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JOHN L. FARLEY, 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
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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.

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COVER: Aerial view of the fishing vessel docks at Tampa--Florida's largest shrimp-producing port. A fleet of over 200 vessels operated out of Tampa in 1954 and, supplemented by vessels from other ports, landed a total of over 15 million pounds of shrimp (heads on), and over 2 million pounds of grouper, mullet, sea trout, red snapper, Spanish mackerel, and other species.

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COMMERCIAL FISHERIES REVIEW

July 1955 Washington 25, D.C. Vol.17, No.7

FREEZING FISH AT SEA--NEW ENGLAND

Part 9 - Improvements in the Brine - Freezing Mechanism on the Trawler Delaware

By C. G. P. Oldershaw*

ABSTRACT

The original experimental freezer that was used on the U. S. Fish and Wildlife Service's research trawler Delaware demonstrated the feasibility of freezing fish in brine on a fishing vessel and provided data and experience that proved valuable in designing a new freezer that is more practical for use in the New England trawl fishery.

This new freezer consists essentially of a deep rectangular tank in which the fish are carried through refrigerated brine in large cylindrical baskets mounted on an endless-chain conveyor. The freezer is rugged, yet simple in design and easy to repair; and it permits loading and unloading on deck. Because the fish that are unloaded from the freezer can be dropped into the frozen-storage hold through hatches located on deck adjacent to the freezer, the fishermen need spend only a minimum of time in the hold when storing the fish.

The design of the new freezer is described in detail.

INTRODUCTION

Freezing fish at sea holds promise of certain economic and technological advantages over the time-honored icing method for preserving the catch aboard fishing vessels. Principal among these potential advantages are the following:

Fig. 1 - View showing location of fish charging and discharging portion of the brine-freezer tank.

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(a) Catching fish on more distant grounds.

(b) Landing fish of high and uniform quality.

(c) Landing capacity loads.

(d) Leveling out supplies of raw material for the processing plant through frozen storage.

Freezing at sea is not new, having been practiced successfully, for example, by the West Coast tuna fishery for many years. However, introducing the practice to another fishery--in this case the New England fishery--requires the development of new equipment and procedures to suit the particular conditions encountered.

One of the principal objectives of the freezing-fish-at-sea project at the Boston Technological Laboratory of the U. S. Fish and Wildlife Service is to develop equipment for handling, freezing, and storing fish which can be readily installed on existing New England trawlers. This approach to the problem has been taken in order that heavy capital expenditures for extensive alterations or new vessel construction may be avoided and that the average annual payloads of the existing vessels may be increased.

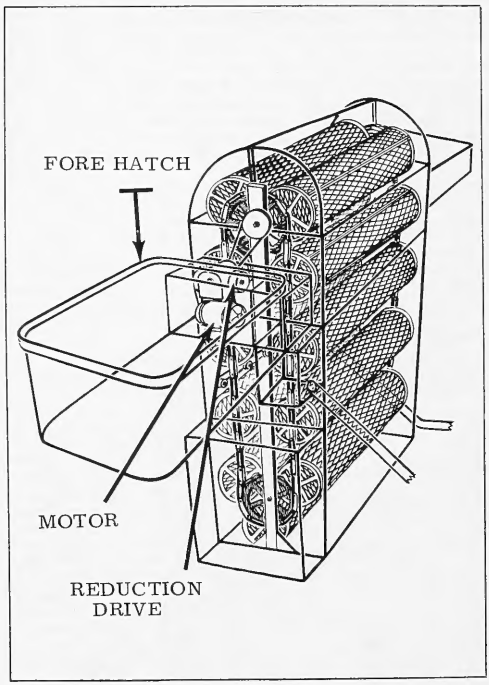

Fig. 2 - Arrangement of perforated containers of freezing mechanism.

Since the processing of raw material into a finished product aboard ship is not involved, the freezer-equipped trawler should not be classed as a factoryship. Rather, fitted with freezing and storage facilities, the trawler would be enabled to land full loads of uniformly high-quality raw material for processing (thawing, filleting, and refreezing of the fillets) in shore plants.

The purpose of this report is to outline briefly the earlier work on the project, and then to describe in more detail the recent progress in the development of equipment aboard the Service's experimental freezing trawler Delaware.

PRELIMINARY INVESTIGATION

Experiments conducted in 1948 (Hartshorne and Puncochar 1952) indicated that frozen fillets of good quality can be produced from haddock frozen in-the-round at sea. The refreezing of these fillets was found not to be deleterious, as is traditionally believed, provided the fish were frozen when fresh-caught and that normally good commercial practices were followed when the frozen fish were thawed and filleted and the fillets were refrozen.

These results led to further experiments (Magnusson, Pottinger, and Hartshorne 1952) designed to explore, on a pilot-plant scale, methods of freezing fish at sea and of thawing, filleting, and refreezing the fillets ashore. In these studies, technological, economic, and engineering

aspects of the problems were all considered in order that the outcome might form a basis for commercial scale experimental development and eventually lead to successful commercial operations.

Of the freezing methods studied, immersing the fish in refrigerated brine appeared the most promising and was therefore chosen for the commercial-scale experiments. The chief favorable features of brine freezing are that it is fast and that the equipment is compact, simple, and rugged.

Of several thawing methods investigated, immersing the frozen fish in circulating fresh water appeared best, and this method was developed through the pilot-plant stage (Magnusson and Hartshorne 1952).

THE TRAWLER DELAWARE

Data obtained in the pilot-plant experiments with a small-scale brine freezer were used as a basis for the design of a commercial-scale freezer for a fishing vessel. The next step was the acquisition, reconditioning, and equipping, in early 1951, of the trawler Delaware. The 148-foot steel trawler, which had been in commercial operation for several years, was among the larger vessels of the New England fishing fleet. Alterations to the hold and the installation of the refrigeration machinery and an experimental freezer have been described fully in this series of reports (Butler, Puncochar, and Knake 1952; Oldershaw 1953). Briefly, this consisted of installing a 25-ton absorption refrigeration machine in the aftermost pen section of the original fish hold, installing a brine freezer, and dividing the hold into two refrigerated rooms (for 0° F. storage of frozen fish) and one insulated pen section for the storage of iced-gutted fish. This hold arrangement facilitates the comparison of brine-frozen fish with iced-gutted fish from the same catches and also provides several storage areas for separating experimental lots of frozen fish.

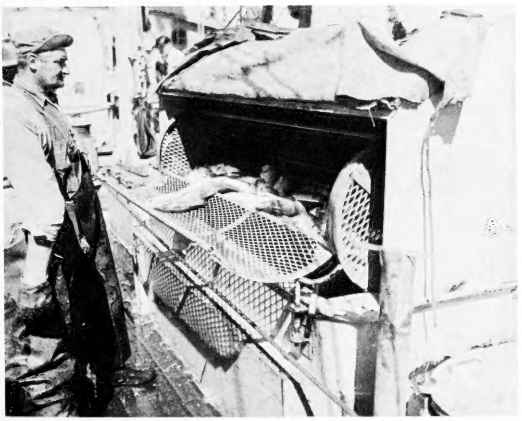

Fig. 3 - Panel of basket is swung open for loading or unloading fish.

REFRIGERATED HOLDS: The two 0° F. cold-storage holds are refrigerated by a secondary refrigerant (a solution of ethanol), chilled by a 5-ton shell-and-tube flooded-type cooler. This solution is circulated through a total of 3,900 linear feet of $1\frac{1}{4}$-inch iron pipe coils mounted on deckheads, bulkheads, and sides of the holds. The original hold insulation of 4 inches of cork, lined with $1\frac{1}{2}$-inch tongue-and-groove sheathing, was considered adequate for the experimental purposes of the Delaware.

FIRST EXPERIMENTAL FREEZER: The first experimental freezer on the Delaware was located amidships in the after-refrigerated hold. It consisted of a rectangular steel tank that contained the refrigerated brine. Mounted on a horizontal drive shaft in the tank was an expanded metal drum divided into 12 equal segments fitted with hinged covers. Each segment had a capacity of about 250 pounds of fish. The brine was pumped through a shell-and-tube cooler, circulated through the freezer, and then returned through a strainer to the cooler. Except during experiments in

which other freezing solutions were being tested, the brine was 22-percent by weight sodium-chloride solution. The freezer was designed to operate at a temperature between 2° and 5° F.

REFRIGERATION MACHINE: The 25-ton ammonia-absorption refrigeration machine was installed to handle both the freezing and the cold-storage loads. To supply steam to the refrigeration machine as well as to heat the vessel, the original 5-hp. boiler located in the engineroom was replaced with a 30-hp. boiler, with no appreciable loss of usable engineroom space. Since the boiler is fired with Diesel oil and the vessel has more than adequate fuel capacity for normal trips, no additional fuel tanks were required.

As a safety measure, the refrigeration machinery, including the 20-ton brine cooler and the 5-ton ethanol-solution cooler, was confined in a watertight compartment equipped with spray nozzles, a sump, and an overboard discharge pump. In case of a serious ammonia leak, the compartment can thus be flooded and then pumped out.

DEVELOPMENT OF AN IMPROVED FREEZER

The original experimental freezer on the Delaware was used extensively during the operating seasons of 1951 and 1952. During that time the machine fulfilled its principal requirements of demonstrating the feasibility of freezing fish in brine on a fishing vessel, supplying the samples of round-frozen fish for laboratory experiments, and providing data and experience upon which the design of an improved freezer could be based. Its chief shortcomings were its inconvenient location within the refrigerated hold and the difficulty encountered in handling the fish from the deck to the freezer and then in discharging them from the freezer into the cold-storage pens.

The following were considered necessary features to be incorporated into the design of a new freezer:

(a) Permit loading and unloading from either side of the deck. (Fish unloaded from the freezer could then be dropped into the cold-storage hold through adjacent hatches.)

(b) Have capacity to handle anticipated normal catches, plus an appreciable overload.

(c) Occupy the least possible deck space and in no way interfere with normal operation of deck gear.

(d) Agitate the fish sufficiently to prevent their sticking together and to promote rapid freezing.

(e) Provide for draining excess brine from the fish before they are discharged into the hold.

(f) Be simple in design, rugged, and easy to repair.

(g) Provide for continuous straining of the brine, with easy access to the strainer for cleaning on deck.

Of several proposed freezers considered, the one judged to be the most satisfactory consisted of a deep rectangular brine tank, extending above deck, in which the fish would be carried through the brine in large cylindrical baskets mounted on an endless chain conveyor.

In the development of this new freezer, it was decided to proceed directly to the full-scale installation on the vessel rather than to undertake small-scale studies

in the shore pilot plant. Since the practicability of brine freezing at sea has already been established, the new freezer was regarded as a step in the development of equipment rather than a new development in itself. Furthermore, the machine could undergo realistic tests only at sea under actual operating conditions. The following is a description of the new freezer, which was installed on the Delaware just prior to the 1953 summer operating season.

BRINE TANK: The rectangular brine-freezer tank, approximately 8 feet long by 5 feet wide by 14 feet deep, is situated lengthwise on the centerline of the vessel between the aft and mid-fish hatches (fig. 1). It extends upward from the bottom of the frozen-storage hold to a height of about 30 inches above deck. The tank was constructed by removing the top from the original brine tank and extending the sides upward through a 5- by 8-foot opening cut in the deck. Fabricated of half-inch steel plate reinforced by vertical 7-inch by 4-inch by $\frac{7}{16}$-inch angles on approximately 2-foot centers, the tank is welded to the deck plate and adjacent hold stanchions.

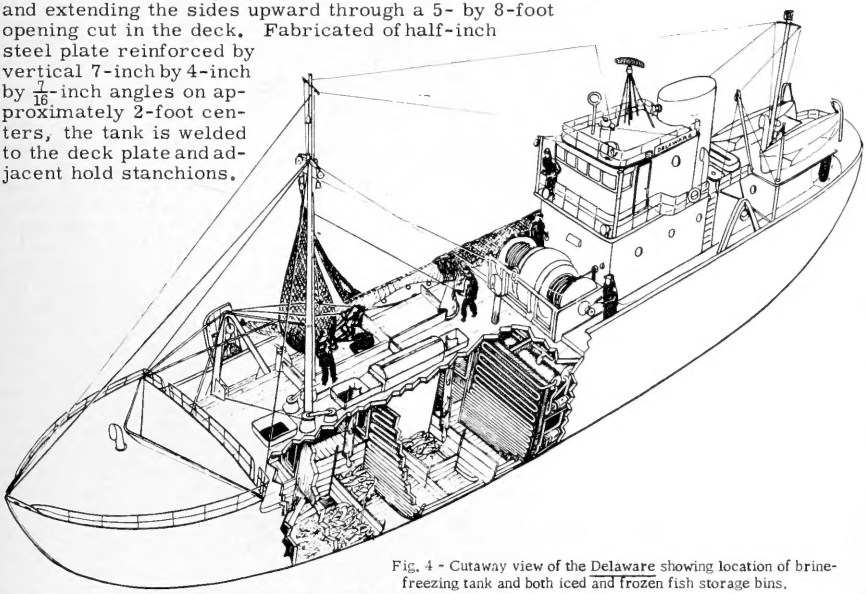

Fig. 4 - Cutaway view of the Delaware showing location of brine-freezing tank and both iced and frozen fish storage bins.

It is thus a watertight integral part of the ship's structure. Filled to a depth of about 10 feet, the tank has a capacity of about 35,000 pounds of sodium-chloride brine.

Four 2-inch inlet ports, located on the starboard side of the tank about one foot below the deck, feed the refrigerated brine at 120 gallons per minute from a 3-inch header. The brine is forced to flow downward on the starboard side and upward on the port side by a vertical baffle attached to the conveyor frame in the center of the tank.

An overflow chamber, approximately 18 inches square, extending from 2 feet above deck to $3\frac{1}{2}$ feet below it, is welded to the forward end of the tank near the port side. The chamber contains a removable strainer basket 12 inches in diameter by 16 inches deep, which is made accessible from the deck through a hinged cover atop the chamber. The brine flows into the chamber through a 18- by 8-inch opening cut in the tank wall and, after passing through the strainer, returns to the brine-circulating pump through a 4-inch return line. This centrifugal pump, driven by a 2-hp. motor, is located in the refrigeration machinery compartment at an elevation of approximately 5 feet below the liquid level in the brine tank. It pumps the brine first through the shell-and-tube brine cooler, which is also located in the refrigeration machinery compartment, then out to the freezing tank, to complete the brine circuit.

The tank may be pumped out by opening the valve in a 3-inch line running from the bottom of the tank to the brine return line. The brine is then discharged overboard through a line connecting with the refrigeration plant cooling-water system.

Other tank accessories include a 22- by 16-inch removable inspection plate on the lower aft end, a 2-inch drain plug, two sets of $1\frac{1}{2}$- by $1\frac{1}{2}$-inch angle guides to receive the conveyor frame, and a removable hoodlike cover. The cover, shown in figure 1, has $\frac{1}{4}$-inch steel plate semi-circular ends to which is welded a No. 14 gauge, sheet-steel hood. The hood envelopes only the upper portion, leaving a full length, 24-inch-wide opening on each side for the loading and the discharging of the fish. The openings, formerly protected by drop curtains of heavy canvas, are now fitted with hinged plywood doors. The purpose of the cover is to prevent excessive refrigeration losses through exposure of the freezing machine to the atmosphere and to prevent the entrance of sea water into the machine during rough weather. The tank opening above the deck is insulated by a 3-inch layer of cork, which in turn is protected by sheet-metal sheathing.

FREEZING MECHANISM: The freezing mechanism is simply a vertical endless-chain conveyor, which continuously circulates the baskets of fish down through the brine and then up to a convenient working height. Eleven baskets, 7 feet long by 2 feet in diameter, are suspended horizontally between two chains, one at each end of the tank (fig. 2). The conveyor may be stopped at any point so as to hold any particular basket in position at the rim of the tank for loading or discharging fish. The main components of the freezing machine are the frame, the conveyor mechanism, the drive, and the baskets.

The frame consists of two 6-inch channels, cross-braced by $2\frac{1}{2}$-inch standard pipe, which stand upright at the middle of each end of the tank, extending from the bottom to the top. Their weight is distributed on the tank floor by 18-inch lengths of channel welded across the foot of each upright. The frame is held in place by the guides, previously mentioned, which are welded to the tank ends, astride the vertical center line. Pairs of parallel channels, mounted on arms welded to the main uprights, serve as tracks to guide the chains along their path between the upper and lower sprockets. These guides lend stability to the operation of the conveyor, especially in rough seas. Also attached to the frame is the central baffle of No. 16 gauge galvanized iron. It is tack-welded to the cross members and to the inner face of the uprights.

The conveyor mechanism consists of two No. 458 rivetless chains (4.0-inch pitch) running on pairs of sprockets 30.65 inches in diameter. The upper drive shaft, $2\text{-}\frac{7}{16}$ inches in diameter, rides in split babbitted pillow blocks bolted to the top of the frame; the lower $1\frac{1}{2}$-inch idler shaft rides in rubber bearings mounted on spring-loaded takeup assemblies, which move in slots cut in the web of the 6-inch channels.

The drive is housed in a $\frac{1}{4}$-inch steel enclosure at the forward end of the tank, adjacent to the overflow chamber, above deck. A 2-hp., 115V, DC motor drives the conveyor at $3\frac{3}{4}$ r.p.m. through a worm-gear reducer and chain drive. The $3\frac{3}{4}$ r.p.m. of the sprockets imparts a linear speed of 30 f.p.m. to the chains; thus the $29\frac{1}{3}$-foot chains, carrying 11 equally-spaced baskets, make a complete cycle in about 1 minute. The motor is controlled by a reversing switch, accessible from either side of the tank at the forward end. The normal direction of travel, looking forward, is counterclockwise in order that the baskets will be carried downward on the port side and upward on the starboard, against the direction of the circulating brine. The drive is controlled by a reversing switch for convenience in positioning the baskets for loading and discharging.

The cylindrical baskets, 2 feet in diameter by 7 feet long, were fabricated of No. 9 gauge flattened $\frac{3}{4}$-inch expanded metal, preformed into cylinders by rolling,

then welded to rigid frames. The ends of the frames were constructed of $1\frac{1}{4}$- x $1\frac{1}{4}$- x $\frac{9}{16}$-inch angle rolled to a diameter of 2 feet and strengthened by four $\frac{1}{4}$- x 2-inch flat steel spokes. The ends were then joined by 7-foot lengths of $\frac{3}{4}$-inch pipe spaced around the perimeter. For loading and discharging, each basket is fitted with a full-length, 20-inch-wide panel of expanded metal, rolled to form a section of the basket wall. In order that these panels could be swung outward and downward when the baskets were positioned on either the port or the starboard side of the tank, it was necessary to attach them to the basket frames by a combination hinge and latch. These fittings, which are similar to a common door bolt, were incorporated into the $\frac{3}{4}$-inch pipe frames of the panels. When extended the bolts act as hinge pins; when retracted they disengage the panel on one side, permitting it to swing out.

When the panel of a basket is swung open in the discharging position, it extends out over the edge of the tank (fig. 3). In this position the panel serves as a working surface and to some extent as a chute to aid in handling the frozen fish toward the hatches leading to the frozen-storage areas.

The baskets are mounted on the chains by pins in order that they may rotate freely. The pins protrude from the hubs of the baskets and fit loosely into holes in the chain links, where they are retained by lock nuts.

FREEZER CAPACITY: Each of the 11 baskets on the new freezer can be loaded with 500 pounds of round fish, giving the machine a total capacity of 5,500 pounds. Pilot-plant studies had indicated that at least 400 pounds could be frozen efficiently in the 20-cubic-foot baskets. Actual experience, however, showed that 500 pounds of round fish can be held in each basket without materially affecting the freezing rate.

As previously reported (Magnusson and Hartshorne 1952), the commercial varieties of fish studied in the current project may be conveniently separated into 3 size-groups. The maximum freezing times in the refrigerated brine, in order of size, are $1\frac{1}{2}$, 3, and 4-5 hours. Thus, the new freezing machine would, theoretically, be capable of handling 3,660, 1,830, and 1,100-1,370 pounds per hour, respectively, of the small, medium, and large fish. The actual sustained capacity of the freezing machine is limited, of course, by the capacity of the refrigeration machinery.

HOLD CAPACITY: A stowage rate of 33 pounds per cubic foot of hold space has been observed for the round-frozen fish on the Delaware. The stowage rate for iced-gutted fish in the New England trawlers is usually 45 to 50 pounds per cubic foot, whereas that reported for Northwest European trawlers is 32 pounds per cubic foot (Eddie 1953).

As now fitted for experimental freezing at sea, the Delaware has a cold-storage capacity of about 125,000 pounds of round-frozen fish. In addition, about 15,000 pounds of iced-gutted fish can be carried in the forward compartment (fig. 4).

Were the Delaware to be fitted for commercial rather than experimental operation, consideration could be given to relocating the refrigeration machinery in the main engine room in order to make more hold space available for refrigerated storage. By the employment of all of the original seven pen sections of the hold for refrigerated storage, the capacity would rise to an estimated 200,000 pounds of round-frozen fish. If 15 percent is deducted to compensate for the weight of the viscera in the frozen fish, this capacity would be equivalent to 170,000 pounds of iced-gutted fish. A survey shows that in 1953, for example, 5 New England trawlers, similar in gross tonnage to the Delaware, landed an average of 115,000 pounds per trip. Their landings exceeded 170,000 pounds in somewhat less than 10 percent of the trips and, in these instances, averaged about 200,000 pounds.

Owing to the peculiarities of the Delaware's hull design, its hold is considered proportionately smaller than are the holds of other similarly-sized trawlers. Were

a more typical 148-foot trawler to be equipped to freeze fish at sea, the capacity to store frozen fish would likely be greater than the 200,000 pounds estimated for the Delaware.

ACKNOWLEDGMENT

The author gratefully acknowledges the assistance of Mr. Boris Knake who prepared the drawings for figures 2 and 4.

LITERATURE CITED

Butler, Charles, and Magnusson, Harris W.
1952. Freezing Fish at Sea - New England. Part 4 - Commercial Processing of Brine-Frozen Fish. Commercial Fisheries Review, vol. 14, no. 2, pp. 26-29.

Butler, C., Puncochar, J. F., and Knake, B. O.
1952. Freezing Fish at Sea - New England. Part 3 - The Experimental Trawler Delaware and Shore Facilities. Commercial Fisheries Review, vol. 14, no. 2, pp. 16-25.

Eddie, G. C.
1953. Freezing at Sea. Paper No. 63, presented at the 1953 International Fishing Boat Congress, Food and Agricultural Organization, Paris, France, and Miami, Florida.

