of the purchase value of craft or gear is the average granted. The credit restrictions have also reduced the number of fishing boats built for west coast fishermen from 20 vessels in 1955 to only 7 in 1956.

Thailand

CANNED SARDINE MARKET: In Thailand there are no sources of the true sardines or sardinelike fish common in United States and Europe. A domestic fish, which is of the greatest importance to the Thai canned fish industry, is the "Pla-Tu" (Rastrelliger chrysozonus), a striped mackerel approximately six inches in length.

The Pla-Tu is the principal source of canned fish and is processed in each of the 12 major canneries of Thailand. These canneries also produce canned fruit, vegetables, and fish sauce for local consumption. The quality of canned Pla-Tu, although satisfactory by local standards, is considered inferior to that of imported sardine products.

In addition to commercial canneries, the Thai Army produces canned Pla-Tu for its own use, the surplus of which is sold on the local market. The surplus is estimated to be approximately 10,000 cans a year, with an annual value of 35,000 Baht (US$1,750). At present, the Thai Navy is considering the possibilities of organizing its own cannery for the production of Pla-Tu.

Although detailed figures are not available from either Thai Government sources or the canning industry, local sources estimate that the total annual production of canned Pla-Tu is approximately 3.4 million cans of the 15-oz. size. The wholesale value of this pack is approximately 14.5 million Baht (US$725,000). It is estimated also that the present production now exceeds the market demand by 20 percent. Taking the overproduction into consideration, the annual consumption of canned Pla-Tu is estimated at 60,000 cases (48 15-oz. cans a case).

The consumption of canned Pla-Tu is higher in the north and northeast of Thailand were fresh fish is scarce, and proportionately less in areas with an abundant supply of fresh fish. The largest consumers of canned Pla-Tu are in the lower and middle income groups. For reasons of taste and economy, canned fish is not considered part of the regular daily food of the Thai and Chinese.

For the canned Pla-Tu, 50 percent of the customers prefer the 15-oz. oval can, 25 percent the $7\frac{1}{2}$-oz. oval, and 25 percent the 5-oz. flat. For style of pack, 100 percent prefer Pla-Tu in tomato sauce. Retail prices for canned Pla-Tu are: 7.50 Baht (37 U. S. cents) a can for the 15-oz. oval can, 3.5 Baht (17 U. S. cents) for the $7\frac{1}{2}$-oz. oval, and 2.5 Baht (12 U. S. cents) for the 5-oz. flat.

Sardines, salmon, and tuna are the leading imported canned fishery products in Thailand. The consumption is largely limited to Western residents and the local higher income group.

Total imports of canned sardines during 1955 amounted to 46,264 pounds with a c.i.f. value of 216,974 Baht (US$10,849). Fifty percent of the consumers use the 15-oz. oval; 20 percent, the 8-oz. oval; and 30 percent, the 4½-oz. rectangular can of sardines. Sixty percent of the consumers prefer canned sardines packed in tomato sauce, and 40 percent, olive oil. The percentage of sardines consumed by the high and middle income groups is estimated at 80 and 20 percent, respectively. The retail market price for the 15-oz. oval can of sardines packed in tomato sauce is 16 Baht (80 U. S. cents a can), 8-oz. oval in natural oil, 12 Baht (60 U. S. cents); 4½-oz. rectangular in olive oil, 6 Baht (30 U. S. cents); and 4½-oz. rectangular in tomato sauce, 5.5 Baht (27 U. S. cents).

There is no import control on canned fish at present in Thailand. The import duty, however, is 50 percent ad valorem (approximately 34 U. S. cents a pound).

Imports of canned salmon in 1955 amounted to only about 200 pounds.

Imports of canned fish January-August 1956 amounted to 41,897 pounds (c.i.f. value of 367,041 Baht or US$18,352). Of these imports, 13,682 pounds (c.i.f. value 82,450 Baht or US$4,123) consisted of sardines of which 3,276 pounds (c.i.f. value 16,630 Baht or US$832) came from the United States. Canned salmon imports totaled 3,307 pounds (c.i.f. value 50,303 Baht or US$2,515) of which 3,159 pounds (c.i.f. value of 47,931 Baht or US$2,397) came from the United States. The balance of the canned fish imports amounted to 24,908 pounds (c.i.f. value of 234,288 Baht or US$11,714) of which 13,028 pounds (c.i.f. value of 134,150 Baht or US$6,708) were shipped from the United States.

Among the higher income group (including Western residents) the average annual per capita consumption of imported canned fish, mostly sardines, is approximately 3 pounds.

Among Thai and Chinese consumers the principal demand is for fresh and dried fish products. These products are abundant and available at prices within the range of the lowest income group. These factors tend to limit the consumption of domestic canned fish, which is only one-half the cost of imported canned fish. In view of the above, the general pattern of consumption is not expected to change appreciably in the near future, a February 9, 1957, dispatch from the United States Embassy at Bangkok points out.

In general, canned fish products are imported either directly by wholesalers or by general import companies. The largest supply of imported products is distributed to retailers in the general area of Bangkok, and only a small amount to other cities in the Provinces.

United Kingdom

FACTORYSHIP "FAIRTRY" PROVES SUCCESSFUL: The British stern-trawling factoryship the M/V Fairtry developed to fillet and freeze fish at sea, has landed 5,000 metric tons of fillets, 1,000 tons of fish meal, and 100 tons of cod-liver oil during 2½ years of continuous operations. The Fairtry, both as to methods of fishing with the otter-trawl and in the filleting and freezing of fish at sea, was admittedly somewhat of an experiment at the time the first trip was landed in July 1954. The tenth trip was completed in November 1956 and in the intervening 2½ years many technical and personnel problems have been overcome, according to an article in the November 23, 1956, issue of The Fishing News, a British trade publication.

The catches made by the factoryship are usually frozen and in the storage holds about six hours after capture. It is generally conceded that for eating qualities this frozen-at-sea fish is unrivaled.

At the start of the venture the Fairtry's production was very slow, even at times when fish were plentiful. To begin with it was not expected that the layout and arrangements on the fish deck and in the processing section would be even near perfect until tried out in practice, nor that the fishermen, new to the methods and gear employed in stern trawling, would avoid mistakes; and the fish workers, however skilled they might be in land-based production, were bound to find production at sea raised new and difficult problems.

Many alterations and improvements had to be made each time the ship arrived back from a fishing trip and time had to pass before the crews became thoroughly familiar with and skilled in their tasks. But slowly the fishing performance and production rate began to improve. New filleting machinery was ordered and installed in haste.

Most important of all, the turnover of personnel serving from voyage to voyage began to decrease as men found the terms and conditions of the job to their satisfaction. As the struggle to obtain good crews slackened and good men presented themselves for re-employment, voyage after voyage the morale on board improved and grew high.

The vessel holds over 600 tons of frozen fillets, 100 tons of fish meal, and 50 tons of liver oil and can remain at sea for over 80 days before requiring to refuel.

* * * * *

CANNED SARDINELIKE FISH IMPORTS: The imports of pilchards, sardines, and sild by country of origin for 1954-56 were incorrectly shown in "Table 3 - Canned Sardinelike Fish Imports into United Kingdom, 1954-56" published on page 110 of the November 1956 issue of Commercial Fisheries Review. A revised table showing the correct United Kingdom imports for all sardinelike fish follows:

Table 3 - Canned Sardinelike Fish Imports into United Kingdom, 1954-56

Product & Principal Country of Origin	January-April 1956			12 Months 1955			12 Months 1954		
	Quantity	Value		Quantity	Value		Quantity	Value	
	1,000 Lbs.	£1,000	US$1,000	1,000 Lbs.	£1,000	US$1,000	1,000 Lbs.	£1,000	US$1,000
Brisling:									
Norway	82	21	60	1,867	507	1,421	3,760	1,045	2,925
Denmark	6	1	3	23	4	10	15	3	7
Other	1	1	1	5	1	2	1	1/	1
Total	89	23	64	1,895	512	1,433	3,776	1,048	2,933
Pilchards:									
Union of South Africa	995	69	193	4,922	328	919	2,139	154	431
South-West Africa	4,961	347	973	12,460	799	2,237	5,903	374	1,046
Other	-	1/	1/	2	1/	1/	2	1/	1
Total	5,956	416	1,166	17,384	1,127	3,156	8,044	528	1,478
Sardines:									
France	53	12	34	47	11	29	227	50	140
Portugal	2,557	376	1,053	13,209	1,842	5,158	14,720	2,038	5,707
Yugoslavia	-	-	-	-	-	-	301	25	70
French Morocco	10	1	3	9	1	3	801	107	300
Other	47	6	15	99	13	36	170	21	59
Total	2,667	395	1,105	13,364	1,867	5,226	16,219	2,241	6,276
Sild:									
Norway	192	37	104	321	63	177	629	121	338
Other	-	-	1/	6	1	3	1/	1/	1/
Total	192	37	104	327	64	180	629	121	338
Grand Total	8,904	871	2,439	32,970	3,570	9,995	28,668	3,938	11,025

1/ LESS THAN 1,000 LBS., £1,000, OR US$1,000.

* * * * *

SUBSIDIES FOR FISHING INDUSTRY INCREASED: A further £879,000 (US$2,461,200) to help the fishing industry during the current year is included in supplementary estimates for the British Ministry of Agriculture and Fisheries presented to the Commons early in February. This will raise the total for the year to £5,728,770 (US$16,640,556).

The largest portion of the new allocation £660,000 (US$1,848,000) is needed for the White Fish Authority's (W.F.A.) increased grants to fishermen for vessels and engines, states the February 15 issue of The Fishing News.

Total sum available for grants goes up to £1,610,000 (US$4,508,000) but it is expected that the W.F.A. will save £300,000 (US$840,000) on loans to fishermen.

An additional £187,000 (US$523,600) is needed by the W.F.A. for loans for reorganization and development of the industry, making a total of £247,000 (US$691,600).

Higher subsidies to near- and middle-water vessels will cost a further £315,000 (US$882,000).

Scottish fisheries and the United Kingdom herring industry need a further £49,950 (US$138,600), making a total of £2,479,951 (US$6,943,863).

TASTE IMPORTANT TO ATTRACT THE CONSUMERS

Give your customers food that tastes good and advertise your products, a former Kentucky Governor told some 800 delegates to the 12th annual convention of the National Fisheries Institute April 29, 1957. The address entitled "The Bait That's Best," advised taking advantage of impulse buying and cooperating with other industries.

He pointed out that United States food consumption is increasing at a rate of more than 4 billion pounds a year. People have more money to spend for food; they are eating more and better food than ever before. "When it comes to interesting the public," he said, "it's the taste of the fish that determines the best bait, not the taste of the fisherman."

"One of the most revolutionary developments in recent years," he pointed out, "has been the phenomenal growth of the frozen food industry." "Last year 8.7 billion pounds of frozen foods were distributed in the United States. Of that quantity, 316 million pounds was fish processed in this country. An additional 260 million pounds was imported."

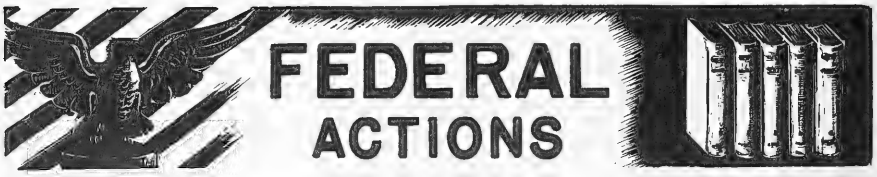
"As you angle for more of the housewife's dollar, remember you've got a convenience food in frozen fish to offer her," he said.

He emphasized that one-third of American women are employed in full-time jobs and therefore are especially interested in foods that are prepared quickly and with the minimum of labor.

"The modern woman," he said, "can throw together a 30-minute meal that looks like she spent two hours on it." But ease of preparation is not enough. "The consumer fears inferior quality and if she gets it she's through."

Impulse buying accounts for a high percent of purchases in supermarkets. A recent survey shows, for example, that 87 percent of frozen fish bought resulted from decisions made after entering the store; 73 percent of fresh fish, and 82 percent of canned fish were bought on impulse. This makes attractive packages a highly important feature of "the bait that's best" for the buying public.

--Address given at the 12th Annual Convention of the National Fisheries Institute, April 29, 1957, Chicago, Ill.



Department of the Interior

DELEGATION OF AUTHORITY TO ASSISTANT SECRETARY FOR FISH AND WILDLIFE:

The April 3 Federal Register contained the following order which delegates authority to the Assistant Secretary for Fish and Wildlife (a new position established by the Fish and Wildlife Act of 1956):

Office of the Secretary

[Order 2509, Amdt. 24]

ASSISTANT SECRETARY FOR FISH AND WILDLIFE

DELEGATION OF AUTHORITY

MARCH 27, 1957.

Order No. 2509, as amended is further amended as indicated below, to delegate authority to the Assistant Secretary for Fish and Wildlife:

1. Section 1 (17 F. R. 6793, 8634) is further amended to read as follows:

SECTION 1. *Under Secretary, Assistant Secretaries of the Interior, Administrative Assistant Secretary.* (a) The Under Secretary, the Assistant Secretaries of the Interior, and the Administrative Assistant Secretary may severally exercise all of the authority of the Secretary of the Interior with respect to any matter, except:

(1) The signing of correspondence addressed to the President;

(2) The issuance of orders delegating the authority of the Secretary;

(3) The exercise of powers delegated by the President to the Secretary without any authorization for redelegation;

(4) The issuance of regulatory documents, which are subject to codification in the Code of Federal Regulations (44 U. S. C., sec. 305; 1 CFR 1.10), other than public land orders; and

(5) The making of appointments under section 710 of the Defense Production Act of 1950, as amended (50 U. S. C. App., sec. 2160).

(b) Notwithstanding the limitation contained in subparagraph (2) of paragraph (a) of this section:

(1) The Under Secretary, the Assistant Secretaries of the Interior, and the Administrative Assistant Secretary may severally authorize officers or employees of the Department to sign on behalf of the United States contracts the provisions of which have been approved by the Under Secretary, an Assistant Secretary, or the Administrative Assistant Secretary; and

(2) The Administrative Assistant Secretary may, in writing, redelegate or authorize the redelegation of such portions of the authority of the Secretary with respect to matters in the field of administrative management, including matters relating to budget, finance, personnel (except appointments under section 710 of the Defense Production Act of 1950, as amended), management research, property management, and administrative services, as the Administrative Assistant Secretary may deem appropriate.

2. A new section, numbered 4 and reading as follows, is added:

SEC. 4. *Assistant Secretary for Fish and Wildlife.* (a) The Assistant Secretary for Fish and Wildlife may exercise all of the authority of the Secretary of the Interior with respect to any fish and wildlife matters, except

(1) The signing of correspondence addressed to the President;

(2) The issuance of orders delegating the authority of the Secretary;

(3) The exercise of powers delegated by the President to the Secretary without any authorization for redelegation;

(4) The issuance of regulatory documents, which are subject to codification in the Code of Federal Regulations (44 U. S. C., sec. 305; 1 CFR 1.10); and

(5) The making of appointments under section 710 of the Defense Production Act of 1950, as amended (50 U. S. C. App., sec. 2160).

(b) Notwithstanding the limitation contained in subparagraph (2) of paragraph (a) of this section the Assistant Secretary for Fish and Wildlife may authorize officers or employees of the Department to sign on behalf of the United States contracts or loan agreements the provisions of which have been approved by the Assistant Secretary for Fish and Wildlife.

(Sec. 2, Reorganization Plan No. 3 of 1950, 5 U. S. C., 133z-15, note; Sec. 3, Fish and Wildlife Act of 1956, 70 Stat. 1120)

HATFIELD CHILSON,
Acting Secretary of the Interior.

* * * * *

UNITED STATES FISH AND WILDLIFE SERVICE

ALASKA BARS IMPORTS OF KING SALMON EARLY IN THE YEAR:

No king salmon caught in the waters off the coasts of Washington, Oregon, California, or British Columbia could be landed in Alaska before April 15, according to a March 26 ruling of the Bureau of Commercial Fisheries of the United States Fish and Wildlife Service. Regardless of whether the catch was made in open waters beyond the territorial limits, the ruling bars the import of king salmon during the closed season in Alaska.

The only exception to the landing regulation is that of king salmon taken from those parts of the inside waters of Southeastern Alaska open to fishing before that date.

At the same time, it was also announced that the closed season on troll-caught king salmon in the outside waters was extended to April 15. Originally the season had been scheduled to open March 15.

* * * * *

BUREAU OF COMMERCIAL FISHERIES POSTS TO BE FILLED BY CAREER PERSONNEL:

Following the policy determined by Interior Secretary Fred A. Seaton, the intention to appoint career fisheries employees to the key positions of Director and Assistant Director in the Bureau of Commercial Fisheries of the reorganized United States Fish and Wildlife Service was announced on April 2 by Assistant Secretary Ross L. Leffler.

The name of Donald L. McKernan, Administrator, Alaska Commercial Fisheries, for the post of Director of the new Bureau of Commercial Fisheries has been submitted to the United States Civil Service Commission for its approval, and Andrew W. Anderson, Chief of the Branch of Commercial Fisheries, has been designated as Assistant Director. Both are career fisheries employees of the Service.

McKernan transferred to the position of Administrator of Alaska Commercial Fisheries in June 1955, after having served for $3\frac{1}{2}$ years as Assistant Director of the Fish and Wildlife Service's Pacific Oceanic Fishery Investigations in Honolulu, Hawaii. He also had extensive research and administration experience with the Washington State Department of Fisheries, where he was in charge of research on the shellfish resources of the State.

Donald L. McKernan

In 1950, McKernan spent four months in Japan as visiting fisheries expert at the request of the Department of the Army. He is a graduate of the University of Washington, and has completed more than two years of graduate work at that university.

Anderson, who was born April 25, 1901 in Dawson, Yukon Territory, Canada, joined the old Bureau of Fisheries in 1930 as a statistical and marketing agent. He is a graduate of the College of Fisheries of the University of Washington.

Andrew W. Anderson

In 1937 Anderson organized the Fishery Market News Service which, through a nationwide reporting system, keeps the fishing industry informed on production, shipments, sales, storage, and imports of fishery products. In 1943 he was named Chief of the Branch of Commercial Fisheries. He has served as fishery advisor on United States delegations to FAO conferences, as well as at the conference at Baguio which established the Indo-Pacific Fisheries Council. In June 1952 he was designated Deputy Administrator of the Defense Fisheries Administration in the Department of the Interior. Previously he had been Chief of the Office of Operations in the defense fisheries organization, and was responsible for much of that agency's functional activities.

* * * * *

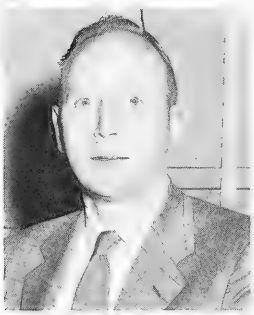
SPECIAL ASSISTANT TO COMMISSIONER NAMED:

The appointment of Robert H. Johnson, Assistant Director of the United States Fish and Wildlife Service since 1955, to the position of Special Assistant to the Commissioner of Fish and Wildlife, was announced April 2 by Assistant Secretary of the Interior Ross L. Leffler.

Johnson, before coming to the Service, was prominent in New England conservation circles and from 1948 to 1955 was Director of the Division of Fisheries and Game of the State of Massachusetts. As

Assistant Director of Fish and Wildlife Service, he was in charge of the wildlife program.

In his new post, Johnson will serve as the immediate and personal assistant to Commissioner Arnie J. Suomela in all matters pertaining to fish and wildlife. He will be vitally concerned with problems of both the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife in connection with the Commissioner's supervision and coordination of those two units which make up the United States Fish and Wildlife Service.



Robert H. Johnson

Active in the old New England Fish and Game Administrators group and its successor, the Northeastern Fish and Game Commissioner's Association, he was also a member of the International Association of Game, Fish and Conservation Commissioners and on its executive committee when he joined the Service staff.

Department of the Treasury

BUREAU OF CUSTOMS

UNITED STATES CANNED IN BRINE TUNA IMPORTS IN 1957 UNDER QUOTA PROVISO:

Because of final data furnished by the United States Fish and Wildlife Service on the United States pack of canned tuna during the calendar year 1956, a revision has been made in the quantity of tuna canned in brine which may be imported during the calendar year 1957 at the 12½-percent rate of duty. The amount has been reduced from 45,460,000 pounds to 44,528,533 pounds.

The notice announcing the revision as published in the April 2 Federal Register follows:

DEPARTMENT OF THE TREASURY

Bureau of Customs

[T. D. 54331]

TUNA FISH

REVISED TARIFF-RATE QUOTA FOR CALENDAR YEAR 1957

MARCH 27, 1957.

Treasury Decision 54299 sets forth the estimated quantity of tuna fish which may be entered for consumption or withdrawn from warehouse for consumption during the calendar year 1957 at the rate of 12½ per centum ad valorem under paragraph 718 (b), Tariff Act of 1930, as modified.

On the basis of final data furnished by the United States Fish and Wildlife Service on the United States pack of canned tuna during the calendar year 1956, it has been determined that 44,528,533 pounds of tuna may be entered, or withdrawn, for consumption during the calendar year 1957 at the rate of 12½ per centum ad valorem under paragraph 718 (b) of the tariff act, as modified. Quota-class tuna entered, or withdrawn, for consumption during the year in excess of this quantity will be dutiable at the full rate of 25 per centum ad valorem under paragraph 718 (b).

[SEAL] RALPH KELLY,
Commissioner of Customs.

Small Business Administration

GROUP LOAN TO BOSTON FISHERIES COOPERATIVE:

The details of a group loan to the Boston Fisheries Cooperative, Inc., for the benefit of the member companies in participation with a Boston bank were published in the March 23 Federal Register as follows:

SMALL BUSINESS ADMINISTRATION

Office of the Administrator

[SBA Group Loan 2]

GROUP LOAN TO BOSTON FISHERIES COOPERATIVE, INC., FOR BENEFIT OF MEMBER COMPANIES IN PARTICPATIION WITH THE FIRST NATIONAL BANK OF BOSTON

Pursuant to section 207 (a) (2) of the Small Business Act of 1953, as amended, the request of The First National Bank of Boston, Boston, Massachusetts (hereinafter called "Bank"), on an Application dated June 11, 1956, and Boston Fisheries Cooperative, Inc., Boston, Massachusetts (hereinafter called "Borrower"), on an Application dated June 8, 1956, for an immediate participation of 90 percent of a loan in the amount of $1,000,000 to be made by Bank to Borrower for the benefit

of certain members of the Borrower, was approved by the Administrator on July 18, 1956.

The Administrator has found that the operations of Borrower and its member firms in connection with said loan contribute to the needs of small business. Prior to the making of this finding, the Administrator consulted with the Attorney General and with the Chairman of the Federal Trade Commission, and the Attorney General has concurred in writing in such finding and approval.

Borrower and the member firms, namely:

O'Hara Bros.
Bay Fish Co.
Baker, Boles & Watson Co.
Bart Tribuna Co., Inc.
Blue Sea Fish Co.
Boston Fish Co.
Cassius Hunt Co.
Columbia Seafoods, Inc.
Coral Sea Fisheries Inc.
Diamond Fisheries, Inc.
Eastern Seafood Co.
F. E. Harding Co.
Hub Sea Food Corp.
John Mantia & Sons Co., Inc.
L. B. Goodspeed Inc.
New England Fillet Co., Inc.
No. Atlantic Fish Co., Inc.
Shamrock Fisheries, Inc.
Super Snooty Seafood, Inc.
Warren Fitch Co., Inc.

are hereby granted immunity from prosecution under the Federal Antitrust Laws and the Federal Trade Commission Act, insofar as they may apply to the activities of the said Borrower and the said member firms conducted pursuant to the said loan.

Dated: March 12, 1957.

WENDELL B. BARNES,
Administrator.

Note: Also see Commercial Fisheries Review, January 1957, p. 87.

Eighty-Fifth Congress (First Session)

Listed below are public bills and resolutions introduced and referred to committees or passed by the Eighty-Fifth Congress (First Session) and signed by the President that directly or indirectly affect the fisheries and allied industries. Public bills and resolutions are shown in this section when introduced and, if passed, when signed by the President; but also shown from month to month are the more pertinent reports, hearings, or chamber actions on some bills.

ALASKA STATEHOOD: H. R. 50 (Bartlett) and other House bills on this subject. Hearings were held by the House Interior and Insular Affairs Committee, March 11-29. An amendment to the bill would leave management of the Territory's fish and wildlife affairs with the U. S. Department of the Interior for five years after statehood. See Commercial Fisheries Review, February 1957, p. 62, for other bills on this subject.

ANTIDUMPING ACT OF 1921 AMENDMENT: S. 1860 (Byrd and Martin) introduced in the Senate on April 12, a bill to amend certain provisions of the Anti-Dumping Act of 1921, to provide greater certainty, speed, and efficiency in the enforcement thereof; to the Committee on Finance. This bill is a companion Senate bill to six or more other bills introduced in the House during this Session. See Commercial Fisheries Review March 1957, p. 59, and April 1957, p. 65, for other bills on this subject.

CHEMICAL ADDITIVES IN FOOD: H. R. 6747 (Harris) introduced in the House on April 9, a bill to protect the public health by amending the Federal Food, Drug, and Cosmetic Act to prohibit the use in food of chemical additives which have not been adequately tested to establish their safety; to the Committee on Interstate and Foreign Commerce. Also: introduced in the Senate on April 16, S. 1895 (Hill and Smith of New Jersey), similar to H. R. 6747; to the Senate Committee on Labor and Public Welfare. See Commercial Fisheries Review, February 1957, p. 63, for other bills on this subject.

DEPRESSED AREAS AID: H. R. 7029 (Fenton) and H. R. 7046 (Saylor) introduced in the House on April 18, bills to establish a program of financial and technical assistance designed to alleviate conditions of substantial and persistent unemployment in economically depressed areas, and for other purposes; to the Committee on Banking and Currency. Similar in purpose to S. 1433 (Martin and others) introduced February 28, also H. R. 5459 (Carrigg) and H. R. 5500 (Van Zandt) introduced on same day in the House. See Commercial Fisheries Review, March 1957, p. 59, under title Aid For Depressed Areas for these bills.

FISH AND WILDLIFE CONSERVATION TO BE EVALUATED IN FLOOD CONTROL PROJECTS: H. R. 7465 (Smith of Mississippi) introduced in the House on May 13, a bill to make the evaluation of recreational benefits and fish and wildlife conservation, resulting from any flood control, navigation, or reclamation project an integral part of project planning, and for other purposes; to the Committee on Interior and Insular Affairs. The bill provides that the evaluation of fish and wildlife benefits shall be based on standards prescribed by the Secretary of the Interior, and upon investigations made by the U. S. Fish and Wildlife Service and the state fish and game agencies.

FISHERY PRODUCTS SURPLUSES FOR EXPORT: S. 1830 (Magnuson and Jackson) introduced in the Senate on April 9, a bill to provide that certain surplus fishery products may be exported under the Agricultural Trade Development Act of 1954; to the Committee on Agriculture and Forestry. The bill provides for amendment to section 106 of the Agricultural Trade Development and Assistance Act of 1954 by inserting before the period at the end thereof the following: ", and the term 'surplus agricultural commodity' shall also be deemed to include herring oil and other fish oil, and any other fishery product, produced in Alaska or elsewhere in the United States, which the Secretary of the Interior certifies to the Secretary of Agriculture as having been determined by him to be reasonably expected to be in excess of domestic requirements, adequate carryover and anticipated exports for dollars."

FISH HATCHERIES: H. R. 6807 (Withrow) introduced in the Senate April 10, a bill to provide for the establishment of a fish hatchery in the State of Wisconsin; to the Committee on Merchant Marine and Fisheries. Also: S. 1784 (Young) introduced in the Senate April 4, a bill to provide for the establishment of a hatchery in the State of North Dakota; to the Committee on Interstate and Foreign Commerce. See Commercial Fisheries Review, February 1957, p. 64, for additional bills on fish hatcheries.

FISHING VESSEL RIGHTS ON THE HIGH SEAS: H. R. 5526 (Bonner) introduced March 4, also H. R. 5886 (Tollefson), H. R. 5888 (Wilson), H. R. 5943 (Magnuson) introduced March 12 to 13. These bills would amend the Act of August 27, 1954 (68 Stat. 863) relating to the rights of vessels of the United States on the high seas and in the territorial waters of foreign countries. Hearings were held before the House Subcommittee on Fisheries and Wildlife Conservation of the Committee on Interstate and Foreign Commerce on H. R. 5526 starting April 17. The bill was unreported as of May 15. See Commercial Fisheries Review, March 1957, p. 59, and April 1957, p. 66, for the above bills.

IMPORT QUOTAS: H. R. 6806 (Van Zandt) and H. R. 6812 (Dorn) introduced in the House on April 10, a bill to regulate the foreign commerce of the United States by establishing import quotas under specified conditions, and for other purposes; also: H. R. 7072 (Saylor) introduced in the House April 29, H. R. 7527 (Lane) introduced in the House on May 14, and H. R. 7400 (Patterson) introduced in the House on May 9; all referred to the Committee on Ways and Means. Similar in purposes to 15 or more other bills previously introduced, except for methods of establishing the import quotas. See Commercial Fisheries Review, February 1957, p. 64, March 1957, p. 59, and April 1957, p. 66, for other bills on this subject.

IMPORT RESTRICTIONS OF FOREIGN FISHERY PRODUCTS URGED BY ALASKA: The Legislature of the Territory of Alaska has forwarded to Congress a memorial requesting that immediate and appropriate steps be taken to restrict the importation of foreign-caught and processed fish, and that more stringent international regulations of pelagic fishing be promulgated; to the Committee on Interior and Insular Affairs.

NORTHWEST ATLANTIC FISHERIES COMMISSION: Protocol to the International Convention for the Northwest Atlantic, signed at Washington June 25, 1956. Passed the Senate on May 13 by unanimous vote. Provides for permission for the Commission, established by that Convention, to hold its annual meetings outside of North America, if the parties so desire. Sent to President on May 13.

SCHOOL LUNCH ACT TO BE EXTENDED: H. R. 6980 (Elliot) introduced in the House on April 17, a bill to amend the National School Lunch Act to permit junior colleges to participate therein; to the Committee on Education and Labor. Similar to H. R. 3248 (Rhodes) introduced on January 17 (Commercial Fisheries Review, February 1957, p. 65).

SMALL BUSINESS ACT AMENDMENT: H. R. 7543 (Yates) introduced in the House on May 14, a bill to amend the Small Business Act of 1953, as amended; to the Committee on Banking and Currency. Similar or related to numerous other bills previously introduced for the aid of small business. See Commercial Fisheries Review, February 1957, pp. 66 and 67, and April 1957, p. 66, for similar bills.

SMALL BUSINESS INTERNAL REVENUE AMENDMENT: H. R. 7056 (Widnal) introduced in the House on April 18, a bill to amend the Internal Revenue Code to assist small business, and for other purposes; to the Committee on Ways and Means. See Commercial Fisheries Review, April 1957, p. 66, for similar bill.

SMALL BUSINESS TAX RELIEF: H. R. 6889 (Harvey) introduced in the House on April 15, a bill to provide a minimum initial program of tax relief for small business and for persons engaged in small business; Also: H. R. 7136 (Laird) introduced in the House May 2; both bills referred to the House Committee on Ways and Means. See Commercial Fisheries Review, April 1957, p. 67, for additional bills on the subject.

SOCKEYE SALMON FISHERY ACT: H. R. 6769 (Magnuson) introduced in the House on April 9, a bill to amend the Sockeye Salmon Fishery Act of 1947; to the Committee on Merchant Marine and Fisheries. See Commercial Fisheries Review, April 1957, p. 67, for other bills on this subject. Also: S. 1806 (Magnuson and Jackson) introduced in Senate on April 4 was reported favorably, with amendments, on May 8 (S. Rept. No. 302), by the Senate Committee on Interstate and Foreign Commerce.

Senate Report No. 302, Enabling Act to Provide for the Implementation of the Pink Salmon Treaty Between United States and Canada, signed at Ottawa, Canada, December 28, 1956 (May 13, 1957, 85th. Congress, 1st Session) to accompany S. 1806), 12 pp., printed. The bill provides for an amendment to the Act making possible the preservation and management of the pink salmon under the coordinated program established for the sockeye salmon between the United States and Canada for the Fraser River system and Puget Sound Area, and provides for funds for United States participation. Presents the testimony of government and private agencies regarding the bill.

SOIL BANK ACT OF 1956 AMENDMENT: H. R. 6714 (Jones) introduced in the House April 8, a bill to amend the Soil Bank Act of March 28, 1956, in order to provide for greater utilization of the technical services and facilities of the State game and fish agencies in the administration of the conservation reserve and for other purposes; referred to the Committee on Agriculture. This bill provides for an amendment to the Soil Bank Act which instructs the Secretary of Agriculture with respect to conservation aspects under this title to consult with soil conservation districts, State foresters, State game fish agencies, land grant colleges, and other appropriate agencies of State governments, and with the United States Fish and Wildlife Service, in the formulation of programs at the State and county levels.

STATE DEPARTMENT APPROPRIATIONS: H. R. 6871 providing funds for International Fisheries Commissions passed the House on April 17 and was

sent to the Senate. The bill provides for the following amounts for fiscal year 1958:

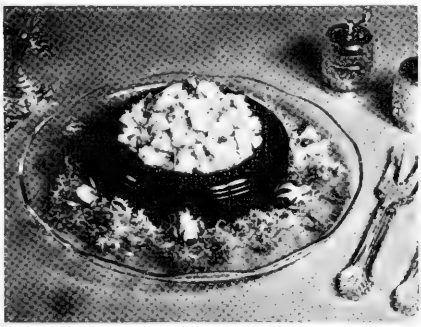
	1957 Appropriations	1958 Budget Request	1958 House Bill
	$	$	$
International Pacific Halibut Comm.	97,170	109,000	109,000
International Pacific Salmon Fisheries Commission	173,550	181,050	181,050
Inter-American Tropical Tuna Comm.	352,725	362,500	362,500
International Commission for the Northwest Atlantic Fisheries	3,885	5,030	5,030
International Whaling Commission	420	420	420
International North Pacific Fisheries Commission	12,837	15,650	15,650
Great Lakes Fishery Commission	615,000	969,100	915,100
Expenses of U. S. Commissioners	10,000	11,250	11,250
Total	1,265,587	1,654,000	1,600,000

TRADE AGREEMENTS EXTENSION ACT: H. R. 7521 (Dixon) introduced in the House on May 14, a bill to amend the Trade Agreements Extension Act of 1951 with respect to escape clause procedure, and for other purposes; to the Committee on Ways and Means. See Commercial Fisheries Review, April 1957, p. 67, for S. 1796 (Watkins). Both H. R. 7521 and S. 1796 provide that the findings of the Tariff Commission in escape clause investigations shall be final unless disapproved by a constitutional majority of either house of Congress within 60 days. The bills would eliminate the President from the escape clause procedure.

HALIBUT IS PLENTIFUL

Halibut is now plentiful because early in May the halibut season opened in the cold waters of the North Pacific Ocean, off the coasts of Washington, British Columbia, and Alaska.

Halibut, taken commercially, range in size from 5 to more than 80 pounds, with a very few as large as 400 pounds. The 5- to 10-pound sizes are referred to as "chicken halibut;" those from 10 to 60 pounds, "mediums;" those from 60 to 80 pounds, "large;" and those over 80 pounds, as "whales."



Halibut Salad Ring.

Halibut is a firm and flavorful fish with white, translucent meat. It may be prepared very successfully by any of the basic cooking methods such as frying, baking, broiling, and steaming.

Even though most of the halibut comes from the Pacific Northwest, halibut is available in all parts of the United States, mainly as frozen steaks. Chunks and fillets of halibut are other forms in which it may be purchased.

Frozen steaks or fillets may be cooked without thawing if additional cooking time is allowed.

Home economists of the United States Fish and Wildlife Service suggest that you take advantage of the abundance of halibut steaks and fillets on the market and serve "Halibut Salad Ring" to your family this summer.

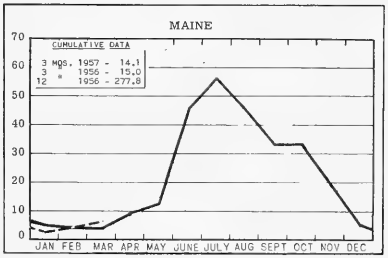
HALIBUT SALAD RING

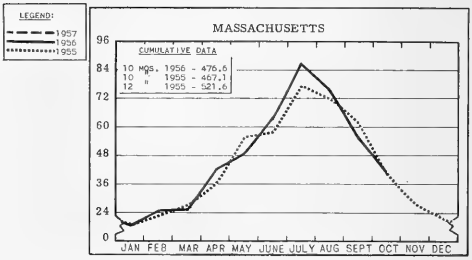
- 2 CUPS FLAKED HALIBUT
- 1 CAN (1 LB. 4 OZ.) CRUSHED PINEAPPLE
- 2 PACKAGES LIME-FLAVORED GELATIN
- 1½ CUPS BOILING WATER
- 2 CUPS PINEAPPLE JUICE AND WATER
- 1 TEASPOON SALT
- ¼ CUP LEMON JUICE
- ½ CUP SLIVERED TOASTED ALMONDS
- ⅔ CUP MAYONNAISE OR SALAD DRESSING
- 1 TEASPOON LEMON JUICE
- ¼ TEASPOON SALT
- SALAD GREENS
- RED RADISHES

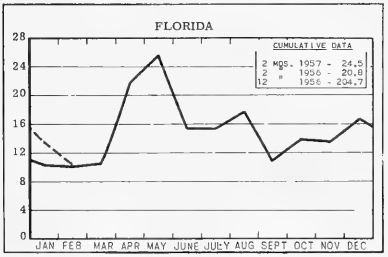
Drain pineapple and save liquid. Dissolve gelatin in boiling water. Add pineapple juice and water, lemon juice, and salt. Place in a 1-quart ring mold; chill until firm. Combine almonds, mayonnaise, lemon juice, salt, pineapple, and fish. Chill. Unmold gelatin on salad greens and fill center with fish mixture. Garnish with radishes. Serves 6.

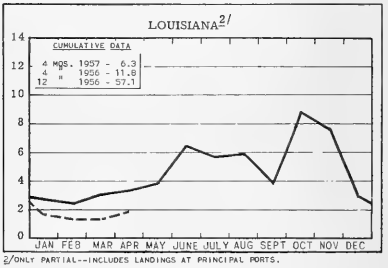
CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

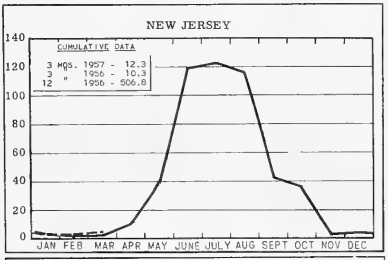


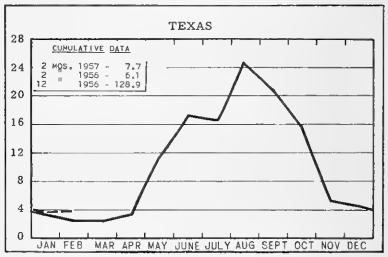


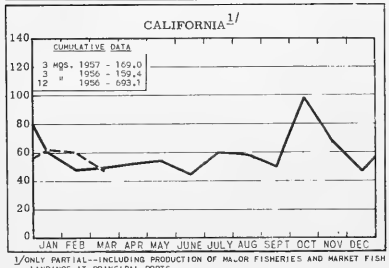




2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.







1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

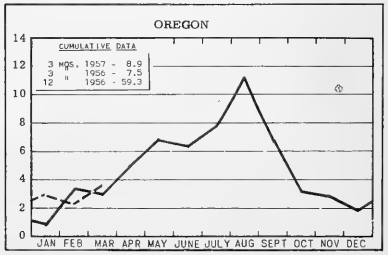
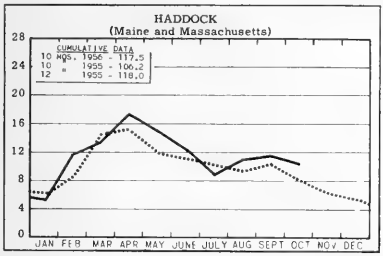
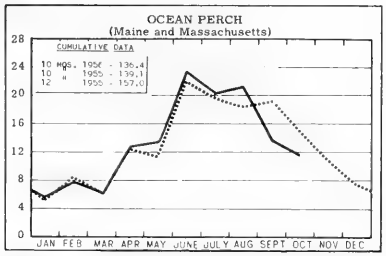


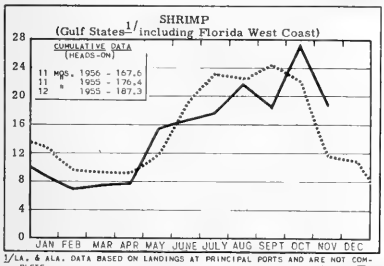
CHART 2 - LANDINGS for SELECTED FISHERIES

In Millions of Pounds

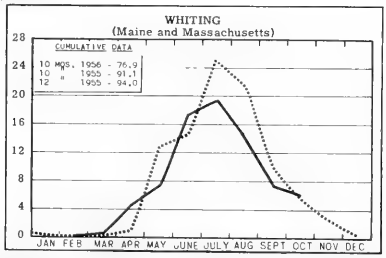




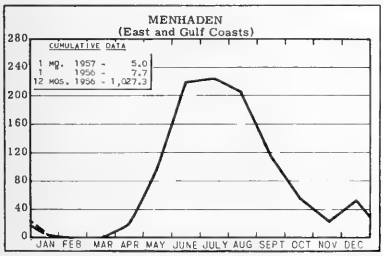
In Millions of Pounds

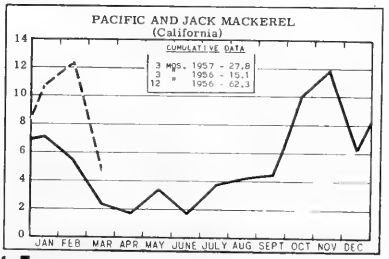


1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

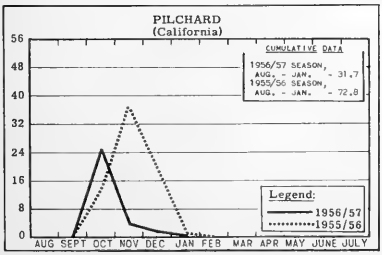


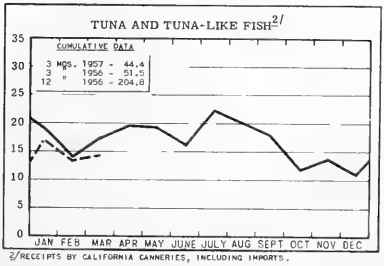
In Thousands of Tons





In Thousands of Tons

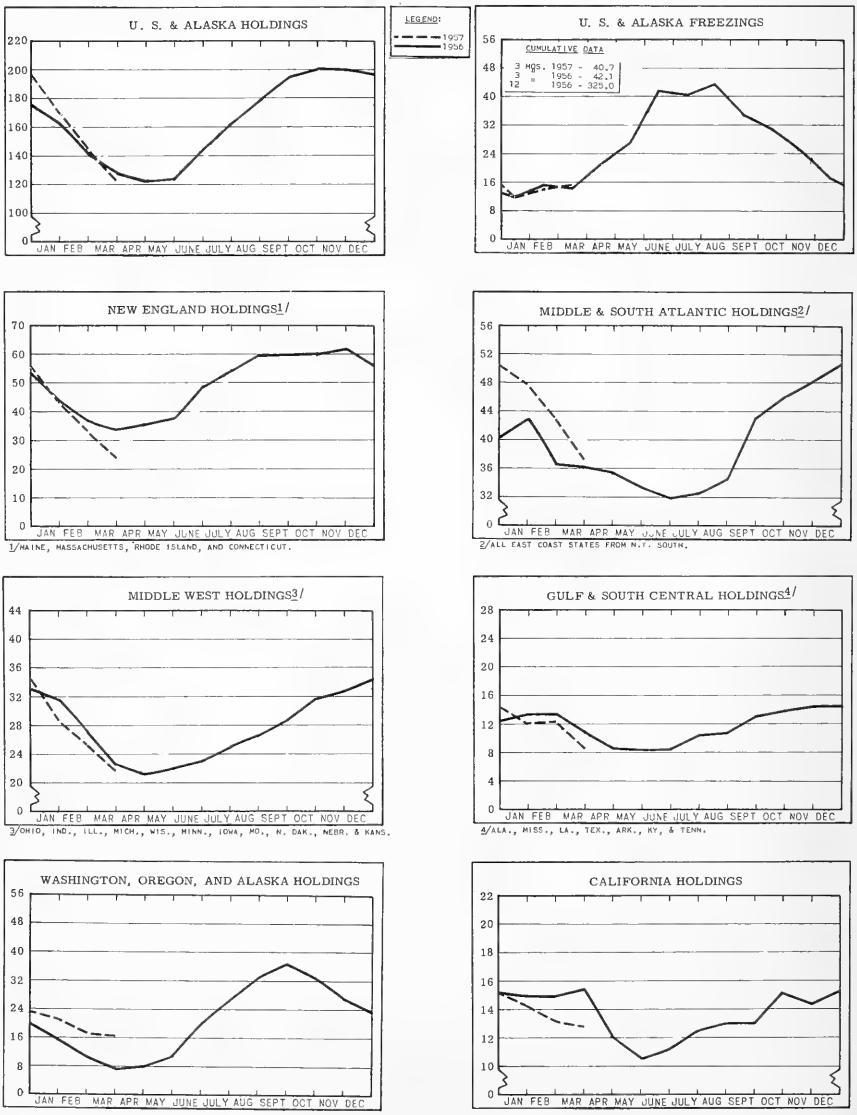




2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

In Millions of Pounds



1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.

4/ALA., MISS., LA., TEX., ARK., KY., & TENN.

*Excludes salted, cured, and smoked products.

CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pounds

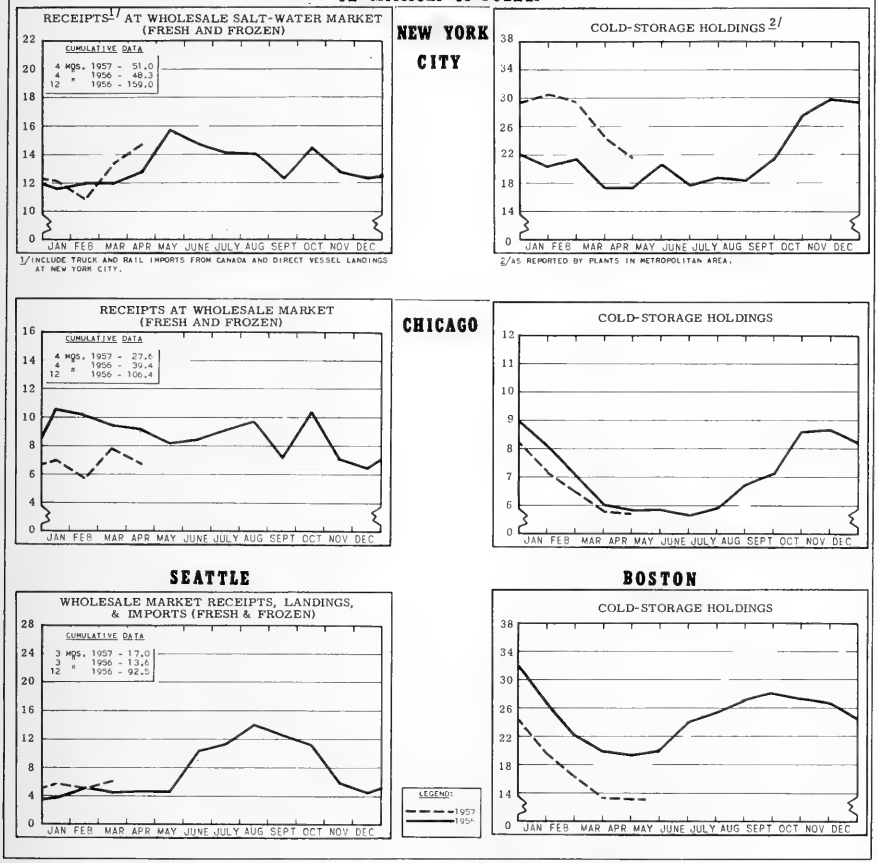


CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA

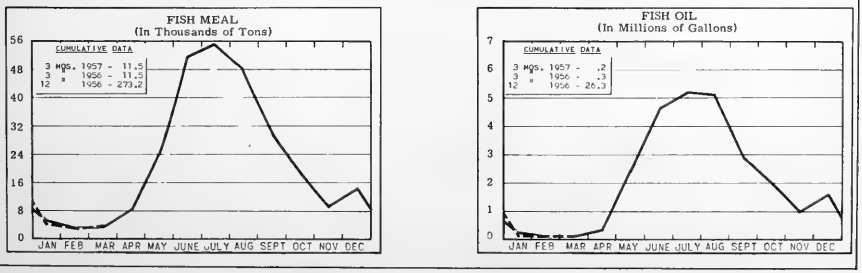
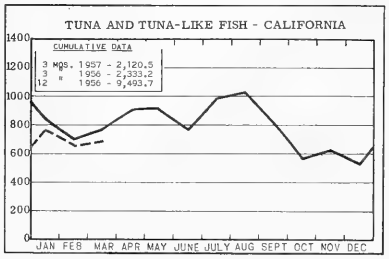
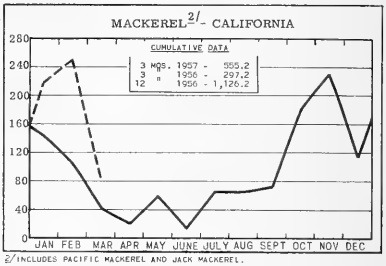


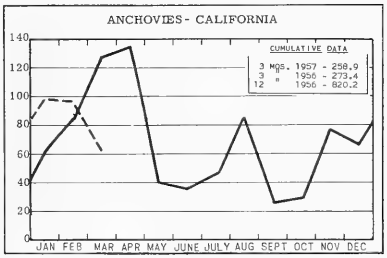
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

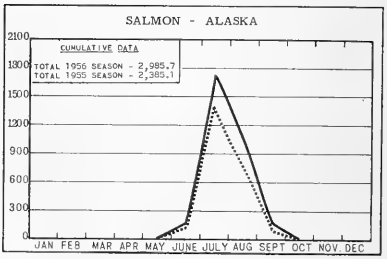
In Thousands of Standard Cases

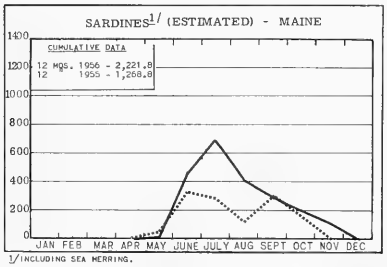




2/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



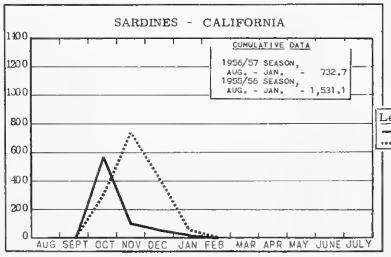


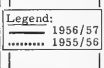


1/ INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	¼ drawn	3¼ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. ½ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	½ lb.	8 oz.





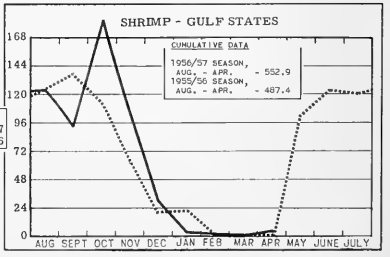
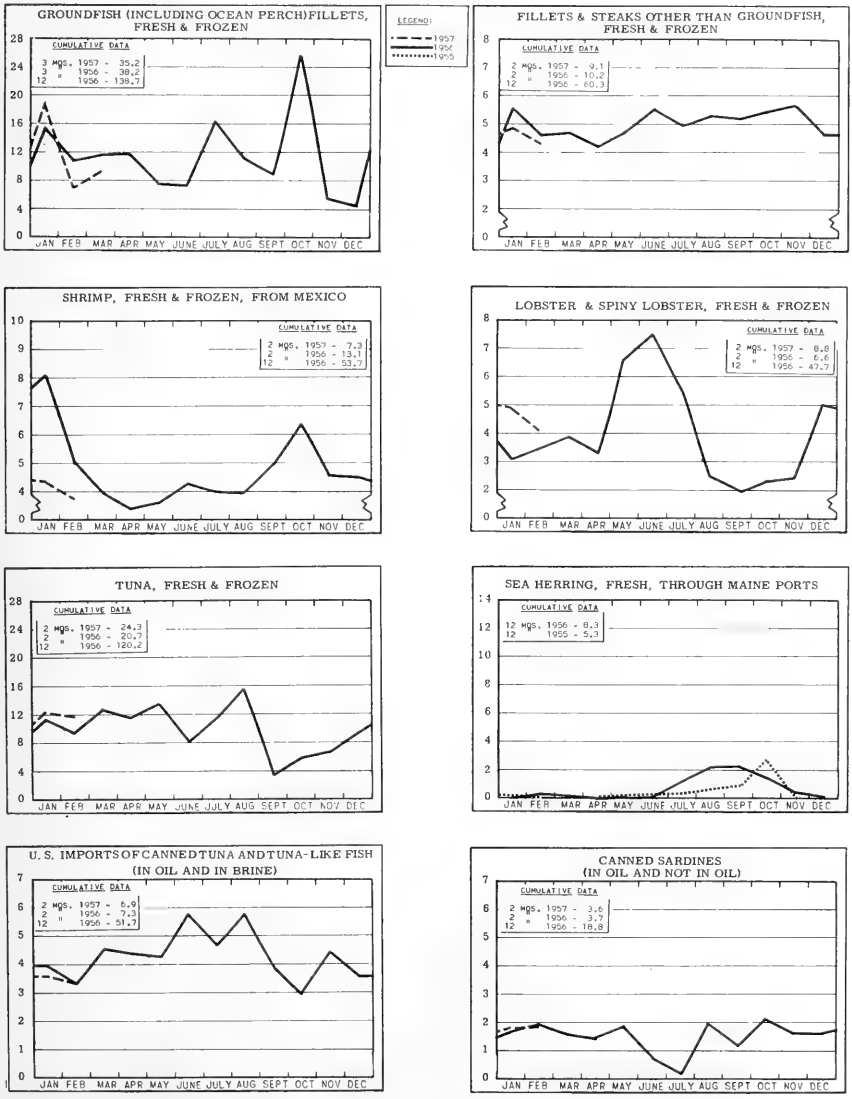


CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

In Millions of Pounds



FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U.S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STSTISTICS OF THE UNITED STATES AND ALASKA.
SSR.- FISH.-SPECIAL SCIENTIFIC REPORTS--FISHERIES (LIMITED DISTRIBUTION).
SSR.- WILDLIFE-SPECIAL SCIENTIFIC REPORTS--WILDLIFE (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1495 - Florida Landings, December 1956, 6 pp.
CFS-1496 - California Landings, October 1956, 4 pp.
CFS-1500 - North Carolina Landings, January 1957, 2 pp.
CFS-1502 - Frozen Fish Report, February 1957, 8 pp.
CFS-1504 - New Jersey Landings, January 1957, 4 pp.
CFS-1507 - Alabama Landings, December 1956, 2 pp.
CFS-1508 - Shrimp Landings, November 1956, 4 pp.
CFS-1509 - Rhode Island Landings, January 1957, 3 pp.
CFS-1511 - Maine Landings, January 1957, 3 pp.
CFS-1516 - South Carolina Landings, January 1957, 2 pp.

SSR-Fish. No. 199 - Gulf-II Semiautomatic Plankton Sampler for Inboard Use, by Albert Collier, 15 pp., illus., February 1957.

SSR-Wildlife No. 35 - Summary of Sportsmen's Expenditures, Missouri River Basin, by A. J. Nicholson, 19 pp., March 1957.

Household Consumer Preferences for Canned Fishery Products, 1956, Circular 45, 48 pp., illus. This report deals with a survey of preferences for canned fish and shellfish in United States households. It presents a graphic version of some of the more important findings of the survey. The survey on which it is based was designed to assist the commercial fishing industry in obtaining a better understanding of factors affecting consumption of canned fishery products. Such factors as consumer preferences, buying practices, and methods of distribution were studied. This is the first of two reports resulting from the survey. The second report, Special Scientific Report: Fisheries No. 200, "Canned Fish and Shellfish Preferences of Household Consumers, 1956," provides more detailed data as to the information supplied by the households analyzed nationally and regionally, as well as by city size, income classes, and by other characteristics.

Annual Report of the Director of Fish and Wildlife Service to the Secretary of the Interior, Fiscal Year Ended June 30, 1956 (Reprinted from the Annual Report of the Secretary of the Interior), 30 pp., printed. Summarizes the various activities of the Service. Specifically discussed are: assistance to the commercial fisheries (describes the activities of the Branch of Commercial Fisheries); conservation of Alaska commercial fisheries; Pribilof Islands fur-seal industry; research in fishery biology (coastal, inland, and marine fisheries); maintenance of the inland fisheries; river basin development and wildlife needs; Federal aid to states for the restoration of fish and wildlife; international cooperation in conservation (international technical cooperation and international conservation agreements); and other activities.

Sep. No. 473 - Iron Sulfide Discoloration of Tuna Cans, No. 6 - Experiments to Elucidate Mechanism of the Reaction.

Sep. No. 474 - An Experimental Air-Pressure Depth-Meter for Use with Midwater Trawls.

Sep. No. 475 - Pacific Coast Fishing Ports.

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Halibut Market Developments at Chicago, 1954-56, by G. A. Albano, 6 pp., processed. (Available free from the Market News Service, U.S. Fish and Wildlife Service, 565 W. Washington St., Chicago 6, Ill.) Observations on the importance of halibut in the fresh and frozen fishery products trade in Chicago. The author discusses marketing and its significance, International Pacific Halibut Commission and the 1957 North Pacific Halibut Regulations, distribution centers for frozen halibut, Chicago market background as a receiving and distribution center, and receipts and market supplies in relation to the Pacific halibut catch. Tables present data on fresh and frozen halibut receipts at Chicago, 1950-56; fresh and frozen halibut receipts at Chicago compared with total United States and Canadian landings, 1950-56; United States and Canadian Pacific halibut landings, freezings, and month of greatest holdings, 1950-56; and United States and Alaska halibut freezings and holdings by months, 1952-56.

Receipts of Fishery Products at New York City, 1947, by Henry M. Bearse, 14 pp., processed. (Available free from the Market News Service, U.S. Fish and Wildlife Service, 155 John St.,

New York 38, N.Y.) Contains an analysis of fishery products receipts for 1947 and marketing trends at New York City. The author discusses in the first part of this report the receipts of fresh and frozen fish and shellfish; receipts by species; vessel landings at New York; receipts by area; fresh-water market receipts; imports into the New York City Customs District; and trends in methods of transportation. The tables, in the second part of this report, present data on receipts of fish and shellfish in the salt-water section of Fulton Market by months and method of transportation, by species and method of transportation, and by states and provinces of origin.

Seattle and Astoria Landings, Receipts, and Value of Fishery Products, 1956, by Charles M. Reardon, 41 pp., processed, 1957. (Available free from the Market News Service, 421 Bell Street Terminal, Seattle 1, Wash.) The Pacific Northwest fisheries trends and their effect upon Seattle fishery products receipts for 1956 are discussed in the first part of this report. This section covers total receipts of fishery products at Seattle; sources of supply of frozen and fresh fishery products; trends in Seattle receipts of of salmon, halibut, tuna, otter-trawl and long-line landings, shellfish, herring meal, and other miscellaneous fishery products and byproducts. The tables present fishery landings and wholesale receipts (including approximate values) at Seattle for 1956 by species, source of origin, and by months; monthly index of receipts of certain fishery products at Seattle; carload shipments of fishery products from Seattle by months; and names, classifications, and approximate standards for fresh and frozen fishery products sold on the Seattle market. The Astoria section includes a discussion of fisheries trends and fishery products receipts at Astoria, Oregon, for 1956. This section covers the Columbia River gill-net fishery, troll and otter-trawl fisheries, and landings and wholesale receipts of fishery products at Astoria during 1956.

California Fishery Products Monthly Summary, February 1957, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, Post Office Bldg., San Pedro, Calif.) California cannery receipts of raw tuna and tunalike fish, herring, mackerel, anchovies, and squid; pack of canned tuna, herring, mackerel, anchovies, and squid; market fish receipts at San Pedro, Santa Monica, San Diego, and Eureka areas; California imports; canned fish and frozen fish prices; for the month indicated.

Gulf Monthly Landings, Production, and Shipments of Fishery Products, March 1957, 5 pp. (Market News Service, U.S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf States shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

Monthly Summary of Fishery Products Production in Selected Areas of Virginia, North Carolina, and Maryland, March 1957, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 18 S. King St., Hampton, Va.) Fishery production for the Virginia areas of Hampton Roads, Lower Northern Neck, and Eastern Shore; the Maryland areas of Crisfield, Ocean City, and Cambridge; and the North Carolina areas of Atlantic, Beaufort, and Morehead City; together with cumulative and comparative data; for the month indicated.

THE FOLLOWING SERVICE PUBLICATION IS FOR SALE AND IS AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D. C.

Fishery Statistics of the United States, 1954, by A.W. Anderson and E.A. Power, Statistical Digest No. 39, 387 pp., illus., printed, $1.75, 1956. This is the latest in a series of annual statistical reports on the fisheries of the United States, Alaska, and Hawaii, which contains data on the catch and ex-vessel value of fishery products, employment in the fisheries, quantity of gear operated, the number of fishing craft employed in the capture of fishery products, and certain information on the production and value of manufactured fishery products and byproducts. The statistical surveys conducted during 1955 for 1954 data covered all sections of the United States. The catch of fishery products in all sections of the United States and Alaska during 1954 totaled approximately 4.7 billion pounds valued at $355.6 million ex-vessel--an increase of 6 percent in quantity and 1 percent in value as compared with 1953. Menhaden landings continued to climb and soared above 1.7 billion pounds to establish a new record. Shrimp was again the most valuable single item taken by domestic fishermen. The catch of these shellfish totaled a record 268 million pounds valued at nearly $61 million ex-vessel. The average price-per-pound paid to fishermen for shrimp during 1954 amounted to 23 cents as compared with 29 cents in 1953. The shrimp industry in the major producing areas suffered severe problems during the year resulting from an oversupply of shrimp, sharply declining prices, and increased operating and labor costs. Several of the major foodfish recorded noteworthy gains during the year: cod (up 12 million pounds); croaker (up 24 million pounds); haddock (up 15 million pounds); halibut (up 14 million pounds); Pacific mackerel (up 18 million pounds); Atlantic ocean perch (up 28 million pounds); Pacific sardines (up 127 million pounds); salmon (up 12 million pounds); and Pacific tuna (up 20 million pounds). Despite a gain, the 1954 catch of cod was, with the exception of the low 1953 catch, the smallest for any year for which records are available. Ocean perch, which for the past 20 years has supported one of the major segments of the New England fishing industry, rallied noticeably during 1954 with a yield of 181 million pounds. To maintain the landings of ocean perch it has been necessary for the fleet to fish farther and farther to the eastward and in recent years there has been a greater percentage of the catch of ocean perch coming from the Gulf of St. Lawrence and off Newfoundland. The 137-million-pound Pacific sardine catch during the year was heartening to both packers and conservationists alike. The total Pacific Coast catch of salmon amounted to 325 million pounds as compared with 313 million pounds in 1953. The production of chum salmon in Alaska was the largest in many years and there was a spectacular increase in the run of sockeye salmon in Puget Sound waters en route to the

rehabilitated Fraser River. The pack of canned fishery products in the United States, Alaska, Hawaii, Puerto Rico, and American Samoa in 1954 amounted to nearly 863 million pounds valued at $331 million to the packers. Increased packs of tuna, Maine and Pacific sardines, salmon, and fish packed for pet food were responsible for the gain in pack. The fish stick industry continued to expand during 1954 with a production of 50 million pounds reported for the year. In 1953, the total production amounted to 7.5 million pounds. The 1954 output averaged over 4 million pounds of sticks a month. Toward the end of the year, output was accelerated and in the last quarter, the manufacture of sticks averaged over 5 million pounds a month. The sticks were manufactured from both imported and domestic fish with a majority of the production coming from imported cod. Fishery statistics of the United States and Alaska are compiled and published annually to make available information on both the economic and biological aspects of the domestic commercial fisheries. Data on the economic aspects are necessary to persons engaged in the commercial fishery and to governmental agencies concerned with its regulation and protection. From the biological standpoint these data are important to sound fishery management in providing detailed information on fluctuations in the commercial catch by species, locality, and gear, and type of craft operated. They assist conservation agencies in regulating the commercial fisheries so as to produce maximum yields without depletion.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

AFRICA:

A Revision of the Lake Victoria HAPLOCHROMIS Species (Pisces, Cichlidae), Part I: H. OBLIQUIDENS Hilgend., H. NIGRICANS (Blgr.), H. NUCHISQUAMULATUS (Hilgend) and H. LIVIDUS Sp. N., by P. H. Greenwood, 22 pp., illus., printed. (Reprinted from Bulletin of the British Museum--Natural History--Zoology, vol. 4, no. 5, London, 1956.) East African Fisheries Research Organization, Jinja, Uganda.

ALGAE:

"Connective Tissue Growth Stimulated by Carrageenin--2. The Metabolism of Sulphated Polysaccharides," by H.G.B. Slack, article, The Biochemical Journal, vol. 65, no. 3, March 1957, pp. 459-464, illus., printed. Cambridge University Press, American Branch, 32 East 57th St., New York 22, N. Y.

BRITISH GUIANA:

Report on British Guiana for the Year 1955, 234 pp. and map, illus., printed. B.G. Lithographic Co., Ltd., Georgetown, British Guiana. A useful source of ready reference material on economic and social activities of the British Guiana government. The section on fisheries describes the principal fishing areas and fishing methods and efforts to improve production. Statistics are given also on the quantity and value of the catch of fishery products during 1955.

COD:

"New Cod Grounds for Longliners," article, Trade News, vol. 9, no. 8, February 1957, pp. 3-8, illus., printed. Department of Fisheries, Ottawa, Canada. (Readers wishing to obtain Bulletin No. 109 of the Fisheries Research Board of Canada from which the information in this article is extracted should address their requests to The Queen's Printer, Ottawa, Canada. For each copy desired a remittance of 50 Canadian cents made payable to the Receiver General of Canada should be enclosed.) Deals with long-lining experiments carried out in the Bonavista, Newfoundland, area during the years 1950-1953 and the discovery of new fishing grounds. Some excellent cod-fishing grounds were found in the deep water to the eastward of the underwater projection of the Bonavista Peninsula, 18 to 20 nautical miles offshore, in about 130 to 160 fathoms. To determine the potential of the newly discovered fishing grounds, the 1951 long-lining experiments off Bonavista were planned along commercial lines. Results of these and other experiments are discussed. The discovery of these new fishing grounds has opened up for exploitation a great population of abundant large cod. These large deep-water fish are much better raw material than are the smaller fish for salt-fish operations, for smoking, and for some fresh fish purposes.

COMMISSIONS:

Gulf States Marine Fisheries Commission Seventh Annual Report, 1955-56 (to the Congress of the United States and to the Governors and Legislators of Alabama, Florida, Louisiana, Mississippi, and Texas), 37 pp., illus., printed. Gulf States Marine Fisheries Commission, 312 Audubon Bldg., New Orleans 16, La. Contains the Commission's activities for the period October 1955-October 1956, with a summary of some of the points of general interest in the compact between the States of Alabama, Florida, Louisiana, Mississippi, and Texas. It is the purpose of the compact to promote the better utilization of the fisheries, marine, shell and anadromous, of the seaboard of the Gulf coast states, by the development of a joint program for the promotion and protection of such fisheries and the prevention of the physical waste of the fisheries from any cause. This report briefly enumerates some of the activities and presents in summary the accomplishments of those agencies with which the organization is directly associated. Also included are short discussions of the U.S. Fish and Wildlife Service activities in technological and biological research and exploratory fishing in the Gulf area. A financial report of the Commission is included.

(International Commission for the Northwest Atlantic Fisheries) Statistical Bulletin for the Year 1955, 52 pp., illus., printed. International Commission for the Northwest Atlantic Fisheries, N.S., Canada, 1957. This bulletin is divided into two parts as follows: Part 1 summarizes the statistics on landings of the past four years, and Part 2 gives the tables of statistics dealing with the fisheries in the Convention Area in 1955. Following the recommendation of the

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Standing Committee on Research and Statistics, the presentation of the basic statistical data has been revised to place greater emphasis on area and month of fishing. It includes all the basic statistics for 1955 on fishing effort and on the landings of cod, haddock, redfish, halibut, the flounder group, and the other groundfish group that were reported according to the Commission's statistical requirements. Previously these basic statistics were tabulated separately for each country. Now they have been combined in one international table. However, a summary of the national statistics is given, including certain supplementary information which was reported by the member countries.

COMPOSITION:
"Tabellen der Chemischen Zusammensetzung von Fischen--I. Vitamine," (Tables of the Chemical Composition of Fish--I. Vitamins) by J. Kuhnau, article, Arch. Fischereiwiss., vol. 7, no. 1, 1956, 28 pp., printed in German. Archiv fur Fischereiwissenschaft, Gustav Wenzel & Sohn, H. Heenemann KG, Berlin-Wilmersdorf Braunschweig, Germany.

CORMORANTS:
"Fishing with Cormorants," by Robert Bruce White, article, Nature Magazine, vol. 49, no. 10, December 1956, pp. 525-527, 547, illus., printed, single copy 60 cents. A brief description of fishing with cormorants by the Chinese and Japanese. In recent years fishing with cormorants has become a tourist attraction.

CRAB MEAT:
"A Rapid Method for Determining Shell in Crab Meat under Ordinary Light," by M. Oakley and A. W. Breidenbach, article, Journal of the Association of Official Agricultural Chemists, vol. 39, 1956, pp. 531-532, printed. Association of Official Agricultural Chemists, Inc., Box 540, Benjamin Franklin Station, Washington, D. C. The incidence of shell in 1-pound samples of retail crab meat was observed; the amount of shell varied from 0 to 350 pieces a pound. A method is described for staining the shell fragments so that they may be removed and counted quickly.

CRAWFISH:
"Crawfishing Time," by William M. Hall, article, Nature Magazine, vol. 50, no. 3, March 1957, pp. 124-126, illus., printed, single copy 60 cents. American Nature Association, 1214-16th St. NW, Washington 6, D. C. Describes briefly the life history and habits of the crawfish, as it is known in Louisiana. The crawfish, a lobster-like crustacean, is a fresh-water inhabitant living mostly in shallow streams and lowlands. Crawfishing is a popular sport in Louisiana and an important commercial item.

DEHYDRATION:
"Fish Dehydration--A Warm Air Process," article, Food Manufacture, vol. 31, August 1956, pp. 326-329, illus., printed. Leonard Hill Ltd., Stratford House, 9 Eden, London N.W.1, England.

DELAWARE:
Annual Report of the Delaware Commission of Shell Fisheries of the State of Delaware for the Fiscal Year July 1, 1955 to June 30, 1956, 6 pp., processed. The Delaware Commission of Shell Fisheries, Dover, Del., 1956.

EAST AFRICA:
Preliminary Survey of the Pelagic Fishes of East Africa, by F. Williams, Colonial Office Fishery Publications No. 8, 70 pp., illus., printed, 15s. 6d. (US$2.16). Her Majesty's Stationery Office, London, England, 1956.

FOOD AND AGRICULTURE ORGANIZATION:
Argentina: Decree No. 7,967 amending Article 91 of the Food Regulations, Food and Agricultural Legislation, vol. 5, no. 3, XVII.2/56.1, 2 pp., printed. Food and Agriculture Organization of the United Nations, Rome, Italy. (For sale by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.) An amendment permitting the sale of raw fish in fillets or pieces providing that the fish has been kept chilled and is prepared under official inspection.

Canada: Fishing Vessel Indemnity Regulations under the Appropriation Act No. 5 of 1955 and Appropriation Act No. 6 of 1956 (SOR/56-304--Order in Council 1956-1291), Food and Agricultural Legislation, vol. 5, no. 3, XVIII.3/56.1, 9 pp., printed. Food and Agriculture Organization of the United Nations, Rome, Italy. (For sale by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.)

Union of South Africa (South-West Africa): Food, Drugs and Disinfectants Regulations made under the Food, Drugs and Disinfectants Ordinance No. 36 of 1952, Food and Agricultural Legislation, vol. 5, no. 3, XI.9/56.2, 43 pp., printed. Food and Agriculture Organization of the United Nations, Rome, Italy. (For sale by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.) Includes, among others, regulations on the quality, labeling, and standards of canned fish and shellfish.

FRANCE:
Bulletin Officiel d'Information du Conseil Superieur de la Peche (Official Information Bulletin of the High Council of Fisheries), 114 pp., printed, 100 francs (29 U.S. cents). H. Sirau-deau & Compagnie, 6 place de la Visitation, Angers - C./C. Paris 4012-03. Contains the following sections: I--Activities of the High Council of Fisheries; II--Technical Section (e.g. Restocking of Pike); III--Official Documentation; IV--Judicial Section; V--Regional Section; and VI--Miscellaneous Information.

Manuel du Poissonier (A Manual for Fish Dealers), 282 pp., illus., printed, 1,000 francs (US$2.86). National Committee for the Promotion of Consumption of Fish, 11 rue Anatole de la Forge, Paris XVII^{e}, France. A compilation of articles by various qualified authors dealing with the technical and general phases of fish wholesaling and retailing. A number of colored plates illustrating different species of commercially-important edible fish are present as well as numerous tables, graphs, and photographs relating to

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

commercial fish distribution. Some of the individual subjects are: the fish dealer and his store; purchases and sales; description of 35 currently-consumed fish and how they are caught; byproducts of the fishing industry and their use; fishing ports; land transportation of fishery products; and laws and regulations connected with fish dealership.

--R. Duckworth

FREEZING:

"Freezing Fish in Alginate Jelly," by I. A. Olsen, article, Food Manufacture, vol. 30, 1955, pp. 267-270, 285, printed. Food Manufacture, Leonard Hill Ltd., 17 Stratford Pl., London, W.1, England.

"Frysning af Krebsdyr" (Freezing of Crustaceans), by E. W. Hansen, article, Kulde, vol. 9, 1955, pp. 18-20, printed in Danish. Dansk Køllteknisk Tidsskrift, Copenhagen, Denmark.

GENERAL:

Chlorophyll a in the Phytoplankton in Coastal Waters of the Eastern Gulf of Mexico, by Nelson Marshall, Contribution No. 29, 19 pp., illus., printed. (Reprinted from Sears Foundation: Journal of Marine Research, vol. 15, no. 1, October 15, 1956, pp. 14-32.) Oceanographic Institute, Florida State University, Tallahassee, Fla.

The Galathea Deep Sea Expedition, 1950-52, by Anton F. Bruun, Sv. Greve, Hakon Mielche, and Ragnar Sparck, Eds., translated from Danish by Reginal Spink, 296 pp., illus., printed, $8. The Macmillan Co., 60 Fifth Ave., New York 11, N.Y. The story of a marine-biological world expedition told by the scientists themselves, describing the wonders they found on a trip around the world to all the Seven Seas.

GULF OF MEXICO:

"Some Observations on the Behaviour of Schools of Fishes in the Gulf of Mexico and Adjacent Waters," by Stewart Springer, article, Ecology, vol. 38, no. 1, January 1957, pp. 166-171, printed. Duke University Press, Box 6697, College Station, Durham, N.C.

HERRING:

Herring Rearing--III. The Effect of Temperature and other Factors on Myotome Counts, by J.H.S. Blaxter, Scottish Home Department Marine Research No. 1, 19 pp., illus., printed, 4s. (56 U.S. cents). Her Majesty's Stationery Office, Edinburgh, Scotland, 1957.

HONG KONG:

Hong Kong Annual Departmental Report by the Registrar of Co-Operative Societies and Director of Marketing for the Financial Year 1955-56, 50 pp., illus., printed. Government Printer, Java Road, Hong Kong. This report covers the activities of the Department from April 1, 1955, to March 31, 1956. The Cooperative Division section discusses the activities of the Fish Pond Society; Fishermen's Thrift Societies; Fishermen's Thrift and Loan Societies; Fishermen's Thrift, Loan and Housing Society; and Fishermen's Credit and Marketing Society. Section III discusses credit facilities for fishermen. Among the subjects discussed in the Marketing Division section are: establishment of the Fish and Vegetable Marketing Organization, wholesale prices of fresh and salt-dried fish, quantity and value of fish marketed, education, and related subjects.

KENTUCKY:

Results of an Opening Week Creel Census and Tagging Study on Three State-Owned Lakes, by Charles C. Bowers and Mayo Martin, Fisheries Bulletin No. 20, 13 pp.; illus., processed. Department of Fish and Wildlife Resources, Frankfort, Ky., October 1956.

KOREA:

Export Directory of Korea, 1957, 110 pp., illus., printed. Ministry of Commerce and Industry, Seoul, Korea. This directory describes and illustrates all items produced in Korea which are available for export. In addition to the listing and description of export commodities, it contains a description of export procedures and policies and lists of trade associations, exporters, and manufacturers. Among the exportable commodities listed are the following fish and related items: dried abalone, agar-agar, live and fresh fish, salted fish, shark-liver oil, dried oysters, pearl essence, seasoned sea urchins, seaweed, shark fins, shells for buttons, dried shrimp, and dried trepang.

LOBSTER:

"The Lobster," by E. B. Dewberry, article, Food Manufacture, vol. 29, 1954, pp. 353-357, 391-395, printed. Food Manufacture, Leonard Hill Ltd., 17 Stratford Pl., London, W.1, England. A description of the distribution, food value, habits and life history, fishing season, and temporary storage of the live lobster. An account is also given of the lobster canning industry in Canada and South Africa, and of processing and packing operations involved.