Hartshorne, Jean C., and Puncochar, Joseph F.
1952. Freezing Fish at Sea - New England. Part 1 - Preliminary Experiments. Commercial Fisheries Review, vol. 14, no. 2, pp. 1-7.

Magnusson, H. W., and Hartshorne, J. C.
1952. Freezing Fish at Sea - New England. Part 5 - Freezing and Thawing Studies and Suggestions for Commercial Equipment. Commercial Fisheries Review, vol. 14, no. 12a, pp. 8-23.

Magnusson, H. W., Pottinger, S. R., and Hartshorne, J. C.
1952. Freezing Fish at Sea - New England. Part 2 - Experimental Procedures and Equipment. Commercial Fisheries Review, vol. 14, no. 2, pp. 8-15

Oldershaw, C. G. P.
1953. Freezing Fish at Sea - New England. Part 6 - Changes and Additions to Experimental Equipment on the Trawler Delaware. Commercial Fisheries Review, vol. 15, no. 3, pp. 25-28.

WHEN WAS THE TRAWL NET INVENTED?

In common with other methods of fishing, no specific date can be assigned to when the method of fishing called trawling was first invented or used. A sketch of a net similar in many respects to a modern trawl was found on the back of an official document of about the sixteenth century, in Europe. No other information is available on this net. Trawling in the modern sense started at about 1880 in Europe with the introduction of steam propulsion for fishing vessels. The gear used today is basically similar to the gear used at the end of the last century, although many refinements have been added. Trawling is now one of the most important methods of commercial fishing. This method, involving the use of a flattened conical net dragged over sea floor and in the middle waters, should not be confused with trolling, in which a hook and line is dragged behind a moving boat. Unfortunately, the term line trawling is also used for the method of fishing which uses a series of baited hooks, which either lie on the bottom or are suspended in midwater. This method is more properly called long-line fishing.

--Sea Secrets, May 31, 1955
The Marine Laboratory, University of Miami,
Coral Gables, Fla.

FREEZING FISH AT SEA--NEW ENGLAND

Part 10 - Studies of Miscellaneous Handling Problems [1/]

By Harris W. Magnusson*

ABSTRACT

This paper deals with miscellaneous studies of the handling problems encountered in the freezing of fish at sea, storing frozen fish on the vessel and ashore, thawing the fish prior to filleting, and cutting the thawed fish and packaging the fillets. Freezing capacity and certain limitations imposed by the brine freezer are discussed along with some problems of storage of round-frozen fish on the vessel. Boxes holding about 410 pounds of fish are suggested for use in moving the fish into cold storage and storing them. Some suggestions for thawing the fish are made. The thawed round fish have proven easy to scale and fillet.

INTRODUCTION

That freezing fish aboard a trawler for subsequent thawing and processing ashore might be practical has been strongly indicated by the results already published by the U. S. Fish and Wildlife Service's Technological Laboratory in Boston, Mass. Fillets prepared from haddock frozen at sea on the experimental trawler Delaware and thawed ashore have proven equal to the best fillets prepared from haddock handled and iced in the usual commercial manner. Freezing fish at sea appears to offer a practical solution to the dream of deep-sea fishermen: always to deliver a capacity load with all the fish of a uniformly high quality and bringing the highest prices.

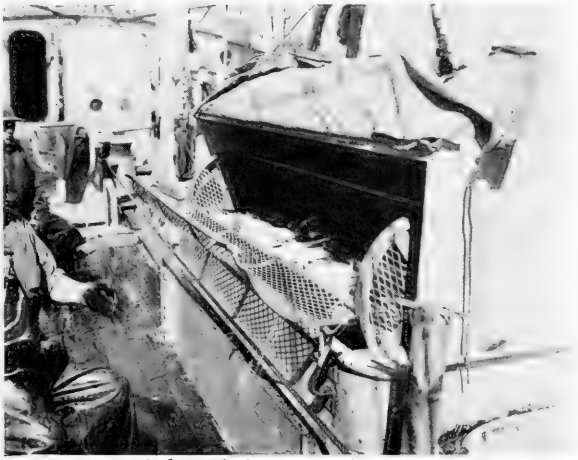

Fig. 1 - Doors on the freezer baskets are opened to permit loading and unloading

For reviews of the related literature and for details of the progress of other phases of this investigation, reference should be made to the earlier reports in this series. The background and the results of the entire investigation were reviewed in the paper by Puncochar and Pottinger (1953).

The installation of refrigeration equipment on the Delaware has not interfered in any way with the normal handling of the fishing nets. However, from the time the fish are on the deck, the procedures employed on the Delaware differ from those employed on a commercial trawler. This paper is a report on miscellaneous studies of the handling problems which are peculiar to (1) freezing fish at sea, (2) storing frozen fish on a vessel, (3) storing these fish ashore, (4) thawing frozen fish, and (5) cutting the thawed fish and packaging the fillets.

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1/ This report is a slightly modified version of a paper read before the Fisheries Symposium, Swedish Institute for Food Preservation Research, Goteborg, Sweden, November 18, 1953.

FREEZING OPERATIONS

The freezing system now in use on the Delaware has been described by Oldershaw (1953 A and B; 1955). The improved freezer being used consists essentially of 11 cylindrical wire-mesh freezer baskets, moving in a tank of refrigerated brine. This tank extends from the floor of the fish hold to about 30 inches above the deck. Each freezer basket is 84 inches long and 24 inches in diameter. These baskets are suspended horizontally between two chains which operate over drive sprockets above the top of the tank and under idler sprockets near the bottom. The freezer baskets move at about 30 feet per minute; 7 or 8 baskets are under the brine at any one time.

In the evaluation of the commercial possibilities of this freezing system, the rate at which it can handle fish is of prime importance. Any one or more of five factors can limit the capacity of the system to freeze fish:

(1) The rate at which the fishermen can load and unload the baskets.

(2) The minimum time required before the fish are completely frozen.

(3) The maximum sustained rate at which fish can be added without warming the brine above the prescribed operating temperatures.

(4) The maximum weight of fish that can be added in a short interval of time without unduly warming the brine.

(5) The maximum weight of fish that can be held in the system at one time.

On the Delaware the preliminary sorting of the fish in the catch is quite similar to the standard commercial practice. However, the use of forks is avoided as much as possible. Since the fish are frozen in-the-round, the tedious and slightly dangerous eviserating operation is eliminated. For convenience, the round fish are sorted into small wire baskets holding about 65 pounds each. While on the deck or while in these small baskets, the fish are washed with sea water from a deck hose. This washing reduces the accumulation of dirt, seaweed, and other debris in the brine tank.

For the loading and unloading operations, the mechanism is stopped so that a freezer basket opens at a convenient height, 30 to 40 inches above the deck (fig. 1). Two fishermen can easily lift a small basket of sorted fish and empty the fish into the freezing-tank baskets. After the fish are frozen, they are removed from the freezer basket by hand and sent down a chute to the hold.

According to observations made on two of the most recent trips of the vessel, 6 fishermen can normally sort and wash 1,000 pounds of scrod haddock, load these fish into the freezer, and remove an equal weight of frozen fish in less than 17 minutes. Miscellaneous operations, including adjustments in the storage space, require an additional 3 or 4 minutes per 1,000 pounds. In an hour and 15 minutes, which is about the average time for the net to be fishing, the fishermen could easily handle 3,300 pounds of fish both into and out of the freezer.

Pilot-plant studies had indicated that it would be safe to load a freezer basket at a rate of 20 pounds of fish per cubic foot. Thus the baskets in the Delaware's freezer were planned to handle at least 400 pounds of fish each. In trials at sea it was found that even when each basket was loaded with 450 to 500 pounds, the freezing rates were not noticeably affected. Thus the entire mechanism, which has 11 freezer baskets, can hold a maximum of 5,000 to 5,500 pounds of fish at one time.

If too large amounts of fish are placed in the freezer at one time, the temperature of the brine will rise above the prescribed maximum limit of +10° F. The extent of the temperature rise and the time interval until the maximum is reached depend on the size of the fish involved, as well as on their total weight. When 2,000 pounds of scrod haddock were added rapidly to the brine at +5° F., the brine temperature reached a maximum of +10° F. after about 30 minutes. When the same weight of larger fish was added, there was less rise in temperature and the maximum temperature was reached after a longer time.

The characteristics of the refrigeration machinery and of the heat exchangers limit the sustained freezing rate of the system. The plant was designed to freeze 1,000 pounds of fish per hour. In trials at sea the system has been able to freeze only 600 to 775 pounds per hour. Changes and additions already made and being made to the absorption plant and heat exchangers are expected to increase the refrigeration rate to at least the amount originally specified.

The results of pilot-plant studies of the time required to freeze fish, as reported by Magnusson and Hartshorne (1952), have been confirmed by observations on the commercial-scale operations of the Delaware. For convenience aboard the vessel at sea, the fish are separated into only three sizes. Scrod cod, scrod haddock, and other small fish weighing less than 3 pounds are left in the freezer for at least $1\frac{1}{2}$ hours; haddock and cod weighing up to 9 pounds, for 3 hours; whereas fish larger than these are left in the freezer for 4 or 5 hours.

The experimental trials so far indicate that it may be necessary to prepare new brine for each full-scale commercial trip. On the Delaware, brine has been prepared most expeditiously by rotating the system with unopened cotton bags of rock salt in the freezer baskets. When the water was at 60° F., the necessary 7,100 pounds of salt could be dissolved in 3 or 4 hours. When fish are being frozen, the salt content of the brine drops, because sea water adheres to the fish being introduced, while concentrated brine adheres to the frozen fish being removed. It has been found necessary to add about 100 pounds of salt for each 10,000 pounds of haddock frozen.

STORAGE OF FISH ON THE VESSEL

For various reasons, the present arrangements on the Delaware do not provide the maximum possible storage space for frozen fish. For experimental convenience and for general safety in the experimental work, the ammonia absorption system and the evaporative coolers were located in a room separate from the main machinery of the vessel (Butler, Puncochar, and Knake 1952). In a vessel intended solely for commercial operations, the refrigeration machinery could be advantageously located elsewhere in the vessel, principally in the main machinery room. From the experience and the information gathered on the Delaware, further space-saving arrangements would bring the total storage space on a commercially-operated vessel to 50 percent or even 75 percent more than on this experimental vessel.

As now arranged, the Delaware has a maximum of 3,800 cubic feet of cold-storage space. When frozen fish were simply dropped into the storage spaces, the average density of the fish was at least 30 pounds per cubic foot. With very little extra time and effort being taken in the arrangement of the fish in the hold, the density was increased to 33 pounds per cubic foot. Several trials indicated that there is very little difference between the volume of storage space required by the different sizes and species of fish.

On the Delaware the fish are now sent directly from the freezer basket down a short chute to an opening in one of the two hatches. In this opening is a moveable arrangement which directs the frozen fish into any of four directions. Semipermanently installed chutes then carry the fish to the proper pen sections. It has proven

unnecessary for anyone to work in the refrigerated holds until the holds are about two-thirds full. Thereafter, as the last third of the load accumulates, 1 or 2 men must occasionally arrange the frozen fish to assure loading each section to its capacity. The total time spent in the hold is only a small fraction of the time required to ice down a comparable load of eviscerated fish.

All frozen fish delivered by the Delaware have been removed in canvas baskets common to the Boston Fish Pier. These hold 150 to 175 pounds of iced fish per load. The weight of frozen fish loaded by an experienced crew averages about 85 pounds per basket. A crew of 3 men in the hold, 1 at the hatch, 1 on the winch, and 1 or 2 on the dock could maintain a rate of unloading of 100 baskets per hour. With 2 hatches being unloaded simultaneously, the maximum that can be unloaded by this method is about 17,000 pounds per hour.

Fig. 2 - Frozen fish delivered by the Delaware are unloaded into large boxes for for holding in frozen storage.

The unloading of large catches of fish has been complicated by the crew's natural aversion towards staying for long periods in the refrigerated holds. Also the work is hampered by a fear of the hard-frozen fish falling from the basket back into the hold. For their protection, the men in the hold wear hard-top hats of the type worn by construction workers.

The ultimate solution to the problem of removing the frozen fish from the storage space seems to be a continuous conveyor lowered to the level of the fish. However, the relatively small quantities delivered so far and the cost of any experimentally constructed conveyor have prevented a testing of this assumption.

It was intended to maintain the frozen-storage holds at 0° to $+5^{\circ}$ F. In practice, the temperature has often approached $+10^{\circ}$ F. When such high temperatures were encountered on a trip, the fish packed a little closer, being over 33 pounds per cubic foot. Whenever the temperatures rose and later fell, or when the fish entering the hold were not completely frozen, there was a tendency for the fish in the bottom of the hold to freeze together. When proper freezing and storage temperatures were employed, this problem was eliminated.

STORAGE OF FISH ASHORE

If fish frozen at sea are thawed and processed within a few hours after the vessel unloads, there is, of course, no need for cold storage ashore. However, it is anticipated that a large portion of the fish frozen at sea will be stored at least for a few days and possibly for several weeks. These fish will then be withdrawn from storage as they are needed to maintain a more or less constant processing rate in the filleting plant. This will provide for the most efficient use of a permanently employed processing crew.

About 70 percent of the frozen fish delivered by the Delaware has gone directly into a cold-storage warehouse located on the Boston Fish Pier. A temporary platform was installed from the regular platform of the warehouse to the edge of the dock. At first boxes which held 110 to 130 pounds were used to move the frozen fish into the warehouse. Eight of these boxes were loaded on a "flat," which was moved on a four-wheel hand truck. Generally, these boxes were emptied in the cold-storage room, and they were used many times during the unloading operation. Between 35 and 45 man-hours were required to transfer 10 tons of frozen fish from the dock into cold storage. Additional labor was required later when the fish were removed. This procedure was soon discontinued, primarily because of the excessive labor requirements. Furthermore, it was difficult to build high piles of loose fish, and therefore the storage space was not efficiently used.

The frozen fish delivered by the last few trips of the Delaware were moved and stored in specially-built larger boxes (fig. 2). The most satisfactory box, 30 by 37 by 23 inches inside dimensions, capable of holding about 410 pounds of fish frozen at sea, was designed to fit on one of the common-type wooden pallets. When properly stacked, these boxes make efficient use of the full height of the storage rooms. The boxes are fairly rugged and can withstand moderately rough treatment. They are sufficiently tight to serve as convenient tanks for thawing the fish in water. Leaving the fish in the boxes has saved much expensive labor in the cold rooms. When these specially-designed boxes were employed, warehouse personnel devoted only 11 man-hours to place 10 tons of frozen fish in cold storage. After only 3 or 4 uses, the savings in labor and in storage charges would equal the cost of the boxes.

A few trials have been made on the use of a variety of paper and fiber bags for handling and storing fish frozen in brine at sea. So far no bag has proven inexpensive, sturdy, easy to handle, and sufficiently resistant to water. A possible advantage to the use of bags or other small containers would be that the fish could be handled, unloaded, and even thawed in convenient units of 40 to 80 pounds. This assumes that the frozen fish would be placed in the bags by the fishermen, preferably at sea.

Most of the frozen fish landed by the Delaware was stored in still-air cold-storage rooms held at 0° F. After six months in this storage, a slight but noticeable odor resembling rancidity developed on the surface of some of the frozen haddock. A few of the small haddock at the top of the stacks showed signs of desiccation after nine months of storage. Less than two percent of the fish stored for one year were not usable. In well-stacked lots of loose fish and in lots of fish left in boxes, the losses were even less. More serious desiccation and rancidity occurred in lots of frozen haddock stored in the cold-storage room of the laboratory. The room is refrigerated by circulated air. Storage of fish in this room in an uncovered box for over one month resulted in excessive losses due to desiccation.

THAWING OPERATIONS

The results of laboratory and pilot-plant investigations of thawing fish frozen at sea have already been reported in considerable detail (Magnusson and Hartshorne 1952). On the basis of these investigations, it was recommended that the frozen fish be thawed by immersion in well-circulated fresh water at about 60° F. When complete thawing was required in semicommercial-scale operations, scrod haddock were left in water at 60° F. for 2 hours. For these fish to thaw sufficiently to permit filleting, 1½ hours in the water was adequate. Haddock and cod weighing 9 pounds were ready to fillet after 3 or 3½ hours in water at 60° F. As might be expected, the rate of thawing was found to be nearly directly proportional to the difference between the water temperature and 30° F. To thaw frozen fish in water at 45° F. required approximately twice as long as at 60° F. At 88° F. the thawing time was half that at 60° F.

Several tests were made to determine the effects of thawing water temperatures above 60° F. on the quality of the thawed fish. Haddock thawed in water at 72° F.--if they were cooled before being filleted--were found to be as good in all respects as similar haddock thawed at 60° or 50° F. Noticeable adverse effects were noted on haddock thawed at 80° F. for over an hour. After haddock were in water at 85° F. for about 40 minutes, the skin separated easily from the meat. The meat of the haddock appeared to be partially cooked when the fish were thawed in water at 95° F.

In several tests the fish were kept in the thawing tank for 3 to 5 times as long as was required to complete thawing. In no case did the fillets exhibit any odors or flavors attributable to deterioration of the viscera. This was true though fish were in water at 80° F. for 4 hours or at 40° F. to 45° F. for 20 hours. There are some indications that excessive time in the thawing water even at 60° F. may make cod and haddock less suitable for smoking. More information is needed on this problem, however.

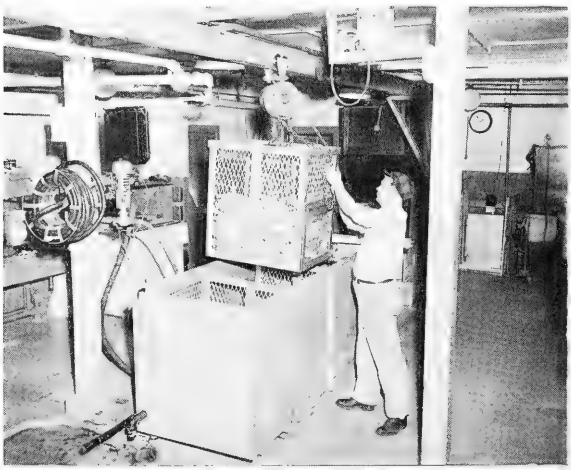

Fig. 3 - Hoisting thawed round fish from the thawing tank.

The methods and the tank successfully used in the laboratory for semi-commercial-scale thawing have been described (Magnusson 1952). This tank--35 inches wide, 95 inches long, and 35 inches deep, with 3 wire-mesh baskets of 14-cubic-feet capacity each--has been used often to thaw 1,100 pounds of frozen haddock (fig. 3). The water in the tank has been kept moving with a $\frac{1}{3}$ hp. centrifugal pump or with a propellor-type mixer of the same power. Both have proven effective at providing the very necessary circulation of water past the fish. An overhead hoist and a monorail system facilitate transporting the baskets from the unloading platform to the thawing tank and later back to the platform.

Transportation of the frozen fish from the cold-storage warehouse to the processing plant offers no unusual problems. Fish frozen at sea have been easily transported by truck in bulk or in the storage boxes. When the load of frozen fish was covered with a tarpaulin, there was no serious thawing during the 30 to 90 minutes required to travel from the cold-storage warehouse to the laboratory pilot plant.

Recent trials have demonstrated that under certain circumstances the frozen fish can be satisfactorily thawed in the 410-pound-size boxes described in an earlier section of this paper. Although such boxes are not watertight, a moderate stream of water can keep them full. This procedure is practical only if the normal supply of water is neither so warm as to harm the fish nor so cold as to require too much time, water, and space to thaw them. When the fish are thawed in boxes, special effort is necessary to agitate the fish frequently to prevent "packing," which slows the thawing process.

There is generally a slight increase in the weight of the fish during the thawing operation. The slime, any dirt, and a few scales are washed off, but a compensat-

ing quantity of water is absorbed. When the frozen fish had been kept in still-air storage, the net gain in weight during thawing generally ranged between 1 and 2 percent. If the fish had been poorly stored, for instance in an air-blast refrigerated room, larger increases in weight resulted during thawing.

CUTTING AND PACKAGING

After fish frozen at sea have been thawed, they can be transported, handled, and processed in essentially the same way as iced eviscerated fish taken directly from a trawler. In fact, if a thawed haddock is eviscerated and its gills are removed, the resulting dressed fish compares well with the freshest available dressed haddock at time of landing. The viscera taken from the thawed fish are generally intact and in fresh condition. If the thawed fish are not cut immediately, the viscera starts to soften and deteriorate. The freezing and the thawing operations cause the gills to turn a muddy brown. Therefore, the color of the gills is not a good criterion of the freshness of these fish.

Except when the viscera were saved for some special experiment, the thawed fish have not been eviscerated before being processed into fillets. The whole round fish, full of viscera, have proven easy to scale and to fillet. Processing-plant employees who have worked with fish frozen on the Delaware unanimously agree that it is easier to scale the thawed round fish than the customary eviscerated fish. A great majority of these employees also reported that the thawed fish was the easier of the two to fillet. The fish frozen at sea and thawed quickly in circulating water exhibit a desirable firmness. Often the fish taken from a thawing tank appears to be in a mild state of rigor mortis. This is not a rigor due to salt; it is simply the firmness of a very fresh fish.

If the thawed fish are too warm when they are filleted, some of the advantages of freshness and firmness are lost. Whenever the temperature of the fish has ex-

Table 1 - Comparative Data on Processing of Iced Eviscerated Haddock and Thawed Round Haddock

Size of Haddock	State of Haddock	Initial Weight (from 1,000 Pounds of Whole Round Fish)	Time Required to Scale	Time Required to Fillet	Weight of Fillets with Skin on
		Pounds	Man-Hours	Man-Hours	Pounds
Small (caught in October)	Iced eviscerated (gills in)	903	0.70	3.2	429
	Thawed round (replicate 1)	1000	0.71	3.5	445
	Thawed round (replicate 2)	1000	0.74	3.3	425
Medium (caught in July)	Iced eviscerated (gills out)	839	0.49	1.6	380
	Thawed round (replicate 1)	1000	0.50	1.5	390
	Thawed round (replicate 2)	1000	-	-	371

ceeded 60° F., the meat has been unnecessarily soft, and therefore the fish has been difficult to handle and cut. This problem has been solved by spraying the fish with cool water or sprinkling ice on them. A simpler solution has been to remove the fish from the water when thawing was only 80- or 90-percent complete. This procedure has the added advantage of saving thawing time and equipment.