NAVIGATION:

The Mariner's Weather Log, vol. 1, no. 1, January 1957, 20 pp., illus., processed. Weather Bureau, U.S. Department of Commerce, Washington 25, D.C. This is the first issue of The Mariner's Weather Log, a bimonthly publication providing information on weather over the oceans and the Great Lakes. This issue includes reports on meteorological and oceanographic navigation; smooth log, North Atlantic Weather, July, August, 1956; rough log, North Atlantic Weather, September-November, 1956; gale tables, and marine weather diary. It also includes the following articles: "Hurricane Frequencies," by William H. Haggard; and "North Atlantic Tropical Storms, 1956," by Howard C. Sumner.

Supplement to United States Coast Pilot 2, Atlantic Coast, Section B, Cape Cod to Sandy Hook, Fifth (April 1, 1950) Edition, Serial 736/7, 69 pp., printed, February 9, 1957; Supplement to United States Coast Pilot 3, Atlantic Coast, Sandy Hook to Cape Henry, Sixth (June 6, 1953) Edition, Serial 770/4, 42 pp., printed, February 2, 1957; and Supplement to United States Coast Pilot 4, Atlantic Coast, Section D, Cape Henry to Key West, Fifth (May 15, 1948) Edition, Serial 715/9, 99 pp., printed, February 9, 1957. Coast and Geodetic

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Survey, U. S. Department of Commerce, Washington 25, D. C.

NORTHEAST PACIFIC:
"Climatic Trends and Fluctuations in Yield of Marine Fisheries of the Northeast Pacific," by K. S. Ketchen, article, Journal of the Fisheries Research Board of Canada, vol. 13, no. 3, May 1956, pp. 357-374, illus., printed. Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B.C., Canada.

NORWAY:
Arsmelding 1955 fra Fiskeridirektoratets Kjemisk-Tekniske Forskningsinstitutt (1955 Annual Report from the Fishery Directorate of the Chemi-Technological Research Institute), no. 3, 51 pp., illus., printed in Norwegian. Kjemisk-Tekniske Forskningsinstitutt, Bergen, Norway, 1957.

OYSTER:
The Crown Conch, MELONGENA CORONA, as a Predator upon the Virginia Oyster, by Gordon Gunter and R. Winston Menzel, 4 pp., printed. (Reprinted from The Nautilus, vol. 70, no. 3, January 1957, pp. 84-87.) Gulf Coast Research Laboratory, Ocean Springs, Miss.; or Oceanographic Institute, Florida State University, Tallahassee, Fla.

POLLUTION:
Pollution Studies in Biscayne Bay during 1956, by J. Kneeland McNulty, Progress Report 57-8, 27 pp., illus., processed. The Marine Laboratory, University of Miami, Coral Gables, Fla., February 1957.

PRESERVATION:
"Badania nad Wplywem Lodu Azotynowanego na Trwalosc i Jakosc Dorsza Baltyckiego" (Studies on the Influence of Nitrite-Treated Ice on the Storage Life and Quality of Baltic Haddock), by J. Borowik, E. Fischer, S. Ostrowski, and P. Trzesinski, article, Przem. Spozyw., vol. 10, 1956, pp. 282-283, printed in Polish with summary in English. Przemysl Spozywczy (Food Industry), Czackiego 3/5, NOT, pok. 29 c, Warsaw, Poland.

"Beitrage zur Methodik der Konservierungsmittelbestimmung in Fischindustriellen Erzeugnissen. II. Uber Bestimmung, Verteilung und Verbleib von Konservierungsmitteln in Fischindustriellen Erzeugnissen" (Contribution to Methods for the Determination of Preservatives in Commercial Fish Products. II. Determination, Distribution and Retention of Preservatives in Commercial Fish Products), by R. Hutschenreuter, article, Zeitschrift fur Lebensmitteluntersuchung und -Forschung, vol. 104, 1956, pp. 161-168, printed in German. Zeitschrift fur Lebensmitteluntersuchung und -Forschung, Berlin, Germany.

"Effectiveness of Chlorotetracycline (Aureomycin) on Keeping Quality of Pacific Round Herring, Etrumeus micropus," by Tetuo Tomiyama, Shunichi Kuroki, Denki Maeda, Moriji Hamada, and Akira Honda, article, Bulletin of the Japanese Society of Scientific Fisheries, vol. 22, no. 2, 1956, pp. 120-127, printed in Japanese with summary in English. The Japanese Society of Scientific Fisheries, Tokyo, Japan.

"Effectiveness of Chlorotetracycline on Keeping Quality of Several Bottom Fish," by Tetuo Tomiyama, Yasuo Yone, Shunichi Kuroki, Minoru Nomura, Shotaro Hara, Tetu Schichizi, Toshihiro Maeda, Ichiro Oda, and Toshio Matsuo, article, Bulletin of the Japanese Society of Scientific Fisheries, vol. 22, no. 2, 1956, pp. 128-135, printed in Japanese with summary in English. The Japanese Society of Scientific Fisheries, Tokyo, Japan.

SALMON:
"Atlantic Salmon Tagged in East Coast Newfoundland Waters at Bonavista," by A.A. Blair, article, Journal of the Fisheries Research Board of Canada, vol. 13, no. 2, March 1956, illus., printed. Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B.C., Canada. Describes methods of tagging salmon and grilse and reports the proportion recaptured and the distribution and movements of recaptures.

Leaper: The Story of an Atlantic Salmon, by Robert M. McClung, 64 pp., illus., printed, $2.25. William Morrow & Co., 425 Fourth Ave., New York 16, N.Y. A story for children of the life cycle of a salmon from his hatching from a pale pink egg to his return to his birthplace to fertilize another generation of salmon eggs.

A Review of the Literature on the Biology of the Atlantic Salmon (SALMO SALAR Linn.), by K.A. Pyefinch, Freshwater and Salmon Fisheries Research Report No. 9, 24 pp., printed. Her Majesty's Stationery Office, Scottish Home Department, 13a Castle Street, Edinburgh, 2, Scotland.

"A Survey of the 1955 Scarcity," condensation of an address by Dr. C.J. Kerswill, The Atlantic Salmon Journal, no. 1, February 1956, pp. 23-24, illus., printed. The Atlantic Salmon Association, 1559 McGregor St., Montreal 25, Canada.

SEA TROUT:
"The Weakfish (Cynoscion regalis) in New York Waters," by Alfred Perlmutter, William S. Miller, and John C. Poole, article, New York Fish and Game Journal, vol. 3, no. 1, January 1956, pp. 1-43, illus., printed. New York Conservation Department, Albany 1, N.Y. Reports on a study to determine the cause of the scarcity of weakfish or gray sea trout in New York waters. The study revealed that a decrease in southern-spawned stock has caused the scarcity and that a means of increasing the stock must be found to produce an abundant supply of weakfish.

STARFISH:
"Intensity of Setting of Starfish in Long Island Sound in Relation to Fluctuations of the Stock of Adult Starfish and in the Setting of Oysters," by Martin D. Burkenroad, article, Ecology, vol. 38, no. 1, January 1957, pp. 164-165, printed. Duke University Press, Box 6697, College Station, Durham, N. C.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

TERRITORIAL WATERS:

(International Law Commission) Report of the International Law Commission on the Work of its Eighth Session: (a) Final Report on the Regime of the High Seas, the Regime of the Territorial Sea and Related Problems. Agenda item 53 (a) (XI). Australia, Brazil, Ceylon, Cuba, Denmark, Dominican Republic, France, Greece, Guatemala, Netherlands, New Zealand, Norway, Pakistan, Panama, Philippines, Portugal, Spain, Sweden, Thailand, United Kingdom, United States, and Uruguay. United Nations, International Law Commission, New York, N.Y. The following processed reports have been issued for limited distribution:

A/C.6/L.385/Rev. 1, 3 pp., December 19, 1956. Revised joint draft resolution.

A/C.6/L.389, 1 p., December 14, 1956. Ceylon, India, and Indonesia: amendment to joint draft resolution.

A/C.6/L.391, 1 p., December 17, 1956. Belgium: amendment to the joint draft resolution.

A/C.6/L.392, 1 p., December 18, 1956. Argentina, Chile, Ecuador, El Salvador, Haiti, Mexico, Paraguay, and Peru: amendments to the joint draft resolution.

A/C.6/L.393, 1 p., December 18, 1956. Afghanistan, Austria, Bolivia, Czechoslovakia, Nepal, and Paraguay: amendment to the joint draft resolution.

A/C.6/L.395, 23 pp., December 21, 1956. Statement by J.P.A. Francois, Rapporteur of the International Law Commission, at the 500th meeting of the 6th Committee.

A/C.6/L.396, 2 pp., December 19, 1956. Israel, Mexico, and Peru: amendments to the joint draft resolution.

A/C.6/L.397, 2 pp., December 19, 1956. Statement of financial implication submitted by the Secretary-General.

A/C.6/L.398, 3 pp., December 21, 1956. Text of the draft resolution adopted by the 6th Committee at its 505th meeting.

TRADE AGREEMENTS AND TARIFFS:

Operation of the Trade Agreements Program, Ninth Report, July 1955-June 1956, 390 pp., processed. United States Tariff Commission, Washington 25, D.C., 1957. During the period covered by this report, the United States and other contracting parties to the General Agreement on Tariffs and Trade met at Geneva, Switzerland, for the fourth round of multilateral tariff negotiations sponsored by the Contracting Parties. This report describes the negotiations at Geneva, and analyzes the concessions that the United States granted and obtained in those negotiations. It also discusses other important developments that occurred during 1955-56 respecting the trade agreements program. These include proposals of legislation that authorize the United States to participate in the Organization for Trade Cooperation; actions of the Contracting Parties relating to the general provisions and administration of the General Agreement; actions of the United States relating to its trade agreements program; and changes in tariffs, exchange controls, and quantitative trade restrictions that were made by countries with which the United States has trade agreements.

TRANSPORTATION:

Protecting Perishable Foods during Transportation by Truck, by Harold D. Johnson and P.L. Breakiron, Agriculture Handbook No. 105, 73 pp., illus., printed, 30 cents. U.S. Department of Agriculture, Agricultural Marketing Service, Washington, D.C., December 1956. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.) Motortruck equipment is available to provide the optimum temperature and humidity for perishable commodities during transportation. However, the requirements of different commodities vary widely, and it is necessary that the shipper or trucker know the specific needs of the commodity being transported so that he may use the right equipment in the right way. Although this handbook describes the proper care of perishable agricultural commodities during transportation by motortruck, some of the information might be of interest to those handling fishery products.

Suggested Methods for Checking Temperatures of Fresh and Frozen Food Shipments, by Robert F. Guilfoy and Harold D. Johnson, Marketing Research Report No. 150, 9 pp., illus., processed, 5 cents. U.S. Department of Agriculture, Agricultural Marketing Service, Washington, D.C. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.) Although this publication contains methods for checking temperatures of fresh and frozen agricultural food products in transit, some of the information might be of interest to those handling fishery products.

TUNA:

"Additional Observations on the Biology of the Northern Bluefin Tuna, Kishinoella tonggol (Bleeker), in Australia," by D. L. Serventy, article, Australian Journal of Marine and Freshwater Research, vol. 7, no. 1, April 1956, pp. 44-63, illus., printed. Australian Journal of Marine and Freshwater Research, Commonwealth Scientific and Industrial Research Organization, 314 Albert St., East Melbourne, C.2, Victoria, Australia.

Changes in the Size Structure of the Yellowfin Tuna Population of the Tropical Eastern Pacific Ocean from 1947 to 1955, by Gordon C. Broadhead, vol. II, no. 1, 20 pp., illus., printed in English and Spanish. Inter-American Tropical Tuna Commission, La Jolla, Calif., 1957. Both the analysis of the logbook data and the study of the hook sizes used by the fleet indicate that in recent years, coincident with the higher fishing intensities, there has been a decrease in the proportion of large yellowfin tuna and a corresponding increase in the proportion of small yellowfin tuna in the catch from the Eastern Pacific. As the baitboat fleet takes about 85 percent of the total catch of yellowfin tuna from this region, this conclusion appears warranted from the study of its catches. The general indications of changes in the average size of the yellowfin tuna landed by the commercial fishery, correlated with changes in the fishing effort during the past decade, while not entirely

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

conclusive, corroborate the strong statistical evidence that the recent levels of fishing intensity have been sufficiently high to affect the stocks of yellowfin tuna in the Eastern Tropical Pacific, and further suggest that the returns from tagging experiments are far below the true levels of exploitation of the stocks.

"Distribution, Age and Growth of Eastern Pacific Albacore (Thunnus alalunga Gmelin)," by J. M. Partlo, article, Journal of the Fisheries Research Board of Canada, vol. 12, no. 1, January 1955, pp. 35-60, illus., printed. Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B. C., Canada.

"The Fishing's Fine!" by John T. Foster, article, The Canner and Freezer, vol. 124, no. 1, January 7, 1957, pp. 13-15, illus., printed, single copy 25 cents. Canner Publishing Co., 105 W. Adams St., Chicago 3, Ill. Discusses the Gulf Coast tuna fishery and the possibility of it becoming a major new industry. The author states that "Interests in the Pascagoula-Biloxi, Miss., area foresee the time when the Gulf Coast, with its Gulf-caught yellowfin tuna, will be a serious competitor to Southern California, the citadel of the United States tuna industry. West Coast interests, of course, foresee nothing of the sort. They concede, however, that the Gulf Coast might engender a small tuna industry, and they are keeping a close watch on developments."

"The Southern Bluefin Tuna, Thunnus thynnus maccoyii (Castelnau), in Australian Waters," by D. L. Serventy, article, Australian Journal of Marine and Freshwater Research, vol. 7, no. 1, April 1956, pp. 1-43, illus., printed. Australian Journal of Marine and Freshwater Research, Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne, C.2, Victoria, Australia.

A Study of Changes in Fishing Effort, Abundance, and Yield for Yellowfin and Skipjack Tuna in the Eastern Tropical Pacific Ocean, by Bell M. Shimada and Milner B. Schaefer, Bulletin--vol. 1, no. 7, pp. 351-469, illus., printed in English and Spanish. Inter-American Tropical Tuna Commission, La Jolla, Calif., 1956. A study was undertaken to determine from the historical records of the fishery the effects of fishing upon the stocks of yellowfin and skipjack tuna of the Eastern Pacific region and to evaluate the present condition of these stocks with respect to the maximum equilibrium yield. It was concluded from the inverse relationships exhibited between changes in apparent abundance and fishing effort that the amount of fishing has had a real effect upon the stock of Eastern Pacific yellowfin tuna, taken in the aggregate, over the period studied. The evidence suggests also that for this species the intensity of fishing in some recent years has reached and might even have exceeded the level corresponding to the maximum equilibrium yield. For skipjack, no correlation was found between changes in population size with changes in fishing intensities thus far encountered, indicating that the fishery has had little, if any, apparent effect on the abundance of this species. It therefore appears that further increases in the sustainable total catch of yellowfin tuna above that already attained cannot be expected from increased fishing effort, whereas, for skipjack, it seems possible to increase the average annual catch on a sustained basis without detriment to the welfare of the resource.

UGANDA:

The Fishes of Uganda--II, by P. H. Greenwood, illus., printed. (Reprinted from The Uganda Journal, vol. 20, no. 2, September 1956, pp. 129-165.) East African Fisheries Research Organization, Jinja, Uganda.

Some Aspects of the Respiration of Six Species of Fish from Uganda, by G. R. Fish, 10 pp., illus., printed. (Reprinted from The Journal of Experimental Biology, vol. 33, no. 1, pp. 186-195, March 1956.) East African Fisheries Research Organization, Jinja, Uganda.

UNION OF SOUTH AFRICA:

The South African Pilchard (SARDINOPS OCELLATA) and Maasbanker (TRACHURUS TRACHURUS), Bird Predators, 1954-55, by D. H. Davies, Division of Fisheries Investigational Report No. 23, 40 pp., illus., printed. (Reprinted from Commerce and Industry, September 1956.) Department of Commerce and Industries, Division of Fisheries, Pretoria, Union of South Africa. Reports on the second year of investigation into the feeding habits of three important fish-eating birds of the main pelagic commercial fishing area of St. Helena Bay off the West coast of the Union of South Africa.

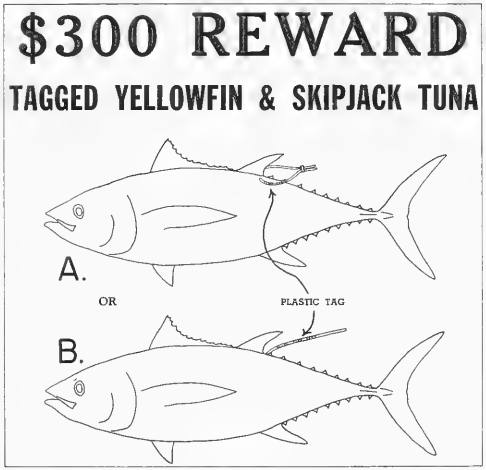
UNITED KINGDOM:

Report on Enquiry into the Costs of Distributing White Fish, 47 pp., printed. White Fish Authority, Tilbury House, Petty France, London, S.W.1, England, 1956. The main purpose of this study was to secure representative information about the costs of distributing white fish. This report explains the procedure and methods used in the study, and includes a number of tables summarizing and analyzing the sales, expenses, and margins of the 4 main groups of distributors--port wholesale merchants, inland wholesale merchants, fishmongers, and fish friers. It also gives an estimate of the aggregate value of white fish bought and sold by each of the above groups, and a synthesis of the retail selling price of cod fillets.

TAGGED YELLOWFIN AND SKIPJACK TUNA ROAMING EASTERN PACIFIC

The Inter-American Tropical Tuna Commission, with the cooperation of the tuna fleet, is releasing marked yellowfin and skipjack tuna throughout the eastern Pacific (California to Peru). The fish bear EITHER type A. or B. tag as shown below. Each tag is numbered and has the legend "Return Tuna Comm. San Diego" printed on the plastic.

To stimulate interest in the program, the Commission will pay a reward of one dollar ($1.00) for each tag returned and in addition will conduct a drawing each year and will award the sum of $300.00 in cash to the person who returned the tag number which is drawn. The tags should be returned to a staff member or mailed to the Inter-American Tropical Tuna Commission.



The tags are short pieces of plastic tubing, of different colors, which are attached to the fish immediately after the second dorsal fin. Each tag bears a serial number and the legend "Return Tuna Comm. San Diego." Only bona fide tags will be eligible for the annual drawing and the Commission reserves the right to make all identifications. In the event a tag number is marred, or otherwise damaged beyond legibility, the Commission shall, for the purpose of the drawing, substitute a different tag number not used during the year.

To be eligible for the drawing, tags must be mailed to the Commission or returned to a staff member. All senders of bona fide tags will be notified by mail that their entries are eligible.

The Commission will conduct a drawing annually at a time and place specified by the Commission. All bona fide tags returned between March 1 and December 31, 1957, will be entered in the 1957 drawing and thereafter all tags returned during a calendar year will participate in that year's drawing.

The drawing shall be held publicly, and in an impartial manner to be determined by the Commission, and $300.00 in cash, will be presented by the Commission to the person who returned the tag number drawn.

In all matters relating to the conduct and results of these drawings, the decision of the Commission shall be final. The Commission shall not be liable for any legal action concerning the drawings, and reserves the right to discontinue the same at any time.

CONTENTS (CONTINUED)

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Alma Greene, and Helen Turner

* * * * *

Photograph Credits: Page by page, the following list gives the source or photographer for each photograph in this issue. Photographs on pages not mentioned were obtained from the Service's file and the photographers are unknown.

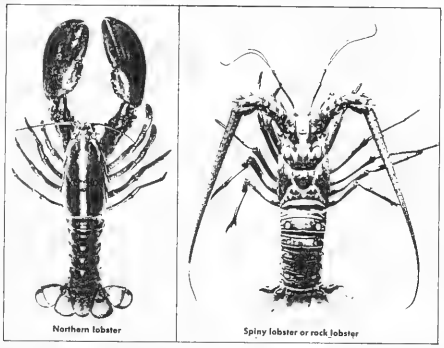
Pps. 1-8, & 17--F. Bruce Sanford; p. 67--Todd Studios, St. Louis, Mo.; pp. 69-70--Rex G. Schmidt.

LOBSTER COOKERY BOOKLET

Not only recipes for cooking lobsters but illustrations on how this shellfish should be eaten are included in a new fish-cookery publication, How to Cook Lobsters, released May 21 by the Bureau of Commercial Fisheries of the United States Fish and Wildlife Service. The booklet contains 33 choice recipes developed and kitchen-tested by the Service's staff of home economists.

Two kinds of lobsters--the large northern and the spiny or rock lobster--are familiar to most housewives in this country.

The northern lobster is particularly prized by gourmets for its sweet pink and white meat. These lobsters are found along the Atlantic Coast from Labrador to North Carolina but the bulk of the United States catch is made along the Maine coast. They usually weigh from 1 to 3 pounds when alive.


Northern lobster

Spiny lobster or rock lobster

The spiny, or rock lobster, found off Florida and southern California ranges through the tropical, subtropical, and temperate waters of the Atlantic, Pacific, and Indian Oceans.

The spiny lobster can be easily distinguished from the northern lobster by the absence of the large heavy claws that are so characteristic of the northern lobster, the presence of many prominent spines on its body and legs, and its long slender antennae. The meat of the spiny lobster comes almost entirely from the broad tail.

Modern handling and transportation methods now make it possible for people living far inland to enjoy the tender delicately-flavored meat of the lobster.

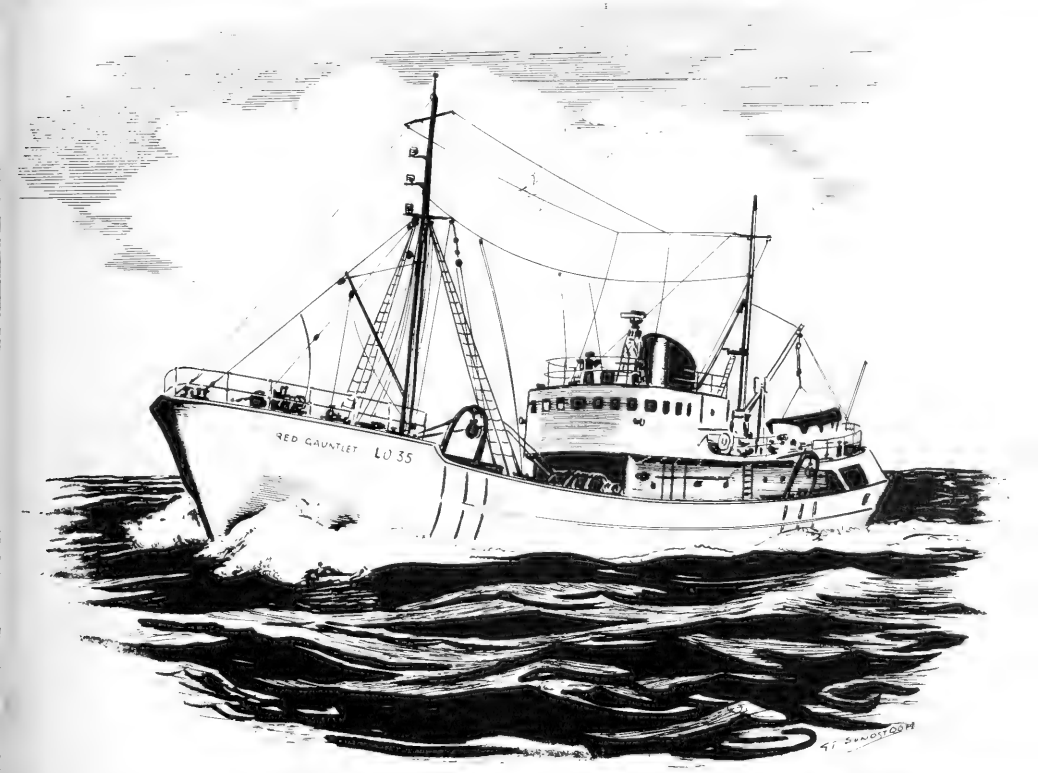
The cooked meat of the northern lobster, picked from the shell, is marketed fresh, frozen, and canned. Frozen spiny lobster tails have gained wide popularity since their appearance in the market and they can now be purchased throughout most of the United States.

Some of the recipes included in the new publications are: Lobster and Cheese Delights, Lobster and Orange Cocktail, French Fried Spiny Lobster Tails, Baked Stuffed Lobsters with Cheese, Lobster Thermidor, Lobster Newburg, Lobster Tarts, Lobster in Sour Cream, Lobster and Walnut Sandwiches, and Lobster Waffles.

A page of five pictures is devoted to illustrating the essential steps in "how to eat a lobster" so that only the shell is left.

Generously illustrated, How to Cook Lobsters is No. 11 in the Service's Test Kitchen Series of fish-cookery publications. It is sold for 20 cents a copy by the Superintendent of Documents Government Printing Office, Washington 25, D. C.

COMMERCIAL FISHERIES REVIEW



Vol. 19, No. 6 JUNE 1957

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
DONALD L. MC KERNAN, DIRECTOR

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor

J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Modern-type British Diesel trawler Red Gauntlet, 135 feet in length and 800 b. hp., illustrates the steady progress being made in the design of foreign fishing vessels.

Contents Continued p. 85

COMMERCIAL FISHERIES REVIEW

June 1957 Washington 25, D.C. Vol. 19, No. 6

NORTH PACIFIC ALBACORE TUNA EXPLORATION BY THE M/V JOHN N. COBB--1956

By Donald E. Powell*

SUMMARY

Albacore tuna were found to be widely distributed off the coasts of Oregon and Washington during the summer of 1956 by the Service's exploratory fishing vessel John N. Cobb. Operations were coordinated closely with the University of Washington's oceanographic vessel Brown Bear. The John N. Cobb explored the waters of the northeastern Pacific Ocean from northern California to southern British Columbia, extending out more than 800 miles offshore, fishing with gill nets and albacore trolling gear.

First albacore were caught in a gill net set on July 20, and subsequent catches indicated that the albacore were scattered over a wide area, but no evidence of offshore schooling was found. Several salmon were taken in the gill nets along 50° N. latitude, but no albacore were taken north of 49° N. latitude.

FIG. 1 - THE HIGH-SEAS GILL NETS WERE HAULED OVER THE BOW OF THE JOHN N. COBB. FISH IN THE NET IS A BLUE SHARK.

Following the early albacore catches made by the John N. Cobb and the Brown Bear, several commercial fishing vessels began trolling near the Oregon coast in mid-August and immediately reported good catches of albacore. A fleet of over 100 vessels found good fishing all along the Oregon coast through September, and nearly 4 million pounds of albacore were landed in Oregon ports. This was the first year since 1950 that sizable catches of albacore were made north of California.

INTRODUCTION

Exploration to determine distribution and availability of albacore tuna in a section of the northeastern Pacific Ocean from northern California to Southern British Columbia was carried out aboard the U. S. Fish and Wildlife Service's exploratory fishing vessel John N. Cobb during the summer of 1956. Offshore fishing was conducted over a seven-week period, from July 16 to August 30, extending out more than 800 miles off the coasts of Oregon and Washington. At the same time, information on high-seas salmon distribution in the area, particularly data on their apparent southern range at that time of year, was obtained for the Service's salmon research program under the International North Pacific Fisheries Commission.

*CHIEF, NORTH PACIFIC FISHERIES EXPLORATION AND GEAR RESEARCH, EXPLORATORY FISHING AND GEAR DEVELOPMENT SECTION, BRANCH OF COMMERCIAL FISHERIES, SEATTLE, WASH.

The work was coordinated with simultaneous cruises of several other research vessels. The University of Washington's oceanographic vessel Brown Bear, participating with the Oregon Fish Commission, operated closely with the John N. Cobb much of the time (Frolander and Lincoln 1956, and Homberg 1956). High-seas salmon research vessels covered the waters to the north and west of where the two vessels operated, and the John R. Manning from the Pacific Oceanic Fisheries Investigations in Hawaii conducted albacore research west of 145° W. longitude (Anonymous 1956). Oceanographic and biological data collected are currently being analyzed by agencies engaged in albacore and salmon research in this area.

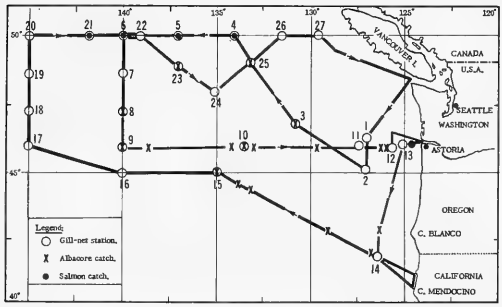


FIG. 2 - TRACK LINE OF THE JOHN N. COBB, SHOWING GILL-NET STATIONS (NUMBERED 1-27) AND ALBACORE AND SALMON CATCHES.

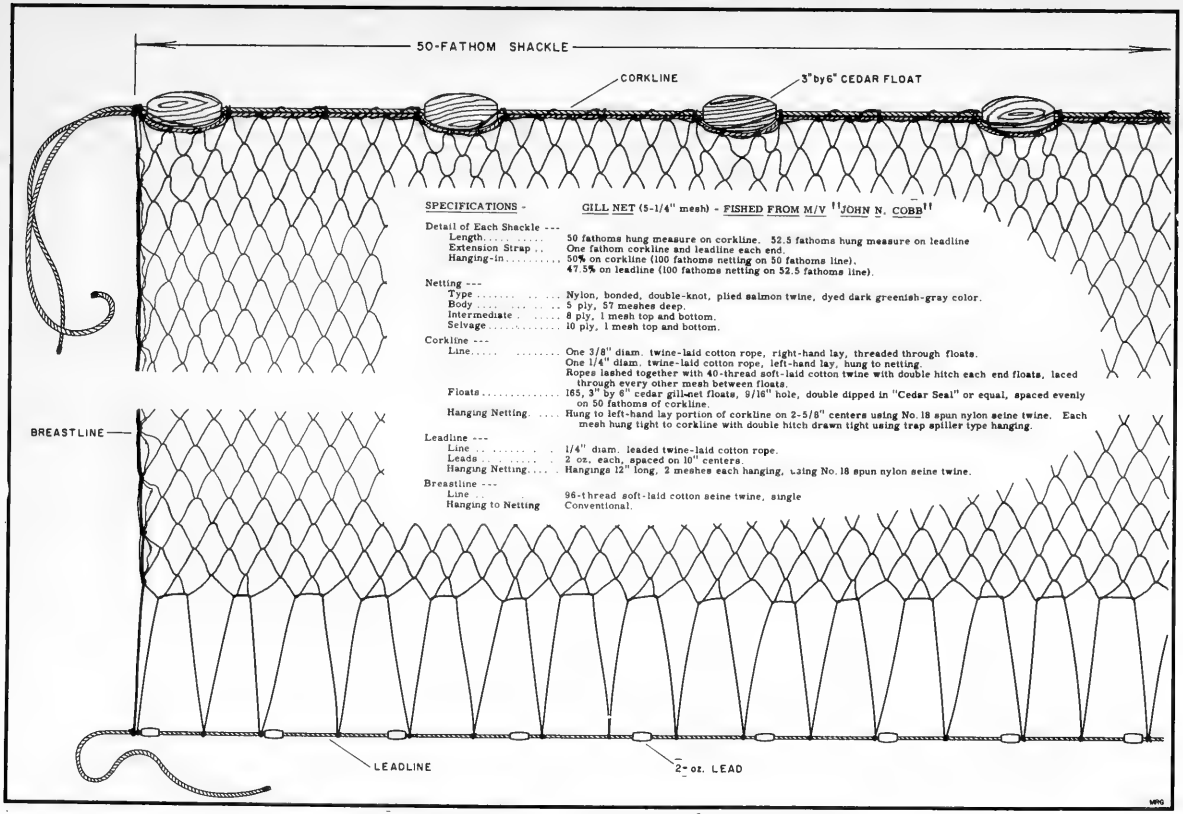
Information obtained by the high-seas salmon research vessels in 1955 indicated that the southern limit of salmon distribution coincided roughly with the northern limit of albacore during the summer months. In the northeastern Pacific this dividing line, with some overlapping, appeared to lie between 45° N. and 50° N. latitude. It was found during those investigations that high-seas gill nets designed to catch salmon were also effective in catching albacore. Accordingly, one of the John N. Cobb's 1956 objectives was to obtain further information on the northern distribution of albacore and the southern distribution of salmon between 40° N. and 50° N. latitude, from the Pacific Coast to 145° W. longitude, fishing with gill nets and albacore trolling gear.

CRUISE PLAN

To assure adequate coverage of the working area in the time scheduled, the cruise plan of the John N. Cobb was laid out with 27 gill-net stations to be occupied in sequence on successive nights, or on alternate nights where distances required two days' running time (see fig. 2). Standard commercial albacore trolling gear was fished during daylight hours while running between stations. Cruise tracks were planned so that the Brown Bear would occupy concurrent all-night oceanographic stations at several of the John N. Cobb's gill-net stations. At other times the vessels took separate courses but arranged to exchange fishing and oceanographic data several times daily by radio. A port call was scheduled in the middle of the cruise for refueling and taking on supplies at Astoria, Ore.

Arrangements were made for the research vessels to keep in radio contact with the trolling fleets of Oregon and Washington to relay information on any significant catches of albacore, especially catches close enough to shore for possible commercial fishing.

A biologist from the Pacific Salmon Investigations staff was assigned to the John N. Cobb to collect data on lengths, weights, stomach contents, etc., of all fish caught and to tag albacore which were landed in good condition. All albacore which were not tagged and released, all salmon, and samples of other species were frozen for future laboratory inspection. The University of Washington furnished oceanographers to make routine observations and collections aboard the John N. Cobb, in-including sea-water samples, bathythermograph casts, and plankton collections. More comprehensive oceanographic work was done by the Brown Bear, which also fished albacore trolling gear between stations.



SPECIFICATIONS - GILL NET (5-1/4" mesh) - FISHED FROM M/V "JOHN N. COBB"

Detail of Each Shackle ---	
Length	50 fathoms hung measure on corkline. 52.5 fathoms hung measure on leadline
Extension Strap	One fathom corkline and leadline each end.
Hanging-in	50% on corkline (100 fathoms netting on 50 fathoms line). 47.5% on leadline (100 fathoms netting on 52.5 fathoms line).
Netting ---	
Type	Nylon, bonded, double-knot, plied salmon twine, dyed dark greenish-gray color.
Body	5 ply, 57 meshes deep.
Intermediate	8 ply, 1 mesh top and bottom.
Selvage	10 ply, 1 mesh top and bottom.
Corkline ---	
Line	One 3/8" diam. twine-laid cotton rope, right-hand lay, threaded through floats. One 1/4" diam. twine-laid cotton rope, left-hand lay, hung to netting. Ropes lashed together with 40-thread soft-laid cotton twine with double hitch each end floats, laced through every other mesh between floats.
Floats	165, 3" by 6" cedar gill-net floats, 9/16" hole, double dipped in "Cedar Seal" or equal, spaced evenly on 50 fathoms of corkline.
Hanging Netting	Hung to left-hand lay portion of corkline on 2-5/8" centers using No. 18 spun nylon seine twine. Each mesh hung tight to corkline with double hitch drawn tight using trap spiller type hanging.
Leadline ---	
Line	1/4" diam. leaded twine-laid cotton rope.
Leads	2 oz. each, spaced on 10" centers.
Hanging Netting	Hangings 12" long, 2 meshes each hanging, using No. 18 spun nylon seine twine.
Breastline ---	
Line	96-thread soft-laid cotton seine twine, single
Hanging to Netting	Conventional.

FIG. 3 - DIAGRAM OF GILL NET RIGGED FOR HIGH-SEAS FISHING.

GEAR AND FISHING METHODS

GILL NETS: The gill nets were of nylon, ranging in size from $3\frac{1}{4}$ inches to $8\frac{1}{2}$ inches, stretched-mesh measure. Each shackle of net was 50 fathoms long and approximately 20 feet deep. Shackles of various size mesh were tied together and fished in a string with a lighted flagpole at each end and in the middle of the string. The standard set consisted of 18 shackles (900 fathoms) made up as follows: 3 shackles of $3\frac{1}{4}$-inch mesh, 5 shackles of $4\frac{1}{2}$-inch mesh, 6 shackles of $5\frac{1}{4}$-inch mesh, 2 shackles of $7\frac{1}{2}$-inch mesh, and 2 shackles of $8\frac{1}{2}$-inch mesh.

Nets of $3\frac{1}{4}$-inch, $4\frac{1}{2}$-inch, and $5\frac{1}{4}$-inch mesh were constructed similar to the net shown in figure 3. The larger nets, $7\frac{1}{2}$-inch and $8\frac{1}{2}$-inch, were used successfully in albacore exploration by the John N. Cobb in 1950((Powell, Alverson, and Livingstone 1952). During the latter part of the cruise, the $7\frac{1}{2}$-inch and $8\frac{1}{2}$-inch nets were replaced with $4\frac{1}{2}$-inch and $5\frac{1}{4}$-inch nets since the larger sizes showed no advantage in catching albacore but did catch more blue shark which tangled badly and slowed down the hauling operation.

FIG. 4 - THE GILL NETS WERE PILED IN THE STERN BIN READY FOR SETTING AT THE NEXT STATION. THE SAIL WAS USED ONLY FOR STABILIZING EFFECT.

Usually the vessel arrived on station in early evening, and the nets were set at dusk. If sufficient daylight remained, some trolling was done on station just before setting the nets. The vessel held on to the string of nets downwind, and the oceanographic station and night-light sampling was normally finished by midnight. Hauling was started shortly after daybreak and required from $1\frac{1}{2}$ to 2 hours depending on the catch.

The nets were set from a bin on the stern of the John N. Cobb and were hauled over the bow with a hydraulic gurdie. Fish were removed on a plywood table between the rail and the gurdie on the bow while the nets were being pulled to the stern for re-stacking in the bin. The crew performed daily maintenance on the nets while trolling between stations.

ALBACORE TROLLING: Three trolling lines were fished from each of two outrigger poles on the John N. Cobb and one or two lines were rigged on the stern. Feathered, plastic, bone, and rubber albacore jigs of various colors were tried, all standard commercial gear as used in the local fishing fleet. Gear makeup and rigging was similar to that described by Powell, et al., 1952.

Trolling was started each day after the gill nets were hauled and the vessel was under way for the next station. Stations were spaced to allow an average trolling speed of 6-7 knots during daylight hours, but occasionally it was necessary to proceed for a few hours at full speed to make up lost time.

A watch was kept at all times for any sign of jumping fish, feed, or other marine life. When albacore struck, the area was circled several times before proceeding on course. Troll-caught albacore were landed in a box lined with foam rubber so that those in good condition could be tagged and released.

CATCH RESULTS

ALBACORE: The first albacore were caught by the John N. Cobb in a gill net set on July 20 near the Cobb seamount which lies about 270 miles west of Grays Harbor, Wash. (see fig. 2 and table 1). From then until August 1, several other gill net catches and trolling catches showed that albacore were widely distributed off

Table 1 - Gill-Net Catch Data--M/V John N. Cobb--Cruise 28--July 16 to August 30, 1956

Station No.	Date 1/	Position of Set		Surface Temperature	Wind Direction and Force 2/	Fathoms of Net	No. Hours Net Soaked 3/	Number Salmon Caught			Number Albacore Caught	Number Incidental Catch				
		Latitude N.	Longitude W.					Red	Silver	Total		Blue Shark	Jack Mackerel	Pomfret	Squid	Other
1	7/17 - 7/18	46°17'	126°58'	60.5°F.	NW-4	900	6½	0	0	0	0	2	9	2	1	1 brown rockfish
2	7/18 - 7/19	45°05'	126°54'	62.1°F.	NW-5-7	900	8	0	0	0	0	3	0	0	0	-
3	7/20 - 7/21	46°45'	130°45'	59.0°F.	SE-4 - SW-7	900	8½	0	0	0	2	11	17	5	0	-
4	7/22 - 7/23	50°01'	133°58'	56.0°F.	SSW-4	900	9	2	0	2	0	2	0	31	0	1 steelhead trout
5	7/23 - 7/24	50°00'	137°00'	55.0°F.	SW-3	900	8	2	1	3	0	0	2	41	3	-
6	7/24 - 7/25	50°00'	140°00'	54.0°F.	W-4	900	8½	1	0	1	0	3	3	206	2	-
7	7/25 - 7/26	48°40'	140°00'	54.0°F.	W-5	900	8½	0	0	0	0	1	5	27	0	-
8	7/26 - 7/27	47°20'	140°00'	55.5°F.	NW-4	900	9½	0	0	0	7	3	2	13	2	-
9	7/27 - 7/28	46°00'	140°00'	58.0°F.	NW-2	900	8	0	0	0	2	6	0	0	97	-
10	7/29 - 7/30	46°00'	133°30'	58.0°F.	WSW-4	900	8½	0	0	0	9	8	8	44	10	-
11	7/31 - 8/1	46°00'	127°28'	61.0°F.	NW-4-5	900	8	0	0	0	0	9	0	1	0	-
12	8/1 - 8/2	45°58'	125°59'	61.0°F.	WNW-5	900	7½	0	0	0	0	11	1	0	0	-
13	8/6 - 8/7	46°12'	125°13'	62.5°F.	NW-4	900	8½	0	0	0	0	14	2	0	0	1 mackerel shark, 2 sablefish
14	8/8 - 8/9	42°50'	126°24'	61.0°F.	NNW-6-7	400	8½	0	0	0	0	4	0	0	0	-
15	8/14 - 8/15	45°00'	135°00'	63.0°F.	ESE-4	900	10½	0	0	0	3	8	98	47	4	-
16	8/16 - 8/17	45°00'	140°00'	62.8°F.	SSW-4-7	900	10½	0	0	0	0	19	0	7	7	-
17	8/18 - 8/19	46°00'	145°00'	59.0°F	SW-8	400	12½	0	0	0	0	7	0	0	0	-
18	8/19 - 8/20	47°20'	145°00'	57.3°F.	SW-6	900	10½	0	0	0	0	31	0	1	5	-
19	8/20 - 8/21	48°40'	145°00'	56.5°F.	SSW-6	900	11½	0	0	0	0	27	5	9	1	-
20	8/21 - 8/22	50°00'	145°00'	56.5°F.	SSW-4	900	10½	0	0	0	0	3	0	59	0	-
21	8/22 - 8/23	49°59'	141°48'	58.2°F.	SW-3	900	10	0	1	1	0	4	52	58	13	1 giant skilfish, 1 mackerel shark
22	8/23 - 8/24	49°58'	139°00'	58.3°F.	W-5	900	11½	0	0	0	0	3	76	62	43	1 giant skilfish
23	8/24 - 8/25	49°00'	137°07'	59.0°F.	SSE-4	900	9½	0	0	0	1	9	38	5	5	-
24	8/25 - 8/26	48°06'	135°10'	61.5°F.	SSW-5	900	9½	0	0	0	0	15	148	22	6	-
25	8/26 - 8/27	48°06'	133°11'	61.0°F.	WSW-5	900	10½	0	0	0	1	12	31	25	0	-
26	8/27 - 8/28	50°01'	131°31'	61.7°F.	SSW-3	900	10½	0	0	0	0	11	0	0	0	-
27	8/28 - 8/29	50°00'	129°30'	61.5°F.	WSW-5 - WNW-6	900	10½	0	0	0	0	2	0	0	0	-
		TOTALS				23,500	253	5	2	7	25	205	497	667	199	

1/ All gill-net sets were made at night

2/ Wind force is according to Beaufort scale

3/ Does not include setting and hauling time

Washington and Oregon out to 140° W. longitude, over 600 miles offshore. During August albacore were also taken as far south as 42° N. latitude near station 14 off northern California and at several of the more offshore stations, but none were caught north of 49° N. latitude.

Although the fishing revealed a wide distribution of albacore, individual catches were small during the entire cruise. A total of 38 albacore were taken on trolling gear and 25 in the gill nets. In addition, 13 observed albacore were lost after striking the trolling gear, and several were seen to fall out of the small-mesh nets during hauling.

FIG. 5 - BLUE SHARK, ALBACORE, JACK MACKEREL, AND POMFRET FROM ONE OF THE GILL-NET CATCHES.

Best catches of albacore were made on July 29 when 9 were taken on trolling gear near 46° N., 134°10' W., and nine were caught that night in a gill-net set some 20 miles eastward. Seven more albacore were taken trolling the next morning along the same track line. On August 1, three albacore were caught approximately 80 to 100 miles off the Columbia River on the trolling gear.

The consistently small catches indicated that the albacore were widely scattered and not in large schools in the offshore waters. This was supported by the fact that no sizable schools were sighted at any time during the cruise. Only occasional jumpers, from one to a few fish, were seen.

Table 2 - Albacore Troll Catch Data--M/V John N. Cobb--Cruise 28--July 16 to August 30, 1956

Date	Position Latitude N.	Position Longitude W.	Time of Day	Surface Temperature	Wind Direction and Force 1/	Number Albacore Caught	Strikes, Fish Lost
7/27	47°13'	140°00'	0900	56° F.	NNW-3	1	
"	46°00'	140°00'	2030	58° F.	NE -2	2	2
7/28	46°04'	138°40'	1615	58.5°F.	NNE-4	1	1
7/29	46°00'	134°10'	1630-1830	58° F.	WSW-4	9	
7/30	46°00'	133°00'	1030-1210	58° F.	NW -4	7	1
7/31	46°04'	129°40'	0825	60° F.	NW -4	1	
8/1	45°57'	126°25'	1340	61° F.	WNW-5	1	1
"	45°58'	125°48'	1730	61° F.	WNW-5	2	
8/8	42°55'	126°25'	1054	60.5°F.	NNW-7	1	
"	42°00'	126°36'	2000	60.5°F.	NNW-7	4	
8/12	42°14'	126°26'	1630-1740	59° F.	SSW-4	-	4
8/13	42°54'	128°58'	0610	62° F.	S -4	2	2
8/14	44°20'	133°06'	0610	63° F.	SSE-3	2	
"	44°36'	133°48'	1050	63° F.	SSE-3	3	
8/15	44°58'	135°32'	1150	62.5°F.	SW -10	1	2
8/26	48°29'	134°27'	1300	61° F.	WSW-5	1	
				Total		38	13

1/ WIND FORCE IS ACCORDING TO BEAUFORT SCALE.

Thirteen of the albacore taken on the John N. Cobb's trolling gear were tagged and released in what was assumed to be good condition. No recoveries have been reported to date. Troll-caught albacore were also tagged from the Brown Bear.

SALMON: Salmon were caught at four gill-net stations along 50° N. latitude. The salmon catch was small, consisting of 5 red salmon and 2 silver salmon. One steelhead trout was taken along with two red salmon in the gill nets on July 22 at 50°01' N., 133°58' W.

No salmon were taken south of 50° N. latitude except for one silver salmon which struck the albacore trolling gear 20 miles off the Columbia River on August 6.

INCIDENTAL GILL-NET CATCH: Several species of pelagic fish far outnumbered the catch of albacore in the gill nets (see table 1). A total of 667 pomfret, 497 jack mackerel, and 225 blue shark were landed. In addition, 199 large squid (2-3 feet in length) were also taken in the nets. All these species were found widely distributed over the fishing area, blue shark being present in all but two of the gill-net catches.

Up to 206 pomfret, 148 jack mackerel, 97 squid, and 31 blue shark were taken in individual gill-net catches. Blue shark were in every catch containing albacore, and jack mackerel and pomfret were in all but one.

Other incidental fish caught in the nets were brown ragfish, mackerel shark, sablefish, and giant skilfish. One of the giant skilfish was kept alive aboard the John N. Cobb for eight days until the end of the trip, when it was transferred to the University of Washington School of Fisheries aquarium where it is still alive and growing.

FIG. 6 - PORTION OF A GILL-NET CATCH INCLUDING MACKEREL SHARK, BLUE SHARK, POMFRET, JACK MACKEREL, AND SQUID.

NIGHT-LIGHT FISHING: After the gill nets were set each evening and the oceanographic station completed, night-light fishing with small-mesh dip nets was carried on for an hour or two usually between 9 p.m. and midnight. A 1,000-watt underwater diving light was suspended just beneath the surface to attract the small feed. On several occasions in choppy seas the 500-watt boom light suspended about six feet above the water was also used. Samples of specimens caught were preserved, and each station was classified as "poor," "fair," or "rich," depending on

the relative numbers of fish and squid observed. No effective night-lighting was done at four gill-net stations because of poor weather conditions.

Saury, from $1\frac{1}{2}$ inches to 12 inches in length, were the most abundant feed species observed. Squid and lanternfish were also quite common. The plankton hauls were preserved for later analysis at the University of Washington Department of Oceanography.

Saury were present at 22 of the 23 stations, squid at 15, and lanternfish at 10. Squid were the most difficult to catch in the dip nets, but it was usually possible to capture enough for a sample. At one station several large squid were speared. Saury and lanternfish were caught quite easily, especially at the richer stations. Seven stations were classified as "poor," eight as "fair," and eight as "rich."

FIG. 7 - TWO OF THE LARGE SQUID, APPROXIMATELY THREE FEET IN LENGTH, WHICH WERE TAKEN IN SEVERAL GILL-NET CATCHES.

Analysis of the night-light fishing results showed a correlation with the catch of albacore in the gill nets. At 7 stations rated as "poor" for night-light fishing only one albacore was taken, at 8 stations rated as "fair" only two albacore were taken, and at 8 stations rated as "rich" 19 albacore were taken.

In addition to the plankton samples taken at each oceanographic station, other floating organisms were observed and collected. Velella (purple-sail jellyfish) were seen in vast numbers over large areas, sometimes for several days running. Floating goose barnacles were also abundant at times, as were salps and round white jellyfish.

SIZE OF ALBACORE

Albacore caught by the John N. Cobb ranged in size from 50 cm. (19.7 inches) to 78 cm. (30.7 inches), and from 5.5 pounds to 20.5 pounds. The gill-net caught fish averaged 67 cm. (26.4 inches) and 14.5 pounds as compared to 64.5 cm. (25.4 inches) and 12.2 pounds for the troll-caught fish. The over-all average was 65.5 cm. (25.8 inches) and 13.4 pounds. These figures include lengths for 62 albacore and weights for 43 albacore.

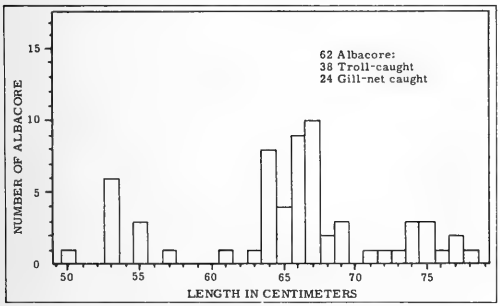


FIG. 8 - LENGTH-FREQUENCIES FOR 62 ALBACORE CAUGHT BY THE JOHN N. COBB.

An examination of albacore length frequencies (see fig. 8) shows three distinct size groups. The smallest-size fish were grouped around 53 cm. (20.9 inches), the middle-size fish were grouped around 66 cm. (26.0 inches) and the largest-size fish were grouped around 75 cm. (29.5 inches). The majority of the catch (60 percent) fell within the middle-size group. It is possible that the size groups represent three age classes, but the total number of measurements is probably too small for any such conclusions to be drawn.

WATER TEMPERATURE IN RELATION TO CATCH

Table 3 shows that catch of albacore and salmon in relation to surface water temperature. Salmon were caught in water from 54° F. to 58° F. Albacore were taken at temperatures ranging from 55.5° F. to 63° F. The area of overlapping

catches was from 55.5° to 58° F., but in general salmon were caught in waters colder than 57° F. and albacore were caught in waters warmer than 57° F.

Table 3 - Surface-Water Temperature for Albacore and Salmon Catches

Surface Temperature	Salmon Gill Net	Albacore Gill Net	Albacore Troll
°F.	No.	No.	No.
54	1		
54.5			
55	3		
55.5		7	
56	2		1
56.5			
57			
57.5			
58	1	11	21
58.5			2
59		3	4
59.5			
60			1
60.5			5
61		1	5
61.5			
62			4
62.5			3
63		3	5
Total	7	25	1/51

1/ INCLUDES 13 TROLLING STRIKES WHERE THE ALBACORE WERE LOST BEFORE LANDING.

Best albacore catches were made in 58° F. water with trolling gear. Only one troll-caught albacore was taken in colder water. Again the total catch was too small for any significant analysis of catch-temperature relationship.

COMMERCIAL FISHERY DEVELOPMENT

Following the early reports of offshore albacore catches made in late July and early August by the John N. Cobb and the Brown Bear, several commercial fishing vessels rigged with albacore trolling gear began fishing along the Oregon coast in mid-August. First commercial catches were reported by the Kiska, Betty, and Nel on August 18 fishing 70 to 100 miles off the central Oregon coast. Other vessels entered the fishery immediately and by August 24 it was reported that 150 vessels were moving into the albacore fishing area.

The fleet found continued good fishing all along the Oregon coast through September, with daily catches up to 700 and 800 fish reported by the more successful vessels. Price disputes slowed fishing somewhat during late September, and by early October the fleet had mostly dispersed with the regular albacore trollers heading for still-productive grounds off California.

Table 4 - List of Common and Scientific Names of Fish Used in This Report

Albacore	Thunnus germo (or T. alalunga)
Red salmon . .	Oncorhynchus nerka
Silver salmon .	Oncorhynchus kisutch
Steelhead trout .	Salmo gairdnerii
Blue shark . . .	Prionace glauca
Jack mackerel .	Trachurus symmetricus
Pomfret.	Brama raii
Brown ragfish .	Acrotus willoughbyi
Mackerel shark	Lamna ditropis
Sablefish	Anoplopoma fimbria
Giant skilfish. .	Erilepis zonifer
Saury	Cololabis saira

Total landings of albacore by the fleet in Oregon ports amounted to nearly four million pounds and these probably would have been larger but for the price disputes. This was the first year since 1950 that sizable catches of albacore were made north California. Whether it signifies a return to the Pacific Northwest coast of the unpredicable white-meat tuna after several years of absence is a matter of conjecture. Surely there is not sufficient scientific evidence available at this time on which to base any prediction.

LITERATURE CITED

ANONYMOUS
1956. GOOD ALBACORE FISHING FOUND NORTH OF HAWAII BY M/V JOHN R. MANNING (CRUISE 32). COMMERCIAL FISHERIES REVIEW, VOL. 18, NO. 11 (NOVEMBER), PP. 48-49.

FROLANDER, HERBERT F., AND LINCOLN, JOHN H.
1956. PRELIMINARY REPORT BROWN BEAR CRUISE 144 OFF THE WASHINGTON, OREGON, AND NORTHERN CALIFORNIA COASTS, JULY 18 TO AUGUST 31, 1956. UNIVERSITY OF WASHINGTON DEPARTMENT OF OCEANOGRAPHY, SEATTLE 5, WASH., NOVEMBER, MIMEOGRAPHED, 15 PAGES.

HOLMBERG, EDWIN K.
1956. A REPORT ON THE EXPLORATORY FISHING FOR ALBACORE TUNA ACCOMPLISHED ABOARD THE RESEARCH VESSEL BROWN BEAR. OREGON FISH COMMISSION, CLACKAMAS, OREGON, OCTOBER, MIMEOGRAPHED, 9 PAGES.

POWELL, DONALD E.; ALVERSON, DAYTON L.; AND LIVINGSTONE, ROBERT JR.
1952. NORTH PACIFIC ALBACORE TUNA EXPLORATION--1950. FISHERY LEAFLET 402, U. S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR, WASHINGTON 25, D. C., APRIL, 56 PAGES.

CREAM OF CRAB SOUP FOR A SUMMER LUNCHEON

Cream of crab soup is a "natural" in the summer since crab meat is plentiful at that time. It is nutritious and delicious and an easy-to-prepare hot meal for our cooler summer days. Crab soup has been a favorite of Marylanders for years.

Crab soup can be prepared by using cooked crab meat from hard shell crabs packed in cans and marketed fresh, frozen, or canned. The four principal species that supply the crab meat are the blue, Dungeness king, and rock crabs. The meat from these crabs can be used interchangeably in most recipes.

The home economists of the United States Fish and Wildlife Service suggest that you serve "Cream of Crab Soup" with crunchy crackers and a crisp vegetable salad.

CREAM OF CRAB SOUP

1 POUND CRAB MEAT
1 CHICKEN BOUILLON CUBE
1 CUP BOILING WATER
¼ CUP CHOPPED ONION
¼ CUP BUTTER OR OTHER FAT, MELTED
3 TABLESPOONS FLOUR.
¼ TEASPOON CELERY SALT
1 TEASPOON SALT
DASH PEPPER
1 QUART MILK
CHOPPED PARSLEY

Remove any shell or cartilage from crab meat. Dissolve bouillon cube in water. Cook onion in butter until tender. Blend in flour and seasonings. Add milk and bouillon gradually; cook until thick, stirring constantly. Add crab meat; heat. Garnish with parsley sprinkled over the top. Serves 6.

COLD STORAGE OF FROZEN PACIFIC OYSTERS (CRASSOSTREA GIGAS)[1/]

No. 2 - Effect of Antioxidant and Other Treatments on Keeping Quality

INTRODUCTION

The frozen-oyster industry of the Pacific Coast is the result of efforts on the part of producers and packers to broaden the market. In some cases the oysters are the excess from the fresh market and have been held at above freezing temperatures for several days before being frozen. Many packers are troubled by an occasional lack of uniformity and good quality in their product after frozen storage. Through the Pacific Coast Oyster Growers Association, they requested that experimental work be carried out to help improve the quality of frozen Pacific Oysters.

A study of the problems concerned with the frozen storage of Pacific oysters has been in progress at the Seattle Technological Laboratory since October 1954.

The initial paper[2/] reported results of a series of exploratory tests designed to determine what factors contribute to the formation of excessive drip in frozen oysters. Of the factors investigated, only the length of blowing time had materially affected drip. The work was limited to oysters frozen for only short periods of time. Commercial samples of frozen oysters always released considerably more drip than did the experimentally-frozen oysters. These differences in drip may have been caused by the greater length of time the commercial samples had been frozen.

Pacific oysters are usually frozen in 10-ounce eastern oyster cans. This procedure leads to some lack of uniformity in the product since Pacific oysters are often quite large and relatively few will fit into this size can.

Pacific oysters are frozen either raw or after blanching. The latter consists of immersing the oysters in boiling water for about one minute. The purpose is to firm the oyster meats and to overcome the natural slippery feel of the oyster which many homemakers find distasteful.

Certain physical and chemical changes take place in oysters during frozen storage. The body of the oyster darkens gradually and the oysters exposed to the headspace of the can become yellow. The oyster loses some of its firmness and becomes flaccid. The dark pigment from the mantle sloughs off and causes the drip to have a slightly sooty appearance.

While these changes are taking place, a change in flavor also develops. The normal fresh oyster flavor disappears and strong bitter off-flavors develop after extended storage.

1/ THIS WORK WAS CARRIED OUT UNDER A PROJECT FINANCED IN PART BY THE REFRIGERATION RESEARCH FOUNDATION.

2/ THE INITIAL REPORT, "COLD STORAGE OF FROZEN PACIFIC OYSTERS (CRASSOSTREA GIGAS)--NO. 1" WAS PUBLISHED IN THE DECEMBER 1955 (P. 11) ISSUE OF COMMERCIAL FISHERIES REVIEW.

The continuing aim of the present experimental work on frozen Pacific oysters is to slow down or prevent these changes so that (1) the quality of the frozen oysters is improved and (2) the marketing period is extended to a period of a year or longer.

The current phase of the project is concerned with an investigation of the effect of various processing treatments of the oysters before freezing on their storage characteristics. The treatments used include blanching, adding oxygen to the headspace, adding nitrogen to the headspace, and dipping the oysters into various antioxidant solutions.

EXPERIMENTAL

PREPARATION OF SAMPLES: The oysters used in these investigations were obtained from beds in the Willapa Bay area of Washington. They were obtained, freshly shucked and blown, from a commercial plant in South Bend, Wash.; placed in 5-gallon milk containers, packed in ice, and transported by truck to the Service's Seattle Fishery Technological Laboratory. The containers were held overnight in crushed ice, treated, and packed in 10-ounce oyster cans, sealed, and frozen the following day.

Approximately one-half of the oysters were blanched for one minute in boiling water and then drained before being treated and packed. The remaining oysters were treated and packed raw. Treatments consisted of dipping the oysters in solutions of the following antioxidants:

1. Antioxidant mixture[3] dissolved in U.S.P. propylene glycol[4].
   a. Nordihydroguaiaretic acid (NDGA) 0.01 percent by weight of oyster.
   b. Beta hydroxyanisole (BHA)--0.02 percent by weight of oyster.
   c. Ascorbic acid--0.02 percent by weight of oyster.
2. Ascorbic-citric acid mixture in water[4] (0.5 percent ascorbic acid--0.5 percent citric acid).

In addition to the antioxidants, the following treatments were included for control and comparison:

1. Control--no treatment.
2. Oxygen--air in headspace of can replaced by oxygen.
3. Nitrogen--air in headspace of can replaced by nitrogen.
4. Propylene glycol--for comparison with oysters treated with Tappel's[3] mixture.

The packaged oysters were frozen at -20° F. and stored at 0° F.

EXAMINATION OF SAMPLES: At two-month intervals over a period of 13 months, samples of the frozen oysters were removed from storage and examined.

3/ RECOMMENDED BY A. L. TAPPEL, UNIVERSITY OF CALIFORNIA, FOOD TECHNOLOGY DEPARTMENT, DAVIS, CALIF.

4/ ANTIOXIDANT PICK-UP WAS ASSUMED TO BE PROPORTIONAL TO THE PICK-UP OF THE SOLVENT. THIS WAS MEASURED PRIOR TO DISSOLUTION OF THE ANTIOXIDANTS.

$$\text{WT. \% ANTIOXIDANT DISSOLVED IN SOLVENT} = \frac{(\text{CONCENTRATION OF ANTIOXIDANT})\ (\text{WT. OYSTERS})}{(\text{WT. SOLVENT ABSORBED PER WT. OYSTERS})}$$

A variety of tests were performed in order to follow any changes that might be taking place. The following determinations were made on the thawed oysters: (1) pH, (2) free drip, (3) expressible drip, and (4) organoleptic evaluation (odor, appearance, and flavor).

The pH of the oysters was determined by measuring the pH of a blended sample by means of a glass electrode pH meter.

Free drip and expressible drip measurements were made on samples of the oysters that had been thawed 16 hours at 34° F. Free drip is defined as the weight of liquid lost in terms of percentage of initial product weight, during exactly two minutes of draining on a standard number 4 brass screen. Expressible drip is the percentage weight of liquid lost during exactly two minutes of compression between two layers of plastic sponges. The expressible drip measurements were made after the free drip was released.

Organoleptic evaluations of flavor were made by the investigators and by a taste panel which consisted of students and staff from the fisheries center at the University of Washington. Each panel consisted of from 8 to 16 people.

The oyster samples were presented to the tasters in the form of a standard oyster stew that consisted of chopped oysters, grade A butter, fresh milk, and salt. All samples of stew were prepared simultaneously. Temperatures were maintained by the use of double boilers containing hot water in the lower part during each taste-test period, which varied from 30 to 45 minutes.

For each examination a sample of fresh oysters was obtained and used in a stew as a reference sample. The reference stew was automatically given the highest score possible. All experimental oyster stews were judged in relation to the known and plainly labeled reference.

The score card used was based on a 10-point scale with 7-10 indicating good quality; 5-6, fair quality; and 1-4, poor quality. The tasters were asked to assign appropriate numbers to each sample. The reference sample was always arbitrarily assigned the score of 10.

General observations of the samples were made by the authors at each examination. These included a comparison of the odor, appearance, and the color of the surface of the oyster exposed to the headspace of the can.

RESULTS

There were no significant differences noted between any of the samples at the two- and four-month examinations of the samples. After six months, the oyster surfaces exposed to the headspace in all of the cans had begun to turn yellow in color. No off-odors were noted at this time. There were slight rancid odors detected in all samples after they had been stored for eight months. These odors were especially noticeable in the discolored areas.

After thirteen months of storage at 0° F. all of the samples were found to be of poor acceptability. The surfaces exposed to the headspace of the cans were discolored, the oysters did not have the firmness generally found in fresh oysters, and the body sections of many of the oysters had darkened. The discoloration on the surfaces exposed in the headspace of the can was the most important factor contributing to the poor appearance. Rancid odors were generally detected in product's surface areas. The blanched samples showed a tendency to shrink and to become shriveled. The results of the general observations made after various storage periods are presented in table 1.

There were variations in the drip values between the individual samples of as much as 30 percent. This variation was caused mostly by the differences in the amount of excess liquid in the cans at the time of packing; however, variation in the size of the oysters and the number of oysters in the cans also contributed to the

Table 1 - Results of General Observations of Frozen Pacific Oysters Stored at 0° F.

Oyster Treatment	Observations								
	After 4 Months of Storage			After 8 Months of Storage			After 13 Months of Storage		
	Acceptability[1]	Odor	Surface Color[2]	Acceptability[1]	Odor	Surface Color[2]	Acceptability[1]	Odor	Surface Color[2]
Raw									
Control	Good	Normal	Normal	Fair	Very slightly rancid	Yellow	Fair	Slightly rancid	Yellow
Oxygen in headspace of can.	Good	Normal	Normal	Poor	Very slightly rancid	Yellow-green	Unacceptable	Rancid	Yellow
Nitrogen in headspace of can	Good	Normal	Normal	Poor	Very slightly rancid	Dark yellow	Poor	Very slightly rancid	Yellow
Dipped 30 seconds in U.S.P. propylene glycol	Good	Normal	Normal	Poor	Very slightly rancid	Yellow-green	Poor	Slightly rancid	Yellow
Dipped 30 seconds in antioxidant mixture	Good	Normal	Normal	Fair	Normal	Red-brown	Fair	Slightly rancid	Yellow-brown
Dipped 30 seconds in ascorbic acid–citric acid mixture	Fair[3]	Normal	Normal	Poor[3]	Very slightly rancid	Yellow-green	Poor[3]	Slightly rancid	Yellow-brown
Blanched									
Control	Fair	Normal	Slightly yellow	Poor	Slightly rancid	Yellow-green	Unacceptable	Rancid	Yellow-green
Oxygen in headspace of can.	Good	Normal	Normal	Poor	Slightly rancid	Gray	Unacceptable	Rancid	Yellow
Nitrogen in headspace of can	Good	Normal	Normal	Poor	Very slightly rancid	Yellow-green	Poor	Slightly rancid	Yellow
Dipped 30 seconds in antioxidant mixture	Good	Normal	Normal	Fair	Slightly rancid	Yellow	Fair	Slightly rancid	Yellow-brown
Dipped 30 seconds in ascorbic acid--citric acid mixture	Fair[3]	Normal	Normal	Poor[3]	Slightly rancid	Yellow-green	Poor[3]	Very slightly grassy	Yellow

1/ ACCEPTABILITY NOT BASED ON FLAVOR OF ANY OF THE SAMPLES.
2/ SURFACE COLOR--THE COLOR OF THE OYSTER SURFACE EXPOSED TO THE HEADSPACE OF THE CAN.
3/ RATING DOWN-GRADED BECAUSE OF WHITE APPEARANCE OF FREE LIQUID.

drip variation. The expressible drip values were more consistent than the free drip values because the excess liquid was removed before expressible drip was measured. There were no significant differences either between the individual drip values of the raw samples or between the individual drip values of the blanched samples. However, the average values of both groups increased with storage time. The average drip values are presented in table 2.

Table 2 - Results of Drip Measurements on Raw and Blanched Pacific Oysters

Item	Product	Storage Period, Months at 0° F.						
		0	2	4	6	8	10	13
Percent free drip[1]	Raw[3]	4.9	7.1	8.0	8.7	9.8	11.9	9.0
	Blanched[4]	14.1	13.9	15.6	16.1	15.4	13.3	13.5
Percent expressible drip[2]	Raw[3]	5.8	7.5	8.9	9.9	9.4	11.5	11.3
	Blanched[4]	8.3	8.0	11.6	11.6	11.1	15.7	15.1

1/ PERCENTAGE OF FREE DRIP--PERCENTAGE WEIGHT OF LIQUID LOST DURING EXACTLY TWO MINUTES OF DRAINING ON A STANDARD NO. 4 BRASS SCREEN.
2/ PERCENTAGE OF EXPRESSIBLE DRIP--PERCENTAGE WEIGHT OF LIQUID LOST DURING EXACTLY TWO MINUTES OF COMPRESSION BETWEEN TWO LAYERS OF PLASTIC SPONGES UNDER A FORCE OF 2,560 GRAMS. DETERMINED AFTER FREE DRIP HAD BEEN REMOVED.
3/ AVERAGE OF 6 VALUES.
4/ AVERAGE OF 5 VALUES.

The pH values of all of the samples varied from 6.0 to 6.4 except for the samples treated with a mixture of ascorbic and citric acids. The pH values of these samples varied from 5.8 to 5.9. No reproducible change in pH occurred during storage.

There were some differences in the flavors of the stews noted by the investigators. The stews made with antioxidant-treated samples did not have the rancid flavor noted in some of the stews made with the control and the oxygen-treated samples. Propylene glycol, the solvent used in the application of Tappel's mixture, gave the stew a bitter unpleasant off-flavor. This flavor was not detected when the oysters were rinsed with water before the stew was prepared.

The taste panel members were found to be somewhat erratic in their judgment of the various samples. The average scores received by the treated samples were not very different from the scores received by the control sample through the 11-

month examination. At the 13-month examination, samples treated with ascorbic-citric acids, Tappel's mixture, nitrogen, and nitrogen-blanched received average flavor scores (8.2-8.3) that were considerably higher than those given the control samples (average 6.8). Because no consistent or significant differences between the control samples and the experimental samples had been noted in previous examinations, the findings at the 13-month examination can be considered as an indication only.

CONCLUSIONS

The storage life of freshly shucked Pacific oysters, frozen in hermetically-sealed containers and stored at 0° F., appears to be approximately 8 months. The antioxidants tested appear to have at least a limited effect in retarding oxidative changes in Pacific oysters frozen in sealed cans. Replacing the air in the headspace of the can with nitrogen or with oxygen had very little effect on the rate at which the samples deteriorated. Nitrogen slowed the rate slightly, whereas oxygen increased it slightly.

There are several important factors which should be considered before antioxidants are used. First, antioxidants are of little or no value if the quality of the oyster is poor at the time of freezing. Second, proper care and handling are more important in obtaining a good frozen oyster than antioxidant treatment. Third, the carrier used in applying the antioxidant must be carefully chosen. It must not have a flavor which would be detectable in the oyster product and it must be acceptable to the Food and Drug Administration.

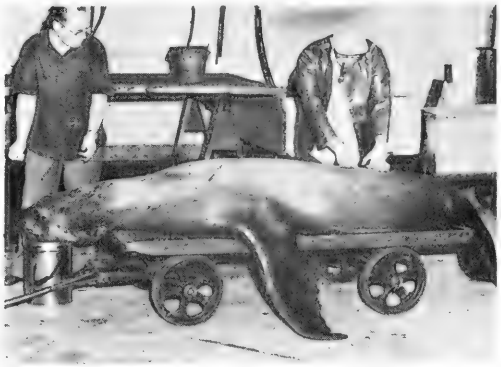
--BY KATHRYN L. OSTERHAUG, FISHERY PRODUCTS TECHNOLOGIST, AND
RICHARD W. NELSON, CHEMICAL ENGINEER,
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

CHEMICAL COMPOSITION VARIES FOR DIFFERENT PARTS OF FISH

Information about the complex composition of fish is needed for such fields as nutrition, processing, and use of waste materials. This knowledge has been sought for many years, but a great deal remains to be learned as to the composition of over 200 edible species of fish and shellfish marketed in the United States. The technological laboratories of the United States Fish and Wildlife Service have under way a continuing project to analyze chemically salt-water and fresh-water fish as samples become available. Recently, at the Seattle laboratory, determinations have been made to compare the composition of different parts of fish meat. Twelve species of fish, caught commercially along the Pacific Coast, were carefully cleaned and the following portions were separated: light meat, dark meat, belly flap, dorsal (strip along back of fish), and waste. A number of interesting results were obtained from these analyses. Oil distribution in the meat, in order of decreasing amounts, was in the dorsal, dark meat, belly flap, and light meat. Dorsal meat from several species contained 11 times more oil than light meat from the same species. Light meat, however, had the highest protein content and dorsal meat the lowest, even lower than the waste material.

COMMERCIAL USE OF ALASKA SEA LIONS STUDIED

Studies of a possible commercial use for the Alaska sea lion, under way at the United States Fish and Wildlife Service Technological Laboratory at Ketchikan, Alaska, have shown that the sea lion may be processed into meal without alteration of the reduction equipment. This large marine animal (weighing up to 2,200 pounds), which is classed as a predator by most commercial fishermen, has potential value as animal food and as raw material for reduction to meal and oil. The present phase of the Laboratory's investigation is concerned with the most likely commercial application, that is, to reduce the animal to meal and oil in existing Alaska reduction plants.



TAKING MEASUREMENTS OF 800-POUND MALE SEA LION.

Laboratory experiments were recently completed whereby a whole sea lion, without viscera, was reduced to meal and oil. These experiments indicated that the only necessary additional piece of equipment would be a suitable grinder to prepare the carcass for reduction in existing equipment. The laboratory-produced meal will be assayed for its value as a protein source by chick-feeding tests.

In past investigations, parts of sea lion such as the liver, viscera, meat, and bone were reduced to separate meals. Protein evaluation of these meals by chick-feeding tests indicated that the liver meal was exceptionally good, meat meal and viscera meal were fair, and bone meal was poor. Proximate analyses have indicated that the hide is a good protein source. It is believed that the carcass meal, recently produced, should be of considerable value for chick feeding.

NOTE: SEE COMMERCIAL FISHERIES REVIEW, JANUARY 1957, P. 5.

STUDY OF DRY SOLIDS, SALT, AND FREE LIQUOR RELATIONSHIPS IN OYSTERS

Collection of samples for studies on the relationships between free liquor, salt, and dry solids of oysters, being conducted by the Service's Fishery Technological Laboratory, College Park, Md., was half completed when the Chesapeake season closed during the last week in March. The collection of samples was started in February. The work has been suspended until the new season begins in September. The three factors mentioned are used to test the degree of loss of liquid from the oyster after processing.

Liquor loss appears to differ in oysters taken from different beds, from one week to the next and from one season to another. Other factors apparently affecting liquor loss from oysters appear to be sex, climatic conditions, degree of cultivation of the oyster, and possibly many others. The data thus far obtained for 44 samples of oysters have shown markedly that the problem of determining the ultimate cause or causes of liquor loss is extremely complex.

TECHNICAL NOTE NO. 38 - A PORTABLE FISH-MEAL BLENDER FOR PILOT-PLANT USE

A portable fish-meal blender was constructed recently by the Seattle Technological Laboratory in order to simplify the mixing and sampling of experimentally-produced meals in quantities up to 200 pounds. The experimental meals, prepared under rigidly controlled processing conditions and from fish of known history, are being used to study the effects of prior history of the raw material as well as of the processing conditions on the nutritive values of the resultant meals. The research is supported by funds made available by the Saltonstall-Kennedy Act of 1954.

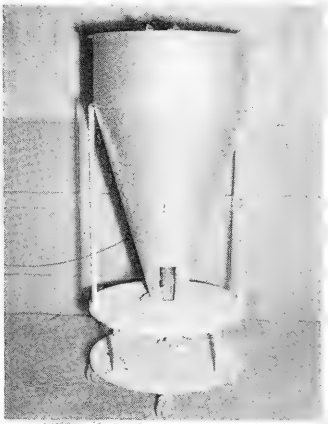


FIG. 1 - THE PORTABLE FISH-MEAL BLENDER, SHOWING THE SLIDE AT THE BASE FOR REMOVAL OF THE MEAL AFTER MIXING.

As shown in the illustrations (figs. 1, 2, and 3), the vertical worm-type blender, used in some commercial units on a larger scale, was adapted for laboratory purposes. The unique features of the modified blender design are the use of a light, strong, funnel-shaped hopper mounted on a wheeled base for portability and a gearhead motor drive located at the base of the unit for safety and convenience of access to the hopper.

Meal, when placed into the hopper for blending, is conveyed from the bottom of the hopper upward to the surface of the meal where the rotating worm throws it tangentially against the sloping sides of the hopper. A cavity is created, at the bottom of the hopper in the neighborhood of the screw, which is continuously refilled by the movement of the meal downward along the sloping sides of the hopper. The blended material is removed through a sliding door at the base of the hopper. Laboratory tests in which a dye tracer was added to a 100-pound batch of meal showed that thorough mixing of all components in the meal required approximately 10 minutes.

FIG. 2 - A DOWNWARD VIEW OF THE MEAL BLENDER, SHOWING THE 6-INCH DIAMETER HELICAL WORM.

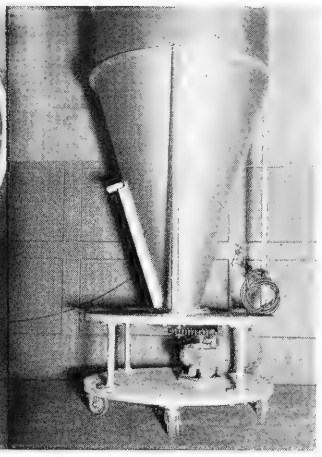


FIG. 3 - THE LOWER PART OF THE MEAL BLENDER, SHOWING THE $\frac{1}{2}$-HORSEPOWER GEARHEAD MOTOR DRIVE.

The blender consists of five main elements: (1) a funnel-shaped hopper 48 inches high with a 26-inch diameter at the top and tapering to a 6-inch diameter at the base; (2) a vertical helical worm 48 inches long and 6 inches in diameter; (3) two

shaft bearings consisting of a top radial bearing and a tapered roller bearing at the base; (4) a ½-horsepower gearhead motor drive; and (5) a double-decked caster-mounted dolly of 1-inch thick plywood to carry the assembly. The 12-inch space between decks on the dolly provide space for the gearhead motor which drives the vertical worm at 250 r.p.m. The unit is constructed to allow the use of a tight cover when desirable during the mixing period.

BOILED SALMON WITH EGG SAUCE

Salmon are caught in both the North Atlantic and North Pacific Oceans, and in certain fresh water streams entering these oceans.

The meat is fine in texture, yet firm and moist. It varies in color from almost white to bright red. The protein content is substantial. Salmon also contain the important minerals and vitamins necessary for proper nutrition of the body.

Regardless of where you reside, the home economists of the United States Fish and Wildlife Service suggest that this summer you try this traditional New England menu which contains "Boiled Salmon with Egg Sauce," new potatoes, and peas.

BOILED SALMON WITH EGG SAUCE

2 POUNDS SALMON STEAKS OF FILLETS
2 QUARTS BOILING WATER
3 TABLESPOONS SALT
EGG SAUCE

Cut steaks into serving-size portions and place in a wire basket or on a plate. If a plate is used it should be tied in a piece of cheesecloth. (This will prevent the fish from breaking up and facilitates removal when cooked.) Lower the fish into the salted boiling water and simmer about 10 minutes or until it flakes easily when tested with a fork. Remove fish carefully to a hot platter. Cover with egg sauce. Serves 6.

EGG SAUCE

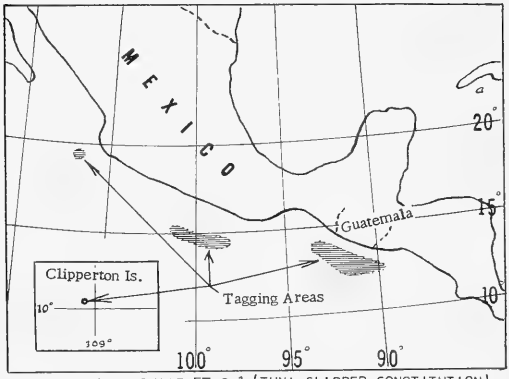
2 TABLESPOONS BUTTER OR MARGARINE
2 TABLESPOONS FLOUR
½ TEASPOON SALT
DASH PEPPER
1 CUP MILK
3 HARD-COOKED, EGGS, CHOPPED

Melt butter; blend in flour seasonings. Add milk gradually and cook until thick and smooth, stirring constantly. Add eggs; heat. Serves 6.

TRENDS AND DEVELOPMENTS

California

TUNA TAGGED OFF THE COASTS OF MEXICO, GUATEMALA, AND EL SALVADOR (M/V Constitution Cruise 57-C-1): In the waters off Southern Mexico, Guatemala, El Salvador, and Clipperton Island, biologists of the California Department of Fish and Game aboard the commercial tuna clipper Constitution tagged 871 yellowfin tuna and 128 skipjack tuna with the cooperation of the crew. The cruise (January 23-March 22, 1957) was cut short due to engine trouble.



TUNA-TAGGING CRUISE 57-C-1 (TUNA CLIPPER CONSTITUTION).

The cruise was planned for the following purposes: (1) to tag yellowfin tuna and skipjack with type G "spaghetti" tags; (2) to continue testing the relationship between tag color (red and white) and tag recovery success; (3) to field test efficiency of dart-type tags: (4) to make incidental collections and observations of marine life.

The 999 tuna tagged and released in good condition consisted of 871 yellowfin and 128 skipjack tuna. Of these 999 fish, 815 were tagged off the coasts of Guatamala and El Salvador, 178 off Southern Mexico, and 6 off Clipperton Island.

Number of Fish Released by Tag Colors and Type

Species	Loop		Dart			Totals
			Hollow Tip		Solid Tip	
	Red	White	Red	White	Clear	
	(Number of Fish)					
Yellowfin	360	403	44	49	15	871
Skipjack	53	53	11	0	11	128
Totals	413	456	55	49	26	999

A total of 130 fish, predominately yellowfin tuna, were tagged with experimental dart tags. Two types of heads were used on the darts--hollow nylon tubing and solid nylon rod. It was found that both types could be applied quicker and easier than conventional loop tags. All dart tags were applied slightly ahead of the second dorsal fin and the dart locked between the spines.

On several occasions during the cruise freshly-caught yellowfin tuna were observed to have large healed and partially healed wounds apparently inflicted by sharks. These fish were actively feeding on the bait thrown from the boat and showed no ill effects from their injuries.

Surface water temperatures in areas fished ranged from 76° F. to 82° F. The Gulf of Tehuantepec showed the greatest temperature variation, 76° F. to 81° F., temperatures elsewhere ranged from 80° F. to 82° F.

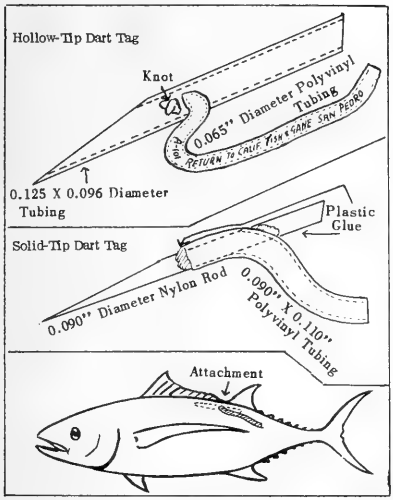


DIAGRAM OF DART-TYPE TAGS AND LOCATION OF TAG ON TUNA (TUNA CLIPPER CONSTITUTION, CRUISE 57-C-1)

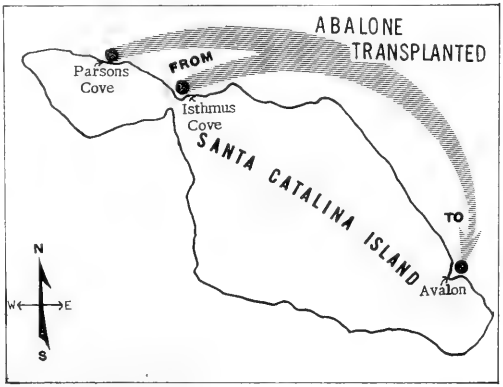
A collection of marine life specimens was made from night light stations, tuna stomach contents, bait-net hauls, and by brailing from the boat when in the vicinity of logs.

* * * * *

ABALONE TAGGING AND SURVIVAL STUDIES (M/V Nautilus Cruise 57-N-1): Over 1,000 pink abalone (Haliotis corrugata) were collected off Santa Catalina Island by divers working from a diving boat (Mollusk) and transported aboard the Nautilis by biologists of the California Department of Fish and Game for tagging. In addition, the red abalone (Haliotis rufescens) transplanted in Isthmus Cove, Santa Catalina Island, in February 1957 were found to have adapted themselves successfully in the new environment.

The purpose of the cruise (March 23-April 1, 1957) was: (1) to measure and tag pink abalone as a method to determine growth rate; (2) to develop transporting methods and techniques for pink abalone; and (3) to inspect the red abalone transplanted to Santa Catalina Island from San Miguel Island by the abalone investigation in February 1956.

Of the 1,000 or more abalone collected, over 800 were taken from Parsons Cove and approximately 200 from Isthmus Cove. The abalone were measured and tagged during transport and placed on the bottom on the east side of Avalon Harbor in the Fish and Game preserve area. Representatives of the City of Avalon and other prominent citizens were advised of the project and promised full cooperation to see that the abalone would not be disturbed. New tags and tagging methods were developed for the pink abalone; due to their shell structure it was not possible to utilize the same tags used on the red abalone. These red abalone have taken over in this new location and adapted themselves successfully. Only one empty shell was found. Many of the red abalone were observed which had added growth to their shells. Of the original plant it is estimated that approximately 85-90 percent have survived.



M/V NAUTILUS CRUISE 57-N-1, MARCH 23-APRIL 1, 1957

Cans--Shipments for Fishery Products, January-February 1957

Total shipments of metal cans for fish and sea food during the first two months of 1957 amounted to 13,335 short tons of steel (based on the amount of steel consumed in the manufacture of cans), compared to 10,542 short tons in the same period of 1956. Fish canning in the first part of 1957 was largely confined to the packing of tuna, mackerel, and anchovies in California and oysters in the Gulf of Mexico area.

NOTE: STATISTICS COVER ALL COMMERCIAL AND CAPTIVE PLANTS KNOWN TO BE PRODUCING METAL CANS. REPORTED IN BASE BOXES OF STEEL CONSUMED IN THE MANUFACTURE OF CANS, THE DATA FOR FISHERY PRODUCTS ARE CONVERTED TO TONS OF STEEL BY USING THE FACTOR: 23.0 BASE BOXES OF STEEL EQUAL ONE SHORT TON OF STEEL.

Coast Pilot for Pacific Coast to be Revised

The Coast and Geodetic Survey, U. S. Department of Commerce, has started revising the Pacific Coast edition of its "Coast Pilot." The new volume, which will give up-to-date descriptions of perils and landmarks from the Mexican to the Canadian border, will be published in 1958 as United States Coast Pilot 14.

The 1958 volume will include the Hawaiian Islands as well as the Pacific Coast. The Survey is using a new and more compact format. By 1960 it will reduce the number of volumes from the present ten to six. Others in the series cover the Atlantic and Gulf Coasts and Alaska. Annual supplements are supplied for each.

Federal Purchases of Fishery Products

DEPARTMENT OF DEFENSE PURCHASES, APRIL 1957: Fresh and Frozen Fishery Products: For the use of the Armed Forces under the Department of Defense, 1.8 million pounds (value $970,000) of fresh and frozen fishery products were purchased in April by the Military Subsistence Market Centers. Beginning with January 1, 1957, a change was instituted in reporting the amount purchased. Instead of reporting deliveries as in the past, the Military Subsistence Supply Agency is reporting what was ordered. Therefore, this year's purchases are not directly comparable with previous years.

Table 1 - Fresh and Frozen Fishery Products Purchases by Military Subsistence Market Centers, April 1957 with Comparisons

QUANTITY				VALUE			
April		April		April		April	
1957	1956	1957	1956	1957	1956	1957	1956
(1,000 Pounds)				($1,000)			
1,837	1,835	7,367	6,778	970	832	3,832	3,533

Assuming that purchases for the first four months of this year as compared with the same months in 1956 are roughly comparable, purchases were higher by about 8.7 percent in quantity and 8.5 percent in value for the first four months of 1957.

Table 2 - Canned Fishery Products Purchases by Military Subsistence Market Centers, Jan.-Apr. 1957

Month	QUANTITY			
	Tuna	Salmon	Sardines	Total
	(1,000 Pounds)			
Jan.-Apr.	841	992	31	1,864

Prices paid for fresh and frozen fishery products in April averaged 52.8 cents a pound, or about 2 percent less than the average of 54.0 cents paid in March, but higher by about 17 percent than the April 1956 average of 45.3 cents.

Canned Fishery Products: Canned sardines (12,000 pounds, valued at $4,027) were the canned fishery products purchased for use of the Armed Forces during April 1957.

In addition to the purchases made under contract, the Armed Forces generally make some local purchases which are not included in the data given. Therefore, actual purchases are higher than indicated, but it is not possible to obtain the local purchases made by military installations throughout the country.

Fish Hatchery

CONTRACT AWARDED FOR OREGON SALMON HATCHERY: The award of a contract for the construction of the Cascade Salmon Hatchery on Eagle Creek near the town of Cascade Locks, Oreg., was announced on April 29 by the Assistant Secretary of the Interior for Fish and Wildlife. The contract for $541,418 was awarded to a Portland, Oreg., firm.

The hatchery is being built as part of the Columbia River Fishery Development program authorized by Congress to restore depleted Columbia River salmon runs.

"Construction of this salmon hatchery is an excellent example of cooperation among Federal and state agencies," the Assistant Secretary pointed out. "Funds for the hatchery are appropriated by Congress to the Corps of Engineers and turned over to the United States Fish and Wildlife Service. The United States Forest Service of the Department of Agriculture has agreed to provide the site and the Oregon Fish Commission will take over operation of the hatchery."

Activation of this contract will start the seventh of 15 salmon and steelhead hatcheries contemplated for the State of Oregon under the program. States cooperating in the program are Oregon, Washington, and Idaho.

Work to be accomplished under the Cascade hatchery contract consists of construction of raceway ponds, holding pond and fish ladder, hatchery and utility building, residence quarters and garages, sewer system, water system roads, and relocation of a Forest Service residence.

The Cascade hatchery, when completed, will be devoted to the artificial propagation of chinook, silver, and chum salmon and will have an estimated annual production of 11,000,000 young migrants--a measurable contribution to the restoration program.

Fisheries Loan Fund

APPLICATIONS TOTAL $8 MILLION: As of April 29, a total of 211 fishery loan applications amounting to $7,962,100 had been received by the United States Fish and Wildlife Service. Of these, 86 cases amounting to $2,487,400 have been approved.

Florida

FISHERIES RESEARCH, JANUARY-MARCH 1956: The following are some excerpts from the Quarterly Report on Fisheries Research, March 1957, of the Marine Laboratory of the University of Miami.

Landings: Preliminary 1956 total landings for Florida show an increase over 1955 of more than 32 million pounds. Much of this can be attributed to a larger menhaden catch. Other preliminary figures indicate an increase in the landings of shrimp, Spanish mackerel, grouper, and spiny lobster. Mullet, the second most important fishery in the State has stabilized over the past few years. Shrimp were again the major source of fishery income to the state and will probably show the second best year in history with over 54 million pounds landed, with an ex-vessel value of over 18 million dollars.

Tortugas Shrimp Fishery: The collection and analysis of shrimp dealers' records continued throughout the quarter. To date records on 11 boats from a single dealer in Key West have been gathered and processed covering the years 1953 through 1956. The yearly average catch per unit of effort shows a downward trend with a decrease of about 90 pounds a boat a night over this four-year period. Records of 16 boats fishing out of Naples have been gathered and processed. These records cover the years 1954 through 1956 and also show a downward trend with a decrease of over 120 pounds a boat a night over the three-year period.

Over this same period there has been a sharp increase in the number of boats fishing the grounds. Preliminary figures suggest that the number in 1953 may have been under 300 and that for 1956 about 600. Total production for this same time period has increased slightly over 20 million pounds.

It is too early in the study to say if these catch-per-unit-of-effort figures are representative of abundance of shrimp or if they reflect fishing intensity. Records from boats fishing during the early period of the fishery will provide us with some clues concerning the value of the catch per boat per night as an indicator of apparent abundance.

The appearance of two peaks in the small shrimp fishery, one in the spring and one in the fall, becomes more certain as additional records are obtained.

Spotted Sea Trout: The apparent decline in commercial landings of spotted sea trout can probably be explained by the fact that these fish were formerly taken incidental to mullet fishing. The decline in mullet landings due to low prices began in mid-1952 and has continued to the present time. This decline is closely paralleled by a decline in landings of spotted sea trout.

A decided shift by the commercial fishermen to species which are not associated ordinarily with the spotted sea trout has become apparent. This shift eliminates much of the production formerly obtained by these experienced fishermen.

Mullet Marketing: Some time was spent during the quarter on a follow-up of the mullet marketing study. Fish dealers from Naples to Pensacola were contacted concerning this study and recommendations made. Market outlets for Florida fishery products were discussed. Particular emphasis was placed on the market areas of Cincinnati, Milwaukee, and Detroit.

Black Spot Control in Shrimp: Control of black spot in shrimp continues to be a major activity. Sodium bisulfite is now being widely used in the Florida industry and tests are being conducted to ensure its proper use, and to determine more accurately its effects.

Earlier reports showed that $2\frac{1}{2}$-percent dip solutions gave the best control of black spot in experimental work. Field tests led to the recommendation that half this concentration ($1\frac{1}{4}$ percent) should be used, balancing a somewhat reduced effectiveness against black spot control with reduced cost and less chance of misuse.

The most recent experiments involved the use of still lower concentrations (0.5 percent) to determine if this was sufficiently effective for practical use. This experiment started at the end of of March and results were expected early in April.

Studies were continued to determine the effect of antioxidant butylated hydroxy toluene (Ionol) on black spot in shrimp. Results from these tests indicate that at levels above 1.0 percent black spot can be retarded up to 14 days, providing that the dipping time is for periods longer than five minutes.

Studies were commenced on the use of Ionol when applied as a glaze to frozen shrimp. Samples will be drawn for testing over a none-month period to determine if blackening during frozen storage can be retarded in this way.

Spoilage Control in Shrimp: Studies were continued to determine the preservative action on shrimp of the antibiotic terramycin when applied in a dipping solution.

A trip was made in February on a shrimp boat out of Key West, and samples of pink shrimp (Penaeus duorarum) were dipped in three concentrations of seawater solutions of terramycin. Concentrations of 10, 30, and 50 parts per million were dipped for 1, 5, and 15 minutes, so that a total of nine conditions were tested. Three control (untreated) samples were also collected.

Bacterial counts on the treated samples from these tests showed no significant differences from the controls. Odor and taste scores likewise showed small and probably insignificant differences compared to control scores. Black-spot incidence did not seem to be increased or decreased by the use of the antibiotic.

Further tests are planned using terramycin in April.

Another bactericidal agent was tested, in an attemp to find a means of reducing shrimp spoilage. This is Dynactol (monoxychlorosene) which was tested as a seawater dip solution at 0.3-percent concentration. This work was carried out on a vessel out of Key West during February.

Results of this one test were promising, the quality of the shrimp (in terms of bacterial counts, taste and odor scores) being better than the controls. An important additional fact was that blackspot incidence seemed to be considerably reduced.

Further tests were planned in May with this chemical.

Rancidity in Fish: The study on the effect of chemicals in controlling the development of rancidity in frozen Spanish mackerel was completed. Results from these tests indicate that concentrations of the antioxidant Ionol in the range of 200-300 p.p.m. are effective in the control of rancidity. At concentrations lower than 200 p.p.m. the chemical was ineffective and taste panel scores were either not higher or below that of the control.

Concentrations of Ionol in the 200-300 p.p.m. range were also effective in preventing the fading of the pigment spots. The controls, which had not been treated, showed bleaching. This follows the successful retention of color of red snappers (Lutjanus aya) with Ionol at the 200-300 parts per million fresh-water solutions. The color remained bright after six months of storage.

Smoking: Studies were continued on the prevention of mold in smoked fish (mullet and mackerel). Results from the first test indicated that neither the treated nor untreated samples of smoked fish showed any signs of mold growth up to 20 days when held under ice box temperatures. This was true whether the samples were wrapped in Mylar 332 (an experimental film produced by DuPont) or unwrapped, whether treated with sorbic acid or not.

Both treated and untreated samples held in room temperatures showed signs of mold growth on the eighth day of storage. Treatment involved dipping the fish in a 0.1-percent solution of sorbic acid.

A second series of tests were run on smoked mullet. Both wrapped and nonwrapped samples were held under room temperatures. In this test samples were wrapped in Mylar 322 and the bag was filled with carbon dioxide gas. Other samples wrapped in Mylar 322 were sprayed with 0.5-percent sorbic acid. None of these two groups of samples showed any signs of mold after 21 days of storage, and the experiment is continuing.

Maine Sardines

CANNED SARDINE STOCKS, APRIL 1, 1957: Distributors' stocks of Maine canned sardines totaled 295,000 actual cases as of April 1, 1957, exactly 49,000 cases or 14.2 percent less than the 344,000 cases held by distributors on January 1, 1957. Stocks held by distributors on April 1, 1956, amounted to 268,000 actual cases, according to estimates made by the U. S. Bureau of the Census.

Canners' stocks on April 1, 1957, were 465,000 standard cases (100 $3\frac{1}{4}$ oz. cans) as compared with the 879,000 cases held on January 1, 1957, and 152,000 cases on April 1, 1956.

Table 1 - Canned Maine Sardines--Wholesale Distributors' and Canners Stocks, April 1, 1956 with Comparisons

Type of Stocks	Unit	1956/57 Season			1955/56 Season				
		4/1/57	1/1/57	11/1/56	7/1/56	6/1/56	4/1/56	1/1/56	11/1/55
Distributor	1,000 actual cases	295	344	388	154	160	268	326	354
Canner	1,000 std. cases 1/	465	879	1,016	315	64	152	475	625

1/ 100 $3\frac{1}{4}$-OZ. CANS EQUAL ONE STANDARD CASE.

The pack of Maine sardines during the 1956 packing season amounted to 2,221,793 standard cases, much higher than the 1,254,222 standard cases packed in the 1955 season. However, the 1955 sardine pack was the lowest since 1939. Shipments from April 15, 1956 (the beginning of the season) to April 1, 1957, totaled 1,877 standard cases, somewhat higher than shipments of 1,793 cases for the same period a year earlier.

Marketing Prospects for Edible Fishery Products, Summer 1957

United States civilian consumption of fishery products per person was at least as large this winter as last, and is expected to continue close to the year-earlier rate this summer. Retail prices, judging from the Bureau of Labor Statistics wholesale prices in primary markets, averaged about the same as in the first quarter of 1956. They will likely maintain this relationship to the year-ago level.

Commercial landings of edible fish and shellfish this winter for use in the fresh or frozen forms differed little in total from those of a year earlier but there were variations in the catch of individual species in the two periods. Commercial fishing operations are now on a seasonal upswing, which will continue until early or midsummer.

About 34 million pounds of edible fishery products were frozen commercially in the continental United States during the first quarter of 1957. This was 12 percent less than in the same part of 1956. Part of the reduction apparently is due to under-reporting on freezings of fish sticks. The total volume of freezings will soon be increasing seasonally with the catch reaching a peak in July or August.

Cold-storage holdings of frozen fish and shellfish on May 1 totaled less than a year earlier. The trade will soon begin building up stocks for marketing next winter when commercial landings are at their seasonal low point.

Imports of edible fishery products during the next few months are expected to be close to the year-earlier total, but some reduction in exports is probable. The latter will in large part be due to the fact that our supplies of canned California sardines (pilchards) are relatively low because of the poor pack last fall. California sardines have always been one of our major export items among edible fishery products.

This analysis appeared in a report prepared by the Agricultural Marketing Service, U. S. Department of Agriculture, in cooperation with the U. S. Fish and Wildlife Service, and published in the former agency's May 2 release of The National Food Situation (NFS-80).

NOTE: SEE COMMERCIAL FISHERIES REVIEW, MARCH 1957, P. 23

Maryland

SHELLFISH RESEARCH STUDIES: The current shellfish research program of the Maryland Department of Research and Education falls into three general divisions. (1) Studies of the soft shell clam (Mya arenaria), and of hydraulic clam dredging, constitute the full time program of two biologists of the Chesapeake Biological Laboratory at Solomons. (2) Oyster studies in the Chesapeake area are conducted by two other biologists of the Laboratory staff who are assigned to this work on an approximate half-time basis. (3) Oyster studies in the Chincoteague Bay area constitute the major portion of the program of a resident biologist stationed at the Department's field laboratory in Worcester County. Certain phases of the research program are conducted jointly by the above divisions, and there are several cooperative projects with personnel of the Department of Tidewater Fisheries and of the United States Fish and Wildlife Service Laboratory at Annapolis.

Soft Clam Studied: Present emphasis in the soft-shell clam program deals with the effects of hydraulic clam dredging upon the bottom structure, upon rooted

marine vegetation, upon the oyster population, upon the clam population, and upon other associated organisms, especially those of economic importance. Experimental plots have been set aside in the Patuxent River and in Eastern Bay. Observations have been made by aerial photography, skin diving, glass-bottomed viewing boxes, direct observation of flats exposed by exceptional low tides, bottom cores, and by instruments for measuring turbidity and siltation. A modern commercial-type hydraulic clam dredge is used for experimental dredging and gatherning clam population data. Studies of spawning, setting and growth of the soft clam in the Chesapeake area are in progress, and a study of the effect of temperature upon pumping rates of the clam has been completed. A paper dealing with the effects of hydraulic clam dredging has just been published. This supplies information of use to the General Assembly in their consideration of regulatory measures for the industry.

Oyster Studies: Active projects in the Chesapeake oyster research program center around setting and oyster growth. The time and intensity of setting are determined annually by test-shell exposures in the Solomons area and in selected areas that offer potentialities for seed production. Counts of the surviving commercial set on State shell plantings and upon old cultch on natural bars, together with observations on the composition of the bar populations, are made during the fall and winter months in cooperation with the Department of Tidewater Fisheries and the Annapolis Shellfisheries Laboratory of the U. S. Fish and Wildlife Service. Comparisons of rates of growth and of mortality are made among groups of experimental seed oysters from different sources when planted on trays at Solomons and in Chincoteague Bay. Determinations of oyster larvae abundance are made by means of single continuous samples of water pumped from a 12-foot depth by a boat moving the length of the area to be studied. The relationship of the observed number of larvae to the subsequent spatfall on test shells is being studied as a possible means of predicting oyster sets in a given area. Trays of shells are planted during different months of the year at a selected location in St. Marys River in order to compare the efficiency as cultch of shells planted at different seasons. The weighted incidence of infection by the fungus Dermocystidium marinum (a standard method for scoring the degree of infection) is determined each fall from oyster samples in those areas where the parasite has been found.

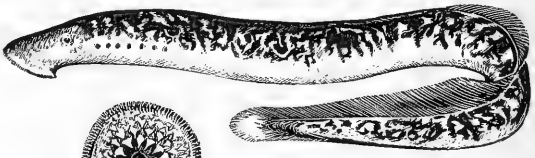
Studies of the seasonal abundance of oyster drills in Chincoteague Bay, and of the effectiveness of drill traps as a control measure are being made in cooperation with the United States Fish and Wildlife Service. Oyster sets on experimental plantings of shells in intertidal windrows, and in suspended wire bags, are being evaluated as a possible source of local seed. The growth and survival of this seed is being compared with that from other sources. Data upon the nature and relationship of the hydrography of the area to oyster growth and to the distribution and abundance of the hard clam are being gathered, together with a general survey of the marine biota.

Compilation of hydrographic and meteorological data is on a continuous basis so that the effects of seasonal and annual variations in environment upon shellfish can be evaluated (G. F. Beaven, Maryland Tidewater News, January-February 1957).

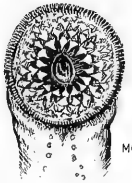
Michigan

SEA LAMPREY WEIRS OPERATING IN 1957: The operation of 90 sea lamprey weirs in Michigan streams was under way in April and many streams will be protected against the passage of the parasitic sea lamprey this year.

The Michigan Conservation Department Director recently granted permission to the United States Fish and Wildlife Service to install, maintain, or operate "screens, weirs, traps and electrical devices" in 90 streams tributary to the Great Lakes for control and suppression of sea lampreys.



SEA LAMPREY
(PETROMYZON MARINUS)



MOUTH OF SEA LAMPREY

The streams include 50 in the upper peninsula, tributary to Lake Superior; 21 upper peninsula streams which flow into Lake Michigan; 17 lower peninsula tributaries of Lake Michigan; and 2 lower peninsula streams which flow into Lake Huron.

The weirs, located near the mouths of streams, set up an electrical barrier which prevents lampreys and fish from moving upstream. Instead, lampreys and fish are guided into traps. The game fish are then removed from the trap and allowed to continue upstream while the lampreys are destroyed.

Lampreys attempt to move from the Great Lakes into streams to spawn and the weirs generally will be in operation from April 1 to July 31, a period which covers the normal spawning time of this parasitic fish that has invaded the Great Lakes in recent years and caused heavy mortality among Great Lakes fish populations, particularly lake trout.

Moorage of Fishing Vessels at Port Orford, Oregon

The safe moorage of fishing vessels presents many difficulties. This article is a photographic report of how the problem of moorage has been solved at Port Orford, a fishing community in southern Oregon not far from the Oregon-California border.

FIG. 1 - THE OPEN EXPOSED HARBOR AT PORT ORFORD. (THE LINE ACROSS THE PICTURE IS A STEEL CABLE ATTACHED TO THE END OF THE DOCK.)

FIG. 2 - THE DOCK. NOTE THE DERRICK USED TO LIFT THE TROLLERS OUT OF THE WATER. THE LARGE BUILDING ON THE RIGHT IS THAT OF A FISH COMPANY.

FIG. 3 - END OF DOCK, SHOWING THE DERRICK AND A PILE DRIVER. (THE CABLE IS THE SAME ONE THAT IS SHOWN IN FIG. 1.)

FIG. 4 - TROLLERS ON DOCK. NOTE HOW THE USE OF THE LARGE DOLLIES PERMITS THE TROLLERS TO BE MOVED EASILY TO ANY DESIRED LOCATION. THESE TROLLERS ARE DAY BOATS: THAT IS, THEY LEAVE IN THE MORNING AND RETURN IN THE EVENING OF THE SAME DAY.

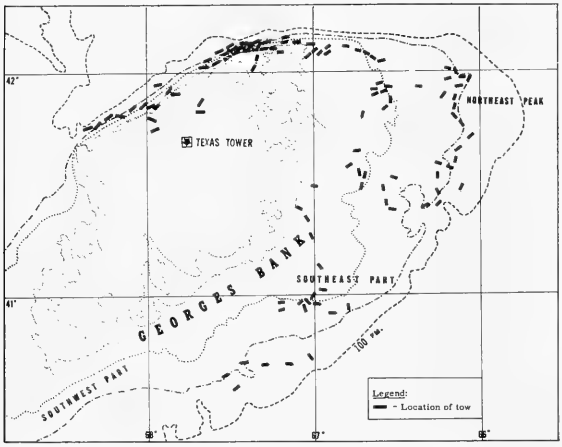
FIG. 5 - FISH COMPANY SITE AT ORFORD. THE PRODUCTS THE COMPANY HANDLES ARE SALMON AND CRAB.

NOTE: THE AUTHOR GRATEFULLY ACKNOWLEDGES THE AID OF CARL FISHER OF THE PORT ORFORD FISH COMPANY.

--BY F. BRUCE SANFORD, CHEMIST,
FISHERY TECHNOLOGICAL LABORATORY,
BRANCH OF COMMERCIAL FISHERIES,
U. S. FISH AND WILDLIFE SERVICE,
SEATTLE, WASH.

North Atlantic Fisheries Exploration and Gear Research

SIZEABLE COMMERCIAL CONCENTRATION OF SCALLOPS ON GEORGES BANK (M/V Delaware Cruise 57-4): Georges Bank supports sizeable commercial concentrations of sea scallops (Pecten grandis) in two areas not presently being fished, according to the results of the second scallop exploratory cruise by the Service's vessel Delaware. The cruise was completed on May 10, 1957.



M/V DELAWARE CRUISE 57-4 (APRIL 23, 1957-MAY 10, 1957)

Scallops were found to be widespread in light commercial quantities in most all areas explored from 30 to 50 fathoms along the northern edge and west of the northeast peak. Most scallops taken were of good commercial size, with some catches yielding nine and ten meats per pound.

During the three-week trip, 117 tows were made with the best catches of 7 bushels/30-minute tow (15 eyes/1 pound) in location 1H3 2152 2138, 1H2 1037 1040 and 8 bushels/40-minute tow (10 eyes/1 pound) in location 1H3 2158 -, 1H2 1066 1057. Eight tows on the SE. part of Georges Bank in depths ranging from 46 to 72 fathoms caught no scallops. Bottom temperature at 72 fathoms was 48.2° F., while the surface temperature was 42° F. Seven tows in depths 52 to 62 fathoms from the NE. Peak in a southwest direction down to Corsair Canyon caught scallops only on two consecutive tows. The catches of 5 and 6 bushels of small scallops yielded 24 and 21 meats per pound. Bottom temperature in this area was 41.9° F. and surface temperature was 42° F. It was interesting to note that in all areas where scallops were taken bottom temperatures averaged about 42° F.

Three variations of scallop dredges were tested:

1. Standard 11' dredge.
2. Standard 11' dredge fitted with depressor plates.
3. Standard 11' dredge fitted with rake teeth and depressor plates.

Dynamometers were used to measure resistance over the bottom as the dredges were towed at different engine speeds. Distance covered was plotted by loran and all tows attempted to cover a localized area.

Initial tests indicate that at 120 r.p.m., resistance of a dredge with a depressor is from 2,000 to 4,000 pounds and the resistance of a dredge without a depressor measured 2,000 to 3,750 pounds. Further tests will be made on the catch efficiency of these two types of dredges.

Six tows made with the rake-toothdredge at 120-140 r.p.m. registered minimum dynamometer readings of 3,200 pounds with maximum readings up to 7,500 pounds. No scallops were taken on these tows probably due to improper thickness and spacing of rake teeth, which caused excessive jumping over the bottom.

Samples of the catch were brine-frozen in bags, brine-frozen individually, dry-frozen in bags, and iced on board for various lengths of time to be used for technological tests at the Service's East Boston Station.

The Delaware was scheduled to depart from East Boston June 6, 1957, for exploration of the offshore Atlantic for pelagic subsurface resources. Four weeks of long-line fishing operations will be conducted within the general offshore area bordered by 65° W. longitude and 35° N. latitude.

Information on the general distribution of tuna (bluefin, yellowfin, and albacore) species in the offshore areas during this season of the year will be the cruise's objective, supplementing the distribution and catch information obtained earlier in the year on cruise 57-3.

North Atlantic Fisheries Investigations

DRIFT OF HADDOCK SPAWN (M/V Albatross III Cruises 90 and 92): A study of the nontidal drift pattern on Georges Bank and its relation to the drift of haddock eggs and larvae was made by the Service's research vessel Albatross III in two cruises (Cruise 90, April 11-17; and Cruise 92, April 25-May 2). The studies were made to develop a method for making predictions of the future abundance of haddock on the basis of the abundance and distribution of haddock eggs and larvae.

This year radio drift buoys developed by the Woods Hole Oceanographic Institution were used to follow the drift of water masses containing developing haddock eggs. Each buoy sends a radio signal on which the vessel can "home" and thus find the instrument.

Cruise 90: The vessel returned from its first cruise of the survey on April 17. On this cruise it observed a strong concentration of eggs on the Northeast Part of Georges Bank, the usual spawning area. Three drift buoys were placed in this area and their drift observed. The buoys drifted to the south and southwest. Samples of the water showed that the eggs were drifting in the same direction. The Albatross III followed these buoys for two days, when she was relieved by the Bear of the Woods Hole Oceanographic Institution which is cooperating with the Service in these studies. The Bear returned to port on April 22.

Approximately 950 miles of continuous plankton tows were made at the surface and 10 meters with Hardy Plankton Recorders; 111 bathythermograph lowerings, 55 salinity samples, 11 meter net and 50 Hensen egg net surface tows were made; 648 drift bottles and 3 transponding buoys were released.

Haddock eggs were found in abundance on the northeast part of Georges Bank. The transponding buoys released in the center of this concentration moved in a southerly direction.

Cruise 92: Approximately 1,200 miles continuous plankton tows were made at the surface and 10 meters with Hardy Plankton Recorders; 119 Bathythermograph lowerings, 60 salinity samples, 8 meter net and 60 Hensen egg net surface tows were made; 720 drift bottles and 1 transponding buoy were released.

Only limited numbers of haddock eggs were found. Failure in triggering mechanism prevented locating transponding buoys "Hotel" and "November."

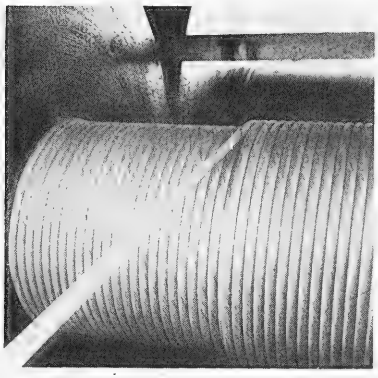
* * * * *

MULTIPLANE KITE OTTER BOARD TESTED (M/V Albatross III Cruise 91): During a short trip (April 22-23) the Service's research vessel Albatross III tested and calibrated a 60-pound multiple-plane kite otter board in the 100-fathom or more area south of Martha's Vineyard.

Fourteen runs were made at 7 knots and 10 knots with the following scopes of cable: 10, 20, 30, 40, 50, 75, and 100 meters. Although vibration was considerable, the gear streamed exceedingly well and appears to have excellent possibilities as a depressor for high-speed sampling gear.

North Pacific Exploratory Fishery Program

MIDWATER TRAWLING EXPERIMENTS TO BE CONTINUED (M/V John N. Cobb Cruise 31): Continuation of midwater trawling experiments was to be the objective of an 8-week cruise by the Fish and Wildlife Service's exploratory fishing vessel John N. Cobb scheduled to begin on April 29, 1957. The experimental fishing was to be done with a 64-foot nylon midwater trawl on the offshore trawling grounds from Oregon to British Columbia. It was planned to work closely with some of the commercial trawlers who have reported seeing schools of fish, presumably Pacific ocean perch, on their echo-sounders in midwater depths on many occasions when their bottom gear was relatively ineffective.



WIRE ROPE WITH INSULATED ELECTRICAL CONDUCTORS AS A CORE BEING USED EXPERIMENTALLY FOR DETERMINING DEPTH OF THE TRAWL ON THE M/V JOHN N. COBB.

A pair of new aluminum midwater trawl doors were to be tried out on this cruise. Equipment was also assembled for experiments to determine depth of the trawl by electrical telemetering. Special trawl cable having electrical conductors in the center were to be tested as a possible substitute for the present system of acoustic depth-telemetering in use on the John N. Cobb.

The cruise was planned to be "split," with a port call at Seattle scheduled for anticipated modifications to the midwater trawling gear and other experimental equipment.

* * * * *

EXPLORATORY BOTTOM FISHING TO BE CONDUCTED IN ALASKAN WATERS (M/V Tordenskjold Cruise 32): The chartered schooner-trawler Tordenskjold was scheduled to leave Seattle on or about May 16 to conduct exploratory bottom-fishing explorations in Alaskan waters. Bottom fish and king crab were to be the primary objectives of the exploration. The vessel is under charter to the Fish and Wildlife Service's North Pacific Fisheries Exploration and Gear Research project for a period of 110 to 150 days, beginning on May 15, 1957.

For approximately the first six weeks of the charter period, the Tordenskjold was to explore potential bottom-trawling grounds off southeastern Alaska, from Dixon Entrance to Baranof Island. Standard commercial-type fish trawls were to be used, and all bottom suitable for trawling will be surveyed out to depths of 300 fathoms.

In the fall of 1956, the Service's exploratory fishing vessel John N. Cobb carried out a preliminary survey on part of these grounds and found that considerable trawling bottom existed north and west of Forrester Island. Some of the catches during that cruise contained fair showings of flatfish and Pacific ocean perch, but the fall weather, which was unusually bad last year, did not allow a complete coverage of the area in which the Tordenskjold will operate.

The last two months or more of the charter were to be spent by the Tordenskjold in explorations south of the Alaska Penninsula and the eastern Aleutian Islands. Fishing with bottom trawls and king crab pots, the vessel was to survey the coastal waters and banks from the Shumagin Islands westward to Umnak Island. Distribution and availability of king crabs and bottom fish were to be recorded, and efficiency of the two types of gear in catching king crabs were to be compared in various localities. Effectiveness of king crab pots on the offshore banks were to be tested, using various types of crab-pot floats and baits.

A biologist was assigned to the Tordenskjold from the staff of the Service's King Crab Investigations to collect data on sizes of the crabs and to tag a number of crabs south of the Aleutians and the Penninsula. While in this area, the Torenskjold was to base at Sand Point in the Shumagin Islands.

NOTE: SEE COMMERCIAL FISHERIES REVIEW, NOVEMBER 1956, P. 45 AND DECEMBER 1956 P. 46.

United States Fishing Fleet[1/] Additions

A total of 45 vessels of 5 net tons and over were issued first documents as fishing craft during April 1957--26 more than during the corresponding month of 1956. The Gulf area led with 13 vessels, followed by the Chesapeake and South Atlantic areas with 9 each, the Pacific Coast area 5, New England 3, and the Middle Atlantic, Great Lakes, and Alaska 2 each.

Table 1 - U. S. Vessels Issued First Documents as Fishing Craft, by Areas, April 1957 with Comparisons

Area	April		Jan.-Apr. Total		
	1957	1956	1957	1956	1956
	(Number)				
New England	3	1	6	6	15
Middle Atlantic	2	1	12	8	26
Chesapeake	9	9	31	21	138
South Atlantic	9	3	28	14	119
Gulf	13	14	35	29	100
Pacific	5	10	19	14	76
Great Lakes	2	-	2	2	6
Alaska	2	9	10	12	40
Hawaii	-	-	-	1	1
Total	45	47	143	107	521

NOTE: VESSELS ASSIGNED TO THE VARIOUS SECTIONS ON THE BASIS OF THEIR HOME PORT.

Table 2 - U. S. Vessels Issued First Documents as Fishing Craft, by Tonnage, April 1957

Net Tons	Number
5 to 9	20
10 to 19	12
20 to 29	3
30 to 39	6
40 to 49	1
80 to 89	1
110 to 119	1
120 to 129	1
Total	45

For the first four months of this year a total of 143 vessels of 5 net tons and over were issued first documents as fishing craft as compared with 107 vessels in the same period a year earlier. This indicated that more vessels entered the fisheries this year than last.

1/ INCLUDES BOTH COMMERCIAL AND SPORT FISHING CRAFT.

U. S. Fish and Wildlife Service

COMMERCIAL FISHERIES ACTIVITIES IN FISCAL YEAR 1956: The Annual Report of the Fish and Wildlife Service for the year ending June 30, 1956, recently released lists activities in fiscal year 1956. The Service's activities of interest to commercial fisheries included:

The establishment of the first voluntary standard of grade and condition for fishery products.

Continuation of a vigorous salmon restoration program in Alaska.

Large-scale testing of several electronic devices used in fish guiding, counting, and other fishery research.

Numerous studies relative to shellfish.

Two promising selective poisons for use in sea lamprey control out of 4,600 compounds tested over a period of time.

Numerous oceanic research problems for the benefit of the fishing industry.

Exploratory fishing cruises discovered a yellowfin tuna resource in the southern part of the Gulf of Mexico, located a red shrimp resource in the deep waters of the South Atlantic, found a fishing ground for large lobsters off New England in deep water, found a new ocean perch fishing area, and studied the Maine sardine fishery.

Through a technological research program, the Service isolated certain chemical components of fish oil which may pave the way for the creation of many new products.

Two fishery motion pictures in sound and color were completed during the year and a third started. These films are financed by interested segments of the fishing industry.

Daily fishery market news reports were released in key areas from seven strategically-located reporting offices. Fish transportation and importation problems were studied. Monthly bulletins were issued on landings in 12 coastal states and Ohio on Lake Erie.

Vigorous restoration measures were continued in the Alaska salmon fisheries. The pink salmon fishery in Prince William Sound was closed completely and trap fishing in southeastern Alaska reduced by 50 percent; more protection was given salmon in the various bays, and the stream guard program was intensified.

Restrictions were invoked and lake fertilization experiments conducted in red salmon areas.

The Pribilof seal harvest was 65,638 skins; 52,597 skins were sold at auction for $4,849,610.

Research on the Atlantic salmon, shad, and striped bass continued in eastern waters. In the Northwest considerable laboratory research was done on electrical fish-guiding devices to divert salmon into bypass channels, and on other devices to protect young salmon from squawfish.

Instruments which record the passage of fish through underwater orifices, giving the direction of the movement were perfected and put into commercial production. Intensive studies of fish behavior during migration were made at the Fisheries-Engineering Research Facility established at Bonneville Dam with the cooperation of the Corps of Engineers. A "sonic tracker," which when attached to a fish sends signals by which the path of the fish can be followed, was developed.

Extensive studies of salmon races were made in accordance with the program outlined by the North Pacific Fisheries Commission.

Studies of the king crab in Bristol Bay, the oyster in Long Island Sound, raft culture for oysters in Massachusetts, soft clam in New England, and the role of chemical elements in the metabolism of marine organism were among the other research projects.

Major attack on the sea lamprey which has ruined fisheries in three of the Great Lakes was centered in Lake Superior where lake trout are still commercially important. All lamprey work was done in accordance with the general program of the International Great Lakes Fisheries Commission.

A new research unit, Ocean Research, located at Stanford University, was opened in September 1955, to study the relationship of climate and ocean conditions to the sudden fluctuations in numbers of commercial fish.

Research continued on sockeye salmon "virus" and on the blue-sac disease.

The lower Columbia River Fisheries Development Program, in its eighth year, brought more evidence of the soundness of that program. Eleven hatcheries have been completed since the program started and two more--at Eagle Creek, Ore., and Carson, Wash.--were nearing completion when the fiscal year closed.

Seal studies indicated that the fur seal is not a salmon predator. Out of 205 stomachs studied during the project only one of them showed any evidence of salmon. Seal hookworm studies were continued.

U. S. Foreign Trade

GROUNDFISH FILLET IMPORTS, APRIL 1957: During April 1957, imports of groundfish and ocean perch fillets and blocks amounted to 12.4 million pounds. Compared with the corresponding month of the previous year, this was a decrease of 912,000 pounds or 7 percent. Reduced imports from Iceland, and no imports from Norway, France, and St. Pierre-Miquelon were primarily responsible for the decrease. Increased imports from Canada (up 1.8 million pounds), Denmark, the United Kingdom, and the Netherlands were not great enough to offset the over-all decrease.

Imports of groundfish and ocean perch fillets and blocks into the United States during the first quarter of 1957 totaled 47.6 million pounds as compared with 51.5 million pounds for the same period the previous year. Canada led all other countries exporting fillets to this country with 34.1 million pounds, followed by Iceland with 10.0 million pounds, Norway 1.9 million pounds, and Denmark with 1.1 million pounds. These four countries accounted for 99 percent of the total imports for the first four months of 1957.

NOTE: SEE CHART 7 IN THIS ISSUE.

* * * * *

EDIBLE FISHERY PRODUCTS, FEBRUARY 1957: United States imports of edible fresh, frozen, and processed fish and shellfish in February 1957 were lower by 24.6 percent in quantity and 23.3 percent in value as compared with the previous month. Compared with February 1956, the imports for February this year were down 11.0 percent in quantity and 11.2 percent in value. Imports for February 1957 averaged 28.7 cents a pound as compared with 28.8 cents a pound for the same month in 1956.

United States Foreign Trade in Edible Fishery Products, February 1957 With Comparisons

Item	Quantity			Value		
	Feb.		Year	Feb.		Year
	1957	1956	1956	1957	1956	1956
Imports:	(Millions of Lbs.)			(Millions of $)		
Fish & shellfish: Fresh, frozen & processed 1/.....	55.0	61.8	786.5	15.8	17.8	231.6
Exports:						
Fish & shellfish: Processed 1/ only (excluding fresh & frozen).....	8.3	6.8	82.8	1.7	1.5	19.2

1/ INCLUDES PASTES, SAUCES, CLAM CHOWDER AND JUICE, AND OTHER SPECIALTIES.

February 1957 imports both as compared with January and the same month a year ago indicate that groundfish fillet imports were down sharply (62 and 42 percent respectively).

Exports of processed edible fish and shellfish in February 1957 declined about 10 percent in quantity as compared with the previous month, but were 23 percent above February 1956. The February 1957 value of these exports was 6 percent lower than the previous month, and higher by 13 percent when compared with the same month a year ago.

During February this year, canned sardine exports were much lower as compared with February 1956, but increases in canned mackerel exports helped to increase the exports of all processed edible fish and shellfish to a higher level than a year ago.

* * * * *

IMPORTS AND EXPORTS OF SELECTED FISHERY PRODUCTS, FEBRUARY 1957: Imports: GROUNDFISH: Fillets imported in February 1957 totaled 4.5 million pounds as compared with 7.1 million pounds in the same month a year ago. Total imports during the first two months of 1957 were 17 percent less than in the same period a year ago, due to a smaller quantity of imports from Canada.

Blocks and slabs imports during February of 2.5 million pounds were 31 percent less than a year ago. But total imports for the first two months of the year amounted to 9 million pounds, 41 percent more than a year earlier. Imports from both Canada and Iceland increased substantially.

FROZEN TUNA: Imports of 11.8 million pounds during February were 25 percent greater than a year earlier due to a large increase in imports of albacore. Imports of other tuna dropped. Total imports for the first two months of 1957 reached 24.3 million pounds, up 17 percent from a year ago.

CANNED TUNA: February imports of 2 million pounds were about the same as the previous year, but total imports for the first two months of 1957 were 10 percent less than a year earlier.

CANNED BONITO: Imports of 1.3 million pounds in February were 2 percent greater than a year ago; imports for January-February this year were about the same as in the first two months of 1956.

CANNED SALMON: Imports of 725,000 pounds dropped off sharply in February. For the first two months of 1957 imports totaled 5.2 million pounds, 2 percent less than a year earlier.

CANNED SARDINES: February imports of sardines totaled 1.8 million pounds, down 8 percent from a year earlier. Imports for January-February 1957 totaled 3.6 million pounds, about 1 percent less than in the similar period of 1956.

SWORDFISH: Imports during February of 1 million pounds were 10 percent less than in 1956. During the first two months of 1957 these imports of 2.4 million pounds were down 12 percent from that period of 1956.

SHRIMP: Imports continued to decline in February when 4.2 million pounds were received, a drop of 29 percent. During the first two months of 1957 a total of 9.9 million pounds were imported, 33 percent less than in that period of 1956.

LOBSTERS: February imports of 4.1 million pounds were 18 percent greater than a year earlier. Total imports for this year through February were 8.8 million pounds, a gain of 34 percent.

CANNED CRABMEAT: Imports declined in February to 215,000 pounds. Imports for the first two months of this year of 520,000 pounds were 37 percent less than in the same period in 1956.

FISH MEAL: Imports of 5,086 tons in February were 34 percent less than a year ago. Total imports for the first two months of 1957 amounted to 9,305 tons, a decline of 51 percent as compared with the same months in 1956. Reduced imports were noted from all countries.

Exports: CANNED SARDINES: Exports of 2.1 million pounds of canned sardines in February 1957 were 56 percent less than in the same month of 1956. Exports during the first two months of 1957 were 64 percent less than a year earlier. Cuba and Philippines were the principal importers.

CANNED MACKEREL AND JACK MACKEREL: Exports in February of 3.2 million pounds were substantially higher than a year earlier as a result of increased shipments to the Philippines.

FISH OIL: February exports totaled 3.7 million pounds, 65 percent less than in that month of 1956. Total exports for the first two months of 1957 amounted to 20.3 million pounds, down 14 percent from a year earlier. Exports to the Netherlands declined, but a large quantity was shipped to Sweden in January.

* * * * *

TUNA CANNED IN BRINE IMPORTS UNDER QUOTA PROVISO, JANUARY-MARCH 1957: The quantity of tuna canned in brine which may be imported into the United States during 1957 at the 12½-percent rate of duty is limited to 44,528,533 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem.

Imports under the quota from January 1-March 30, 1957, amounted to 8,212,021 pounds, according to data compiled by the Bureau of Customs. This leaves a balance of 36,316,512 pounds of the quota which may be imported during the remainder of 1957 at the 12½-percent rate of duty.

Wholesale Prices, April 1957

Demand and prices for fresh and frozen fish and shellfish at wholesale held up well during April due in part to the late Lenten season. Generally prices decline in April as supplies increase seasonally and frozen items in good supply are sold off to decrease carryover into the new freezing season. In April this year the overall edible fish and shellfish (fresh, frozen, and canned) wholesale index (119.3 percent of the 1947-49 average) was about unchanged from the previous month, but higher by about 10 percent than for April 1956.

April 1957 wholesale prices for drawn, dressed, or whole finfish were 3.2 percent lower than in March. Higher prices in April for large drawn haddock and whitefish at New York were more than offset by lower prices for yellow pike, halibut, and salmon. As compared with April 1956, this April's index for the subgroup was up 18.8 percent. Higher prices for large drawn haddock and all the fresh-water varieties were responsible for the increase. The Jewish religious holidays in April were responsible for the price increases for fresh-water varieties, but these increases were partially offset by lower prices for dressed halibut (down 13.1 percent) and dressed salmon (down 2.7 percent).

Prices for the processed fresh fish and shellfish items in April 1957 declined 1.6 percent as compared with the previous month due primarily to a decline in shucked oyster prices which was not completely offset by an increase in fresh small haddock fillet prices at Boston. The April 1957 index for this subgroup was 10.9 percent higher than in April 1956.

During April this year prices for processed frozen fish and shellfish increased 9.0 percent over the preceding month because of higher frozen haddock fillet prices (up 5.3 percent) and a rather sharp rise of about 10 cents a pound (13.1 percent) in frozen shrimp prices at Chicago. As compared with April 1956, wholesale prices for the items in this subgroup in April 1957 were higher by 14.5 percent due chiefly to higher shrimp prices (up 25.5 percent). Wholesale prices for frozen ocean perch and flounder fillets were unchanged this April from the preceding month and April 1956.

Wholesale prices for canned fish remained steady during April with only a slight decline (0.03 percent) from March, but an increase of 2.0 percent over April

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, April 1957 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices1/ ($)		Indexes (1947-49=100)			
			Apr. 1957	Mar. 1957	Apr. 1957	Mar. 1957	Feb. 1957	Apr. 1956
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					119.3	119.4	115.3	108.6
Fresh & Frozen Fishery Products:					132.0	132.0	124.9	115.2
Drawn, Dressed, or Whole Finfish:					119.4	123.4	113.0	100.5
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.11	.10	111.0	100.5	60.7	50.1
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.30	.31	92.3	95.9	105.2	106.2
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.60	.62	134.3	139.3	142.7	137.1
Whitefish,L. Superior, drawn, fresh	Chicago	lb.	.92	.79	198.3	195.8	171.1	171.0
Whitefish,L. Erie pound or gill net, rnd., fresh	New York	lb.	1.12	.90	227.5	182.0	151.7	121.3
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.80	.79	163.9	161.8	143.4	110.6
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.32	.74	75.0	173.5	152.4	49.3
Processed, Fresh (Fish & Shellfish):					140.4	142.7	132.6	126.6
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.36	.34	120.8	117.4	88.5	81.7
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.91	.91	143.8	143.8	130.4	124.8
Oysters, shucked, standards	Norfolk	gal.	5.75	6.00	142.3	148.5	145.4	139.2
Processed, Frozen (Fish & Shellfish):					130.9	120.1	124.4	114.3
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.40	.40	103.4	103.4	103.4	103.4
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.30	.28	92.6	87.9	97.3	91.0
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.29	.29	114.8	114.8	114.8	114.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.94	.84	145.8	128.9	131.2	116.5
Canned Fishery Products:					101.2	101.5	101.5	99.2
Salmon, pink, No.1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	22.65	22.65	120.0	120.0	120.0	120.0
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.20	11.20	80.8	80.8	80.8	77.1
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	9.00	9.00	105.0	105.0	105.0	86.1
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	7.70	7.95	81.9	84.6	84.6	89.9

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.

1956. Prices for canned pink salmon and California sardines were only nominal as supplies from the past packing season were about exhausted. Supplies of canned tuna were plentiful with the market firm. In order to reduce the carryover into the new season that started April 15, canned Maine sardine prices dropped slightly from March to April. Canned fish prices were somewhat lower than in April 1956.

EVALUATING FROZEN TUNA QUALITY

Experiments conducted in Japan have shown that the quality of frozen tuna can be evaluated by measuring the "internal friction" of the frozen meat. The "internal friction" of the frozen fish meat increases with a decrease in its freshness. On the basis of this finding, an instrument was invented for measuring the quality of frozen tuna.

--Modern Refrigeration, August 1955,

International

JAPAN AND RUSSIA SIGN PACT ON PACIFIC SALMON CATCH

An agreement was signed between Japan and the Soviet Union on April 6 that fixed the 1957 salmon quota for Japan in Northwest Pacific waters this season at 120,000 metric tons or 132,276 short tons. Special limitations were put on the catch in the Sea of Okhotsk and the waters off the Soviet Union's Kamchatka Peninsula, according to press dispatches from Tokyo.

The proposal on the part of the Soviet delegates that Japan recognize the Sea of Okhotsk as part of Soviet territorial waters was withdrawn.

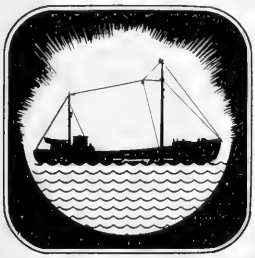
TRADE AGREEMENTS

JAPAN-UNITED KINGDOM PACT INCLUDES FISHERY PRODUCTS: Canned tuna valued at US$1.4 million can be exported to Britain by Japan under the recently-concluded March 1957 Anglo-Japanese trade and payments agreement. Another new quota is for the import from Japan of canned pilchards, worth US$84,000.

Certain goods from Japan placed on the open general license include frozen salmon, while imports of canned crab and whale oil will be admissible without restriction of quantity but under open individual licenses (Fishing News, April 5, 1957).

NORTHWEST ATLANTIC FISHERIES COMMISSION

GERMANY ADHERES TO CONVENTION: The proposal for the adherence of the Federal Republic of Germany to the International Convention for the Northwest Atlantic Fisheries has been ratified by the German Parliament--Bundestag. The last formalities of the procedure of the German adherence were expected to be completed in the near future, possibily before the 1957 Annual Meeting.



CHANGE OF PLACE FOR COMMISSION'S ANNUAL MEETINGS: The Commission's decision in its 1955 Annual Meeting to change the 1949 Convention in order to make possible the holding of Annual Meetings in any of the member countries was approved by all ten member governments by their signature in Washington on August 21, 1956. Up to now information has been received from the Depositary Government on the ratification by the following countries: Denmark, Iceland, Portugal, United Kingdom, and Spain.

MESH REGULATIONS FOR COD AND HADDOCK TRAWL FISHERY IN SUBAREAS 3, 4, AND 5: Proposed by the Commission in its 1955 Annual Meeting, mesh regulations for the cod and haddock trawl fishery in Subareas 3, 4, and 5 in the Northwest Atlantic, were accepted by all countries concerned October 1955-December 1956 (by France with reservations as far as chafing gear is concerned). The amendments to these regulations proposed by the Commission in its 1956 Annual Meeting

have up to date been accepted by the following member governments: Canada, France (with the reservation that the chafing gear clause only come into effect from January 1, 1958), Norway, United Kingdom, and the United States. The Depositary Government has further informed the Commission that as the regulations and their amendments have been accepted by the only two countries members of Panel 5, these regulations and their amendments will become effective for all countries concerned from March 26, 1957.

Although the regulations and amendments have not yet become effective for Subareas 3 and 4, a number of the member countries are already introducing and enforcing them.

1957 ANNUAL MEETING: The Commission's 1957 Annual Meeting was held in Estoril, Lisbon, Portugal, May 20-25. It was being preceded by meetings of the Committee on Research and Statistics on May 17-18. From May 27 to June 3 a Workshop on Population Dynamics and Gear Selectivity was held as a joint meeting by FAO, ICES, and ICNAF.

Delegations from the member countries participated in the Annual Meeting. Observers were present from West Germany and the U.S.S.R., as well as from various international fisheries organizations. (Commission's Newsletter No. 23, dated April 29, reporting activities during December 1956-April 1957).

Note: See Commercial Fisheries Review, January 1957, p. 56.

Australia

FREEZING FISH AND SHRIMP AT SEA PLANNED: In order to process and freeze fish and shrimp at sea in prepackaged form, a Sydney (Australia) firm has purchased the Gulf of Mexico shrimp freezership Rican Star. Present plans call for an investment of about US$445,000. The Rican Star (586 tons) is 182 feet long and has a refrigerating capacity of 350 tons. In addition to the freezership, a steam trawler (Mary Cam) was also purchased. The Mary Cam, plus three or four seine vessels, and a number of smaller craft will make up a fleet of catcher boats which will use the Rican Star as a processing mothership.

The head of the Sydney firm stated that the fleet will fish all around the coast of Australia. Processing the fish and shrimp at sea will enable the firm to market only high quality products. It is planned to market the frozen processed fishery products in 7-pound packages and not in consumer-size packages.

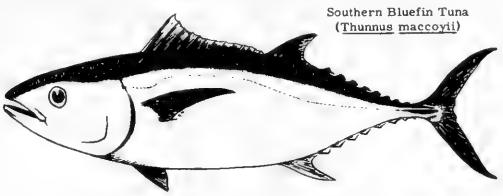
The Rican Star was especially built for freezing shrimp at sea and came to Australia from New York, states the November issue of Fish Trades Review, an Australian fishery publication.

* * * * *

1956/1957 TUNA SEASON SETS NEW RECORD: By the first week of January 1957, the southern bluefin tuna season off the south coast of Australia's New South Wales had reached the record total of 2,296,000 pounds. The commercial fishery for southern bluefin tuna began in 1949 and in the intervening years the catch has varied from 108,621 pounds in the 1951/52 season to the above total for the 1956/57 season. Final figures for the 1956/57 season, which began in September 1956, will undoubtedly be higher. The ex-vessel or landed value of the tuna catch in 1956/57 was about US$115,840 or close to 5 U.S. cents a pound.

The record tuna catch was taken within a few miles of the New South Wales coast by a small fleet of bait boats and trollers. It is possible that large tuna re-

Australia's Tuna Landings 1950/51-1956/57 Season	
Season	1,000 Lbs.
1956/57 to 1st week in January	2,296
1955/56	655
1954/55	921
1953/54	1,053
1952/53	536
1951/52	109
1950/51	305



Southern Bluefin Tuna (Thunnus maccoyii)

sources are available to larger bait boats further offshore. The southern bluefin tuna caught in 1956/57 averaged 15-17 pounds each as compared with an average of 25-30 pounds in the previous season. Live bait was reported plentiful in Twofold Bay (Eden) and in the bays near Bermagui. In the Bermagui area there was a run of 6- to 8-pound bluefin tuna and the fishermen reported that the waters "were alive" with striped tuna.

Lack of adequate freezer space at Eden forced the tuna fishing fleet to restrict their catches during the early part of December when the fish were plentiful. This lack of adequate storage space has made the tuna fishery of New South Wales a stop-and-go affair.

Two firms are processing tuna at the present time. One with canneries at Eden and Narooma received about 88 percent of the 1956/57 catch. A smaller firm at Bermagui received the balance and has had some success with smoked "tuna ham" and "tuna chicken." (Fisheries Newsletter of the Australian Commonwealth Director of Fisheries, February 1957.)

Canada

INSURABLE VALUE OF FISHING VESSELS INCREASED: According to an April 1957 announcement by Canada's Minister of Fisheries, fishermen on both coasts are now able to insure vessels up to an appraised value of $10,000 under the Fishermen's Indemnity Plan of the Federal Department of Fisheries. The previous maximum value of craft eligible for coverage was $7,500. The minimum remains at $250.

The increase was approved by the Canadian Government because of the substantial increase in the cost of replacement of the classes of vessels which have been insured under the Indemnity Plan since 1953.

Provision is made for protection against total or partial loss from collision, foundering, storm and other marine perils, and from fire. The annual premium paid by the fishermen who insure their vessels under the plan is one percent of the appraised value of their craft. At the end of March 1957, some 3,900 fishing vessels valued at about $8,600,000 were covered under the plan.

* * * * *

NORTHEAST PACIFIC SALMON STUDIES: Field studies carried out by Canada's Fisheries Research Board's Station at Nanaimo, B. C., in 1956 included (1) participation for the first time in exploratory fishing for salmon in the North Pacific to determine their distribution and to obtain samples, and (2) extension of the

work begun in 1955 on young salmon to learn more about their migration from rivers of origin and by means of tagging, their subsequent entry into high seas or coastal fishing areas. Both research projects are connected with the work of the International North Pacific Fisheries Commission, states the Canadian Department of Fisheries Trade News of February 1957.

The high seas operations were conducted from mid-May to mid-September using the chartered vessels Challenger and Key West II within an area bounded by latitudes 42° N. and 58° N. and extending off the North American coast westward to longitude 150° W. Thirty-five stations were fished, 10 of which were revisited a second time. Fishing was carried out with gill nets of varying mesh sizes which at times exceeded a mile in length. A total of 943 salmon was caught: chum salmon were most numerous (37.1 percent) and were followed in order of abundance by pink (26.5 percent), sockeye (21.2 percent), silver or coho (14.7 percent), and king or spring salmon (0.5 percent).

The work on young salmon was carried out from early July to mid-September using the chartered drum seiner Cape Blanco and the Key West II which converted from gill-netting to purse-seining. The areas of operation included Chatham Sound, Dixon Entrance, and the west coast of the Queen Charlotte Islands. Young salmon were caught in each of these general areas and many were tagged, using the "spaghetti"-type tag. The numbers of young salmon tagged according to species were: pink--6,639; chum--979; sockeye--134; and silver or coho--192.

In conjunction with both operations, bathythermograph records of water temperatures, water samples for salinity and total phosphate determinations, plankton samples, and Secchi disc readings for water transparency were also collected in an attempt to relate salmon occurrence to certain environmental factors.

* * * * *

SOCKEYE SALMON EGGS SHIPPED TO JAPAN: British Columbia sockeye salmon--about 98,000 of them--will soon be swimming in Lake Chuzenji in Japan. The Canadian Department of Fisheries was advised recently that a shipment of eyed sockeye salmon eggs, despatched in mid-January, had arrived safely at the Nikko National hatchery near Tokyo, where they will be retained until ready for planting, that Department's Trade News (February 1957) says.

The gift arose from meetings between Canadian and Japanese scientists working on fishery surveys in the North Pacific Ocean under the International North Pacific Fisheries Commission.

Japanese members had mentioned that stocks of Kokanee--a landlocked sockeye--in the lake were diminishing. The Canadians offered to send replenishments.

Eggs were procured from 75 sockeye spawners at Cultus Lake and brought to the eyed stage at the British Columbia provincial hatchery before being sent to Japan.

* * * * *

1957 PACIFIC HALIBUT REGULATIONS APPROVED: The 1957 Pacific Halibut Fishery Regulations were approved by the Canadian Government by an Order-in-Council dated March 21, 1957. The Regulations were adopted by the International Pacific Halibut Commission at its annual meeting, held in Seattle January 28-31, 1957.

Ceylon

LIST OF FISHERY PRODUCTS IMPORTS PERMITTED FROM THE U. S.: Canned fish, dried or salted fish, and fish fertilizer are included in the list of products that may be imported into Ceylon from the United States. Canned fish and fish fertilizer are allowed to enter Ceylon without restrictions as to quantity, value, or the amount of foreign exchange that can be allotted. Dried or salted fish require an individual license which is issued at the discretion of the Controller of Imports, and permits are granted only up to the value specified in the individual license.

Fish nets are also included in the list of imports that can be imported into Ceylon without restrictions.

Fiji Island

STATUS OF THE FISHERIES: Although there are plenty of fish in the waters around the Fiji Islands, the fishing industry is not organized and a part of the growing demand for fish must be met by imports. Imports of canned fish have increased in value from £F 184,886 (US$462,000) in 1953 to £F302,562 (US$756,000) in 1955.

A company financed by American capital attempted fishing for tuna in Fiji after World War II. Some £F190,000 (US$475,000) was spent on research and initial expense and £F168,000 (US$420,000) on special vessels and equipment. The fish caught were to have been sent to American Samoa for canning and eventual export to the United States. The company eventually had to abandon operations due to an insufficient supply of fish. The Fijians employed by the company did not know how to fish with long lines and for that reason were unable to catch tuna.

Trocas shell exports have been comparatively high in recent years. Prices continued to rise throughout 1956 and the demand for trocas shell was strong, in spite of the increasing use of synthetics for button manufacture, points out a March 13 despatch from the United States Consul at Noumea.

Note: Values converted at the rate of one Fiji pound equals US$2.50.

Iceland

EXPORT TRADE BILL EXPECTED TO PASS: The bill calling for reorganization of the export trade has passed Iceland's lower house and it is considered almost a foregone conclusion that it will become law during the current session. It may or may not lead to any significant change in fish marketing arrangements, however. With regard to the salt-fish trade, which is presently handled entirely by one organization and which might have been the one most affected by the bill, the Federation of Cooperative Societies has decided that its best interests lie in continuing to do its selling through the present organization rather than set up a new and competing one. At the recent meeting of the Union of Icelandic Fish Producers it voted together with all other members against the bill and against a change in the present arrangements.

The bill is primarily concerned with the question of marketing and not of production. The Union of Icelandic Fish Producers does not limit the amount of salt fish that a producer may turn out. However, members must undertake not to sell to nonmembers. Since the cooperatives have decided to remain in the organization, it is difficult to envisage any new marketing group acquiring an important role. Conservatives consider this a victory of no mean proportions (U. S. Embassy dispatch dated March 15, 1957).

India

NYLON NETS USED SUCCESSFULLY BY FISHERMEN: The excellent catches made by Indian fishermen using a mechanized boat and nylon nets, demonstrated to them by experts of the Food and Agriculture Organization, Rome, is creating a strong demand in India for modern fishing boats and gear.

An Icelandic master fisherman, who is on an assignment for FAO in Madras State, reports: "During the past month we hired out the FAO 22-foot Danish motor-boat and 14 nylon gill nets to some fishermen in Kilakarai. They have landed 7,628 pounds of fish in 12 days of fishing.

They have been so impressed by the results obtained that they have written a letter to the Fisheries Department of the Madras Government urgently requesting the Department to make available such boats and nets immediately."

The second FAO Danish boat in India, with 14 nylon nets, has similarly been hired out to fishermen at Pamban. They have landed 8,067 pounds of fish after 18 days of fishing.

Before the FAO expert trained these fishermen in the operation of the boat and gear, few of them had seen a mechanized boat. But they have been quick to learn. When they have demonstrated their skill in handling the boat and gear, the FAO expert has hired out the boat and gear to them on contract, charging a commercially-justified share of the catch and has left them to prove for themselves the value of mechanized boats and nylon nets.

"This is the most convincing and practical way to introduce modern boats, gear, equipment and techniques," states the Icelandic master fishermen.

Nylon gill nets can also be used in fishing from local log rafts and small sail or rowing boats. Thousands of such craft in India offer a very good chance of quickly increasing the Indian fish catch if nylon nets can be widely introduced, points out a March 1956 news release from FAO.

Japan

CANNED OYSTER PACK, 1954-57: The pack of Japanese oysters in 1957 will reach about 90,000 cases (vary from 6 to 100 cans to the case)--see table 1. The oyster pack data derived from the records of the Japanese Canners' Association and reported in a January 17 dispatch from the United States Embassy in Tokyo, is incomplete for 1956 and 1957, but estimates are believed to be reliable. The 1956 pack was large and due to a substantial carryover the 1957 pack will be reduced.

Table 1 - Japan's Canned Oyster Pack, 1954-1957

Type of Pack	Can's Net Weight		Cans/Cs.	1957 1/	1956 1/	1955	1954
	GRAMS	OZS.		(NO. OF CASES)			
Boiled	187	6.6	48	2/	2/	417	9,166
	145	5.1	48	2/	2/	10,663	-
	273	9.6	48	2/	2/	96	-
Total boiled				30,000	19,000	11,176	9,166
Smoked in oil	55	1.9	50	2/	2/	443	1,070
	55	1.9	100	2/	2/	480	-
	90	3.2	6	2/	2/	2,500	2,407
	90	3.2	24	2/	2/	138	-
	90	3.2	25	2/	2/	6,084	26,643
	90	3.2	50	2/	2/	57,583	30,994
	90	3.2	100	2/	2/	564	2,755
Total smoked in oil				60,000	95,000	67,792	63,869
Broiled	2/	2/	2/	2/	2/	5,821	2,136
Other	2/	2/	2/	2/	2/	1,312	1,816
Grand total				90,000	114,000	86,101	76,987

1/ Estimated. 2/ Not available.

Prices for the principal packs of canned oysters f.o.b. Japan for boiled oysters varied between US$7.30 to 7.90 a case (48 cans of about 5.1 ozs.) from 1954-56 and smoked oysters in oil varied from US$7.00 to 7.30 a case (50 cases of about 3.2 ozs.) during the same period.

CANNED OYSTER EXPORTS: Japanese exports of canned oysters varied from 59,130 cases

in 1954 to 88,000 cases in 1956. In 1954 the United States imported 68 percent (40,281 cases) and in 1955 about 66 percent (47,217 cases), mostly smoked oysters

Table 2 - Japan's Exports of Canned Oysters

Type of Pack	Can's Net Weight		Cans/Cs.	1957 1/	1956 1/	Total			
						1955		1954	
	GRAMS	OZS.				OTHER COUNTRIES	U. S.	OTHER COUNTRIES	U. S.
Boiled	273	9.6				1,722	1,240	1,747	1,300
	187	6.6	48	2/	2/	822	100	3,217	1,350
	145	5.1				9,233	8,643	1,477	1,310
Total boiled				23,000	18,000	11,777	9,983	6,441	3,960
Broiled	2/	2/	2/	2/	2/	2/	2/	25	25
Smoked in oil	90	3.2	50			56,527	35,429	50,656	34,508
	55	1.9	50			2,436	1,635	1,908	1,788
	2/	2/	2/			600	170	100	
Total smoked in oil				55,000	70,000	59,563	37,234	52,664	32,296
Grand total				78,000	88,000	71,340	47,217	59,130	40,281

1/ Estimated. 2/ Unavailable.

in oil. In 1954 smoked oysters in oil made up 90 percent of the canned oyster imports into the United States and about 79 percent in 1955.

* * * * *

COMBINATION LIVE-BAIT AND LONG-LINE TUNA VESSEL BUILT: The Miho Shipyard in Shimizu has launched the first of 6 combination live-bait and long-line tuna vessels ordered by the Omaezaki High-seas Fisheries Association, the No. 1 Nikko Maru (310 tons). This vessel is characterized by its suitability for both types of tuna fishing, and by its large carrying capacity. Hold space is 66 cubic meters (2,331 cubic feet) for frozen tuna, 70 cubic meters (2,472 cubic feet) for iced storage, and 8 cubic meters (283 cubic feet) reserve hold. The ship has an ammonia plant with a freezing capacity of 800 kan (6,600 pounds) a day.

The Nikko Maru has a top speed of 11.5 knots, cruising speed of 10 knots, and 65 days cruising range. Equipment is worthy of a modern fishing boat, including automatic pilot, loran, echo sounder, and a remote sea-water thermometer. Construction cost was US$330,000. It is expected that the remaining 5 vessels will be completed by August 1957, states the Nippon Suisan Shimbun of February 18.

* * * * *

NEW TUNA FISHING GROUND OFF MARQUESAS ISLANDS REPORTED: The Japanese tuna vessel No. 10 Seisho Maru (720 tons), which sailed from Shimizu on December 20, 1956, has since been working actively in the Southeastern Pacific and has recently reported to Shimizu the discovery of a new tuna fishing ground on the eastern side of the Marquesas Islands. According to this report, the new ground is in the vicinity of 6° S., 126° W. Since January 26, the vessel has been making catches day after day of 4,000-5,000 kans (16-20 tons), which is 2 or 2.5 times the catches made on the Indian Ocean grounds.

The catches are composed of yellowfin and big-eyed tuna and black marlin. The fish are large, mostly 160 to 300 pounds, and it looks as if the fishing may be good there throughout the year, reports the February 18 Nippon Suisan Shimbun.

* * * * *

TUNA FISHING PERMITS TRADED AT HIGH PRICES: Because of the record-breaking catches made along the Japanese Pacific coast last year by tuna seiners, the shipyards of the coastal prefectures are enjoying a seiner construction boom. Because of the desire of the operators to qualify for government financing for these

new seiners, efforts are being made in various fishing ports to buy up tuna fishing permits, according to reports from Aomori Prefecture. Brokers in the neighboring prefectures have already taken a number of permits from that Prefecture, and the Aomori Prefecture Seiners' Association is trying to put a stop to the buying up of these permits, points out the Nippon Suisan Shimbun (February 20, 1957).

* * * * *

TUNA INDUSTRY AND LICENSING SYSTEM PROBLEMS: It is difficult at the present juncture to get an accurate grasp of the state of the tuna resources, and there is no landmark for a new direction in the production end of the industry, according to a Tuna Investigative Committee report, an article points out in the Japanese fishing industry weekly Suisan Shuho (January 25).

Table 1 - Income and Operating Costs of Japanese Tuna Boats

Vessel	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Tonnage	360	360	360	320	310	240	180	160	160	160	150	80	90	40	30	80	69
Refrigeration	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Period surveyed	1/55-3/56	1/55-12/55	1/55-12/55	11/54-11/55	1/55-12/55	1/55-12/55	12/54-1/56	11/54-12/55	8/55-7/56	9/55-8/56	2/55-1/56	8/55-7/56	8/55-6/56	8/55-7/56	8/55-1/56	6/55-5/56	10/54-9/55
Number of trips	4	4	3	5	4	4	4	5	5	3	5	9	6	20	11	12	8
Weight of catch (lbs)	1,719,755	1,510,176	1,325,615	1,771,955	1,265,310	1,030,450	723,642	829,388	450,128	450,128	574,112	315,848	321,926	187,448	216,368	371,679	300,679
Value of catch (US$)	154,129	119,101	104,669	163,874	102,178	80,743	60,013	61,669	44,567	44,581	47,832	39,642	33,575	26,355	27,444	32,433	18,757
Direct expenses (percent)	35.6	34.3	31.6	33 1	30.1	33.6	44.0	47 0	35 8	39.2	35.1	45 9	45 0	53 9	24 8	37 8	37.7
Sales commissions	4.6	3.0	3.0	3.9	4.8	2.1	5.0	4.3	7.9	5.4	2.8	8 8	5.7	8.5	7.6	3.5	0.4
Trip expenses	31.0	31.3	28.6	29.2	25.3	31.5	39.0	42.7	27.7	32.8	32.3	37.1	39 3	45.4	35.2	34.3	37.3
Crew's share (percent)	21.4	20.0	17.8	29.8	19.7	15.0	14.2	25.2	24.9	17.7	20.8	25.5	14.5	20.4	24.4	18.6	16.5
Indirect expenses (percent):	43.0	45.5	50.6	37.1	50.2	53.4	41.8	27.8	39.5	43.1	44.1	28.6	39 5	25 7	32.8	43.6	45.8
Interest	5.2	6.5	10.0	2.6	9.8	11.2	8.7	1.9	11.4	6.3	7.8	4.2	-	4.8	4.1	15.3	12 9
Amortization of ship	20.7	12.1	22.4	20.6	19.9	24.5	16.6	6.7	12.7	14.5	9.0	0	7.0	9.8	9.7	6.0	8.3
Other expenses	17.1	17.0	18.2	13.9	20.5	17.7	16.5	19.2	15.4	22.3	27.3	24.4	32.5	11.1	18.9	22.3	24.6
Total expenses (US$)	150,598	117,982	114,729	133,119	120,751	109,787	75,653	63,116	1/96,743	52,265	62,002	36,959	39,859	25,074	27,522	42,223	23,769
Income less expenses (US$)	+3,531	+1,120	-10,059	+30,755	-18,574	-29,044	-15,640	-1,447	+425	-7,684	-14,071	+2,684	-6,284	+1,281	-78	-8,956	-5,009
Month launched and material (S-steel; W-wood)	3/55 S	2/54 S	12/54 S	2/53 S	10/52 S	9/52 S	10/54 S	6/37 1/S	5/54 W	8/54 W	2/47 S	12/48 W	5/48 W	9/52 W	5/54 W	8/49 W	8/48 W
Remaining fitting out capital owed (US$)	52,782	51,699	53,340	None	36,114	1/71,117	74,108	None	51,449	41,670	23,813	None	None	None	8,195	19,140	14,132

1/Original figure garbled?