Data have been secured on the times required to scale and to fillet both round fish and iced eviscerated fish. The yields of fillets from both have also been compared. Data for two such series of trials made in a cooperating commercial plant are given in table 1. It will be noted that rates of processing and the yields of fillets for iced eviscerated fish and for thawed round fish are not significantly different. Both the frozen fish and the iced eviscerated fish used in these trials were delivered by the Delaware. It is believed that if frozen fish were compared with fish handled and iced on a regular commercial trawler, there would be a definite processing rate

and yield advantage in favor of the frozen fish. For example, the frozen fish are delivered to the filleting table at the same weight as when they are caught, whereas there apparently is quite an appreciable shrinkage of eviscerated fish during storage in ice on the trawler.

The fillets prepared from haddock frozen at sea tend to be firmer and darker than fillets from iced eviscerated fish. The difference in color is most noticeable on freshly cut samples. After they have been held a short time under ice or in frozen storage, the color difference is reduced or eliminated. The results of consumer-type taste-panel tests (Pottinger, Holston, and McCormack 1952) indicate that freezing fish at sea for subsequent processing ashore can produce a uniform, high-quality, marketable, and delectable fillet.

LITERATURE CITED

Butler, C.; Puncochar, J. F.; and Knake, B. O.
1952. Freezing Fish at Sea--New England. Part 3 - The Experimental Trawler Delaware and Shore Facilities. Commercial Fisheries Review, vol. 14, no. 2, pp. 16-25.

Magnusson, H. W.
1952. Equipment and Procedures for Thawing Fish Frozen at Sea. Technical Note No. 21. Commercial Fisheries Review, vol. 14, no. 7, pp. 18-19.

_____, and Hartshorne, J. C.
1952. Freezing Fish at Sea--New England. Part 5 - Freezing and Thawing Studies and Suggestions for Commercial Equipment. Commercial Fisheries Review, vol. 14, no. 12a, pp. 8-23.

Oldershaw, C. G. P.
1953A. Freezing Fish at Sea--New England. Part 6 - Changes and Additions to Experimental Equipment on the Trawler Delaware. Commercial Fisheries Review, vol. 15, no. 3, pp. 25-28.

1953B. The Experimental Freezing Trawler Delaware. Technical Paper No. 12, Presented at the 1953 International Fishing Boat Congress, Food and Agricultural Organization, Paris, France, and Miami, Fla.

1955. Freezing Fish at Sea--New England. Part 9 - Improvements in the Brine-Freezing Mechanism on the Trawler Delaware. Commercial Fisheries Review, vol. 17, no. 7, pp. 1-8.

Pottinger, S. R.; Holston, J.; and McCormack, G.
1952. Fish Frozen in Brine at Sea: Preliminary Laboratory and Taste-Panel Tests. Technical Note No. 22. Commercial Fisheries Review, vol. 14, no. 7, pp. 20-23.

Puncochar, J. F., and Pottinger, S. R.
1953. Freezing Fish at Sea. Food Technology, vol. 7, pp. 408-411.

SINGLE FISH STICKS SOLD IN NEW YORK CITY

Fish sticks are being sold by the individual stick in a number of New York City markets. The merchant sells the individual breaded sticks, both cooked and uncooked, from bulk packages. Sales are reported to be brisk.

--N. F. I. Flashes, December 17, 1954.

PACKAGING FROZEN FISH IN TIN RESULTS IN SUPERIOR STORAGE LIFE

SUMMARY

Laboratory tests on 19 species of fish have shown that fish frozen and stored in evacuated tin cans keep far better than in any conventional packaging material. The original flavor is retained, and adverse alteration in color and flavor is almost eliminated. Certain health hazards based on the possibility of the user storing the product at room temperature have in the past prevented adoption of such a method. With the consumer becoming accustomed to purchasing frozen fruit juices, certain fruits, and frozen soups in tin containers, this difficulty may no longer exist. Certain production problems will have to be worked out before such a method can be adopted for commercial use.

BACKGROUND

Many of the adverse changes which develop during prolonged cold storage of frozen fish can be completely eliminated or greatly retarded by packaging the frozen product in evacuated hermetically-sealed tin cans. Much of the deterioration of frozen fish in cold storage is brought about by the action of oxygen. This oxygen may be present when the fish is packaged or may seep through the packaging material during cold storage. Packaging materials made of paper or fiberboard cannot withstand a vacuum; hence, considerable air and oxygen must be left in contact with the product within the package. Most all such materials, while resisting any large transfer of oxygen, permit slow seepage over a period of months such that as fast as the oxygen reacts with the fish more enters from the outside, providing a relatively constant atmosphere to continue the deleterious reactions taking place. Tin cans can be evacuated to remove most all of the air, and no more can ever enter the can after the lid is fastened in place.

EFFECT OF OXYGEN ON COLOR AND FLAVOR OF FISH

Oxygen combines with the fish in several ways to produce undesirable changes. The first such change generally noticed is the disappearance of the natural flavor of the fish resulting in a tasteless product. The natural flavor constituents become oxidized giving rise to a loss of flavor. This change occurs early in the storage of fish so that a very great part of the frozen fish reaching the consumer has already lost a part or nearly all of its natural flavor and may be relatively tasteless although still entirely edible. This loss of flavor occurs so gradually that the deterioration often goes unnoted. Indeed, many persons to whom fresh fish is unavailable are unfamiliar with the flavorful taste of really fresh fish and are under the impression that a flat tasteless product is the natural original condition of most species.

Long after disappearance of most of the natural flavor constituents of fish held in cold storage, certain off-flavors and odors, which are described as rancid, make their appearance. These are caused by oxidation of the fish oils. When rancidity has proceeded only a short way, the fish become of borderline acceptability and shortly thereafter are completely unmarketable.

Simultaneously with changes in flavor occur alterations in the appearance of fish. These changes, caused by oxidation of the pigments, take place in a variety of ways, depending upon the species of fish involved. With some species (e.g. salmon) the natural color may fade. With other species a darkening or discoloration may occur. Changes in color, while perhaps not quite so serious as changes in flavor, detract from the general appearance and, in extreme cases, may render the product unsalable.

EFFECT OF VACUUM ON TEXTURE OF FROZEN FISH

Another type of change occurring during the holding of fish in cold storage is the development of a tough or rubbery texture. Toughening is especially noticeable in certain species of shellfish. Heerdt (1947) demonstrated (table 1) that vacuum

Table 1 - Tenderometer Values of Crab Meat as Affected by Container and Storage Time[1/]

Container	Seal	Tenderometer Readings After Storage of Crab Meat at 5° F. For:								
		3 Months			6 Months			9 Months		
		Leg	Body	Avg.	Leg	Body	Avg.	Leg	Body	Avg.
MSAT cellophane[2/]	-	28	22	25	31	32	31	44	32	38
Can	First operation roll[3/]	27	21	23	23	28	25	37	34	35
Can	Vacuum	13	8	10	12	9	10	17	14	15

1/ Freshly-picked crab meat will yield tenderometer values varying from 10 to 16, depending upon cooking time and other conditions. Freezing and thawing may lower these readings to values varying from 7 to 13. Frozen storage causes a toughening that results in increasingly higher values.
2/ MSAT = moistureproof-vaporproof, sealable by heat, anchored coating, transparent.
3/ First operation roll securely attaches the lid to the can but does not give a hermetic seal.

packing in tin was very effective in delaying toughening in frozen dungeness crab meat. The development of toughness apparently is greatly retarded by storage of the product in the absence of air. Reasons for this effect are unknown.

SPOILAGE HAZARDS

Storage of frozen fish in completely hermetically-sealed containers (such as tin cans)--while reducing the alterations in flavor, appearance, and texture--presents certain disadvantages. The public has long associated fish packed in tin cans with a steam processed product which will keep indefinitely at room temperature. If fish frozen in tin containers were to be placed on the pantry shelf, spoilage would occur in a very short time, and with spoilage of certain types, gases might form within the can which might build up sufficient pressure to cause the can to explode. If botulinum organisms happened to be present under such conditions, toxins might form resulting in an exceedingly dangerous condition. On the other hand, the housewife is becoming accustomed to seeing frozen fruit juices, strawberries, peaches, etc., packaged in tin containers. Even some fishery products such as oysters and crab meat have been frozen and marketed in tin cans. Under these circumstances, it seems likely that if the fishery product were plainly marked "perishable--do not thaw until ready for use," the product would be handled properly.

LABORATORY RESULTS

For a period of more than 10 years the Seattle Laboratory of the U. S. Fish and Wildlife Service has been experimentally storing fish in evacuated hermetically-sealed tin cans. In the beginning these tests were not set up with the object of recommending that the fishing industry might consider packing fish commercially in this way. At the time these studies were initiated no other frozen foods were packed extensively in tin, and it was believed that such a proceeding would be impractical. Rather, the tests were set up as control samples for comparison with others packaged in cellophane or in other ways. These control samples in tin were found not to change or to change very little during the experiment. Hence they served to remind the experimenter as to the exact original condition of the samples.

Such tests, in which fish were packaged in evacuated tin cans, have been carried out with albacore tuna, silver smelt, Columbia River smelt, English sole, surf perch, Dolly Varden trout, steelhead trout, true cod, herring, pilchard, orange rockfish, sablefish, pink salmon, chum salmon, silver salmon, Pacific oysters, dungeness crab, king crab, and tanner crab. In each experiment the fishery product kept in cold storage in much better condition with respect to flavor, appearance, and, in some cases, texture than did a fishery product packaged or treated in any other way. Generally, there was no detectable change in appearance or flavor in the fishery product after nine months storage at 0° F. In these experiments the products were packed in half-pound C-enamel tins with 22 inches of vacuum applied at the seamer. Most cans, when tested after storage intervals of up to nine months, had at least 15 inches of vacuum.

In some instances the differences in keeping quality between the fish vacuum-packed in the cans and those packed in cellophane were most outstanding. One such example is that of pink salmon, a species which deteriorates in cold storage at such an exceedingly rapid rate that it has never been possible to market it in the frozen state.

Bucher (1944) found that pink salmon when steaked, wrapped in cellophane, frozen, and placed in storage became faded and very slightly rancid after only 7 weeks at 0° F. (table 2) and was discolored and decidedly rancid after 3 months at 0° F.

Table 2 - Effect of Method of Packing and of Time in Frozen Storage on Pink Salmon Steaks

Method of Packing	Condition of Pink Salmon Steaks After Storage at 0° F. For:			
	7 Weeks	3 Months	5 Months	9 Months
Cellophane-wrapped steaks packed in 5-pound fillet boxes.	Color fading--becoming yellow; very slightly rancid.	Definitely discolored; odor rancid; flavor rancid.	Appearance very bad; rancid.	Darkened; blood spots very brown; large amount of rusting; very rancid.
Steaks packed in vacuumized tin cans.	Perfect condition.	Appearance normal; flavor normal.	Appearance normal; flavor normal; texture normal.	No deterioration.

Similar steaks when packed in evacuated tin cans were still in good condition after 9 months at 0° F.

ADVANTAGES TO PACKING FROZEN FISH IN TIN CANS

Frozen fish stored in tin cans would be of immeasurable higher quality than those packaged in the ordinary way. If care were taken to see that only first class fresh fish were frozen, for the first time it would be possible for all consumers, no matter how far removed from the fish-producing centers, to purchase fish which retained its original sea-fresh flavor. It would no longer be necessary to offer for sale frozen fish having altered flavor or appearance.

Species hitherto not handled in the frozen state could be made available in the packaged frozen form. As an example of the possibilities along this line, pink salmon can be cited. This species before canning is a light red color but, upon canning, fades to a faint pink color. If frozen in tin cans, it would reach the consumer with a bright red color equal or very nearly equal in appearance to the canned more expensive varieties such as coho (medium red).

If frozen fish were to be packaged, before freezing, in tin cans, considerable labor in preparation and packaging would be saved, since high speed can-handling equipment could be used. It might even be possible to adapt existing fish-canning lines for the frozen product, merely by eliminating the salting stage and substituting the freezer for the retort. Such a product could be put up at a very low cost but would be quite different from what the public expects when a frozen fishery product is purchased. For example, salmon might be handled as for canning and then

frozen instead of being retorted. Such a process, however, would result in a chunk of frozen fish containing the skin and backbone. This product might not be acceptable to the consumer although frozen salmon steaks containing skin and bones are marketed in consumer packages. In canned salmon the retorting or cooking process softens the bones so that they may be eaten along with the balance of the can contents.

DISADVANTAGES

In addition to the spoilage hazards from improper storage mentioned in a preceding section, certain production problems would occur. If the fish were packaged in round cans, such cans would be difficult to freeze in high-speed freezers of the plate type. Also frozen-food merchandisers sometimes object to handling round containers because they do not pack well in frozen-food cabinets with the usual square frozen-food cartons. The recent advent of frozen soups in round tin cans may be a step toward overcoming this objection.

If the fish were to be cut as fillets or steaks, a production problem in filling the cans would be created, since the usual mechanical fish can fillers could not be used.

LITERATURE CITED

Bucher, Dorris L.
1944. Storage Tests on Frozen Pink Salmon. Commercial Fisheries Review, vol. 6, no. 11 (November), pp. 2-4. (Also Separate No. 82.)

Heerdt, Martin, Jr.
1947. Toughening of Frozen Crab Meat Can Be Retarded. Commercial Fisheries Review, vol. 9, no. 2 (February), pp. 7-10. (Also Separate No. 166.)

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STUDY OF PHARMACEUTICAL AND OTHER INDUSTRIAL PRODUCTS FROM SALMON EGGS

To further study the possible utilization of salmon cannery waste for industrial purposes, investigations are in progress on the enzymatic digestion of salmon eggs. Work to date has indicated that enzyme digestion is effective but that the digested mass putrefies under optimum conditions for action of the enzyme. This putrefaction may be prevented by the addition of aureomycin. The optimum level for addition has not been determined, however. When the digested egg mass is extracted with a solvent, an almost oil-free salmon-egg meal is produced. It is hoped that the oil-free egg meal may have possibilities as a fish-hatchery feed.

SULFIDE DISCOLORATION IN CANNED TUNA

Occasional lots of canned tuna may develop a dark discoloration caused by reaction in the can of hydrogen sulfide with iron to form black iron sulfide. A joint collaborative program between the Continental Can Company and the U. S. Fish and Wildlife Service is under way to find the reason why this occurs in some cases and not in others and to develop a method of minimizing its occurrence. In these studies

at the Service's Seattle Fishery Technological Laboratory it has been noted that the black iron sulfide does not form until after the cans of fish have been removed from the cannery retort. It has been found that if the cans of tuna are retorted on trays and the cans are inverted between 5 and 20 minutes of their coming out of the retort, no discoloration takes place. This solution to the problem will work in the relatively few canneries which are equipped to retort on trays and can not be applied to the majority of canneries where jumbled lots of cans in cars are retorted except by rather drastic modification in facilities.

TECHNICAL NOTE NO. 32 - FREEZING RATES AND ENERGY REQUIREMENTS FOR FREEZING PACKAGED FISH FILLETS AND FISH STICKS IN A MULTIPLATE-COMPRESSION FREEZER

INTRODUCTION

The multiplate compression-type freezer is used quite extensively for the freezing of packaged fish fillets and fish sticks. Some advantages of this type of freezer are that (1) it is a compact unit requiring but a small amount of floor space; (2) it is easily loaded and unloaded; (3) it has a fast freezing rate; and (4) it yields uniformly-shaped packages.

Although the multiplate-type freezer has been used for a number of years, information pertaining to its freezing rates and efficiency for freezing various sized packages of fish fillets and fish sticks has not been readily available to fish processors and freezer operators. As a result packages of fish are often left in the freezer much longer than is necessary for complete freezing. This practice is not only uneconomical from the standpoint of power consumed, but it limits the daily capacity of the equipment. In other cases, the packages of fish are removed from the freezer before the meat has passed through the critical freezing temperature range of approximately 29° to 20° F., and the quality of the fish is accordingly decreased.

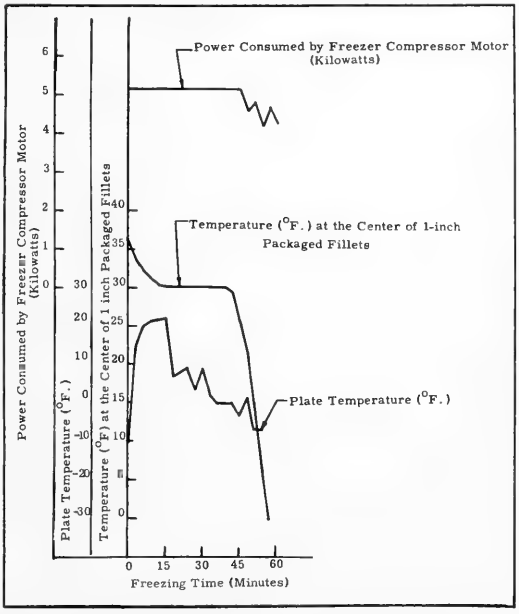

Fig. 1 - Freezing 187 pounds of 1-inch packaged pollock fillets in a multiplate compression freezer.

To provide data which would be of value to those engaged in the freezing of fishery products, representative tests on a multiplate-compression freezer were conducted by the U. S. Fish and Wildlife Service Fishery Technological Laboratory at East Boston, Mass.

OBJECTIVES

The objectives of the tests were as follows:

1. To determine (a) the freezing rates and (b) the electrical energy requirements for freezing full-freezer loads of pollock (Pollachius virens) fillets in packages of various thicknesses and of fish sticks in $1\frac{1}{2}$-inch-thick 10-ounce packages.

2. To determine the thickness of packaged pollock fillets which can be frozen the most economically.

3. To calculate from the results of the freezing determinations the total number of kilowatt-hours required to freeze 1,000 pounds of pollock fillets in packages of various thicknesses and of fish sticks in $1\frac{1}{2}$-inch-thick 10-ounce packages.

EXPERIMENTAL

DESCRIPTION OF FREEZER: A 6-station junior-model multiplate compression-type freezer designed to freeze about 200 pounds of 1-inch-thick packaged fish fillets within a period of 60 minutes was used in the various tests (fig. 5 and fig. 6). The refrigeration machinery consisted of a $7\frac{1}{2}$-hp. induction motor connected by means of 4 V-belts to a 4-cylinder freon-12 reciprocating compressor capable of producing 2.4 tons of refrigeration at a suction pressure of 0 pounds per square-inch gauge.

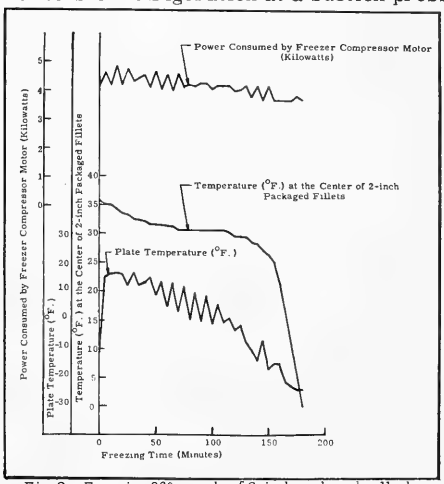

Fig. 2 - Freezing 360 pounds of 2-inch packaged pollock fillet in a multiplate compression freezer.

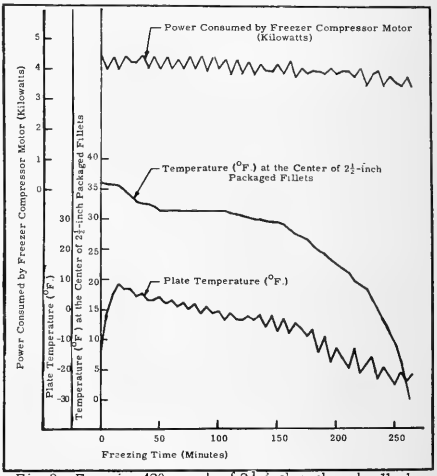

Fig. 3 - Freezing 420 pounds of $2\frac{1}{2}$-inch packaged pollock fillets in a multiplate compression freezer.

The freezer consisted of seven horizontal movable aluminum plates stacked vertically within an insulated cabinet. (See fig. 5 and fig. 6.) Expansion of the refrigerant through the plates furnished the low plate temperatures necessary for freezing.

MEASUREMENT OF TEMPERATURE AND ELECTRICAL POWER AND ENERGY: A multiple-station potentiometer with calibrated copper constantan thermocouples was used to measure the temperature of the plates and of the packaged fillets and

fish sticks during the freezing process. An electric analyzer was used to measure the electrical power and energy requirements of the motor driving the compressor.

TEST SERIES: Four test series were carried out using full freezer loads of 1-, 2-, and $2\frac{1}{2}$-inch-thick packages of pollock fillets and of $1\frac{1}{2}$-inch-thick packages of fish sticks.

The 1-inch-thick package consisted of unwrapped fillets packed in a 1-pound commercial waxed chipboard box with no overwrap. The 2-inch-thick package and the $2\frac{1}{2}$-inch-thick package consisted of fillets individually wrapped in moisture-vaporproof cellophane and packed in 5-pound commercial waxed chipboard boxes with no overwrap. The $1\frac{1}{2}$-inch-thick fish-stick package consisted of breaded precooked fish sticks, 2 layers deep, packed in a 10-ounce commercial waxed chipboard box with a microcrystalline wax overwrap.

Owing to the differences in the size of the packages, full freezer loads of the product being frozen varied in weight as follows:

a. 1-inch-thick pkgs. of fillets - 187 lbs.
b. 2-inch-thick pkgs. of fillets - 360 lbs.
c. $2\frac{1}{2}$-inch-thick pkgs. of fillets - 420 lbs.
d. $1\frac{1}{2}$-inch-thick pkgs. of fish sticks - 165 lbs.

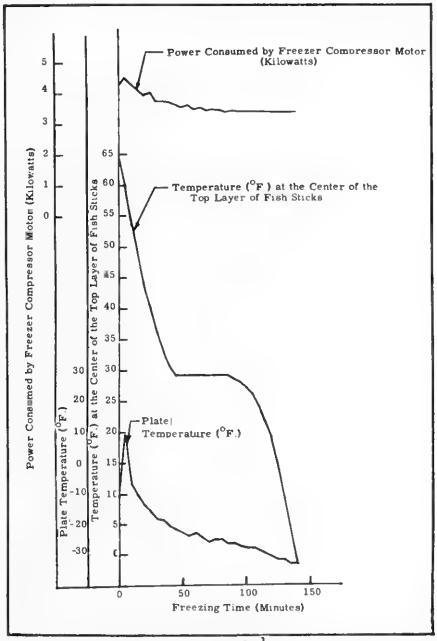

Fig. 4 - Freezing 165 pounds of $1\frac{1}{2}$-inch thick (10 ounce) packages of fish sticks in a multiplate compression freezer.