However, the drying up of the tuna stocks is already regarded as an actual and growing problem, the assignment of the Japanese Fishery Agency's research ship Shoyo Maru to a survey of tuna grounds in the Atlantic appearing to be in itself an admission that the resources of the Pacific and Indian oceans are declining. Therefore it is probable that when the results of the Atlantic surveys are known, tuna boats cannot be allowed to swarm into that area and catch as much tuna as they can take out of it. The domestic demand for tuna sausage has increased strongly, and a large supply of raw material is desired, but on the other hand the medium and small vessel operators are criticizing mothership-type operations as outrageous. The tuna industry has its problems in the lack of coordination of the resource--production, distribution, and consumption relationships--and unlike other fisheries, these problems are too difficult to be handled simply by a shift of fishing grounds. Therefore, before trying to take a new, over-all view of the "tuna industry," let us first attempt to look at the problems of the present licensing system, while keeping in direct view the actual state of tuna business operations.

From the Operational Point of View the Resources are Declining: It is said that when conservation scientists are listened to, it is generally too late. The time of seeking their opinions has come, and these good people have been dragged into the limelight by the Tuna Investigative Committee. The idea was to get the opinions of the experts, and then to determine the degree of regulation of production. However, the scientists were of two opposite opinions. One is the theory that there is no decline in the tuna resources, and that changes in the fishing conditions are controlled to a greater extent by natural causes than by man's fishing activity. The other opinion holds that changes in catch rates are to be regarded as changes in the resources, and that among the individual tuna species, yellowfin are just holding their own, albacore still offer room for expansion, there is no need to worry about black tuna and big-eyed, but the spearfishes should be watched carefully.

For both of these theories, data with which to elucidate the state of the tuna resources are lacking, and they both lead to the conclusion that "We have not yet reached a stage where we can determine the causes of fluctuations in fishing conditions or

estimate the catch accurately, so at present we should pay very close attention to the trends of the tuna resources," which is no conclusion at all.

However, an entirely different and powerful claim has been put forth. It says that "The tuna resources, from the point of view of fishery operations, are declining. This can be seen by looking at the drop in the average catch rates and the decrease in catch per vessel-ton. The shifts year by year to more distant grounds are also an indication of the decline of the resources in home waters. Even though it be said that biologically the resources are not being depleted, from the standpoint of the operators the falling catch rates, the increasing trip time, and the changes in the value of fishing grounds have to be considered indicative of a decline in the fishery resource."

In short, this is an expression of the thinking on the subject of resources from the point of view of actual fishing operations, as opposed to that of purely scientific study. The same disparity is seen in the views of Japan on the one hand and of the United States and Canada on the other with regard to the investigations of salmon resources under the tripartite treaty, and it is also like the opposition of the views of the Soviet scientists Baranov and Moiseev concerning the North Pacific salmon resources.

Increasing Distance of the Fishing Grounds and the Actualities of Operation: Leaving aside this problem of declining resources, the Japanese tuna fleet, under the encouragement of special legislation (repealed June 8, 1955), has increased in number and size of vessels until the 1955 catch of 361,410 tons was 1.6 times that of the highest prewar year, 1940. Since the repeal of the special legislation, the trend has been toward stricter regulation, but if we look at the cases of individual vessels of the existing fleet, there has been a conspicuous tendency for the rising costs accompanying the fall in catch rates and the increasing distance to the fishing grounds to greatly hinder tuna fishing operations.

At present the tuna fishing grounds can be broadly divided into three--the Pacific, the Indian Ocean, and the Atlantic. Japanese tuna boats are actually working in two of these, the Pacific and the Indian Ocean, and according to operational statistics of vessels fishing in these areas, the catch rates in both are falling year by year. In pursuing the tuna, there is a natural competition to build bigger boats, but the result has been to bring about a vicious circle in which there is not much difference between a 600-ton boat and a 1,000-ton boat. Table 1 gives examples of tuna-boat operations compiled from data gathered during the past year by the Tuna Fishermen's Association on the income and expenditures of 24 tuna boats ranging in size from 30 to 360 tons. From this table it can be seen that about 30 percent of the boats are operating in the red. And leaving out of consideration the cases where boats came into port at a time when fish prices were high, it is indicated that the cause of these unprofitable operations was the trip expenses, that is, the cost of directly consumed material such as fuel. It is shown that among vessels of the same size class, those that made a smaller number of trips went in the hole just that much deeper, and it is clear that in the case of both distant-water and medium-size boats income and outgo were only balanced by making a large number of trips.

Problems of the Present Licensing System: If we look at the problem of the increase in tuna boat size, we can immediately see the contradictions which actually exist in the tuna fishery. And if we dig deeper into the crisis of the tuna fishing industry, it appears--as long as the problem of the resource is not understood--that the root of the trouble is in the present licensing system.

The tuna fishery licensing system in force at present distinguishes four groups: small, medium, distant-water, and mothership-type operations. The fact that there is no consistent policy applied vertically through these four groups gives rise to problems of various kinds. Even the Investigative Committee's report recognized

that "in the regulation of the tuna fisheries, with due regard to the business operations of the industry and to international factors, the system under which the operations of medium-size, distant-water, and mothership-fleet vessels are separated should be reorganized into a coordinated system." This could even mean a departure from present fisheries legislation and the establishment of a distant-water fishing law. However, such legislation could hardly be expected to materialize very soon, and the idea was set aside pending a general reform of fishery laws.

Nevertheless, under present conditions the opposing movements within this fishery will probably grow stronger and stronger. This is because, with regard to the increase in vessel size mentioned earlier, there are many factors which bring about inequities at the producing level in the relationships between medium and large vessels and between single-vessel operations and mothership-type operations.

Now to look at the licensing policies for the four separate types of fisheries. First, for the small coastal boats, the Investigative Committee has recommended giving each prefecture a licensing quota under certain fixed conditions, for the sake of reviving and rationalizing the fishing villages, and since this is also approved by the authorities, we will expect its materialization. For the medium-size boats, whose growth is now blocked at the 100-ton line, steps are to be taken to remove this restriction. In this case a combined vessel replacement system will probably be adopted, taking into account production and consumption and avoiding an unlimited expansion of vessel size. For the distant-water vessels, however, no upper limit has been set. Doubtless improper competition should be restrained, perhaps with a limit set provisionally at the 1,000-ton line.

Conflicts Between Mothership-Type and Single-Vessel Operations: The problem is, of course, in the relationship between mothership operations and those of vessels working singly. It is considered that for the motherships a quota limit of 14,930 tons, like that of last year, will be continued. The dissatisfaction of the mothership companies with this is very great. The Nippon Suisan Company, which last year was held down to 2,150 tons, maintains that it must have at least 3,300 tons to break even. However, there are also the small and medium operators, who are dead set against this mothership-type operation, and the views of the fishermen's association are that, even though it may not be possible to eliminate them altogether, the mothership operations might be continued at the present level if it were part of an over-all policy for the relief of the small and middle-size operators. At any rate, there will be no change in their opposition to any expansion of mothership operations. The cries of the small and medium operators that the motherships should be completely done away with because of the decline of the resources can probably be dismissed as an appeal to emotion, in view of the ratio of their 14,930 tons to the total catch of over 350,000 tons. The source of this opposition is alarm at the subjection of small and medium operators to big capital through the formation of direct connections between individually-operated ships and the mothership companies, which since they are caught in a bind between the growing domestic demand for tuna sausage and the restraint on the catches of their mothership-type fleets, are seeking to get large supplies of raw material from the individually-operated vessels. However, even among the so-called individually operated vessels, some of the large ones working in the Indian Ocean are using boats which they carry aboard or which accompany them and are thus operating in a semi-mothership form, so the whole subject needs re-examination. The problem is whether to put the semi-motherships in with the regular motherships. With single-vessel operations in distant waters becoming gradually more difficult, it is probably a natural development to apply mothership-type techniques in both the Indian Ocean and the South Pacific. There is much doubt, however, as to what course will be taken by the Fishery Agency, which is in somewhat of a dilemma.

Supply Bases as a Means of Overcoming the Crisis: As the fleet has gone farther out in pursuit of the fish, the grounds have become more distant, but there are natural limits to this trend. The boats are fishing in waters around Mad-

agascar, on the east coast of Africa, and in the Arabian Sea, but to go farther than that appears to be unreasonable from a business standpoint.

This would seem to mean that in the present stage we need to set up supply bases near the fishing grounds in order to lighten the trip expenses, which have grown into an unreasonable burden. Industry circles consider that the promotion of plans for supply bases for vessels fishing the Indian Ocean is a project for this year. Their first candidate is the port of Mombasa on the east coast of Africa, and they have initiated negotiations with the ruling power and with the ministries concerned. If this materializes, fuel can be obtained at approximately the same price as at Singapore, and it is considered that fully profitable operations will be possible not only for large vessels but also for boats of the 300-ton class. The only obstacle is the problem of increasing the quota of foreign exchange for fuel oil, and strong efforts are being made at the Finance Ministry to get this done as a measure to overcome the difficulties of the tuna fishing business.

If this is advanced a step further, we come to the stage of agreements for fishing bases, with landings and sales of the catch, amounting to an advance of the tuna fishing industry into foreign territory, but this development is forced to mark time because of the Fishery Agency's administrative policy of holding back foreign-based enterprises which have the export of tuna to the United States as their object. The only hope is for expansion of the European market, but although France and Italy have begun to show signs of activity, it is likely to be a long time before anything important develops.

Early Establishment of Assignment of Fishing Grounds by Vessel Size: One remaining means of breaking through the crisis of the tuna fishery is to develop new fishing grounds by privately-owned vessels, as in the past, the limit of what can be done by private capital has been reached. Great expectations are held for the Fishery Agency's research ship Shoyo Maru, and the problem seems essentially to be to get a rapid grasp of the facts concerning tuna spawning grounds, migration of the young, and growth rate.

Mothership-type operations, which cover a ground intensively over a short period of time and clean it out at one crack, will probably be a problem from a conservation point of view, but even aside from mothership operations, it seems desirable in the present stage to hasten the adoption of selective gear and fishing methods and the establishment of a system of assignment of fishing grounds in accordance with the size of the vessels.

This latter point is particularly related to the encouragement of construction of larger vessels, and it should be an extremely effective means of relieving the problem of excess fishing power. With the series of nuclear experiments by the British at Christmas Island coming up, the fishermen's association is planning for a shift to the fishing grounds of the Indian Ocean. This, however, as set forth earlier, will have serious effects on the business operations of the fishery just because of the increased distance to the grounds. At any rate, it does represent a step toward the assignment or rotation of fishing grounds, and if it is accompanied by investigations of the resources, it may possibly lead to a regulative policy which will take into account the business management of the industry.

Is There Little Hope for Effect From the Committee's Report?: The Fishery Agency has, while wrestling with the 1957 budget, had on its hands the matter of establishing tuna policies based on the Investigative Committee's report, but with the decision of the cabinet on the budget, the Agency will at the end of this month at last begin work on this matter.

A conference on tuna export policies which includes persons connected with the markets has already taken up where the Investigative Committee left off in the field

of exports, and it is known that they are taking up the problem of agreements on ex-vessel prices. However, on the problem of the licensing system, which should be the keystone of tuna policies, there is ample reason to fear that the matter will be passed off with just some partial reforms.

This is because the reform of the fishery laws is many years in the future, and the tuna fishery, which cannot get free of the fishery rights with which that law is so involved, has no hope for any basic reform at an early date.

Although we now have the report which was made as a result of the setting up of a consultative body by the Kono fishery administration, there are those who think it all the more doubtful that this report will be reflected to any extent in administration for the very reason that the tuna fishery does present such important problems.

Don't Shy Away from the Establishment of Policies: Now that 12 years have passed since the end of the war, one feels that all of the problems of the fisheries have come to light and that the time has come to find the way to stability for the fishing industry. As a beginning, the Fishery Agency is going to examine the reorganization of whaling. When the results on that are out, they will get around to the reorganization of other fisheries, but in the case of tuna, as has been said, the internal maladjustments are extremely bad. Although consistent policies running through conservation--production--distribution--and consumption are desired, wherever one touches the structure there are immediate repercussions of opposition between levels, and that is why the authorities shy away from any reforming of the system, let alone seeking new legislation.

The tuna fishery is up against a great wall, and although in this it shares the fate of the fisheries in general, another reason can be found in the length of the period during which it was let go without policies or management. We hope that the Fishery Agency will go deeply into the actualities of the business operations of the fishery, without wasting time on "careful study," and if they see a need for concrete action, that they will go ahead with enough enthusiasm to set up a tuna policy even if it has to be done in the form of an emergency order.

Mexico

MERIDA SHRIMP FISHERIES TRENDS, JANUARY-MARCH 1957: Shrimp exports from Merida, Mexico, during the first quarter of 1957 totaled 3.3 million pounds, all of which went to buyers in the United States, according to a dispatch from the United States Consul in Merida (April 11, 1957).

Average prices for 15-20 count headless shrimp per pound f.o.b. Brownsville, Tex., were reported to be: 70 cents in January, 68 cents in February, and 75 cents in March. Smaller sizes were approximately 5 cents a pound lower for each size grade smaller than 15-20 count. These prices at Brownsville were approximately 20 percent higher than the prices for the similar quarter in 1956.

Total shrimp landings in the Merida area were good, but the catch per boat fell off considerably. This may be attributed to the increased number of fishing vessels. At the moment, there are approximately 40 more fishing vessels under construction at Ciudad del Carmen and approximately 35 more at Campeche.

Due to the rapid depletion of large shrimp on the banks off Campeche, the Mexican Maritime Department has ordered part of the State shrimping fleet to Veracruz and Tamaulipas, where large shrimp are reported more plentiful. In compliance with the order, 20 fishing vessels moved into the new areas and it is anticipated

that several more vessels will also be transferred to those areas, if found to be necessary.

* * * * *

VERACRUZ FISHERIES TRENDS, MARCH 1957: Catches of fish and shrimp in the Veracruz area were not good at the beginning of the January-March 1957 quarter, but improved at the end of February. Early in March about 660,000 pounds of mackerel were taken near Veracruz and by the end of the month catches were definitely good. The fishermen were receiving about one peso a kilo (about 3.6 U.S. cents a pound) and this price was considered to be high enough to enable the fishermen to make some money. Improvements in the refrigeration plants located in Veracruz, Alvarado, and Frontera may have contributed to the more profitable operations.

During the first quarter of 1957 large brown shrimp have been relatively scarce and the Veracruz area shrimp vessels were catching the smaller less profitable white shrimp found closer to shore (United States Consulate at Veracruz, dispatch dated April 1).

* * * * *

SHRIMP FISHERY TRENDS, MARCH 1957: Shrimp landings by the Mexican shrimp fleets in March followed the pattern established early in 1957. The catch through March on the west coast is falling behind that of 1956 and the catch on the east coast is greater this year as compared with last year.

The National Cooperative Confederation during March was in the process of negotiating shrimp fishing contracts with the boat owners for the west coast of Mexico. The present contract expired on March 15, 1957. The cooperatives were asking for an increase of 1,345.00 pesos (US$107.69) a metric ton of headless shrimp. This represents an increase of about 4.9 U.S. cents a pound, headless weight.

At Salina Cruz, Oaxaca (the only area open in March for fishing on the west coast because a closed season is in effect for Lower California, Sonora, Sinaloa, and Nayarit beginning with March 15 and probably continuing through May 15) the boat owners agreed to an increase of 1,125.00 pesos a ton plus an additional 30 pesos a ton when the catch per trip was two tons or more. In addition the boat owners agreed to pay for the loading and unloading of the boats. This represents an increase of about 4.2 U.S. cents a pound (heads-off) when the trip is less than two metric tons and about 4.3 U.S. cents a pound when the catch is two tons or more. The boats out of Salina Cruz in March were averaging less than two tons a trip, states an April 18 dispatch from the United States Embassy in Mexico.

Norway

FISHERIES TRENDS, MARCH 1957: The catch of winter herring by Norwegian fishermen for the season that ended February 15, 1957, amounted to about 786,250 metric tons as compared with 1,166,666 tons for the 1956 season. The 1957 herring catch was utilized as follows: for fresh purposes, 98,570 tons; for curing, 83,918 tons; for canning, 13,015 tons; for fish meal and oil, 581,882 tons; for fish bait, 4,087 tons; and used for domestic comsumption, 4,778 tons.

As of the first week in March the spawning cod fisheries continued to be disappointing with bad weather contributing to the lower catch. The catch of cod from the Lofoten fishery was only 7,753 tons, down 5,869 tons from the 13,616 tons landed

in a similar period in 1956. The total catch of cod from all districts up to the first week in March 1957 was 26,413 tons as compared with 44,280 tons for the same period last year. The cod catch has been sold as follows: for drying, 6,280 tons; for curing, 14,691 tons; and 5,442 tons for fresh purposes (Fiskets Gang, March 7, 1957).

* * * * *

COD FISHERIES TRENDS TO MARCH 28, 1957: Landings of spawning cod continued to be disappointing, especially from the Lofoten Islands area. The total Lofoten cod catch through March 28 was only 14,800 metric tons, as compared with 49,397 tons landed during a similar period in 1956.

Landings of cod from the Finnmark-More og Romsdal districts were close to 43,456 tons as of March 28, or 46,253 tons below the catch of 89,709 tons landed by this date a year ago. The season's cod catch has been sold for the following purposes: 13,041 tons for drying: 22,768 tons for curing; and 7,647 tons for fresh purposes. In addition, 1,815 tons of cod liver oil have been processed and 2,704 tons of cod roe have been either salted, canned, or sold as fresh (Fiskets Gang, March 28, 1957).

* * * * *

SARDINE ADVERTISING CAMPAIGN IN BRITAIN SPONSORED BY CANNERS: The Norwegian fish canning industry has provided three million kroner (US$420,000) for a three-year advertising campaign in Great Britain. Industry leaders hope that the Volvo-type agreement for the exchange of Norwegian sardines for British cars will represent a first step in the campaign to win back the British market backed up by the projected advertising campaign.

Before the war, Norwegian sardines were very popular in Britain, about 200,000 cases a year being sold to the British, but postwar sales gave way to British competition.

The British producers are launching a campaign against the sardine-car agreement. A sharp protest to the British authorities is being prepared, in which the agreement is referred to as "dumping," as the sardines are exported at 11.5 percent below the regular price. Norwegian canners, however, maintain that they are not dumping, and that they are selling the sardines at the authorized minimum price, according to press sources quoted by the United States Embassy in Oslo (April 5, 1957).

GOVERNMENT ASSISTANCE TO FISHERMEN PROPOSED: Because of the failure of the Lofoten cod fisheries, many fishermen have suffered severe losses and are unable to finance continued fishing in other waters. The Norwegian Ministry of Fisheries has therefore proposed the appropriation of 7 million kroner (US$980,000) for loans to fishermen, and 300,000 kroner (US$42,000) to be added to the Government's Guarantee Fund for Fishermen.

Panama

PINK SHRIMP CATCHES IN 1957 HIGHER: The February 1957 run of pink shrimp (Penaeus brevirostris) promises to exceed all past records, according to a March 28 dispatch from the United States Embassy in Panama City. The pink shrimp run, which usually occurs in March, appeared earlier than usual this year. During February the packing firms operated at capacity level for most of the month and at times the smaller firms had some losses due to the heavy volume.

The early dry season accompanied by the strong northeasterly winds brought the pink shrimp into the Gulf within reach of the Panamanian shrimp boats whose maximum fishing depth does not exceed 50 fathoms. The catch in November-January was about 1 million pounds, well above the total catch of pink shrimp in the 1956 season. Catches of the boats increased steadily from the end of January with the height of the season the last half of February. On February 23, some 131,000 pounds (which was estimated to be about 50 percent of the total catch that day) were unloaded by the boats owned by the Cooperative. The daily catches were spotty in March with a sharp reduction in the first week offset by heavy catches around the middle of the month. Several holidays on which the boats did not go out also reduced the total catch for the month of March.

The Cooperative, principal packer in Panama, reports that it was able to handle all pink shrimp offered by independent boats as well as the catch of its own 52 boats. The bottleneck this year was in the unloading of the boats due to the tide. Three tides were required on several of the heavy days to unload the catch and service the boat for its next trip. The company handled as high as 72,000 pounds of packed and frozen shrimp in a single day. Refrigerated storage space of the national abbatoir was used to supplement the firm's own plant facilities. The longshoremen's strike which cancelled one round trip of a ship of The Panama Line, regular carrier of shrimp, placed further strain on limited storage facilities. Four shipments totaling around 68,500 pounds of packed and frozen shrimp were sent to Miami by air freight.

Facilities of the three smaller packers are known to have been taxed heavily and some losses were incurred, particularly in the first week of the heavy run. The total amount of pink shrimp packed by the small companies, however, is 4 to 5 times greater than their production in the 1956 season.

The total catch of pink shrimp for the 1957 season may reach 3 million pounds as compared with 600,000 pounds taken in the 1956 season. The pink shrimp were still being caught at the end of March on an average of 15,000 to 20,000 pounds a day. The water temperature, however, was gradually rising and the pink shrimp were expected to return to deep water.

Peru

CANNED BONITO PACK LOWER: Due to a shift in ocean currents, the 1956/57 Peruvian bonito season, which usually ends in April, has been cut short, points out a March 26 United States Embassy dispatch from Lima. Thus the canned bonito pack for this season will probably be at least 100,000 cases less than that of the previous season (estimated to be between 1.4-1.5 million cases).

Portugal

FISHERIES TRENDS, DECEMBER 1956: Sardine Fishing: The Portuguese sardine catch during December 1956 of 9,531 metric tons (value US$1,663,000 ex-vessel) was better than average and exceeded that for December 1955 by 2,329 tons. The December sardine catch declined seasonally from the November 1956 catch of 16,906 tons.

Sardines purchased by the packing centers during the month amounted to 6,712 tons (value US$970,000) or about 70 percent of the catch. During December 1955 the canners purchased 4,303 tons. The fresh fish markets in December 1956 took 2,811 tons and only 8 tons were used for salting.

The principal port of landings for sardines in December was Matosinhos with 61 percent of the catch followed by Setubal with 11 percent and Peniche, 10 percent.

Other Fishing: The December 1956 landings of fish other than sardines was confined to 8,233 tons (value about US$420,000 ex-vessel) of chinchard. Landings previously unreported for October and November 1956 included 170 tons of tuna, 62 tons of bonito, and 1,678 tons of mackerel (Conservas de Peixe, February 1957).

* * * * *

SARDINE LANDINGS, 1956: Sardines landed in 1956 by the Portuguese fishing fleet totaled 93,172 metric tons, an increase of 11 percent from the 1955 landings of 83,967 tons, points out an April 3 United States Embassy dispatch from Lisbon.

Other species landed by the fleet of 370 boats and from the 13 traps were: chinchards, 33,885 tons (28,233 tons in 1955); anchovies, 4,523 tons (3,918 tons in 1955); other, 32,085 tons (11,162 tons in 1955). The fishing boats alone--excluding traps--accounted for a catch of 93,163 tons of sardines and 66,796 tons of other species.

Of the sardines landed in 1956, 51,202 tons were purchased by canneries and 41,970 tons were purchased as fresh fish for local consumption.

COD FLEET SAILS: The 53 sailing and motor vessels comprising the hand-line cod fleet were assembling in the Tagus River late in March before proceeding next week to the Newfoundland banks, and later to the Davis straits, for the 1957/58 season. The hand-line fishing vessels will have aboard some 4,000 men, mainly dorymen.

The 22 vessels of the cod trawler fleet, with about 1,500 men, preceded the hand-line vessels to the banks. Some units of the trawler fleet left in the latter part of February. The trawlers will return to unload cod cargos during mid-summer, later going to the banks for a second fishing voyage.

The Portuguese cod fleet was reported here to be the largest of the cod fleets, and the fleet this year comprises more vessels and a larger aggregate tonnage than ever before. Modernization of the fleet and the development of improved fishing methods have been achieved along with steady expansion of the industry.

The cod catch rose to a peak of 75,054 metric tons (wet basis) in 1956/57, from 68,537 tons in 1955/56 and 65,238 tons in 1954/55. The total number of vessels (hand-line fishing vessels and trawlers) increased to 75 in the present season from 72 last year and 70 in 1955. The number of fishermen has increased by about 500 since 1954 and there are about 100 additional crew members.

Other species landed by the fleet of 370 boats and from the 13 traps were: chinchards, 33,885 tons (28,233 tons in 1955); anchovies, 4,523 tons (3,918 tons in 1955); other, 32,085 tons (11,162 tons in 1955). The fishing boats alone--excluding traps--accounted for a catch of 93,163 tons of sardines and 66,796 tons of other species.

Of the sardines landed in 1956, 51,202 tons were purchased by canneries and 41,970 tons were purchased as fresh fish for local consumption.

* * * * *

CANNED FISH EXPORTS, 1956: During 1956 Portugal's exports of canned fish amounted to 62,756 tons (3,302,900 cases), valued at US$37.4 million, as compared with 63,701 tons, valued at US$32.4 million, for the same period in 1955. Sardines

in olive oil exported during 1956 amounted to 46,695 tons, down 4,730 tons from 1955.

In 1956 the leading canned fish buyer was England with 12,145 tons (valued at US$7.1 million), followed by Germany with 8,849 tons (valued at US$5.1 million), Italy with 8,149 tons (valued at US$4.8 million), Belgium-Luxenbourg with 5,707 tons (valued at US$3.4 million), and the United States with 5,098 tons (valued at US$3.9). Exports to the United States consisted of 2,629 tons of sardines, 1,881 tons of anchovies, and 39 tons of tuna.

Portuguese Canned Fish Exports, 1956

Species	1956	
	Metric Tons	US$ 1,000
Sardines in olive oil	46,695	26,935
Sardinelike fish in olive oil	5,074	4,142
Sardine & sardinelike fish in brine	2,030	487
Tuna & tunalike in olive oil	2,050	1,651
Tuna & tunalike in brine	338	227
Mackerel in olive oil	5,528	3,295
Other fish	991	415
Total	62,756	37,152

During 1956 the United States was Portugal's fifth best canned fish customer in terms of quantity (8.1 percent) and ranked fourth (10.5 percent) in value.

Portuguese canned fish exports in December 1956 totaled 13,016 tons (685,000 cases), valued at US$7.9 million, as compared with 6,477 tons, valued at US$3.3 million for the same month in 1955.

In December 1956, England was the principal buyer of Portuguese canned fish, followed by Belgium, Italy, and Germany (Conservas de Peixe,, February 1957).

Spain

VIGO FISHERIES TRENDS, JANUARY 1957: Fishing: Landings at Vigo during January 1957 amounted to about 7.7 million pounds valued at US$884,506, a decrease in quantity of about 32 percent as compared with December 1956 and about 17 percent as compared with the same month in 1956. The lower January 1957 catch was partly due to unfavorable weather and uncertainty over the cost of Diesel and fuel oil. In addition, the port authorities were trying to force the fishing fleet to carry adequate life-saving equipment, states a February 6 dispatch from the United States Consul at Vigo.

Small hake (Merluccius merluccius) was the principal species landed in January (2.3 million pounds), followed by dollarfish (Brama raii) 1.4 million pounds, and horse mackerel (Trachurus trachurus) 773,149 pounds. Sardine landings amounted to 289,155 pounds (down from 1.4 million pounds in December). Rough weather held the small sardine boats in port during part of January.

During the latter part of January, as is customary at that time of the year, part of Vigo's long-range fishing vessels moved to ports in the south of Spain, especially to Huelva and Cadiz, for fishing off the African coast during the balance of the winter months. The fleet was expected to return to Vigo during the early part of April, if weather conditions are favorable, for fishing off the coast of Ireland.

Other fishing ports of commercial importance in the Vigo consular district are Marin and La Curuna. The landings for these ports for 1955-56 are as follows:

District	1956		1955	
	Quantity	Value	Quantity	Value
	1,000 Lbs.	US$1,000	1,000 Lbs.	US$1,000
Marin ... 1/ ...	19,950	1,649	30,077	1,691
La Coruna 1/ ...	132,076	11,418	117,145	8,621

1/ All ports except El Ferrol.

Fish canning: The fish canneries in the Vigo area operated at a very low level during January 1957. By the end of January, approximately 90 percent of the canneries were idle. The canneries in operation packed small quantities of sardines and dollarfish but were engaged mainly in packing anchovies, received in brine from other parts of Spain. Purchases of fresh fish by the canneries at the Vigo fish exchange amounted to 171,540 pounds during the month as compared with 1,921,051 pounds in December and 815,574 pounds in January 1956. January is usually a slow month for the canneries, but the output this year was far below normal.

Domestic sales of canned fish were practically at a standstill during January 1957. Although this is a normal situation, conditions are different this year because of the uncertainty over prices. It is the general opinion that prices for domestic markets may be increased by at least 15 percent as the result of the new wage scales and other higher operating expenses.

Exports of canned fish were at a low level and, for the dollar areas, were confined mainly to Cuba, Venezuela, and Central American countries. The canneries may not make any great effort to increase exports until they are granted a more favorable rate of exchange. The exchange rate of 33,835 pesetas to the dollar makes it more difficult than ever to meet competition in foreign markets under present conditions.

Note: Values converted at the rate of 1 peseta equals US$0.0257.

* * * * *

VIGO FISHERIES TRENDS, FEBRUARY 1957: Fishing: During February 1957 landings of fish at Vigo amounted to about 6.6 million pounds, valued at US$754,767. The February catches represent a decrease in quantity of about 14 percent as compared with the previous month and were about 18 percent under the February 1956 catch. The weather was unfavorable for fishing operations during February 1957.

A closed season for sardines was established from February 15 through April 15, 1957, in the Cantabrian and Northwestern regions. Some fishermen in Galicia (Northwestern region) feel that this measure is not justified at the present time, and that they should be allowed to continue to take advantage of the abundance of sardines in these coasts. However, the official view is that suspension of sardine fishing will help to conserve the existing shoals and increase the future yield. Sardines (scarce during the past 10 years) appeared in great quantities late in 1956 and the early part of 1957, to the extent that what has been known as the "sardine crisis" was considered ended.

Fish Canning: The fish canneries in the Vigo area were practically inactive during February, this is a normal situation for this time of the year. According to the Vigo fish exchange, only 88,164 pounds of fresh fish were purchased by canneries in this area during February as compared with 171,493 pounds during the previous month and 128,564 pounds during February 1956. The main varieties packed were anchovies and dollarfish.

The tinplate situation continues to be the main concern of canneries, and available foreign exchange (20 percent of the value of products exported) is used to buy it. The outlook for an adequate supply of olive oil is good for 1957. Requirements of canneries are estimated at 14,000 metric tons for all of Spain and about 60 percent of this quantity may be needed for fish packing in the Vigo area.

Domestic sales of canned fish continued to be very slow in February. Buyers were probably holding off for possible fixing of prices by the Central Government. The export market continued in a state of flux. Few export sales were made in February. Canneries were waiting for a more favorable rate of exchange and expect to get it. Stocks of canned fish are known to be high.

Surinam

SURVEY OF FISHERIES RESOURCES IN SURINAM WATERS: The Chief of Fisheries, Surinam Department of Agriculture, Animal Husbandry and Fisheries, has informed the United States Consulate in Paramaribo (February 4, 1957) that a survey of Surinam offshore waters will begin in the spring of 1957. The Surinam Government has signed a contract for this work with a United States citizen of Miami, Fla. The shrimp trawler Coquette, which will do the job, was expected to leave San Diego, Calif., around March 1, 1957. The contract provides for a three-month survey. The Government is paying US$18,900 under the contract.

The purpose of the project is twofold: (a) to determine whether large-size shrimp are present in the deeper waters off the coast (on the continental shelf); and (b) learn about what fish may be present in commercial quantities in the same area. It was also indicated that the survey boat might also operate off the French Guiana coast, outside of territorial waters.

The project is part of the Government's effort to assure a continuing shrimp supply for the shrimp-processing plant now established in Surinam.

The plant, which opened last summer to produce frozen shrimp for the United States market, has had difficulties in obtaining a steady supply of the local estuarian-type (small) shrimp. The present shrimp supply is obtained by nets placed in tidal estuaries of the Saramacca and Surinam Rivers. At the same time, the Government wishes to see what fish possibilities there are in addition to shrimp. Up to the present the trawlers available to the Government are too small and underpowered to go out to deep-water.

If the survey indicates that larger shrimp are present, it is expected that the Government would undertake the financing of trawlers large enough to go after the shrimp and perhaps fish that could be used for fish meal to be added to cattle and poultry feeds now being produced for the local market. The prepared feed industry (a private enterprise using imported ingredients plus the local fish meal) has recently tried its hand in the export market.

Sweden

SYNTHETIC MATERIALS FAVORED BY FISHERMEN: Plastic and nylon materials are steadily finding greater use by the Swedish fishing industry, according to the Swedish West Coast Fishermen's Central Association, which reports that nylon thread--short and long fiber thread as well as solid-drawn thread--is ousting cotton yarn as fishing gear material, and that also cordage, buoys, and floats are now to a great extent being made of synthetic materials. This is especially evident as respects trawl floats, and the glass floats are gradually disappearing and being replaced by plastic trawl floats. The weight of a plastic float is about one-third of that of a glass ball of the same size, and its supporting capacity has been found to be considerably greater, states a March 27, 1957, dispatch from the United States Consul at Goteborg.

* * * * *

LARSSON FLOATING TRAWL WINS AWARD. The inventor, Naval Architect Karl-Hugo Larsson, of the Swedish floating trawl (operated by one trawler) was awarded the silver medal at the 1956 International Inventors' Fair held in Paris in 1956

The floating trawl, which has been named the "Phantom" trawl, has recently won general acclaim for its outstanding qualities. Major advantages of the new trawl are (1) it is specially suited for use in combination with modern echo-sounding devices, and (2) can be operated by a single vessel. When so used for pelagic (mid-water) trawling it gives most effective fishing results, and the young fish and spawn are spared.

The "Phantom" trawl has undergone protracted tests by fishery experts and fishing authorities in most North-European countries, who have given it their full approval. Larsson, who has experimented since 1944 with this new type of trawl, based his construction on scientific hydro-dynamic designs and tests at the Swedish State Shipbuilding Tank in Gothenburg.

The usual bottom trawl boards are not very effective for keeping the mouth of the trawl open laterally. Sometimes pelagic trawling is done by two vessels using no trawl boards, but this system has many drawbacks. It can only be used by small vessels, control of the size of the catch is difficult, and the trawl is subject to heavy strain when used in that way. However, after having tried some 15 different models, the inventor designed a "floating wingboard," which moves through the water without touching the seabed. The shearing effect is just about twice that of an ordinary board, and it moves steadily through the water.

During the experiments it was found necessary to make some arrangements for increasing the height of the mouth of the trawl net. After much experimental work the inventor succeeded in designing a self-stabilizing shearing-plane, the so-called "trawl-toad," which can be attached to the headline and footrope by single ropes and works quite automatically. The shearing effect of the wingboard and trawl-toads increases with the square of the speed, which means that the mouth of the trawl net stands well open.

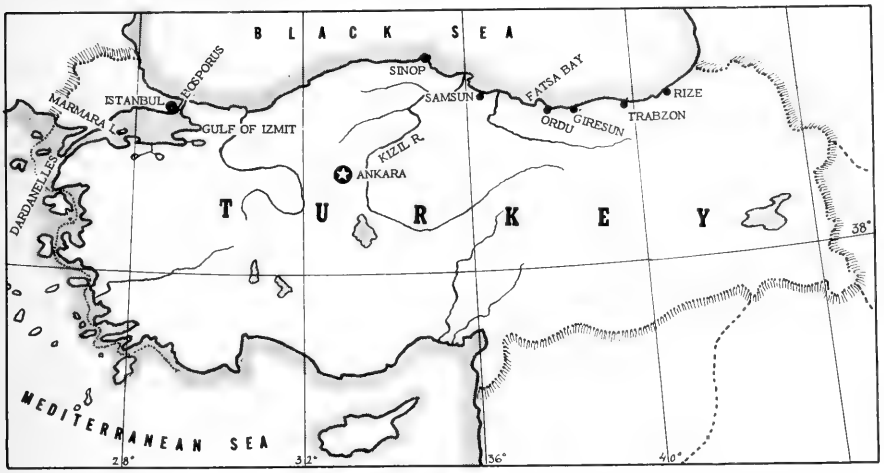
The echo-sounding devices, originally designed for locating submarines during World War II, which are now available for fishing purposes, make conditions for pelagic trawling very good at present. The new type of trawl net seems to be the technical solution of the problem of overfishing in the North Sea, as it leaves the young fish and the spawn unmolested at the greater depths. An incidental advantage is that the design of this trawl obviates the difficulties of being caught in obstructions at the bottom.

Outstanding practical experience has been gained with the use of the new trawl net in combination with echo-sounding instruments. As an instance it may be mentioned that the biggest catch so far recorded was made by the Swedish trawler Patricia, which caught 7 tons of herring in a ½-hour haul. (The Swedish International Press Bureau, March 30, 1957.)

Turkey

FISHERIES OF BLACK AND MARMARA SEAS: Turkish waters are richly endowed with fishery resources, according to the author who directed a purse seine technical assistance program in Turkey for the International Cooperation Administration. The author and his three assistants (all from California) were sent to Turkey in May 1955 as purse-seine specialists to work with the Turkish Meat and Fish Administration in organizing California-type purse-seine fishing and investigate

the pelagic fish resources in Turkish waters. At the end of the first year, two of the assistants returned to the United States, but the author and one assistant remained until December 1956.



Exploitation of Turkish fishing waters is now carried on largely by private fishermen using small equipment and rather primitive methods. One of the principal fishing methods is the "girgir" system--small boats which operate in pairs trolling with a net. Much of the fishing for the larger species is done by line.

For the investigation, a steel hull German dragger (Sazon) vessel was supplied, which had to be converted to purse-seining. Finally, the vessel (71 feet long with a beam of 19 feet) was converted after many delays. During the conversion, four purse-seine anchovy nets from the United States west coast were overhauled and mended, local fishing conditions were observed, and purse-seining was explained to the fishermen.

Fig. 1 - Schools of bluefin tuna follow anchovy in the Black Sea.

It is believed that refrigeration facilities are available, but minor additions are needed to facilitate the handling of fish. Processing and marketing facilities are lacking. Although the refrigeration plant in Istanbul can handle 100 tons of fish a day, it has no conveyor system for unloading boats and such unloading must be done by hand labor.

An extended trip along the Black Sea coast was made by the author and his three assistants to observe fishing methods and the types of fish landed.

Fishing in Turkey is seasonal and for some reason there are sharp year to year fluctuations in the quantity of fish in Turkish waters. Freak runs are very common, particularly among some types. This is especially true of the pelagic fish found in the Black Sea and the Sea of Marmara. The most abundant is the bonito which are thought to spawn in the Marmara

Sea. They are found in the Marmara during certain seasons from spawning size up to six pounds. Supposedly these fish spend the winter in the depths of the Marmara and migrate in the spring to the feeding grounds of the Black Sea. Winter fishermen locate these fish in great numbers in depths of 30 to 60 fathoms.

Fig. 2 - A 400- to 500-ton school of bluefin tuna sighted in Turkish waters.

Turkish fishermen with their present "girgir" system are not able to handle the big runs of bonito often encountered. Their frail "girgir" nets often break under the weight of the fish and everything is lost. The boats have no booms to lift the nets. Everything must be done by hand. The boats are open, narrow, and unstable in choppy seas for handling heavy weights over the sides. The "girgir" boats, which operate in pairs, are often towed by motor boats. They also depend a great deal on their own oars to move around. Probably a hundred pairs of these boats are in operation.

Because of the small size, the boats do not venture far out to sea. They have two main fishing grounds. One around the entrance to the Bosporus (connects the

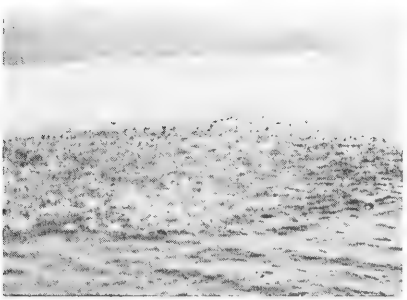


Fig. 3 - A school of about 200 tons of tuna in the Gulf of Mudanya.

Fig. 4 - A closer view of a school of bluefin tuna.

Black and Marmara Seas) on the Black Sea side and the other in the Marmara Sea. Several species of fish migrate regularly back and forth between the Marmara and Black seas. They accumulate in the autumn around the entrance of the Bosporus on the Black Sea side as they come down from the Black Sea feeding grounds on the way to the Marmara. During this period fishermen concentrate their attention in the area around the entrance to the Bosporus on the Black Sea side. Later fishing operations are transferred to the Marmara. In the spring the fish return to the Black Sea. The favorite fishing grounds appear to be between Sinop and Trabzon where anchovies are found in abundance. Large concentrations of bonito can be found here, particulary during July, August, and September. My colleagues and I observed large numbers there in August 1955. We saw local fishermen catching the bonito which often were observed in large schools. Bluefin tuna, Spanish mackerel, and "lufer" were also observed in abundance along this coast. Anchovies appeared to be rather scarce in 1955 and small in size.

The tuna have much the same habits as the bonito. In the spring they migrate to the Black Sea feeding grounds and in the winter they return to the Marmara. All three species mill around the entrance to the Bosporus on the Black Sea side from September through November, feeding on anchovies and blue mackerel which appear at the entrance of the Bosporus at about the same time.

Fig. 5 - School of bluefin tuna.

During this time fishermen make some heavy catches--anywhere from several hundred metric tons to as high as 800 or 900 tons a day. In October 1956, the largest single day's catch was 1,000 tons. Most of the fish were large and fat having just returned from the summer feeding grounds. Bonito may run up to 7 pounds each in weight. These fish stay rather fat for several months after they come down from the feeding grounds, but in the spring when they again migrate to the Black Sea they are very lean.

The Turkish name for the larger bonito is "torik" and for the smaller one "palamut." These fish are not weighed but are counted in pairs. Annual landings of these fish vary considerably, according to records which have been kept for the last 25 years. There have been poor years in which only 200,000 pairs or less were landed. In average years from one million to two million pairs were landed. In especially good years, as, for instance during the last two years, nearly 5 million pairs were landed annually. These increased landings are undoubtedly due in part to improved equipment such as better nets and bigger boats. Catches could still be greatly increased, however, by using heavier and stronger nets, but this would require a provision for lifting the nets mechanically rather than by hand as is now done. At present 25 men are used on a pair of "girgirs." The prevailing attitude is, if 25 men are not enough then get 50 men. In addition to being inefficient, this method is very tiring. A modern purse-seine boat with a crew of 11 could handle

Fig. 6 - German-built steel-hull dragger converted for purse-seining in Turkish waters hauling in the purse seine.

100 tons of catch much easier than the 25 men fishing under the "girgir" system could handle 25 tons of catch. The life of a "girgir" fishermen is full of hardship. He is constantly exposed to weather and sea and since he has no protection except for a raincoat, he is usually wet through. There are 18 oars manned by 9 men on each boat. The crews have no hot meals. Practically all of the fishing is done at night. For light they use cotton waste soaked with cheap oil and tied to the end of a stick which is held over their heads. The most important thing which these fishermen have in their favor is weather, which is very good compared to other fishing areas of the world.

The blue or green mackerel is found mostly around the entrance of the Bosporus on the Black Sea side. This mackerel is found in large schools chiefly from October through December. They are slender, not very big, but excellent to eat. His brother mackerel, or "kolyoz," is found mostly around the Dardanelles in the Sea of Marmara from June through August. This fish is a pale green in color and somewhat larger than the blue mackerel. This species is usually salted. Most of the catch is purchased by the Greek fishermen who come to the fishing grounds in season in their boats. There is a small cannery on Marmara Island which cans and salts small quantities of fish--mackerel, sardines, and anchovies.

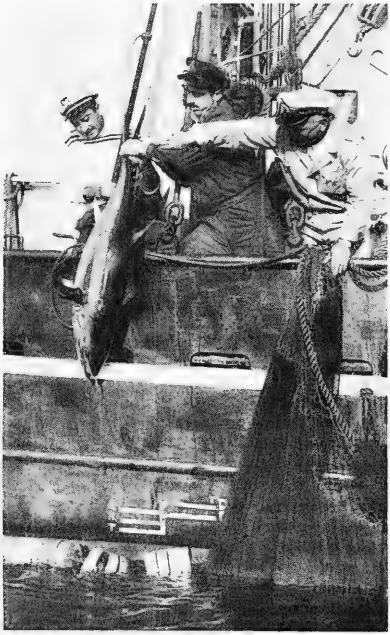


Fig. 7 - Hauling aboard the Sazon a bluefin tuna caught with a purse seine in Turkish waters.

The mackerel are usually found running in small schools, ranging anywhere from 2 up to 6 or 8 tons. The fishermen fish for the mackerel day and night. Sardines are also found around Marmara Island, which is near the entrance to the Dardanelles. They are excellent quality, similar to European sardines and very good when salted properly. The sardine season runs for four months from July through October. Fishermen fish for sardines mostly at night with a light. The sardines are found in small schools, usually of not more than two or three tons. These sardines are also fished with beach seines and gill nets.

Anchovies are found more or less in the same area as the sardines and likewise in small schools. Anchovies are not as abundant in the Marmara as they are in the Black Sea, however.

One of the most interesting observations in connection with the Black Sea trip was the caviar-carrying sturgeons observed in the Kizilirmak and Yesitirmak Rivers. The author spent several days with an interpreter in the mouth of these rivers observing the sturgeon fishing. The caviar from the sturgeon fetch fabulous prices on the market and the meat is also very good. With the present methods employed, sturgeon fishermen are taking only a fraction of the quantity they could take from the mouth of these two rivers. The camps of the fishermen are located at the entrance to the rivers and sometimes the fishermen are isolated for a week or ten days because of the weather. The caviar is salted and preserved, but the meat, which is very good quality, is discarded. The sturgeon come into the rivers to spawn in the early summer.

The "lufer" fish look like Atlantic bluefish or Pacific Coast blue perch. It is a very good fish to eat and it has been observed that the "lufer" follow the same migratory habits as the bonito. Tuna are mostly the big bluefin tuna. This fish also goes back to the Marmara in the fall. There are also other species of fish found on the Black Sea coast, particularly where the anchovies are found. Spanish mackerel ("istavrit") were observed running in large schools and the fish are quite large in size. From this coast are also taken the famous red mullets ("barbunya"). The present harbor facilities along this coast are limited, but with the completion of the breakwater at Samsun Harbor, Samsun will undoubtedly become a center of fisheries development. It is strategically located and if developed should rival the Bosporus as the fishing center in Turkey. The Bosporus undoubtedly will remain the greatest fishing center in Turkey because of its two very rich fishing grounds on either side--one in the Marmara Sea and one at the Black Sea entrance. At present the catch is limited because of the primitive equipment and methods employed. Considerable tuna are caught, for example, by hook-and-line fishing, particularly the bluefin which come in large sizes. Bluefin are also caught in a few traps along the Bosporus, up to 200 or 300 tons in some years. I saw one bluefin tuna which tipped the scales at 1,100 pounds. Better facilities for receiving fish from these grounds are needed some place on the Bosporus. At present fishermen are sometimes out for periods up to 30 hours. The first fish caught are thrown into the bottom of the boat with additional layers added later as more catches are made. Since no ice is carried, the result is that the first layers of fish have often already started to spoil by the time the boats return for unloading. This is particularly true in warm weather when no protection from the warm sun is provided. Facilities for preserving and handling fish at present are inadequate when large catches are made. I have observed personally large quantities of fish which have been allowed to spoil and were thrown away because the catch was greater than the marketing and handling facilities available to care for them.

The use of explosives to kill fish is also a common practice in various places along the Turkish coast.

The investigation vessel Sazan was not ready for work until April 1956. It was not until this date that the author and one assistant sailed to train Turkish fishermen in purse seining. The net was one of the type used for anchovies. The Turkish fishermen demonstrated they were anxious to learn. After two days, few additional alterations proved necessary, however, and the vessel docked. The vessel was again ready in mid-June 1956. During June and July we made trips to the Marmara Sea to do some exploring for fish and to make observations of casts. Around Marmara Island we saw a number of schools of small anchovies, also schools of small sardines, a few schools of tuna and several hundred schools of medium bonito. Our net was to small to be very successful in catching bonito, but we did catch one ton of medium-size bonito. In late July we set out for the Black Sea. We traveled up to the eastern end beyond Trabzon to Rise. The weather was excellent but few fish were sighted except between Sinop and Trabzon. In the section of the coast between Sinop and Trabzon we saw many fish. In the famous bay of Fatsa, which is the main point at which anchovies gather and on up to Ordu and Giresun, we found abundant fish. On many occasions one could see as many as 10 to 15 schools of fish at one time. Most of these schools were large bonito, but quite a few schools of "lufer" and Spanish mackerel were also observed. The anchovies were abundant but they were small, in fact too small for our mesh. We were able to give the crew much practice in handling a purse-seine net. Our net, however, was too light and too small to use for catching bonito. These were frequently seen in schools of 20 to 30 tons. This trip lasted 22 days, including four days at the Port of Trabzon. This is a very excellent port and we obtained much useful information regarding the fishing industry along this part of the coast. When we returned to Istanbul, our nets had to be cleaned and dried. Our net was treated with a tanning preservative. Nets treated in this manner cannot stay wet too long.

Again, after a few adjustments, we returned to the Black Sea to fish in the entrance of the Bosporus. We found the fishing very good at night. In early October we transferred to the Gulf of Ismet in the eastern end of the Marmara. Here we saw numerous schools of small sardines, medium-size bonito, and quite a few schools of small anchovies. The most impressive sight, however, was the abundance of tuna. We cast our net in one school that must have been at least 100 tons in size. The fish averaged about 60 to 70 pounds each. We cast our net in this school to prove that tuna could be caught with purse-seining, which is not believed by Turkish fishermen. We must have encircled 60 to 70 tons. Our net was, of course, too weak to hold the catch and in the end we managed to save only about 4 tons. The net was, of course, badly damaged, but we had proved our point that tuna could be caught with purse-seine nets.

Based on my observations and the information which I collected, the Gulf of Ismet is an ideal fishing ground for tuna, particularly in late autumn. Weather is perfect for fishing and there is hardly any current. We continued during October to fish in the Marmara Sea and large schools of tuna were observed in several other areas of the Marmara. A number of schools of sardines or small anchovies were located with echo-sounders. We had the greatest success in catching these fish at night since our net was so small we could not cast deep enough to fish in the daytime.

We continued our fishing throughout November in the Bay of Indjir Liman. In no other place in Turkish waters did we see so many tuna. There must have been up to 500 tons in one school. Although we gave the crew much practice in casting and using the purse-seine nets, our catch of fish was on the whole disappointing. As pointed out earlier, our net was entirely too weak and too small to use for bonito and the tuna. On the other hand, most of the anchovies were too small to be held in the net. They ran in size from three up to 7 or 8 centimeters (about three inches). Since the mesh of our net was one-half inch, it did not hold anchovies smaller than about 9 centimeters. We were told that up to two years ago the anchovy run was much bigger. It appears to be a fact, however, that the fish in Turkish waters run in unpredictable cycles.

Note: Based on an original report by Samuel J. Braco which was edited by Irwin R. Hedges, Chief, Office of Food and Agriculture, U. S. O. M., Turkey.

--BY SAMUEL J. BRACO, IN CHARGE OF TECHNICAL ASSISTANCE PROJECT FOR PURSE-SEINE FISHING IN TURKEY

United Kingdom

FIRST SHIPMENT OF AUSTRALIAN SHRIMP: The first consignment of frozen Australian shrimp was expected to arrive at Southhampton, England, about the middle of April. The shrimp were packed by the Queensland (Australia) Fish Board and were consigned to a Grimsby, England, distributor, according to the March 29 Fishing News.

The manager of the Grimsby firm stated that the demand for shrimp or prawns is always greater than the supply in England. He also stated that earlier small sample shipments of shrimp were good quality, and on the basis of these samples a larger consignment was ordered.

* * * * *

SUBSIDIES FOR FISHING INDUSTRY, 1939-57: British Government subsidies provided for fishermen in near and middle waters, including inshore fishermen,

since 1939, total close to US$58.5 million, according to a statement by the Minister of Agriculture and Fisheries (The Fishing News, April 5).

This total is made up as follows: Grants under the Herring Industry Act, 1944, for provision of boats and equipment (United Kingdom) 1946-1953, US$1,120,000; grants under the Inshore Fishing Industry Act, 1945, boats and equipment, Great Britain 1946-1952, US$2,240,000; grants under the White Fish and Herring Industries Act, 1953, boats and engines (Great Britain) from 1953 to date (including estimate for 1956/57), through White Fish Authority, US$9,240,000, through Herring Industry Board, US$560,000; subsidy to White Fish Industry (United Kingdom) from 1950 to date (including estimate for 1956/57), US$38,680,000; grants to the Herring Industry Board, respecting the Herring, Oil and Meal Scheme from 1948 to date (including estimate for 1956/57), US$7,280,000.

* * * * *

FISHING FLEET SUBSIDIES EXPECTED TO END BY 1961: The British Government hopes that the fishing industry will be in need of no more subsidies by 1961, the Minister of Agriculture stated during a debate (March 12) on the White Fish and Herring Industries Bill.

The White Fish and Herring Industries Bill extends the period subsidies will be paid to the white fish industry up to May 1961, to provide grants for the conversion of coal-burning vessels up to 140 feet in length to oil, and to provide a new subsidy to herring fishermen.

In the course of the debate on the bill it was revealed that experiments had been carried out with an aircraft carrying a fish finder. The tests were made with a transducer pulled through the water by the airplane. It is believed that an airplane with a fish finder can cover a wide ocean area in a few hours. Once herring have been located by the airplane it will stay with them until the drifters at sea can make a haul, states The Fishing News (March 15, 1957).

* * * * *

ECHO-SOUNDER EQUIPPED HELICOPTER FOR FISH FINDING TESTED: Fish-finding experiments by helicopter have proved that shoals and their extent can be tracked with an airborne echo-sounder.

Following technical trials (by an air charter firm and a manufacturer of echo-sounding equipment), technicians felt completely satisfied with a helicopter-borne version of an established fish-detecting device. These tests may revolutionize fisheries that are seeking ways and means to locate fish schools between the surface and the sea bottom. If practical fishing trials bear out the preliminary tests, one airborne echo-sounder could lead trawlers to midwater fish schools and reduce the time wasted searching for a favorable spot. On the other hand, practical fishing tests (which will include the economics of the project) may prove that application to the commercial fisheries is not feasible.

In the autumn of 1956 a trial installation of an echo-sounder was made in a helicopter. To obtain an underwater reading equivalent to that obtained from echo-sounders installed on vessels, special bomb-shaped submarine gear was designed to be suspended 20 feet from the aircraft and towed through the water up to 50 knots, the March 22 issue of The Fishing News points out.

Early in 1957, trials off the English south coast established that underwater noise resulting from the downbeat of the helicopter rotors on the surface of the water do not affect the echo characteristics shown on the screen.

The tests also proved that noise arising from the travel of the submarine body through the water at a convenient cruising speed presented no major problem. Some difficulty was, however, encountered in the mechanical problems associated with the towing of the body at speeds in excess of 30 knots.

Subsequent redesign of the submarine gear, and extended trials under different weather conditions enabled the technicians to overcome this problem. Arrangements are now being made to install the equipment in a lighter and more-economical helicopter so that trials can be made under actual fishing conditions in cooperation with vessel owners.

Although the installed equipment is capable of fish detection as efficiently as in its more conventional form, its value from the fisherman's point of view cannot be assessed until full working trials have taken place.

An aircraft operating from a shore base within economical range of seasonal fishing grounds can conduct a search of a large area in a short time and make available information on shoal location to a number of fishing vessels.

Similarily, in principle, a shipborne helicopter operating in fishing grounds in distant waters can conduct a high-speed search to serve a fishing fleet.

PORGY AND THE POGY NOT THE SAME FISH

The name "porgy" is used for any of the porgy family (Sparidae), a spiny-finned group of marine fishes with strong teeth. The commonest of the group is the scup or northern porgy (Stenotomus chrysops), which is known along the Atlantic Coast from South Carolina northward to Maine.

While the porgy is sometimes called "pogie," the name "pogy" refers to the menhaden or mossbunker (Brevoortia tryrannus). This member of the herring family (Clupeidae) is a soft-spined fish with no teeth.

The porgy has some food value while the menhaden is rarely eaten. The latter is of great economic value, however. It is rich in oil, and about 1.3 billion pounds are caught in the United States each year for the manufacture of fish meal and oil. The meal is used to fortify poultry and hog feeds, and the oil has many industrial uses. The menhaden occurs from Nova Scotia to northern Florida and the Gulf of Mexico.

--Sea Secrets, The Marine Laboratory, University of Miami, Coral Gables, Fla.

FEDERAL ACTIONS

Department of Agriculture

AGRICULTURAL MARKETING SERVICE

NOTICE ON PROPOSED STANDARDS FOR GRADES OF FROZEN RAW BREADED SHRIMP: The notice of proposed voluntary standards for grades of frozen raw breaded shrimp was published in the May 18, 1957, Federal Register. The notice as published was as follows:

DEPARTMENT OF AGRICULTURE

Agricultural Marketing Service

[7 CFR Part 52]

UNITED STATES STANDARDS FOR GRADES OF FROZEN RAW BREADED SHRIMP[1]

NOTICE OF PROPOSED RULE MAKING

Notice is hereby given that the United States Department of Agriculture is considering the issuance of the United States Standards for Grades of Frozen Raw Breaded Shrimp pursuant to the authority contained in the Agricultural Marketing Act of 1946 (60 Stat. 1087 et seq., as amended; 7 U. S. C. 1621 et seq.). These proposed grade standards are recommended by the Fish and Wildlife Service, U. S. Department of the Interior, based on data developed by that agency. These standards, if made effective, will be the first issued by the Department of grade standards for this product.

All persons who desire to submit written data, views, or arguments for consideration in connection with the proposed standards should file the same with the Chief, Processed Products Standardization and Inspection Branch, Fruit and Vegetable Division, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C., not later than 60 days after publication hereof in the FEDERAL REGISTER.

The proposed standards are as follows:

PRODUCT DESCRIPTION, TYPES, AND GRADES

Sec.
52.3601 Product description.
52.3602 Types of frozen raw breaded shrimp.
52.3603 Grades of frozen raw breaded shrimp.

STYLES AND SIZE DESIGNATIONS

52.3604 Recommended styles of frozen raw breaded shrimp.
52.3605 Recommended size designations and counts per pound.

FACTORS OF QUALITY

52.3606 Ascertaining the grade.
52.3607 Evaluation of the unscored factor of flavor and odor.
52.3608 Ascertaining the rating for the factors which are scored.
52.3609 Appearance.
52.3610 Defects.
52.3611 Character.

DEFINITIONS AND METHODS OF ANALYSIS

52.3612 Definitions and methods of analysis.

LOT CERTIFICATION TOLERANCE

52.3613 Tolerances for certification of officially drawn samples.

SCORE SHEET

52.3614 Score sheet for frozen raw breaded shrimp.

AUTHORITY: §§ 52.3601 to 52.3614 issued under sec. 205, 60 Stat. 1090, as amended; 7 U. S. C. 1624.

[1] Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act.

PRODUCT DESCRIPTION, TYPES, AND GRADES

§ 52.3601 *Product description.* Frozen raw breaded shrimp are clean, wholesome, headed, peeled, and deveined shrimp, of the regular commercial species, coated with a wholesome, suitable batter and breading. They are prepared and frozen in accordance with good commercial practice and are maintained at temperatures necessary for the preservation of the product. Frozen raw breaded shrimp contain not less than 50 percent by weight of shrimp material.

§ 52.3602 *Types of frozen raw breaded shrimp*—(a) *Type I, Fantail*—(1) *Subtype A.* Split (butterfly) shrimp with the tail fin and the shell segment immediately adjacent to the tail fin.

(2) *Subtype B.* Split (butterfly) shrimp with the tail fin but free of all shell segments.

(b) *Type II, Round fantail*—(1) *Subtype A.* Round shrimp with the tail fin and the shell segment immediately adjacent to the tail fin.

(2) *Subtype B.* Round shrimp with the tail fin but free of all shell segments.

(c) *Type III, Split.* Split (butterfly) shrimp without attached tail fin or shell segments.

(d) *Type IV, Round.* Round shrimp without attached tail fin or shell segments.

§ 52.3603 *Grades of frozen raw breaded shrimp.* (a) "U. S. Grade A" is the quality of frozen raw breaded shrimp that possess a good flavor or odor, that possess a good appearance, that are practically free from defects, that possess a good character, and that for those factors which are rated in accordance with the scoring system outlined in the following sections the total score is not less than 85 points: *Provided,* That the frozen raw breaded shrimp may possess a reasonably good appearance and a reasonably good character if the total score is not less than 85 points.

(b) "U. S. Grade B" is the quality of frozen raw breaded shrimp that possess a reasonably good flavor and odor, that possess a reasonably good appearance, that are reasonably free from defects, that possess a reasonably good character, and that for those factors which are rated in accordance with the scoring system outlined in the following sections the total score is not less than 70 points: *Provided,* That the frozen raw breaded shrimp may fail to possess a reasonably good appearance and fail to possess a reasonably good character if the total score is not less than 70 points.

(c) "Substandard" is the quality of frozen raw breaded shrimp that fail to meet the requirements of "U. S. Grade B."

STYLES AND SIZE DESIGNATIONS

§ 52.3604 *Recommended styles of frozen raw breaded shrimp*—(a) *General.* Styles refer to the several ranges of amounts of coating commonly applied to frozen raw breaded shrimp, the specific range of coating, or style, to be determined by the method described in § 52.3612. The recommended styles are not incorporated in the grades of the finished product since coating content, as such, is not a factor of quality for the purposes of these grades. For ease of marketing, the following descriptive style designations are recommended:

(b) *Style 1: Light breading.* The average coating content of the frozen raw breaded shrimp is not more than 35 percent of the total weight of the frozen raw breaded shrimp.

(c) *Style 2: Medium breading.* The averaged coating content of the frozen raw breaded shrimp is more than 35 percent but not more than 45 percent of the total weight of the frozen raw breaded shrimp.

(d) *Style 3: Heavy breading.* The averaged coating content of the frozen raw breaded shrimp is more than 45 percent but not more than 50 percent

of the total weight of the frozen raw breaded shrimp.

§ 52.3605 *Recommended descriptive size designation and counts per pound.* (a) The recommended descriptive size designations and counts per pound of frozen raw breaded shrimp are not incorporated in the grades of the finished product since size designations and counts per pound, as such, are not factors of quality for the purposes of these grades. The degree of uniformity of size among units of the finished product is rated since it is a definite factor affecting the quality of the cooked product.

(b) For ease of marketing, the following descriptive size designations and counts are recommended:

RECOMMENDED SIZE DESIGNATIONS AND COUNTS PER POUND

Descriptive size designation	Count of breaded shrimp per pound
Colossal	15 or under.
Jumbo	16–20.
Extra Large	21–25.
Large	26–30.
Medium	31–35.
Small	36 and over.

FACTORS OF QUALITY

§ 52.3606 *Ascertaining the grade*—(a) *General.* In addition to considering other requirements outlined in the standards, the following quality factors are evaluated in ascertaining the grade of the product:

(1) *Factor not rated by score points.* Flavor and odor.

(2) *Factors rated by score points.* The relative importance of each factor which is rated is expressed numerically on the scale of 100. The maximum number of points that may be given such factors are:

Factors:	*Points*
Appearance	30
Defects	40
Character	30
Total score	100

(b) The grade of frozen raw breaded shrimp is determined by observing the product in the frozen and thawed states and after it has been cooked in a suitable manner.

§ 52.3607 *Evaluation of the unscored factor of flavor and odor*—(a) *Good flavor and odor.* "Good flavor and odor" (a required characteristic of a Grade A product) means that the product has the good flavor and odor of properly prepared breaded shrimp. The flesh portion has either the good flavor and odor of fresh shrimp or at least a bland flavor and odor. The batter and breading have the good flavor and odor obtained when all components have been properly prepared, used, and maintained. The product is free from rancidity, bitterness and staleness, from bacterial spoilage flavors and odors, and from acquired off flavors or off odors of any kind.

(b) *Reasonably good flavor and odor.* "Reasonably good flavor and odor" (minimum requirement for a Grade B product) means that the product may be somewhat lacking in good flavor and odor, but is free from rancidity, from objectionable bacterial spoilage flavors and odors, and from acquired off flavors and off odors of any kind.

§ 52.3608 *Ascertaining the rating for the factors which are scored.* The essential variations within each factor which is scored are so described that the value may be ascertained for each factor and expressed numerically. The numerical range within each factor which is scored is inclusive. (For example 25 to 30 points means 25, 26, 27, 28, 29 or 30 points).

§ 52.3609 *Appearance*—(a) *General.* The factor of appearance refers to the amount of loose breading and frost in the package, the amount of moisture in the coating, the degree of freedom of the shrimp flesh from discoloration or dehydration, and to the uniformity and desirability of color of the product after cooking.

(b) *(A) classification.* Frozen raw breaded shrimp that possess a good appearance may be given a score of 25 to 30 points. "Good appearance" means that the appearance of the product is characteristic of properly prepared raw breaded shrimp and is of such quality with respect to loose breading or frost; moisture in the coating; discoloration or dehydration of the flesh; and lack of uniformity or desirability of the color of the cooked product that, collectively, the appearance is not more than slightly affected.

(c) *(B) classification.* Frozen raw breaded shrimp that possess a reasonably good appearance may be given a score of 21 to 24 points. "Reasonably good appearance" means that the appearance of the product is characteristic of reasonably well prepared raw breaded shrimp and is of such quality with respect to loose breading or frost; moisture in the coating; discoloration or dehydration of the flesh; and lack of uniformity or desirability of the color of the cooked product that, collectively, the apearance is not more than moderately affected.

(d) *(SStd.) classification.* Frozen raw breaded shrimp which fail to meet the requirements of paragraph (c) of this section may be given a score of 0 to 20 points and shall not be graded above U. S. Grade B, regardless of the total score for the product (this is a partial limiting rule).

(e) *Schedule of point deductions.* For the purpose of rating the factor of appearance the following schedule of point deductions in Table I applies:

TABLE I—SCHEDULE OF POINT DEDUCTIONS

Factor	Deductions
Loose breading or frost:	
Less than 2 percent by weight of product	0
Less than 3 percent by weight of product	3
Less than 6 percent by weight of product	6
6 percent or more by weight of product	10
Excess moisture in coating: Degree of balo or baling up:	
No obvious	0
Very slight	1
Slight	2
Moderate	4
Marked	8
Excessive	10
Discoloration and dehydration:	
None obvious	0
Slight but obvious, on average	3
Moderate, on average	6
Excessive—per unit	3
Uniformity of color (after cooking):	
Uniform; desirable color	0
20 percent lack uniform desirable color	2
Each additional 20 percent	3

§ 52.3610 *Defects*—(a) *General.* The factor of defects refers to the degree of freedom of the product from such defects as broken or damaged frozen raw breaded shrimp, fragmented shrimp, black spots, sand veins, and from extraneous shrimp material.

(1) *Broken or damaged frozen raw breaded shrimp.* "Broken frozen raw breaded shrimp" means a frozen raw breaded shrimp which has been separated into two or more parts or that has been crushed or otherwise mutilated to the extent that its appearance is materially affected.

(2) *Fragmented shrimp.* "Fragmented shrimp" means a breaded unit containing less than one headed, peeled, deveined shrimp.

(3) *Black spot.* "Black spot" means any blackened area which is markedly apparent on the flesh of the shrimp.

(4) *Sand vein.* "Sand vein" means any sand vein or portion thereof that has not been removed, except for that portion under the shell segment adjacent to the tail fin when present.

(5) *Extraneous shrimp material.* "Extraneous shrimp material" means heads, swimmerets, walking legs, and antennae, whether loose or attached to the shrimp or other material normally removed in the cleaning process except that Fantail Shrimp or Round Fantail Shrimp may have a properly attached tail fin (and in Subtype A, one adjoining segment of shell).

(b) *(A) classification.* Frozen raw breaded shrimp that are practically free from defects may be given a score of 34 to 40 points. "Practically free from defects" means that the product is of such quality with respect to freedom from broken or damaged frozen raw breaded shrimp; fragmented shrimp; black spot; sand veins; extraneous shrimp material; and other similar defects that, collectively, the quality is not more than slightly affected.

(c) *(B) classification.* Frozen raw breaded shrimp that are reasonably free from defects may be given a score of 28 to 33 points. Frozen raw breaded shrimp that fall in this classification may not be graded above U. S. Grade B, regardless of the total score for the product (this is a limiting rule). "Reasonably free from defects" means that the product is of such quality with respect to freedom from broken or damaged frozen raw breaded shrimp; fragmented shrimp; black spot; sand veins; extraneous shrimp material; and other similar defects that, collectively, the quality is not more than moderately affected.

(d) *(SStd.) classification.* Frozen raw breaded shrimp that fail to meet the requirements of paragraph (c) of this section may be given a score of 0 to 27 points and may not be graded higher than Substandard, regardless of the total score for the product (this is a limiting rule).

(e) *Schedule of point deductions.* For the purpose of rating the factor of defects, the following schedule of point deductions in Table II applies:

TABLE II—SCHEDULE OF POINT DEDUCTIONS

Factor	Deductions
Broken or damaged shrimp:	
None	0
5 percent of units	3
10 percent of units	6
Each additional 5 percent of units	3
Tail fin broken or missing, per unit	1
Limit 5 percent A; 10 percent B.	
Fragmented shrimp, less than 4 complete segments:	
None	0

For each 5 percent	3
Limit 5 percent A; 10 percent B.	
Black spot, extending to ventral line:	
None	0
For each 5 percent	3
Limit 5 percent A; 20 percent B.	
Sand veins:	
None	0
For each 5 percent	3
Limit 5 percent A; 20 percent B.	
Extraneous shrimp material:	
None	0
For each 5 percent	3
Limit 5 percent A; 10 percent B.	

§ 52.3611 *Character*—(a) *General.* The factor of character refers to the degree of uniformity of size of the frozen raw breaded shrimp, the ease of separation of the frozen units without damage to coating or breakage of shrimp, the adherence and continuity of the coating of the cooked product, and the texture of the flesh and of the coating of the cooked shrimp.

(b) (*A*) *classification.* Frozen raw breaded shrimp that possess a good character may be given a score of 26 to 30 points. "Good character" means that the product is characteristic of properly prepared raw breaded shrimp and is of such quality with respect to the degree of uniformity of size; the ease of separation of the units; the adherence and continuity of the coating; and the texture of the flesh and of the coating that, collectively, the character is not more than slightly affected.

(c) (*B*) *classification.* Frozen raw breaded shrimp that possess a reasonably good character may be given a score of 21 to 25 points. "Reasonably good character" means that the character of the product is characteristic of reasonably well prepared raw breaded shrimp and is of such quality with respect to the degree of uniformity of size; the ease of separation of the units; the adherence and continuity of coating; and the texture of the flesh and of the coating that, collectively, the character is not more than moderately affected.

(d) (*SStd.*) *classification.* Frozen raw breaded shrimp that fail to meet the requirements of paragraph (c) of this section may be given a score of 0 to 20 points and shall not be graded above U. S. Grade B regardless of the total score for the product (this is a partial limiting rule).

(e) *Schedule of point deductions.* For the purpose of rating the factor of character, the following schedule of point deductions in Table III applies:

TABLE III—SCHEDULE OF POINT DEDUCTIONS

Factor	Deductions
Uniformity of size (frozen units) (ratio of weight of 2 largest to 2 smallest shrimp in sample unit):	
1.70	0
1.80	1
1.90	2
2.00	3
2.10	4
2.20	5
2.30	6
2.40	7
2.50	8
2.60	9
Over 2.60	10
Ease of separation (frozen units):	
Easy—No or slight damage to coating	0
Moderate—Damage to coating	2
Difficult—Requires a knife	5
Difficult—Breakage 1 or 2 units	5
Difficult—Breakage more than 2 units	8
Adherence (cooked product):	
No obvious damage	0
Up to 20 percent blistered or cracked coating	2
Over 20 percent blistered or cracked coating	5
Texture of flesh (cooked product):	
Firm, yet tender and moist	0
Moderately dry, tough, stringy or mushy:	
20 percent of units	5
Each additional 20 percent of units	1
Markedly dry, tough, stringy or mushy:	
20 percent of units	10
Each additional 20 percent of units	3
Texture of coating (cooked product):	
Good crisp tender texture	0
Moderately dry, tough, mushy or with some hard lumps:	
20 percent of units	3
Each additional 20 percent of units	1
Markedly dry, tough, mushy or with many hard lumps:	
20 percent of units	5
Each additional 20 percent of units	2

DEFINITIONS AND METHODS OF ANALYSIS

§ 52.3612 *Definitions and tentative method of analysis*—(a) *Percent of breading.* "Percent of breading" means the percent of weight of batter and breading in a sample as determined by the following method:

(1) *Equipment needed.* (i) Two-gallon butter churn equipped with a 4-vaned wooden paddle;

(ii) Stirring device capable of rotating the wooden paddle at 120 rpm;

(iii) Balance accurate to 0.01 ounce (or 0.1 gram);

(iv) U. S. standard sieve—ASTM—No. 20, 12-inch diameter;

(v) U. S. standard sieve—½ inch sieve opening, 12-inch diameter;

(vi) Spatula, 4-inch blade.

(vii) Forceps, blunt points;

(viii) Shallow baking pan.

(2) *Procedure.* (i) Weight sample to be debreaded. Fill churn ¾ full of water at 70–80 degrees Fahrenheit, lower churn in place and adjust speed to 120 rpm. Add shrimp and stir for 10 minutes. Stack the seives, the ½ inch mesh over the No. 20, and pour contents of churn onto them. Set the sieves under a faucet, preferably with spray attached and rinse shrimp with no rubbing of flesh, being careful to keep all rinsings over the sieves and not having the stream of water hit the shrimp on the sieve directly. Lay the shrimp out singly on the sieve as rinsed, remove top sieve and drain on a slope for two minutes, then remove shrimp to weighing pan. Rinse contents of the No. 20 sieve onto a flat pan and collect any particles other than breading (flesh, tail fin or extraneous material) and add to shrimp on balance pan and weigh.

(ii) Calculate percent breading removed:

$$\frac{\text{Weight of sample} - \text{weight of debreaded sample}}{\text{Weight of sample}} \times 100 = \text{percent breading}$$

(b) *Cooked in a suitable manner.* "Cooked in a suitable manner" means cooked in accordance with the instructions accompanying the product. However, if specific instructions are lacking, the product for inspection is cooked as follows:

(1) Place the sample to be cooked while still frozen in a wire mesh deep fry basket sufficiently large to hold the shrimp in a single layer without touching each other;

(2) Lower the basket into suitable liquid oil or hydrogenated vegetable oil at 350°–375° F. Fry for three minutes, or until the shrimp attain a pleasing golden brown color; and

(3) Remove basket from oil and allow to drain for 15 seconds. Place the cooked shrimp on a paper napkin or towel to absorb excess oil.

LOT CERTIFICATION TOLERANCES

§ 52.3613 *Tolerances for certification of officially drawn samples.* (a) The grade of a specific lot from which samples have been officially drawn may be certified on the basis of such samples: *Provided,* That all packages meet applicable provisions of the Federal Food, Drug, and Cosmetic Act in effect at the time of the aforesaid certification. *And provided further,* That, with respect to those factors which are rated by score points, such grade will be determined by averaging the total scores, if:

(1) Not more than one-sixth of the packages fail to meet the grade indicated by the average of such total scores;

(2) None of the packages fall more than one grade below the grade indicated by the average of such total scores; and

(3) The average score of all packages for any factor subject to a limiting rule is within the score range of that factor for the grade indicated by the average of the total scores of the packages comprising the sample.

SCORE SHEET

§ 52.3614 *Score sheet for frozen raw breaded shrimp.*

Size and kind of container	
Container mark or identification	
Label	
Size of lot	
Number of samples	
Actual net weight (ounces)	
Number of shrimp per container	
Descriptive size name	
Product type	
Product style (breading percentage)	
Loose breading percentage	
Ratio weights: 2-largest/2-smallest	

Factors		Score points	
Appearance	30	(A)	25–30
		(B)	21–24
		(SStd.)	[1] 0–20
Defects	40	(A)	34–40
		(B)	[2] 28–33
		(SStd.)	[2] 0–27
Character	30	(A)	26–30
		(B)	21–25
		(SStd.)	[1] 0–20
Total score	100		

Grade for scored factors	
Flavor and odor	
Final grade	

[1] Indicates partial limiting rule.
[2] Indicates limiting rule.

Dated: May 14, 1957.

[SEAL] ROY W. LENNARTSON,
Deputy Administrator,
Marketing Services.

Federal Trade Commission

TWO CANNERS CHARGED WITH ILLEGAL BROKERAGE PAYMENTS:

Two Eastport, Me., processors of sardines were charged on April 4 by the Federal Trade Commission with making illegal brokerage payments to some of their customers.

According to the complaint, the respondents customarily sell canned sardines through brokers who receive commissions of up to 5 percent of the market price. However, the complaint charges, some sales are made by respondents directly to purchasers at prices as much as 5 percent below the market price.

The result of these latter transactions, the complaint alleges, is that the respondents are giving direct buyers discounts in lieu of brokerage in violation of the law. Sec. 2(c) of the Robinson-Patman Amendment to the Clayton Act prohibits sellers from giving brokerage or other compensation to customers buying for their own account.

The complaint notes that the respondents' products are packaged in cans with and without keys. Brokers, the complaint says, receive a 3-percent fee on sales of keyless cans and 5 percent on sales of cans with keys.

Since early 1954, the complaint continues, brokers have been permitted to make sales to purchasers at 5 percent below market price. When the broker makes such a sale, however, the respondents pay him fees of less than 3 or 5 percent. (On these sales he is usually paid 10 cents per case of sardines.) The result of this transaction, the complaint charges, is that the buyer purchasing through the broker at 5 percent off is receiving part of the commission to which the broker is ordinarily entitled. This practice also violates the law, the complaint says.

The parties are granted 30 days in which to file answer to the complaint. A hearing is scheduled June 12 in Eastport, Me., before a Commission hearing examiner.

Another Maine cannery was charged on February 12 by the Commission with making illegal brokerage payments to some of its customers. That company was granted 30 days to file an answer to the complaint. A hearing was scheduled for April 16 in Lubec, Me., before a Commission examiner.

Department of Health, Education, and Welfare

FOOD AND DRUG ADMINISTRATION

EFFECTIVE DATE EXTENDED FOR CANNED TUNA FILL-OF-CONTAINER STANDARD:

An order adopting definition and standard of identity and standards of fill-of-container for canned tuna was published in the Federal Register of February 13, 1957, by the Food and Drug Administration of the U. S. Department of Health, Education, and Welfare. The effective date for the standards of fill of container for canned tuna has been extended to August 13, 1957, according to the May 2 Federal Register. Originally the standard of fill of container was to become effective 90 days after February 13, 1957. The definition and standard of identity promulgated by the same order is still scheduled to become effective on the original date of February 13, 1958.

A request for a 60-day extension of time in which to file objections to the order promulgating a definition and standard of identity and standards of fill of container for canned tuna was granted by an order published in the March 7 Federal Register. The time for filing objections was extended until May 13, 1957.

TITLE 21—FOOD AND DRUGS

Chapter I—Food and Drug Administration, Department of Health, Education, and Welfare

Subchapter B—Food and Food Products

PART 37—FISH; DEFINITIONS AND STANDARDS OF IDENTITY; STANDARDS OF FILL OF CONTAINER

ORDER EXTENDING EFFECTIVE DATE ON FILL OF CONTAINER STANDARDS FOR CANNED TUNA FISH

In the matter of adopting standards of fill of container for canned tuna fish.

Pursuant to the provisions of the Federal Food, Drug, and Cosmetic Act (secs. 401, 701, 52 Stat. 1046, 1055, as amended; 21 U. S. C. 341, 371), the Commissioner of Food and Drugs, under authority delegated to him by the Secretary of Health, Education, and Welfare (20 F. R. 1996) caused to be published in the FEDERAL REGISTER of February 13, 1957 (22 F. R. 892), an order fixing and establishing a definition and standard of identity and standards of fill of container for canned tuna fish. A period of 30 days was permitted for the filing of objections to the order, in accordance with the provisions of the statute (supra), and an order granting an extension of time for the filing of objections was subsequently published (22 F. R. 1429).

A request having been received for an extension of the effective date for the standards of fill of container for canned tuna fish, in order to permit more effective compliance with these standards, and such request appearing to be based on reasonable grounds: *It is ordered*, That the effective date for the standards of fill of container for canned tuna fish be extended to August 13, 1957.

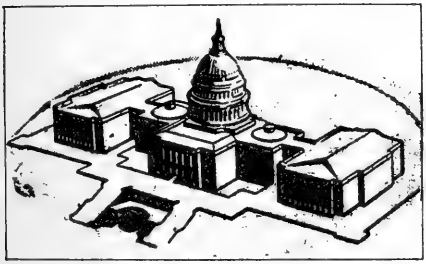
(Sec. 701, 52 Stat. 1055, as amended; 21 U. S. C. 371)

Dated: April 25, 1957.

[SEAL] GEO. P. LARRICK,
Commissioner of Food and Drugs.

Eighty-Fifth Congress
(First Session)

Listed below are the public bills and resolutions and reports that directly or indirectly affect the fisheries and allied industries. Public bills and resolutions



are shown when introduced; from month to month the more pertinent reports and hearings, or chamber actions on the bills shown are published; and if passed, the date when signed by the President.

ALASKA STATEHOOD: H. R. 50 (Bartlett), reported favorably to the House on May 28 by the Committee on Interior and Insular Affairs (amended and a clean bill drafted and introduced), provides for the admission of the State of Alaska to the Union. The bill as approved by the Subcommittee on Territorial and Insular Affairs included an amendment that would defer for five years after Alaskan statehood took effect the transfer of fish and wildlife resources from the Interior Department to Alaskan authorities. This amendment was deleted by the full committee. See Commercial Fisheries Review, February 1957, p. 62 and May 1957, p. 71 for other information on this subject.

Amendment to Alaska statehood bill (Westland) would provide supervision for five years by Fish and Wildlife Service; adopted by the subcommittee, but thrown out by the full House Committee on Interior and Insular Affairs. Believes amendment would be necessary to maintain Northwest fishing industry without danger of being frozen out by laws made for and by Alaskans.

CHEMICAL ADDITIVES IN FOOD: H. R. 7798 (Delaney) introduced in the House on May 28, a bill to protect the public health by amending the Federal Food, Drug, and Cosmetic Act so as to provide for the safety of chemical additives in food. Also: H. R. 7938 (Mrs. Sullivan) introduced in the House on June 5; both bills referred to the Committee on Interstate and Foreign Commerce. See Commercial Fisheries Review, February 1957, p. 63 and May 1957, p. 71 for other bills.

FAIR LABOR STANDARDS ACT INCREASED COVERAGE: S. 1853 (Kennedy and McNamara) introduced in the Senate on April 9, a bill to amend the Fair Labor Standards Act of 1938, as amended, to provide coverage for employees of enterprises engaged in commerce or in the production of goods and services for commerce or the sale thereof, to eliminate certain exemptions, and for other purposes; the Committee on Labor and Public Welfare. This is a substitute bill for other Senate bills previously introduced. The bill, which would eliminate the overtime exemption for fish canners contained in Section 13 (b) (4) of the Fair Labor Standards Act of 1938, was approved by the Subcommittee, without recommendation, on May 7. The full Committee considered bill on May 27-28, but took no action. See Commercial Fisheries Review, February 1957, p. 63, March 1957, p. 59, for other bills.

INTERNATIONAL FISHERIES COMMISSIONS: H. R. 6871, a bill making appropriations for Departments of State and Justice, the Judiciary, and related agencies for fiscal year 1958. House Conference Report (No. 492, May 28, 1957) appropriated $1,600,000 for the use of International Fisheries Commissions. This sum is $54,000 less than the amount proposed by the Senate.

NORTH PACIFIC FISHERIES ACT OF 1954: S. 2212 (Magnuson) introduced in the Senate June 5, 1957, a bill to amend the North Pacific Fisheries Act of 1954; to the Committee on Interstate and Foreign Commerce. This bill proposes to extend Federal authority to regulate United States fisheries operations on the high seas, south of Dixon entrance in Alaska, to the entrance of the Strait of Juan De Fuca, between the State of Washington and British Columbia, Canada. Provides for the coordination of conservation practices for the States of Washington, Oregon, and California, the United States and Canada. Similar legislation has already been enacted by the Canadian Legislature, and the three Pacific Coast States. Similar in purpose: H. R. 7954 (Tollefson) introduced in the House on June 6, 1957.

SMALL BUSINESS ACT AMENDMENT: H. R. 7963 (Spence) introduced in the House on June 6, a bill to amend the Small Business Act of 1953, as amended; to the Committee on Banking and Currency. This bill is a substitute to one or more other bills previously introduced and was ordered favorably reported to the House by the Committee on Banking and Currency. The bill provides that Title II of the Act of July 30, 1953 (Public Law 163, 83rd Congress), as amended, is hereby withdrawn as a part of that Act and is made a separate Act to be known as the "Small Business Act." Defines a small business concern as one which is independently owned and operated and which is not dominant in its field of operation, plus other criteria that can be used by the Administrator of the Act to establish a new definition of "Small Business." Also: authorizes appropriations not to exceed $650 million to be made to a revolving fund in the Treasury. See Commercial Fisheries Review, February 1957, pp. 66 and 67; April 1957, p. 66; and May 1957, p. 72; for other bills on this subject.

SOCKEYE SALMON FISHERIES CONVENTION: Protocol between the United States and Canada to the convention for the protection, preservation, and extension of the sockeye salmon fisheries in the Fraser River system. Favorably reported by the Committee on Foreign Relations on May 23 (Ex. Rept. 2) and ratified unanimously by the Senate on June 6.

S. 1806 (Magnuson and Jackson), a bill to amend the Sockeye Salmon Act of 1947. Passed the Senate with amendments on May 22. Provides for the inclusion of pink salmon under the Act. The amendments under this Act will take effect on the date of entry into force of the protocol, signed at Ottawa on December 28, 1956, between the United States and Canada to the convention for the protection, preservation, and extension of the sockeye salmon fisheries of the Fraser River system, signed at Washington on May 26, 1930. Also: H. R. 6587 (Tollefson) favorably reported to the House Committee on Merchant Marine and Fisheries on June 4 by the Subcommittee on Fisheries and Wildlife Conservation.

UNEMPLOYMENT IN DEPRESSED AREAS: H. R. 8001 (Reuss) introduced in the House on June 7, a bill to alleviate conditions of excessive unemployment and underemployment in depressed industrial and rural areas; to the Committee on Banking and Currency. H. R. 8001 is similar in purpose to H. R. 1087 (Celler) introduced January 3, 1957 (see Commercial Fisheries Review, February 1957, p. 66). H. R. 1087 would be titled the "Area Development Act" and provides that an area is an "industrial development area:" if (1) unemployment of not less than 6 percent of the labor force, adjusted seasonally, exists and has existed during the major portion of each of the preceding two years, or (2) unemployment of not less than 10 percent of the labor force, adjusted seasonally, exists, with no reasonable prospect for improvement in the immediate future, and has existed throughout the preceding six months.

TOASTED TUNA SANDWICH LOAF

The home economists of the U. S. Fish and Wildlife Service have recently developed and tested a new sandwich which they call "Toasted Tuna French Loaf." It is a combination of toasted French bread filled with canned tuna, grated cheese, prepared mustard, and chopped sweet pickles. Here's the recipe for this newest of sandwiches.

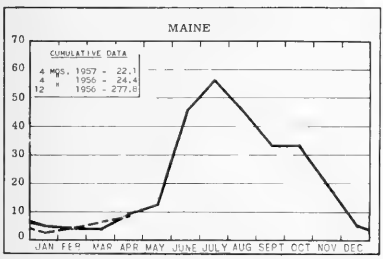
TOASTED TUNA FRENCH LOAF

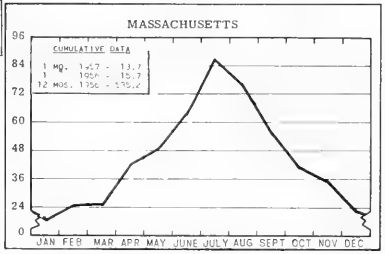
1 CAN ($6\frac{1}{2}$ OR 7 OUNCES) TUNA
$\frac{1}{4}$ CUP BUTTER OR MARGARINE
1 TEASPOON PREPARED MUSTARD
1 SMALL LOAF FRENCH BREAD
1 TABLESPOON GRATED ONION
1 TEASPOON PREPARED MUSTARD
1 CUP GRATED CHEESE
2 TABLESPOONS CHOPPED SWEET PICKLE OR SWEET PICKLE RELISH

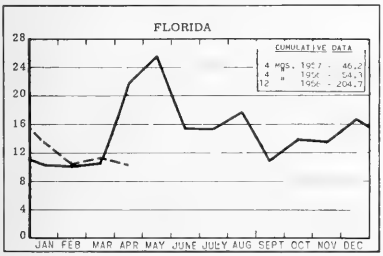
Drain tuna. Flake. Cream butter and mustard. Cut bread in half lengthwise and remove a small amount of the center. Spread the bread with mustard-butter. Combine remaining ingredients. Fill bread with tuna mixture. Cut loaf into 12 slices and wrap in aluminum foil. Bake in a very hot oven, 450° F., for 30 minutes or until heated through and cheese melts. Serves 6.

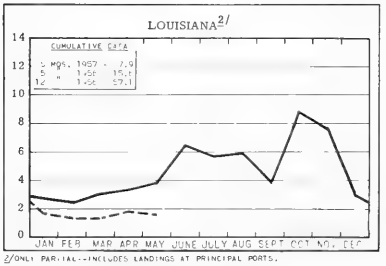
CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

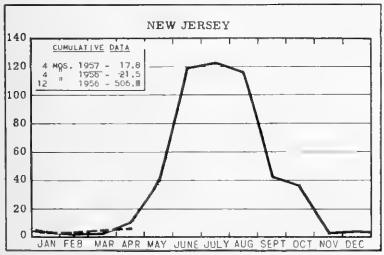


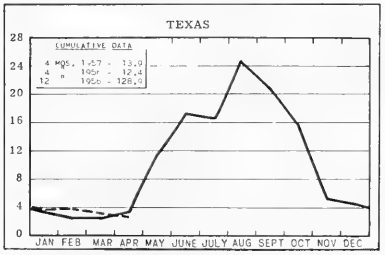


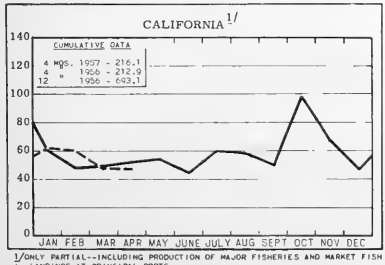




2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.







1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

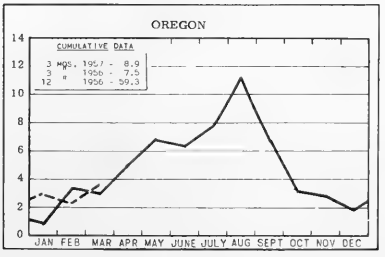
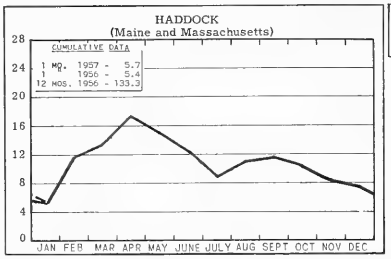
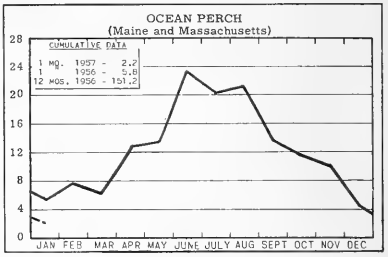


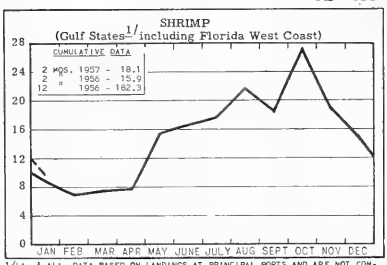
CHART 2 - LANDINGS for SELECTED FISHERIES

In Millions of Pounds

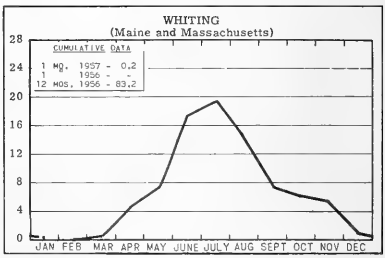




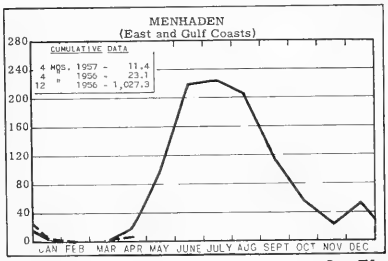
In Millions of Pounds

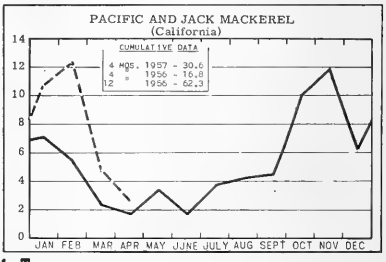


1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

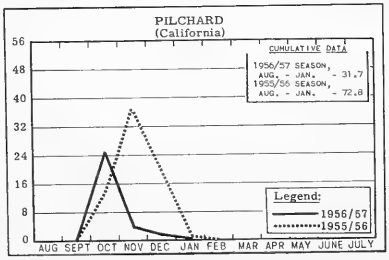


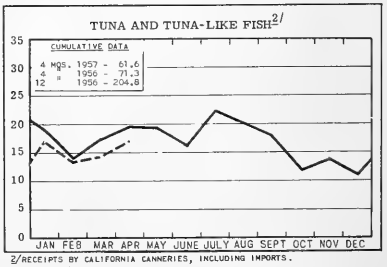
In Thousands of Tons





In Thousands of Tons

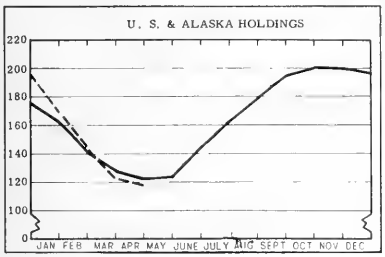


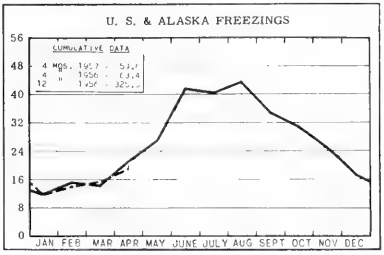


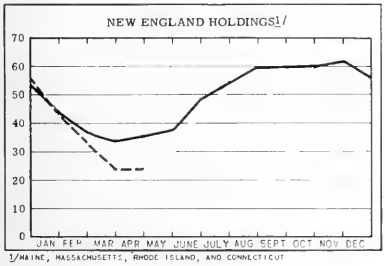
2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

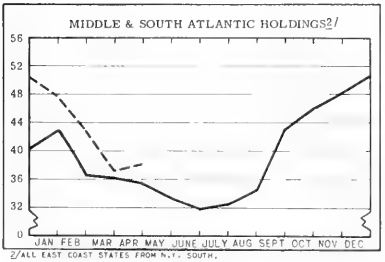
In Millions of Pounds



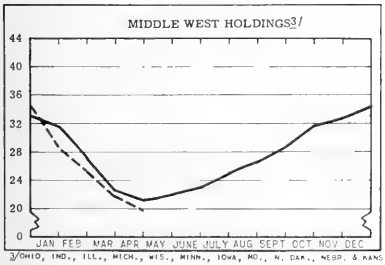




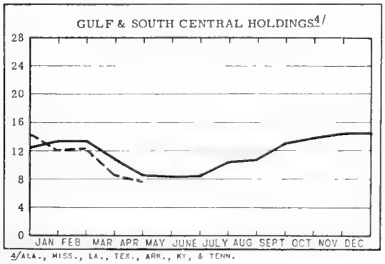
1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT



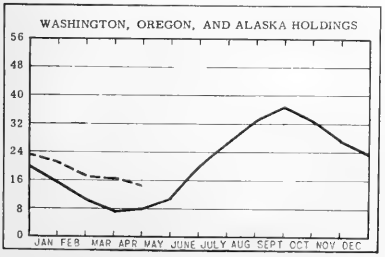
2/ALL EAST COAST STATES FROM N.Y. SOUTH.

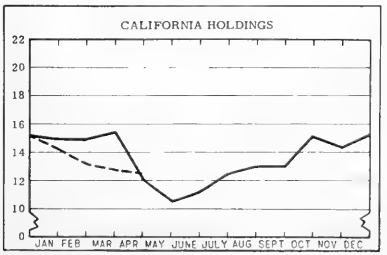


3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.



4/ALA., MISS., LA., TEX., ARK., KY., & TENN.





*Excludes salted, cured, and smoked products.

CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pounds

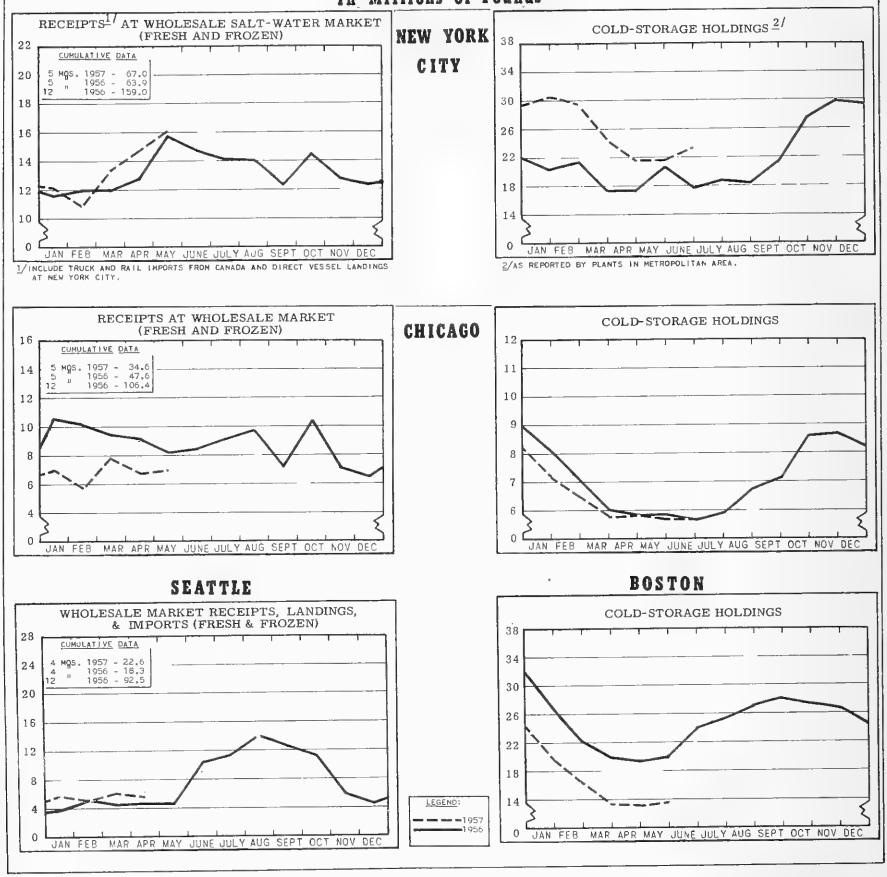


CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA

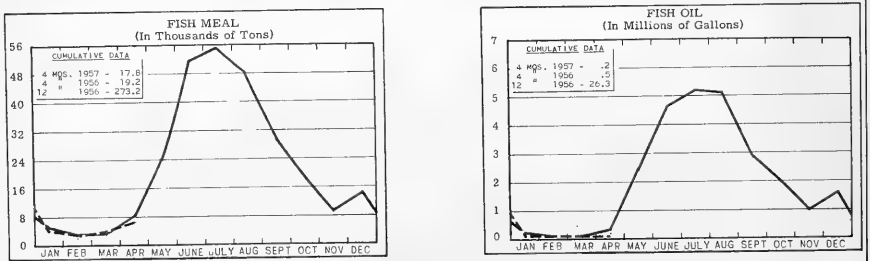
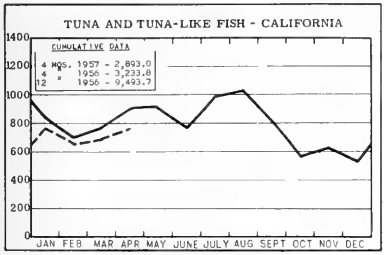
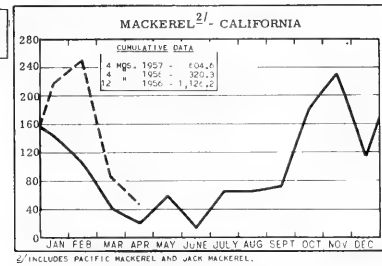


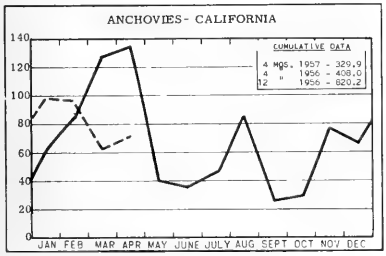
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

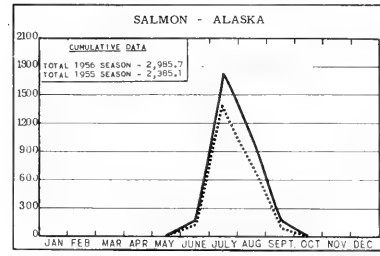
In Thousands of Standard Cases

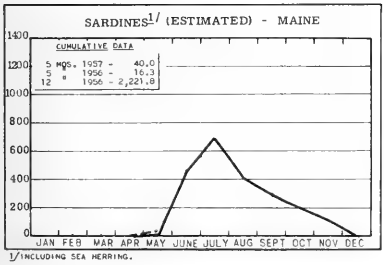




2/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



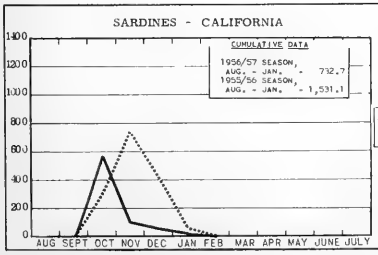




1/ INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	¼ drawn	3¾ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. ½ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	½ lb.	8 oz.



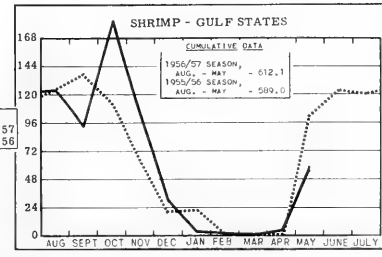
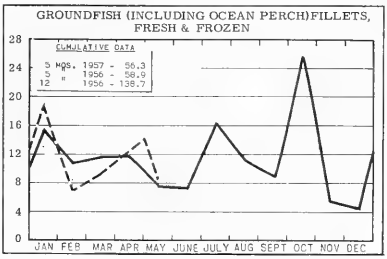
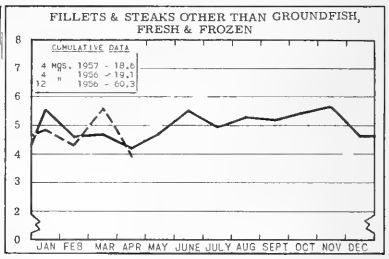
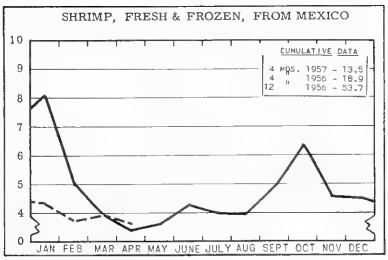


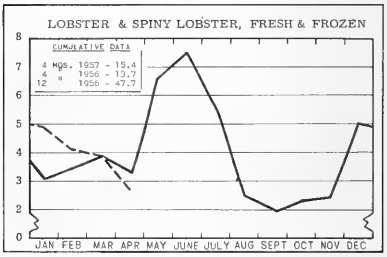
CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

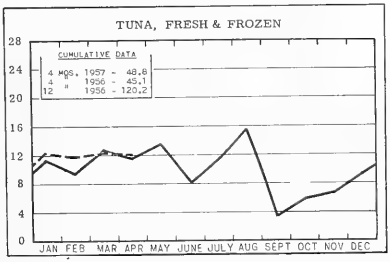
In Millions of Pounds

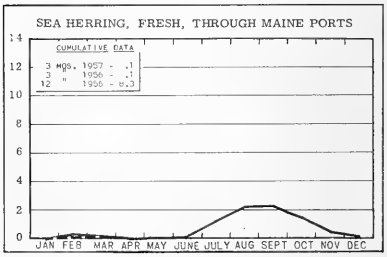


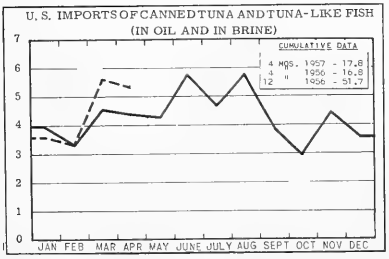


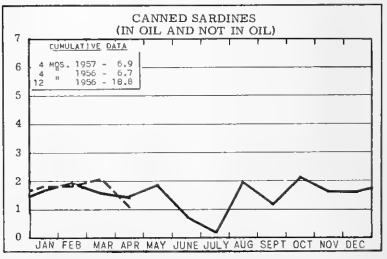












FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U.S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D.C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
SL - STATISTICAL SECTION LISTS OF DEALERS IN AND PRODUCERS OF FISHERY PRODUCTS AND BYPRODUCTS.
FL - FISHERY LEAFLETS.
SSR - FISH, - SPECIAL SCIENTIFIC REPORTS--FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1499 - New Jersey Landings, 1956 Annual Summary, 4 pp.
CFS-1503 - Texas Landings, January 1957, 3 pp.
CFS-1505 - Massachusetts Landings, August 1956, 4 pp.
CFS-1513 - California Landings, November 1956, 4 pp.
CFS-1514 - New York Landings, January 1957, 4 pp.
CFS-1515 - Lake Fisheries, 1955 Annual Summary, 11 pp.
CFS-1517 - Canned Fish and Byproducts, 1956 Annual Summary, 20 pp.
CFS-1518 - Packaged Fish, 1956 Annual Summary, 4 pp.
CFS-1519 - Mississippi Landings, January 1957, 2 pp.
CFS-1520 - California Landings, December 1956, 4 pp.
CFS-1521 - Florida Landings, January 1957, 6 pp.
CFS-1522 - Georgia Landings, February 1957, 2 pp.
CFS-1523 - Alabama Landings, January 1957, 2 pp.
CFS-1524 - Frozen Fish, 1956 Annual Summary, 13 pp.
CFS-1525 - Texas Landings, February 1957, 2 pp.
CFS-1526 - North Carolina Landings, February 1957, 2 pp.
CFS-1527 - South Carolina Landings, February 1957, 2 pp.
CFS-1528 - Frozen Fish Report, March 1957, 7 pp.
CFS-1529 - Maine Landings, February 1957, 3 pp.
CFS-1530 - New York Landings, February 1957, 4 pp.
CFS-1531 - Rhode Island Landings, February 1957, 3 pp.
CFS-1532 - New Jersey Landings, February 1957, 4 pp.
CFS-1533 - Fish Stick Report, January - March, 1957, 2 pp.
CFS-1534 - Mississippi Landings, February 1957, 2 pp.
CFS-1536 - Alabama Landings, February 1957, 2 pp.
CFS-1546 - Shrimp Landings, December 1956, 4 pp.

SL-25 - Wisconsin 1957 (Lakes Area), Wholesale Dealers in Fishery Products (Revised), 2 pp.

FL-336ff - Commercial Fisheries Outlook, April - June 1957, 43 pp., April 1957.

FL-393 - Fisheries of the United States and Alaska, 1956 (A Preliminary Review), by E.A. Power, 42 pp., April 1957. A preliminary review of commercial fishery activities in 1956. A record 5.2 billion pounds of fish and shellfish was taken by United States and Alaskan fishermen in 1956--a gain of 8 percent as compared with the previous year. It is estimated that the 1956 catch had an ex-vessel value of about $363 million--about 27 million dollars more than the previous year. The record 1956 catch resulted from the largest menhaden production in the history of the fishery, and sharp increases in catches of tuna, Alaska and Maine herring, jack and Pacific mackerel, and industrial fish in New England. Small gains occurred in salmon, haddock, Pacific halibut, and anchovies while smaller catches were made of shrimp, Pacific sardines, and whiting. In 1956, about 150,000 commercial fishermen utilized 90,000 boats to fish. This leaflet points out that the commercial fishing industry was responsible for the employment of an estimated 300,000 workers in allied industries such as gear manufacture, making processing machinery, and boat construction; the employment of 101,000 shore workers in 4,024 shore establishments including processing plants and some wholesale units but not retailers; and the employment of 3,300 workers using 1,350 boats to transport fish from area of capture to handling and processing plants. The consuming public's response to this activity was to eat an average of 10.1 pounds (edible weight) of fish per person during the year; of this 5.7 pounds were fresh and frozen fish, 3.8 pounds were the canned product, and 0.6 pound was cured. In 1955 the consumption was 10.2 pounds per capita. While the total 1956 catch set an all-time record, the record-shattering portion of it was in industrial fish, with menhaden production setting the pace. The industrial catch, which is largely converted into oil and meal, totaled 2.4 billion pounds, 300 million pounds above the previous record set in 1955. The catch of edible fish was 2.8 billion pounds which is considerably below the record 3.4 billion pounds harvested in 1950. The total value of the catch, including both industrial and food fish, was $363 million, or $4 million below the high mark set in 1948. The average price of the catch dropped below 7 cents a pound for the first time since 1945. The 1956 average was 6.98 cents a pound as compared with the record of 8.17 cents in 1951. This decline is due largely to the big industrial catch which comprised a greater portion of the catch than ever before. This leaflet also contains information on the canned pack for 1956 and data by states on the quantity and value

of the 1955 catch and considerable data on imports and exports and world fisheries.

SSR-Fish. No. 197 - Nature of Green or Offcolor Condition in Precooked Yellowfin Tuna, by John J. Naughton, Michael M. Frodyma, and Harry Zeitlin, 12 pp., illus., December 1956. Preliminary results from the analytical use of spectral reflectance in the study of the "greening" condition in precooked yellowfin tuna are reported. It was found possible to predict tendency to greening from laboratory precooking. The preliminary conclusions were that color changes in tuna are the results of oxidative changes in the hemoglobin and myoglobin pigments of the meat, and that differences in color, including greening, result from differences in the concentration of these pigment derivatives. A relatively higher concentration of methemoglobin or metmyoglobin in raw fish meat seems to be indicative of a tendency to greening on precooking.

Sep. No. 476 - A Picture Study of an American Whaling Operation.

Sep. No. 477 - Bulk Handling of Alaska Herring Meal.

Sep. No. 478 - Research in Service Laboratories (May 1957): Contains these articles-- "Technical Note No. 37 - Use of Bacterial Culture to Aid Separation of Menhaden Oil in Gravity Tanks;" "Progress on Fish Meal Nutritive Value Studies;" and "Iron Sulfide Discoloration of Tuna Cans."

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Receipts and Prices of Fresh and Frozen Fishery Products at Chicago, 1956, by G. A. Albano, 54 pp., processed, April 1957. (Available free from the Market News Service, U. S. Fish and Wildlife Service, 565 West Washington St., Chicago 6, Ill.) This report presents an analysis of the marketing trends for fresh and frozen fishery products and statistical tables on the receipts of fresh and frozen fish and shellfish at Chicago during 1956. Statistics on arrivals of fishery products at Chicago are presented by species and by states and provinces of origin; states and provinces by species; species by months; states and provinces by months; totals by species; and totals by states and provinces. Receipts are tabulated by methods of transportation (truck, express, and freight). A table shows the monthly range of wholesale prices of some of the leading varieties of fresh and frozen fishery products handled on the Chicago market. In the analysis of the marketing trends for fresh and frozen fishery products at Chicago, the author discusses the sources of the receipts, methods of transportation, months of greatest receipts, receipts by species and varieties, lake trout and whitefish receipts, U.S. imports of fresh and frozen fish from Canada, U.S. imports of frozen fillets, and cold storage inventories. Also included is a table giving the names, classifications, and approximate weights of certain fishery products sold in the Chicago wholesale market.

Boston Fishery Products Monthly Summary, February 1957, 15 pp.; Boston Fishery Products Monthly Summary, March 1957, 15 pp.; Boston Fishery Products Monthly Summary, April 1957, 15 pp. (Market News Service, U.S. Fish and Wildlife Service, 10 Commonwealth Pier, Boston 10, Mass.) Landings and ex-vessel prices by species for fares landed at the Boston Fish Pier and sold through the New England Fish Exchange; and Boston frozen fishery products prices to primary wholesalers; for the months indicated.

California Fishery Products Monthly Summary, March 1957, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, Post Office Bldg., San Pedro, Calif.) California cannery receipts of raw tuna and tunalike fish, herring, mackerel, anchovies, and squid; pack of canned tuna, herring, mackerel, anchovies, and squid; market fish receipts at San Pedro, Santa Monica, San Diego, and Eureka areas; California imports; canned fish and frozen fish prices; for the month indicated.

(Chicago) January 1957 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp.; February 1957 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp.; March 1957 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, 565 W. Washington St., Chicago 6, Ill.) Receipts at Chicago by species and by states and provinces; fresh-water fish, shrimp, and frozen fillet wholesale market prices; for the months indicated.

Gulf Monthly Landings, Production, and Shipments of Fishery Products, April 1957, 5 pp. (Market News Service, U.S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf States shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

(New York) Monthly Summary - January 1957 - Receipts of Fishery Products at the New York City Wholesale Salt-Water Market, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 155 John St., New York 38, N.Y.) Receipts in the salt-water section of the Fulton Fish Market by species and by states and provinces for the months indicated.

(Seattle) Monthly Summary - Fishery Products, March 1957, 6 pp. (Market News Service, U.S. Fish and Wildlife Service, 421 Bell St. Terminal, Seattle 1, Wash.) Includes landings and local receipts, with ex-vessel and wholesale prices in some instances, as reported by Seattle and Astoria (Oregon) wholesale dealers; also Northwest Pacific halibut landings; for the month indicated.

THE FOLLOWING SERVICE PUBLICATIONS ARE FOR SALE AND ARE AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D.C.

Effects of Environment and Heredity on Growth of the Soft Clam (MYA ARENARIA), by Harlan S. Spear and John B. Glude, Fishery Bulletin 114 (From Fishery Bulletin of the Fish and Wildlife Service, vol. 57), 17 pp., illus., printed, 20 cents, 1957. The objective of the experiment, described in this report, was to determine whether differences in growth rates of soft clams in two parts

of one bay were caused by environment or by heredity. The experiments demonstrated that environment, not heredity, is the important factor in growth. Clams from one origin may have highly significant differences in growth rate when planted in different areas. Clams of different origins assume similar growth rates when transplanted to the same area.

Laws and Regulations for Protection of the Commercial Fisheries of Alaska, 1957, Regulatory Announcement 51, 82 pp., printed, April 1957, 30 cents. This publication is divided into two sections. One section contains laws for the protection of the commercial fisheries of Alaska and related information, including the authority for regulation, rules regarding oyster culture, Bristol Bay residence requirements, regulation of salmon escapement, fishing gear restrictions, exceptions to weekly closed seasons, etc. The second section contains all the regulations for the commercial fisheries of Alaska amended to date and which became effective April 5, 1957. These 1957 regulations supersede the regulations published in Regulatory Announcement 48 which became effective April 21, 1956.

A Method of Estimating Abundance of Groundfish on Georges Bank, by George A. Rounsefell, Fishery Bulletin 113 (From Fishery Bulletin of the Fish and Wildlife Service, vol. 57), 16 pp., illus., printed, 15 cents, 1957.

Yellowfin Tuna Spawning in the Central Equatorial Pacific, by Heeny S.H. Yuen and Fred C. June, Fishery Bulletin 112 (From Fishery Bulletin of the Fish and Wildlife Service, vol. 57), 17 pp., illus., printed, 15 cents, 1957.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

AMBERGRIS:

Ambergris, Its Properties and Identification, Special Service Bulletin no. 2, 1 p., processed. Marine Laboratory, University of Miami, Coral Gables, Fla., revised June 1953.

CALIFORNIA:

"Report on California's Sacramento River Fisheries," article, 32 pp., processed. Department of Fish and Game, 722 Capitol Ave., Sacramento, Calif., March 29, 1957. There are seven parts to this paper: Part I--Problems of the Sacramento River Salmon, Striped Bass, and Shad Fisheries; Part II--Summary of Facts Relating to Sacramento River Migratory Fisheries; Part III--Conclusions; Part IV--Recommendations; Part V--Reasons for Recommendations; Part VI--Salmon Spawning Survey Results; and Part VII--Incidental Losses of Striped Bass in the Sacramento River Gill-Net Fisheries for Shad and Salmon.

CANADA:

Fisheries Statistics of British Columbia, 1956 (Preliminary), 11 pp., illus., processed. Canadian Department of Fisheries, Vancouver, B.C., Canada, April 5, 1957. A summary of fisheries statistics of British Columbia containing graphs and tables covering quantities and value of the most important species of fish for 1956; landed and marketed value of fish and fishery products for 1942-56; landings and manufactured products marketed in British Columbia for 1956; salmon pack; inventory of boats (10 tons and over), 1956; inventory of boats (less than 10 tons), 1956; and quantity and value of gear used in the primary fisheries, 1956.

Fisheries Statistics of Canada, 1954 (New Brunswick), 59 pp., printed in French and English, 50 Canadian cents. Queen's Printer and Controller of Stationery, Ottawa, Canada, 1957. Consists of tables giving the production and value of the principal species of fish and shellfish in New Brunswick in 1951-54; quantity and value of landings by species and fisheries districts, 1953-54; quantity and value of manufactured fishery products by species and fisheries districts, 1953-54; capital equipment in the primary fisheries operations; and the number of persons engaged in the fisheries.

Fisheries Statistics of Canada, 1954 (Ontario, Prairie Provinces and Northwest Territories), 71 pp., printed in French and English, 50 Canadian cents. Dominion Bureau of Statistics, Ottawa, Canada, 1957. Consists of tables giving the quantity and value of the principal species of inland fish landed in Ontario in 1951-54; quantity and value of landings by species and fisheries districts, Ontario, 1953-54; capital equipment in the primary fisheries operations; and the number of persons engaged in the fisheries. Similar data are also given of the Prairie Provinces (Manitoba, Saskatchewan, and Alberta) and the Northwest Territories.

CEYLON:

Food Regulations of Ceylon, World Trade Information Service Part 2, no. 57-35, 4 pp., printed, 10 cents. Bureau of Foreign Commerce, U.S. Department of Commerce, Washington, D.C. (For sale by the Superintendent of Documents, Government Printing Office, Washington 25, D.C.) The Food and Drugs Act, No. 25 of 1949, provides "for the regulation and control of the importation, sale and distribution of food and drugs and for matters connected therewith or incidental thereto," and gives the Government of Ceylon authority to issue regulations for administering and enforcing its provisions. This leaflet gives the sanitary requirements, special regulations, local regulations, and marking and labeling requirements of Ceylon's imported foods.

CROAKER:

Distribution, Growth, and Availability of Juvenile Croaker, MICROPOGON UNDULATUS, in Virginia, by Dexter S. Haven, Contributions from the Virginia Fisheries Laboratory, No. 68, 10 pp., illus., printed. (Reprinted from Ecology, vol. 38, no. 1, January 1957, pp. 88-97.) Virginia Fisheries Laboratory, Gloucester Point, Va.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

EXPORTS:

United States Exports of Domestic and Foreign Merchandise (Commodity by Country of Destination), Calendar Year 1956, Report No. FT 410, processed, Part I, 238 pp., 30 cents; Part II, 413 pp., $2. Bureau of the Census, U.S. Department of Commerce, Washington, D.C., 1957. (For sale by the Superintendent of Documents, Washington 25, D.C.) The statistics in Part I cover exports of domestic and foreign merchandise (including fishery products and byproducts) under group 00 to group 5 from the United States to foreign countries. Part II covers merchandise under group 6 to 9 (some items of interest to the fishery and allied industries are included).

FLORIDA:

(Florida State Board of Conservation) Twelfth Biennial Report, 1955-56, 77 pp., illus., printed. Florida State Board of Conservation, Tallahassee, Fla., 1957. Describes the activities of the Florida State Board of Conservation during 1955-56, summarizing the goals attained and progress achieved in the betterment of salt-water conservation. Includes chapters on sport fishing, commercial fisheries, commercial fish landings, oyster cultivation and rehabilitation, research, licenses, administration, and trends. The chapter on commercial fisheries discusses the principal problem of the commercial fishing industry; the continued decline in demand for mullet. Several studies were concluded during the two-year period on the economic and marketing aspects, and other investigations, centered on new products that might be developed from mullet, provided technological know-how for producers. The chapter on commercial fisheries also discusses the second major commercial problem confronting the department, the persistent suspicion that the Tortugas shrimp fishery might be overexploited. The Board sponsored studies into possible preliminary measures to protect the shrimp fisheries' future. Following this research a rule was passed setting a minimum size for shrimp and prescribing certain mesh sizes for shrimp trawl nets.

FRANCE:

"Shell Fishing Methods in Brittany," by Dr. A.V. Brandt, article, World Fishing, vol. 6, no. 4, April 1957, pp. 48-49, illus., printed. John Trundell, Ltd., Temple Chambers, Temple Ave., London, E.C. 4, England. A brief article describing the different types of pots and creels used in taking lobsters and crabs along the French coast.

INTERNATIONAL LAW OF THE SEA:

La Utilizacion y Conservacion de las Riquezas del Mar (The Utilization and Conservation of the Resources of the Seas), by F.V. Garcia Amador, 250 pp., printed in Spanish. Editorial Lex, Amargura 259-261, Havana, Cuba, 1956. Discusses the utilization and conservation of the resources of the seas as one of the most pressing problems of contemporary international law. According to the author, abuse of the freedom of exploitation of the seas makes it necessary to formulate limitations on exploitation through close international cooperation. This book contains the five following chapters: (1) Introduction: Freedom of the Seas and Contemporary Problems; (2) The Legal Control of the Seas and New Projections of State Authority; (3) Submarine Areas and the Right to Utilize Their Resources; (4) Conservation of the Living Resources of the Seas; and (5) Conclusion: The New International Law of the Sea.

JELLYFISH:

Some Inhabitants of Chesapeake Bay, Animals of Jelly, by Robert Bailey, Contributions from the Virginia Fisheries Laboratory, No. 66, 2 pp., illus., printed. (Reprinted from Virginia Wildlife, vol. XVII, no. 9, September 1956, pp. 12-13.) Virginia Fisheries Laboratory, Gloucester Point, Va.

LAWS AND REGULATIONS:

Conference on Co-ordination of Fisheries Regulations between Canada and the United States (Summary of Proceedings, Seattle, Washington--February 27-28, 1957), 15 pp., processed. U.S. Department of State, Washington 25, D.C. Discusses a meeting of representatives of Canada and the United States to discuss coordination of specific fisheries regulations for the Pacific area pertaining to offshore salmon net fishing, salmon troll fishing, and trawl fishing for petrale sole and black cod. The representatives of both Canada and the United States agreed that development of major offshore salmon net fisheries posed a serious problem and that regulations of such fishing in the eastern Pacific ocean was essential to the conservation of salmon stocks of North American origin. The United States Delegation stated that different regulations with regard to open season and size limit applied to the troll fisheries off the coast of continental United States, Canada, and Alaska and that in their view, such regulations were necessary to conserve the salmon stocks and thus it would be desirable to have these conform in the respective areas. The United States Delegation outlined certain recent developments in the otter trawl fisheries which demonstrated in their view the necessity for further restrictions particularly with respect to the fishing season for petrale sole, a minimum size limit for black cod, and the mesh size authorized for trawl nets. The major agreements which were reached between the Canadian and United States Delegations during the Conference are presented, as well as a list of those attending the Conference. Reports of the various subcommittees on troll and trawl regulations and the location of the line delimiting offshore waters at the entrance to the Strait of San Juan de Fuca are also included.

Oregon Commercial Fisheries Code, 1955-1956, 158 pp., printed. Oregon Fish Commission, 307 State Office Bldg., Portland 1, Ore. A compilation of the laws of the State of Oregon relating to the protection and propagation of food fish and shellfish.

(Washington) Commercial Fishing Regulations, 1956 (Salmon and Bottomfish), 30 pp., printed. Department of Fisheries, Olympia, Wash., May 1956. This summary is condensed from regulations for the taking of food fish and shellfish for commercial purposes. Contains fishing gear definitions and general definitions and regulations.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

The sections on Puget Sound salmon, Columbia River salmon, Grays Harbor, Willapa Harbor, Pacific Ocean waters, and coastal waters summarize regulations pertaining to areas, gear, and seasons.

MOLLUSKS:

Notes on Fungus Parasites of Bivalve Mollusks in Chesapeake Bay, by Jay D. Andrews, Contributions from the Virginia Fisheries Laboratory, No. 54, 7 pp., processed. (Reprinted from Proceedings of the National Shellfish Association, vol. 45, 1954, pp. 157-163.) Virginia Fisheries Laboratory, Gloucester Point, Va.

MULLET:

Interim Report on Mullet Research, by G.C. Broadhead and H.P. Mefford, Special Service Bulletin no. 8, 9 pp., processed. Marine Laboratory, University of Miami, Coral Gables, Fla., January 1954.

NAVIGATION:

Annual Report of the Director of the Coast and Geodetic Survey for the Fiscal Year Ended June 30, 1956, 75 pp., illus., printed, 40 cents. Coast and Geodetic Survey, U.S. Department of Commerce, Washington, D.C. Describes the activities and functions of the Coast and Geodetic Survey for 1956, including the preparation and issuance of nautical charts and coast pilots.

List of Lights and Other Marine Aids, Great Lakes, United States and Canada, Ninth Coast Guard District, Corrected to March 1, 1957, 235 pp., illus., processed, $1.75. U.S. Coast Guard, Washington, D.C. (For sale by the Superintendent of Documents, Government Printing Office, Washington 25, D.C.) Lights and other marine aids to navigation maintained by or under authority of the United States Coast Guard and the Dominion of Canada on the Great Lakes and the St. Lawrence River above St. Regis River are contained in this list. This list is intended to furnish more complete information concerning aids to navigation than can be conveniently shown on charts. It is not intended to be used in navigation in the place of charts and the lake pilot and should not be so used. The charts should be consulted for the location of all aids to navigation.

Supplement to United States Coast Pilot 1, Atlantic Coast, Section A, St. Croix River to Cape Cod, Fifth (July 1, 1950) Edition, Serial 737/7, 39 pp., printed, February 2, 1957; Supplement to United States Coast Pilot 9, Alaska, Cape Spencer to Arctic Ocean, Sixth (November 6, 1954) Edition, Serial 779/2, 22 pp., printed, February 16, 1957; and Supplement to United States Coast Pilot 10, Hawaiian Islands, Third (January 1, 1950) Edition, Serial 735/7, 14 pp., printed, February 16, 1957. Coast and Geodetic Survey, U.S. Department of Commerce, Washington 25, D.C.

OYSTERS:

Changes in the Physiography of Oyster Bars in the James River, Virginia, by Nelson Marshall, Contribution No. 17 of the Oceanographic Institute, Florida State University, 9 pp., illus., printed. (Reprinted from The Virginia Journal of Science, vol. 5, no. 3, July 1954, pp. 173-181.) The Oceanographic Institute, Florida State University, Tallahassee, Fla.

Cultivation of Oysters in Ponds at Bears Bluff Laboratories, by G. Robert Lunz, 5 pp., processed. (Reprinted from Proceedings of the National Shellfisheries Association, vol. 46, pp. 83-87.) Bears Bluff Laboratories, Wadmalaw Island, S.C. One of the greatest drawbacks to good quality oyster production is "wrap-up," or the crowding of oysters on cultch. This is due to the long setting season, the intensity of setting, and the low mortality of the young. To control this intense setting, to practice water farming, and to utilize unproductive lands, cultivation of oysters in ponds was begun in 1944. This paper describes the construction of the ponds, the planting of seed oysters, and the results of the experiments.

Osmotic Behavior and Bleeding of the Oyster, CRASSOSTREA VIRGINICA, by Milton Fingerman and Laurence D. Fairbanks, 19 pp., illus., printed. (Reprinted from Tulane Studies in Zoology, vol. 3, no. 9, April 12, 1956, pp. 151-168.) Department of Zoology, Tulane University, New Orleans, La. The present investigation was undertaken with a twofold purpose. The first aim was to obtain quantitative information concerning the weight changes and fluid losses that occur during the summer months in Southern oysters after the body has been removed from the shell. The second aim was to investigate in a detailed fashion the osmoregulatory ability of the American oyster, Crassostrea virginica. Results of these studies are presented.

Oyster Mortality Studies in Virginia--II. The Fungus Disease Caused by DERMOCYSTIDIUM MARINUM in Oysters of Chesapeake Bay, by Jay D. Andrews and Willis G. Hewatt, Contributions from the Virginia Fisheries Laboratory, No. 69, 25 pp., illus., printed. (Reprinted from Ecological Monographs, vol. 27, no. 1, January 1957, pp. 1-25.) Virginia Fisheries Laboratory, Gloucester Point, Va.

Setting of Oysters in Virginia, by Jay D. Andrews, Contributions from the Virginia Fisheries Laboratory, No. 53, 9 pp., processed. (Reprinted from Proceedings of the National Shellfish Association, vol. 45, 1954, pp. 38-46.) Virginia Fisheries Laboratory, Gloucester Point, Va.

Temperature Control Experiments on the Fungus Disease, DERMOCYSTIDIUM MARINUM, of Oysters, by Willis G. Hewatt and Jay D. Andrews, Contributions from the Virginia Fisheries Laboratory, No. 62, 5 pp., processed. (Reprinted from Proceedings of the National Shellfish Association, vol. 46, pp. 129-133.) Virginia Fisheries Laboratory, Gloucester Point, Va.

What Killed Your Oysters? by Jay D. Andrews, Contributions from the Virginia Fisheries Laboratory, No. 65, 2 pp., illus., printed. (Reprinted from Southern Fisherman, vol. XVI, no. 7, July 1956, pp. 22-23.) Virginia Fisheries Laboratory, Gloucester Point, Va.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

OYSTER DRILLS:

Trapping Oyster Drills in Virginia--I. The Effect of Migration and Other Factors on the Catch, by Jay D. Andrews, Contributions from the Virginia Fisheries Laboratory, No. 63, 15 pp., illus., processed; and II. The Time Factor in Relation to the Catch per Trap, by J. L. McHugh, Contributions from the Virginia Fisheries Laboratory, No. 64, 14 pp., illus., processed. (Reprinted from Proceedings of the National Shellfish Association, vol. 46, pp. 140-168.) Virginia Fisheries Laboratory, Gloucester Point, Va.

PHILIPPINES:

"Commercial Trawling in the Philippines," by Porfirio R. Manacop, article, The Philippine Journal of Fisheries, vol. 3, no. 2, July-December 1955, pp. 117-188, illus., printed. Department of Agriculture and Natural Resources, Manila, Philippines, 1956. Describes the trawl fishery which has developed to some magnitude in the Philippines over the last 30 years. Because of the increasing economic importance of the trawl industry, the author has written a detailed account of the nature and extent of the fishery as a whole and a study of the gear requirements and its operation. In addition to the excellent description and clear illustrations of the different types of trawling gear used in the Philippines, the author discusses the care and handling of the catch aboard the vessel; the species of fish, with their English and scientific names, taken by the commercial otter trawlers; marketing the catch; care and maintenance of fishing gear and accessories; and the outlook of the trawl fishery.

PRESERVATION:

"Aureomycin as an Ice Additive for Fresh Fish," by B. Albertson, article, Industrial Refrigeration, no. 3, September 1956, pp. 19-20, 52, printed. Nickerson and Collins Co., 435 North Waller Ave., Chicago 44, Ill.

"Organoleptic Studies of Irradiated Foods," by G. B. Pratt and O. F. Ecklund, article, Food Technology, October 1956, pp. 496-499, illus., printed. Institute of Food Technologists, 176 West Adams St., Chicago, Ill.

"Radiation Preservation of Foods: The Present Position," by R. S. Hannan, article, Bulletin de l'Institut International du Froid, vol. XXXVII, no. 1, 1957, pp. 179-209, illus., printed in English with a summary in French. Institut International du Froid, 177, Boulevard Malesherbes, Paris 17e, France.

RED TIDE:

Irritant Gases Associated with Red Tide, by Robert M. Ingle, Special Service Bulletin no. 9, 4 pp., processed. Marine Laboratory, University of Miami, Coral Gables, Fla., March 1954.

A Tentative Method for the Prediction of the Florida Red Tide Outbreaks, by Frank Chew, Contribution No. 162, 13 pp., illus., printed. (Reprinted from Bulletin of Marine Science of the Gulf and Caribbean, vol. 6, no. 4, pp. 292-304, December 1956.) The Marine Laboratory, University of Miami, Coral Gables, Fla. Terrigenous nutrient supply in a mass of water of estuarine origin as a significant parameter in red tide outbreak is further studied as part of an investigation for the Florida State Board of Conservation. A relationship between an estuarine mass, carrying the nutrient supply, and the ambient environment is suggested. This relationship is applied to the Florida red tide with the help of a new hypothesis of red tide outbreak.

REFRIGERATION AND FREEZING:

"Changes of Internal Temperature in Carps Subjected to Refrigeration by Means of Fresh-Water Ice" (Comportamento della temperatura in carpe sottoposte a refrigerazione con ghiaccio d'acqua comune), by P. Savi and G. Braccio, article, Il Freddo, vol. 10, no. 4, July-August 1956, pp. 51-54, illus., printed in Italian. Associazione Frigorifica Italiana, Via Donatello 8, Milano, Italy.

"The Cooling of Sea Perch on Board Freezer Ships" (Okhlazdenje stavridy na refrizeratorakh), by Z.I. Vetrova, G.I. Ciplakova, and P.I. Kjokova, article, Rybnoe Khozjaistvo, no. 4, 1956, pp. 10-11, printed in Russian. Kotel 'nicheskaia Naberezhiaia D 1/15, Souizpechati Otdelu "Zhurnal-Pochtoi," Moscow, Zh-240, U.S.S.R.

"Fish Fillets and Fish Sticks," article, Quick Freezing, October 1956, pp. 280-282, illus., printed. Refrigeration House, Victoria Road, Woking, Surrey, England. Describes a new freezing line for consumer packs at Hull, Great Britain. After being filleted, graded, and weighed, then packaged, the fish is loaded into new type trolleys which contain 10 hollow aluminum shelves. These can be compressed over the packs by means of hydraulic pressure in order to avoid the kind of distortion that occurs when small rectangular packs are subjected to air blast freezing.

"Handling and Chilling of Fresh Fish on Vessels at Sea," by F. Bramsnaes, article, FAO Fisheries Bulletin, vol. X, no. 1, January-March 1957, pp. 25-41, illus., printed, single copy 30 U.S. cents. Food and Agriculture Organization of the United Nations, Rome, Italy. (For sale by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.) This report is intended to cover the scientific and industrial progress made since the FAO Meeting on Herring Technology, held in Bergen, Norway, in 1950, in the field of handling and chilling of fresh fish. It discusses the experimental work being conducted on the influence of temperatures on keeping time, handling of fish at sea, exposure on deck, gutting of fish, washing on board, ways of chilling, losses of protein in stowage, storage limits, bilgy odors, functions of ice, salt-water ice, storage in chilled sea water, and preservatives. A section on progress in the industry discusses washing fish on deck and hold construction.

"Refrigeration and Modern Storage Processes for Foodstuffs. III(1). Sterilization of Foodstuffs by Means of Irradiation" (El frio y los metodos modernos en la conservacion de alimentos. III.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

Esterilizacion de los alimentos por radiacion), by A. Santos Ruiz and J. Moreno Calvo, article, Revista del Frio, no. 3, July-September 1956, pp. 181-188, printed in Spanish. Centro Experimental del Frio, Serrano 150, Madrid, Spain. Discusses a study of the treatment of foods by radiant energy, which has been recommended in recent years for food sterilization. Also includes a general bibliography.

SCALLOPS:

"Scallops--and Scallop Dredges," and "New Type Dredge is Far More Effective," by James Mason and R.H. Baird, respectively, articles, World Fishing, vol. 6, no. 4, April 1957, pp. 35-39, illus., printed. John Trundell, Ltd., Temple Chambers, Temple Ave., London, E.C.4, England. The first article is abstracted from Scottish Fisheries Bulletin No. 6, January 1957, published by the Fisheries Division, Scottish Home Department. It describes the life history of the scallop in detail and discusses the existing fishery in Scotland and the Isle of Man. The second article is based on a paper from the Journal du Conseil International pour l'Exploration de la Mer, vol. XV, no. 3, 1955, from which the drawings were also taken. It describes the new, more efficient type of scallop dredge which was developed after careful research by the Ministry of Fisheries. In terms of catches, the gear described here has proved itself, after test hauls on various grounds, three times as efficient as the standard scallop dredge.

SEAWEEDS:

How to Know the Seaweeds, by E. Yale Dawson, 203 pp., illus., printed, spiral bound $2.25. Wm. C. Brown Co., Dubuque, Iowa, 1956.

SHAD:

The Shad in Virginia Waters, by W. H. Massmann and Robert S. Bailey, Contributions from the Virginia Fisheries Laboratory, No. 60, 4 pp., illus., printed. (Reprinted from Virginia Wildlife, April 1956, pp. 1-4.) Virginia Fisheries Laboratory, Gloucester Point, Va.

SHRIMP:

Protective Coloration and Habitat of the Shrimp TOZEUMA CAROLINENSIS Kingsley (Caridae: Hippolyttidae), by Gilbert L. Voss, Contribution No. 172 from The Marine Laboratory, University of Miami, 5 pp., illus., printed. (Reprinted from Bulletin of Marine Science of the Gulf and Caribbean, vol. 6, no. 4, December 1956, pp. 359-363.) The Marine Laboratory, University of Miami, Coral Gables 34, Fla.

SPINY LOBSTER:

A Prenaupliosoma Stage in the Larval Development of the Spiny Lobster, PANULIRUS ARGUS (Latreille), from Puerto Rico, by Carmelo Feliciano, Contribution No. 171 from The Marine Laboratory, University of Miami, 4 pp., illus., printed. (Reprinted from Bulletin of Marine Science of the Gulf and Caribbean, vol. 6, no. 4, December 1956, pp. 341-345.) The Marine Laboratory, University of Miami, Coral Gables 34, Fla.

SPONGES:

Sponge Cultivation, by F. G. Walton Smith, Special Service Bulletin no. 3, 5 pp., processed. Marine Laboratory, University of Miami, Coral Gables, Fla., December 1948.

The Sponge Industry of Florida, by John F. Storr, Florida State Board of Conservation, Educational Series No. 9, 29 pp., illus., printed. Director of Conservation, State Board of Conservation, Tallahassee, Fla., 1957. A clearly written booklet which describes feeding and reproduction and other phases of the life of the sponge. Also discusses many parts of the sponge industry, including such topics as: where sponges are found and how they are gathered, cleaned, and sold; the value of the sponge industry; repopulation of sponge beds; and investigations to assist the sponge industry.

TILAPIA:

"The Tilapias and Their Culture, A Second Review and Bibliography," by Pierre Chimits, article, FAO Fisheries Bulletin, vol. X, no. 1, January-March 1957, pp. 1-24, illus., printed, single copy 30 U.S. cents. Food and Agriculture Organization of the United Nations, Rome, Italy. (For sale by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.) A supplement to the author's first article, "The Tilapias and Their Culture, A Preliminary Bibliography" (FAO Fisheries Bulletin, 1955, vol. 8, no. 1, pp. 1-33). Additional information is given on all three chapters of the original article, and there is a fourth chapter, concerning barrier-lakes and artificial reservoirs that have been stocked with tilapia, using a technique which is half-way between that used for open waters and that adopted for pond culture. There is also a brief fifth chapter on the use of tilapia for other purposes.

TRADE AGREEMENTS:

Trade Agreements Manual, second edition, 49 pp., processed. United States Tariff Commission, Washington 25, D.C., March 1957. A summary of selected data relating to the various trade agreements that the United States has entered into under the authority of the Trade Agreements Act of 1934 and the subsequent extensions of that authority. Part I of the manual considers United States trade-agreement obligations, past and present. This part includes, among other things, a list of the countries with which the United States had trade-agreement obligations in effect on March 1, 1957; a master list of all agreements that the United States has concluded under the Trade Agreements Act, whether or not those agreements are still in force; and a brief legislative history of the trade agreements program. Part II is devoted to information about the General Agreement on Tariffs and Trade. This part includes, among other things, a list of the countries that were contracting parties to the General Agreement on March 1, 1957; a master list of all accessions to, and withdrawals from, the General Agreement between October 30, 1947, and March 1, 1957, and a list of the conferences and sessions pertaining to the General Agreement that have been held since 1947.

TRADE LISTS:

The Office of Intelligence and Services, Bureau of Foreign Commerce, U.S. Department of Commerce, Washington 25, D.C., has published the

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

following mimeographed trade lists. Copies of these lists may be obtained by firms in the United States from that office or from Department of Commerce field offices at $2 each.

Oils (Animal, Fish, and Vegetable)--Importers, Dealers, Producers, Refiners, and Exporters, Belgium, 9 pp. (February 1957). Lists the name and address, size of firm, and type of product handled by each firm. Includes firms dealing in marine-animal oils.

Oils (Animal, Fish, and Vegetable)--Importers, Dealers, Producers, Refiners, and Exporters, Brazil, 35 pp. (February 1957). Lists the name and address, size of firm, and type of product handled by each firm. Includes firms dealing in fish and fish-liver oils.

Oils (Animal, Fish, and Vegetable)--Importers, Dealers, and Producers, Colombia, 16 pp. (February 1957). Lists the name and address, size of firm, and type of product handled by each firm. Includes a brief summary of Colombia's imports of marine-animal oils for 1955. Firms dealing in fish and marine-animal oils are listed.

UNITED KINGDOM:

Report on the British Fishing Industry, Distant Water Trawlers, 1956, 40 pp., illus., printed. The British Trawlers' Federation (Distant Water Section), Hull, England. A report on Britain's distant-water fleet in 1956, stating that "The past year has again been one of progress for the British Fishing Industry's Distant Water Fleets sailing from Hull, Grimsby and Fleetwood. Landings, human consumption, and earnings all increased in spite of atrocious weather on the Arctic fishing grounds during the last quarter of the year. Unfortunately, operating costs also rose very steeply and in view of this and of the scarce supplies due to bad weather at the end of the year, it was a remarkable achievement in the public interest that the average over-all price at the quayside went up by less than a farthing (about 0.3 cents) a lb. The increased landings were achieved with fewer trawlers, great progress having been made in the modernization of the Fleet and the replacement of obsolete vessels by highly efficient new ships." The report also states that "Great progress was also made in achieving safety at sea. The year was notable for the fact that not a single trawlerman lost his life as a result of shipwrecks. The fact that only two ships were lost in spite of apalling weather may well have been due to a combination of more modern and efficient ships with more up-to-date navigational aids and the maintenance of extremely high standards of seamanship. The fact that no lives were lost in the two shipwrecks was undoubtedly due to the introduction of inflatable rubber liferafts, which were responsible for saving 57 lives. These have now been made compulsory and will replace lifeboats."

VIRGINIA:

History of Virginia's Commercial Fisheries, by J. L. McHugh and Robert S. Bailey, Contributions from the Virginia Fisheries Laboratory, No. 70, 23 pp., illus., printed. (Reprinted from The Virginia Journal of Science, vol. 8, no. 1, January 1957, pp. 42-64.) Virginia Fisheries Laboratory, Gloucester Point, Va.

Oyster Yields in Virginia, by J.L. McHugh and J.D. Andrews, Contributions from the Virginia Fisheries Laboratory, No. 55, 6 pp., illus., printed. (Reprinted from Southern Fisherman, August 1955.) Virginia Fisheries Laboratory, Gloucester Point, Va.

WHALES:

Here Come the Whales! by Alice E. Goudey, 94 pp., illus., printed, $2.50. Charles Scribner's Sons, New York, N.Y., 1956.

FISH STICKS--A VERSATILE FOOD

When you want an economical, convenient, and versatile food to appease hot-weather appetites, golden-fried fish sticks are the answer. They may be served for breakfast with scrambled eggs; luncheon with a tossed salad; snack time with a glass of milk; dinner as the main dish of the meal; midnight supper with crisp potato chips and a tempting beverage; or as a hot appetizer for an easily prepared hors d'oeuvre tray.

These oblong sticks of skinned, boned, breaded, precooked, and frozen fish of several varieties are one of the most popular fish items on the market. This versatile food is also rated tops among the convenience foods as they are handy to store in the freezer, easy to prepare, and yet nutritious and delicious.

CONTENTS (CONTINUED)

BLUEFIN TUNA SPAWN OFF SOUTH FLORIDA

The occurrence of recently-spawning fish and eggs and larvae believed to be those of the bluefin tuna suggest that these fish spawn in the Straits of Florida during May and early June. The main spawning area appears to be on the outer margin of the Florida current between Riding Rocks and Bimini in the Bahamas. The spawning habits of the smaller tuna in the area are at present unknown. The evidence suggests that the American and European tuna represent independent units inasmuch as the spawning time overlaps and the areas of spawning are about 4,000 miles apart.

--Sea Secrets, The Marine Laboratory, University of Miami, Coral Gables, Fla.

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Alma Greene, Helen Joswick, Helen Turner, and Vera Eggleston

* * * * *

Photograph Credits: Page by page, the following list gives the source or photographer for each photograph in this issue. Photographs on pages not mentioned were obtained from the Service's file and the photographers are unknown.

Pp. 1, 4, 5, 6, 7--North Pacific Fisheries Exploration and Gear Research, Exploratory Fishing and Gear Development Section, Bureau of Commercial Fisheries, Seattle, Wash.; p. 15--Fred W. Hipkins; pp. 26-27--F. B. Sanford; pp. 57, 58, 59, and 60--Nick Knezic, San Pedro, Calif.; outside back cover, fig. 1--R. P. Elliott.

INT.-DUP. SEC., WASH., D.C. 19712

THE DUNGENESS CRAB INDUSTRY

Fishery Leaflet 439 (The Dungeness Crab Industry) describes the Dungeness or the Pacific crab, the fishery, processing methods, and marketing.

In the section on Marketing the author states that:

"Dungeness crab is marketed in three different forms: (1) whole crab, fresh or frozen, (2) fresh or frozen meat, and (3) canned meat. Nearly 85 percent of the total catch is marketed fresh and frozen, either as whole crab or as picked meat, in States west of the Rocky Mountains, particularly in the Pacific Coast States. Nearly all the crabs landed in California, the largest marketing area on the Pacific Coast, go to the fresh-market trade. Fresh-crab shippers in Oregon and Washington also supply the California market. A few individually packaged and frozen whole crabs are marketed in the Midwestern States as well as in some of the large eastern cities. Canned Dungeness crab meat is offered for sale throughout the United States.

FIG. 1 - DUNGENESS CRAB.

"Before 1920, Dungeness crab was marketed in one form only--freshly-cooked whole crab. Up to that time, the domestic canned crab meat market was completely dominated by foreign crab meat, mainly from Japan. Domestic producers, lacking a good formula, were skeptical about canning the meat and felt that they could not compete with foreign producers. For several years before 1920, trade journals strongly emphasized that Dungeness crab meat had a flavor superior to foreign canned crab meat and had urged the crab industry to start canning Dungeness crab. It is claimed that a canning formula was borrowed from Japan, and with the encouragement of a trade journal, Dungeness crab meat was first canned in Alaska in 1920, and in Washington and Oregon in 1927.

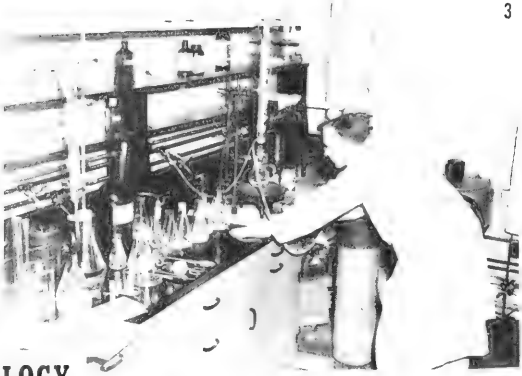
FIG. 2 - BARGE TRANSPORTING CRAB POTS TO SOUTHEASTERN ALASKA.

"The small Alaska pack of 75 cases in 1920 was a success, and the industry in Alaska quickly expanded. Canners were quick to enter this new field because it afforded off-season employment to cannery workers and fishermen. In 1948 a record pack of 169,798 cases of Dungeness meat, valued at $3,820,622, was produced by the entire industry. This amount represented about 30 percent of the crabs landed that year, while the remaining 70 percent was marketed fresh or frozen as either whole crabs or picked meat.

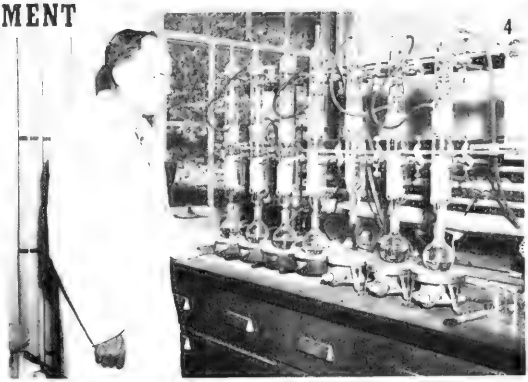
"In recent years, the production of canned crab meat has declined. Two factors have caused a reduction in the production of heat-processed canned crab meat: (1) the demand for fresh and frozen crab has steadily increased, and (2) increased production and importation of canned crab meat, mainly from king crabs, have caused the domestic industry to proceed cautiously."

Free copies of FL 439 may be obtained from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C. Additional information on the processing and canning crab may be found in Fishery Leaflets 85, 88, and 374 and Separate No. 50.

COMMERCIAL FISHERIES REVIEW



TECHNOLOGY SUPPLEMENT



Vol. 19, No. 4a APRIL 1957-SUPPLEMENT

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor
J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Photos 1 and 2: Loading herring and menhaden aboard vessels for reduction into fish meal and oil.
Photos 3 and 4: Chemists in Service Laboratories making tests on fish oils.

COMMERCIAL FISHERIES REVIEW

April 1957-Supplement Washington 25, D.C. Vol.19,No.4a

COLLECTION AND DISTRIBUTION OF MENHADEN OIL FOR RESEARCH USE

By Maurice Bender *

ABSTRACT

More than 900 gallons of menhaden oil were collected and distributed in 15-dram to 55-gallon lots to contractors and other interested groups. Samples represented the entire range of geographical, seasonal, and process-type sources found in the industry. Contractors, whose interests varied from the solution of the most fundamental structural problems to immediate large tonnage applications, were supplied with required oils.

Samples of menhaden oil totaling more than 900 gallons were collected and distributed for research purposes during the 1955 and 1956 menhaden fishing seasons. Contractors and other interested individuals requested quantities ranging from those in 15-dram vials to 55-gallon drums. All these were supplied from either a stock of more than 50 samples kept on inventory or from producers' special stocks. In the latter cases, full histories of the samples were supplied as for those samples collected personally by staff members of the Service's College Park Fishery Technological Laboratory. Oil samples from most of the major menhaden-producing areas were covered in this program. These included the Atlantic Coast south from New York to north Florida and the Gulf Coast from west Florida to Port Arthur, Tex. The samples also represent the entire fishing season from May until January.

Several types of oil processing were represented in these samples. Included were oils removed from the press liquor by centrifuges and then put through polishers for further purification, oils separated by centrifuges alone, and oils gravity separated while held hot in settling tanks. In addition to the oils collected at reduction plants, several samples were obtained from a secondary processor who prepares cold-pressed, kettle-bodied, and alkali-refined oils.

A program was also set up with cooperating commercial oil producers and a research contractor to study certain chemical and physical characteristics of menhaden oils. Samples were supplied on a seasonal and geographical basis. Plants representing the previously-mentioned producing areas as well as the different types of production sent one-pint oil samples at weekly intervals during the entire producing season, which extended from May to January, to the College Park Laboratory. They were then indexed, coded, and shipped to the Contractor at North Carolina State College. Records of these samples were kept at College Park and usually included information about the name and location of the plant, date of processing, time elapsed from catch to landing, gallons of oil per 1,000 fish, and type of separation. The results of these analyses are presently being subjected to statistical treatment in order to determine their significance and allow for more precise interpretation of data.

Menhaden oil samples were sent to a large group of investigators representing many fields of interest. These ranged from research programs of a fundamental

* Bio-Chemist, Middle and South Atlantic Technological Research, Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, College Park, Md.

nature to those of an immediate practical nature. For example: samples were supplied contractors at the University of Minnesota who were studying the structural analysis of the unsaturated and saturated acids of fish oils by methods designed to eventually concentrate and purify these acids. At the same time members of this same group were studying the possibilities of separating out the fish-oil fatty acids as complexes of the inclusion type with one of the bile acids and with urea. In the area of applied research this group is studying the nature of the chemical reaction involved and the products formed in the development of undesirable odors during storage of fish oils. Results from these researches should greatly increase the range of uses for fish oils. Menhaden oil has also been supplied for a project at the University of Minnesota School of Mines and Metallurgy which, if successfully concluded, might create a large tonnage domestic outlet for fish oils in the flotation separation of metallic ores.

College Park Laboratory staff members were asked to supply a single gallon of menhaden oil to a research group at the Texas A & M Research Foundation for their attempt to develop chromatographic techniques which would be used for qualitative and quantitative analyses of fish oils. However, when it was demonstrated that application of these techniques, which had been developed with pure compounds, to commercially-produced fish oils could not be achieved, the project was terminated. At about the same time more than 30 gallons of menhaden oil were delivered to a research group at the University of Delaware where the nature and properties of the nonglyceride fraction of fish body oils are being studied. These studies require sufficient quantities of oil to separate and purify the nonglyceride fractions which can then be investigated as separate compounds.

Menhaden oil has been supplied for such contrasting areas of experimentation as poultry feeding, leather lubrication, and fungicide activity. At the University of Connecticut feeding studies of high-energy poultry rations containing fish oils were conducted to determine the relative abilities of fish oils and other fats to supply adequately the energy requirements of chickens. The Southern Bio-Research Laboratory at Lakeland, Florida, has reached the pilot-plant stage in their investigation of the use of menhaden oils as fungicides and nematocides for the citrus industry and consequently raised their requirements from 5 gallons to over 100 gallons of oil. The same supply situation recently occurred at the Tanner's Research Council of the University of Cincinnati where pilot-scale experiments were begun with sulfated menhaden oils to develop their commercial possibilities as fat-liquoring agents for leather. Successful commercial development of the latter two uses described above could themselves well require large tonnage consumption of menhaden oil.

It can be readily seen from the foregoing brief review that the areas of research with menhaden oils have been well covered and that the variety of possible collection sources and methods of distribution have also been thoroughly explored and utilized.

TO KEEP NYLON ROPE FROM UNRAVELING

To keep nylon rope from unraveling, encircle the ends with a little tape to keep them in place and then hold them over a burner or torch until they have melted and fused together. When the nylon has cooled, it will harden and the remaining tape can be removed.

--The Progressive Fish-Culturist,
July 1956 (vol. 18, No. 3)
U. S. Fish and Wildlife Service

COMMERCIAL USES FOR MENHADEN OIL

Epoxidation of winterized, deodorized menhaden oil should produce a commercially-attractive plasticizer suitable for blending with other materials into resins, e.g. polyvinyl chloride.