PROCEDURE: At the beginning of each test, prior to the loading of the unit, the freezer-compressor was operated for a period of time sufficient to bring the temperature of the plates down to -10°F. Thermocouples were then inserted into the geometric centers of the packaged fish fillets. In the case of fish sticks, the thermocouples were inserted in the center of the middle sticks of the top layers. (Preliminary tests had shown that the top layer of fish sticks was the last portion of the product to freeze.) Thermocouples were also placed on the plates where the various products were located.

The machine was loaded to its full capacity with the particular sample under test. Proper spacers were then inserted, and the plates were forced down in order

Table 1 - Data on Freezing Packaged Pollock[1/] Fillets and Fish Sticks in a Multiplate Compression-Type Freezer

Description of Samples				Weight of Product Frozen[2/]	T_1, Temp. of Product Before Freezing	T_2, Final Temp. of Frozen Product	Time Required to Lower Temp. of Product from T_1 to T_2	Energy Consumed by Freezer Compressor Motor in Cooling Product from T_1 to T_2	Product-Freezing Capacity of Unit in a 24-hr. Period (Calculated)[3/]		Energy Required to Lower the Temp. of 1,000 Lbs. of Product From T_1 to T_2[3/] (Calculated)	
Packaged Product	Thickness of Package	Weight of Package										
	Inches	Lbs.	Ozs.	Lbs.	°F.	°F.	Minutes	Kw.-hr.	Lbs.	Ratio	Kw.-hr.	Ratio
Fillets[4/]	1	1	-	187	36	0	57	4.66	4,730	1.00	24.9	1.00
Fillets[5/]	2	5	-	360	36	0	180	12.33	2,880	0.61	34.3	1.38
Fillets[5/]	$2\frac{1}{2}$	5	-	420	36	0	262	17.35	2,310	0.49	41.4	1.66
Fish Sticks[6/]	$1\frac{1}{2}$	-	10	165	65	0	137	8.34	1,730	0.37	50.6	2.03

1/ Preliminary tests indicated that the results obtained with pollock fillets would apply also to haddock fillets.
2/ Full-load capacity of the freezer.
3/ Calculated values (assuming no lost time in loading and unloading freezer).
4/ Unwrapped fillets packaged in a 1-pound commercial waxed chipboard box with no overwrap.
5/ Fillets individually wrapped in moisture-vaporproof cellophane and packaged in a 5-pound commercial waxed chipboard box with no overwrap.
6/ Breaded precooked fish sticks (2 layers) packaged in a 10-ounce commercial waxed chipboard box with a microcrystalline wax overwrap.

to provide good contact between the plates and the product. The zero-time readings for temperature of the fish, temperature of the plates, and electrical power required were taken immediately prior to lowering the plates. Subsequent readings were taken at specific intervals until the products reached an internal temperature of 0° F. (figs. 1-4).

RESULTS AND DISCUSSION

ONE-INCH-THICK PACKAGES: The 1-inch-thick packages (187 pounds) of fillets were lowered from an initial temperature of 36° F. to a final temperature of 0° F. within 57 minutes (fig. 1). A total of 4.66 kilowatt-hours of electrical energy was required (table 1). The plate temperature rose from -10° to 22° F. because of the fast rate of heat transfer due to the relatively thin packages of fish (fig. 1). If the refrigeration capacity of the machine had been larger, the initial plate-temperature rise would not have been as high, and a faster freezing rate would have resulted.

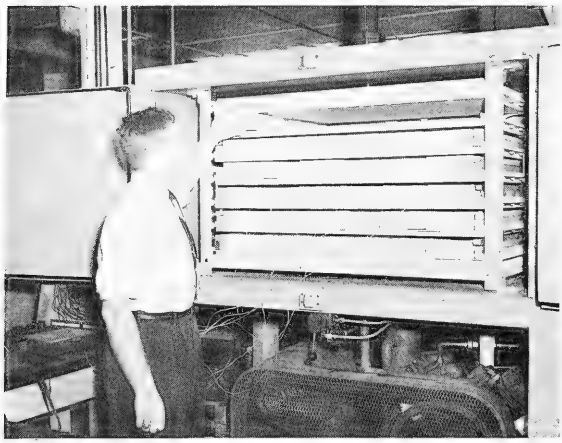

Fig. 5 - Loading multiplate freezer prior to conducting tests.

TWO-INCH-THICK PACKAGES: The 2-inch-thick packages (360 pounds) of fillets were lowered from 36° to 0° F. in 180 minutes (fig. 2). The total electrical energy required was 12.33 kilowatt-hours (table 1). The plate temperature rose from -11° to 16.5° F. (fig. 2). This plate-temperature rise was less than that which occurred when the 1-inch-thick packages of fillets were frozen. This indicates a slower rate of heat transfer due to the increased thickness of the package.

TWO AND ONE-HALF-INCH-THICK PACKAGES: The $2\frac{1}{2}$-inch-thick packages (420 pounds) of fillets were lowered from 35° to 0° F. in 262 minutes (fig. 3). The total electrical energy required was 17.35 kilowatt-hours (table 1). The initial rise of the plate temperature was from -13° to 8° F. (fig. 3). The plate temperature then began to drop. The immediate drop of the plate temperature and the maintenance of the plates at a low temperature indicates that the heat from the fillets was given off at a very slow rate. This was due to the relatively thick packages of fillets.

EFFECT OF THICKNESS OF FILLET PACKAGES: A comparison of the "Time required to lower temperature of product from T_1-T_2" and the "Product freezing capacity of unit in a 24-hour period" (table 1) indicates that as the thickness of the packaged fillets increases the rate of heat transfer decreases, resulting in a slower freezing rate and a lower freezing output capacity. It is also noted that the amount of electrical energy required to freeze 1,000 pounds of fillets (table 1) increases as the thickness of the package increases. Therefore, fillets can be frozen faster and more economically in the thinner packages than in the thicker ones.

FISH STICKS: The $1\frac{1}{2}$-inch-thick packages (165 pounds) of fish sticks were lowered from a temperature of 65° to 0° F. within a period of 137 minutes (fig. 4). The total electrical energy required was 8.34 kilowatt-hours. The plate temperature rose from -11° to 9.5° F. (fig. 4). It then dropped very rapidly and remained at a low temperature, indicating a slow rate of heat transfer between the plates and the product. The relatively slow rate of freezing was caused by (1) the thickness of the package ($1\frac{1}{2}$-inch), (2) the relatively large air space between the top layer of fish sticks and the package wall, and (3) the insulation effect of the overwrapped package.

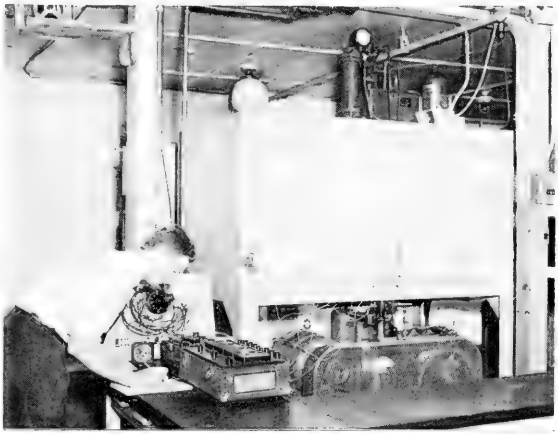

Fig. 6 - Recording data during tests.

Results given in table 1 show the freezer to be capable of lowering the temperature of 1,730 pounds of packaged fish sticks from 65° to 0° F. in a 24-hour period. A total of 50.6 kilowatt-hours would be required to lower the temperature of 1,000 pounds of fish sticks from 65° to 0° F. A comparison of the results (table 1) indicates that the multiplate-compression freezer in terms of capacity and energy requirements is not as suitable for the freezing of packaged fish sticks as it is for the freezing of packaged fish fillets.

APPLICATION OF DATA TO OTHER MULTIPLATE-COMPRESSION FREEZERS:

1. Freezing Rates: The freezing rates (figs. 1-4) would be similar for all multiplate-compression freezers that are designed to freeze a full capacity load of 1-inch-thick packaged fillets in 60 minutes.

2. Energy Requirements: The energy requirements (table 1) would vary for other multiplate-compression freezers depending on (1) capacity of freezer, (2) type of refrigerant used, and (3) the type and number of compressors used to supply the necessary refrigeration. The ratios between the kilowatt-hours required to freeze 1,000 pounds of the various products (table 1) would to a large extent be applicable for the majority of multiplate-compression freezers in commercial use today.

SUMMARY

A 6-station junior-model multiplate-compression-type freezer was used in tests in which the following observations were made.

1. The time intervals required to freeze full freezer loads of pollock fillets and of fish sticks were found to be as follows:

   a. Pollock Fillets (1-inch package) - 57 minutes
   b. Pollock Fillets (2-inch package) - 180 minutes

c. Pollock Fillets ($2\frac{1}{2}$-inch package) - 262 minutes
d. Fish Sticks ($1\frac{1}{2}$-inch package) - 137 minutes

2. The energy required to freeze full freezer loads of pollock fillets and of fish sticks was found to be as follows:

a. Pollock Fillets (1-inch package) - 4.66 kilowatt-hours
b. Pollock Fillets (2-inch package) - 12.33 kilowatt-hours
c. Pollock Fillets ($2\frac{1}{2}$-inch package) - 17.35 kilowatt-hours
d. Fish Sticks ($1\frac{1}{2}$-inch package) - 8.34 kilowatt-hours

3. In terms of frozen capacity and power requirements, it is more efficient and more economical to freeze 1-inch-thick packages of fillets than to freeze 2-inch-thick, or larger, packages.

4. The amount of electrical energy required for freezing 1,000 pounds of the various commercial packages of pollock fillets and of fish sticks was found to be as follows:

a. Pollock Fillets (1-inch package) - 24.9 kilowatt-hours
b. Pollock Fillets (2-inch package) - 34.3 kilowatt-hours
c. Pollock Fillets ($2\frac{1}{2}$-inch package) - 41.4 kilowatt-hours
d. Fish Sticks ($1\frac{1}{2}$-inch package) - 50.6 kilowatt-hours

ACKNOWLEDGMENT

Acknowledgment of assistance in conducting the various freezing tests is made to J. Holston and J. Carver.

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Branch of Commercial Fisheries,
U. S. Fish and Wildlife Service, East Boston, Mass.

CUTTLEFISH MEAL

A new feeding meal made from cuttlefish is stated to give a better growth response and increased egg yield than herring meal when added at a 10-percent level to a chicken ration which includes maize, wheat, and rice. The cuttlefish feeding meal is made by autolysing 100 parts of the viscera with 10 parts of water at 50° to 52° C. (122°-126° F.) and at pH 5.0 to 5.2 for 4 hours. The autolysate is heated to 80° to 85° C. (176° to 185° F.) and centrifuged to remove the oil. It is adjusted to a pH of below 4.5 to preserve it, absorbed in wheat bran, and dried. The protein content is stated to be about 31 percent and vitamin B_{12} about 0.4 ug./g.

--Bulletin of the Japanese Society of Scientific Fisheries, Vol. 18, No. 10, 1953.

Additions to the U. S. Fleet of Fishing Vessels

A total of 36 vessels of 5 net tons and over received first documents as fishing craft during April 1955. This was 47 vessels less than the 83 reported for the same month of last year, a decrease of 57 percent, according to the U. S. Bureau of Customs.

In the Gulf section, only 10 vessels were documented for the first time as fishing craft, compared with 45 during the same month of 1954. The Pacific section had 9 additions, the South Atlantic section had 6, the Alaska section had 4, Hawaii and the Middle Atlantic and Chesapeake Bay sections each had 2, and the New England section had one.

During the first four months of the current year, 109 vessels were documented for the first time as fishing craft, compared with 272 for the corresponding period of last year.

U. S. Vessels Issued First Documents as Fishing Craft, April 1955 and Comparisons

Section	April		Jan.-Apr.		Total
	1955	1954	1955	1954	1954
	(Number)				
New England	1	5	7	8	23
Middle Atlantic	2	2	5	2	15
Chesapeake Bay	2	5	11	28	93
South Atlantic	6	9	15	32	119
Gulf	10	45	29	153	313
Pacific	9	15	26	37	117
Great Lakes	-	-	2	3	6
Alaska	4	1	12	8	27
Hawaii	2	1	2	1	1
Puerto Rico	-	-	-	-	2
Unknown	-	-	-	-	1
Total	36	83	109	272	717

Note: Vessels have been assigned to the various sections on the basis of their home port.

Canned Foods Value to Civil Defense Tested in Nuclear Explosion

Approximately 25,000 samples of about 60 different canned foods in various-sized tin and glass containers were exposed to the effects of a nuclear explosion at the Nevada proving grounds May 5 in the first scientific test of the effects of such a nuclear explosion on various kinds of foods.

The canned foods test is part of an over-all civil defense test of foods and other items essential to the every day existence of a civilian population. A National Canners Association technical group will examine post-blast effects on the canned food samples.

From observations made within six hours after the atomic blast of May 5, it can be stated with considerable assurance that the test foodstuffs would be suitable for emergency feeding. In residential structures, 4,700 feet from ground zero, commercially-packaged foods came through the test relatively better than the houses in which they were stored, and were found substantially free of radioactivity. Food products in physically intact packages were found acceptable for use. Failure of packages was due largely to gross dislodgement from cupboards or from flying missiles. There was no bursting by blast over-pressures. Generally, the containers

stored in basements fared better than those in cabinets. There are no reports yet on results obtained closer to the blast. A more complete report will be issued later.

The Association is participating in the civil defense tests at the invitation of the Federal Civil Defense Administration, which contracted with the Association last fall for the furnishing of samples, technical assistance in setting up the tests, and further scientific testing of the effects of the explosion.

The value of the tests to the canning industry will be to establish that canned foods in tin and glass may be used safely under such extreme emergency.

Canned and glass packed foods were exposed to the explosion at about 18 different locations ranging from 1,050 to 15,000 feet from ground zero, and in various exposure conditions (both cased and uncased in most of them); on the surface of the desert floor to test fall-out effects; on shelves, in cupboards, and on the floors of kitchens and basements of test structures; in emergency shelters; in industrial-type structures for testing of the foods under conditions of retail storage and handling; and in shallow trenches near enough to the explosion to test radioactivity in the absence of blast effects. Some of the test samples will be used in long-range animal-feeding experiments to check for possible toxicity.

In a press statement issued jointly by the Federal Civil Defense Administration, the Department of Defense, and the Atomic Energy Commission, the tests are explained as follows:

"Test effects to be examined include those of neutron and gamma irradiation of foods; the problems resulting from fall-out on foods and packaging, including decontamination feasibility; and the effects of blast and thermal radiation on food packaging.

"Food test stations will be placed just below the level of the ground at two positions along the main FCDA test line. In addition, food will be placed in a number of test structures, including residences and commercial buildings. Some samples will be exposed in locations where maximum fall-out is expected. Others will be exposed primarily to blast. The purpose of the below-ground food stations is to expose the various kinds of food to neutron and gamma radiation without causing the food packages to be disrupted by blast. The stations are actually just below ground level with a very light covering of earth sufficient to attenuate the neutrons or gamma rays to an appreciable degree.

"The project will determine which foods subjected to neutron or gamma irradiation may tend to become radio-active or toxic."

Including the 60 different canned foods, a wide range of food products was exposed. In addition to the heat-sterilized foods, staples such as flour and sugar, semiperishables such as potatoes and processed meats, and perishables such as fresh meats, butter, and frozen foods were included.

Canned Tuna Promotion Program Well Under Way

The buying attention of housewives throughout the entire United States was directed toward canned tuna during the period June 2-11, as a result of the joint industry-Government special canned tuna sales program. Although record stocks of canned tuna were available, it was felt that the intensive sales promotion program would be instrumental in moving a record volume of these stocks.

The campaign, which was first announced by Secretary of the Interior McKay on April 11, is directed towards both the institutional and the home-consumer markets. In this connection the industry distributed point-of-sales and other merchandising material, both through its representative trade association, the Tuna Research Foundation, and through the individual members. This was supplemented by a vigorous public relations program featuring television, newspaper, and radio coverage. Such name stars as Dave Garroway, Steve Allen, Arlene Francis, and Liberace were among the television and radio personalities publicizing canned tuna during the summertime drive. The slogan, Summertime is Tuna Time, was a familiar one in these media during this period.

TOASTED TUNA FRENCH LOAF

1 can tuna (6½ or 7 oz.)
¼ 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 pickle relish

Drain tuna. Flake. Cream butter and mustard. Cut bread in half lengthwise and remove a small amount of the center. Spread center with mustard-butter mixture. Combine remaining ingredients. Fill loaf. Wrap in aluminum foil. Bake in a moderate oven, 350° F., for 20 minutes or until cheese melts. Serves 6.

TUNA A LA STROGANOFF

2 cans tuna (6½ or 7 oz. each)
1 can (4 ounces) mushroom stems and pieces
½ cup chopped onion
1 clove garlic, minced
¼ cup butter or other fat, melted
1 can (10½ ounces) condensed cream of mushroom soup
1 tablespoon Worcestershire sauce
½ teaspoon salt
Dash pepper
2 tablespoons catsup
½ teaspoon paprika
1 cup sour cream
3 cups steamed rice

Drain tuna. Flake. Drain mushrooms and save liquid. Cook onion, garlic and mushrooms in butter until tender. Add mushroom liquid, mushroom soup, seasonings and sour cream. Stir until well blended. Add tuna; heat. Serve over mounds of fluffy steamed rice. Serves 6.

TUNA PIZZA PIE

2 cans tuna (6½ or 7 oz. each)
½ cup chopped onion
3 tablespoons butter or other fat, melted
1 can (8 ounces) tomato sauce
1 can (6 ounces) tomato paste
1 teaspoon crushed oregano
½ teaspoon salt
Dash pepper
1 package hot roll mix
½ cup sliced stuffed green olives
½ pound sliced cheese

Drain tuna. Flake. Cook onion in butter until tender. Add tomato sauce, tomato paste and seasonings; bring to a boil and simmer 10 minutes. Prepare hot roll mix as directed. Divide in half; roll in 2 circles about 9 inches in diameter. Place each circle on a well-greased baking sheet and fold over ½ inch of the outside edge to form a rim. Cover each circle with ½ the sauce, tuna and olives. Arrange slices of cheese on top. Bake in a hot oven, 425° F., for 20 minutes or until crust is brown. Serves 6.

TUNA AND APPLE SALAD

2 cans tuna (6½ or 7 oz. each)
1 cup diced apples
½ cup chopped celery
½ cup chopped nutmeats
½ cup mayonnaise or salad dressing
Lettuce

Drain tuna. Flake. Combine all ingredients and mix lightly. Chill. Serve on lettuce. Serves 6.

As its contribution in the program, the Service's field fishery marketing specialists of the Educational and Market Development Section contacted each state School Lunch Department in the United States and arrangements were made whereby the schools in the country, featuring a hot school lunch, were supplied special Service-prepared canned tuna bulletins. Similar contacts were made with the state institutions and restaurant associations throughout the country, and special canned tuna bulletins were made available to the more than 30,000 members and guests of the recent National Restaurant Association convention in Chicago.

In addition, the Service's marketing specialists personally contacted the television, newspaper, and radio food program directors in each of the cities with a population of 100,000 or more. Supplementing these calls were mailings to many food program directors in smaller cities. Considerable assistance was made available by the U. S. Department of Agriculture, which cooperated by distributing canned tuna recipes and information through its many informational outlets.

Following closely the Boston haddock industry-Government promotion program to move the burdensome inventories of scrod haddock fillets, the current canned tuna program has every prospect of being equally as successful.

Cans--Shipments for Fishery Products, January-March 1955

Total shipments of metal cans for fish and sea food during January-March 1955 amounted to 15,237 short tons of steel (based on the amount of steel consumed in the manufacture of cans), compared to 13,118 short tons in the same period a year earlier.

Can shipments in the first quarter of 1955 by area are: East Coast 2,932 tons, Central States 1,435 tons, and West Coast 10,870 tons, as compared

with 5,531, 1,091, and 20,929 tons, respectively, in the last quarter of 1954. The decreases in January-March 1955 were due mainly to the off-season for canning Maine sardines and California sardines, and a lighter pack of canned 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.

Federal Purchases of Fishery Products

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY DEPARTMENT OF DEFENSE, APRIL 1955: The Army Quartermaster Corps in April 1955 purchased fresh and frozen fishery products for the military feeding of the U. S. Army, Navy, Marine Corps, and Air Force in the amount of 2.2 million pounds, valued at $1.0 million (see table). This was a decrease of 14.0 percent in quantity and 18.2 percent in value as compared with March purchases, but greater by 22.9 and 26.3 percent, respectively, than purchases in April 1954.

Purchases of Fresh and Frozen Fishery Products by Department of Defense (April and the First Four Months of 1955 and 1954)

QUANTITY				VALUE			
April		Jan.-Apr.		April		Jan.-Apr.	
1955	1954	1955	1954	1955	1954	1955	1954
. . . (Million Pounds) . . .				. . . (Million Dollars) . .			
2.2	1.8	8.7	6.9	1.0	.8	3.7	3.0

Purchases of fresh and frozen fish by the Army Quartermaster Corps during the first four months in 1955 totaled 8.7 million pounds (valued at $3.7), higher by 25.0 percent in quantity and 23.9 percent in value as compared with the similar period a year earlier.

An average price of 42.5 cents per pound was paid by the Army Quartermaster Corps for fresh and frozen fishery products purchased in April 1955, compared with 44.2 cents in March and 41.3 cents in April 1954.

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

Florida

SHRIMP INDUSTRY AIDED BY MARITIME ADMINISTRATION LOAN GUARANTEES: In January the Florida shrimp industry felt a relaxation of the pressure which has been building up for the last year or more, when the Maritime Administration of the U. S. Department of Commerce agreed to extend loan guarantees for the purchase or rebuilding of shrimp vessels. An immediate result in Florida will be increased exploration by the industry, reports the February Commercial Fisheries Newsletter (#2) of the University of Miami Marine Laboratory.

A Tampa shrimp firm is seriously considering deep-water explorations, stating that they are made possible because boat alterations and the other costs can now be financed conveniently. This means that (1) shrimp vessel owners can obtain better interest rates than formerly since the loans are guaranteed by the Federal Government; (2) they can obtain loans on more favorable installment terms, over a period of 5 to 6 years instead of the present maximum of 3 years; (3) shipbuilding firms, relieved of the necessity of being guarantors of loans, can give the industry better service.