The hydroxylation and epoxidation of menhaden oil as a source of new materials suitable for commercial development were studied by Arthur D. Little, Inc., as part of the over-all Service program to develop new uses for fish oils. Three possible uses for hydroxylated oil were investigated: (1) polyisocyanate adhesives, (2) alkyd resins, and (3) isocyanate foams. Epoxidized oil was investigated as a possible plasticizer for polyvinyl chloride.

Hydroxylated oils showed some possibility for use in adhesive formulations. Hydroxylation converts the double bonds to vicinal glycol structures, the degree of hydroxylation being readily controllable. A typical hydroxylation procedure is given: 288 grams of winterized and deodorized oil was mixed into 123 grams of acetic acid with 6 grams of sulfuric acid. The mixture was heated to 60° C., and 44.8 grams of 50 percent hydrogen peroxide was added slowly, keeping the temperature at 65° ± 5° C. The mixture was held at 65° C. for 4 hours with constant stirring. The reaction mixture was then washed with water, and with a 5-percent sodium carbonate solution. The product was extracted from the mixture with ether. After extraction, the ether solution was dried with magnesium sulfate, and the ether was evaporated from the product. The iodine number dropped from 179 in the raw oil to 127 in the product, indicating a loss of 28.8 percent unsaturation. It was later found that a 20-percent sodium chloride solution in place of plain water and eliminating the alkaline wash speeded up the washing.

The hydroxylated oil was tried in various adhesive formulations, with one using 1-chloro-2, 4-phenylene di-isocyanate (Mondur C) showing some promise. However, though the tensile strength of this adhesive was good, as measured by the sugar-maple block ASTM test D897-49, the impact and shear resistance was poor.

The use of hydroxylated menhaden oils in the formation of alkyd resins and isocyanate foams showed very little promise. The more expensive hydroxylated menhaden oils, due to the added expense of hydroxylation, did not produce better alkyd resins than did the cheaper dehydroxylated vegetable oils used in the resin industry. Hydroxylated menhaden oils formed poor isocyanate foams, having foamed (due to the entrapping of gases within the liquid resin as it sets into the rigid plastic) to only about twice the original volume. A commercially-successful foam will expand 10 to 30 times its original volume.

The most promising results were obtained with epoxidized oils made from winterized and deodorized menhaden oils. Epoxidation was carried out by adding, with agitation, oil to a 10-percent solution of preformed peracetic acid at 20° C. The temperature was allowed to rise to 50° C., and the product was extracted in the same manner as the hydroxylated oil. The report states that peracetic acid for commercial epoxidation of menhaden oil would be formed cheaper in situ--through the action of hydrogen peroxide on acetic acid in the presence of a mineral acid catalyst. (A recent development in epoxidation technique utilizes a cation-exchange resin catalyst.) The chemical cost of epoxidizing menhaden oil using peracetic acid in situ was calculated to be around 12 cents a pound. Acetylated monoglycerides (prepared by transesterification with glycerine and acetylated with acetic anhydride and sodium acetate) were also epoxidized. Acetylation of partially hydroxylated menhaden oil using systems of acetic acid with sodium acetate and acetyl chloride in pyridine proved unsuccessful.

NOTE: ABSTRACT OF FINAL REPORT SUBMITTED BY ARTHUR D. LITTLE, INC., CAMBRIDGE, MASS. THIS FIRM WAS AWARDED A CONTRACT BY THE UNITED STATES FISH AND WILDLIFE SERVICE TO STUDY THE HYDROXYLATION AND EPOXIDATION OF MENHADEN OIL AS A SOURCE OF NEW MATERIALS SUITABLE FOR COMMERCIAL DEVELOPMENT. FUNDS PROVIDED BY THE SALTONSTALL-KENNEDY ACT OF 1954 FINANCED THIS RESEARCH CONTRACT.

Analytical methods employed to measure the degree of hydroxylation and epoxidation are given. The report points out that the iodine number determinations were used as an indirect estimation of the degree of the above reactions. The iodine value gave a measure of the decrease in unsaturation and could not be used as an accurate method of determining the degree of reaction, since cross-linking occurred in the oxidation processes. Therefore, the oxirane or epoxy oxygen and the hydroxyl content was determined. The procedures for these last two determinations are given.

Some important considerations using epoxidized menhaden oil as a plasticizer are as follows: (1) it does not bleed (the tendency of the plasticizer to "bleed" to the surface of the film, thus producing an oily coating); (2) it has low volatility (the length of time a plasticizer remains in the compounded resin without evaporating); (3) it has some decomposition on heating; (4) it appears to be stable towards ultraviolet light; (5) it has no fire-retarding action; (6) its water extraction should be low (the degree of extractibility of the plasticizer from the polymer by water); (7) it has a fishy odor in some samples. Substantially odorless plasticizers were prepared using winterized steam-blown oil. The tendency of creep was not determined. (The lack of "creep" is a property of the plasticizer of imparting flexibility without permitting permanent distortion under stress.)

The report contains 5 tables and 21 references.

NOTE: THIS IS AN ABSTRACT PREPARED BY JOSEPH CARVER, CHEMIST, FISHERY TECHNOLOGICAL LABORATORY, BOSTON, MASS.

WHAT DO WHALES EAT?

The diet of the different kinds of whales is extremely varied, according to the anatomical difference of the various species. The toothed whales (such as the sperm whales, beaked whales, bottlenose dolphin, and killer whale) feed largely upon fishes, squids, and cuttlefish. The killer whale also eat any other mammal found swimming in the water. Bottlenosed dolphins feed upon mullet, sea trout, certain croakers, and even catfish. They have also been reported to eat shrimp. Some of the fresh-water dolphins evidently feed on plant material to some extent.

The baleen whales, of which the blue whale or sulphur bottom (the largest of living animals) is an example, feed upon great masses of very small animals called plankton. In the mouth of this type of whale are suspended the closely set plates of whalebone through the frayed ends of which water is passed while the plankton, such as the shrimplike krill and other forms, are filtered out. The baleen whales feed by cruising with their large mouths wide open, taking in the krill, among others, and occasionally schools of small fishes are also engulfed. One baleen whale was found to contain two tons of plankton in its stomach. Other types of baleen whales are the finback, piked whale, sei whale, and humpback whale.

--"Sea Secrets," May 15, 1956
The Marine Laboratory,
University of Miami,
Coral Gables, Fla.

FISH OIL RESEARCH AT THE HORMEL INSTITUTE

By W. O. Lundberg*

The Hormel Institute is a research branch of the Graduate School of the University of Minnesota, established at Austin, Minn., under an agreement between the University and the Hormel Foundation. It is staffed by academic and civil service personnel of the University. A major portion of the program at the Hormel Institute consists of researches on lipid materials.

Fig. 1 - Main building Hormel Institute of University of Minnesota, Austin, Minn.

Currently, the Hormel Institute is carrying on several projects in the research program started by the U. S. Fish and Wildlife Service with Saltonstall-Kennedy funds. The three original projects begun in 1955 were concerned with (1) determining the structures of fish-oil fatty acids and developing an analytical method for the determination of the fatty acid composition of fish oils, (2) studying the chemistry of the odor problem in fish oils, and (3) studying the fractionation of fish-oil fatty acids by means of "inclusion" compounds. The third one of these projects has been completed and now has been replaced by a fourth project: A study of chemical reactions of fish-oil fatty acids. Although all of the projects fall in the category of what is commonly called fundamental research, it is anticipated that the results will have important practical applications. The following describes each of the projects briefly:

STRUCTURE AND ANALYSIS OF FISH-OIL FATTY ACIDS

For the development of new derivatives and new applications of fish oils, it is obviously important to know the composition and structure of fish-oil fatty acids. Relatively complete information is available about common animal and vegetable fats and oils, but much remains to be learned about fish oils. It is well known that the commercially-important fish oils contain appreciable amounts of highly unsaturated fatty acids and that the carbon skeletons of some of the fatty acids are longer than are those in ordinary animal and vegetable fats, but the locations of the unsaturated centers in the fatty acids have not been established unequivocally. Knowledge of the locations of the double bonds is essential to the development of new and useful derivatives and to the development of analytical methods whereby the composition of fish oils may be determined accurately.

It has been established that the more unsaturated fatty acids of land-animal and vegetable fats have what is called a methylene-interrupted type of unsaturation; that is, a single $-CH_2-$ group lies between successive double bonds in the carbon chain. It is a well-known fact in organic chemistry that a $-CH_2-$ group between two double bonds is highly reactive. The reactivity of the $-CH_2-$ group in unsaturated fatty acids of this type is exploited in the manufacture of commercially-important derivatives of vegetable oils, particularly in the field of protective coatings.

In various past studies of the structure of fish-oil fatty acids, it has been reported that ethylene groups, $-CH_2-CH_2-$, rather than methylene groups, separate the double-bond systems. This type of structure, if it predominates in fish oils, is

*Director of Hormel Institute, University of Minnesota, Austin, Minn.

decidedly disadvantageous insofar as developing certain potentially useful derivatives is concerned, because the ethylene-interrupted type of structure is far less reactive than is the methylene-interrupted type. Further, the existence of any appreciable amount of ethylene-interrupted structures would greatly complicate the problem of analyzing fish oils to determine the proportions of the various types of fatty acids. There was, however, some reason to doubt the reports of the ethylene-interrupted type of structure for fish-oil fatty acids, and thus a critical study of structure was undertaken.

A complete determination of the structure of the more unsaturated fish-oil fatty acids involves the isolation of the individual fatty acids in highly purified form. This has not been accomplished yet in the project at the Hormel Institute, but good progress is being made. Various methods--including solvent segregation, urea-complex fractionation, distillation, and chromatography on silica-gel columns--are being applied in the isolation of individual pure acids.

Even though the pure acids have not yet been isolated, the studies to date have shown that, in the common types of commercially-important fish oils, the more favorable methylene-interrupted type of unsaturation predominates. That at least some of this type of unsaturation is present was evident from the ultraviolet absorption spectra of various fish oils following isomerization with alkali. Alkali-isomerization followed by spectral measurements has served as a basis for the analysis of vegetable oils, and may also be applied to fish oils if methylene-interrupted unsaturation exists.

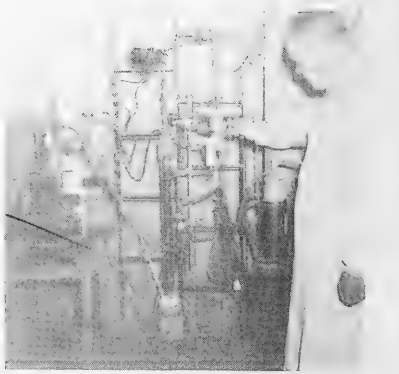


Fig. 2 - Low-pressure fractional distillation of methyl esters of menhaden oil fatty acids being performed on a Podbielniak Whirling Heli-Band Column at Hormel Institute.

The predominance of methylene-interrupted unsaturation was unequivocally established in studies using soybean lipoxidase. It is well known that this enzyme catalyzes the oxidation only of substances that contain the 1,4 pentadiene grouping, that is, methylene-interrupted unsaturation. In the work at the Hormel Institute, it was found that at least 97 percent (and possibly more) of the polyunsaturated fatty acids of menhaden oil have their double bonds separated by methylene rather than by ethylene groups. On this basis, it appears highly probable that the alkali-isomerization spectrophotometric technique can be adapted to the analysis of common fish oils.

The investigators in this project, Dr. O. S. Privett and his coworkers, are now concentrating on the isolation of individual polyunsaturated fatty acids from menhaden oil for complete structural determination and to establish analytical constants to be used in the analysis of all common fish oils.

CHEMISTRY OF THE ODOR PROBLEM

It is well known that the typical odor of fish oils is a deterrent to their use in many applications. Even though in the production of fish oils the objectionable odor may be removed almost entirely by steam deodorization, an objectionable odor returns in a relatively short time. Evidence indicates that the returning odor may stem from two sources: (1) a liberation of nitrogeneous compounds of low molecular weight from proteins or other nitrogeneous materials of higher molecular weight, and (2) the development of substances of low molecular weight by reaction of atmospheric oxygen with highly unsaturated fatty acids. Obviously it is important to find out what these compounds are and how they are formed, if one is to endeavor intelligently to prevent their formation or to neutralize them as they are formed.

In a first approach to the problem, Dr. J. R. Chipault and his coworkers are studying the products formed in the oxidation of fish oils by air. The volatile odor components are being removed from oxidized oil and analyzed. This is not easy because the offensive volatile components, although possessing powerful odors, ordinarily are present only in very small amounts.

Fig. 3 - Paper chromatography of fatty acids derived from fish oils and their quantitative measurement with a densitometer at Hormel Institute.

Nevertheless, by prolonged and repeated oxidations of relatively large quantities of oils, appreciable amounts of the odor components have been collected. Paper chromatography now is being used to separate various derivatives of the volatile products, and it is hoped that later they may be analyzed more completely by gas-phase chromatography.

The studies to date indicate that the odor and flavor components to a considerable extent consist of unsaturated carbonyl and dicarbonyl compounds derived primarily from the more unsaturated fatty acids. An effort will be made to establish whether the undesirable odors can be attributed predominantly to one category or one type of compound. If this should be the case, there is a good possibility that additives can be found that will react with and destroy the odor components.

SEPARATION OF FATTY ACIDS BY MEANS OF INCLUSION COMPOUNDS

The development of new uses for fish oils depends largely on an exploitation of those structural characteristics of fish oils that distinguish them from common land-animal and vegetable fats and oils. The principal distinguishing characteristics are that fish oils contain appreciable quantities of fatty acids having relatively long carbon-chain lengths and high degrees of unsaturation. For some applications, therefore, it will be important to have economical methods for separating the longer and more unsaturated acids.

Fatty acids have the peculiar property of forming solid complexes or "inclusion" compounds with materials like urea. The extent to which such solid complexes are formed, however, depends upon the structure of the fatty acid. Differences in the tendencies of various fatty acids to form such inclusion compounds may be employed in their separation. Dr. Hermann Schlenk and his coworkers, who have had much experience with inclusion compounds, devoted their efforts to finding materials other than urea that might be employed in such separations. In particular, they studied thiourea and deoxycholic acid. Neither of these "host" compounds would be practical at present because of their cost, even if they were found to give better separations than does urea, but it was important to study them in order to obtain additional information about types of molecules that might be employed effectively.

As is often the case in fundamental research, certain findings were made that were incidental but, nevertheless, important. First, it was found that thiourea was effective in removing peroxides from fish oils, apparently by reaction of the hydroperoxide group with thiourea. This reaction will be explored further in connection with the odor problem, inasmuch as hydroperoxides are probably the precursors of the odor components that develop by oxidation of fish oil. Second, it was found that deoxycholic acid inclusion compounds of fish-oil fatty acids can be separated readily by paper chromatography. This finding will be useful in establishing the purity of the individual fish-oil fatty acids that are being prepared in the first project described

above, and it also has been applied by Dr. Schlenk to show that the content of fatty acids of different chain lengths in menhaden oil are quite different from the value published heretofore.

CHEMICAL REACTIONS OF FISH-OIL FATTY ACIDS

Following completion of the project on inclusion compounds of fish-oil fatty acids, Dr. Schlenk and his coworkers recently have undertaken a new project, the purpose of which is to investigate various types of reactions of fish-oil fatty acids, with a view to developing new derivatives. The project aims to exploit those characteristics of fish oils that cause them to be different from common vegetable and animal fats, notably their content of long-chain highly unsaturated fatty acids.

Reactions of the carboxyl group will not be explored to any appreciable extent because such reactions, and the derivatives obtainable from them, already are well known. Instead, attention will be devoted particularly to reactions of the double bonds. A number of promising reactions have been formulated on paper, and experiments to determine the feasibility of them now are well under way.

SEA LAMPREY

The sea lamprey, Petromyzon marinus, is found along the Atlantic coast of Europe and North America; from the west coast of Greenland to Florida in the western side of the Atlantic; from northern Norway to the Mediterranean and West Africa in the eastern Atlantic. This species runs up fresh rivers to breed and is found in certain American lakes.

Lampreys have on occasion been found fastened to sea fish, and judging from the activities of their landlocked relatives they probably are destructive to some marine species. They have been found preying on mackerel, various herrings, cod, haddock, pollock, salmon, basking sharks, swordfish, hake, sturgeons, and eels. Sometimes as many as 3 or 4 are fast at one time to a single shad.

In the past, considerable numbers of lampreys were caught for food in the rivers of New England, and prior to that in Europe. The lamprey fishery has declined and now only small numbers are taken for consumption.

Another use of the lamprey is to supply biological laboratories with specimens for student use. The larvae are taken in large numbers for bait in certain localities along the Atlantic coast.

--"Sea Secrets," July 17, 1956
The Marine Laboratory,
University of Miami,
Coral Gables, Fla.

CHROMATOGRAPHIC ANALYSIS OF SOME CONSTITUENTS OF MARINE-ANIMAL OILS[1/]

By Raymond Reiser,* Mary Frances Sorrels,** and Maurice Bender***

Most existing methods for the determination of lipid mixtures of natural origin are laborious, time-consuming, and uncertain. This is particularly true in the case of marine-animal oils, which are the most complex of these lipids. This study was undertaken to determine whether the separation and identification of lipid constituents of marine oils could be accomplished with the aid of the silicic acid-impregnated glass-fiber filter paper technique of Dieckert and Reiser. This method allows for the separation of microgram quantities of lipids.

EXPERIMENTAL

Several well characterized lipids were used as reference standards with 10 different solvent systems. R_f values, a measurement of position on the paper which may be used as an identifying index, of the various combinations were determined, each value being the average of at least five tests. Because of the large proportion of triglycerides occurring in marine oils, the mixtures were first separated on a column into 5 groups with 5 solvent systems according to the method of Fillerup and Mead. The eluates were concentrated and then chromatographed on the silicic acid paper.

A certain amount of variation, more pronounced with some of the reference compounds than with others, made absolute R_f values unreliable. For this reason, reference compounds were chromatographed simultaneously with the unknowns. Ascending chromatography was the method used.

The similarity of R_f values for vitamin D_3 and cholesterol in all solvents tried presented a problem which was solved by the addition of iodine to the isooctane ether solvent system. Vitamin D_3 remained at the point of origin while the R_f value for cholesterol was 0.30.

Densitometers were used in an attempt to make the chromatograms quantitative as well as qualitative. Substances such as plastic sprays, collodion, light cedarwood oil, plastic spray over light cedarwood oil, silicone water-repellent spray, and glycerine were used to minimize the irregularity in density in the paper.

RESULTS AND DISCUSSION

Of the five fractions obtained by the column separation, the first three contained all the lipids used in the reference compounds. The fourth contained the fatty acids, and the fifth the phospholipides. This study was not concerned with the fatty acid constituents so the fourth fraction was disregarded. The first fraction contained vitamin A palmitate, cholesteryl palmitate, squalene, hexadecyl palmitate, and the tocopherols. All the triglycerides came through in the second fraction with a part of the aliphatic alcohol. The remainder of the latter appeared in fraction three along with vitamin A alcohol, cholesterol, and vitamin D_3. The 7-dehydrocholesterol, according to preliminary tests, should have appeared in the third fraction. However, it was not recovered from the mixture containing all the reference compounds. The

* PROFESSOR OF BIOCHEMISTRY AND NUTRITION
** RESEARCH ASSISTANT
} DEPT. OF BIOCHEMISTRY AND NUTRITION, RESEARCH FOUNDATION, TEXAS AGRICULTURAL & MECHANICAL COLLEGE.

*** BIOCHEMIST, MIDDLE & SOUTH ATLANTIC TECHNOLOGICAL RESEARCH, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U.S. FISH AND WILDLIFE SERVICE, COLLEGE PARK, MD.

1/SUMMARY OF A STUDY CONDUCTED WITH FUNDS PROVIDED BY THE SALTONSTALL-KENNEDY ACT OF 1954 BY CONTRACT WITH THE U. S. FISH AND WILDLIFE SERVICE. THE COMPLETE MANUSCRIPT HAS BEEN SUBMITTED FOR PUBLICATION IN A SCIENTIFIC JOURNAL. THIS IS AN ABSTRACT BY MAURICE BENDER, FISHERY TECHNOLOGICAL LABORATORY, COLLEGE PARK, MD.

fifth fraction contained the phospholipides. In the oil samples studied, phosphatidylethanolamine was the only phospholipide demonstrable. Ninhydrin tests for phosphatidylethanolamine were much less sensitive than the chromatograms. Tests with Dragendorff's reagent for lecithin were negative.

Vitamins A alcohol and D_3 seemed to undergo some change during the process of separation and concentration which made them difficult to demonstrate consistently in the natural oils. "Super D" cod-liver oil showed spots corresponding to triglycerides, vitamin D_3, vitamin A alcohol, phosphatidylethanolamine, and an unidentified component. Silmo cod-liver oil and menhaden oil chromatograms indicated the presence of squalene, triglycerides, vitamins A alcohol and D_3, and phosphatidylethanolamine.

Most of the substances used to rectify the paper for density measurements darkened the paper and were unsatisfactory after drying. Glycerine gave better results than the others but the wet paper was difficult to handle. The lipid spots were too large to be measured with the reflection densitometer. With the transmission densitometer, differences between portions of the paper were often as great or greater than the differences between the paper alone and the charred spots. The spots from a chromatogram were irregular and their variation in size and shape made their densities impossible to measure accurately with this method.

SUMMARY AND CONCLUSION

A scheme for the separation and identification of some constituents of marine animal oils was developed. A preliminary separation on a silicic acid column with five solvent systems was followed by further separation and identification on silicic acid impregnated glass fiber filter paper. This method can be used successfully for qualitative determinations, but the irregularities in the density of the glass paper prevent an accurate quantitative assay.

COMMON MARINE WORMS USED FOR BAIT

The two common marine bait worms are the "sandworm" or "clamworm" and the "bloodworm."

The clamworm (Nereis virens) is usually taken by digging it from its burrow in the muddy or sandy bottom of estuaries during periods of low tide. These burrows vary in depth from a few inches to about eighteen inches or more.

The bloodworm (Glycera dibranchiata) is found in a similar habitat with most of the commercial digging taking place in Maine and extending into Canada.

The greatest use of these worms is in the sport fishery from Maryland to Connecticut with a large demand existing for them in the Long Island Sound area. The worms should be at least 6 or 7 inches long and may be used to catch bluefish, fluke, scup, gray sea trout, sea bass, striped bass, blackfish, kingfish and flounder.

--"Sea Secrets," October 23, 1956
The Marine Laboratory,
University of Miami,
Coral Gables, Fla.

FEEDING FISH OILS TO DOMESTIC ANIMALS

By J. E. Oldfield,* Allen F. Anglemier,* and M. E. Stansby**

BACKGROUND

In recent years, the increasing use of animal fats as major sources of energy in the diets of farm animals has suggested that marine oils might also be used successfully in a similar way. Knowledge of the effects of fish oils in the rations of domestic animals is not nearly as extensive as is that concerning the use of other fishery products.

Two important questions rated priority in the fish-oil feeding investigations. First, the most effective level at which fish oils might be fed should be determined; and second, a comparison of different oils--both from different species of fish and from different processing methods--needed to be made. A program, supported by funds from the Saltonstall-Kennedy Act, was started in July 1955 at Oregon State College to supply information regarding these questions. Experimental work was carried out in the Department of Animal Husbandry, Oregon State College, Corvallis, Ore., and came under the general supervision of the Fishery Technological Laboratory of the U. S. Fish and Wildlife Service at Seattle, Wash.

METHODS AND FACILITIES

Facilities employed in this study included (1) swine from the Berkshire herd of the Oregon Agricultural Experiment Station and (2) individual feeding pens that enabled the keeping of accurate feed and performance records on each animal throughout the test period (figs. 1 and 2). Full-time staff members were responsible for the design of the experiments and the care of the animals. In addition to the facilities of the Department of Animal Husbandry, considerable assistance on this project was made available through the Food Technology Department, Oregon State College (particularly through its branch Seafoods Laboratory at Astoria, Ore.) and the School of Home Economics, Oregon State College.

FIG. 1 - INDIVIDUAL FEEDING PENS IN THE SWINE NUTRITION UNIT AT OREGON STATE COLLEGE MAKE POSSIBLE THE KEEPING OF INDIVIDUAL FEEDING AND PERFORMANCE RECORDS.

Several criteria had to be considered in evaluating fish oils as additives to swine feeds. First, the rate of gain of the animals fed had to be checked to ensure that the oil-containing rations produced at least as rapid gains as did the nonoil-containing rations; second, the efficiency of conversion of the feed to pork had to be satisfactory; and third, the end product of the feeding (hog carcass) had to be acceptable from a market point of view.

Two feeding trials were set up involving 16 pigs each--four pigs were allotted to each ration treatment under consideration. The duration of the trials was from shortly after weaning until the pigs reached about 190 pounds in weight; that is, the animals were carried through the normal growing-fattening period followed in farm practice.

* DEPARTMENT OF ANIMAL HUSBANDRY, OREGON STATE COLLEGE, CORVALLIS, ORE.
** CHIEF, PACIFIC COAST AND ALASKA TECHNOLOGICAL RESEARCH, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

In the first trial, California sardine oil replaced 5-, 10-, and 15-percent of the grain portion of the diets. In addition, a nonoil-containing diet was fed as a check control. At the conclusion of the tests, all the animals were slaughtered at a commercial packing house, carcass measurements were made, and samples were obtained. A shoulder roast was cut out of each carcass and, after being cooked under standard controlled conditions, was subjected to taste testing by a panel.

FIG. 2 - FEEDING FACILITIES IN INDIVIDUAL SWINE PENS KEEP FEED SEPARATE FOR EACH ANIMAL. COMMON WATER TROUGHS ARE PROVIDED.

After the results of the first trial were made known, a second was started using different oils fed at a constant level. In the second trial, the oils in each case made up 5 percent of the total diet. Again, a nonoil-containing diet was fed as a check. The oils used in this case were derived from menhaden. One sample was crude menhaden oil, one was alkali-refined-and-bleached menhaden oil, and the third was polymerized (kettle-bodied) oil. These rations were fed over the same length of time, and the results were evaluated in the same way as already described in the first experiment.

PROGRESS MADE TO DATE

In the first trial, it was found that the pigs fed 5 or 10 percent California sardine oil grew at about the same rate and at about the same feed efficiency as did those that got the check ration. When oil replaced 15 percent of the grain in the diet, the pigs went off feed and failed to grow properly. When the carcasses were evaluated, it was found that a fishy odor and taste were present, especially in the fat, of all pigs fed all three levels of fish oil. In the case of the pigs on the 10-percent and 15-percent level of oil substitution, a marked yellow color was evident in the fat, which further detracted from the quality of the carcass.

It was concluded from this trial that a 5-percent level of fish-oil addition should be satisfactory in swine rations provided that something could be done to the oil to prevent the "fishiness" in the carcass.

In the second trial, it was found that pigs fed 5 percent of either crude or alkali-washed menhaden oils gained weight at a better rate than did the pigs on the control ration, while those fed the polymerized menhaden oil gained weight less quickly than did the controls.

The carcass quality of the pigs fed the polymerized oil, however, was vastly superior to that of the pigs fed either of the other types of oil and closely approximated that of the controls. From this trial, it was concluded that the type of oil fed is most important in determining the effectiveness of that oil in livestock rations. It seems possible that a fish oil polymerized under carefully controlled conditions might yield a product satisfactory from the nutritional (that is, growth-promoting) as well as the carcass-quality standpoint.

NEW PRODUCTS FROM FISH OILS

Part III - Preparation and Separation of Fatty Alcohols Made from Fish Oils--A Preliminary Study

By Edward H. Gruger, Jr.*

ABSTRACT

Sodium reduction of methyl palmitate, methyl stearate, methyl oleate, and of the natural glycerides of menhaden and pilchard oils was carried out in order to prepare the corresponding long-chain fatty alcohols. The resulting prepared fatty alcohols were then fractionated into saturated and unsaturated alcohols by acetone crystallization at low temperature. A complex mixture of unsaturated alcohols prepared from pilchard oil was used in studies of the efficiency of various separation methods. The methods studied were fractional distillation, urea countercurrent distribution, and column chromatography. Ultraviolet spectrophotometry was used to measure qualitatively the degree of unsaturation in the various fatty-alcohol fractions.

INTRODUCTION

A project has been undertaken at the Seattle Technological Laboratory to prepare long-chain unsaturated fatty alcohols from fish oils and to study the corresponding physical properties of these alcohols, with the ultimate objective of providing information that will stimulate the development of new fish-oil products (Stansby 1956).

Why study fatty alcohols? The fatty alcohols are extremely valuable in organic research because of the wide variety of other substances that can be prepared from them. They are among the most important of the synthetic fatty derivatives (Ralston 1948) that can be prepared from fatty acids and esters.

Some of the reactions of primary aliphatic alcohols are esterfication, oxidation or catalytic dehydrogenation to aldehydes, dehydration to unsaturated hydrocarbons, and halogenation to alkyl halides. The alkyl halides thus formed from fatty alcohols also act as important intermediates in the synthesis of other compounds. The formation of various esters, 1/ aldehydes, and alkyl halides offers the greatest potentialities for fatty alcohols with respect to chemical synthesis of new products or the modification of older established products.

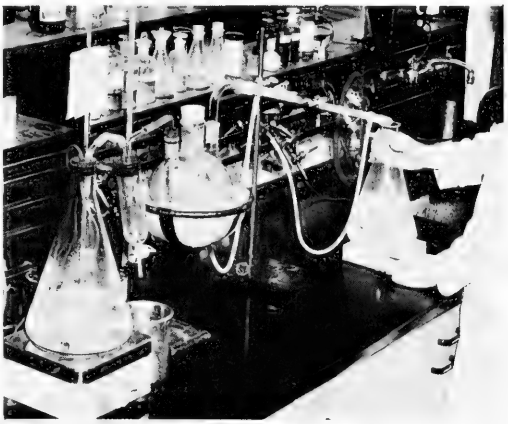


FIG. 1 - HYDROLYSING A SODIUM-REDUCTION-MIXTURE OF FISH OILS IN THE PREPARATION OF LONG-CHAIN FATTY ALCOHOLS.

Owing to the fact that unsaturated alcohols of high molecular weight are difficult to prepare in a state of high purity, few reliable constants for such compounds have been reported in the literature (Ralston 1948). The initial work at the Seattle laboratory therefore has been to obtain information regarding a satisfactory method of isolating pure polyunsaturated fatty alcohols and to report in the scientific literature

* ORGANIC CHEMIST, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

1/ FOR EXAMPLE $R'COOR$, WHERE R' IS THE PORTION DERIVED FROM THE LONG-CHAIN FATTY ALCOHOL.

NOTE: "PART 1 - INTRODUCTION" APPEARED IN THE AUGUST 1956 (P. 1) ISSUE AND PART II - POLYAMINO FATTY ACIDS DERIVED FROM FISH OILS" IN THE SEPTEMBER 1956 (P. 7) ISSUE OF COMMERCIAL FISHERIES REVIEW.

reliable constants for these alcohols. The techniques commonly employed for seprating fatty acids and their derivatives are as follows: (1) fractional distillation (Weitkamp 1955), (2) fractional solvent crystallization (Brown 1955), (3) countercurrent distribution (Dutton 1955), (4) chromatography (Allen 1955), and (5) fractionation by the formation of inclusion compounds (Schlenk 1954). The research work here has employed all of these techniques.

EXPERIMENTAL RESULTS AND DISCUSSION

PREPARATION OF FATTY ALCOHOLS: To prepare long-chain fatty alcohols from fish oil, we used a sodium reduction process (Hansley 1947; Pryde 1951). The method is as follows: To a rapidly-stirred suspension of 92 grams (4.00 moles) of finely divided sodium, in 100 milliliters of refluxing xylene, is slowly added a mixture of 300 grams of fatty acid glycerides, 264 milliliters (214 grams, 2.10 moles) of 4-methyl-2-pentanol (the reducing alcohol), and 600 milliliters of xylene. After the reaction of fatty-acid glycerides with the sodium and reducing alcohol is complete the resulting mixture is hydrolyzed.

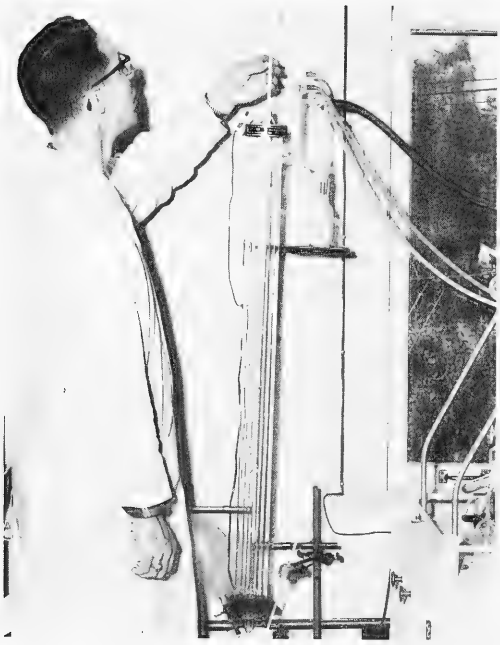


FIG. 2 - FRACTIONAL DISTILLATION APPARATUS WITH PROVISION FOR INTERNAL-INERT ATMOSPHERE THROUGH THE USE OF AN ATTACHED NITROGEN-FILLED BALLOON.

The hydrolysis apparatus used (fig. 1) provides for simultaneous steam distillation of the xylene and the 4-methyl-2-pentanol. At the start of the hydrolysis, 300 milliliters of boiling water is added to a 3-liter, three-neck "hydrolysing flask." Steam, from a steam generator, is passed through the hot water via a gas-inlet tube attached to one of the side arms of the hydrolysing flask. The steam generator is fitted with a water-vapor trap between it and the gas-inlet tube. To the other side arm of the hydrolysing flask is connected a Liebig-type condenser. At the end of the condenser is a flask to receive the condensed xylene and reducing alcohol.

After the steam has passed through the hydrolysing flask for 3 minutes, the sodium-reduction mixture is added through the center neck of the flask, by the use of a large funnel-tube that extends beneath the surface of the hot water. The joint at the center-neck of the flask is tightly sealed to prevent air leakage. The long-chain fatty alcohols, liberated during the hydrolysis, are recovered from the hydrolysis-mixture by an ethyl ether-petroleum ether extraction.

Experience with the details of the sodium-reduction process was gained through the preparation of cetyl alcohol (1-hexadecanol) from methyl palmitate, octadecyl alcohol (1-octadecanol) from methyl stearate, and oleyl alcohol (9-octadecen-1-ol) from methyl oleate. The process was then applied to the natural glycerides of menhaden and

pilchard oils. With the latter oils, the crude mixtures of saturated and unsaturated fatty alcohols were obtained as light-brown, mildly viscous liquids in yields of 85 to 90 percent. The saturated and unsaturated fractions were separated by crystallization in acetone at -18° C. It was the unsaturated fraction, obtained in the foregone manner, that became the starting material for further studies of the separation and the identification of unsaturated fatty alcohols.

FRACTIONAL DISTILLATIONS: A sample of mixed unsaturated fatty alcohols (prepared from pilchard oil) was used to study the effects of fractional distillation. The distillation apparatus (fig. 2) included an electrically-heated column jacket for simulating adiabatic conditions, a still-head with internal reflux condenser and adjustable take-off for controlling the rate of distillate take-off for a given reflux ratio (usually about 8 to 1), and a pressure regulator for maintaining a constant pressure during distillations.

The distillations were carried out at a pressure of 0.1 to 10.0 millimeters of mercury. A considerable amount of decomposition and polymerization occurred during the course of a distillation, thereby decreasing the yield of the more highly un-

Table 1 - Analytical Data for Alcohol Fractions Obtained by Fractional Distillation

Fraction 1/	Boiling Point		Refractive Index	Iodine Number	Hydroxyl Equivalent 2/
	Temperature	Pressure			
No.	°C.	Mm. Hg.	n_D^{30}		
1	113.0-126.0	0.50	1.4458	26.6	234.6
3	139.0-141.0	0.50	1.4562	104.0	252.8
9	163.0-165.0	0.51	1.4620	132.5	277.2
11	167.0-170.0	0.63	1.4630	134.2	290.0
12	170.0-172.0	0.50	1.4611	131.4	285.0
17	187.0-189.0	0.60	1.4843	198.2	311.8
18	189.0-191.0	0.65	1.4899	216.4	311.7
21	204.0-208.0	0.65	1.4960	199.8	329.9
22	208.0-210.0	0.65	1.4980	222.9	348.3

1/THESE ARE THE MAJOR FRACTIONS THAT APPEARED TO CONTAIN NEARLY PURE COMPOUNDS.
2/THEORETICAL MOLECULAR WEIGHTS OF SATURATED ALCOHOLS ARE AS FOLLOWS: C_{16}, 242; C_{18}, 270; C_{20}, 298; C_{22}, 326; C_{24}, 354.

saturated fatty alcohols. The data in table 1 show iodine numbers and refractive indices of the distilled fractions. The yield of total distillate indicated that a large amount of high boiling, polyunsaturated alcohols were not recovered. Unrecovered pot residue amounted to as much as 34.3 percent of the starting material for one of the best distillations.

Oxygen-free nitrogen was bubbled through the pot charge while the distillation proceeded, in order to lessen the loss due to polymerization. This bubbling was done by the use of a nitrogen-filled balloon attached to a capillary tube (fig. 2) inserted into the distilling flask containing the charge of unsaturated fatty alcohols. Additional work along these lines is postponed until distillations can be studied on a spinning-band type of distillation column such as the type described by Murray (1951).

UREA COUNTERCURRENT DISTRIBUTION: In another phase of the research, a study was made of the utility of fractionation by the use of urea inclusion compounds incorporated into a countercurrent distribution system (Domart, Miyauchi, and Sumerwell 1955). It was shown that the urea-countercurrent-distribution technique makes possible the separation of highly unsaturated alcohols. To what extent this separation is complete has not yet been determined for mixtures occurring naturally. The experiments performed thus far have shown an abnormal weight-distribution curve for urea countercurrent distribution of the unsaturated alcohols prepared from pilchard

oil. Nevertheless, refractive indices of the fractions obtained have indicated that a separation was made. The fractions separated in this manner are currently being studied as to the degree of unsaturation and the chain-length of the respective alcohols.

CHROMATOGRAPHIC SEPARATIONS: The alcohols obtained from fractional distillation have appeared colorless, whereas those obtained from the urea countercurrent distribution have appeared yellowish. Studies on column chromatography were started to determine to what extent the various fractions separated by these other methods could be further purified by the removal of polymerized materials. The chromatography has been carried out principally with fractions from the countercurrent distribution.

Preliminary work was undertaken to find an adsorbent that would remove the impurities and still permit good yields of the purified fractions. A mixture of Fuller's earth, powdered silica, and powdered calcium oxide was found to give fractions much lighter in color. Inasmuch as the fractions going into or coming out of the column were not protected by an inert atmosphere, it is believed that this adsorbent will be more satisfactory when used with nitrogen.

DETECTION OF UNSATURATION: Ultraviolet spectrophotometry has been used to determine the extent of conjugated and nonconjugated double bonds in the polyunsaturated alcohols being studied. The ultraviolet spectra is being used to determine the success in isolating the more highly unsaturated fatty alcohols by the various separation techniques. Alkali isomerization of nonconjugated unsaturation is employed with ultraviolet absorption when the number of double bonds in the alcohols of the particular fractions is being measured. 2/

A certain amount of conjugation has taken place during the sodium-reduction process, as the ultraviolet spectra of the crude alcohol mixtures have indicated. This was expected, since the method used to isomerize and measure the nonconjugated double bonds involves treatment of the unsaturated alcohols with strong alkali 2/ at a high temperature (180° C.) and since the unsaturated portions of the prepared alcohols are in contact with a strongly alkaline mixture at a temperature close to the boiling point (138° C.) of the xylene solvent during the sodium reduction process. The amount of isomerization and possible decomposition that occurs during this treatment can be minimized by working rapidly and by utilizing an inert atmosphere over the reaction mixture. To obtain the alcohols that correspond to the naturally-occurring fatty acid glycerides, we will have to develop a method for the removal of the conjugated unsaturated alcohols that occur via the sodium-reduction process and/or other reactions.

Abu-Nasr and Holman (1954) have pointed out that conjugation of unsaturated-fatty-acid esters occurs during fractional distillation. They therefore suggested that fractional distillation be avoided as a final step in purifying polyunsaturated esters. This suggestion would apply also to the polyunsaturated alcohols. For this reason, the detection of conjugated unsaturation in fractions of distilled unsaturated alcohols is not surprising. It is also expected that such analytical data as iodine numbers will be erroneously low 3/ when quantities of conjugated unsaturated alcohols are present in the various fractions.

It has been indicated here that double bonds are conjugated by an alkaline treatment during sodium reduction and by fractional distillation. Thus, it can be seen why difficulties may be encountered in isolating pure fractions of nonconjugated polyunsaturated fatty alcohols. Displacement chromatography is one method of isolating pure compounds of this type (Abu-Nasr and Holman 1954). Another method that has

2/ AMERICAN OIL CHEMISTS' SOCIETY TENTATIVE METHOD CD 7-48.
3/ IODINE IS VERY SLOW TO REACT WITH CONJUGATED DOUBLE BONDS; THEREFORE EXPERIMENTALLY-DETERMINED IODINE NUMBERS ARE LOW WHEN THE CONVENTIONAL ANALYTICAL METHODS ARE USED.

proven successful for the separation of fatty materials is the formation of urea inclusion compounds (Schlenk 1954); (Schlenk and Holman 1950); (Abu-Nasr, Potts, and Holman 1954). Both of these techniques are to be given additional study at this laboratory.

LITERATURE CITED

ABU-NASR, A. M., AND HOLMAN, R. T.
1954. HIGHLY UNSATURATED FATTY ACIDS. III - ISOLATION OF METHYL EICOSAPENTAENOATE, ETHYL DOCOSAPENTAENOATE, AND ETHYL DOCOSAHEXAENOATE FROM COD LIVER OIL ESTERS BY CHROMATOGRAPHY. JOURNAL AMERICAN OIL CHEMISTS' SOCIETY, VOL. 31, PP. 41-45.

ABU-NASR, A. M.; POTTS, W. M.; AND HOLMAN, R. T.
1954. HIGHLY UNSATURATED FATTY ACIDS. II - FRACTIONATION BY UREA INCLUSION COMPOUNDS. IBID., VOL. 31, PP. 16-20.

ALLEN, R. R.
1955. CHROMATOGRAPHY. IBID., VOL. 32, PP. 638-640.

BROWN, J. B.
1955. FRACTIONAL SOLVENT CRYSTALLIZATION. IBID., VOL. 32, PP. 646-652.

DOMART, C.; MIYAUCHI, D. T.; AND SUMERWELL, W. N.
1955. THE FRACTIONATION OF MARINE OIL FATTY ACIDS WITH UREA. IBID., VOL. 32, PP. 481-483.

DUTTON, H. J.
1955. THE ANALYSIS OF LIPIDS BY COUNTERCURRENT DISTRIBUTION. IBID., VOL. 32, PP. 652-659.

HANSLEY, V. L.
1947. SODIUM REDUCTION OF FATTY ACID ESTERS. INDUSTRIAL AND ENGINEERING CHEMISTRY, VOL. 39, PP. 55-62.

MURRAY, K. E.
1951. A MODIFIED SPINNING BANK COLUMN FOR LOW PRESSURE FRACTIONATION. JOURNAL AMERICAN OIL CHEMISTS' SOCIETY, VOL. 28, PP. 235-239.

PRYDE, E. H.
1951. ALCOHOLS FROM MENHADEN OIL BY SODIUM REDUCTION. IBID., VOL. 28, PP. 16-20.

RALSTON, A. W.
1948. FATTY ACIDS AND THEIR DERIVATIVES. JOHN WILEY & SONS, INC., NEW YORK, N. Y., PP. 711-742.

SCHLENK, H.
1954. UREA INCLUSION COMPOUNDS OF FATTY ACIDS. PROGRESS IN THE CHEMISTRY OF FATS AND OTHER LIPIDS, EDITED BY R. T. HOLMAN, W. O. LUNDBERG, AND T. MALKIN, ACADEMIC PRESS INC., PUBLISHERS, NEW YORK, N. Y., VOL. 2, PP. 243-267.

SCHLENK, H., AND HOLMAN, R. T.
1950. SEPARATION AND STABILIZATION OF FATTY ACIDS BY UREA COMPLEXES. JOURNAL AMERICAN CHEMICAL SOCIETY, VOL. 72, PP. 5001-5004.

STANSBY, M. E.
1956. NEW PRODUCTS FROM FISH OILS. PART I - INTRODUCTION. COMMERCIAL FISHERIES REIVEW, VOL. 18, NO. 8, PP. 1-3. (ALSO SEPARATE NO. 444.)

WEITKAMP, A. W.
1955. DISTILLATION. JOURNAL AMERICAN OIL CHEMISTS' SOCIETY, VOL. 32, PP. 640-646.

NEW PRODUCTS FROM FISH OILS

Part IV - Preliminary Investigations on Alkyl Halides, Silicones, and Quaternary Ammonium Salts

By Edward H. Gruger, Jr. *

ABSTRACT

LONG-CHAIN ALKYL HALIDES WERE PREPARED FROM PURE CETYL ALCOHOL, N-OCTADECYL ALCOHOL, AND OLEYL ALCOHOL. SOME ALKYL HALIDES WERE PREPARED FROM ALCOHOLS DERIVED FROM MENHADEN AND PILCHARD OILS. THESE COMPOUNDS WERE USED TO PREPARE SILICONES AND QUATERNARY AMMONIUM SALTS.

THE SILICONES PREPARED RESULTED FROM THE HYDROLYSIS AND SUBSEQUENT DEHYDRATION OF CHLOROSILANES OF THE TYPE $RSiCl_3$. THESE ALKYLTRICHLOROSILANES WERE PRODUCTS OF ALKYL MAGNESIUM HALIDE REACTIONS WITH SILICON TETRACHLORIDE.

THE QUATERNARY AMMONIUM SALTS ARE A COMBINATION OF THE ALKYL HALIDES AND TRIETHYLAMINE. THE LONG-CHAIN, POLYUNSATURATED ALKYLTRIETHYLAMMONIUM BROMIDES FROM FISH OIL ARE BEING TESTED AS ORE-FLOTATION COLLECTORS AND AS FUNGICIDES FOR THE CITRUS INDUSTRY.

INTRODUCTION

There is great need for research and development of derivatives [1/] prepared from fish-oil fatty acids. In the past, relatively little work has been done on these derivatives as compared with that done on the derivatives from the fatty acids of vegetable and animal oils.

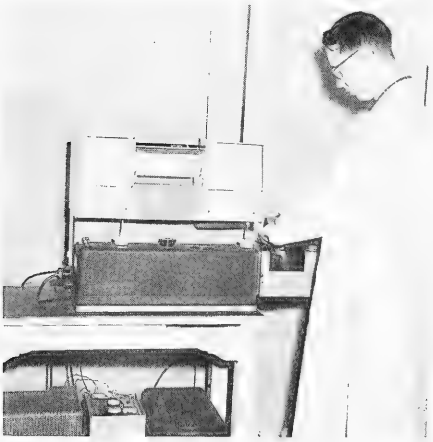


Fig. 1 - Ultraviolet absorption measurements being made on long-chain fatty alcohols used to prepare alkyl halides.

Fish oils are known to be unique in containing a high percentage of long-chain fatty acids with many double bonds. These unique properties of fish oils make them potentially valuable for the manufacture of many industrial and pharmaceutical products (Stansby 1956). The present paper is one in a series reporting the research now being carried out at the Seattle Technological Laboratory on these potential products from fish oils.

Polyunsaturated fatty alcohols (Gruger 1956) have been prepared from fish oils and are being used as the starting material in the preparation of other derivatives. Polyamino fatty acids (McDonald and Gruger 1956), alkyl halides, silicones, and quaternary ammonium salts are presently the compounds being studied in the research program.

ALKYL HALIDES: The alkyl halides prepared from fish oils are the products of direct reaction of the fatty alcohols with an appropriate halogenating agent. Special

*ORGANIC CHEMIST, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

1/THE TERM DERIVATIVE IS USED IN ITS BROADEST SENSE. THUS, ANY GROUP OF COMPOUNDS THAT CAN BE PREPARED FROM FATTY ACIDS, EITHER DIRECTLY OR INDIRECTLY, IS CONSIDERED AS A FATTY-ACID DERIVATIVE.

NOTE: "PART I - INTRODUCTION" APPEARED IN THE AUGUST 1956 (P. 1) ISSUE; "PART II - POLYAMINO FATTY ACIDS DERIVED FROM FISH OILS" IN SEPTEMBER 1956 (P. 7) ISSUE; AND "PART III - PREPARATION AND SEPARATION OF FATTY ALCOHOLS MADE FROM FISH OILS--A PRELIMINARY STUDY" IN THIS ISSUE (P. 13) OF COMMERCIAL FISHERIES REVIEW.

attention is being given to the long-chain polyunsaturated alkyl halides, although the preliminary work has been centered on saturated compounds that are commercially available in a relatively high state of purity.

Alkyl halides have numerous applications. Employed in various coupling reactions they are used to prepare long-chain hydrocarbons. Alkyl magnesium halides--commonly called Grignard reagents--offer a means of producing many useful compounds of distinct chemical structures, such as silicones, primary alcohols, substituted secondary and tertiary alcohols, ketones, and sulfinic acids. Alkyl halides are also useful in undergoing displacement reactions to form such compounds as nitriles, ethers, and mercaptans. Each one of these products prepared from the alkyl halides have great potential utility.

Fig. 2 - Fractional distillation of long-chain alkyl bromides prepared from fatty acids of fish oils.

SILICONES: Another field of investigation has been the silicones. McGregor (1954) defines a silicone as "a compound containing the elements of silicon, oxygen and organic groups, the silicon being present in sufficient amount to affect the properties measurably." Silicones are known to be quite stable at high temperatures, to be somewhat resistant to oxidation, and to have good lubricating and water-repellent properties. Silicones containing long-chain polyunsaturated alkyl groups would probably possess special properties and would have interesting potential uses. There is a possibility that a highly stable drying oil or a tough resilient copolymer could result from this type of silicone.

QUATERNARY AMMONIUM SALTS: During the work on the alkyl halides, a satisfactory derivative was sought for use in the identification of the various long-chain alkyl halides that were being synthesized. Quaternary ammonium salts were chosen because of their relative ease of formation and reasonably sharp melting points. (With these compounds, a sharp melting point, however, does not necessarily indicate purity.) The quaternary ammonium salts have recently become commercially important as germicides and as surface-active agents in the textile field (Harwood 1952). Ralston (1948) has suggested their use in the production of disinfecting and preserving agents, detergents, fire-extinguishing foams, wetting agents, and flotation agents. Therefore the quaternary ammonium salts were studied somewhat extensively, with a view toward their eventual use with the unsaturated alkyl halides prepared from fish oils.

PRELIMINARY INVESTIGATIONS OF LONG-CHAIN ALKYL HALIDES

At the outset of the studies of long-chain alkyl halides, it was quickly learned that when the complex mixtures of the fatty acids found in fish oil were used, very little information could be obtained about the chemistry of the substances reacting. The experiments therefore centered on reactions of single, pure, long-chain compounds (commercially available) in an effort to study the completeness of a given reaction. The pure compounds used were cetyl alcohol, n-octadecyl alcohol, and oleyl alcohol. For the preparation of alkyl chlorides, the halogenating agents used were zinc chloride and hydrochloric acid, thionyl chloride, phosphorus trichloride, and phosphorus pentachloride. Phosphorus tribromide was reacted with the alcohols to prepare the alkyl bromides. Similarly, hydriodic acid was used to prepare the alkyl iodides. Of the chlorinating agents used, thionyl chloride gave the best yield. When the alkyl halides were being purified by fractional distillation, the alkyl iodides showed a marked tendency to decompose. The decomposition was made evident by the appearance of iodine-colored distillates. Table 1 lists the halogen compounds prepared and their observed physical constants.

The relative ease of alkyl-halide formation was observed to be in the order: iodides > bromides > chlorides. This is also the order of reactivity of the corresponding alkyl halides (Fieser and Fieser 1944). [2/] For the purpose of carrying out laboratory-scale experiments with alkyl halides, the bromides are most often chosen, since they are more reactive than are the chlorides and more economical to work with than are the iodides. Therefore, as the experiments in the Seattle laboratory progress with alkyl halides prepared from fish oil, only the bromides will be made. If any larger-than-laboratory-size quantities are made, the alkyl chlorides will probably be used, since they are cheaper to prepare than are the bromides.

Table 1 - Physical Constants for Alkyl Halides

Compound	Boiling Point		Refractive Index
	Temperature	Pressure	
	°C.	Mm.Hg	n_D^T
Cetyl chloride	191-194	15	-
Cetyl bromide	197-203	21	1.4593^{20}
Cetyl iodide	151-153	3	$1.4389^{49.9}$
n-Octadecyl chloride	195-203	12	-
n-Octadecyl bromide	213-216	14	$1.4441^{49.9}$
n-Octadecyl iodide	180-190	7	-
Oleyl chloride	153-163	3	1.4582^{20}
Oleyl bromide	141.7-147.7	1.0	1.4692^{25}
Satd. alkyl bromides 1/	170.5-185.0	4.0	1.4619^{24}
Unsatd. alkyl bromides 2/	181.0 201.0	9 0.57	1.4832^{25}

1/ Prepared from menhaden oil. 2/ Prepared from pilchard oil with boiling points at two different pressures.

INVESTIGATION OF SILICONES DERIVED FROM FISH OIL

There are four commercial methods for preparing silicon compounds containing carbon. These methods are (1) the "direct process," (2) the Grignard method, (3) the olefin addition method, and (4) the sodium method (McGregor 1954). The Grignard

2/ FOR A GIVEN ALKYL RADICAL, R, THE ORDER OF REACTIVITY OF ALKYL HALIDES IS RI > RBR > RCL. THEREFORE, THIS WOULD BE TRUE FOR ANY GIVEN LONG-CHAIN ALKYL HALIDE.

method is the one that has been studied at the Seattle laboratory. This method involves the substitution of an organic group for one or more of the chlorine atoms in silicon tetrachloride. In this way, compounds of the types $RSiCl_3$, R_2SiCl_2, R_3SiCl or R_4Si can be formed from $SiCl_4$, where R represents a group, such as the octadecyl group ($-CH_2(CH_2)_{16}CH_3$).

Table 2 - Analytical Data for Alkyl Trichlorosilanes

Alkyl Trichlorosilane ($RSiCl_3$)	Boiling Point		Amount of Silicon in $RSiCl_3$	
	Temperature	Pressure	Experimental	Theoretical
	°C.	Mm. Hg	Percent	Percent
Dodecyl trichlorosilane . .	154.0-157.0	10.0	35.32	35.01
Cetyl trichlorosilane . . .	199.0-201.0	10.0	27.21	27.56
Oleyl trichlorosilane . . .	166.0-167.0	1.5	29.63	29.55

GRIGNARD METHOD: In the Grignard method, the Grignard reagent (alkyl magnesium halide) is first prepared. This reagent is made by placing magnesium chips and an appropriate dry solvent--usually ethyl ether--into a reaction vessel equipped with a stirrer and reflux condenser. Next, an alkyl halide (the long-chain alkyl bromides, in the present case), diluted in the same solvent, is allowed to drip into the stirred mixture of magnesium and solvent, while protecting the reaction mixture from the moisture in the air. This reaction is represented by the following general equation (where X represents the halogen):

$$RX + Mg \xrightarrow[\text{dry ether}]{} RMgX$$

The next step in the synthesis involves the reaction of the Grignard reagent and silicon tetrachloride. The Grignard reagent is added, with stirring, to the silicon tetrachloride in dry ether. This reaction is represented as follows:

$$RMgX + SiCl_4 \longrightarrow RSiCl_3 + MgXCl$$

It is evident from the equation that, by varying the ratio of amounts of Grignard reagent to silicon tetrachloride, the other types of compounds (R_2SiCl_2, R_3SiCl, and R_4Si) may be formed.

ALKYL CHLOROSILANES: The alkyl chlorosilanes, as they are called, have a marked reactivity toward compounds containing a hydroxylic group or groups. Therefore, by reacting alkyl chlorosilanes with water, for example, one can form compounds called alkyl silanols. (This is the reaction that has been investigated most in the Seattle laboratory in the study of silicones.) Because low-molecular weight alkyl silanols dehydrate readily to form silicon polymers or silicones, it was decided that this same reaction should be tried in the preparation of long-chain alkyl silanols. One type of reaction involved can be expressed, generally, as follows:

$$RSiCl_3 + 3H_2O \longrightarrow RSi(OH)_3 + 3HCl$$

$$xRSi(OH)_3 \longrightarrow \left[\begin{array}{c} R \quad R \\ | \quad | \\ -O-Si-O-Si-O- \\ | \quad | \\ O \quad O \\ | \quad | \\ -O-Si-O- \\ | \\ R \end{array}\right]_x + xH_2O$$

(a resinous cross-linked polymer)

Thus far, the only type of alkyl chlorosilane that has been produced in the Seattle laboratory is of the $RSiCl_3$ type (table 2). The type R_2SiCl_2 was attempted; however, the analyses indicated that only one mole of Grignard reagent reacted instead of two moles, in all the chlorosilanes made here. Apparently, there is too much steric hindrance in the $RSiCl_3$ formed for it to react with a second mole of the Grignard reagent. In any case, more severe reaction conditions are necessary.

REACTIVITY OF ALKYL HALIDES: Another phase of the silicone work included a study of the reactivity of the alkyl halides in the preparation of the corresponding Grignard reagents. The findings were in accord with the order of reactivity given earlier (RI > RBr > RC1). In some attempts, the long-chain alkyl chlorides would not react with the magnesium, even under forcing conditions. It therefore appears that the yield of Grignard reagent and consequently the yield of silanol is dependent on the reactivity of the alkyl halide.

Table 3 - Silicon Content of Silicones

Alkyl Group, R	Amount of Silicon Found	Theoretical Amount of Silicon	
		$[R_2SiO]$ x 1/	$[RSiO_2]$ x 2/
	(Percent)		
n-Butyl	23.8	17.7	23.9
n-Hexyl	18.4	13.1	19.3
n-Decyl	9.36	8.58	13.9
n-Dodecyl	9.61	7.33	12.2
n-Hexadecyl	6.58	5.14	9.83
n-Octadecyl	4.59	3.66	6.65
Oleyl	2.43	3.68	6.68

1/ A POLYMER UNIT RESULTING FROM $R_2Si(OH)_2$ DEHYDRATION.
2/ A POLYMER UNIT RESULTING FROM $RSi(OH)_3$ DEHYDRATION.

HOMOLOGS OF THE SATURATED ALKYL SERIES: In attempting to purify silanols or silicones containing long-chain saturated alkyl groups, we learned that no common solvent would completely dissolve them. The dehydration products of cetyl silanetriol and n-octadecyl silanetriol, in particular, were only partially soluble. These latter compounds are white solids, whereas the homologs of lower molecular weight are liquids.

Table 4 - Melting Points of Triethylalkylammonium Halides

Alkyl Halides Reacted With Triethylamine	Melting Point of the Salt (Uncorrected)
	°C.
Cetyl bromide	173.0-176.5
Cetyl iodide	182.0-182.5
n-Octadecyl bromide	178.0-179.5
n-Octadecyl iodide	184-187
1,10-Diiodooctadecane 1/	117.0-119.0
Satd. menhaden bromides	69-75
Oleyl bromide	243-245
Unsatd. pilchard bromides	135 2/

1/ 1,10-DIIODOOCTADECANE WAS PREPARED FROM OLEYL ALCOHOL BY THE REACTION OF TWO MOLES OF HI PER MOLE OF THE ALCOHOL. A SUITABLE SOLVENT GIVES MOSTLY THE ONE ISOMER.
2/ THESE SALTS WERE GREASES; TEMPERATURE GIVEN IS THAT AT WHICH THE GREASE BECAME FLUID.

At one point in the investigation, it was thought that the compounds produced in this manner were the products of a major side reaction. A study was made of the formation of various homologs of a saturated alkyl series to determine if the technique used produced solids in all cases. The corresponding derivatives were prepared from n-butyl bromide, n-hexyl bromide, n-decyl bromide, n-dodecyl bromide, and n-hexadecyl (cetyl) bromide. The silicon content of the resulting silicones are listed in table 3. Using the same reaction conditions for each preparation, we observed that a transition from liquid to solid product occurred between the C_{10} and C_{12} alkyl-containing derivatives. It was assumed that the formation of solid products was due to molecular weight characteristics and not to side reactions.

Some preliminary work was done in preparing silicones from saturated and unsaturated alcohols (via the halides) prepared from menhaden oil. Further work has been postponed until the problems characteristic of the reaction are worked out for the pure unsaturated compounds. The only preparation of a pure unsaturated alkyl-containing silicone that has been attempted is a derivative of oleyl bromide. In contrast to the C_{18} saturated derivative, the oleyl or C_{18} unsaturated derivative is a slightly viscous liquid. This observation indicates the possibility of forming similar polyunsaturated derivatives from fish oil.

QUATERNARY AMMONIUM SALTS PREPARED FROM FISH OILS

In the preparation of a quaternary ammonium salt, an alkyl halide is reacted with an appropriate amine. The following equation is representative:

$$RX + R'_3N \longrightarrow R'_3N.RX$$

Triethylamine quaternary salts have been prepared from the alkyl halides listed in table 4.

Harwood (1952) mentions that melting points of quaternary ammonium compounds are not a good criterion for purity because the compounds are subject to decomposition when heated to the melting point. Some uncorrected, observed melting points are listed in table 4. Apparently, the observations for the triethylamine salts of oleyl bromide and n-octadecyl bromide are anomalous, since it would not be expected that the melting point of the oleyl bromide derivative would be higher than that of the n-octadecyl bromide derivative.

Samples of some quaternary ammonium compounds prepared were tested for fungicidal activity and for use as ore-flotation collectors. The fungicidal activity was shown by workers at Florida Southern College [3/] to be positive for the quaternary ammonium iodides prepared from an unsaturated fraction of menhaden oil. This salt, however, was prepared only in a small amount at a time, so that when a request was received for additional samples for testing, only the unsaturated alkyl bromides from pilchard oil were available for synthesis. There should be little difference, however, between the two types of compounds. Results of these tests on the pilchard oil derivative are still pending. The quaternary ammonium salts of unsaturated pilchard bromides are being tested as ore-flotation collectors at the University of Minnesota.[4/] The results of these tests are also pending.

LITERATURE CITED

FIESER, L. F., AND FIESER, M.
1944. ORGANIC CHEMISTRY. D. C. HEATH AND COMPANY, BOSTON, MASS., P. 152.

GRUGER, E. H., JR.
1957. NEW PRODUCTS FROM FISH OILS. PART III - PREPARATION AND SEPARATION OF FATTY ALCOHOLS MADE FROM FISH OILS--A PRELIMINARY STUDY. COMMERCIAL FISHERIES REVIEW, VOL. 19, NO. 4A, PP. 13-17.

HARWOOD, H. J.
1952. DERIVATIVES OF THE FATTY ACIDS. PROGRESS IN THE CHEMISTRY OF FATS AND OTHER LIPIDS. ACADEMIC PRESS INC., PUBLISHERS, NEW YORK, N. Y., VOL. 1, PP. 147-153.

MCDONALD, R. N., AND GRUGER, E. H., JR.
1956. NEW PRODUCTS FROM FISH OILS. PART II - RESEARCH ON POLYAMINO FATTY ACIDS. COMMERCIAL FISHERIES REVIEW, VOL. 18, NO. 9, PP. 7-11 (ALSO SEPARATE NO. 448).

MCGREGOR, R. R.
1954. SILICONES AND THEIR USES. MCGRAW-HILL BOOK COMPANY, INC., NEW YORK, N. Y., PP. 222-285.

RALSTON, A. W.
1948. FATTY ACIDS AND THEIR DERIVATIVES. JOHN WILEY AND SONS, INC., NEW YORK, N. Y., PP. 684-696.

STANSBY, M. E.
1956. NEW PRODUCTS FROM FISH OILS. PART I - INTRODUCTION. COMMERCIAL FISHERIES REVIEW, VOL. 18, NO. 8, PP. 1-3 (ALSO SEPARATE NO. 444).

3/SOUTHERN BIO-RESEARCH LABORATORY. } ENGAGED IN CONTRACT RESEARCH WORK FOR THE U.S. FISH & WILD-
4/SCHOOL OF MINES AND METTALLURGY. } LIFE SERVICE AS PART OF THE PUBLIC LAW 466 (1954) PROGRAM.

UTILIZATION OF FISH OILS IN ORE FLOTATION

By S. R. B. Cooke* and M. E. Stansby**

ABSTRACT

RESEARCH IS BEING CONDUCTED TO RETURN FISH OILS TO THEIR PREVIOUS USE AS FLOTATION AGENTS FOR THE SEPARATION OF METALS FROM ORES. POTENTIAL FLOTATION USAGE OF SUCH OILS AT ONE-HALF POUND PER TON OF IRON ORE IS ABOUT 5,000,000 GALLONS A YEAR. STUDIES HAVE BEEN CONDUCTED ON THE EFFECTS OF CONCENTRATION, FATTY ACID CARBON-CHAIN LENGTH, AND UPON THE DEGREE OF UNSATURATION OF SUCH COMPOUNDS ON THEIR EFFICIENCY AS FLOTATION AGENTS. FATTY ACIDS WITH IODINE VALUES OF 70-115, INDICATING MODERATE UNSATURATION, HAVE GIVEN THE GREATEST EFFICIENCY. SEPARATION OF THE INDIVIDUAL FATTY ACIDS FROM THE OILS HAS BEEN COMPLETED AND WORK ON THE EFFECTS OF CARBON-CHAIN LENGTHS ON FLOTATION EFFICIENCY IS IN PREPARATION.

Although at one time fish oils were used to a small extent in ore flotation, this is no longer the case. Research carried out by competing oil producers has resulted in the development of oil derivatives such as alkyl amines, that in some cases are superior to the aliphatic acids, although oleic acid is still widely employed as a flotation collector.

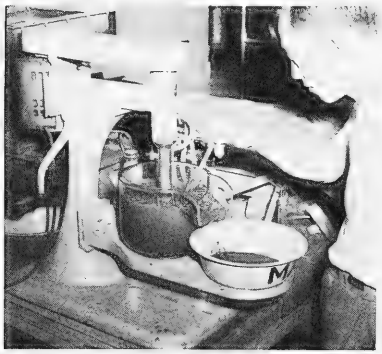


FIG. 1 - H. S. CHOI USING A FAGERGREN FLOTATION CELL TO INVESTIGATE THE USE OF FISH OIL FATTY ACIDS IN ORE CONCENTRATION. THE HEAVY GLASS CELL CONTAINS AN AQUEOUS PULP OF FINELY-GROUND IRON ORE. FATTY ACIDS SELECTIVELY COAT THE IRON OXIDE MINERAL PARTICLES, MAKING THEM HYDROPHOBIC. MECHANICAL STIRRING OF THE PULP AND SIMULTANEOUS ADMISSION OF AIR PERMITS THE COATED IRON OXIDE PARTICLES TO BECOME ATTACHED TO AIR BUBBLES, WHICH RISE TO THE SURFACE AND ARE SCRAPED INTO THE PAN IN FRONT OF THE OPERATOR, THUS PRODUCING AN IRON-RICH "CONCENTRATE." THE SILICEOUS GANGUE MINERALS, BEING HYDROPHILIC, REMAIN IN THE PULP AND DO NOT CONTAMINATE THE CONCENTRATE, THUS PRODUCING A "TAILING."

The flotation process is currently employed for sulfide ores (using sulphydric collectors), as well as in many applications to other types of ore. The flotation process can be applied to the concentration of low-grade iron ores. At the present time, the high-grade iron ores are nearing exhaustion, and these lower-grade ores, which are very abundant, will be the principal future source of iron production in this country. The School of Mines and Metallurgy and the Mines Experiment Station at the University of Minnesota have carried out research for the past 30 years to develop methods for concentrating these ores. Based on this research, plants valued at over 500 million dollars are now under construction.

There are two general types of iron-concentration methods that can be used and that are being considered at the present time. One of these involves magnetic separation; the other flotation. Although the magnetic-separation process has been widely investigated and most of the plants now under construction make use of this method, there are many iron ores to which the magnetic-separation process is not directly applicable and for which flotation may well be the favored method. Should the flotation process eventually be adopted for this purpose there would be a very great expansion in demand for flotation agents. Less than one-half pound of oil or oil derivative is required for flotation of a ton of iron ore, but since nearly 100 million tons of iron ore are processed annually, the amount of oil required for the flotation of this amount of ore is considerable (about 5 million gallons).

* PROFESSOR OF MINERAL DRESSING AND METALLURGY, SCHOOL OF MINES AND METALLURGY, UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINN.

* * CHIEF, PACIFIC COAST AND ALASKA TECHNOLOGICAL RESEARCH, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

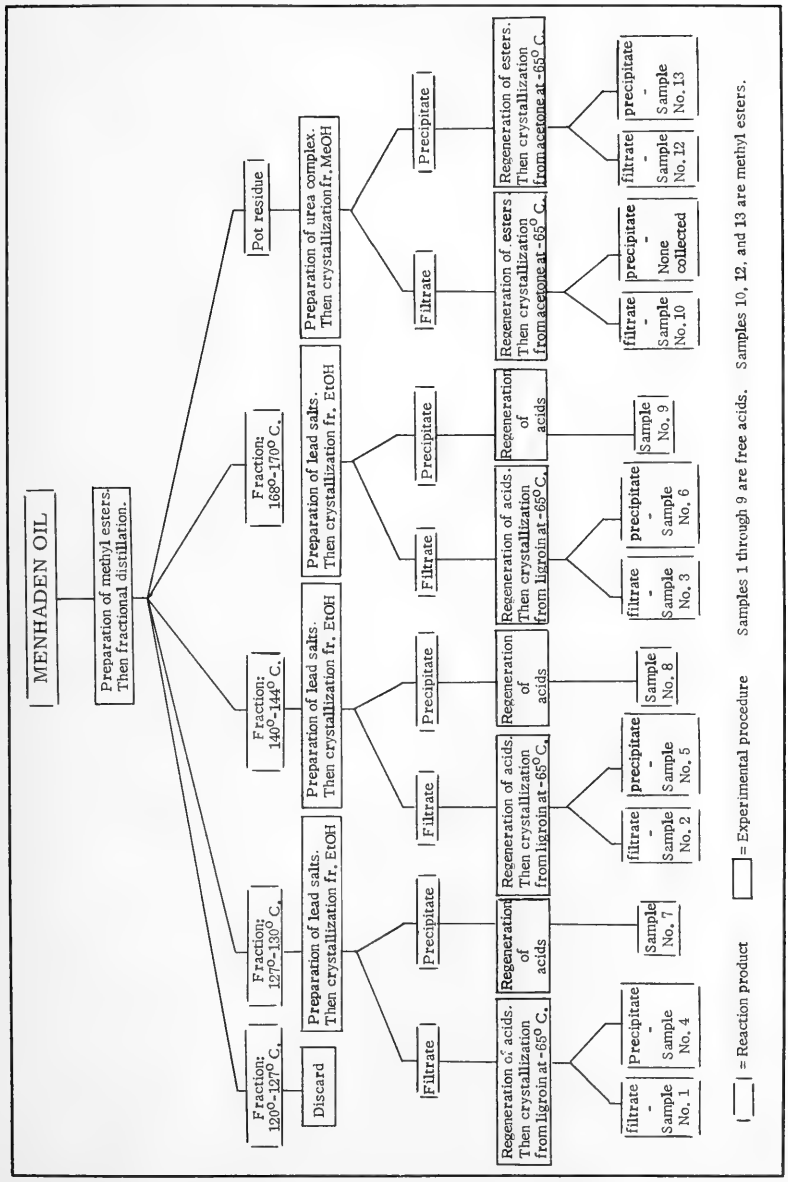


FIG. 2 - FLOW SHEET FOR SEPARATION OF THE COMPONENTS OF MENHADEN OIL.

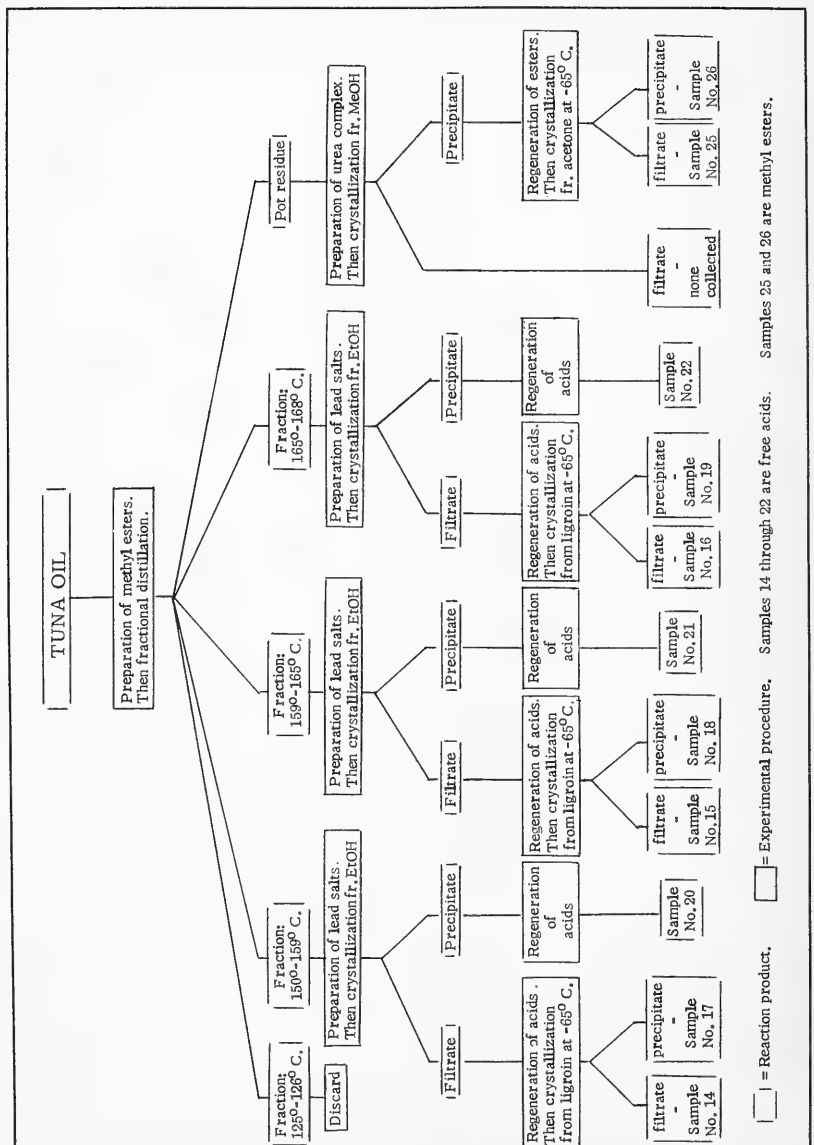


FIG. 3 - FLOW SHEET FOR SEPARATION OF THE COMPONENTS OF TUNA OIL.

In addition to this very large potential use of oils for the concentration of iron ore, there are sizable quantities of other ores that at present are being concentrated by flotation methods, including manganese and nonmetallic ores such as fluorite and phosphate. The work on this project will consider the application of fish-oil derivatives to iron-ore concentration and to flotation of manganese and other types of ores.

Research on the effect of the chain length and degree of unsaturation of such compounds on their efficiency as ore-flotation agents has been carried out at the School of Mines and Metallurgy of the University of Minnesota. The present study includes an extension of this work to consider the longer-chain compounds of higher degree of unsaturation contained in fish oils to determine if they offer any advantages over the flotation agents being currently employed. Some of the preliminary work on shorter-chain fatty acids already carried out at Minnesota has indicated that there are advantages both to long-chain length and to high degree of unsaturation. In past work, alkyl amines in some cases have proved superior to the fatty acids as flotation agents. In the initial experimental work, tests have been confined to use of fish-oil fatty acids. Some tests of derivatives of fish oil, such as alcohols, will be made to see if they will function as compatible frothers with the fish-oil fatty acids.

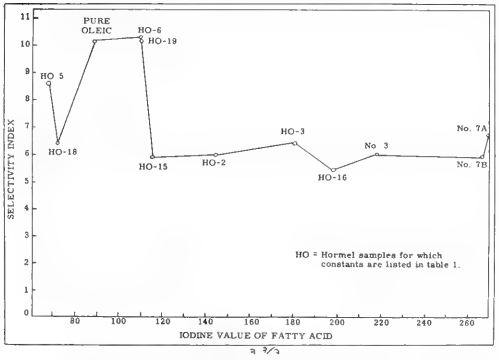


FIG. 4 - RELATIONSHIP BETWEEN THE EFFICIENCY OF THE VARIOUS FATTY ACID FRACTIONS IN THE COLLECTION OF ORE AND THEIR DEGREE OF UNSATURATION AS MEASURED BY IODINE VALUE. ORE WAS CONDITIONED WITH FATTY ACIDS AT 60 PERCENT SOLIDS, FLOATED AT 19-PERCENT SOLIDS AT PH 6, AND ROUGHER CONCENTRATES WERE CLEANED TWICE.

During the first year of the investigation, the work has been restricted entirely to studies on the flotation of iron ore. Most of the work has been with Michigan specularite (jasper ore), which at present is being commercially concentrated by a flotation process. A standard procedure has been developed for testing the efficiency of different flotation agents with this ore. The ore first is crushed fine enough to pass through a 20-mesh screen and then is de-slimed (that is, very fine material of minus 10-micron size is removed) by use of a hydraulic elutriator. Flotation then is carried out using each fatty acid under test at a series of pH values and, in some instances, employing different ratios of fatty acid to ore (figure 1).

The iron content of the concentrates and of the tailings then is determined. This work has been carried out in the analytical laboratories of the Mines Experiment Station, University of Minnesota.

In calculating results, one finds that both the final content of iron in the concentrates and the percentage recovery of iron is of importance. For a given series of tests, the curves obtained by plotting both of these factors against pH can be compared. A more simple measure of the efficiency of collectors is possible by calculation of the selectivity index (S. I.):

$$\text{S. I.} = \sqrt{\frac{M}{m} \times \frac{n}{N}} \qquad \text{where}$$

M = Percentage of iron in concentrate
m = Percentage of iron in tailing
N = Percentage of insoluble in concentrate
n = Percentage of insoluble in tailing

The selectivity index varies from 1, when no concentration has been made, to infinity for complete concentration (never practically obtainable).