All this has lifted pressure from the shrimp industry. They need not be under the necessity of paying such heavy mortgage payments on new construction or reconstruction as formerly, and can show a profit with the decreased catches prevalent today, rather than having all the money go to buying their vessels.

To arrange gaurantee of a loan obtained to build or repair a shrimp boat on a five-year basis, application forms can be obtained from the Assistant Chief, Division of Contracts, Maritime Administration, U. S. Department of Commerce, Washington 25, D. C., by asking for "Application for Ship Mortgage and for Loan Insurance under Title XI, Merchant Marine Act 1936. Interim Form 11/22/54." Applicants should remember that the Maritime Administration does not lend the money, but insures loans up to 90 percent of their value for a moderate fee.

Note: See Commercial Fisheries Review, January 1955, p. 73.

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SOFT-SHELL CRAB INDUSTRY BEING DEVELOPED: Methods of producing soft-shell crabs in Florida on a commercial scale have been developed by the University of Miami Marine Laboratory in cooperation with a Florida west coast crab dealer. For some years soft-shell crabs have been produced in small quantities by one or two dealers in Florida, but there has been no large-scale industry. Following preliminary work by the Marine Laboratory, the crab dealer requested the Laboratory to supervise the installation of equipment for holding shedding crabs.

Preliminary work on this problem by The Marine Laboratory included tests of a gear called the crab scrape, used successfully in Chesapeake Bay in collecting "pre-peelers." The success of this gear is limited during some periods of the year since rolling "grass" (Gracillaria) is picked up in such abundance that it prevented the capture of crabs. The scrape can be used during March with more success since the grass is at a minimum.

A crab fyke net, another type of gear used to collect "pre-peelers" in Chesapeake Bay, is now being tested in the Peace River. This gear consists of a wire fence running from the high-water mark on shore to a funnel opening in a trap 4 x 4 feet, made of wire on a wooden frame. The lead, or fence, is 500 feet long in this particular trap. This type of gear is effective in early spring.

The floats for the shedding crabs consist of 3 wooden bins arranged in tiers, each 4 x 10 feet, with a water depth of 9 inches. The water depth is regulated by an opening which drains the water from one bin to the next. The water is supplied by a Jaeger self-priming pump powered by a one hp. motor. A pump of this size will serve another set of bins which will be installed later. This system holds approximately 1,000 gallons of water which can be changed in 18 minutes, and is capable of holding several hundred crabs per bin without danger of overcrowding.

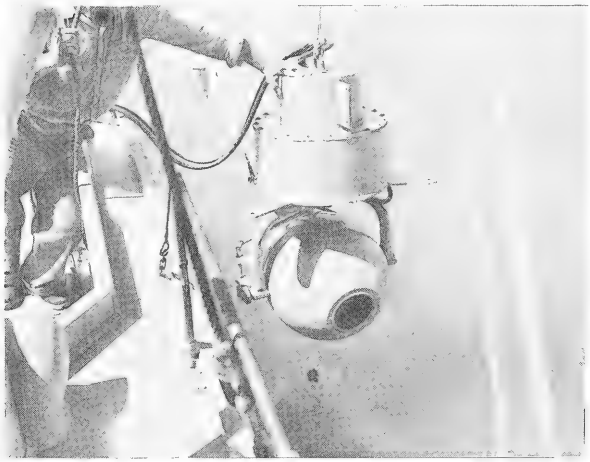
Since it is important that the system contain no copper which is poisonous to the crabs, a cast-iron pump was used rather than bronze, and plastic pipe rather than copper. Similarly copper paint cannot be used on the bins.

Drawings for the system, estimates of the approximate cost of materials, and all necessary advice will be given by The Marine Laboratory to anyone who is interested in installing such a system. Address inquiries to: The Marine Laboratory, University of Miami, Coral Gables, Fla.

Gear Research and Development

BEHAVIOR OF SHRIMP TRAWL VIEWED WITH UNDERWATER TELEVISION: The utility of underwater television as a practical gear-research tool was further demonstrated by the Service's Exploratory and Gear Development Section at Key West, Fla., during March 11-16, 1955.

These experiments took place on the shrimp grounds northwest of Key West with the assistance of the chartered shrimp trawler Miss Ethel W, engaged to handle the trawls. Observers aboard the Service research vessel Pompano were able to view the behavior of a 40-foot flat trawl and a 70-foot balloon trawl under normal dragging conditions at depths to 50 feet.



UW-TV scanning vehicle used in shrimp-trawl viewing. The unit is remote controlled with 360° horizontal and 90° vertical scanning ability.

The UW-TV unit was submerged (see figure), trained on one of the trawling cables, and lowered down to the doors and the trawl. With the 360° remote-control scanning facility and by careful positioning of the Pompano it was possible to view the trawl nets from the front, top, rear, and several lateral angles. Good close-up views were afforded of twine, doors, floats, and lead lines. At times, for more accurate positioning for observations it was advantageous to tow the Pompano from the chartered trawler. While it was shown during the continued observations that these two nets were apparently performing as designed and rigged, it was possible by means of the direct observation afforded to make adjustments and corrections which improved the apparent fishing ability of the trawls.

The tests were carried out during daylight hours to facilitate the visual observations with the UW-TV unit and increase the possibility of successful photographic recordings from the monitor screen.

Results showed that an important consideration in performance of trawl nets is towing speed. An excessive rate of speed caused leap-frogging of lead lines over the bottom, with resulting loss of probable catches. Too slow a rate of speed resulted in a smaller angle of doors and decreased spread of the net opening. An excessive amount of trawl cable played out also resulted in a smaller angle of doors and reduced spread of net.

By increasing the length of the towing legs between trawl wings and doors by 8 feet on the 40-foot trawl, the angle of sheer of the trawl doors was increased, the opening of the net was enlarged, and individual meshes were opened more fully. At the same calculated speed (2 knots) the sheer increased 5 to 7 degrees. This greater sheer enlarged the horizontal opening of the trawl by a calculated 6 feet and did not cause any decrease in vertical height of the net (calculated to be 4 feet). The mesh shape appeared to be more square than diamond shape.

Determination of the maximum and optimum spread are dependent upon further observations, as is the application of this same principle to other types of shrimp trawls.

Great Lakes

"BLOATERS" A NUISANCE IN LAKE MICHIGAN: Since the invasion of the sea lamprey and the subsequent destruction of the lake trout, the problem of the "bloater" (Leucichthys hoyi) has arisen in Lake Michigan. A small cisco (chub) of almost no commercial value, the bloater was formerly a major item in the diet of the lake trout. As the inroads of the sea lamprey upon the lake trout population have decreased the predation of that species on the bloater, however, the bloater has multiplied so rapidly that it is now competing with the more valuable chubs for space and food, as well as creating a nuisance by becoming entangled in large numbers in fishermen's nets.

Gulf of Mexico

OYSTER CANNERS SET NET-WEIGHT STANDARDS: Standards for the net weight of canned oysters packed in the Gulf of Mexico area were set (effective April 21) at a meeting of oyster canners of Louisiana, Mississippi, and Alabama in New Orleans on April 21. Eighteen canners were represented at the meeting.

The meeting was called for the purpose of discussing and formally adopting standards of net weight of canned oysters. In order to ascertain the actual net weight of the canned oysters packed by the different canners of the Gulf area a thorough check was made. Based on these findings, resolutions for adoption of net-weight standards by the Gulf packers and future labeling of oysters on the basis of net weight were unanimously adopted as follows:

(1) That in accordance with the interpretation issued by Mr. Geo. P. Larrick, Commissioner of Food & Drugs and dated April 4, 1955, and published in Federal Register, April 9, 1955; 20 F. R. 2304, the weight declaration on canned oysters packed in the Gulf area including Louisiana, Mississippi, and Alabama be made on the basis of the entire contents of the can in place of the drained weight declaration heretofore used.

(2) That as based on an investigation of the oysters canned in the Gulf area, the industry standard for the net fill (net contents) of canned oysters be and hereby is established as follows:

Can Size	Existing Standard of Drained Weight Per Can	New Standard of Net Contents
	Ounces	Ounces
211 x 300	4.66	8
211 x 400	6.43	11
307 x 113	4.17	7
202 x 204	2.84	5

Also that the specific drained weight of oysters as promulgated as standard under the Federal Food, Drug and Cosmetic Act and listed in above table shall continue to be observed by all Gulf oyster packers even though the drained weight declaration is not shown on the label.

(3) That all Gulf oysters shall henceforth show the net weight on the labels either as "net weight . . . ounces" or "net contents . . . ozs.," or in a similar manner; That optionally the applicable drained weight may be shown on the label in addition to the net-weight declaration; That in order to provide an orderly transition period even though all labels printed in the future shall show the net contents, all existing labels showing the drained weight only, may be used up until the stocks of such labels are exhausted.

(4) That this day of April 21, 1955, be set as the date for adoption of these standards:

(5) That a copy of these resolutions be sent to the U. S. Department of Health, Education & Welfare, Food & Drug Administration, Washington, D. C., New Orleans, La., and Atlanta, Ga.

(6) That wide and thorough publicity be given to these new standards.

Maine

SHORT CANNED MAINE SARDINE PACK TO MID-JUNE: With a total pack of only about 125,000 actual cases of canned Maine sardines as of mid-June, the Maine sardine industry is witnessing one of its smallest early season packs on record, reports a June 17 news release. A shortage of fish is the cause of the small pack to date, says the Executive Secretary of the Maine Sardine Industry. He said that the industry's output was approximately 500,000 actual cases less than the last 20-year average for the same period.

Only 16 or 18 of the States 44 plants had been in operation to mid-June and no substantial runs of fish showed up anywhere along the coast. Records show that so far this year most of the canning has been in the Portland and mid-coast areas with no plants open east of Jonesport.

"It is anybody's guess what may happen from now on, but at present the season has many of the earmarks of 1951 and 1953 when the total pack was 1,600,000 and 1,800,000 cases, respectively," the Executive Secretary reports.

The annual pack for the past 20 years has averaged about 2,750,000 cases and 2,900,000 standard cases were packed in 1954.

In June, packers inventories which appeared burdensome in April were on a level with or less than in mid-June 1954 and were expected to grow smaller by comparison until fish showed up in quantity.

Missouri

COMMERCIAL FISHERIES CATCH, 1954: Missouri waters yielded 379,000 pounds of fish to commercial fishermen in 1954 with a retail value estimated at $97,000, according to the Missouri Conservation Commission's fisheries section.

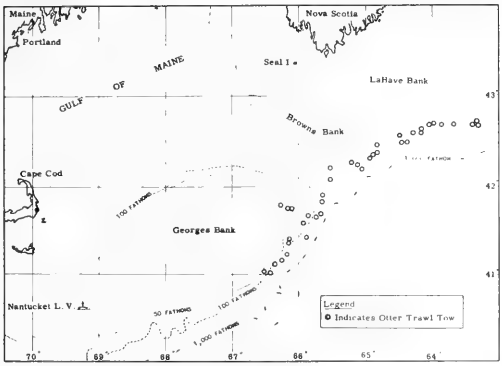
A total of 1,023 Missourians purchased commercial fishing permits and 532 of these operated on the Missouri River, 476 fished the Mississippi, and only 15 the St. Francis River. Permits purchased were for 3,200 yards of seines, 30,500 yards of trammel nets, 2,426 hoop nets, and 64,500 hooks.

The Mississippi River led in total quantity of commercial fish taken with 211,573 pounds. Missouri River fishermen netted 165,342 pounds, and the St. Francis River produced 2,219 pounds of fish.

Carp made up 43.6 percent of the total commercial fish harvest, followed by buffalofish, drum, and flathead catfish, in that order.

New England Exploratory Fishery Program

LARGE OCEAN PERCH CAUGHT IN DEEP WATER ON EDGE OF CONTINENTAL SHELF BY "DELAWARE" (Cruise 5): Good catches of large-size ocean perch were made in 200-300 fathom depths on the edge of the Continental Shelf by the Service's exploratory fishing vessel Delaware on a 12-day cruise (which ended May 20) in offshore New England waters. Ocean perch were taken in depths to 400 fathoms, but the best catches (up to 3,000 pounds) were made in the 200- to 300-fathom range. These fish averaged about 2 pounds in weight. This was the third in a series of cruises designed to explore the availability of bottom species on the edge of the continental shelf in waters deeper than ordinarily fished by commercial vessels.



Delaware Exploratory Cruise 5, May 9-20, 1955.

A total of 40 tows of one-hour duration was made. Thirty-nine of these were made with a No. 41 "balloon" trawl. The net apparently fished very effectively, but no tows were made to effect a performance comparison with the standard No. 41 trawl.

In general, tows were made in successive depths to 400 fathoms. Two species were widely distributed in the depth range covered--whiting (Merluccius bilinearis) and white hake (Urophycis tenuis). Commercial quantities of these species were taken in depths up to 350 fathoms.

Of surprising abundance was the Argentine (Argentina silus), a smelt-like species. Catches up to 1,000 pounds were made, and samples were frozen for examination by Service technologists at the East Boston Fishery Technological Laboratory.

Lobsters (Homarus americanus) were widely distributed on the edge of the continental shelf in the area east of Georges Bank, but few were taken south of Browns and La Have Banks. The average weight of lobsters taken was $5\frac{1}{2}$ pounds. Forty large egg-bearing female lobsters were turned over to the Massachusetts Division of Marine Fisheries for use in the lobster propagation hatchery at Martha's Vineyard.

The Delaware is scheduled to depart on Tuesday, May 31, for an 11-day trip to continue exploration for northern shrimp in waters of the Gulf of Maine and northward.

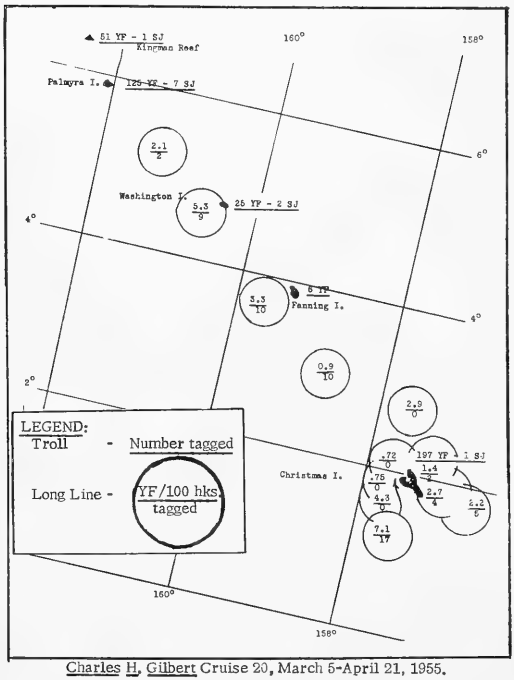
Oregon Canner Might Buy Tuna in South Pacific from Japanese Vessels

A representative of an Astoria, Ore., fish canner said his organization was investigating the possibility of purchasing tuna from Japanese vessels operating in the New Caledonia-New Hebrides-Loyalties area in the South Pacific. The plan envisages a United States refrigeration vessel stationed at Noumea, New Caledonia. Fish landed aboard that vessel would technically be United States-produced, according to the representative of the Astoria firm. The intention appears to be either to can the fish aboard this vessel, or to ship it frozen to the United States.

The representative emphasized that the whole scheme is at present merely under investigation. Even if the necessary arrangements can be made in Noumea it probably would be some time before operations could be commenced, reports the March Pacific Islands Monthly, a magazine of the South Seas Islands.

Pacific Oceanic Fisheries Investigations

YELLOWFIN TUNA ABUNDANCE STUDIED BY "CHARLES H. GILBERT" (Cruise 20): The distribution and abundance of yellowfin tuna was studied by the Service's research vessel Charles H. Gilbert on a 7-week cruise in various areas of the Pacific Ocean. The distribution and abundance of deep-swimming and surface yellowfin tuna were tested by live-bait fishing, scouting, trolling, and long lining; while the feasibility of a tagging program was tested to discover (1) the relation between deep-swimming and surface tuna, and (2) migration as a possible cause for fluctuations in the abundance of yellowfin.



Charles H. Gilbert Cruise 20, March 5-April 21, 1955.

In 142 hours of scouting 60 bird flocks and/or fish schools were noted. They were wild and tended to disperse when approached. Added to this, only a few of the 20 buckets of live bait taken in Hawaii survived to Palmyra Island so it was impossible to try to work the schools.

Almost all direct trolling was done from 100 yards to 3 miles off the various islands. There were about 142 hours of trolling which netted 438 yellowfin or 3.1 per hour. As high as 7.8 per hour were taken at Palmyra and as few as 1.3 per hour near Christmas Island. About two wahoo per hour were also taken during the trolling. These may represent an additional source of income to fishermen.

Thirteen long-line stations were occupied in the Line Islands area. Catches fluctuated considerably and the average of 3.0 yellowfin per 100 hooks was surprisingly low. A high of 7.1 yellowfin per 100 hooks was obtained within a few miles of Christmas Island. While fishing with-

in a few miles of each other the Charles H. Gilbert had catches of the same size as the John R. Manning which was testing gear, indicating that a few miles' difference in location makes little difference in the catch rate.

It is interesting to note that despite the low long-line catch rate the catch per 10-hour day was 1,650 pounds, comparing very favorably with a catch of 940 pounds per 10-hour day of trolling.

About 18 percent of the long line-caught yellowfin were shark eaten.

By trolling and long lining 461 yellowfin, 11 skipjack, and 1 little tunny were tagged. Trolling was by far the best method for obtaining yellowfin suitable for tagging. Of the 438 yellowfin caught, 406 averaging 33 pounds were tagged, or about 93 percent of the total. On the other hand, of the 238 yellowfin caught on long-line gear only 53 were tagged. This low figure in part reflects the difficulty in landing these larger fish (mean weight 110 pounds) without injury.

The Charles H. Gilbert also did considerable other biological work on the cruise: (1) continuous surface temperature and routine BT observation were taken; (2) skipjack stomachs were preserved; (3) night light stations were occupied at Christmas Island and Kingman Reef; (4) serviced Christmas Island meteorological instruments; (5) yellowfin and big-eyed tuna loins were prepared for treatment by the Pauley process; (6) indirect trolling was conducted during all daylight runs; (7) the depth of the main line was determined by sounding tubes, and the deepest hooks were between 40 and 60 fathoms; (8) morphometric data were obtained on istiophorids and uncommon sharks; (9) reef fishes (mostly snappers and groupers) from Palmyra and Kingman Reef were brought back both alive and frozen for the Territorial Division of Fish and Game.

The weather during the trip was fair; no time was lost from fishing due to bad weather.

Palmyra Island Commercial Tuna Fishery Abandoned for Present

Hopes for a successful tuna fishery based on Palmyra Island have failed--at least for the present, reports the February Pacific Islands Monthly.

Original fishing surveys carried out under the sponsorship of the U. S. Fish and Wildlife Service were very successful, and on those results a Seattle firm commenced operations in mid-1954. They employed the 150-ton converted schooner Commonwealth, with 40 tons of refrigeration space as the mothership and two smaller fishing vessels.

Catches were poor and the Commonwealth is now lying idle in Honolulu. One of the fishing vessels, Brothers, was missing at sea off Kaual, Hawaii, in December 1954, while returning from French Frigate Shoals where it had been operating more profitably. An occasional boat has gone down from Honolulu to Palmyra in recent months, but with little success.

Saltonstall-Kennedy Act Fisheries Projects

FOREIGN FISH OIL MARKET SURVEY UNDER WAY: The U. S. Fish and Wildlife Service has arranged with the Foreign Agricultural Service of the U. S. Department of Agriculture to conduct preliminary surveys of the production and market outlets for domestically-produced fish oils in Western Europe and South America, in connection with the foreign market development project made possible by Saltonstall-Kennedy Act funds. Following an outline developed by the Service, the Agriculture representatives will investigate the present market trends and consumer preference for domestic oils in these foreign countries, and make preliminary surveys into the foreign production potentials insofar as they constitute competition for United States products. It is expected that the Agriculture representatives will have completed their assignment by July 1 and an informal report of their findings will be released shortly thereafter.

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SERVICE OPENS FISHERY STATISTICAL OFFICE IN ARANSAS PASS, TEXAS: A statistical office for the collection of fishery data was opened at Aransas Pass, Tex., in July by the Service's Branch of Commercial Fisheries. Activities of the Aransas Pass office will include the collection of detailed data on employment in the fisheries, number of craft and quantity of gear operated, the catch of fishery products, and related activities in the vicinity of Aransas Pass. Detailed statistics on the shrimp fishery will be obtained for that area in connection with the Service's expanded program for the collection of shrimp statistics.

Gordon R. Luce, Jr., who has been engaged in the collection and tabulation of Florida fishery statistics by the University of Miami, will be in charge of the office.

This project is being financed by funds provided by the Saltonstall-Kennedy Act (68th Stat. 376).

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SERVICE SIGNS CONTRACTS TO EXPAND ALASKA SALMON RESEARCH: As a further step in the U. S. Fish and Wildlife Service's vigorous program for the restoration of depleted salmon runs in Alaskan waters, a second contract has been signed with the University of Washington for salmon research in the Territory, Acting Secretary of the Interior Davis announced June 16.

The new $55,400 contract provides for expanded research under the Saltonstall-Kennedy Act on problems affecting the survival of salmon. It supplements an earlier $64,000 contract as well as the extensive Government program.

Salmon is Alaska's economic mainstay. The catch declined disastrously in 1953 as the result of an unknown disaster at sea. Secretary McKay promptly ordered the institution of unprecedented conservation measures designed to maintain a healthy fishing industry for the Territory.

The salmon run improved in 1954 and is expected to increase further this year but more needs to be known about salmon before ultimate recovery of the fishery is assured. The two contracts, totaling $119,400, with the University of Washington provide for much of the needed research.

The work will be conducted at the University's Fisheries Research Institute under the supervision of its Director, Dr. W. F. Thompson. For the past several years the Institute has been making limited studies of the Alaska salmon resources. The signing of the contracts permits activity in Alaska during the 1955 salmon runs.

The first contract provides for a tagging program to ascertain where Alaska salmon go when at sea and the rate at which they are caught. Work on the marine life of salmon has been largely neglected in the past because of the high cost of sea-going research.

Certain phases of the salmon's life in fresh water are likewise not too well known. This is particularly true of the numbers of young salmon passing downstream each year, and of the physical and chemical conditions which affect their survival in lakes and streams. The second contract covers the investigation of these problems. In addition it provides for the further development of relatively cheap photographic counting methods to replace the costly weirs and their attendants now employed to enumerate spawning escapements.

The tagging contract will be administered by Clinton E. Atkinson, Chief of the Service's Pacific Salmon Investigations, headquartered at Seattle, Wash. The fresh-water research program will be headed by Donald L. McKernan, newly appointed Administrator of Alaska Commercial Fisheries at Juneau.

Thompson, who will exercise university supervision over both programs, is a noted authority on the life history and conservation of salmon, halibut, tuna, and sardines. He was the Director of the initial research work of the International Halibut Commission and the International Pacific Salmon Fisheries Commission. The rehabilitation of the halibut of the north Pacific and the sockeye salmon of the Fraser River are widely considered as outstanding examples of conservation.

Service Contracts for National Survey of Fishermen and Hunters

Data on the amount of time and money that United States sportsmen spend annually on hunting and fishing will be collected for the first time on a national basis, Acting Secretary of the Interior Davis announced June 7. The U. S. Fish and Wildlife Service will supervise the project and publish the final results.

This nationwide personal interview survey, scheduled to start next January after preliminary field-testing, will provide information on the number of persons (12 years of age or older) who participated in recreational hunting and fishing during calendar year 1955; the days spent by them in these pursuits; and the amount of money they spent which can be directly attributed to these sports.

No national survey of this scope has ever been conducted previously although a number of states have carried out similar surveys within their own borders. Methods employed in these state surveys, however, varied to such an extent that it has been impossible to correlate the data for use on a national basis.

To obtain accurate data at the national level, the International Association of Game, Fish, and Conservation Commissioners, representing all of the 48 state fish and game departments, adopted a resolution at its meeting in September 1954 at Seattle, Wash., which requested the U. S. Fish and Wildlife Service to contract with a survey organization for a nationwide economic survey of hunting and sport fishing activities.

In implementing this resolution, the Service submitted a plan for a personal interview survey to 21 fact-finding organizations and invited specific proposals for conducting the study. Nine definite proposals were received. These were carefully reviewed by a committee composed of Service representatives and statistical experts from several Federal agencies. Crossley, S-D Surveys, Inc., of New York

City, was the successful bidder and a contract was signed between that firm and the Fish and Wildlife Service on June 1.

A number of the state fish and game departments have indicated their interest in expanding the national survey for their particular state so as to obtain state estimates. These states will be able to conduct such surveys through individual contracts with Crossley, S-D Surveys.

Also, at the request of the International Game, Fish, and Conservation Commissioners, the cost of the survey--$134,000--will be financed from funds available to the Fish and Wildlife Service for administering the Federal Aid in Fish and Wildlife Restoration programs. These funds, under the terms of the Pittman-Robertson and Dingell-Johnson acts, are derived from the Federal excise tax on sporting arms and ammunition, and on fishing rods, reels, creels, and artificial lures, baits, and flies.

State wildlife administrators have long recognized the need for data on the economic status of hunting and fishing which they can use in planning their programs for the management of these natural resources. The Fish and Wildlife Service and other Federal agencies dealing with wildlife, as well as numerous private conservation organizations, will also benefit from the results of such a survey which will provide an authentic measurement of the National interest in hunting and fishing.

Under the terms of the contract, the final statistical report on survey results must be submitted to the Fish and Wildlife Service by June 15, 1956. The results will be published as soon as possible by the Service and made available to all Federal, state, and private agencies interested in learning the impact of hunting and sport fishing on the National economy.

Service Dedicates New Marine Laboratory in North Carolina

A new U. S. Fish & Wildlife Service laboratory for fisheries research on the Atlantic Coast was formally dedicated at Beaufort, N. C., on May 13. This marine biological laboratory will serve as headquarters for the shad, striped bass, and menhaden investigations conducted by the Service along the Atlantic Coast. It replaces the old wooden structure built in 1902 which had long been a landmark in the Beaufort-Morehead City area.

Construction of the new Beaufort laboratory began in 1952 and was completed in 1954. It was designed by the Service's Branch of Engineering. By using simplified construction methods, the cost was among the lowest of any buildings recently constructed by the Service. It consists of a laboratory building and a service building. The laboratory building has fully-equipped office space and a research area with circulating sea water. The service building contains a heating plant, garage, and shops. The laboratory unit is fully air-conditioned. Both units are of one-story modern design.

The Beaufort laboratory is situated on Pivers Island which lies within Beaufort Harbor about one mile from Beaufort Inlet. It is separated from the mainland and the town of Beaufort by a channel about 150 yards wide.

Beaufort, N. C., was early found to be a place especially well suited for the study of the marine fauna and flora. It was visited in 1860 by such eminent zoologists as Gill and Stimpson, by Coues and Yarrow in 1871-72, and by Professor Spencer Fullerton Baird, first head of the U. S. Fish Commission established in 1871. Beaufort soon became a resort for persons interested in biology and for a

period of 10 years or so prior to the establishment of a Federal station, professors and students of John Hopkins University maintained a laboratory there. In 1899 the first Federal fisheries laboratory at Beaufort was set up in a rented building. In 1900 Congress authorized the erection of a biological station which was completed and opened to investigators for the first time in 1902.

Extensive life history studies and practical fishery experimental work on a variety of species of fish found along the Atlantic coast have been made at Beaufort since establishment of the station. This information, aside from its scientific value, is essential when it becomes necessary to enact regulatory measures to protect the commercial species from overfishing.

For nearly 40 years the old Beaufort station was headquarters for one of the most unusual farming operations ever conducted by the Fish and Wildlife Service--that of hatching and rearing diamond-back terrapins. During the period when the farm was in operation, as many as 12,000 young terrapins were released each year in suitable brackish water areas along the coast from Maryland to Louisiana, with the result that they have now become well reestablished over much of their former range. This activity was discontinued in 1948 when the objective of the Service in demonstrating hatchery and farming procedures and in restocking depleted areas was considered accomplished.

During World War II the Beaufort laboratory was inactive in fishery research. In 1949, however, it was reopened when the Service concluded an agreement with the Atomic Energy Commission whereby cooperative research on shellfish and other marine organisms, using radioactive tracer methods, was begun at the laboratory. One main objective of the study was to learn more about the accumulation in marine life of radioactive material and its possible effects on shellfish. This work is still going on at Beaufort but in a building separate from the new laboratory.

Limited facilities for visiting investigators will be available in the new laboratory.

Tuna Industry Group Presents Problems to State Department

A delegation representing the California Commission on Interstate Cooperation, composed of California State officials, accompanied by representatives of the canning and fishing segments of the tuna industry and of the Council of State Governments, called on Under Secretary of State Herbert C. Hoover, Jr., and other officials of the United States Government on June 20 to discuss the situation which has arisen in the industry in California. Maurice C. Sparling, Chairman of the Commission, and Assemblyman Vincent Thomas, Vice Chairman of the Commission, headed the delegation. The delegation was accompanied by Representative Robert C. Wilson of the Thirtieth Congressional District of California and Merrell F. Small, Administrative Assistant to Senator Thomas Kuchel.

In addition to representatives of the Department of State, representatives of the Departments of Interior, Commerce, and Treasury were also present to meet with members of the delegation. Jack Martin, Administrative Assistant to the President, also attended the meeting.

Various related aspects of the tuna situation in California were discussed. The delegation presented information bearing on the matter and advanced a number of suggestions to deal with the situation. The Government representatives indicated that this matter is now under immediate and active study by the Executive Branch. It is expected that this study will be completed in the very near future.

The Delegation is planning to meet further with other agencies of the Government to consider the situation in the tuna industry in California.

U.S. Consumption of Fishery Products, 1954

Apparent United States civilian per-capita consumption of fishery products in 1954 totaled 11.1 pounds (edible weight)--comprised of fresh fish 6.1 pounds, canned fish 4.4 pounds, and cured fish .6 pounds (see table), according to the May 2 issue of The National Food Situation, a U. S. Department of Agriculture publication. This is an increase of 2.7 percent for all fishery products as compared with 10.8 pounds consumed in 1953, and 0.9 percent more than the 11.0 pounds consumed in 1952.

U. S. Apparent Civilian Per-Capita Consumption of Fishery Products, 1954 with Comparisons

Type	1954	1953	1952	1947-49 Average
	(Pounds)			
Fresh and frozen fish	6.1	5.9	6.3	5.9
Canned fish1/	4.4	4.3	4.1	3.8
Cured fish	.6	.6	.6	.6
Total	11.1	10.8	11.0	10.3

1/ Excludes canned food products containing small quantities of fish, such as clam chowder, etc.

The per-capita consumption of fishery products in 1955 from preliminary indications is estimated at 11.1 pounds.

U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, MARCH 1955: United States imports of fresh, frozen, and processed edible fish and shellfish in March 1955 totaled 76.7 million pounds (valued at $18.5 million), according to a Department of Commerce summary tabulation (see table). This was an increase of 38 percent in quantity and 36 percent in value as compared with February imports of 55.4 million pounds (valued at $13.6 million). Compared with a year earlier, March imports were also up considerably--19 percent in quantity and 16 percent in value.

United States Foreign Trade in Edible Fishery Products, March 1955 with Comparisons

Item	Mar. 1955		Mar. 1954		Year 1954	
	Quantity	Value	Quantity	Value	Quantity	Value
	(In Millions of Lbs. & $)					
Imports:						
Fish & shellfish: fresh, frozen & processed1/	76.7	18.5	64.7	15.9	801.7	202.8
Exports:						
Fish & shellfish: processed1/ only (excluding fresh and frozen)	7.1	1.6	4.1	1.4	50.8	13.2

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

Exports of processed edible fish and shellfish (excluding fresh and frozen) in March 1955 amounted to 7.1 million pounds (valued at $1.6 million). This was an increase of 6 percent in quantity and 7 percent in value as compared with February exports of 6.7 million pounds (valued at $1.5 million). March 1955 exports were up 73 percent in quantity and 14 percent in value as compared with a year earlier.

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SELECTED FISHERY PRODUCTS, JANUARY-MARCH 1955: A comparison of imports and exports of certain fishery products during the first three months of 1955 with the same period a year ago shows large gains in imports of frozen tuna,

U. S. Foreign Trade in Selected Fishery Products, January-March 1954 and 1955

Product	Jan.-March 1955	Jan.-March 1954	Percentage Increase or Decrease
	. .(1,000 Pounds) . .		%
IMPORTS:			
Tuna, fresh or frozen	35,455	21,739	+ 63
Tuna, canned in oil	366	407	- 10
Tuna, canned in brine	6,970	7,612	- 8
Bonito, canned in oil	5,496	6,754	- 19
Salmon, fresh or frozen.	2,920	3,803	- 23
Salmon, canned	803	6,668	- 88
Sardines, canned in oil	5,223	5,554	- 6
Sardines, canned not in oil . . .	223	4,253	- 95
Shrimp	9,329	10,636	- 12
Lobsters, fresh or frozen. . . .	9,775	7,228	+ 35
Fillets (including blocks), groundfish and ocean perch . .	35,704	27,580	+ 29
Swordfish	5,164	3,361	+ 54
Fish Meal	27,294 tons	36,275 tons	- 25
EXPORTS:			
Salmon, canned	966	2,154	- 55
Sardines, canned, not in oil . .	14,665	2,355	+523
Fish oils, inedible.	37,578	44,158	- 15

swordfish, and groundfish fillets (see table). Substantial declines are noted in imports of salmon (fresh or frozen and canned), canned sardines not in oil, and fish meal. The principal change shown in exports was a decline in canned salmon and an increase in canned sardines.

* * * * *

MANY COUNTRIES EXPORT FISHERY PRODUCTS TO UNITED STATES IN 1954: An increasing number of foreign countries are supplying fishery products to United States markets, according to a preliminary review made by the U. S. Fish and Wildlife Service of certain of the principal fishery product imports.

Shrimp, for example, was imported from 23 countries during 1954, compared with 10 countries supplying that product in 1949. Imports of groundfish fillets now come from 13 countries located on three continents. In 1940 such imports were supplied by two neighboring countries.

Tuna in its various forms came to the United States from 18 different countries in 1954. In 1940, 12 countries supplied tuna to the United States. During 1954, 12 countries were shown as the source of fresh or frozen tuna, 8 countries for tuna canned in oil, and 12 countries for tuna canned in brine.

Swordfish came principally from 4 countries in 1954, compared with 2 countries in 1940. Crab-meat imports originated in 6 countries, about the same as in 1940.

About 38 different countries in all contributed to the imports of these commodities during 1954. Imports of these products during 1954 totaled about 350 million pounds and had a foreign value of US$87 million. In 1940 these same products totaled 47 million pounds at a value US$7 million.

U.S. Production of Fishery Byproducts, 1954

MARINE-ANIMAL SCRAP AND MEAL: The production of marine-animal scrap and meal in the United States (including Alaska and Samoa) during 1954 totaled 257,000 short tons, valued at $32.7 million (table 1), according to the data collected by the U. S. Fish and Wildlife Service. This is an increase of 7.5 percent in quantity and

Table 1 - U. S. Production of Marine-Animal Scrap and Meal, 1954 and 1953

Product	1954		1953	
	Quantity	Value	Quantity	Value
	1,000 Short Tons	$1,000	1,000 Short Tons	$1,000
Anchovy	.2	25.4	.7	88.5
Crab, blue	10.1	598.1	8.4	502.2
Crab, Dungeness	.2	10.3	.3	16.2
Fur seal	.3	33.5	.4	27.7
Groundfish (including ocean perch)	7.2	934.6	16.4	2,298.5
Herring	7.0	928.9	5.2	717.5
Menhaden	183.1	23,783.4	174.8	21,767.2
Sardine (pilchard)	6.5	842.6	.1	19.0
Salmon	1.2	137.5	1.5	185.3
Shrimp	.9	50.3	1.0	80.0
Tuna and mackerel	21.5	2,845.2	20.0	2,622.6
Unclassified	18.7	2,558.0	10.1	1,234.9
Total	256.9	32,747.8	238.9	29,559.6

10 percent in value as compared with the 1953 production of 239,000 tons, valued at $29.6 million. Menhaden meal comprised the bulk of the production, accounting for 71 percent of the total in 1954 and 73 percent in 1953.

MARINE-ANIMAL OIL: Production of marine-animal oils in the United States and Alaska during 1954 totaled 21.9 million gallons, valued at $12.8 million, as com-

Table 2 - U. S. Production of Marine-Animal Oil, 1954 and 1953

Product	1954		1953	
	Quantity	Value	Quantity	Value
	1,000 Gallons	$1,000	1,000 Gallons	$1,000
Body Oil:				
Anchovy	9.3	5.0	81.9	35.1
Fur seal	40.2	19.9	46.8	23.3
Herring	760.9	434.3	718.6	360.5
Menhaden	18,641.4	9,755.3	17,824.5	8,806.3
Sardine (pilchard)	755.9	420.5	13.1	6.4
Salmon	183.0	141.9	217.2	165.5
Tuna and mackerel	584.9	243.5	659.2	314.6
Unclassified	652.4	393.1	528.5	333.6
Total	21,628.0	11,413.5	20,089.8	10,045.3
Liver and Viscera Oil:				
Cod	161.5	133.8	113.7	102.0
Shark	26.3	298.4	26.5	402.4
Tuna	-	-	3.0	57.5
Miscellaneous	48.9	959.7	61.1	874.7
Total	236.7	1,391.9	204.3	1,436.6
Grand Total	21,864.7	12,805.4	20,294.1	11,481.9

pared with 20.3 million gallons, valued at $11.5 million in 1953 (table 2). The bulk of this was body oil, with menhaden oil comprising 86 percent of the body oil in 1954 and 89 percent in 1953.

CONDENSED FISH SOLUBLES AND HOMOGENIZED CONDENSED FISH: The United States production of fish solubles in 1954 totaled 172.2 million pounds, valued at $8.3 million, and homogenized condensed fish production amounted to 57.9 million pounds valued at $2.3 million (table 3). Production of fish solubles and homogenized condensed fish combined in 1953 totaled 163 million pounds, valued at $7.3 million.

Table 3 - U. S. Production of Fish Solubles and Homogenized Condensed Fish, 1954 and 1953

Product and State	1954		1953	
	Quantity	Value	Quantity	Value
	1 Million Pounds	$1 Million	1 Million Pounds	$1 Million
Fish Solubles:				
Maine	1.4	.1	1.1	.1
Massachusetts and Rhode Island	8.5	.4	49.3	2.0
New York, New Jersey, and Delaware	64.7	3.1	44.2	1.9
Virginia	20.7	1.1	13.2	.7
North Carolina and Florida	7.3	.4	6.0	.3
Mississippi	5.5	.3	3.0	.1
Louisiana	13.1	.6	4.7	.2
California and Oregon	51.0	2.3	41.5	2.0
Total	172.2	8.3	163.0	7.3
Homogenized Condensed Fish:				
Massachusetts and Rhode Island	57.9	2.3	1/	1/
Grand Total	230.1	10.6	163.0	7.3

1/ Included with fish solubles.

Wholesale Prices, May 1955

Increased production of fishery products and improved demand held wholesale prices to only a slight drop from April to May. The over-all index of edible fish and shellfish (fresh, frozen, and canned) in May 1955 was 98.1 percent of the 1947-49 average (see table)--0.6 percent less than in April and 5.4 percent below May 1954.

Lower ex-vessel prices for large dressed haddock at Boston were mainly responsible for a 3.9-percent decline in the drawn, dressed, or whole finfish subgroup index from April to May. Western salmon prices at New York were down slightly, while Western halibut prices remained unchanged. All fresh-water prices were down substantially from April to May, except yellow pike prices at New York which rose significantly. Compared with May 1954, haddock, halibut, and

A moderately busy morning on the floor of the England Fish Exchange with buyers bidding for the offshore trips which are listed on a board facing the buyers.

salmon prices in May 1955 were all considerably lower, and the index for the subgroup was down 10.1 percent. All fresh-water fish prices in May 1955 were higher than a year earlier.

There was a mixed trend from April to May in the fresh processed fish and shellfish subgroup. Increased production of fresh haddock fillets resulted in lower prices while lighter production caused higher shrimp prices from April to May--the over-all May index for the subgroup increased 3.1 percent. Oyster prices were unchanged. The May 1955 index for the fresh processed fish and shellfish subgroup was 0.6 percent higher than a year earlier, with shrimp and oyster prices up and haddock fillet prices down.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, May 1955 With Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ ($)		Indexes (1947-49=100)			
			May 1955	Apr. 1955	May 1955	Apr. 1955	Mar. 1955	May 1954
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					98.1	98.7	100.7	103.7
Fresh & Frozen Fishery Products:					97.9	98.1	100.1	106.9
Drawn, Dressed, or Whole Finfish:					85.6	89.1	96.3	107.1
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.06	.06	57.6	64.2	60.3	102.1
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.22	.22	68.1	68.1	74.3	97.5
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.50	.50	111.8	112.4	118.0	120.8
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.57	.73	141.3	179.7	167.3	114.0
Whitefish, L. Erie pound or gill net, rnd., fresh	New York	lb.	.73	.75	146.6	151.6	131.4	123.3
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.47	.69	96.3	141.4	138.3	79.9
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.40	.28	93.8	64.5	161.8	84.4
Processed, Fresh (Fish & Shellfish):					103.5	105.2	104.2	107.8
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.25	.26	85.1	88.5	78.3	107.2
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.69	.64	103.6	101.1	98.0	99.6
Oysters, shucked, standards	Norfolk	gal.	4.63	4.63	114.4	114.4	117.5	117.5
Processed, Frozen (Fish & Shellfish):					95.6	95.3	96.8	104.5
Fillets: Flounder (yellowtail), skinless, 1-lb. pkg.	Boston	lb.	.38	.42	99.5	110.0	106.0	96.9
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.26	.28	80.0	86.3	89.4	105.1
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.27	.28	106.7	111.8	111.8	117.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.59	.55	91.0	84.1	85.6	99.5
Canned Fishery Products:					98.3	99.4	100.0	98.8
Salmon, pink, No. 1 tall (16 oz.), 48 can/cs.	Seattle	case	20.70	20.70	109.6	109.6	109.6	99.1
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans cs.	Los Angeles	case	12.50	12.70	90.1	91.6	93.0	102.4
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	case	7.55	7.30	88.1	85.2	85.2	2/
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	case	6.70	7.20	71.3	76 6	76.6	81.9

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.
2/ Not available.

Higher frozen shrimp prices more than offset lower prices for all other frozen items and were responsible for an 0.3-percent increase in the frozen processed fish and shellfish subgroup from April to May. However, the May 1955 frozen fish and shellfish prices were 8.5 percent below a year ago with all items priced lower except flounder fillets.

Canned fish prices in May indicated a mixed trend also, with prices lower for tuna and Maine sardines and higher for California sardines. Canned salmon prices were the same as a month earlier. The over-all index for canned fishery products dropped 1.1 percent from April to May. Compared with the same month a year earlier, this May's prices for tuna and Maine sardines were substantially lower and for salmon higher.

International

FOOD AND AGRICULTURE ORGANIZATION

INTERNATIONAL TERMINOLOGY FOR FISHERIES BIOLOGY: Experts from Canada, France, Germany, Italy, Netherlands, Sweden, United Kingdom, and United States were invited by the Biology Branch of FAO Fisheries Division to collaborate in the study of the living aquatic resources of the world, according to the February 1955 report from the FAO Director General. This task involves a great deal of reading and searching of scientific literature, as well as drafting definitions of terms, and classifying and planning a documentation program.

The experts met in Paris from December 8-14, 1954, and discussed at great length problems regarding terminology, classification, and documentation, as well as a bibliographic program for fisheries biology. They drafted a program for FAO Fisheries Division concerned with its work in assessing the scope and content of fisheries science. It is hoped that this will help the standardization of classified terms. They also recommend the use of a provisional decimal classification of fisheries science, primarily for the internal use of the Organization, but also with the view to its being used by other workers and eventually its possible inclusion in the Universal Decimal Classification. Other recommendations consisted in collaborating closely with the editor of "Bibliographia Oceanographica" towards the compilation of comprehensive bibliographic lists of biological publications relevant to both marine and inland fisheries. Dr. George S. Myers represented the U. S. Fish and Wildlife Service at the meeting.

* * * * *

SURVEY OF WORLD'S FISHERY RESOURCES PROPOSED: A proposal for a survey and appraisal of world agricultural, fisheries, and forestry resources in relation to world needs will be considered by the Food and Agriculture Organization at its November conference, according to that agency's annual report prepared for the United Nations Economic and Social Council and distributed at U. N. Headquarters. The report is one of a series received from U.N. specialized agencies for consideration at the Council's 20th session which opened July 5 in Geneva.

Noting that concern has been expressed whether the world can meet the requirements of the "rapid growth of population now taking place," the report indicates that FAO could be expected to give "a reasonably authoritative answer to such questions as to how resources for the production of food and agricultural and forest raw materials can be made adequate to meet the needs of the existing population or of the much higher population already foreseeable."