Concentration experiments have been completed at a series of pH values between 5 and 9, comparing the selective index when using oleic acid and the mixed fatty acids from pilchard oil. On the ores so far investigated, the optimum pH seems to lie between 6 and 7. Selectivity is extremely poor at pH 8 or higher, and frothing is unsatisfactory below 5. When an addition of fatty acid of one pound per ton of ore was employed (the optimum value for oleic acid), the pilchard fatty acids showed a lower selectivity index than did the oleic acid. When, however, the pilchard-oil fatty acid concentration was lowered to 0.5 pound per ton of ore, the selectivity index was equal to that of oleic acid, at the lower pH values, and was markedly higher, at a pH value of 8.

A systematic investigation of the effect of fish-oil fatty acids, fractionated according to degree of unsaturation and approximate chain length upon their effectiveness as iron-ore flotation collectors, is under way.

Fractionation of both menhaden and tuna oils was carried out in the laboratories of Hormel Institute. Separations were made by distillation of the methyl esters of the fatty acids in a spinning-band column followed by lead-salt and low-temperature crystallization from Skellysolve F and by use of urea-complex separations. The details of these separations are shown in figures 2 and 3. Chemical constants of the separated fractions were determined and are shown in table 1.

Table 1 - Fractions of Fatty Acids or Methyl Esters Obtained from Menhaden and Tuna Oils

Menhaden Oil				Tuna Oil			
Sample No.	Quantity	Saponification Value	Iodine No.	Sample No.	Quantity	Saponification Value	Iodine No.
	Ml.				Ml.		
1	5	1/	1/	14	10	1/	1/
2	100	214.5	144.0	15	150	194.1	115.8
3	150	207.2	181.2	16	50	193.6	197.4
4	10	1/	1/	17	10	1/	1/
5	250	219.2	67.6	18	150	200.8	71.2
6	250	204.1	109.7	19	150	197.2	109.4
7		2/	2/	20		2/	2/
8		2/	2/	21		2/	2/
9		2/	2/	22		2/	2/
10	225	166.5	196.5				
12	50	179.7	202.2	25	25	175.8	149.8
13	50	175.2	111.1	26	75	170.8	69.7

1/ DENOTES SAMPLE TOO SMALL FOR ANALYSIS.
2/ DENOTES SOLID, SATURATED FRACTION AND THAT NO ANALYSIS WAS MADE.

Application of these various fractions of fish oils to the flotation of certain Mesabi Range wash-ore tailings are now under way. Although all fractions have not been completely tested, enough results for some preliminary conclusions have been obtained. Figure 4 shows the relationship between the degree of unsaturation of the various fractions, as expressed by iodine value, and their efficiency as ore collectors, as given by the selective index. These preliminary results indicate that the efficiency of fatty acids as collectors for iron ore is determined, at least in part, by the degree of unsaturation. Fatty acids having iodine values in the range of 70-115 give the greatest efficiency. This range includes the degree of unsaturation of oleic acid, which has been used as a standard in the work to date.

The oleic acid used has been a relatively pure product, whereas in the commercial flotation operation, an impure commercial grade oleic acid is employed. In some

preliminary experiments, it was found that the efficiency of oleic acid was greatly affected by its purity. Accordingly, work is now under way to compare the efficiency of the oleic acid used in commercial iron ore flotation with that of the purer oleic acid used in this research. Work also will be started soon on derivatives of fish-oil fatty acids prepared at the Service's Seattle Fishery Technological Laboratory.

ACKNOWLEDGMENT

To H. S. Choi, who carried out the ore flotation tests; to K. V. Batra, who carried out the fatty acid separations; to Dr. W. O. Lundberg and staff of the Hormel Institute, who carried out the complex fractionation separations; and to H. H. Wade, Acting Director of the University of Minnesota Mines Experiment Station, whose analytical laboratories carried out the iron analyses.

FERTILIZING THE SEA

In different parts of the world, the technique of applying chemical fertilizers to increase the yield of fish in the sea has been used both experimentally and on a commercial scale in an attempt to increase the fish yield in the sea. Under natural conditions, the sea can only support a limited population of marine animals. The food chain in the sea is very complex, small animals feeding on small plants, larger animals feeding on the small animals, and in turn being fed upon by the fish. Theoretically if the abundance of any link in the chain could be increased, the fish would also increase in quantity. In most marine situations, it does not appear to be feasible to introduce a sufficient number of living organisms to have a significant effect on the food chain. The method which has been used is that of applying chemicals or organic waste to the water to increase the abundance of the lowest living link in the food chain, the tiny plants. If this were done in the open sea an enormous wastage would occur since the ocean currents would disperse the fertilizer and perhaps also the organisms feeding on it. Thus it seems that this experiment could only be successful if conducted in an enclosed area of water. Some water exchange may be necessary to maintain the oxygen supply.

An experiment of this type was carried out in an inlet on the west coast of Scotland. This technique has also been used in pond-culture work in Japan and elsewhere. While an increase in the yield of fish can be obtained using such methods, the gain is not usually in proportion to the amount of fertilizer applied. Some of the fertilizer may be wasted if it sinks to the bottom and became unavailable to living organisms. Some of the fertilizer will be taken up by organisms which do not enter into the food chain of the fish whose yield the experiment is intended to increase. Such organisms may prey upon the organisms in the food chain or on the fish themselves. Hence it is possible, under special circumstances, to increase the yield of marine animals, but "sea farming" will pay only rarely, if at all.

--"Sea Secrets," September 11, 1956
The Marine Laboratory,
University of Miami,
Coral Gables, Fla.

ENZYMES AS AN AID IN SEPARATING OIL FROM PROTEIN IN SALMON EGGS

By Robert M. Kyte*

ABSTRACT

THE DIGESTION OF SALMON EGGS BY ENZYMES OFFERS ADVANTAGES IN SEPARATING OIL FROM PROTEIN IN SALMON EGGS, PARTICULARLY IN ALASKA WHERE THE SOURCE OF EGGS IS WIDELY SCATTERED AND OFTEN IN REMOTE LOCATIONS.

INTRODUCTION

Stansby and Associates (1953A) stated that the oil from salmon eggs was highly unsaturated (iodine value over 200). These authors also found that salmon-egg oil contained significant quantities of cholesterol, although less than reported by earlier workers (Koenig and Grossfeld 1913: Anno 1940), and phospholipids (25-39 percent of the total oil) that might have commercial interest. Research is now being carried out in U. S. Fish and Wildlife Service laboratories and in industrial laboratories on new chemical products (Anonymous 1955) that can be made from fish oil. Kyte (1956) determined the distribution of the fatty acids of which salmon-egg oil is composed and indicated the amount of unsaturation in the fatty acids. The double bonds in the unsaturated salmon egg oil make this oil particularly attractive in the synthesis of polymers and highly substituted compounds and as a reactive intermediate for the synthesis of other organic compounds.

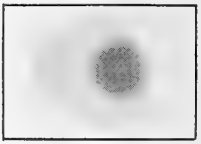


FIG. 1 - PHOTOGRAPH OF SALMON EGG SHOWING OIL DROPLET.

Seagran, Morey, and Dassow (1954) determined the amount of the ten essential amino acids in the protein of salmon eggs. The amount and distribution of these acids indicated salmon-egg protein would be a good animal feed and, being relatively rich in methionine, isoleucine, and lysine, would balance the vegetable protein concentrates which are often deficient in these amino acids. Robinson, Palmer, and Burrows (1951) reported salmon eggs to be an excellent feed for hatchery fish, particularly when water temperatures are over 50° F. and the fish are eating relatively large amounts of food.

Many of the present or potential uses of salmon eggs depend on either the protein fraction or the oil fraction, not the two together. In dried protein concentrates such as fish meals, or in this case egg meal, oil may be an undesirable diluent. Oil for chemical uses or industrial processing is subject to even more rigid purity requirements than is the protein concentrate. Traces of protein matter are undesirable. The purpose of this paper is to discuss methods for separating oil from protein in salmon eggs and, in particular, to stress the role enzymes can play in this process.

METHODS FOR SEPARATING OIL FROM PROTEIN

Sinnhuber (1943) developed a simple method for recovering the highly pigmented oil from the free-oil droplet in salmon eggs (fig. 1). He broke the egg shell or membrane by grinding, then added warm dilute brine (4 percent NaCl) and allowed the oil to separate. The oil was further clarified by centrifuging to remove traces of suspended protein and moisture. This clear brightly-colored oil and the body meat oil derived from the cannery trimmings other than the viscera were used by canners as additives to canned salmon. The Sinnhuber method, however, recovered only one-third of the total oil in the egg and left the protein much diluted. Recovery of the protein was not considered in this method of separating the oil and the process would be expensive.

The dry-rendering process--the drying of fish in a steam-jacketed vessel--is ordinarily used for reducing fish and fish wastes of low oil content to meal. The pressing of the dry-rendered product for removal of oil is usually not carried out because of the difficulty with which the oil is expressed. Salmon eggs processed by this method give a low yield of oil and the protein meal has a very high and undesirable oil content.

*ANALYTICAL CHEMIST, FISHERY PRODUCTS LABORATORY, KETCHIKAN, ALASKA.

The wet-reduction process is used extensively on a commercial scale for the reduction of fish with high oil content such as menhaden and herring. In this process the fish is cooked, then pressed to remove most of the oil and a large portion of the moisture. Laboratory experiments indicated, however, that cooking ground salmon eggs for periods as long as three hours freed only about 65 percent of the available oil (fig.2). The remaining oil was retained with the protein probably bound as a lipo-protein complex. The particle size of the cooked egg protein is very small and pressing this material by itself in the standard fish meal press would be extremely difficult because the cooked protein does not form the necessary mat or shoulder. Thus, neither of the processes most commonly used for the reduction of fish is satisfactory for the handling of salmon eggs.

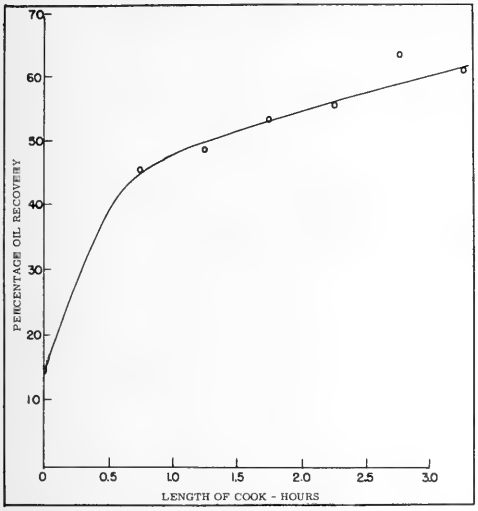


FIG. - 2 THE EFFECT OF COOKING TIME ON OIL RECOVERY FROM PINK SALMON EGGS.

Levin and Lerman (1951) reported an azeotropic distillation process for the dehydration and oil extraction of vegetable and animal products. Tests in this laboratory using an azeotropic distillation with benezene, n-butyl alcohol, or di-chlorethane as solvents for the dehydration and oil extraction or raw fresh salmon eggs, removed from 75 to 80 percent of the oil from the eggs. It was only by the use of several solvents (acetone, ethanol, and a methanol:chloroform mixture) that essentially all of the lipid was removed from the raw salmon eggs.

Chargaff and Cohen (1939) reported the enzymes in rattlesnake venom to be effective in separating certain of the oils in egg yolk. Lovern (1955), however, reported proteolytic enzymes to be ineffective in freeing bound oil from the protein with which it was associated. He reported that the oil was bound quite as strongly to the peptides and other products of enzyme hydrolysis as to the original protein. Nevertheless, proteolytic enzymes might play a desirable role in the separation of oil from protein in salmon eggs.

Thomson, MacLeod, and Idler (1954) report that proteolytic enzymes are used extensively to reduce the viscosity of stickwater in the production of fish solubles. Salmon canneries--the source of supply for salmon eggs--are scattered over a large area and in rather remote locations in Alaska. Preliminary processing at the canneries with minimum equipment and manpower requirements would permit a gross separation of oil and protein and allow the oil and protein concentrates to be collected and transported to centralized processing facilities where efficient utilization might be possible.

EXPERIMENTAL ENZYME DIGESTION

The action of a number of proteolytic enzymes on salmon eggs was investigated. Conditions of pH and temperature reported to be within the active range of the enzymes were maintained and the rates of solubilizing the protein and liberating the oil were observed. The general pattern of action was the formation of a clear protein solution, a free oil, an oil emulsion layer, and, in some cases, a small amount of

sediment. Figure 3 shows the rate of formation of clear solution from salmon eggs using pepsin (N. F. grade), Rhozyme B-6 and Rhozyme A-4 (commercial proteolytic enzymes) and Bromelain (a mixture of several proteolytic enzymes obtained from the stem of the pineapple plant). Bacterial action was inhibited by the addition of 20 p.p.m. of aureomycin (chlortetracycline hydrochloride).

Even though the protein solution of the enzyme digest was clear after centrifuging, 10 to 20 percent of the dry weight of the protein solution was oil (as determined by acid hydrolysis). A benzene or dichloroethane azeotropic distillation of the enzyme digest removed one-half to two-thirds of the oil but the dried residue still contained 6 to 8 percent oil. The enzyme digestion did, however, solubilize or put into solution the egg protein and did permit a gross separation of an oil emulsion and protein solution by simple settling or centrifuging.

The oil emulsion phase contained 40 to 60 percent oil and 5 percent protein. The dried protein residue from the enzyme digestion had a bright orange glassy to dull semiplastic appearance depending on the enzyme and length of digestion.

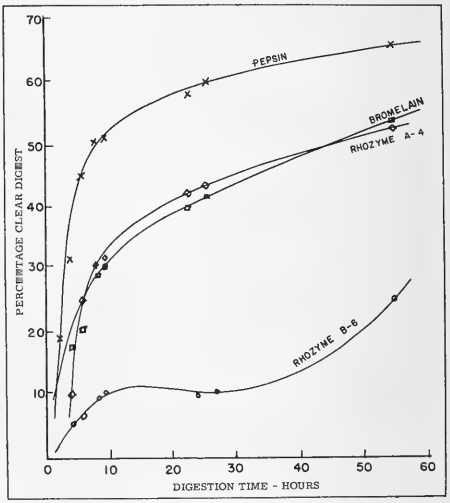


FIG. 3 - THE EFFECT OF DIGESTION TIME ON THE AMOUNT OF CLEAR DIGEST FORMED IN THE DIGESTION OF SALMON EGGS USING ONE PERCENT BY WEIGHT OF FOUR DIFFERENT ENZYMES.

The oil of the salmon egg was recovered as free oil and oil emulsion on centrifuging or allowing the digest to settle. The emulsion was very stable. The oil could be recovered from the emulsion, however, by drying or solvent extraction. The oil recovered from the emulsion was bright red, and was similar in appearance to brine-extracted oil. However, its chemical characteristics were not determined.

The digestive tract of fish contains a variety of proteolytic enzymes (Stansby and Associates 1953B: Kenyon 1925) which probably attack peptides and peptones (protein fragments) as well as whole proteins. The enzyme system in the digestive tract of pink salmon was effective in solubilizing the salmon egg protein (a direct comparison of rate with the other enzymes was not obtained) and permitted an azeotropic distillation extraction to remove essentially all of the oil from the protein residue. It is suggested that the enzyme system of salmon digestive tracts either broke the salmon egg protein molecule to very short fragments from which the lipid could be readily extracted or contained an enzyme which split the protein lipid bond.

NUTRITIVE QUALITY OF ENZYME DIGEST

The effect of enzyme digestion on the nutritive value of the salmon egg protein had not been established. A single evaluation of three samples of dried salmon egg protein was carried out by Dr. Grau of the University of California by a method found effective in evaluating fish protein in poultry rations (Grau 1955). The protein was prepared from (a) salmon eggs with fat removed by exhaustive solvent extraction, (b) salmon eggs digested with the enzymes of the digestive tract of salmon and solvent extracted to remove the fat, and (c) salmon eggs digested with the commercial enzyme Rhozyme B-6 and not solvent extracted. The results are shown in table 1 and indicate that, in chick feeding, enzyme digestion did not affect the protein quality.

Table 1 - Quality of the Protein of Salmon-Egg Meals Produced With or Without Enzyme Digestion as Determined by Chick Feeding Tests

	Sample	Gain/Day	Gain/Feed
		. . . .(Percent). . . .	
Salmon-Egg Meal	Defatted by exhaustive solvent extraction	4.8	0.42
	Enzyme digested[1/], solvent defatted	4.9	0.38
	Enzyme digested[1/], high fat content	4.8	0.42

1/ENZYME USED WAS THE DIGESTIVE TRACT OF A PINK SALMON, ONE PERCENT OF THE WEIGHT OF THE EGGS.
2/ENZYME USED WAS RHOZYME B-6 AT 0.5 PERCENT WEIGHT OF THE EGGS.

With the salmon egg-enzyme systems investigated, bacterial decomposition became a factor of major importance in the pH range of 4.5 to 8.5. Aureomycin (chlortetracycline hydrochloride) at 20 p.p.m. was found effective in controlling bacterial action for over one week. Twelve p.p.m. aureomycin did not adequately inhibit bacterial action as judged by the formation of offensive odors.

Preliminary experiments with the complete offal from the canning of salmon indicated that enzymes were effective in dissolving most of the protein and separating a large part of the oil from the proteins.

SUMMARY

The oil and protein contained in salmon eggs are valuable when separated from each other. Common methods of reduction are not entirely satisfactory for separating oil from protein in salmon eggs.

The action of certain enzymes on salmon eggs partially separates the oil from protein as it solubilizes the protein.

An enzyme digestion might find application to salmon cannery offal as well as to salmon eggs as a processing step in producing concentrates of oil and protein at scattered and remote canneries in Alaska.

ACKNOWLEDGMENT

The author is indebted to Rohm and Haas Company for samples of Rhozyme A-4 and Rhozyme B-6; Libby, McNeill and Libby Company for samples of Bromelain; and the Cudahy Packing Company for samples of pepsin.

LITERATURE CITED

ANNO, K.
1940. INVESTIGATIONS OF THE LIPIDES OF SALMON EGGS. I. THE ACETONE SOLUBLE FRACTION. JOURNAL AGR. CHEM. SOC. JAPAN, VOL. 16, P. 181.

ANONYMOUS
1955. SALTONSTALL-KENNEDY ACT FISHERIES PROJECTS. COMMERCIAL FISHERIES REVIEW, VOL. 17, NO. 6, JUNE, P. 55.

CHARGAFF, E. AND COHEN, S. S.
1939. LYSOPHOSPHATIDES. JOURNAL OF BIOLOGICAL CHEMISTRY, VOL. 129, P. 619.

GRAU, C. R. AND WILLIAMS, M. A.
1955. FISH MEALS AS AMINO ACID SOURCES IN CHICK RATIONS. POULTRY SCIENCE, VOL. 34, NO. 4, JULY, PP. 810-816.

KENYON, W. A.
1925. DIGESTIVE ENZYMES IN POIKILOTHERMAL VERTEBRATES; AN INVESTIGATION OF ENZYMES IN FISHES WITH COMPARATIVE STUDIES IN THOSE OF AMPHIBIANS, REPTILES AND MAMMALS. U. S. DEPT. OF COMM. BUREAU OF FISHERIES, DOCUMENT 977.

KOENIG, J. AND GROSSFELD, J.
1913. FISH ROE AS FOOD FOR MAN. BIOCHEMICAL JOURNAL, VOL. 54, PP. 351-394.

KYTE, R. M.
1956. POTENTIAL BY-PRODUCTS FROM ALASKA'S FISHERY. PART I. UTILIZATION OF SALMON EGGS. U. S. FISH AND WILDLIFE SERVICE, WASHINGTON, D. C. (IN PREPARATION).

LEVIN, E. AND LERMAN, F.
1951. AN AZEOTROPIC EXTRACTION PROCESS FOR COMPLETE SOLVENT RENDERING OF RAW TISSUE. J. AMER. OIL CHEMISTS' SOC., VOL. 28, PP. 441-444.

LOVERN, J. A.
1955. THE CHEMISTRY OF LIPIDS OF BIOCHEMICAL SIGNIFICANCE. JOHN WILEY AND SONS, INC., NEW YORK, P. 71.

ROBINSON, L. A., PALMER, D. D., AND BURROWS, R. E.
1951. TESTS OF HATCHERY FOODS FOR BLUEBACK SALMON 1949. U. S. DEPT. OF INTERIOR, FISH AND WILDLIFE SERVICE, SPECIAL SCIENTIFIC REPORT: FISHERIES NO. 60, P. 18.

SEAGRAN, H. L., MOREY, D. E., AND DASSOW, J. A.
1954. THE AMINO ACID CONTENT OF ROE AT DIFFERENT STAGES OF MATURITY FROM THE FIVE SPECIES OF PACIFIC SALMON. JOURNAL OF NUTRITION, VOL. 53, NO. 1, MAY, PP. 139-150.

SINNHUBER, R. O.
1943. PRODUCTION OF SALMON EGG OIL. INFORMATION CIRCULAR 302, AGRI. EXP. STATION, OREGON STATE COLLEGE.

STANSBY, M. E. AND ASSOCIATES

1953A. UTILIZATION OF ALASKA SALMON CANNERY WASTES. U. S. DEPT. OF INTERIOR, FISH AND WILDLIFE SERVICE, SPECIAL SCIENTIFIC REPORT: FISHERIES NO. 109, P. 78.

1953B. IBID., P. 28.

THOMSON, W. A. B., IDLER, D. R., MACLEOD, R. A.
1954. THE CONVERSION OF HERRING STICKWATER SOLUBLES. II. PREVENTION OF BACTERIAL DECOMPOSITION OF HERRING STICKWATER AT HIGH TEMPERATURES. FISHERIES RESEARCH BOARD OF CANADA, PROGRESS REPORTS OF PACIFIC STATIONS, NO. 101, P. 6.

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Alma Greene, and Vera Eggleston

* * * * *

Photograph Credits: Photographs on pages not mentioned were obtained from the Service's file and the photographers are unknown.

Cover: No. 1--N. P. Wigutoff; No. 2--E. A. Macklow; No. 3--F. B. Sanford; and No. 4--G. T. Sundstrom; pp. 5, 6, and 7--Photographic Department, C. O. A. Hormel & Co., Austin, Minn.

DOMESTIC SOAP FROM SEAL OIL

In localities where seal oil is easily available it would probably be advantageous if it could be used in the form of domestic soap. But raw seal oil contains unsaturated molecules which are responsible for the softness of the soap and its tendency to turn rancid rapidly. In order to obtain a hard, stable soap, it would therefore be necessary to change the unsaturated condition of the oil. This could be accomplished by hydrogenation, a process which is used mostly for edible oils; but because of the special apparatus required, it is not adaptable to home use. It was thought that polymerization, which can be carried out at home, might furnish a solution to the problem.

Polymerization makes the unsaturated molecules react among themselves; the extent of which depends upon the temperature used and the length of time the reaction is allowed to proceed.

In a previous study, it was established that polymerization of seal oil proceeds readily at a temperature of 525° F. However, the speed of the reaction in an open air vessel was unknown. Therefore, several experiments were carried out to follow the course of the reaction over a period of hours. Since polymerization produces a lowering in iodine value, and an increase in viscosity, the iodine value and viscosity of seal oil heated at 525° F. were followed on samples withdrawn at hourly intervals. Figure 1 shows the rate at which the iodine value decreases during the polymerization of raw and of refined seal oil. It also shows that the reaction is at first rapid and that it then slows down gradually, the rate being the same for refined and unrefined oil.

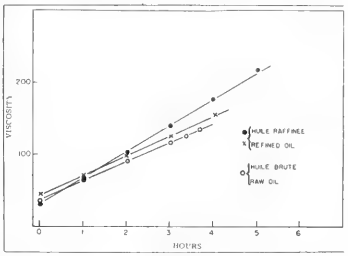


Fig. 1 - Variation in iodine value with time of polymerization.

The iodine value of seal oil is about 145. It must be lowered to at least 90 before the oil shows resistance to oxidation. Thus, it is apparent that the oil must be heated for about four hours to obtain the desired iodine value.

Figure 2 shows the change in viscosity which accompanies polymerization. It shows that the viscosity of the oil increases regularly with time. In practice, the viscosity index could be used to determine the extent of polymerization and thus to indicate whether uniform products were obtained.

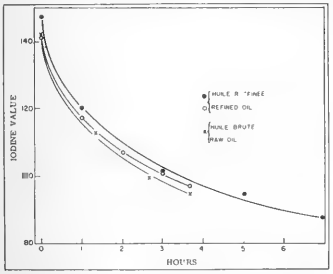


Fig. 2 - Viscosity change with time of polymerization.

Since the object of this investigation was the preparation of soap, some oil was first heated at 525° F. for four hours, then subjected to the usual procedure for the preparation of domestic soap. A product of suitable firmness was obtained. With the addition of rosin, it showed good lathering properties.

Thus the polymerization process offers a cheap means of preparing domestic soap from seal oil. No special apparatus is required since polymerization and saponification can be done in the same kettle. The technique is also very simple: it consists in heating the oil at 525° F. for about four hours. After polymerization the oil is transformed into soap by means of the standard procedure used for the preparation of domestic soap.

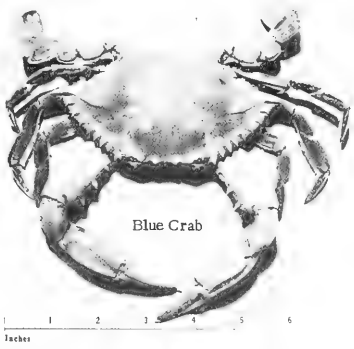
At 525° F. the oil gives off smoke and care must be taken not to heat it much higher because it might catch fire.

The process described above could, in all probability, be applicable to other oils, such as fish oils, to yield a domestic soap of fair quality. Depending on the kind of oil used, certain modifications of the temperature and heating time would no doubt be required.

"Gaspe Fisheries Experimental Station, Note No. 35"
Progress Reports of the Atlantic Coast Stations, Aug. 1954
Fisheries Research Board of Canada

BOOKLET ON "HOW TO COOK CRABS"

Housewives, home economists, and food editors will be interested in a new fish-cookery publication, How to Cook Crabs, which was released January 24 by the United States Fish and Wildlife Service. The booklet contains 32 choice recipes which have been developed and kitchen-tested by the Service's staff of home economists.



Crabs are one of our popular shellfish because of their tender meat and distinctive flavor. Crab meat also is an excellent source of high-quality proteins, vitamins, and minerals needed for good nutrition. Modern processing and marketing methods now make crabs available almost everywhere in the United States. Crabs are available in these market forms: live; cooked in the shell; cooked and frozen; fresh cooked meat; and canned meat.

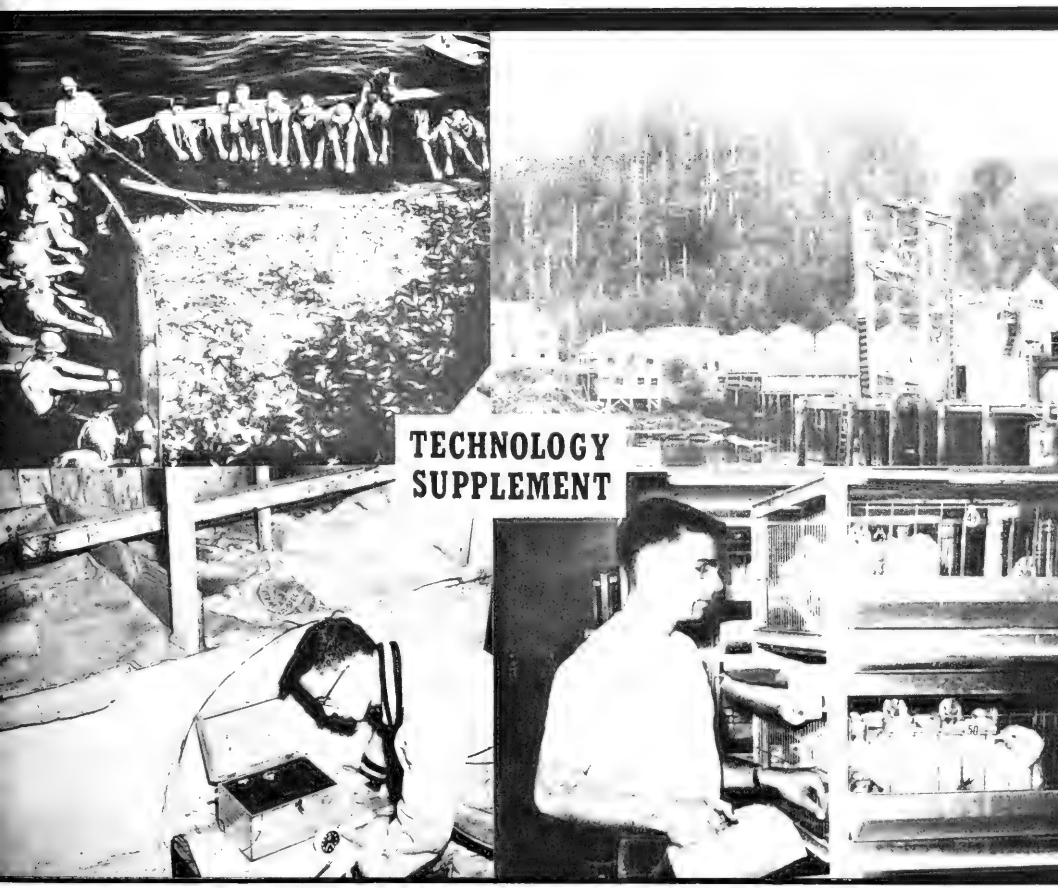
As the booklet explains, four principal kinds of crabs are taken from the marine waters of the United States and Alaska. From the Atlantic and Gulf coasts come blue crabs which compose three-fourths of all the crabs marketed in this country. Dungeness crabs are found on the Pacific coast from Alaska to Mexico. King crabs come from the North Pacific off Alaska. Rock crabs are taken on the New England and California coasts. Of local importance are stone crabs in Florida and tanner crabs in Alaska.

The four principal kinds of crabs are pictured in the booklet and their approximate weights are listed. Complete illustrated instructions are given for picking the meat from blue crabs.

Some of the easy-to prepare recipes included in the new publication are: Crab Louis, Crab Ravigote, Crab Newburg, Deviled Crab, Imperial Crab, Avocados Stuffed with Crab Meat, and Barbecued Crab Sandwiches.

Generously illustrated, How to Cook Crabs, Test Kitchen Series No. 10, may be purchased for 20 cents each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

COMMERCIAL FISHERIES REVIEW



TECHNOLOGY SUPPLEMENT

Vol. 19, No. 5a MAY 1957 - SUPPLEMENT

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
DONALD L. MCKERNAN, DIRECTOR

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor
J. Pileggi, Associate Editor H. M. Bearse, Assistant Editor

Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

CONTENTS

COVER: Photo 1: Menhaden in "dried-up" seine alongside vessel and ready for loading aboard.
Photo 2: View of plant in Alaska processing herring into fish meal and oil.
Photo 3: Service chemist determining amount of heating of meal by oxidation of the fish oil.
Photo 4: Battery of cages used for chick-growth evaluation of the nutritive value of fish meal.

COMMERCIAL FISHERIES REVIEW

May 1957-Supplement Washington 25, D.C. Vol. 19, No.5a

DETERMINATION OF UNKNOWN GROWTH FACTORS IN FISH MEALS BY CHICK-GROWTH TESTS

By H. R. Bird* and N. L. Karrick**

ABSTRACT

COMMERCIAL AND EXPERIMENTAL MEALS FROM FISHERY BYPRODUCTS WERE ASSAYED BY CHICK-FEEDING TESTS FOR UNKNOWN GROWTH FACTORS. IN THESE ASSAYS, THE SAMPLES WERE COMPARED WITH THE UNKNOWN GROWTH FACTORS IN A REFERENCE SAMPLE FOR FISH SOLUBLES THAT HAD BEEN ASSIGNED A VALUE OF 10 UNITS. THE RESULTING DATA INDICATED THAT THE COMMERCIAL AND EXPERIMENTAL MEALS HAD POTENCIES THAT RANGED FROM 2.5 TO 13.8 UNITS.

INTRODUCTION

Fish meals are believed to contain factors other than the known nutrients that are important in the diets of poultry. The present project was started (1) to determine the amounts of these factors in different fish meals and (2) to investigate what variables might affect the amounts of these factors.

ASSAY PROCEDURE

The assay procedure and some of the difficulties encountered in the assays were discussed in a report by Barnett and Bird (1956). The purified basal diet used in the present work is given in their article. In the present experiments, soybean protein was used as the source of protein, and sucrose was used as the source of carbohydrate. Supplements were added at the expense of the sucrose. Chicks were fed the diet with or without supplement from the time that they were 1-day old to the time that they were 4-weeks old. The chicks used were obtained from hens that were kept in wire cages and artificially inseminated. The diet of the hens was a good complete breeder mash. In these assays, the growth effect of fish meals was compared to that of a standard sample of fish

Fig. 1 - Battery room in the Poultry Husbandry Department of the University of Wisconsin where fish meal assays are conducted.

*DEPARTMENT OF POULTRY HUSBANDRY, UNIVERSITY OF WISCONSIN, MADISON, WISC.
**CHEMIST, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

solubles. The standard solubles was included in each series of assays and was assigned a potency of 10 units per gram.

SAMPLES

Both commercial fish meals and experimental fish meals were tested. The commercial meals were processed from menhaden, tuna, and salmon waste. The experimental meals were prepared either in the Fishery Products Laboratory at Ketchikan, Alaska, or in the Service's Fishery Technological Laboratory at Seattle. The raw materials used in the preparation of the experimental meals were pink salmon eggs, whole herring, pink shrimp waste, Dungeness crab waste, tuna waste, both with and without red meat, and sea-lion liver and viscera. These materials were processed by mild methods, such as freeze-drying, enzyme digestion, or minimum cooking followed by air-drying. The experimental meals were included in the study in an attempt to find a product that might be exceptionally high in the unknown growth factors.

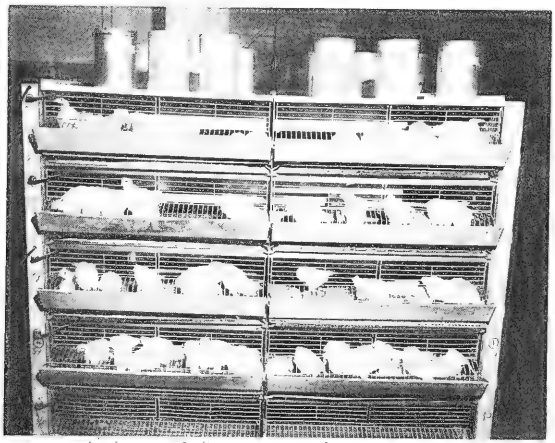


Fig. 2 - Chicks being used to assay unknown growth factors in fish meal.

RESULTS

The samples analyzed to date have had potencies from 2.5 to 13.8 units. Eight commercial menhaden meals gave results that fell within this entire range. The values in descending order were 13.8, 11.8, 9.5, 5.4, 5.3, 3.0, 2.7, and 2.7 units. Two commercial tuna meals had 6.7 and 5.6 units, and a commercial salmon meal had 2.5 units.

The experimental samples gave results that varied from 2.9 to 8.7 units.

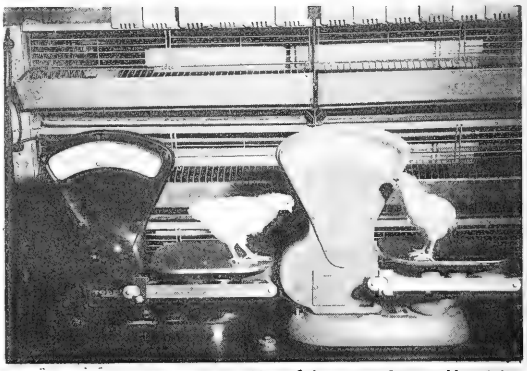


Fig. 3 - The chicken on the right had been fed an unsupplemented basal diet. It weighed 200 grams. The chicken on the left had been fed the same diet plus 2 percent menhaden meal. It weighed 260 grams.

DISCUSSION

The unknown growth factors in the commercial fish meals varied from sample to sample. The meal containing the highest concentration of growth factors had more than 5 times the amount found in the one containing the least. The differences that occurred among the meals could not be traced to any information known about the meals.

None of the experimental samples proved to be equal in unknown growth factors to the solubles being used as a standard. Since the experimental samples were prepared under mild conditions, the variations found probably were due to differences in the raw materials.

No studies were made on the effect of storage on the unknown factors in fish meals, although the age of the commercial meals varied considerably. Systematic studies now are being made, however, on the effects of storage and of storage conditions.

LITERATURE CITED

BARNETT, B. D., AND BIRD, H. R.
1956. STANDARDIZATION OF ASSAY FOR UNKNOWN GROWTH FACTORS. POULTRY SCIENCE, VOL. 35, NO. 3 (MAY), PP. 705-710.

STUDY OF THE SPAWNING HABITS OF FISHES NECESSARY TO DETERMINE ABUNDANCE

In most species a successful spawning occurring almost every year is necessary in order that the number of fishes be maintained at a high level. If for any reason the spawning is restricted, numbers in future years may be reduced. The success of spawning and the subsequent survival of the eggs and larvae changes markedly from year to year and these changes are normally the main causes of changes in the abundance of adult fish.

Under natural conditions, when subjected to little or no fishing, fish fluctuate in abundance about an average level. When the number reaches a low level. due to natural fluctuations, conservation restrictions may not increase the abundance and may even be harmful. Fishing and other activities, such as dredging, filling, pollution, etc., also cause fish stocks to be reduced or dispersed.

When a decline in the abundance of any species of fish is noticed, it is necessary to determine whether natural fluctuations or man's activities are the main cause. A detailed knowledge of spawning habits and the factors which affect spawning is important in this connection.

While it is known that man's activities usually affect the spawning and egg survival of offshore fishes only to a limited extent, little is known about the effect of such activities on the spawning habits of coastal fishes. Studies made so far show that many such species spawn and spend their larval life in waters adjacent to shorelines which are increasingly being subjected to land development schemes. Before the effect on the spawning habits of fishes can be ascertained, it is necessary to determine the "optimum" conditions (most desirable from the point of view of the fishes) of, for example, water temperature, salinity, etc., for spawning and the range of tolerance of the fish. If land development causes changes beyond the limits of tolerance, the spawning activity may be adversely affected.

--"Sea Secrets," December 4, 1956,
The Marine Laboratory,
University of Miami, Coral Gables, Fla

DEVELOPMENT OF METHODS FOR BIOASSAY OF GROWTH FACTORS PRESENT IN FISHERY INDUSTRIAL PRODUCTS--PRELIMINARY INVESTIGATION OF PRESENCE OF UNIDENTIFIED NUTRITIONAL FACTORS [1/]

By B. H. Ershoff* and E. Geiger**

ABSTRACT

PRELIMINARY STUDIES OF PHYSIOLOGICAL STRESS-FACTORS IN TEST ANIMALS AS POSSIBLE METHODS OF MEASURING UNIDENTIFIED GROWTH-FACTORS PRESENT IN FISH MEALS WERE MADE. STUDIES WERE DESIGNED TO ELIMINATE GROWTH-MEASUREMENT AND THE MANY VARIABLES AFFECTING SUCH GROWTH, AS A METHOD OF MEASURING THE PRESENCE OF GROWTH FACTORS. ALPHA ESTRADIOL AND THYROACTIVE SUBSTANCES IN EXCESS WERE TESTED. A STUDY OF THE RESULTS SHOWED THIS BIOASSAY METHOD TO BE RELATIVELY EXPENSIVE AND TIME-CONSUMING. NO FURTHER STUDIES ARE NOW PLANNED.

Available data indicate that fish meal and condensed fish solubles contain, in addition to the known nutrients, factors essential for optimal growth and development of poultry and other animals. The data published in the literature, however, are equivocal because the effect of these "unidentified factors" could not be demonstrated in all cases under laboratory conditions. These diverse findings may be due to a number of reasons: (1) different batches of fish meal or fish solubles may contain different amounts of the active factor (or factors); (2) noxious or deleterious substances may have been produced in the preparation or processing of some of these supplements which masked the effect of the "unidentified growth factor;" (3) strain and species differences may exist in the animals' requirements for this factor(s); or (4) the growth-promoting effect of the unidentified factor in fish meal or condensed fish solubles may only be demonstrable in animals with certain kinds of intestinal flora. These complications not only retard work leading toward the isolation of the above unidentified factor(s) but make it difficult to determine the growth-promoting value of commercial fishery products.

The experiments undertaken in the present project had the objective of developing a practical and reliable method for bioassay of "unidentified nutritional factors" in fishery industrial products. It was recognized from the start that factors which might be shown to exist by such procedures may or may not be identical to the factor(s) in fishery industrial products which promotes growth. It was felt by the present investigators, however, that assay procedures might be developed which are a more sensitive index for the quantitative measurement of such factors than increment in body weight. Subsequent tests would have to establish the degree of correlation between the chick-growth effect and the results of the new assay procedures.

For a number of reasons it was felt that some index other than increment in body weight of the chick would be desirable as a bioassay procedure. Increment in body weight in the final analysis is the resultant of an almost endless number of factors. Genetic background, pretest diet, environmental temperature, nature and type of bacterial flora, degree of crowding, degree and type of infestation, physical state of the diet, particle size, moisture content of diet, taste of the ration, possible presence of noxious materials in the diet which might inhibit food intake--any one or more of the above as well as countless other factors might all serve to decrease food consumption and weight increment in the chick. Although it is recognized that whereas, from a practical point of view, a more rapid growth increment or a more efficient degree of food utilization is the objective of the poultryman, from the stand-

*DEPARTMENT OF BIOCHEMISTRY
**DEPARTMENT OF PHARMACOLOGY AND TOXICOLOGY
} UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES, CALIF.

1/THIS WORK WAS CARRIED OUT ON CONTRACT WITH THE U. S. FISH AND WILDLIFE SERVICE. THIS ARTICLE IS A PROGRESS REPORT SUBMITTED BY THE AUTHORS. NO ADDITIONAL WORK IS PLANNED BECAUSE THIS PARTICULAR PHASE OF THE FISH MEAL RESEARCH PROGRAM IS NOT BEING CONTINUED AT THIS TIME.

point of a bioassay procedure, methods which are not so sensitive to the effects of slight alterations in food intake or some of the other factors indicated before might be more desirable.

From a historical point of view, virtually all essential nutrients were at one time or other "unidentified growth factors." In fact the existence of a new nutrient in many cases first became evident by feeding animals diets containing all nutrients known as of that time and then showing that the growth increment obtained on these diets could be increased by feeding a particular food or fraction thereof. If the active factor could subsequently be shown to be distinct from any of the known identified nutrients, the data might be interpreted as evidence for the existence of a new nutrient. In the early work on the concentration and isolation of such factors, these nutrients were assayed by their capacity to promote growth on rations deficient in these factors. It was only when further data became available as to the physiologic role of the various nutrients that other bioassay procedures could be devised that more specifically measured the particular nutrient in question (for example, odontoblast assay for vitamin C; blood levels of pyruvic acid in a thiamine assay; xanthuronic acid excretion as an assay procedure for vitamin B_6, etc.) than the increased growth. It is possible that a similar situation prevails in respect to an unidentified factor(s) in fishery industrial products. If an essential nutrient distinct from any of the known nutritional factors does exist in such material, it is possible that such a factor may exert demonstrable physiologic effects other than the indirect manifestations of increased growth. Experiments were accordingly undertaken in an effort to find such effects.

Available data indicate that in addition to the known nutrients substances are present in natural foodstuffs which are required in increased amounts under various conditions of stress. Such factors are apparently dispensable under normal conditions, or their requirements are so small they may readily be met by amounts present in the diet or through the synthetic activity of the intestinal flora or the animals' own tissues. Certain stressor agents or drugs, however, may increase requirements for these substances to such an extent that deficiencies occur, manifested by retarded growth or tissue pathology and preventable by the administration in appropriate amounts of the missing nutrient.

The induction of nutritional deficiencies by exposing animals to various stressor agents and the correction of these deficiencies by the administration of graded levels of the missing nutrient have been employed by a number of investigators as a bioassay procedure. This technique has proved of particular value in the bioassay of vitamin B12. Experiments undertaken in the present project have attempted to apply this technique to the development of a bioassay for unidentified physiologically active factors in fish meal and fish solubles. Evidence for the existence of such a factor(s) was obtained.

Available data indicate that the ovaries of immature rats fed a purified ration containing 10 milligrams of alpha-estradiol per kilogram of diet remain immature both in weight and microscopic appearance. This effect can be largely counteracted by the concurrent feeding of desiccated whole liver (Ershoff and McWilliams (1948) or dried alfalfa (Ershoff, Hernandez, and Mathews 1956). Experiments were undertaken to determine the effects of fish meal and fish solubles under comparable experimental conditions. Findings indicate that the deleterious effects of alpha-estradiol feeding on ovarian development in the immature rat could be largely counteracted by the concurrent feeding of sardine solbules or tuna solubles at a 5-percent level in the ration. Blended tuna meal when added at a 5-percent level in the diet was similarly active; sardine meal at a 5-percent level, however, was without activity. Samples of menhaden meal and menhaden solubles when fed at a 5-percent level in the diet were both inactive. The protective factor(s) was apparently distinct from any of the known nutrients. Supplements of all the known vitamins (both fat-soluble and water-soluble), salt mixture, corn oil, casein or cellulose, either alone or in combi-

nation, were without protective effect. Present findings suggest the possibility of employing reversal of alpha-estradiol toxicity as a bioassay procedure for an unidentified factor(s) in fishery industrial products. The method, however, has the disadvantage of being time-consuming and relatively expensive.

Available data indicate that rats fail to survive when fed purified diets containing massive doses of desiccated thyroid or thyroactive substances. Experiments were conducted which indicate that fish meal contains a factor(s) apparently distinct from any of the known nutrients which significantly prolonged the average survival time of hyperthyroid rats.

Findings indicate that both tuna meal and sardine meal when fed at a 5-percent level in the diet resulted in a significant increase in the average survival time of hyperthyroid rats fed a purified ration under conditions of the present experiment. Tuna solubles or sardine solubles had little if any protective effect. Supplementing the basal ration with protamone diet with additional amounts of the known vitamins, salt mixture roughage, 5-percent casein or corn oil at levels of 2-percent, 5-percent, or 10-percent of the diet was without beneficial effect. It would appear from these findings that tuna meal and sardine meal contain a factor or factors apparently distinct from any of the known nutrients which significantly prolonged the survival time of hyperthyroid rats fed a purified ration containing sucrose as the source of dietary carbohydrate and methionine-supplemented soy protein as the source of dietary protein. Findings suggest the possibility of employing increase in the average survival time of thyrotoxic rate as a bioassay procedure for an unidentified factor(s) in fish meal. The method, however, has the disadvantage of being time-consuming and relatively expensive.

Additional studies were undertaken with rats fed diets similar to the above but with casein replacing the methionine-supplemented soy protein as the source of dietary protein and with desiccated thyroid fed at a 0.5-percent level in place of the iodinate casein. On the latter diet, in contrast to the soy protein-containing ration, supplements of tuna meal or sardine meal had little if any beneficial effect as judged by increased length of survival. These findings suggest that the source of dietary protein may significantly affect requirements for the unidentified factor(s) present in fish meal.

LITERATURE CITED

ERSHOFF, B. H.; HERNANDEZ, H. J.; AND MATHEWS, J. H.
1956. BENEFICIAL EFFECTS OF ALFALFA ON THE OVARIAN DEVELOPMENT OF IMMATURE RATS FED MASSIVE DOSES OF ALPHA-ESTRADIOL. JOURNAL OF NUTRITION, VOL. 59, NO. 1, MAY, PP. 147-154.

_____ AND MCWILLIAMS, H. B.
1948. EFFECTS OF B VITAMINS, YEAST AND LIVER ON OVARIES OF IMMATURE RATS FED MASSIVE DOSES OF ALPHA-ESTRADIOL. PROCEEDINGS OF THE SOCIETY OF EXPERIMENTAL BIOLOGY AND MEDICINE, VOL. 67, NO. 3, MARCH, PP. 323-325.

EAR BONES (OTOLITHS) USED TO DETERMINE AGE OF OCEAN PERCH

The age of ocean perch (Sebastes marinus) has been determined accurately from the ear bones, according to the Fish and Wildlife Service's Fishery Biologists at Woods Hole (Mass.) Laboratory. By making collections of ear bones from the same stock every three or four months it was established that a single ring was formed each year and that older specimens grew about 1 centimeter (0.39 inch) per year.

DYE-BINDING CHARACTERISTICS OF FISH-MEAL PROTEIN

Part 1 - Some Preliminary Findings as to Suitable Dyes

By Claude Thurston*

ABSTRACT

THERE ARE REPORTS IN THE SCIENTIFIC LITERATURE THAT THE QUALITY OF A VEGETABLE PROTEIN CAN BE DETERMINED BY ITS DYE-BINDING CHARACTERISTICS. IN AN INVESTIGATION TO FIND IF A SIMILAR RELATIONSHIP EXISTS BETWEEN DYES AND THE PROTEIN IN FISH MEAL, MORE THAN 100 DYES WERE SCREENED AS TO THEIR SUITABILITY. EIGHT DYES WERE FOUND TO HAVE GOOD BINDING PROPERTIES. SIX OF THEM--ACID FUCHSIN, ANILINE BLUE, BROMOCRESOL GREEN, ALIZARIN RED S, ORANGE II, AND ORANGE G--WERE ACID DYES; AND TWO OF THEM--CONGO RED AND TETRABROMOPHENOLBLUE--WERE BASIC DYES. IN THE USE OF THESE, FISH MEALS EXHIBITED A WIDE VARIATION IN THE EXTENT OF DYE BINDING. SUFFICIENT DATA, HOWEVER, ARE NOT AVAILABLE AS YET TO DETERMINE THE RELATIONSHIP OF THE DYE-BINDING CHARACTERISTICS TO THE NUTRITIVE VALUE OF FISH-MEAL PROTEIN.

INTRODUCTION

Several of the investigations reported in the scientific literature indicate that the quality of a vegetable protein can be determined by its dye-binding characteristic. Loeb (1922), studying the process of digestion, stated that pepsin is an anion and that it combines with cations. Chapman, Greenberg, and Schmidt (1927) showed, by reactions of several acid dyes with various protein solutions, that the amount of dye that was bound was proportional to the number of basic groups in the protein. Rawlins and Schmidt (1929) extended the investigation to include basic dyes and obtained similar results; they later (1930) used acid dyes with gelatin granules and gelatin solutions and verified their previous conclusions. Fraenkel-Conrat and Cooper (1944) found that dyes could be used to determine the number of acidic and basic groups in a protein. Udy (1954)--working with vegetable proteins, chiefly wheat--found that the quality of the protein could be determined from its dye-binding characteristics.

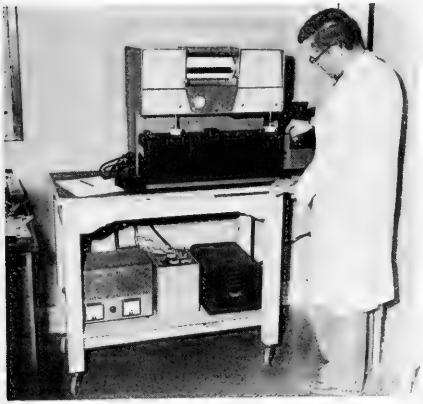


FIG. 1 - DETERMINING LIGHT TRANSMISSION OF DYE SOLUTIONS WITH A RECORDING SPECTROPHOTOMETER.

If a similar relationship exists between dyes and the proteins in fish meal, the nutritive value of the proteins might be determined by a chemical index, in hours, rather than in 1 to 3 weeks as is now required when a feeding test is used. An investigation of the dye-binding characteristics of the protein in fish meal therefore has been undertaken at the Seattle Technological Laboratory in order to determine whether there is any correlation between the nutritive value of the meal, as determined by chick-feeding tests, and the extent of binding of the dye. The specific objectives of the work reported in the present paper were to determine (1) what dyes will bind the proteins of fish meal and (2) what are the optimum conditions in the use of these dyes.

*CHEMIST, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

EXPERIMENTAL

More than 100 dyes, including all of the major types of chemical structures listed in the Color Index (Rowe 1924) have been screened. Most of these dyes had to be discarded for one or more of the following reasons:

1. The dye was insoluble in the buffer solution used.
2. Solutions of maximum solubility failed to give adequate depth of color.
3. The dye adhered to the spectrophotometer cells to such an extent that the readings were valueless, and cleaning was unduly tedious.
4. The color faded on standing or on exposure to light.
5. The pH of the solution changed greatly on standing.
6. The color of the dye was discharged by the sample without apparent binding.
7. The dye was not appreciably taken up by the meal.

DISCUSSION

SUITABLE DYES: On the basis of the above screening tests, eight dyes exhibited satisfactory dye-binding characteristics. Six of them--acid fuchsin, aniline blue, bromocresol green, alizarin red S, orange II and orange G--were found to be satisfactory in acidic solution (pH 2.5), and two of them--congo red and tetrabromophenolblue--were found to be satisfactory in alkaline solution (pH 11).

Summary of Experimental Results

Satisfactory acid dyes (pH 2.5):	Acid fuchsin Aniline blue Bromocresol green Alizarin red S Orange II Orange G
Satisfactory basic dyes (pH 11):	Congo red Tetrabromophenolblue
Optimum concentration of dye:	0.0001 to 0.003 percent
Optimum particle size of meal:	60 mesh
Optimum meal-to-dye ratio:	1 milligram of meal to 1 milliliter of dye solution
Optimum time of shaking:	$4\frac{1}{2}$ hours
Amount of dye bound by meal:	25 to 40 percent of basic dye 60 to 90 percent of acid dye

OPTIMUM CONDITIONS: Dye concentrations from 0.0001 percent to 0.003 percent gave transmission ranges from 90 to 10 percent in the spectrophotometer. Meal samples varying from 8 to 80 mesh were used, with 60 mesh giving the best results. The meal samples were employed in amounts varying from 5 to 25 milligrams in 10 to 50 milliliters of dye solution. The ratios of meal to dye solution that gave the best results were of the order of 1 milligram of meal to 1 milliliter of solution. The mixtures of meal and dye were shaken in a mechanical shaker for 2 to 24 hours, but 4 to 5 hours of shaking gave the maximum binding. Under these conditions, the meals bound 25 to 40 percent of the basic dyes and 60 to 90 percent of the acid dyes.

PRELIMINARY RESULTS: Preliminary work on the application of these dyes has been carried out on meal samples that have been used in feeding tests and for which the nutritive value of the protein is known. A wide variation in the extent of

dye binding was observed, but sufficient data are not available as yet to determine the relationship of the dye-binding characteristics to the nutritive value of the protein in the meal.

CONCLUSIONS

Eight dyes have been selected, from a group of approximately 100 tested, which showed satisfactory protein-binding characteristics. The dyes will be used to study the possibility of relating the dye-binding characteristics of the protein of various fish meals to the known nutritive value of the respective meals.

LITERATURE CITED

CHAPMAN, L. M.; GREENBERG, D. M.; AND SCHMIDT, C. L. A.
1927. STUDIES ON THE NATURE OF THE COMBINATION BETWEEN CERTAIN DYES AND PROTEINS. JOURNAL OF BIOLOGICAL CHEMISTRY, VOL. 72, NO. 2 (APRIL), PP. 707-729.

FRAENKEL-CONRAT, H., AND COOPER, MITZI
1944. THE USE OF DYES FOR THE DETERMINATION OF ACID AND BASIC GROUPS IN PROTEINS. JOURNAL OF BIOLOGICAL CHEMISTRY, VOL. 154, NO. 1 (JUNE), PP. 239-246.

LOEB, J.
1922. PROTEINS AND THE THEORY OF COLLOIDAL BEHAVIOR. FIRST EDITION, NEW YORK, P. 36.

RAWLINS, L. M. C., AND SCHMIDT, C. L. A.
1929. STUDIES ON THE COMBINATION BETWEEN CERTAIN BASIC DYES AND PROTEINS. JOURNAL OF BIOLOGICAL CHEMISTRY, VOL. 82, NO. 3 (JUNE), PP. 709-716.

1930. THE MODE OF COMBINATION OF CERTAIN DYES AND GELATIN GRANULES. JOURNAL OF BIOLOGICAL CHEMISTRY, VOL. 88, NO. 1 (AUGUST), PP. 271-284.

ROWE, F. M.
1924. COLOUR INDEX. BRADFORD, ENGLAND, SOCIETY OF DYERS AND COLOURISTS. FIRST EDITION.

UDY, DOYLE C.
1954. DYE BINDING CAPACITIES OF WHEAT FLOUR PROTEIN FRACTIONS. CEREAL CHEMIST, VOL. 31, NO. 5 (SEPTEMBER), PP. 389-395.

"DRIP" IN FROZEN FISH

Drip is the term applied to the clear or sometimes slightly cloudy fluid that is not reabsorbed by the fish tissue when frozen fish thaws. The fluid consists of water with dissolved protein, other nitrogenous constituents, and minerals. The quantity of drip from frozen fish depends upon many factors, including the kind of fish involved and the length and temperature of storage prior to thawing. Drip may be less than one percent or more than 20 percent of the weight of the fish.

--"Sea Secrets," April 16, 1957
The Marine Laboratory,
University of Miami,
Coral Gables, Fla.

NEW ENGLAND FISH MEALS IN THE NATIONAL FISH-MEAL RESEARCH PROGRAM

By Joseph H. Carver*

BACKGROUND

A nationwide program of research on fish meal and fish oil financed by funds provided under the Saltonstall-Kennedy Act of 1954 was initiated in 1955 by the U. S. Fish and Wildlife Service. The program included studies of composition, nutritional value, and of possible new uses for fish meal and fish oil. The projects were carried out largely by contractors, such as universities and other research organizations. The supervision, liaison, and responsibility for samples were handled by Service personnel.

In order to supply the research contractors with authentic samples of meals and oils, the four Service Fishery Technological Laboratories procured them from the various commercial plants within their own areas. Each was obtained by a staff member who was temporarily stationed at the plant. The bulk of each sample collected was sent to the College Park, Md., laboratory along with all the available data, and these were distributed to the various research contractors.

The role of the East Boston laboratory in the fish meal and oil research program was to collect the various samples of meal and oil from the fish-meal manufacturers in the New England area. The laboratory also arranged for the commercial manufacture of controlled lots of meal. Various samples of meal were also prepared in the laboratory. All samples were analyzed for proximate composition--moisture, protein, fat, and ash content.

SAMPLE PREPARATION

In the New England area, fish meals are made from ocean perch offal, whole menhaden (pogy, mossbunker), whole or broken herring (called sardine, and these materials include the raw and cooked scrap from the canneries), and to a lesser extent, whiting offal and mixed whole "trash" fish. The offal consisted of the waste remaining after filleting and of very small fish. An attempt was made to obtain representative samples of the usual production of each type of meal produced. However, it was impossible to get a representative sample of meal from mixed "trash" fish, since the species composition of the "trash" fish load varied from hour to hour. Fish meal and oil made from ocean perch, menhaden, herring, and whiting were procured from commercial plants in Gloucester, Mass., and Portland and Rockland, Me. Each commercial sample drawn was 100 pounds except sample EBGH-8, ocean perch, which was 2,000 pounds. The raw material was inspected by the staff member of the Service. Where possible, data were also obtained on the location of the catch and the length of time the fish were out of water. The meal sample was taken from the midproduction run on each lot of raw material, so that the first half of the production run would thoroughly clean the equipment of any fish or fish meal of unknown history. All data concerning the history of the samples procured are found in table 1.

All the commercial fish-meal samples, EBGH-1 to EBGH-11, were made by the wet-reduction process, from lots of not less than 50,000 pounds of raw material. The average cooking times ranged from 4 to 5 minutes and the steam pressures employed were from 40 to 50 p.s.i. The cooked material was pressed for an average of 5 minutes in a screw-type press. In samples number EBGH-1, -2, -4, -7, and -8 the press cakes were dried in a continuous hot-air drier whose inlet temperatures ranged from 1400° to 1500° F. Samples EBGH-3, -5, and -6 were dried in a continuous steam-tube dryer at steam pressures of 60 to 100 p.s.i. Before drying samples EBGH-9 (men-

*FISHERY PRODUCTS TECHNOLOGIST, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, EAST BOSTON, MASS.

Table 1 - Data and Composition of Meal Samples

Code No.	Sample Size	Description of Meal Sample: Raw Material: Species of Fish	Date and Location of Catch	Portions Used	Condition of Raw Material	Preparation of Meal: Scale	Method	Proximate Composition of Meal (Percent): Moisture	Protein	Fat	Ash
	Lbs.										
EBGH-1	100	Ocean perch	Gully[1] 6/24/55	Filleted fish frames with viscera	Good	Commercial	Cooked 4 min. at 40 p.s.i. steam, pressed 5 min., and hot-air dried. Drying air temp. was 1400° - 1500° F	6.3	63.3	11.4	22.4
EBGH-2	100	Ocean perch	Gully[1] 9/19/55		Fair	Commercial		7.1	58.2	9.0	25.9
EBGH-4	100	Ocean perch	Gully[1] 4/23/56		Good	Commercial		6.2	58.7	9.5	26.1
EBGH-5	100	Ocean perch	No data on area of catch 6/27/56		Good	Commercial	Cooked 4 min. at 40 p.s.i. steam, pressed 5 min., and dried in steam jacketed drier. Drying air temp was 212° F.	7.6	61.5	8.2	21.7
EBGH-8	2,000	Ocean perch	Gully[1] 8/17/56		Good	Commercial	Cooked 4 min. at 40 p.s.i. steam, pressed 5 min., and hot-air dried. Drying air temp. was 1400° - 1500° F.	5.4	59.2	10.5	23.7
EBGH-11	100	Ocean perch	No data on area of catch 8/24/56		Fair	Commercial	Cooked 4-5 min. at 50 p.s.i. steam, pressed, oil-free press liquor returned to press cake and vacuum-dried. Drying temp. not given.	4.9	53.6	11.9	22.3
EBGH-3	100	Herring[3]	Rockland, Me., area 9/28/55[4]	Small whole fish	Good	Commercial	Cooked 4-5 min. at 50 p.s.i. steam, pressed 5 min., dried in steam-jacketed drier. Drying air temp. was 212° F.	6.1	62.7	13.0	18.1
EBGH-10	100	Herring[3]	Portland, Me., area 9/28/56[4]	Small whole fish and "brokers" fish	Good to Fair	Commercial	Cooked 4-5 min. at 50 p.s.i. steam, pressed 5 min., oil-free press liquor returned to press cake and vacuum dried. Drying air temp. was not given.	8.4	59.1	14.1	16.0
EBGH-6	100	Menhaden	Gloucester, Mass., area 7/2/56[4]	Whole fish	Good	Commercial	Cooked 4 min. at 40 p.s.i. steam pressed 5 min. and dried in a steam-jacketed drier. Drying air temp. 212° F.	9.4	56.8	20.0	15.4
EBGH-9	100	Menhaden	Portland, Me., area 9/28/56[4]	Whole fish	Good	Commercial	Cooked 4-5 min. at 50 p.s.i. steam, pressed 5 min., oil-free press liquor returned to press cake and vacuum dried. Drying air temp. not given.	2.0	66.5	13.0	16.1
EBGH-7	100	Whiting	Gloucester, Mass., area 8/10/56[2]	Filleted fish frames without viscera	Good	Commercial	Cooked 4 min. at 40 p.s.i. pressed 5 min., and hot-air dried. Drying air temp. was 1400° - 1500° F.	6.4	65.2	6.0	-
EBA	100	Haddock	Georges Bank 8/54	Filleted fish frames with viscera	Good	Commercial	Cooked 4 min. at 40 p.s.i. steam, pressed 5 min., and hot-air dried. Drying air temp. was 1400° - 1500° F.	7.9	59.3	4.9	26.0
EBB	100	Haddock	Georges Bank 9/54		Good	Commercial	Batch-cooked 6 hrs. at 100 p.s.i. steam, and dried in a steam-jacketed drier. Drying air temp. was 212° F.	7.3	53.3	18.9	20.9
None[5]	10	Haddock	Georges Bank 5/54 to 12/54	Filleted fish frames without viscera	Good	Laboratory	Oven-dried at 212° F.	2.1	71.2	2.9	23.4
None[5]	10	Haddock			Good	Laboratory	Boiling solvent-extraction, using ethylene dichloride. Drying temp. was 181° F.	2.1	73.9	0.2	23.1
None[5]	10	Haddock		Filleted fish frames with viscera	Good	Laboratory	Oven-dried at 212° F.	2.0	53.1	18.6	23.9
None[5]	10	Haddock			Good		Boiling solvent-extraction, using ethylene dichloride. Drying temp was 181° F.	4.1	67.6	1.5	27.5

1/GULLY (LIES ABOUT 25 MILES NE. OF SABLE ISLAND).
2/THESE FISH WASTES CAME FROM SEVERAL FILLETING PLANTS WHERE NO FIRM DATA ON THE LOCATION AND DATE OF CATCH WAS AVAILABLE
3/HERRING MEAL IS ALSO CALLED SARDINE BY SOME MEAL MANUFACTURERS.
4/THESE FISH WERE CAUGHT IN THE WATERS WITHIN THE VICINITY OF THE NAMED CITIES.
5/NO CODE DESIGNATION WAS GIVEN TO THESE SAMPLES.

haden), -10 (sardine) and -11 (ocean perch), the oil-free press liquor was returned to the press cake before drying. The press cakes with the added press liquors were then dried in a batch-type steam-tube vacuum drier operated at about 60 p.s.i. steam pressure.

Samples EBA and EBB were special samples made from haddock offal with industrial equipment. A conventional wet-reduction process with a hot-air drier as described in the previous paragraph was used to prepare sample EBA. This meal was made from 15,000 pounds of haddock offal with the viscera left intact, obtained by the laboratory to supply a manufacturer of fishery byproducts.

Sample EBB was made from 10,000 pounds of the same material. This offal was cooked in a batch cooker, known as the dry-reduction process, operated at 100 p.s.i. steam pressure for six hours. After being cooked, this meal was dried in a steam-jacketed drier operated at an average of 90 p.s.i. steam pressure.

Lots of haddock meals of about 10 pounds were prepared in the laboratory from haddock offal from eviscerated fish by oven-drying and by solvent-extraction. The

raw material was ground to a slurry in preparation for drying. Oven-dried samples were prepared by drying the slurry at a temperature of 212° F. in circulating air. The solvent-extracted meals were prepared by the following procedure. The ground slurry was mixed into a boiling solvent system of ethylene dichloride, at 181° F., and boiling was continued until almost all the water was removed. The solvent along with the solvent-extracted fat was removed by filtration, and the residual solvent in the meal was removed by heating the meal to 194° F. in circulating air. Additional laboratory-size lots of haddock meals were prepared from the offal of filleted haddock with the viscera left intact, by the oven-drying and by the solvent-extraction methods.

From each lot of meal a representative sample was withdrawn for proximate composition. The results of the analyses are shown in table 1. The bulk of the meal was sealed in polyethylene bags and the bags placed in fiberboard cartons. These cartons were then sent to the Service's College Park laboratory for distribution.

DISCUSSION OF RESULTS

The six ocean-perch meals had an average composition as follows: moisture, 6.2 percent; protein, 59.9 percent; fat, 10.1 percent; and ash, 23.7 percent (on a dry-matter basis: protein, 63.9 percent; fat, 10.8 percent; and ash 25.3 percent). The maximum deviation from the mean protein value was 3.8 percent protein with an average deviation of 2.1 percent protein on a dry basis. The ash content of these ocean-perch meals is high and probably is due to at least two factors. The more important factor for the high ash is the removal of the fillets, which causes an increase in the total ash of the offal. The second factor in increasing the ash content is probably the sand which is found in the viscera of these fish.

Since only two herring meals, two menhaden meals, and only one whiting meal were procured and analyzed, no conclusions or trends can be drawn from these few samples. It will be noted that both the herring and menhaden meals were high in oil content. The oil content of the whiting, as expected, was low and the protein content was high.

Haddock meal samples EBA and EBB reflect the effect of the method of processing the offal. Both samples were made from haddock offal with the viscera included. Sample EBA was made from cooked offal that had been pressed, whereas EBB offal had not been pressed. The unpressed meal was high in fat content, 18.9 percent (20.4 percent on a dry-matter basis), as compared to the fat content of the pressed meal, namely, 4.9 percent (5.4 percent on a dry-matter basis). The protein content shows an inverse relationship to the fat content, namely, 53.3 percent (57.2 percent on a dry-matter basis) for the unpressed meal and 59.3 percent (65.6 percent on a dry-matter basis) for the pressed meal.

The haddock meals prepared in the laboratory from eviscerated haddock offal had very high protein contents. Meal made by drying the ground offal in an oven had a protein content of 71.2 percent (73.0 percent on a dry-matter basis) and a fat content of 2.9 percent (3.0 percent on a dry-matter basis). By processing this offal with the boiling solvent method (using ethylene dichloride) most of the fat, being very soluble in the solvent, was removed by the solvent. As a result, the protein content rose 2.7 percent to a value of 73.9 percent (76.0 percent on a dry-matter basis). Correspondingly, the fat content of the extracted meal went down about 2.7 percent to a value of 0.24 percent (0.25 percent on a dry-matter basis).

Meals made from haddock offal in which the viscera of the fish was left intact showed a lower protein content and a higher ash content. Oven-dried meal made from this offal had a protein content of 53.1 percent (55.6 percent on a dry-matter basis) as compared with the protein content of 71.2 percent (73.0 percent on a dry-matter basis) for oven-dried offal of eviscerated haddock. Again, the protein content of the

meal prepared by the boiling solvent method from haddock offal with the viscera included increased to a value of 67.6 percent (70.0 percent on a dry-matter basis). A sharp difference in fat content is evident, it being 18.6 percent (24.0 percent on a dry-matter basis) for the oven-dried meal and 1.5 percent (1.6 percent on a dry-matter basis) for the solvent-dried meal.

SUMMARY

The Service's East Boston Fishery Technological Laboratory obtained commercial samples of fish meal and oil from the various fish-reduction plants in New England. These meals and oils were scheduled to be used in a nationwide research project to determine factors affecting the nutritive value and use of fishery byproducts. Those samples obtained were representative of the production of the New England fishery byproducts manufacture. The meals collected were ocean-perch meal, herring (sardine) meal, menhaden meal, and whiting meal. Pertinent data, such as the history of the raw material used and the processing techniques employed, were obtained with each sample. The proximate composition of each meal was determined--moisture, protein, fat, and ash content. The samples were then sent to contractors for further evaluation

THE COLOR OF THE SEA

The sea is not always blue, but may vary from an indigo, or deep blue, to an intense green, or in certain circumstances brown or brown-red. Blue waters are typical of the open oceans, particularly in the middle or lower latitudes, whereas green water is more common in coastal areas, and the brown or "red" waters are usually observed in coastal regions only. The blue color can be explained as a result of the scattering of light against the water molecules themselves, or against suspended minute particles smaller than the shortest visible wave lengths. The blue color of the water is therefore comparable to the blue color of the sky.

The transition from blue to green color, however, cannot be explained as a result of this scattering, and it has been pointed out that a "yellow substance," which seems to be a metabolic product of plant plankton and which occurs in greatest abundance in coastal areas, in combination with the "natural" blue of the water, leads to a variety of shades of the green colors which are observed at sea.

When water is full of silt or other suspended large particles, the sea may take on the colors of the particles. Discoloration can be observed when large quantities of suspended mineral particles are carried into the sea after a heavy rainfall. This also may occur when very large populations of certain kinds of microscopic algae or dinoflagellates, such as those found in the "red tide," are present very near the surface. Thus, the "red water," which is actually more often brown than red, which is observed in many areas and after which the Red Sea and the Vermillion Sea in the Gulf of California have been named is due to the abundance of certain algae or dinoflagellates.

--"Sea Secrets" The Marine Laboratory
University of Miami, Coral Gables, Fla.

VITAMIN CONTENT OF FISHERY BYPRODUCTS

Part 3 - Riboflavin, Nicotinic Acid, Vitamin B_{12}, Moisture, Oil, Ash, and Protein Content of Commercial Fish Meals

By Neva L. Karrick,* William Clegg,** and M. E. Stansby***

ABSTRACT

Samples of commercial fish meals prepared from herring, mackerel, menhaden, sardine, and tuna were assayed for their content of riboflavin, nicotinic acid, vitamin B_{12}, protein, moisture, ash, and oil. The results of these assays are reported in six tables.

INTRODUCTION

In recent years the nutritive factors present in fish meal have received increased attention from both producers and consumers. Actually, the true value of the product is based upon these ingredients--both known and unknown--even though the price of the meal is based upon the crude protein content. One example of this interest occurs among those feed manufacturers who utilize the vitamin content of fish meal as one of the vitamin sources in their feed mixes. They are at a disadvantage, however, because little information has been published on the vitamin content of fish meals.

Fig. 1 - The weighing of samples before the vitamins are extracted for their quantitative determination by microbiological assays.

To increase the existing knowledge of the nutritive ingredients in fish meal, the Service's Seattle Technological Laboratory therefore undertook to survey fishery byproducts for some of their nutritional factors, including proximate composition and content of three members of the vitamin B complex.

Information needed by the users of fish meal includes (1) an indication of the variability of the vitamin content of fish meals; (2) the range of values for the different kinds of meal; (3) whether a range can be established for a particular kind of meal and, if so, what percentage of the meals will fall outside the range; (4) whether a knowledge of the history of the meals will help to determine if the meals will come within the range; (5) whether having high values for one vitamin indicates high values for all of the vitamins; and (6) the variation in the content of protein, moisture, oil, and ash in the meals.

An extended survey of products on the commercial market has been necessary to answer these questions. Thus, this project has been carried out over a period of several years, and the results are being published in a series of papers. The first paper reported the effect of processing methods on the content of riboflavin, nicotinic acid, and vitamin B12 in solubles and meal (Karrick and Stansby 1954). The second paper reported the content of these vitamins in visceral organs of albacore

*Chemist
**Former Chemist
***Chief, Pacific Coast and Alaska Technological Research
} Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

tuna (Germo alalunga) and of sardine (Sardinops caerulea) (Karrick 1955). This paper reports the results of vitamin and proximate analyses on the principal kinds of fish meals produced commercially in the United States. Fish meal samples whose history, method of production, and sampling procedure usually were known were analyzed for their content of riboflavin, nicotinic acid, and vitamin B_{12} as well as for their content of moisture, oil, protein, and ash. The vitamins are among those that are important in animal nutrition. Analyses for nicotinic acid were specifically requested by the American Feed Manufacturers' Association. The vitamin B_{12} results were also of major interest to both producers and users of fish meal.

To encourage the production of a more uniform product, the California Hay, Grain and Feed Dealers Association has suggested a code for fish meal (Anonymous 1951) that includes recommendations on the protein, fat, and moisture content. They recommend (1) that the protein content of individual bags of meal within a lot should not vary over a range greater than 5 pounds per 100 pounds of meal; (2) that the moisture content should be from 6 to 10 percent; and (3) that the fat content should be between 5 and 10 percent, and preferably not more than 8 percent. Producers of fish meals are interested in the comparison of the analyses of their meals with these recommendations as well as how much variation occurs both within a lot and among different lots. The proximate compositions of the samples of fish meal were determined in order to check both whether they fall within the recommended ranges and what variation occurred in them.

SAMPLES

The samples analyzed for this project were commercially-prepared meals and were obtained from two sources: testing laboratories and the plants where the meals were processed. Most of the samples obtained from the testing laboratories were representative of carload lots, although the tuna and the mackerel samples represented from 500 to 1,000 100-pound bags. The remaining samples varied in the amounts of meal represented. The majority of these remaining samples were representative of 100-pound bags of meal, but a few were random samples that cannot be considered representative of any amount of meal other than the size of the sample, which was usually 2 to 3 pounds. There were a few samples that represented large batches of unknown size. When the results of the analyses were being evaluated, a sample representing a large batch of meal was given more weight than was a sample representing only itself or a 100-pound bag. This method of evaluation is not meant to imply that samples of a 100-pound bag were analyzed as a substitute for samples from larger batches of meal; rather, the samples from the small amounts of meal were analyzed to determine the variability of fish meal from bag to bag and within lots.

As complete a history as possible was obtained for each sample to help to evaluate the results of the analyses. This history, whenever possible, included the following:

1. Species of fish.
2. Location of the catch.
3. Storage history of the raw material.
4. Condition of the raw material when processed.
5. Portion of the fish processed.
6. Methods used for cooking, pressing, and drying the raw material.
7. Storage history of the meal.

After samples of the meals were obtained, they were stored in glass jars at 0° F. until analyzed. Before the assays were started, the meals were ground as fine as possible in an attrition-type laboratory mill.

ASSAY METHODS

The meal samples were assayed microbiologically for their content of riboflavin, nicotinic acid, and vitamin B_{12}. Riboflavin and nicotinic acid were determined by a modification of the method of Roberts and Snell (1946). Vitamin B_{12} was determined by a modification of the method of Hoffman, Stokstad, Hutchings, Dornbush, and Jukes (1949).

Riboflavin and nicotinic acid were extracted from the meals by incubating 1-gram samples with papain and takadiastase in a pH 4.6 buffer at 37° C. for 16 hours. The samples then were neutralized, filtered, diluted, and assayed. Vitamin B_{12} was extracted by autoclaving 1-gram samples for 5 minutes at 15 pounds pressure with about 25 milliliters of water and 0.025 grams of sodium bisulfite. The samples then were filtered, diluted, and assayed.

In all of the assays, the samples were run in duplicate at four different concentrations, and the growth of the organism produced by the sample was measured by titration of the acid formed. The amount of vitamin present was determined by comparison with the growth produced by known amounts of the vitamin.

The content of protein, moisture, oil, and ash in the products was determined using standard techniques of the Association of Official Agricultural Chemists (1950).

HERRING MEALS

The results of the analyses of 29 herring meals for their proximate composition and content of riboflavin, nicotinic acid, and vitamin B_{12} are reported in table 1.