Such an answer could be given only on the basis of "a global survey of resources in respect of their potentials for production so far as this can be judged at present levels of knowledge," the report states, adding that the FAO Conference at Rome Headquarters in November will discuss the proposal.

The proposed survey would be of "fundamental importance for FAO's practical task of assisting countries to develop unexploited resources and to raise crop,

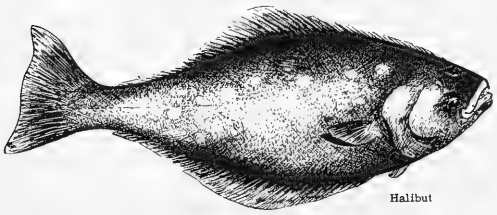
livestock, fisheries, and forestry yields in the areas already under exploitation." Such a survey has already been made for forestry.

Assessing the world's "renewable resources" is one of five fields of activity suggested by the Director-General for FAO's work toward its ultimate goal: "to enlarge human well-being by increasing and improving the production, distribution, and utilization of food and other products of agriculture, forestry, and fisheries."

The other fields are: assessing the needs of people for better nutrition and higher standards of living; improving the quantity, quality, and efficiency of production; achieving methods of distribution and consumption which will most nearly meet the goal of enlarged human well-being; and educating producers, distributors, and consumers in the adoption of more rational and progressive methods.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

AREAS 2 AND 1B CLOSED JUNE 5: The International Pacific Halibut Commission has announced the closure of Pacific halibut Areas 2 and 1B to halibut fishing at 6:00 a.m. (P.S.T.) June 5, 1955, until the commencement of the second fishing season in these areas.



Halibut

The Commission estimated that the 26.5-million-pound limit set for Area 2 would have been caught, and Area 1B which had no quota also was closed when the catch limit for Area 2 was attained.

The opening date for all halibut fishing in the Pacific regulatory areas this year was May 12 at 6:00 a.m. In 1954 the opening date was May 16, and Areas 2 and 1B in that year also closed June 5. This means that halibut fishing in Areas 2 and 1B this year lasted 24 days as compared with 21 days in 1954 (the shortest season on record for these areas), 24 days in 1953, 26 days in 1952, 28 days in 1951, and 32 days in 1950.

The second fishing season in Areas 2 and 1B shall commence at 6:00 a.m. (P.S.T.) on July 27 and shall terminate at 6:00 a.m. (P.S.T.) on August 3 with no catch limit, and said areas shall be closed to halibut fishing thereafter until reopened in 1956.

Area 2 includes all Convention waters off the coast of the United States and Alaska and Canada between Area 1B and a line running through the most westerly point of Glacier Bay, Alaska, to Cape Spencer Light and south one-quarter east, and to be exclusive of the nursery areas defined in the regulations.

Area 1B includes all Convention waters between a line running northeast and southwest through Heceta Head Light and a line running northeast and southwest through Willapa Bay Light on Cape Shoalwater.

Areas 3A and 3B are still open to halibut fishing and will close when the catch limit for Area 3A of 28.0 million pounds has been attained.

LATIN AMERICA TERRITORIAL WATERS

PERUVIAN CONGRESS RATIFIES TRIPARTITE AGREEMENT ON 200-MILE TERRITORIAL-WATERS ZONE: The Peruvian Congress convoked for a special session beginning May 5 to ratify the Tripartite Agreement concluded between Peru, Chile, and Ecuador establishing maritime sovereignty over a zone of 200 miles from

the coast (Declaration of Santiago), reports a May 5 U. S. Embassy dispatch from Quito.

CONFERENCE OF THE PERMANENT COMMITTEE OF SOUTHERN PACIFIC: It was announced on May 3 that the Governments of Chile and Peru have designated their respective delegations to the Conference of the Permanent Committee of the Southern Pacific scheduled to be held in Quito beginning the first week of July. As of May 4 the Ecuadoran Government had not yet named its delegation to the Conference.

ECUADORAN CABINET DISCUSSES PROTECTION OF FISHERIES RESOURCES: A meeting of the Ecuadoran Cabinet was held on April 29 during which the Acting Minister of Foreign Affairs discussed the protection of fisheries resources off the Ecuadoran coast, as well as the defense of Ecuador's national sovereignty over the territorial sea up to 200 miles seaward in conformity with the Declaration of Santiago. The Cabinet (Consejo de Ministros) gave a vote of congratulations to the Minister, as well as the Minister of Economy, for the manner in which they were handling fishing problems, particularly as regards foreign fishing vessels that have been fined for "violating territorial waters."

UNITED NATIONS

ROME MEETING ON WORLDWIDE FISHERIES CONSERVATION: The Rome International Conference on "the conservation of the living resources of the sea" attended by experts from countries in many parts of the world ended on May 10. The purpose of the Conference was to examine all fishery conservation techniques, both national and international, which have been employed to date and see how they could be applied in areas where conservation is needed but where little or nothing has so far been done. The United States delegation was expected to leave Rome by mid-May for Geneva, Switzerland, where the report of the Conference will be submitted to the International Law Commission.

The Conference agreed on objectives of conservation, types of scientific information required, types of conservation measures applicable, and applicability procedures in present conventions to existing problems not now covered by conventions. They also agreed upon the proposal for resolving disagreement through findings of qualified experts and the principle that all states fishing a stock of fish accept responsibility to cooperate in conservation programs.

The problem of special rights of coastal states was agreed to be outside the province of the Conference, but this problem was included in Conference conclusions with recommendations for further study.

The final report and conclusions were accepted by all but a few delegates who filed reservations. Over-all results of the Conference were considered satisfactory, or better, by most delegations.

TRADE AGREEMENTS

JAPANESE-NATIONALIST CHINA TRADE AGREEMENT INCLUDES DRIED AND SALTED FISH: The Governments of Japan and Nationalist China (Formosa) agreed to extend the present trade agreement to cover the period April 1, 1955, to March 31, 1956. Under the agreement Japan will ship Nationalist China dried and salted fish valued at approximately US$3.5 million during the period. Nationalist China will not ship any fishery products to Japan under this agreement, reports an April 25 U. S. Embassy dispatch from Taipei, Formosa.

WHALING

WORLD WHALE- AND SPERM-OIL PRODUCTION, 1955: World production of whale and sperm whale oils in 1955 is forecast at 415,000 and 85,000 short tons, respectively, as compared with 455,000 and 75,000 tons in 1954, according to the May 9 Foreign Crops and Markets, a U. S. Department of Agriculture publication. A smaller output of whale oil and a much larger production of sperm oil during the 1954/55 Antarctic pelagic season largely account for the respective changes from last year in the total outturns forecast for 1955 (see table).

Antarctic production of baleen whale oil in the past 5 years, including the production of 3 South Georgia shore stations, has accounted for nearly 90 percent of the world supply. During the same period oil produced from sperm whales taken in this area has made up slightly less than one-half of the total output of sperm oil. Numerous shore-station operations in scattered parts of the world and sperm whaling by factoryship, mainly off the coast of Peru, account for the remaining production. Those countries which normally engage in Antarctic whaling--Norway, United Kingdom, Japan, Netherlands, Panama, Union of South Africa, and the Soviet Union--produce the bulk of the world's whale oil. Australia's production of whale oil also has been substantial in recent years.

World Whale- and Sperm-Oil Production by Major Producing Countries, 1955 with Comparisons

Country	Whale Oil			Sperm Oil		
	1955 1/	1954 2/	1953	1955 1/	1954 2/	1953
	(1,000 Short Tons)					
Norway	138	188	148	26	7	6
United Kingdom	77	90	81	11	9	10
Japan	69	58	44	16	15	6
Netherlands	11	17	19	1	1	3/
Panama	27	-	29	3/	10	2
Union of South Africa	21	31	33	6	4	5
Soviet Union	33	32	31	15	15	14
Australia	17	19	19	-	-	-
Argentina	9	10	6	3/	3/	1
Chile	3	3	3	3	3	3
Portugal 4/	-	-	-	4	4	3
Others	10	7	7	3	7	5
World Total	415	455	420	85	75	55

1/ Forecast. 3/ Less than 500 short tons.
2/ Preliminary. 4/ Production of Azores and Madeira Islands.

Nineteen factoryships and about 230 catcher boats engaged in Antarctic pelagic whaling in 1954/55. The combined production of whale and sperm oil, according to provisional data, was 383,657 short tons, or slightly less than in 1953/54, reports the United States Embassy at Oslo. Whale oil output alone was down about 10 percent but sperm-oil production was twice that of the previous season.

In addition to Antarctic pelagic operations, production of whale and sperm oil by the 3 shore stations on South Georgia was reported at 32,967 and 763 tons, respectively. This compares with 32,882 tons of whale oil and 1,620 tons of sperm oil in 1953/54.

The catch of baleen whales in the 1954/55 Antarctic season, provisionally reported at 15,300 blue-whale units, was well under the maximum catch quota of 15,500 units established by international agreement. This may account partly for the lower outturn of whale oil in the past season, as the 1953/54 catch of baleen whales reached 15,456 units. No maximum quota has been established for the catch of sperm whales, however, and the increase in Antarctic production this season was due largely to more favorable prices.

EASTERN PACIFIC OCEANIC COUNCIL--CORRECTION

The Eastern Pacific Oceanic Council, an organization for the purpose of furthering oceanographic and biological investigations in the eastern Pacific for the benefit of fisheries, was organized at an informal meeting held at the Scripps Institution of Oceanography in California on November 2 and 5, 1954. The March 1955 Commercial Fisheries Review, page 48, incorrectly reported on the meeting under the heading "Pacific Science Association," and that the meeting was an informal conference

of the Pacific Science Association. The Eastern Pacific Oceanic Council has no formal connection with the Pacific Science Association, although the work of both groups is closely related.

Angola

FISH-OIL INDUSTRY: Angolan fish-oil production appears to have averaged about 3,000 short tons per year from 1950 through 1952 and about 7,000 tons were produced in 1953. Production may have been near 10,000 tons in 1954, according to Foreign Agriculture Circular of April 9 (FFO 11-55), a U.S. Department of Agriculture publication. The available information indicates there has been a steady increase from production of a few hundred tons per year in the period 1940-1945. Annual exports are believed to have varied widely and to have averaged about 3,000 tons in the last few years. There may have been as much as 4,500 tons in some years.

It is expected fish-oil production will increase. There is a growing internal market for fish, transportation facilities are being extended in the interior, and there is a good supply of many kinds of fish in the coastal waters. This trend is indicated by issuance of licenses for 23 new fish-oil installations in 1952 and 16 in 1953. About 31 of these newly-licensed plants were installed and in operation by the middle of 1954.

The Angolan fishing industry centers in the coastal districts of Lobito and Mocamedes. There are many small processors of dried fish, fish meal, and fish oil in the coastal towns from the vicinity of Benguela to Bafa dos Tigres to the south. The fishing industry is of importance because it supplies a protein food in the diet. Modern plants are located at Baia Farta and Samba Marie. Sun drying of fish is being replaced by mechanical driers and centrifugal extractors for processing meal and oil are being installed in some plants previously using presses. Improvement in processing methods and mechanization of all plants is now required and additional production of higher-grade products may result. A considerable part of the production is used in the Angolan fish-canning industry, but fish oil is not used industrially in Angola. The fish-canning industry also uses the commercial production of peanut oil.

Argentine Republic

FISHERIES PRODUCTION EXPECTED TO INCREASE: The second Five-Year Plan (1952-57) of the Republic of Argentina foresees an increase in fish production of about 185 percent above the average for 1947-51 (67,000 metric tons), and to reach a total of 200,000 tons in 1957.

To obtain such an increase, a coordinated research program for the systematic investigation of the continental seas of Argentina was started in May 1954. These investigations are to be carried out at sea and in various scientific institutions of the country, reports the January-March Fisheries Bulletin published by FAO.

The program includes (1) physical, chemical, and biological studies of the sea; (2) study of the geological characteristics of the sea bottom; (3) study of the areas of major concentration of hake (merluza), a basic resource for the trawl fisheries; (4) study of the populations of hake covering age composition, growth, feeding habits, reproduction, and migration; (5) investigation of the correlation between the variations of productivity of the seas and the natural fluctuations in the annual yield of commercial fisheries; (6) calculation of exchanges between the sea and the atmosphere for future climatologic predictions based on oceanographic data.

The following institutions will be cooperating in this program: The Oceanography Branch of the Division of Navigation and Hydrography, the recently created

Fisheries Research Branch in the Argentine Fish and Wildlife Service (Direccion General de Pesca y Conservacion de la Fauna), the National Institute for the Investigation of Natural Sciences "Bernardino Rivadavia;" and the School of Sciences of the University of Buenos Aires. Scientists from other institutions will also take part.

Unloading and packing fish at fish wharf, Mar del Plata, Argentina

The first research expedition was conducted during May and June 1954 with the oceanographic vessel Madryn of the Ministry of the Navy, in the main trawl fishing areas, between latitudes 36° S. and 42° S. The chemists, general biologists, and fishery biologists taking part in this investigation were divided into working groups of three members each, covering the study of plankton, benthos, physical oceanography, and commercial fisheries.

Observations and collections were made in 53 oceanographic stations from the surface to a depth of 1,600 feet. On board the vessel determinations of phosphates, alkalinity, and pH were made. Water samples for determining salinity, oxygen, and other elements were analyzed by the Oceanography Branch of the Ministry of the Navy, and samples of bottom sediments are being studied in the National Institute for the Investigation of Natural Sciences. Fish collections have been distributed to this Institute and the Fisheries Research Branch for examination.

Concurrently with this expedition, fishery biologists went out with the trawlers to make a general study of the species caught with particular regard to the yield of hake per haul in the areas where oceanographic observations are being made.

The Madryn will make further oceanographic expeditions, one during each season of the year, to obtain a complete cycle of observations, and each month fishery biologists will go out in different types of fishing boats to make continuous observations to collect samples of hake, pursue the study of the life cycle of this fish, and to determine the fishery potentialities of the Argentinian waters.

This research program, which is being initiated and developed in the Argentine, at present covers a limited number of related oceanographic and fisheries problems, however, these are well defined and of immediate interest to the country. It also proves the advantage of cooperation between the institutions engaged in a combined effort which permits a maximum yield with a minimum of expense.

The final results of these investigations will be used as basic data for the composition of fishing charts, which will be edited by the Division of Navigation and Hydrography in cooperation with the Argentine Fish and Wildlife Service. They will also help to establish norms to be followed in the exploration of the fisheries resources of the country.

Australia

IMPORTS OF CANNED SARDINES AND SALMON ALLOWED FROM DOLLAR AREA: The Australian import control authorities announced recently that imports of canned sardines from the dollar area will be permitted in 1955, reports the May 14 Foreign Trade, a Canadian Government publication. This product has been a prohibited import from the dollar area in recent years. In addition, it has been announced that the arrangements for imports of canned salmon from the dollar area which were made in 1954 will be continued this year.

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TUNA MARKETING TRENDS: Australia's young tuna industry has been suffering from growing pains, reports the February Fisheries Newsletter, an Australian fishery magazine. Marketing problems, temporary suspension of buying by canneries on the south coast of New South Wales, and price reductions caused misgiving and brought a flood of wild statements. But these events should prove beneficial in the long run and help put the Australian tuna industry on a sound footing.

Table 1 - United Kingdom Wholesale Canned Tuna (Fancy in Oil) Prices

Date	Peruvian (C.I.F. + 10% duty) Per Dozen 7-oz. Cans		Australian (C.I.F.) Per Dozen 7-oz. Cans	
1954	Stg.	US$	Stg.	US$
July	18/-	2.52	18/4	2.56
August	16/6	2.30	-	-
November	16/3	2.27	15/6	2.16
	14/4	2.00	-	-

Canned and raw tuna are world trade commodities. Tuna is the first Australian fish to attain that status and it is the first Australian fish product which potentially can match imported fish in quality and price. Tuna must be regarded differently from Australian salmon, barracouta, and the minor species canned in Australia. Taking a long view, the tunas appear to be the only species which can provide the mainstay of a strong Australian fish-canning industry.

Table 2 - Australian Tuna Production 1954/55 and Comparisons

Season	Pounds (round weight)
1954/55 (to 12/17/54)	1/ 1,400,000
1953/54	1,273,601
1952/53	683,445
1951/52	214,008
1950/51	1/ 40,859
1949/50	807,839

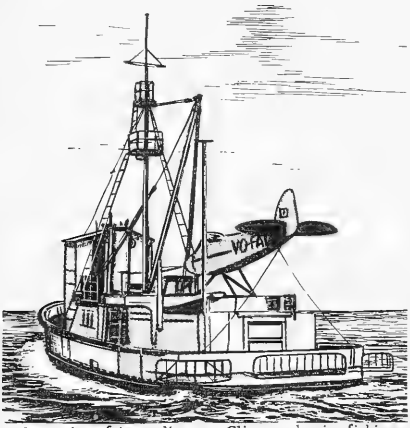
1/ New South Wales production only.

In mid-1954 the outlook for disposal of the new season's tuna catch seemed good. It was planned to offer tuna in 7-oz. cans to the United Kingdom at greatly reduced prices, compared with those obtained for $3\frac{1}{2}$-oz. cans in 1953.

But orders from the United Kingdom were not forthcoming. Relaxation of restrictions on non-Commonwealth countries by the United Kingdom, and deals involving the importation of large quantities of Canadian salmon made the market highly competitive.

Tuna in 7-oz. cans was not offered in Australia at the new low prices as Australians are not yet educated to appreciate tuna, and there was a heavy accumulation of $3\frac{1}{2}$-oz. cans from the previous season's catch. A total of 5,000 cases of 7-oz. cans of tuna in brine are now passing into local outlets. The brine pack has a pink appearance and should appeal as a quality substitute for imported salmon. But an extensive sales promotion program will probably be necessary before large quantities of the brine and oil packs can be disposed of in Australia.

The fact that stocks were in the $3\frac{1}{2}$-oz. size appears to be one of the reasons for the recent break in the industry. One should hesitate however, to criticize the earlier decision to pack tuna as a luxury snack rather than as a standard grocery line. Introduction of the 7-oz. can required expensive changes in plants. The approach to marketing this new product was necessarily tentative and only experience could point the way. Tuna catching commenced in 1949/50, and table 2 shows annual production since that year.



Stern view of Australian tuna Clipper, showing fishing racks and live-bait tanks. Spotting plane fitted with floats on top of tanks.

The potential capacity of the vessels (14 with live-bait tanks) on the New South Wales coast, provided the fish run normally, is perhaps 3 million pounds in a season. It is still a small fishery but could become Australia's largest in a short time.

All the effort put into prospecting markets for tuna bore fruit in late November and December 1954. Orders totaling 18,000 cases from the United Kingdom and the shipment of one-half million pounds of frozen fish to the United States changed the outlook. The fishermen agreed to accept 5d. (5 U. S. cents) per pound--previously they received 8d. (8 U. S. cents). All the publicity given to Australian tuna proved valuable. Inquiries were received from Egypt and Singapore for raw fish, presumably with the sale in Europe in view. At 5d. (5 U. S. cents) per lb., or an average of 6d. (6 U. S. cents) for the season, there is no doubt that the fish can be sold now and in the future.

The various markets for Australian tuna require careful study.

Canned Tuna Markets: The domestic market demands first consideration for availability of stocks and distribution of canned tuna. Australia imports £2,330,000 (US$5.1 million) worth of canned fish annually. With imaginative advertising, an increasing quantity of these imports should be displaced by tuna in its various canned forms. The aim should be to establish tuna as a standard grocery article as it is in the United States. There is considerable scope for selling it to Government Departments, especially the Navy, Army, and Air Force. If National Service trainees were given tuna in camp, they would be sure to sing its praises in their homes. But it is unlikely that the local market would absorb the total output as the industry expanded.

The United Kingdom is a potential outlet for large quantities of canned tuna but many factors are involved and the demand is likely to be variable. There is a duty of 10 percent against non-Commonwealth countries. The present foothold in this market needs to be consolidated and a continuous demand for Australian tuna worked up.

The New Zealand market is being prospected. New Zealanders eat about 6 million pounds of imported fish annually. Norwegian tuna is on sale there, and even some high-priced United States packs are sold. South Africa has plenty of fish of its own, but no tuna is packed there. It is not unlikely that Australian tuna could be placed in South Africa.

South-East Asia would bear investigation, especially the British places, but in some countries Japanese competition would make sales difficult.

Currently the possibility of exporting tuna in brine to the United States is being considered. It is dutiable at 12½ percent.

Frozen Tuna Markets: While possibilities may exist for selling frozen tuna in Europe, the United States must be treated as the only established outlet. The view is held that sale of raw fish should be regarded as a safety valve, rather than as the main outlet. It is desirable that Australia can as much as possible. Sale of raw fish to the United States has, however, the virtue of earning dollars.

The present poor market for raw tuna in the United States is due to several main causes.

Recent reports from San Francisco and New York show that there is very lively interest in Australian tuna, both in California and on the East Coast. There was a time when it was rumored that a move would be made for a duty on raw tuna but this now seems unlikely. All reports indicate that there will be a continuing demand in the United States for the raw fish.

Summarized, the outlook for Australian tuna is good. By exploiting all markets to the fullest extent, the industry can become big enough to operate economically and maintain profit margins at world price levels.

British Honduras

FISHERY PRODUCTS EXPORTS, 1954: British Honduras exports of fishery products in 1954 totaled 343,100 pounds, valued at BH$143,500 (US$100,400), compared with exports for 1953 totaling 260,200 pounds, valued at BH$102,400 (US$71,500). The United States received 62 percent of the British Honduras fish and shellfish exports in 1954 as compared with 79 percent a year earlier. Spiny lobsters comprised the bulk of these exports, and a large increase in shipments of whole spiny lobsters in 1954 accounted for the increase in total fishery products exports from British Honduras.