Table 1 - Analyses of Herring-Meal Samples Representing Large Batches [1/] of Meal

Type of Drier	Date Processed[2/]	Proximate Composition[3/]				Vitamin Content (Moisture- and Oil-Free Basis)		
		Protein	Moisture	Oil	Ash	Riboflavin	Nicotinic Acid	Vitamin B_{12}
		(Percent)				(Micrograms Per Gram)		
Direct-heat	1/5/53	68.1	7.8	11.6	11.1	6.4	71	0.40
	1/5/53	68.2	8.3	11.9	11.1	7.6	70	0.39
	1/27/53	69.9	7.8	11.3	10.9	8.2	57	0.34
	1/27/53	69.1	8.6	11.5	11.2	8.9	61	0.33
	2/24/53	60.9	7.1	20.2	10.7	4.3	57	0.26
		67.9	7.5	11.8	10.8	7.3	47	0.37
	2/26/53	71.4	8.0	11.5	11.5	7.8	81	0.36
		71.1	6.7	11.5	11.6	8.7	75	0.37
	7/21/53	69.2	8.0	14.3	10.1	8.9	99	0.52
		74.2	7.9	13.6	10.0	8.1	98	0.52
		68.9	8.3	13.7	9.6	8.5	102	0.48
		69.0	7.7	14.5	9.2	8.9	103	0.50
	8/12/53	70.5	7.2	11.4	10.0	7.8	100	0.47
		70.7	6.8	11.6	9.8	7.4	101	0.44
	8/31/53	68.3	8.3	12.9	9.7	7.5	103	0.40
		70.2	8.0	13.6	9.5	7.7	104	0.45
		70.3	7.9	12.2	10.0	7.7	99	0.43
		69.9	7.7	11.8	-	7.5	105	0.43
		69.6	7.9	12.3	-	7.9	108	0.44

1/ The amount of meal represented by the samples was carload lots.
2/ Meals processed by the same company are grouped together.
3, Protein and ash determinations reported in this table were made by the feed control laboratory of the Bureau of Field Crops of the State of California Department of Agriculture.

The 29 meals were processed during 1953 in Alaska or British Columbia from whole fish. Meals processed by the same company are grouped together in the table. Information concerning the details of methods used to dry these meals was not avail-

able; however, all of the processing plants used direct-heat driers. The exact amounts represented by each sample were not known, but the samples were all from large composite batches of herring meal representing thousands of pounds of product.

The range covered by the values for proximate composition was less than a first glance at table 1 would indicate. One of the samples was unusually high in oil and low in protein. If this sample were not included, the range in proximate composition would be as follows: protein, from 67.9 to 74.2 percent; moisture, from 6.7 to 8.6 percent; oil, from 9.6 to 14.5 percent. The amount of oil is the only one of these results that is not within the recommendations in the suggested code for fish meal (Anonymous 1951).

The same sample that had the unusual proximate composition had a lower vitamin content than did the other samples. It contained the least riboflavin and vitamin B_{12} and the next to least nicotinic acid. The range in vitamin content of the meals would be changed very little, however, if this meal were not included. The vitamin content of the samples of herring meals was determined as micrograms of vitamin per gram of meal on a moisture- and oil-free basis. The values ranged from 4.3 to 8.9 for riboflavin, from 47 to 108 for nicotinic acid, and from 0.26 to 0.52 for vitamin B_{12}. For all three vitamins, the maximum value was at least twice the minimum value.

MACKEREL MEAL

The results of the analyses for proximate composition and vitamin content of 12 samples of mackerel meal manufactured in California are reported in table 2. Four

Table 2 - Analyses of Mackerel-Meal Samples

Type of Drier	Amount of Meal Repr. by Sample	Date Processed 1/	Proximate Composition				Vitamin Content (Moisture- and Oil-Free Basis)		
			Protein	Moisture	Oil	Ash	Riboflavin	Nicotinic Acid	Vitamin B_{12}
	Bags		(Percent)				(Micrograms Per Gram)		
Steam-tube	1	11/10/50	62.8	9.7	7.3	18.6	5.5	62	0.40
			66.3	9.0	6.7	19.1	5.6	62	0.41
			63.6	10.4	6.9	16.8	6.8	71	0.49
Direct-heat	1	1/29/51	60.2	9.7	10.9	-	5.3	70	0.32
	624	7/14/53	59.8	5.6	12.4	21.0	5.4	70	0.24
	500	8/13/53	61.4	6.5	12.4	18.9	6.1	75	0.30
Modified direct-heat	600	6/29/53	57.1	7.8	9.3	22.1	4.9	120	0.23
		7/13/53	55.6	7.4	10.2	23.7	4.2	112	0.24
		7/23/53	54.1	6.7	11.3	23.2	3.8	93	0.20
		7/20/53	59.7	7.6	11.2	19.4	7.0	142	0.23
		7/24/53	60.6	7.7	9.8	19.6	6.5	137	0.23
		8/7/53	60.6	6.8	8.7	20.3	6.6	139	0.24
Minimum 2/			54.1	5.6	8.7	18.9	3.8	70	0.20
Average 2/			58.6	7.0	10.7	21.0	5.6	111	0.24
Maximum 2/			61.4	7.8	12.4	23.7	7.0	142	0.30
Standard deviation			2.65	0.76	1.38	1.78	1.18	28.8	0.028

1/Meals processed by the same company are grouped together.
2/Only the analyses of samples representing large batches of meal were included in these calculations.

of these samples were each representative of one 100-pound bag. The other eight samples were representative of 500 to 624 100-pound bags. In the computation of averages and of standard deviation, the samples representing one bag could not be considered equal to those samples representing 600 bags. Thus the four samples of individual bags were not included in these calculations. It is interesting to note that, for most of the analyses, the samples of individual bags fall outside of the range

found for the samples of large lots. The four individual bags of meal were processed in a different year. Three of these meals were dried in a steam-tube drier, but since none of the other 12 samples were dried in this way, no comparisons can be made. The fourth meal was prepared in a direct-heat drier by a company that had processed two of the large batches of meal. The composition of these three meals that were dried by direct heat was quite similar.

For none of the samples could any correlation be established between the composition of the meal and the type of drier used for processing the meal. The oil content of 5 out of the 8 samples representing large batches of meal were higher than that recommended in the suggested code for fish meal.

MENHADEN MEAL

Analyses for 23 samples of menhaden meals are reported in table 3. These were random samples not representative of any particular amount of meal. The meals were processed by 16 different companies and those processed by the same company are grouped together. Since only 2 samples were not dried in a direct-heat drier, no conclusions can be made about the effect of other types of driers.

Table 3 - Analyses of Menhaden-Meal Samples 1/

Type of Drier	Date Processed 2/	Proximate Composition				Vitamin Content (Moisture- and Oil-Free Basis)		
		Protein	Moisture	Oil	Ash	Riboflavin	Nicotinic Acid	Vitamin B12
		(Percent)				(Micrograms Per Gram)		
Direct-heat	6/12/51	60.3	9.2	7.8	20.6	4.0	59	0.19
	8/14/51	59.3	9.2	8.5	-	4.0	64	0.17
	No Date	57.4	9.8	10.4	21.8	4.4	65	0.20
	6/12/51	59.1	9.4	9.0	18.9	4.4	61	0.23
	8/27/51	54.9	7.2	13.2	23.0	4.0	42	0.25
	No Date	50.1	9.1	10.7	25.6	3.7	50	0.21
	6/12/51	59.2	10.2	7.8	20.1	4.2	52	0.23
	8/27/51	59.7	8.4	9.7	19.7	3.6	57	0.18
	10/17/51	57.7	8.6	9.8	22.4	4.4	62	0.19
	6/13/51	59.9	8.1	7.5	22.9	3.0	55	0.08
	8/14/51	60.9	9.5	6.8	19.5	4.1	56	0.19
	8/27/51	57.5	8.1	12.5	20.6	4.7	72	0.21
	8/15/51	60.3	8.4	8.5	20.8	4.0	54	0.19
	9/7/51	58.1	9.4	9.8	19.8	4.2	67	0.32
	9/16/51	62.4	9.9	12.5	15.9	3.7	91	0.23
	9/18/51	61.9	8.6	11.4	18.8	3.0	80	0.18
	9/17/51	62.3	10.8	8.1	19.4	3.0	91	0.15
	9/20/51	58.9	8.9	10.1	21.4	3.0	79	0.15
		53.4	8.9	13.5	24.4	2.6	71	0.12
	11/16/51	57.6	10.4	8.6	20.0	4.8	62	0.17
	8/52	60.6	9.2	8.3	21.5	4.1	64	0.20
Hot Air	8/14/51	60.1	8.7	9.3	21.0	3.9	81	0.09
Steam	11/16/51	59.0	10.4	7.5	21.5	4.4	68	0.19
Minimum		50.1	7.2	6.8	15.9	2.6	42	0.08
Average		58.7	9.2	9.6	20.9	3.9	65	0.19
Maximum		62.4	10.8	13.5	25.6	4.8	91	0.32
Std. deviation		2.78	0.86	1.91	2.05	0.60	12.6	0.046

1/ These samples were taken at random and are not representative of any given amount of meal.
2/ The samples obtained from the same company are grouped together.

Standard deviations and ranges calculated for the different ingredients indicated that there was not an unusual number of extreme values. This observation is of interest because greater individual variation might be expected from random samples of meals. The moisture contents were in general, within the recommendations suggested in the code for fish meal (Anonymous 1951). The oil contents, however, tended to be high and the protein contents varied more than the recommended 5 percent.

SARDINE MEALS

The results of the analyses of sardine meals are reported in table 4. All of the samples were representative of large batches. The meals which were produced in

Table 4 - Analyses of Sardine-Meal Samples Representing Large Batches of Meal

Type of Drier	Amount of Meal Repr. by Sample	Date Processed[1/]	Proximate Composition				Vitamin Content (Moisture- and Oil-Free Basis)		
			Protein	Moisture	Oil	Ash	Riboflavin	Nicotinic Acid	Vitamin B_{12}
			(Percent)				(Micrograms Per Gram)		
Air-lift	Carload	10/13/50	59.4	9.9	7.4	20.8	4.2	73	0.23
		11/3/50	60.0	10.6	7.6	21.0	5.0	75	0.23
	1 day's production	11/14/50	53.6	13.3	7.0	-	2.6	42	0.22
Direct-heat	Carload	10/4/50	57.7	7.5	7.0	22.7	4.3	73	0.24
		10/14/50	59.0	7.7	7.3	21.8	5.0	82	0.29
			59.3	7.9	8.0	20.9	5.8	96	0.37
		10/4/50	59.8	7.0	8.5	21.0	5.4	85	0.23
		11/3/50	58.1	6.4	9.7	22.4	5.4	87	0.25
		10/6/50	59.6	7.7	9.3	17.0	5.8	89	0.26
		10/14/50	62.2	8.2	7.5	17.8	5.7	98	0.29
		10/6/50	57.4	8.7	7.5	22.9	5.0	66	0.22
		10/21/50	57.4	10.6	8.2	22.9	5.9	81	0.26
		11/1/50	56.6	10.6	7.7	23.8	5.3	69	0.23
		10/12/50	58.1	6.1	7.0	23.3	4.2	61	0.20
		11/4/50	58.6	8.3	7.3	22.7	4.7	69	0.26
		11/8/50	55.6	8.9	10.8	21.5	6.2	87	0.29
		10/13/50	65.2	3.9	7.4	18.8	5.0	93	0.29
		10/13/50	62.1	7.4	7.2	19.5	5.2	94	0.27
		10/20/50	66.9	7.8	7.1	14.8	7.2	115	0.33
		10/31/50	64.8	7.1	8.5	18.5	6.0	107	0.27
Modified direct-heat	1 day's production	11/14/50	57.2	7.5	7.9	-	3.8	80	0.24
Steam-tube	Carload	11/3/50	69.4	10.2	7.1	12.8	6.6	125	0.38
Unknown		10/13/50	60.2	8.8	8.0	18.7	5.4	89	0.31
		10/20/50	59.3	8.4	7.2	21.6	5.6	84	0.32
		11/3/50	63.2	4.8	8.8	-	4.7	74	0.24
Minimum			53.6	3.9	7.0	12.8	2.6	42	0.20
Average			60.0	8.2	7.9	20.3	5.2	84	0.27
Maximum			69.4	13.3	10.8	23.8	7.2	125	0.38
Standard deviation			3.66	1.98	0.95	2.85	1.0	17.4	0.046

1/Meals processed by the same company are grouped together.

1950 are classified according to the type of drier in which they were dried: airlift, steam-tube, modified direct-heat, or direct-heat drier.

The protein contents of the samples had a range of 16 percent. The moisture contents of five of the samples were above the recommended upper limit of 10 percent (10.6, 13.3, 10.6, and 10.2 percent), and those of two samples were below the recommended lower limit of 6 percent (3.9 and 4.8 percent). Except for one value of 10.8 percent, the oil contents of the samples were within the recommended limits.

The contents of all three of the vitamins covered a wide range, with values from 2.6 to 7.2 micrograms per gram of moisture- and oil-free material for riboflavin, 42 to 125 for nicotinic acid, and 0.22 to 0.38 for vitamin B_{12}. Despite this wide variation in actual values, however, only a comparatively few samples had extreme values. It might be noted that in two samples the analyses of the vitamin content showed high results for all three vitamins. One of the batches of meal represented by the samples had been dried by a steam-tube drier and the other by a direct-heat drier. With the knowledge available, however, there is no way to ascertain why the vitamin content of these meals was higher than that of the other meals.

TUNA MEALS

Table 5 reports results on 14 samples of tuna meals, all of which were representative of large lots of meal. The kind of tuna used in the preparation of these

Table 5 - Analyses of Tuna-Meal Samples Representing Large Batches of Meal

Type of Drier	Amount of Meal Repr. by Sample	Date Processed 1/	Proximate Composition				Vitamin Content (Moisture- and Oil-Free Basis)		
			Protein	Moisture	Oil	Ash	Riboflavin	Nicotinic Acid	Vitamin B_{12}
	Bags		(Percent)				(Micrograms Per Gram)		
Direct-heat	360	7/8/53	60.3	5.2	11.4	18.6	4.8	117	0.23
	870	7/20/53	56.7	5.0	12.5	22.2	4.9	107	0.22
	600	7/30/53	60.3	4.6	14.2	17.4	5.4	136	0.24
	1065	8/13/53	57.0	5.7	14.3	19.6	6.0	121	0.27
Modified direct-heat	600	6/30/53	60.5	5.0	11.8	19.7	6.6	93	0.25
		7/13/53	60.9	5.2	12.4	20.3	7.2	97	0.30
		8/8/53	58.1	6.3	13.7	20.0	7.3	145	0.33
		7/14/53	59.6	6.6	10.6	-	6.6	178	0.30
		7/27/53	58.3	9.3	9.8	19.1	5.6	120	0.26
		8/3/53	55.4	8.8	13.3	-	6.6	150	0.27
		8/7/53	55.3	8.8	12.1	20.6	5.5	126	0.27
		8/10/53	55.1	7.8	11.4	21.8	5.5	127	0.22
		8/12/53	59.3	7.8	10.4	19.8	6.3	136	0.28
Steam-tube	Carload	11/3/50	61.7	5.9	11.4	18.0	7.3	174	0.26
Minimum			55.1	4.6	9.8	17.4	4.8	93	0.22
Average			58.5	6.6	12.1	19.8	6.1	131	0.27
Maximum			61.7	9.3	14.3	22.2	7.3	178	0.33
Standard deviation			2.24	1.62	1.4	1.40	0.96	25.2	0.32

1/ Meals processed by the same company are grouped together.

meals is unknown. With one exception, the meals were processed during the summer of 1953. One meal was dried by steam-tube drier, nine were dried by a modified direct-heat drier, and four by a direct-heat drier. The samples processed by the same company are grouped together.

Probably the most significant observations can be made by comparing the range covered by the samples reported in table 5 with that covered by those reported in table 6. The samples in table 6 are representative of individual 100-pound bags and, as such, would be expected to cover a wider range than would the samples representative of larger amounts. The amount of material represented by the samples reported in table 6 is 22 100-pound bags of meal as compared with more than 8,000 100-pound bags represented by the samples in table 5. This means that the results reported in table 6 are applicable only to the bags reported there. The fact that the results in table 6 cover a wider range than do those in table 5, however, indicates that there are wide differences among individual bags.

The individual differences in table 6 are of particular interest because all but two of the samples were dried by the same type of drier--a steam-tube drier. In the case of these samples, the kind of tuna scrap that was used to prepare the meals is also known, and 16 of the 22 samples were from the same kind of tuna and were processed on the same day. It is interesting to note that, of the three groups of samples prepared by the same type of drier, the analyses within a group are essentially the same, although the results of the groups do differ. The exception to this is

the moisture content of the 12 meals produced from 50-percent skipjack and 50-percent yellowfin scrap.

Table 6 - Analyses of Tuna-Meal Samples Representing Single 100-Pound Bags of Meal

Type of Drier	Raw Material	Date Processed 1/	Proximate Composition			Vitamin Content (Moisture - and Oil-Free Basis)		
			Protein	Moisture	Oil	Riboflavin	Nicotinic Acid	Vitamin B_{12}
			(Percent)			(Micrograms Per Gram)		
Steam-tube	50 percent skipjack 2/	11/7/50	62.9	8.1	8.9	6.7	120	0.26
			63.8	8.6	8.4	6.8	123	0.26
	50 percent yellowfin 3/ scrap		64.7	9.3	7.1	6.6	126	0.28
			64.1	9.6	7.4	6.3	135	0.29
		11/15/50	66.6	3.6	9.8	8.3	157	0.35
			66.0	5.4	9.5	7.9	159	0.39
			65.4	6.2	10.2	8.0	165	0.41
			66.3	3.2	9.7	8.1	157	0.37
			66.5	4.4	9.8	7.6	150	0.40
			66.3	4.2	9.7	7.6	156	0.39
			65.4	5.3	9.4	7.8	155	0.36
			65.6	6.5	9.1	7.6	162	0.37
			65.4	6.3	9.0	7.8	164	0.37
			65.3	5.4	9.2	7.9	153	0.37
			65.3	5.5	9.1	8.1	162	0.39
			65.6	4.8	9.3	8.2	158	0.35
	Albacore 4/ scrap	9/15/50	52.9	6.3	13.3	6.8	166	0.29
			54.6	6.0	13.8	7.2	171	0.29
			54.0	8.8	11.7	6.6	169	0.30
	Mixed tuna scrap	11/14/50	67.2	8.3	8.7	6.4	201	0.27
Direct-heat	Skipjack 2/ scrap	12/28/50	52.5	9.3	11.0	6.4	142	0.34
	Yellowfin 3/ scrap	11/31/51	-	14.4	8.0	4.2	67	0.22
Minimum			52.2	3.2	7.1	4.2	67	0.22
Average			63.2	6.8	9.6	7.2	151	0.33
Maximum			67.2	14.4	13.8	8.3	201	0.41
Standard deviation			4.91	2.57	1.64	0.95	25.9	0.055

1/Meals processed by the same company are grouped together.
2/Katsuwonus pelamis.
3/Neothunnus macropterus.
4/Germo alalunga.

DISCUSSION

The data collected on a large number of fish meals gave no indication that any correlation existed between the results of proximate analyses and of vitamin analyses and the methods used to process the meals. This lack of correlation would indicate that any differences in analytical results that may occur due to processing methods are either concealed or compensated for by other factors. An important point to be made, however, is that no biological tests were made on these meals. Thus, from the data reported here, it is not possible to say how important processing methods may be in determining the biological value of the meals. It also is not possible to determine whether any correlation exists between the analytical results and the over-all nutritive value of the meals.

When an attempt was made to correlate analytical results of fish meals from different species, only meals representing large quantities of meal were included

because the use of large batches of meals would tend to give average results, or at least to avoid extreme values. Consequently, this discussion will include only the data in tables 1, 2, 4, and 5. These data are on samples representative of large amounts of meal.

The data on the proximate analyses can be compared with the recommendations for fish meal suggested by the California Hay, Grain, and Feed Dealers Association (Anonymous 1951). The code recommends that moisture be between 6 and 10 percent and oil between 5 and 10 percent.

In moisture content, all of the herring meals were within the recommended range. One of the mackerel meals was low (5.6 percent); one of the sardine meals was low (3.9 percent); and seven of the tuna meals were low (5.2, 5.0, 4.6, 5.7, 5.0, 5.2, and 5.9). Five of the sardine meals were high (10.6, 13.3, 10.6, 10.6, and 10.2), and none of the others were high.

In oil content, none of the meals were below the recommended range. Most of the herring meals were high, the average being 12.0 percent. Five out of eight mackerel meals were high. The average, however, was only 10.7 percent. One of the sardine meals was above the recommended range, and it was only 10.8 percent. Most of the tuna meals were high, with the average being 12.1 percent.

The recommendation on protein was concerned with variability among the bags in a batch of meal and did not recommend a definite amount. Among the meals analyzed the mackerel, sardine, and tuna meals averaged close to 60 percent. The herring meal averaged nearly 70 percent.

If the data on the amount of each of the vitamins in the large batches of meal are combined, the variation in the moisture- and oil-free meals was as follows: riboflavin ranged from 2.6 to 8.9 micrograms per gram, nicotinic acid ranged from 42 to 178 micrograms per gram, and vitamin B_{12} ranged from 0.20 to 0.52 micrograms per gram. Thus the maxima ranged from about 2.5 to 4 times that of the minima.

The herring meals, in general, had higher contents of both riboflavin and vitamin B_{12}. The tuna meals generally ranged higher in nicotinic acid. These results again indicate that fish meals are variable in their contents of nutritive factors and suggest that much work remains to be done before a standard product can be obtained. In the meantime, much of the information needed by the users of fish meal must be determined on the individual batches of meal. The large variations obtained in the vitamin analyses indicate that the variations are due to complex factors and that no one phase in the production of fish meal will yield the complete solution to the manufacture of a standard product.

ACKNOWLEDGMENT

Acknowledgment is made to Mrs. Mabel Edwards, who assisted with the vitamin analyses.

LITERATURE CITED

Anonymous
1951. Suggested Code for Fish Meal. Commercial Fisheries Review, vol. 13, no. 11a (November Supplement), pp. 34-35.

Association of Official Agricultural Chemists
1950. Official Methods of Analysis. Seventh edition. Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington 4, D. C., pp. 296-297, 346.

Hoffmann, C. E.; Stokstad, E. L. R.; Hutchings, B. L.; Dornbush, A. C.; and Jukes, T. H.
1949. The Microbiological Assay of Vitamin B_{12} with Lactobacillus leichmannii. Journal of Biological Chemistry, vol. 181, no. 2 (December), pp. 635-644.

Karrick, N. L.
1955. Vitamin Content of Fishery Byproducts. Part 2 - Vitamin B_{12} in Pacific Sardine (Sardinops caerulea) Organs and Riboflavin, Nicotinic Acid, and Vitamin B_{12} in Albacore Tuna (Germo alalunga) Organs. Commercial Fisheries Review, vol. 17, no. 2 (February), pp. 8-11.

Karrick, N. L., and Stansby, M. E.
1955. Vitamin Content of Fishery Byproducts. Part 1 - Effect of Processing Methods on Riboflavin, Nicotinic Acid, and Vitamin B_{12} Content of Solubles and Meal. Commercial Fisheries Review, vol. 16, no. 2 (February), pp.7-10.

Roberts, E. C., and Snell, E. E.
1946. An Improved Medium for Microbiological Assays with Lactobacillus casei. Journal of Biological Chemistry, vol. 163, no. 2 (May), pp. 499-509.

PARTIAL LIST OF REFERENCES ON THE UNIDENTIFIED GROWTH FACTORS IN FISHERY PRODUCTS

The purpose of this list is to aid in the search for unidentified factors in fishery products.

To limit the list strictly to the subject indicated in the title, however, would largely defeat its purpose, for the elucidation of the growth factors in these fishery products has involved much work with the so-called animal protein factor, vitamin B_{12}, and antibiotics. Furthermore, the rate of progress has been determined in no small part by the adequacy of the available assay methods. It was therefore felt that these other subjects should be included.

The list was prepared almost exclusively from articles appearing in the journal called Commercial Fisheries Abstracts. Inasmuch as this journal covers only 73 periodicals largely published in the United States, undoubtedly many important references, especially those in the foreign literature, have been omitted. It is for this reason that the word "partial" appears in the title.

Progress in the field of unknown growth factors has been so rapid that the significance of many of the articles is lost unless consideration is given to the time at which the work was done. Therefore, in order that the historical perspective be maintained, the references are listed chronologically. The list is divided in five sections as follows: (1) Animal Protein Factors, (2) Vitamin B_{12}, (3) Antibiotics, (4) Methods of Assay, and (5) Unidentified Growth Factors. A limited supply of the list is available for research workers and students in the field of fishery technology and may be obtained by writing to the author (F. Bruce Sanford) at the Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, 2725 Montlake Blvd., Seattle 2, Wash.

OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS

Part I - Introduction

By M. E. Stansby*

ABSTRACT

HEMATIN COMPOUNDS ARE SHOWN TO PLAY A MAJOR ROLE IN PROMOTING OXIDATION OF OIL IN FISH TISSUE. ANTIOXIDANT MIXTURES OF FAR GREATER EFFECTIVENESS THAN WAS PREVIOUSLY KNOWN HAVE BEEN DEVELOPED FOR RETARDING OXIDATION OF OIL IN THE MEAT OF FISH. ANTIOXIDANT TREATMENT OF FISH MEAL HAS BEEN STUDIED.

BACKGROUND

Oxidation of fish oils, when occurring spontaneously, causes great deterioration in the quality of a variety of fishery products. The oxidation of the oils and of the associated pigments in fish meat causes rancidity and discoloration in fresh, canned, preserved, and especially frozen fish. Oxidation of that part of the oil left in fish meal causes heating of the meal, and certain so-far unidentified reactions take place which apparently impair the nutritive value of the meal. Oxidation of rendered fish oils alter their properties and result in off-odors.

FIG. 1 - EMULSIFYING MENHADEN OIL FOR OXIDATION STUDIES AT THE FOOD TECHNOLOGY LABORATORY, UNIVERSITY OF CALIFORNIA, DAVIS, WHERE A PORTION OF THE PROGRAM ON OXIDATIVE DETERIORATION OF FISHERY PRODUCTS IS BEING CARRIED OUT.

A collaborative program is under way between the U. S. Fish and Wildlife Service and the University of California Department of Food Technology to investigate various aspects of the oxidation problem. The work, at present, covers four phases, which will be discussed briefly in this introductory paper; each phase then will be described in greater detail in succeeding papers.

The program is being carried out both at the Davis and at the Berkeley laboratories of the Food Technology Department of the University of California. At Davis, the program, which is under the immediate supervision of Professor A. L. Tappel, is being carried out in the new Food Technology building, which possesses excellent facilities for application of research on the chemistry of foods to practical problems of the food industry. The Fish and Wildlife Service has one full-time and one part-time chemist who are stationed at Davis in the laboratories of the Food Technology Department and who are working on this program. Since July 1, 1956, the Institute of Marine Resources of the University of California has had a laboratory in the Food Technology Department at Berkeley. The Fish and Wildlife Service has a full-time and a part-time chemist working on the program in this laboratory under Professor Harold Olcott. These programs come under the general supervision of the Seattle Fishery Technological Laboratory of the U. S. Fish and Wildlife Service. The pro-

*CHIEF, PACIFIC COAST AND ALASKA TECHNOLOGICAL RESEARCH, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, SEATTLE, WASH.

NOTE: THIS SERIES REPLACES THE ONE STARTED IN THE FEBRUARY 1956 ISSUE (P.10) OF COMMERCIAL FISHERIES REVIEW TITLED "OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS--NO. 1."

gram has been concerned principally with four fields of study: (1) mechanism of oxidation of oil in fish tissue; (2) reaction of fish oil and protein while in fish tissue or in fish meal; (3) oxidation of extracted fish oil; and (4) oxidation of pigments in tuna.

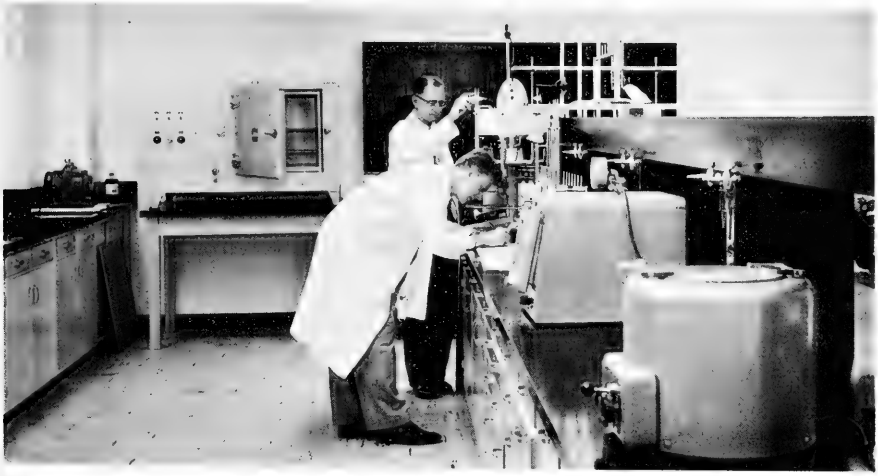


FIG. 2 - GENERAL VIEW OF FISHERY TECHNOLOGICAL LABORATORY OF THE INSTITUTE OF MARINE RESOURCES, UNIVERSITY OF CALIFORNIA, BERKELEY, WHERE A PORTION OF THE PROGRAM ON OXIDATIVE DETERIORATION OF FISHERY PRODUCTS IS BEING CARRIED OUT.

OXIDATION MECHANISM IN FISH TISSUE

In the program on the mechanism of oxidation of oil in fish tissue, it has been shown that the hematin blood of pigments are probably of major importance as catalysts in accelerating the oxidation of oil in fish. The amounts of these pigments in a number of species of fish have been measured. It has been shown that the oxidation of oil occurs much more rapidly in those localized areas in the fish tissue where these hematin pigments are concentrated. Model systems have been set up, and the effectiveness of numerous antioxidants, alone and in combination, toward retarding oxidation has been investigated; certain combinations have been found that are many times as effective as are the individual antioxidant components. The effectiveness of commercial antioxidants added to fish meals also has been studied.

FISH OIL-PROTEIN REACTION

The reaction between oil, oxygen, and protein in fish results in such phenomena as rusting in frozen fish and darkening of the color of fish meal. The mechanism of this reaction has been investigated, and it has been found that two types of reactions are involved: oil oxidation and the carbonylamine reaction. Evidence has been obtained to show that the former reaction predominates and that factors influencing oxidation are of primary importance in retarding this oil-protein reaction.

OXIDATION OF EXTRACTED OILS

The role of the naturally-occurring antioxidants, the tocopherols, in extracted oils is being investigated. These occur in small concentrations in all of the fish oils

studied. Added tocopherols are not particularly effective antioxidants, but the naturally occurring tocopherols may play an important role in determining stability. Certain commercial antioxidants can exert a considerable effect on the retardment of oxidation of extracted oils. The same antioxidants that exert the most powerful action in retarding oxidation of oil in fish tissue are not necessarily the best for use with extracted oils. Each substance or combination of substances must be assayed separately in the different systems.

PIGMENT CHANGES IN TUNA

It has been shown (1) that the normal change in the color of tuna--from the neutral shade in the raw fish to the desirable pink color after precooking and thence, under unfavorable circumstances, to an undesirable tan shade-- results from a series of oxidation reactions of hematin blood and muscle pigments and (2) that the reaction of the pink to the tan pigment is, under suitable conditions, reversible. The formation of the pink color is favored by the presence both of reducing conditions and of nicotinamide. Strong evidence that the pink pigments are denatured globin hemochrome or nicotinamide hemochrome, or both, has been obtained.

WHALE MEAT AN IMPORTANT FOOD IN SOME COUNTRIES

The people of Japan and the Faeroe Islands habitually eat whale meat and so do some aboriginal peoples, including the Eskimos. In England, Norway, and Canada some whale meat has been produced, and in the United States it has appeared on the menus of seafood restaurants, as a novelty item.

In the Faroe Islands, which lie in the North Atlantic between Iceland and Great Britain, whale meat is a very important item of food. Almost all of the animal is eaten. Some of the meat is eaten fresh while some is dried for future consumption. Pieces of black dried whale meat are a common sight hanging up outside the homes of the Faroese people.

The method which the Faroese use in capturing the whales is also of interest. When a school of whales are sighted at sea near the islands the person sighting the school arouses the inhabitants of the nearest community who encircle the school in boats and gradually drive the whales into the nearest fjord. The whales are slaughtered in the shallow water at the head of the fjord and the meat shared among all the inhabitants of the area. The whale hunt is a great social occasion in the islands and it is always followed by dancing. The customs relating to the division of the meat are very rigid and have apparently been in existence for a considerable length of time.

--"Sea Secrets," The Marine Laboratory, University of Miami.

OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS

Part II - Progress on Studies Concerning Mechanism of Oxidation of Oil in Fish Tissue

By W. D. Brown,* A. W. Venolia,* A. L. Tappel,**
H. S. Olcott,** and M. E. Stansby***

ABSTRACT

Studies showed that the mechanism of oxidation of fish oils in the meat of fish or in fish meal differs from that of extracted oils owing to the activity of biocatalysts in the tissues. The fish meat content and activity of hematin, found to be the primary catalytic agent in such oxidation, was studied. Activities of the proteins of the meat were found to be of lesser importance. Studies were made on naturally-occurring and commercial antioxidants. A mixture of the natural antioxidants citric acid, ascorbic acid, and tocopherol was found to be 80 times as effective, owing to synergism, than was citric acid or ascorbic acid alone. Method of addition of the antioxidant to the test system was found to be of importance in retarding oxidation.

The portion of the program on which progress is reported in this paper deals with the mechanism of oil oxidation while the oil still is associated with the fish tissue or while it is present in fish meal. The mechanism of the oxidation is different under these conditions from that in extracted oils because of the presence in the tissue of certain biocatalysts that affect the course of the oxidation.

Fig. 1 - Colorimetric determination of tocopherol in king salmon oil.

This phase is basic to applications whether involving changes in oil in situ in the meat of stored fish, in fish meals, or in the extracted oil itself because, in all these cases, the oil starts out in the meat and some changes always take place initially in the meat before any manufacturing steps have been started. Accordingly, chief emphasis in the initial stages of this program has been toward elucidating the mechanism of oxidation of oil in fish meat.

HEMATIN CATALYSIS

HEMATIN-COMPOUND CONTENT OF FISH: In the first phase of the work a number of species of fish were analyzed for their content of hematin compounds, substances that have been shown to be powerful biocatalysts for oil oxidation in other foods. Nine species of fish were examined, and the hematin compounds were found to vary in content from 5.4×10^{-5} M in pilchard down to 0.1×10^{-5} M in cod.

*Chemist, U. S. Fish and Wildlife Service, Davis, Calif.
** University of California, Department of Food Technology, Davis and Berkeley, Calif.
*** Chief, Pacific Coast and Alaska Technological Research, Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

CATALYTIC EFFECT OF HEMATIN COMPOUNDS: The effect of the hematin compounds of fish meat on the catalysis of oil oxidation next was determined. This work was carried out by measuring the oxygen uptake of a salt of an unsaturated fatty acid, ammonium linoleate, when shaken in a Warburg respirometer. With the reaction being carried out at 20° C. and at a pH of 9.0, aqueous extracts of fish were added to the ammonium linoleate substrate and their effect on the rate of oxidation was determined. The fact that the catalysis was due primarily to hematin compounds and not to some other biocatalysts in the fish was confirmed by repeating the experiment in the presence of cyanide, in which case no catalytic effect was observed. Cyanide inhibits hematin catalysis of unsaturated fatty acids oxidation.

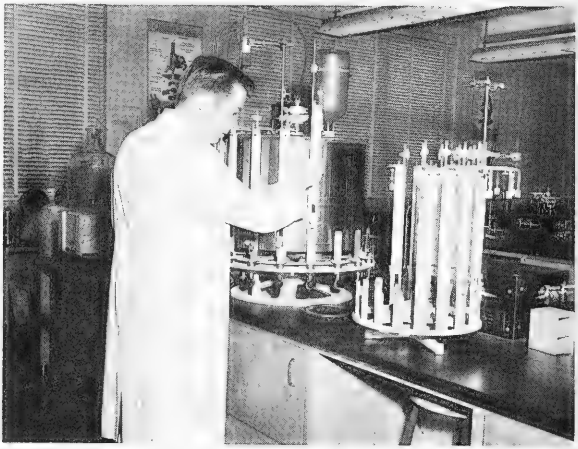


Fig. 2 - Measuring oxidation of tuna meals employing a Warburg apparatus for measurement of oxygen adsorption.

In another series of experiments (1) cubes of fish meat and (2) extracted fish oil from different species were measured for rate of oxygen uptake in a Warburg apparatus.

The results of all these experiments showed a direct correlation between the hematin-compound content of the various species of fish and the catalytic effect on the linoleate oxidation. The rate of oxidation of the fish meat also was correlated with the content of hematin compounds.

Table 1 - Oxidation Rate of Cubes of Light and Dark Meat of Fish in a Warburg Apparatus at 0° C.

Species	Rate of Oxidation	
	Light Meat	Dark Meat
	Microliters of Oxygen Uptake Per Hour Per Gram	
Chum salmon	0	17
Pink salmon	0	13
Tuna	0	13
Sheepshead	0.4	1.5
Lake chub	0.6	1/
Pilchard	7	1/
Rockfish	1	1/
Cod	0.5	1/
Mackerel	8	1/

1/ For these species, no separation of light and dark meat was attempted. The cubes of meat used, however, were mostly light meat.

CATALYTIC EFFECT OF PROTEINS: Some experiments were carried out to determine the catalytic effect of various proteins on the oxidation of fish oils. It was shown that all of the proteins studied had a measurable effect, but that none of these proteins approached hemoglobin in catalyzing the oxidation reaction.

HEMATIN-COMPOUND CHANGES DURING OXIDATION: During oxidation of oil in fish tissue, the hematin compounds that catalyze the oxidation are chemically altered, and their concentration diminishes. Cubes of tuna meat, cut from both the light and the dark tissue, were allowed to oxidize in a Warburg apparatus at 0° C. The content of hematin compound diminished from 2.1×10^{-5} M to 1.0×10^{-5} M in the light

meat and from 67.2 x 10^{-5} M to 49.6 x 10^{-5} M in the dark meat. Spectral absorption curves of aqueous extracts of the samples before and after oxidation showed a shift

Table 2 - Protective Factors for Antioxidants, With or Without Synergists, in a Linolenate Model System

Antioxidant 1/	Protective Factor 2/ in Presence or Absence of Indicated Synergist				
	None	Citrate	Citrate + Ascorbate	Ascorbate	10X Ascorbate
BHA	4.0	4.8	2.0	2.0	9.0
2X BHA	8.6				
BHT	4.9	8.7	1.4	1.4	7.1
2X BHT	15.9				
BHA + BHT	13.5				
NDGA	2.6				
2X NDGA	9.2				
DPPD	2.4				
2X DPPD	54				
Santoquin	8.9				
2X Santoquin	80				

1/ The concentration of antioxidants and synergists was 10^{-4} M in final solutions except that it was 2 or 10 times this amount when 2x or 10x respectively, are indicated.
BHA = butylated hydroxyanisole; BHT = butylated hydroxytoluene;
NDGA = nordihydroguaiaretic acid; DPPD = N, N-diphenyl-p-phenylenediamine.

2/ Protective factor = $\frac{\text{Time for system to absorb 300 } \mu 1.0_2}{\text{Time for control to absorb 300 } \mu 1.0_2}$

in maxima from 542 and 578 millimicrons for the unaltered samples to 500 and 630 millimicrons for the oxidized ones. This shift indicates a transformation of oxyhemoglobin (or oxymyoglobin) to methemoglobin (or metmyoglobin).

RATE OF OXIDATION IN FISH MEAT: The rate of oxygen adsorption by cubes of different species of fish were measured in a Warburg apparatus at 0° C. The samples were treated with aureomycin to retard bacterial decomposition. Measurements were made on both the light and the dark meat. The results are shown in table 1.

ROLE OF ANTIOXIDANTS

NATURALLY-OCCURRING ANTIOXIDANTS: Certain antioxidants occur in foodstuffs and are harmless for use as added antioxidants to foods. These include such substances as ascorbic acid, citric acid, and alpha tocopherol. The latter substance occurs in the vitamin E group present in fish oils. Initial work was concentrated on the effect of these types of antioxidants. Oxygen-absorption tests were carried out in model systems in which in most cases an emulsion of (1) one of the fatty acids found in fish-oil glycerides with (2) hemoglobin and a buffer solution was employed. The use of this model system permitted reproducible results to be obtained over a period of time, whereas the use of a fish oil rather than of a pure fatty acid as a test material would have made it impossible to obtain repeat results because of the changes that occur in fish oils with storage and the impossibility of getting new lots of fish oils that are chemically identical to those used in earlier work.

In one test, results using the model system were compared with those obtained employing menhaden oil, and it was found that parallel types of results were obtained. The rate of oxidation was greater and the effect of a given antioxidant was less with menhaden oil, but the comparative effectiveness of different antioxidants was the same in the model system as in the menhaden-oil system. In general, it was found that citric acid and ascorbic acid synergize with tocopherol in inhibiting oxidation. A mixture of alpha tocopherol and citric acid and ascorbic acid, for exam-

ple, was about 80 times more effective in retarding oxidation than was citric acid and ascorbic acid alone.

COMMERCIAL ANTIOXIDANTS: For certain applications to fishery products, it is possible to use some of the more potent antioxidants that are commercially available. A series of tests were carried out employing some of these commercial antioxidants in a model system.

This system consisted of 10 milliliters of linoleic acid (60 percent), 20 milliliters of phosphate buffer (pH 7.0), 0.25 milliliters of Tween 40, and sufficient hemoglobin solution to effect a concentration of 5×10^{-5} M in the final mixture. To this was added the particular antioxidant system under test, and the oxygen adsorption was measured for at least 1 hour in a Warburg apparatus at a temperature of 37° C.

Table 3 - Oxidation Rate of Fish Meals and Freeze-Dried Fish at 30° C.

Sample	Oxidation Rate
	Microliters Per Hour Per Gram
Menhaden meal 1/	10
Tuna meal 1/	3
Freeze-dried:	
Pilchard	300
Mackerel	300
Tuna	28
Pink salmon (light meat)	44
Pink salmon (dark meat)	370
Chum salmon (light meat)	2
Chum salmon (dark meat)	34
Sole	3
Halibut	2
Cod	0.8

1/ These commercial meals had been stored for several months and hence already had gone through the rapid initial oxidation.

The results obtained with the various substances tested are shown in table 2. It can be seen that the antioxidant Santoquin gave the greatest protection against oxidation. This particular antioxidant is not now approved by the Food and Drug Administration for general commercial use.

OXIDATION OF OIL IN FISH MEALS

RATE OF OXIDATION OF MEALS: In this work, both commercial fish meals and freeze-dried fish were used. The latter may be considered as fish meals dried under ideal conditions. The commercial fish meals used in this work had been stored for a period of months before the studies on rate of oxidation were started. They therefore already had gone through the initial high rate of oxidation, which was not the case with the freeze-dried samples. Table 3 shows the oxidation rate for these samples, the moisture content of which had been adjusted to 5 percent. The rate of oxidation was measured in a Warburg apparatus at 30° C.

Table 4 - Oxidation Rate of Tuna Meal 1/ Protected by Various Antioxidants

Antioxidant	Oxidation Rate of Tuna Meal
	Microliters Per Hour Per Gram
Santoquin	3.0
DPPD	3.8
BHA	5.8
BHT	6.7
Propyl gallate	17.0
NDGA	22.0
None (control)	27.5

1/ Yellowfin-albacore mixture.

EFFECT OF COMMERCIAL ANTIOXIDANTS: The oxidation rates of fish meals to which had been added various commercial antioxidants were measured. Antioxidants were added to meals that had been prepared commercially as described in the preceding paragraph. In all cases, the antioxidants reduced the rate of oxygen uptake (table 4).

The slowing of the oxidation rate by any one antioxidant was closely related to the method by which it was added to the meal. Use of a solvent increased the effectiveness considerably (table 5).

The antioxidant effectiveness also was increased by increasing the thoroughness of mixing. Thus in one case where Santoquin was stirred in by hand (employing a solvent), an oxidation rate of 12.0 microliters per hour per gram was obtained, whereas when the antioxidant was added (in a solvent) by grinding twice a value of 3.0 microliters per hour per gram was obtained.

Table 5 - Effect of Using Solvent to Incorporate Antioxidant in Tuna Meal 1/

Antioxidant	Used for Incorporation of Antioxidant	
	No Solvent	Solvent
	Microliters Per Hour Per Gram of Oxygen Uptake	
DPPD	7.0	3.8
BHA	7.4	5.8
BHT	8.0	6.7
Control.	27.5	27.5

1/ Yellowfin-albacore mixture.

SUMMARY

1. Hematin compounds have been shown to play a major role in catalysis of oxidation of fish oils. The content of such compounds, measured in nine species of fish, varied from 5.4×10^{-5} M to 0.1×10^{-5} M.

2. Various combinations of antioxidants were developed for application in retarding oxidation of oil in fish tissue. Some of these were far more effective than were the usual antioxidants used alone or with a single synergist. A mixture of tocopherol, ascorbic acid and citric acid, for example, was about 80 times as effective as was ascorbic acid alone or mixtures of ascorbic acid and of citric acid.

3. The effectiveness of the most widely-used commercial food and feed antioxidants was compared.

4. The rate of oxygen adsorption in fish meals was measured, and certain commercial antioxidants were found to be effective in retarding oxidation. The method of mixing the antioxidant with the meal was found to be of considerable importance in determining the effectiveness of the antioxidant.

USE OF CHEMICALLY-TREATED ICE FOR FISH

"Storage of Fish in Ice Containing Antibiotics or Chemical Storage Products, Annual Report, 1954." Institute of Chemical and Technical Investigations of the Fisheries Department, Bergen, 1955, pp. 11-12.

The experiments were done on cod, one part of which was stored in ice containing aureomycin, and the other, used as a control sample, in pure ice. The temperature range was 0° to -2° C. (32° and 28.4° F.). After 2 days, 97 percent of bacteria were destroyed. Between -0.5 and $+1^{\circ}$ C. (31.1° and 30.2° F.), aureomycin is still more efficient: 99.2 percent of bacteria are destroyed.

The use of foromycene, a chemical storage product, gave similar results.

OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS

Part III - Progress on Investigations Concerning Reactions Resulting in Brown Discoloration

By A. W. Venolia,* A. L. Tappel,** and M. E. Stansby***

ABSTRACT

STUDIES ARE IN PROGRESS ON THE UNDESIRABLE COLOR CHANGES, SOMETIMES FOUND IN FISH PRODUCTS, THAT ARE ASSOCIATED WITH OXIDATIVE DETERIORATION OF THE MEAT AND OIL OF THE FISH. WORK TO DATE INDICATES THAT AT LEAST THREE DIFFERENT REACTIONS CAN CAUSE SUCH PIGMENT CHANGES. METHODS OF CONTROLLING THE REACTIONS ARE NOW UNDER INVESTIGATION. A HYPOTHESIS AS TO THE MECHANISMS AND THE ROLE OF THESE DIFFERENT REACTIONS IN PRODUCING BROWN DISCOLORATION PRODUCTS IS PRESENTED.

BACKGROUND

Development of a brown color during processing or storage of fishery products is quite common. Several species of fish with white meat, upon being canned, turn to various shades of yellow to brown. Dehydrated fish, which immediately after manufacture may be of a white hue, slowly darken and eventually become a deep brown during storage. Fish meals often slowly change from an initial light brown color to a deeper brown color. Frozen whole fish frequently exhibit, at their surface, a brown discoloration in the oil that has seeped through the skin; this discoloration is known as rust.

Some of these changes in fish are ascribed to the well-known Maillard reaction in which the amino acids combine with free aldehyde groups of sugars or carbohydrate (Tarr 1950). Such reactions are common in vegetables that contain considerable quantity of carbohydrate. Fish, however, contain at most, only a few tenths of a percent of such carbohydrate, and it seems somewhat strange that these substances, which occur in trace amounts, could cause such extensive reactions as to decolorize the product completely.

Rusting of frozen fish generally has been ascribed to an oxidation of oil, although Brocklesby (1929) obtained evidence that nitrogenous compounds such as ammonia were somehow involved in the reaction.

Fig. 1 - Measurement of color developed during browning reaction employing a differential type color instrument.

Work is currently under way to investigate the mechanism of production of brown colors in fish (1) by a reaction between oxidized fish oils and proteins, (2) by oxidation or polymerization of fish oils, and (3) by a combination of these general types of reactions. The carbonyl groups in oxidized fish oil present the same opportunity for reaction with amino acids as might occur with carbohydrate, and since oils occur to a much greater extent in fish than do carbohydrates, this possibility should not be overlooked.

* Chemist, U. S. Fish and Wildlife Service,
** Food Technology Department, University of California, } Davis, Calif.
*** Chief, Pacific Coast and Alaska Technological Research, Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

EXPERIMENTAL

PROBABLE TYPES OF REACTIONS INVOLVED: In initial experiments, an attempt was made to determine, by use of model systems, whether the reaction resulting in the development of the brown color was one of oxidation or one between fish oil and protein. In these initial experiments, it was shown that emulsions of menhaden oil and protein invariably reacted to form a deep brown color so that the presence of carbohydrate definitely was not necessary. The rate of browning of emulsions prepared from menhaden oil and egg albumen, buffered at pH 7, was determined at 21.1°, 44.7°, and 55.0° C. The color of emulsions stored in Petri dishes was measured with a differential-type color instrument (fig. 1). From these data, the activation energy for the reaction between egg albumen and menhaden oil was calculated to be 19 kilogram calories per mole. This value, which lies between the values of 16 kilogram calories per mole for unsaturated fat oxidation and 30 kilogram calories per mole for carbonyl-amine browning would indicate that we are dealing with a combination of these two types of reactions.

METHOD OF MEASURING THE DEGREE OF BROWNING: In subsequent experimental work, precise measurement of the effect of a number of factors upon the degree of browning was made with the differential color instrument. Emulsions of fish oil and protein were allowed to react in Petri dishes, and the degree of browning was obtained objectively by making reflectance measurements through the bottom of the dish. The results were expressed in terms of $\triangle E$, the deviation of a sample, in Bureau of Standards units, from its original color. To make data comparable regardless of the initial color of any individual sample, we calculated the deviation ratio, $R = \triangle E / \triangle E_{max}$, where $\triangle E_{max}$ is the distance, in Bureau of Standards units, between the initial color of a sample and pure black.

Color changes of samples were compared to those of controls by subtracting from the deviation ratio, R, of the specific sample that of the control, R_c. The value $(R - R_c)$ is a measure of the change in the color behavior of an emulsion resulting from a known difference between it and the control.

PROTEIN-OIL REACTION AND OIL-OXIDATION REACTION: Experiments were set up to investigate the effect of conditions that might favor or retard the protein-oil reaction or the oil-oxidation reaction. Thus acetylation of the protein would retard or stop the protein-oil reaction, whereas incorporation of antioxidants would retard the oil-oxidation reaction. Comparing plots of $(R - R_c)$ values against time, we found that both antioxidants (NDGA[1/], BHT[2/], Santoquin) and prooxidants (cupric ion, hemoglobin, oxygen) diminished the rate of browning. Increased rate of browning occurred only when the active carbonyl amine (Maillard) reaction was blocked by acetylation of the egg albumen to make the protein amine groups inaccessible or when active carbonyl groups were made unavailable by treatment with sulfite ion.

TENTATIVE HYPOTHESIS: Although this work is still in progress, a tentative hypothesis has been drawn up to account for these observations. Three different reactions--called (1), (2), and (3)--are postulated as competing to some extent for the available reactants:

(1) Active carbonyl amine browning, yielding a more lightly-colored product than that from (2).

(2) Unsaturated lipid oxypolymerization.

(3) Rapid unsaturated lipid oxidation, also yielding a more lightly colored product than that from (2).

Treatment of emulsions to block active carbonyl amine browning favors reaction (2) with resulting augmented development of color. On the other hand, antioxi-

1/ Nordihydroguaiaretic acid.
2/ Butylated hydroxyanisole.

dants block (2) and (3), whereas prooxidants divert reactants from (1) and (2); and thus both types of treatment diminish the rate of color development. It is to be noted, however, that the decrease in the rate of browning is more pronounced when caused by the antioxidants BHT and Santoquin, than when caused by the pro-oxidants.

SUMMARY

1. The browning reaction, which results in formation of rust in frozen fish and darkening during canning of certain species of fish as well as development of brown colors in fish meal and other fishery products, is being studied.

2. It has been shown that a number of different reactions are concerned in the development of these brown colors.

3. These reactions include (1) those between oil and protein at the carbonyl and amino groups, (2) oxypolymerization, and (3) oxidation of unsaturated oils.

4. Factors important in controlling these various reactions are being investigated.

5. A hypothesis concerning the role of these different reactions in the development of brown discoloration products has been formulated.

LITERATURE CITED

BROCKLESBY, H. N.
1929. A CHEMICAL STUDY OF THE OIL OF SALMON IN COLD STORAGE. MANUSCRIPT REPORT OF THE EXPERIMENTAL STATION, FISHERIES RESEARCH BOARD OF CANADA, PRINCE RUPERT, B. C.

TARR, H. L. A.
1950. THE MAILLARD REACTION IN FISH PRODUCTS. JOURNAL OF THE FISHERIES RESEARCH BOARD OF CANADA, VOL. 8, NO. 2 (MAY), PP. 74 81.

FOOD PROTEIN INCREASED WITH FISH FLOUR

Adding a small amount of defatted fish flour to millet and grain sorghum results in as much as sixfold increase in the body weight of rats fed on this kind of diet, Dr. Barnett Sure, University of Arkansas, Fayetteville, reported to the American Institute of Nutrition Meeting in Chicago.

The defatted fish flour is a mixture of carp, smelts, and whiting and increases the protein efficiency of the foods as well as the body weight, he reported.

When 5-percent defatted fish flour was added to the proteins of grain sorghum, the animal's body weights increased by 644 percent and the protein efficiency ratio, which is the gain in weight per gram of protein intake, increased by 213.2 percent.

--Science News Letter, May 11, 1957

OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS

Part IV - Progress on Studies Concerning Oxidation of Extracted Oils

By E. Einset,* H. S. Olcott,** and M. E. Stansby***

ABSTRACT

Studies are being made to determine the mechanism of oxidative deterioration prevailing in extracted fish oils. Initial studies were made to determine the tocopherol (a naturally-occurring antioxidant) content in oils extracted from 10 different species of fish. The stability of the tested oils was greater in oils containing a higher tocopherol content and lower in oils containing higher iodine numbers.

INTRODUCTION

In previous papers in this series, results obtained when oil, located in fish tissue or fish meal, oxidizes have been described. When oil is extracted from fish tissue (either commercially or under laboratory conditions), however, the resulting oil may behave quite differently from the way that it does while it is still in the tissue. The extracted oil is no longer in contact with such tissue constituents as protein and hematin compounds, which can play a profound role in modifying the oxidation process. In addition, the heating of the oil during processing may destroy other antioxidants or pro-oxidants that might have altered the oxidation pattern if the oil had remained in the tissue. A program therefore has been started to investigate the oxidation of extracted fish oils, and some preliminary results are described in this report.

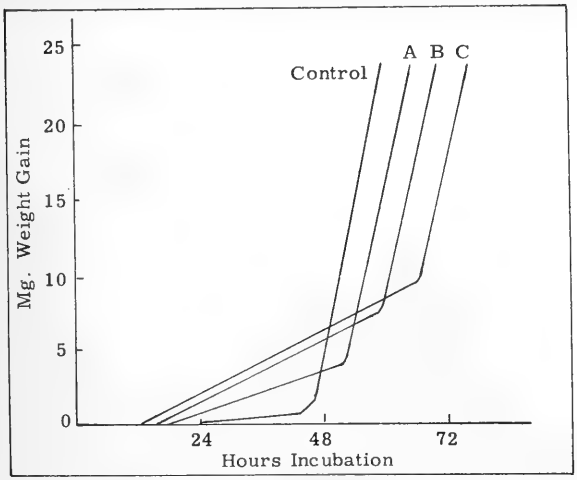


Fig. 1 - Effect of different levels of alpha-tocopherol on the induction period of pink salmon oil. (Incubation in 50 ml. beakers.)
A = 0.1 percent
B = 0.3 percent } alpha-tocopherol
C = 0.5 percent

This phase of the program is being undertaken primarily to obtain a better understanding of the oxidation of commercially-produced fish oils. Some work, however, is included on noncommercial oils extracted in the laboratory from species of fish not generally used for commercial fish-oil production. Information on the chemical behavior of such extracted oils, when combined with that on the behavior of these oils when still in the fish tissue, will give us a better insight into the role of the biocatalysts present in the tissues on the course of oxidation of all fish oils.

*Chemist, U. S. Fish and Wildlife Service, Berkeley, Calif.
**Institute of Marine Resources, University of California, Berkeley, Calif.
***Chief, Pacific Coast and Alaska Technological Research, Fishery Technological Laboratory, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, Wash.

Work undertaken so far on extracted oils has dealt with the following: (1) a survey of some fish oils in which their stability was compared with their iodine numbers and their contents of naturally occurring tocopherols and (2) the further elucidation of details on the role of naturally-occurring tocopherols in retarding oxidation of fish.

OXIDATION RATE OF EXTRACTED FISH OILS

The rate of oxidation of commercially-prepared tuna, menhaden, sardine, pink salmon, and herring oils was compared in a Warburg apparatus at 37° C. After 1 hour, the tuna oil had adsorbed 94 microliters of oxygen per gram as compared to 67 microliters for menhaden oil and 46 and 27 for two different batches of sardine (pilchard) oil. Neither pink salmon nor herring oils absorbed any oxygen under these conditions.

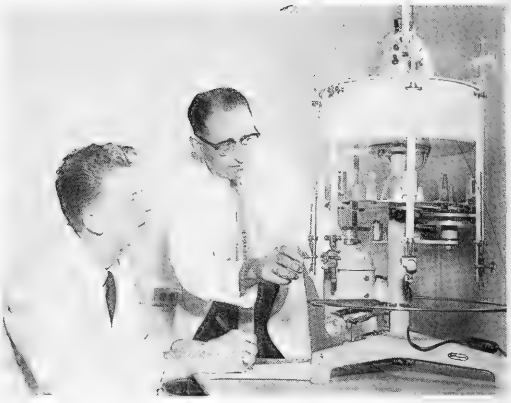


Fig. 2 - Operation of Warburg equipment for measurement of oxygen uptake by fish oils.

A number of fish samples were treated to extract the oil on a laboratory scale by (1) blending in a Waring Blendor with water and ethyl ether, (2) separating out the ether phase in a centrifuge, and (3) evaporating the ether phase under an atmosphere of nitrogen. The resulting oil was stored under nitrogen in a refrigerator until needed. The oils were analyzed in the form as prepared and also after extended oxidation, which was carried out by storage of 10 grams of oil in a 9-centimeter petri dish at 91° F. for 70 hours. Oxidation rate in a Warburg apparatus at 37° C. and total tocopherol content were determined, with the results given in table 1. There was (1) a general increase in oxidation rate after prolonged oxidation (the sheepshead oil was an exception) and (2) a decrease in tocopherol content.

Table 1 - Properties of Extracted Oils

Oil	Rate of Oxidation of Oil		Total Tocopherol Content of Oil	
	Original	Oxidized	Original	Oxidized
	μ l. Oxygen Per Hr. Per Gram		μ g. Per Gram of Oil	
Sheepshead	279	194	27	3
Mountain trout	14	36	46	35
Pink salmon	7	40	101	0
Lake chub	4	39	297	58
Commercial tuna 1/	113	188	112	43

1/ Species unknown, probably mixed skipjack and yellowfin.

Table 2 - Comparison of Stability of Fish Oils with Iodine Number and Tocopherol Content

Oil	Induction Period at 50° C.	Iodine No.	Tocopherol Content
	Hours		Mg./Kg.
Sardine . . .	6	199	40
Menhaden. .	9	167	66
Tuna	36	185	159
Herring . . .	45	142	142
Pink salmon	48	164	217
Whale	93	161	198
Sablefish . .	136	99	628

TOCOPHEROLS AND FISH-OIL STABILITY

Preliminary experiments indicated an inverse correlation between the rate of autoxidation of various fish oils and their content of tocopherols (table 2). It was

Table 3 - Protection Afforded Pink Salmon Oil by Various Antioxidants

Antioxidant		Time Needed for Oil to Gain 1 Percent in Weight
Kind	Amount	
	Percent	Day
None (control)	-	1.5
2,2'-methylenebis (4-methyl-6-tertiary-butylphenol	-	
	0.5	1/ 95
5-ethoxy, 2-2-4-trmethyl-dihydroquinoline	0.1	8
	0.5	87

1/ This 1-gram sample had gained a total of 5.0 mg. in weight and was still fresh when the test was discontinued.

observed that treatments tending to destroy the tocopherols also accelerated autoxidation, which is in accord with the theory that tocopherols play an important role in the relative stability of the fish oils. Successively larger additions of tocopherols to fish oils, however, increased the rates of the initial oxygen absorption. It has been reported previously that, at certain higher concentrations, tocopherols may become pro-oxidants. We do not know what this concentration is for the various fish oils, but increasing concentrations of alpha-tocopherol, gamma-tocopherol, and mixtures of the two did not give proportionate decreases in the autoxidation of several of the fish-oil samples tested. This aspect is being studied further.

To investigate the effect of alpha-tocopherol upon "stable" fish oils, that is, those still in their induction periods, some method was desired that would obviate certain difficulties associated with long-term Warburg experiments. The method used consisted of recording the increase in weight, due to oxygen absorption, of a fish oil during a period of exposure to air in a forced-draft oven at 50° C. In these experiments, 1-gram samples of oil plus the appropriate level of antioxidant were weighed into small beakers, and the beakers were placed in the oven. At intervals, the beakers with their contents were removed and then allowed to cool at room temperature for one-half hour before being weighed. Figure 1 illustrates what effect different levels of alpha-tocopherol have upon the induction period of pink salmon oil. Increases in the tocopherol level of the oil exert a definite although minor effect upon the stability of the oil.

COMMERCIAL ANTIOXIDANTS AND PINK SALMON-OIL STABILITY

Two synthetic antioxidants in relatively large amounts (5-ethoxy, 2-2-4-trimethyl-dihydroquinoline, and 2,2'-methylenebis (4-methyl-6-tertiary-butylphenol) gave excellent protection to pink salmon oil as measured by the weight-gain method (table 3). The former is not presently permitted by the U. S. Food and Drug Administration to be used in contact with foods.

SUMMARY

1. The tocopherol content of a group of fish oils varied from about 40 micrograms per gram of oil for sardine oil to 630 micrograms per gram of oil for sablefish oil.

2. The induction period of the oils tested was roughly proportional to the tocopherol content and roughly inversely proportional to the iodine number.

PRESENT STATUS OF THE FISH MEAL QUALITY RESEARCH UNDERTAKEN TO MEET THE NEEDS OF THE INDUSTRY

Until recently, all poultry nutritionists, although with some reservations, had accepted fish meals as an essential source of animal protein. There has now arisen the matter of effects of processing conditions on vitamin content and on nutritive value in general. Then too, there has been a marked improvement in the quality of the principal competitor to fish meal--soy bean meal. An intensive and effective research and quality improvement campaign has made the latter product very acceptable in poultry rations.

It behooves the fish meal industry to justify their position in the poultry nutrition field by establishing similar improvements in its products. These improvements should include a standardized product on which detailed information is available.

For about five years the Nutrition Council of the American Feed Manufacturers Association has urged studies designed to insure the following desirable characteristics in fish meal:

1. Uniform color.

2. Uniform particle size.

3. Uniform quality (believed to be largely related to protein).

The fish meal and oil producers group, a very substantial part of our nation's fishing industry, have utilized a double-barreled technique in working toward these objectives. Individual processors have studied methods to improve their own products. In addition, they worked to obtain adequate funds for study of the factors contributing to these admittedly desirable goals by the Federal Government's fisheries products research agency, the Technological Section of the U. S. Fish and Wildlife Service. Such funds were made available through the Saltonstall-Kennedy Act of 1954.

A broad program of research was planned by the Service administrative personnel in concert with competent industry scientists, to elucidate: (1) Those characteristics of fish meal which are related to one or more of such supposedly quality-affecting factors as condition of raw material, processing variables of time, equipment and temperature, and of meal storage conditions; (2) the establishment of the relation of these processing variables to the nutritive values of the resulting fish meals as measured by (a) practical poultry (broiler) feeding tests; (b) estimations of effect on "growth factor" and on the amount and rate of availability of the principal amino acids in the fish meal protein; and (c) any variability in residual content of the essential vitamins.

The research so laid out has been under way for more than two years at several universities considered entirely capable in their respective fields of effort, as well as at the several Service technological laboratories.

UNIFORM COLOR: The color of fish meal, as a result of these studies, has been judged to be: (1) a function of the material in the digestive tract of the fish at the time of meal preparation, (2) a function of the size and the size range distribution of the fish meal particles delivered to the feed mixer, and (3) the degree of chemical alteration resulting from oxidation and reaction between oil and protein components of the meal which occurs during drying and especially during curing and subsequent storage.

UNIFORM PARTICLE SIZE: The studies referred to above indicated that particle size and the uniformity thereof, as delivered to the feed mixer, can be adjusted within rather broad limits, by appropriate control of such related but variable factors as condition of raw material, cooking and pressing times and temperature, conditions of drying and curing, and grinding including blending of scrap from the curing pile. In this connection, it may be pertinent to mention that the bone particles, sometimes concentrated in the exterior and bottom portion of the curing pile, were found to have very nearly as high protein nutritive value as the non-bone body protein portions. In fact, protein partition studies have shown markedly little variability in the amounts or types of desirable protein available regardless of the considerable variability in any and all of the several factors under study.

UNIFORM QUALITY: This particular phase of the fish meal controversy has been attacked from several angles. It must, therefore, be considered first as to the progress in each, and second in terms of the over-all aspects. The elements of quality studied were four: (1) the amounts of unknown growth factors delivered in the fish meals under study; (2) the effects of the processing or handling variables investigated on the vitamin content of the fish meals; (3) the evaluation of small differences in amount and rate of availability of the principal amino acids of these fish meals and consequent quality of the protein as a function of the growth response when measured under certain stress conditions; and (4) variability in rate of gain of weight and in feed efficiency as measured by a practical commercial ration on chickens in battery-lot tests of broilers from one day old to 10 weeks of age.

The reports contained in this Supplement are to be considered Progress Reports on research now under way on the over-all question of fish meal quality.

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky and Vera Eggleston

* * * * *

Photograph Credits: Photographs on pages not mentioned were obtained from the Service's file and the photographers are unknown.

Pages 1 and 2-- University of Wisconsin Photographic Laboratory, Madison, Wisc.

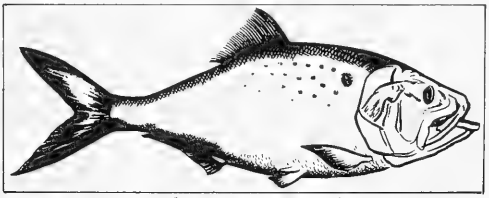
INT.-DUP. SEC., WASH., D.C. 19411

MENHADEN INDUSTRY--PAST AND PRESENT

Fishery Leaflet 412 (Menhaden Industry--Past and Present) describes the early history of the menhaden industry from its start in New England sometime prior to 1875, the role of the Federal Government in the development of this industry, a description of the menhaden, the early history of the menhaden oil industry, and a comparison of the early and modern menhaden plants, economic comparison of past (about 1875) and present-day (1950) plant operations, geographic shifts in the importance of menhaden fisheries, fishing methods, uses of menhaden--past and present, and the future of the menhaden industry. Since this Fishery Leaflet was published (June 1953), the menhaden have returned to New England waters and at the present time are of considerable economic importance to the port of Gloucester, Mass.

The menhaden industry has expanded considerably during recent years--the catch reached a record high of 2.1 billion pounds in 1956, plants and vessels have been modernized, demand and prices for both menhaden oil and meal have been excellent, and due to a vigorous program of research on the improvement of present and the development of new uses, the future appears bright for this industry.

The modern plant is mechanized to the ultimate degree. Fish are unloaded from the hold by conveyors, or, in many plants, by large suction pumps, onto conveyors which carry them through a weighing device and directly to the cookers or to temporary holding bins. The fish are then forced through long steam cookers in a continuous stream by screw conveyors, and, while hot, go directly to huge continuous screw presses.



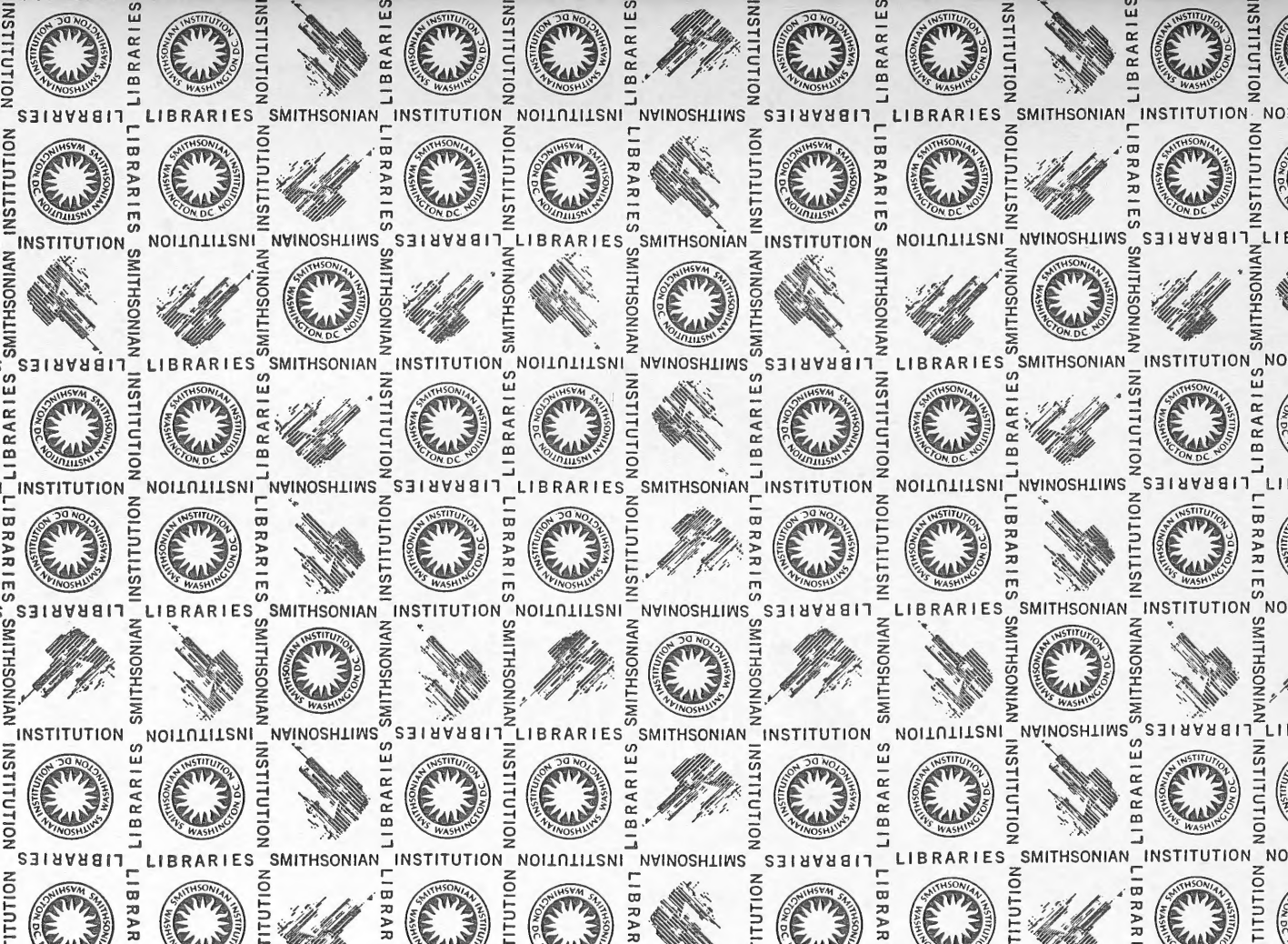
The menhaden, alias porgy, fatback, mossbunker, old wife, bony-fish, hardhead, white-fish, bug-fish, chebog, alewife, and yellowtail shad--in short Brevoortia tyrannus--is similar in appearance to the herring, has a black spot just back of the head on each side, ranges in size from 5 to 8 inches, which make up most of the present catch, to a maximum of 18 inches.

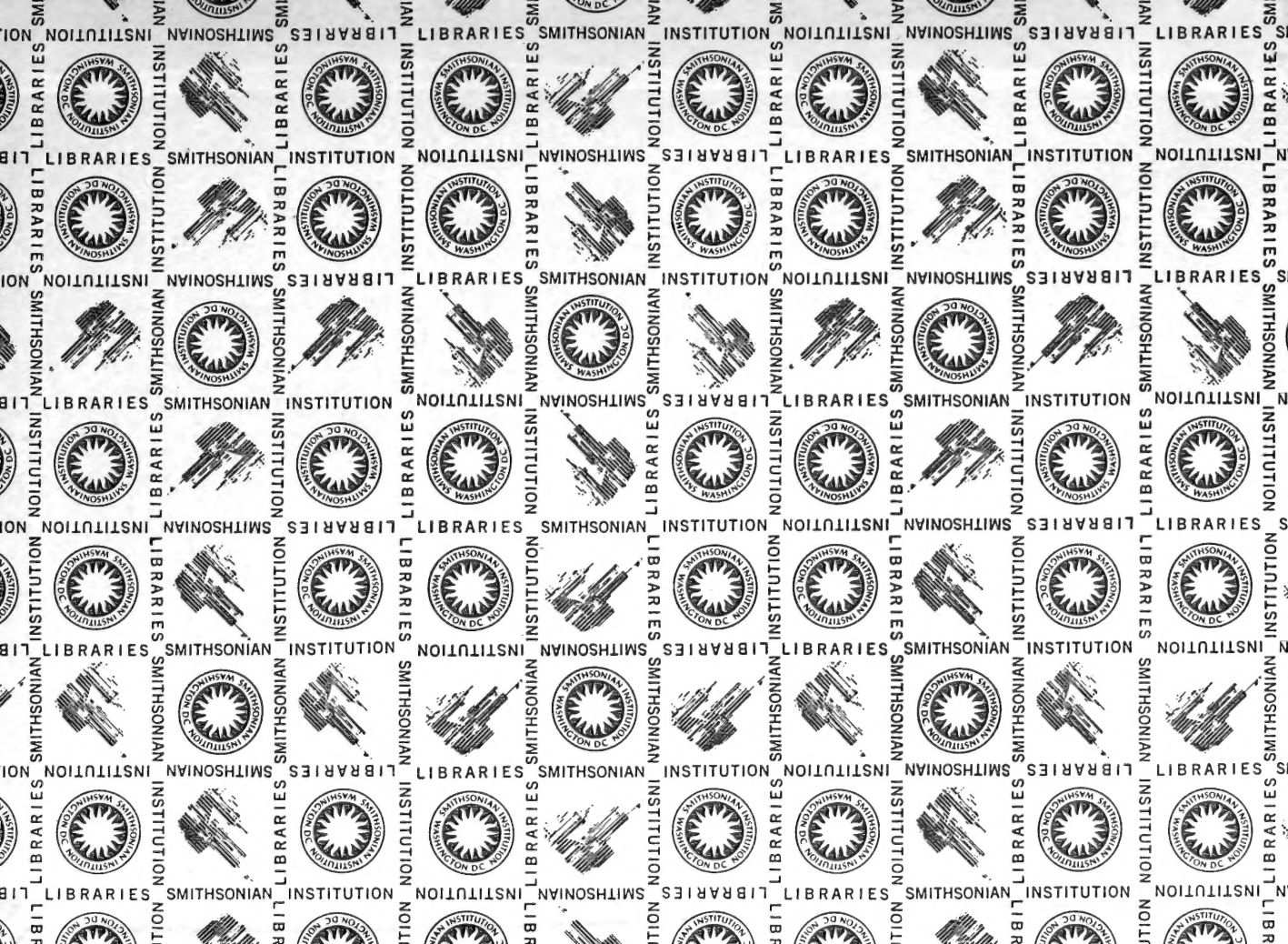
In some plants the press liquors are still run off to settling tanks, a procedure not unlike the earliest methods. However, in most modern plants the fines are first filtered out on vibrating screens and the filtrate of liquor-and-oil mixture goes through two batteries of centrifuges. An almost dry, clear, yellow oil emerges from the second series of centrifuges. The water phase, called stickwater, contains considerable amounts of dissolved protein and vitamins but was ordinarily discarded. However, it is now concentrated to 50-percent solids in many plants to yield "condensed fish solubles." Most plants now have equipment of all types individually driven by electric motor rather than by steam power. This eliminates the maze of shafting and belts which is necessary for power transmission from a single central power unit.

The press cake is fed directly into large rotary, direct flame or steam driers where the wet material is reduced to "scrap" with a moisture content of six to ten percent. Most of the driers are now fired with fuel oil rather than coal, a change which results in a cleaner, more readily controlled operation. Some plants have cyclone separators to remove fine material from the exhaust gases.

The dried scrap is piled on the "scrap house" floor to cool before being bagged. In many plants, cooling is hastened by shoving the scrap into a conveyor that carries it up to the ceiling and then sifts it down to the floor in a fine shower. The ultimate in mechanical handling is reached by plants using small truck-tractors equipped with 'dozer blades for moving meal piles around the cooling floor.

In some plants the scrap is ground to meal, in others the unground scrap is shipped. In either case, the material is weighed into sacks automatically and the sacks are sewed by a special sack-sewing machine in modern plants. Another recent innovation in the menhaden industry is the use of pallettes and special fork-hoist trucks to load the sacked scrap or meal into trucks or freight cars.


SMITHSONIAN INSTITUTION LIBRARIES


SMITHSONIAN INSTITUTION LIBRARIES