British Honduras Exports of Fishery Products, 1954 and 1953
(Total Exports and Exports to United States)

Product	1954			1953		
	Quantity	Value		Quantity	Value	
	1,000 Lbs.	1,000 BH$	1,000 US$	1,000 Lbs.	1,000 BH$	1,000 US$
Fresh, frozen, or live fish:						
Total exports	67.7	17.4	12.2	62.7	16.2	11.3
Exports to U. S.	51.6	14.8	10.4	52.2	13.8	9.7
Salted, dried fish, etc.:						
Total exports	75.9	17.4	12.2	28.9	5.2	3.6
Exports to U. S.	-	-	-	-	-	-
Spiny lobsters, whole:						
Total exports	97.9	31.2	21.8	14.7	3.0	2.1
Exports to U. S.	65.2	24.6	17.2	3.7	.8	.6
Spiny lobster tails:						
Total exports	94.2	75.1	52.6	143.2	75.3	52.7
Exports to U. S.	92.8	73.9	51.7	142.2	74.7	52.3
Conchs:						
Total exports	3.9	.5	.3	8.4	1.2	.8
Exports to U. S.	1.5	.3	.2	6.5	1.1	.8
Shrimp:						
Total exports	3.5	1.9	1.3	2.3	1.5	1.0
Exports to U. S.	3.5	1.9	1.3	2.3	1.5	1.0
Total all fishery products:						
Total exports	343.1	143.5	100.4	260.2	102.4	71.5
Exports to U. S.	214.6	115.5	80.8	206.9	91.9	64.4

Canada

NEWFOUNDLAND SCHOOL FOR FISHERMEN: Fishermen, young and old, in many parts of Newfoundland are going back to school--a very special one making an important contribution to the program of development in the fisheries currently taking place there, reports the February 1955 Trade News, a Canadian Government publication. With the new look in the Province's fisheries placing greater emphasis on offshore fishing involving larger boats and more powerful engines than those used in the inshore fishery, the school is filling a fundamental need in giving the fishermen groundings in navigation and Diesel engineering.

The school is tailored to meet fishermen's requirements in certain necessary respects; for example, instead of being established in one place and bringing the fishermen to it, a highly impractical course to pursue, it has been set up as a traveling school to bring its benefits to the fishermen. The school is conducted by the provincial fisheries department of the Newfoundland Government and its operations are directed by the Newfoundland Fisheries Development Authority. The Federal government is giving valuable assistance in that half the expenses involved are met by the Federal Department of Labour.

During 1954, school "terms" were held in various parts of the Province's south coast, and this year an early start has been made at Bonavista on the northeast coast, which is a focal point of the fisheries in that area and is accessible to a large number of fishermen throughout a wide section of that district.

Fishermen who have already taken the courses are putting their newly acquired knowledge to good use in various aspects of the fisheries. Many others will put to sea better informed and better equipped to cope with their old element and with new devices, when the fishery reopens in other districts in 1955.

Colombia

200-MILE TERRITORIAL-WATERS ZONE STUDIED: The Colombian Agricultural Society is studying the problem of the continental shelf and conservation of marine fisheries, according to the Colombian press (El Tiempo, April 16, 1955). Colombia may be preparing a resolution to claim the continental shelf surrounding its coast, and adherence to the tripartite claims of Chile, Peru, and Ecuador to jurisdiction over a 200-mile zone of territorial waters, according to an April 18 U. S. Embassy dispatch from Bogota.

Colombia's most prominent expert on international law spoke to the Natural Resources Committee of the Agricultural Society. This expert has been a vocal advocate of Colombian claims to its continental shelf and the 200-mile limit. He has previously recommended to the Colombia Constitutional Study Commission a constitutional amendment claiming Colombian sovereignty over the continental shelf. The Commission has accepted the recommendation. In an address to the Agricultural Society Committee he did not confine himself to the continental shelf, but called for support by the Committee of proposed action by Colombia to adhere to the "Latin American movement to protect its maritime resources."

Cuba

FROG LEG EXPORTS, 1954: Cuban exports of frog legs (mostly to the United States) in 1954 totaled 325 metric tons, valued at US$430,000, reports a May 12 U. S. Embassy dispatch from Habana (see table). This is an increase of 47 percent in quantity and 20 percent in value as compared with 1953 exports. In 1938 Cuban frog leg exports totaled only 3 metric tons, valued at US$2,000. Most of the frog leg exports are frozen.

Year	Quantity	Value	Year	Quantity	Value
	Metric Tons	US$1,000		Metric Tons	US$1,000
1954	325	430	1949	349	521
1953	220	358	1948	307	437
1952	145	210	1947	140	271
1951	134	164	1946	114	166
1950	200	255	1945	89	73

Denmark

FAROE ISLAND FISHERY LIMITS AGREEMENT REACHED WITH BRITISH: Agreement has been reached between the United Kingdom and Denmark that the fishery limits around the Faroe Islands should remain at three miles from the coastline, with adjustments to preserve spawning grounds, reports an April 29 U.S. Embassy dispatch from London. The new limits, which became effective July 1, can be regarded as a reasonable compromise between the interests of Faroese inshore fishermen and those of British deep-sea trawlers. They are to be firm for at least 12 years and will apply to the fishing vessels of all other countries.

According to the April 29 issue of The Fishing News, the British Foreign Secretary remarked: "The Danish Government proposed an extension of fishery limits around the Faroe Islands. During the negotiations this proposal has been modified so that the new limits can now be regarded as a balance between the fishing interests of the two parties. The Danish Government have given an assurance that the new limits will be applied to the fishing vessels of all other countries. The limits will be firm for at least 12 years; this period of stability will be valuable to our fishing industry.

"The Secretary for Scotland and the Minister of Agriculture, Fisheries and Food, have kept the organizations representing our trawling industry informed of these negotiations.

"We welcome these Agreements, which show that problems of fishing grounds can be settled by negotiation without economic dislocation and bitterness. I am confident that we have arrived at a reasonable compromise between the interests of Faroese inshore fishermen and those of British deep-sea trawlers."

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FISH MEAL AND OIL INDUSTRY EXPANDS: Production of herring fish meal and oil in Denmark is going through a phase of rapid development, reports the March 25 issue of The Fishing News, a British fishery periodical. The great richness of herring on Bloden Grund is in itself a marvel. England, Germany, Holland, and Belgium all get their supplies there. In Denmark it has caused a mighty rise in this trade.

The main centers of production in Denmark are concentrated in the harbors of Skagen, Frederikshaven, Hirtshals, and Esbjerg, where byproduct plants are being extended and new plants built.

In Hirtshals there are two modern plants. Esbjerg has two big plants. To these will be added two new ones. These will be opened with a capacity of 250-300 metric tons of raw material per day. The machinery will be delivered from Norway and West Germany and will be of the most modern type. At Thyboron on the west coast of Jutland another plant is planned for immediate building. This plant will be started on a cooperative basis. These expansions will allow Denmark, before long, to double its exports of herring oil and fish meal.

Besides these stationary plants, the building of a big modern trawler is planned, which will be constructed as a fish-meal and herring-oil factoryship and a salting-house at sea. Moreover, a freezing machine will be installed. It will also be able to fulfill all the functions of a modern trawler.

As a herring-oil plant it is an obvious advantage that this floating factory can stay on the fishing grounds. It is both an experiment and innovation made for the Danish fishing industry. Many look forward with great interest to the result.

The factories have already received in advance considerable export orders besides those for the home market.

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BYPRODUCTS IMPORTS AND EXPORTS, 1953-54: Denmark's byproducts imports amounted to 34,422 metric tons in 1954 as compared with 22,378 tons in 1953, according to an April 15 U. S. Embassy dispatch from Copenhagen. Byproducts exports amounted to 35,303 tons in 1954 as compared with 20,153 tons the previous year.

Danish Imports of Marine Oils and Meals, 1953-54

Product	1954			1953		
	Quantity	Value		Quantity	Value	
	Metric Tons	1,000 Kroner	1,000 US$	Metric Tons	1,000 Kroner	1,000 US$
Fish-liver oil	2,798	5,382	779	2,597	4,503	652
Herring oil, etc.	1,622	2,527	366	422	611	88
Whale and seal blubber	-	-	-	1,128	1,142	165
Whale oil	13,581	18,542	2,685	10,468	13,926	2,016
Seal oil	1,882	2,798	405	18	24	3
Herring meal	7,475	8,265	1,197	4,763	4,902	710
Other fish meal	7,064	7,558	1,094	2,982	2,870	416
Total	34,422	45,072	6,526	22,378	27,528	4,050

Danish Exports of Marine Oils and Meals, 1953-54

Product	1954			1953		
	Quantity	Value		Quantity	Value	
	Metric Tons	1,000 Kroner	1,000 US$	Metric Tons	1,000 Kroner	1,000 US$
Fish-liver oil	418	673	97	715	1,050	152
Herring oil, etc.	9,526	12,520	1,813	6,727	8,511	1,232
Whale and seal blubber	-	-	-	12	12	2
Whale oil	86	122	18	312	333	48
Seal oil	153	267	39	241	380	55
Herring meal	23,453	25,677	3,718	10,296	11,642	1,686
Other fish meal	1,667	1,597	231	1,850	1,860	269
Total	35,303	40,856	5,916	20,153	23,788	3,444

Ecuador

LATIN AMERICAN FISHERIES COUNCIL RATIFIED: Ecuador by publication of a legislative decree in the May 5 Registro Oficial ratified the Latin American Fisheries Council which was approved at the FAO Conference at Rome in December 1953, reports a U. S. Embassy dispatch (June 3) from Quito.

Formosa

FISHERY PRODUCTS EXPORTS, 1954: Formosan exports of fishery products in 1954 totaled 16,466 metric tons, valued at NT$53 million (US$3.4 million), according to an April 22 U. S. Foreign Operations Administration dispatch from Taipei.

Iceland

TRANSPORTATION WORKERS' WAGE INCREASE WILL AFFECT FISH EXPORTS: Ten percent wage increases and a State-subsidized unemployment fund have been granted to 7,000 transportation strikers who returned to work in Reykjavik and two other main Icelandic towns late in April after a 42-day stoppage.

The wage rise will add to the financial burdens of Iceland's fish export industry. Higher taxes are expected if other wage demands are granted.

Fishing is reported to be good. Winter fishing was continued by hundreds of fishing boats whose small-town labor unions refused to sympathize with the strike, which tied up 10 Reykjavik trawlers, reports the May 6 issue of The Fishing News, a British fishery paper.

Iran

FISHERY PRODUCTS PRODUCTION AND CONSUMPTION, 1954: Iranian production of fishery products in the year ending August 22, 1954, amounted to 30,000 metric tons, according to a November 2, 1954, U. S. Embassy dispatch from Tehran. Iranian fishery products production in the year ending August 22, 1953, totaled 27,000 metric tons.

Domestic consumption for the year ending August 22, 1955, was estimated at 20,000 metric tons, and exports were estimated at 8,000 tons. Consumption for the previous 12 months was estimated at 18,000 tons. (Iranian statistics are kept on the basis of the marketing year, August 23 to August 22.)

Irish Free State

NEW SCALLOP DREDGE: A startling new method of scallop fishing has been developed through experiments carried out with a new type of gear used in Bantry Bay, Ireland, by a team of fishermen directed by the Irish Department of Fisheries and the Harbor Master at Bantry.

The new dredge, which is entirely different from that now being used, resembles a miniature plough and is fitted with a 5-foot adjustable swivel-toothed dredge and bar. A hood keeps it level in the water. Adjustable skids to either side make it far easier to pull than the present type of dredge.

The results of the dredging, done from a launch when an old and a new dredge were tried out simultaneously, revealed that the new method secured from 5 to 8 times more scallops than the old, according to the April 22 issue of The Fishing News, a British trade paper.

These results are considered to be little short of revolutionary where scallop fishing is concerned, and will affect hundreds of inshore fishermen along the southwest coast of Ireland who live by dredging scallops during the winter months from November to March. During the season now ended, scallops brought an average of 35s. per hundredweight (5 U. S. cents per pound).

The main centers for the industry are Bantry Bay and Kenmare Bay, but with the new dredging apparatus now available, the industry may extend along the coast on either side, where it has not been an economic proposition up to now with the old type of dredge.

Israel

FISHERIES TO BE DEVELOPED: Shrimp: A program for the development of a shrimp industry in Israel has been under way by the Industrial and Agricultural Division, an April 22 U. S. Foreign Operations Administration dispatch from Tel Aviv states. This would be a new industry to Israel. A survey of Mediterranean waters near Israel's shores revealed the availability of sizable quantities of excellent quality shrimp. Sufficient initial equipment is available to establish the enterprise.

Shrimp is not consumed in Israel in quantity due to religious restrictions, but there is a good demand in the United States; and the program being developed is slanted toward the United States market. It has been established that as much as 250 metric tons can be obtained annually from Israeli waters, with a total value of about US$250,000. Arrangements have been made for quick freezing shrimp samples in a small laboratory freezer.

Sea Fisheries: A tentative program of operations for the next two years in Israeli sea fisheries has been drawn up. Progress was made during February in the location of large supplies of species of "bouri," and a technique has been developed for ready identification of all major species of bouri present in Israel's Mediterranean waters.

Preliminary arrangments have been made for experiments on sponge culture to start within a short time. Plans have been drawn as well for a program of exploratory fishing in waters over 200 fathoms deep. The possibility of utilizing the seasonal tuna run and the more steady shark fishery resource of Eilat are being considered.

Italy

FISHERIES PRODUCTION, 1954: Italian marine fisheries production in 1954 totaled 192,000 metric tons as compared with 186,000 tons in 1953, according to the Quarterly Statistical Bulletin (Vol. VIII, No. 1, First Quarter 1955) published by the United States Operation Mission to Italy (see table). The 1954 production was the highest in the postwar years. Sardines and mackerels were the principal species landed by the Italian fisheries, and the heaviest landings were made in the midsummer months.

Italian Marine Fisheries Production, 1950-1954

Species	1954	1953	1952	1951	1950
	.. (1,000 Metric Tons).				
Sardines and mackerels ..	68	67	79	61	61
Other fish	90	91	83	76	76
Mollusks	28	22	21	21	21
Crustaceans ..	6	6	5	6	6
Total	192	186	188	164	164

Italian trawler

Japan

SALMON FLEETS SAIL FOR NORTH PACIFIC: A total of 12 Japanese salmon expeditions were due to sail for the North Pacific on May 2, according to a U. S. Embassy dispatch (May 4) from Tokyo. Originally 11 fleets were planned for this year's operations but a twelfth mothership was authorized without increasing the number of fishing boats--its 20 boats were drawn from other fleets. The total number of survey boats is increased from 50 to 56.

Japanese North Pacific Salmon Fleets, 1955

Mothership		Fishing Vessels	Survey Vessels
Name	Gross Tonnage	No.	No.
Miyajima Maru 1/	8,964	30	6
Itsukushima Maru 2/	5,700	23	4
Koyo Maru 2/	7,400	23	6
Einin Maru 1/	7,456	20	6
Kyoho Maru 1/	7,050	25	4
Meisei Maru 1/	5,618	20	6
Kizan Maru 3/	7,933	31	4
Terutama Maru 3/	5,643	24	4
Kyokusei Maru 4/	4,804	23	4
Kyokko Maru 3/	6,979	25	4
Choko Maru 3/	5,598	20	4
Nichian Maru 3/	5,277	20	4
12 Total		284	56

1/ Existing mothership.
2/ Newly-built mothership.
3/ Converted from cargo ship.
4/ Converted from whaling ship Baikal Maru.

The final makeup of the fleets which will fish for salmon in the Sea of Okhotsk has not been officially announced. These fleets were scheduled to sail about June 1.

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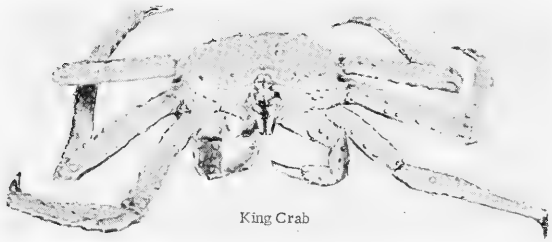
NORTH PACIFIC FACTORYSHIP CRAB FISHING, 1955: Japanese motherships especially fitted for canning crabs departed for their prescribed fishing grounds, reports an April 15 U. S. Embassy dispatch from Tokyo.

The Tokei Maru, converted from a World War I Hog Island vessel, is proceeding to the Eastern Bering Sea (Bristol Bay) where it will fish until its limit of 57,000 cases of king crab is reached. This will be the third expedition of the Tokei Maru to Bristol Bay since the Peace Treaty. The fishery will be under a joint management of three Japanese companies. Two catcher boats of about 70 tons and 6 utility boats of about 10 tons (to be carried on board) will join the expedition.



King Crab

The Yoko Maru, a newly converted Japanese cargo ship, is proceeding to the Sea of Okhotsk, where it will fish off the west coast of Kamchatka. Its limit is stated to be 60,000 cases of king crab. This will be not only the first trip of the Yoko Maru in her present role but also the first time a Japanese vessel has entered the Sea of Okhotsk since World War II. This fleet, under the joint management of two Japanese companies, will include besides the factoryship 3 catcher boats of about 70 tons and 9 utility boats of about 10 tons.

Another fleet, with the factoryship Kakuyo Maru under the joint management of two other Japanese companies, consists of 3 catcher boats of about 70 tons and 8 utility boats of about 10 tons (to be carried on board). This fleet will also operate in the Eastern Bering Sea.

Each mothership is the base of operations for the catcher, trawlers, and for the smaller craft (carried on davits) used to handle the tangle nets. Besides the crew of the mothership and 50-60 fishermen to man the small boats carried, each ship houses about 240 cannery hands who clean, cook, and can the crab. On the average, 22 king crabs will supply meat for one case of 48 $6\frac{1}{2}$-oz. cans.

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NORTH PACIFIC 1955 SALMON INVESTIGATIONS: The Japanese 1955 North Pacific salmon and trout investigations program to be conducted by the Japanese Fisheries Agency, as reported in an April 14 U. S. Embassy dispatch from Tokyo, is as follows:

Object: (a) Exchange and migration of the salmon and trout population; (b) Ecology of salmon and trout during living period at sea; (c) Ecology and composition of fish schools which are objects of catch.

Research Vessels: Two vessels of about 150 tons and 350 hp. will be chartered.

Investigation Schedule: May 1--departure from Hakodate and commencement of investigations; May 16--stop at Amchitka Island; June 20 stop at Dutch Harbor; August 20--return to Hakodate.

As the research vessel to be used had not yet been determined, the above program is subject to some changes.

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FISHERY PRODUCTS EXPORTS TO UNITED STATES, JANUARY-MARCH 1955: Japanese exports of the principal fishery products and byproducts to the United States and its territories and possessions in the first quarter of 1955 totaled about 43 million pounds, valued at US$12.0 million as compared with about 39 million pounds, valued at US$11.8 million (see table) in the same period a year earlier, reports a May 12 U.S. Embassy dispatch from Tokyo. Frozen tuna comprised the bulk of the total and in January-March 1955 increased 52 percent above the similar period in 1954. Fish and marine oils and pearl exports were up from a year earlier, while exports of canned tuna and crab meat and other canned fish were down.

Japanese Fishery Products Exports to United States, January-March 1954

Products	Jan.-Mar. 1955		Jan.-Mar. 1954	
	Qty.	Value	Qty.	Value
	1,000 Lbs.	1,000 US$	1,000 Lbs.	1,000 US$
Tuna, fresh or frozen	32,450	5,278	21,022	4,500
Tuna, canned	3,193	1,499	5,559	2,918
Crab meat, canned	446	500	242	256
Other canned fish	2,905	1,785	11,690	3,288
Fish & marine oils	4,155	1,549	42	12
Pearls, natural & cultured	-	1,423	-	783

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FISHERY PRODUCTS EXPORTS, 1954: Total Japanese exports of fishery products (not including certain marine products, such as whale oil, agar-agar, etc.) in 1954 amounted to 141,000 metric tons, valued at US$74.2 million, reports a U.S. Embassy dispatch (March 23) from Tokyo. This is an increase of 16 percent in quantity and 22 percent in value as compared with 1953 exports of 121,000 tons, valued at US$61 million. In 1952 exports of 100,000 metric tons were valued at US$46 million.

Japanese Fishery and Marine Products Exports, 1954 (Total Exports and Exports to the United States)

Product	Total Exports				Exports to the United States		
	1953	1954			1954		
	Quantity	Quantity	Value		Quantity	Value	
	Metric Tons	Metric Tons	Millions of Yen	Millions of US$	Metric Tons	Millions of Yen	Millions of US$
FISH PRODUCTS							
Oceanic bonito, frozen	541	1,979	211	0.6	1,969	209	0.6
Tuna, frozen	40,218	51,027	7,544	21.0	46,862	6,971	19.4
Salmon, canned	1,801	7,915	3,376	9.4	1/	1/	1/
Tuna, canned	11,648	8,197	3,289	9.1	6,677	2,750	7.6
Oceanic bonito, canned	4,204	8,068	2,489	6.9	6,770	2,125	5.9
Sardine, canned	13,592	14,491	1,871	5.2	2,079	255	0.7
Crab meat, canned	1,837	2,949	2,095	5.8	1,119	894	2.5
Other fish	1/	1/	5,850	16.2	1/	532	1.5
Total	1/	1/	26,725	74.2	1/	13,736	38.2
MARINE PRODUCTS							
Whale oil	24,000	33,072	2,332	6.5	1/	1/	1/
Pearls	7	12	2,663	7.4	5	1,452	4.0
Fish & fish-liver oil	7,405	9,463	2,730	7.6	4,546	1,133	3.1
Agar-agar	999	684	964	2.7	136	197	0.5

1/Not available.

Japanese exports of agar-agar in 1954 totaled 684 tons (valued at US$2.7 million) as compared with the 1953 total of 999 tons (valued at US$2.8 million) and 722 tons (valued at US$1.6 million) in 1952.

The United States was the principal receiver of Japanese exports of fishery products in 1952-54 on the basis of quantity and value. In 1954 shipments to the United States totaled 66,000 metric tons (valued at US$38 million); and in 1952, 37,000 tons (valued at US$22 million).

Exports of marine products (whale oil, fish oil, pearl shell, pearls, agar-agar, etc.) in 1954 reached 8.7 billion yen (US$24.2 million) in value with 32 percent going to the United States, a March 25 U. S. Embassy dispatch from Tokyo reports.

The United Kingdom received the largest part of the Japanese exports of agar-agar in 1954, followed by the United States. In 1953 the United States was the principal receiver, followed by Singapore, United Kingdom, and West Germany. Singapore received the largest share of Japanese agar-agar in 1952, followed by United Kingdom, United States, and France in that order.

The increase in Japan's exports in 1954 appeared to have stemmed in part from an excess of production over domestic demand, but mostly was due to special export promotion measures sponsored by the Japanese Government. The terms of trade were undoubtedly less favorable because of the subsidies granted for certain exports, but they made it possible, at least, to narrow the gap between the country's export and imports.

By a system of linking imports of sugar, which sold for a premium on the domestic market, with the export of products which could be sold on the world market only at a loss, it was possible to use the excess profit made on the one to cover the deficit incurred on the other. Among the products which were subsidized in this way were exports of agar-agar, canned sardines, whale oil, and vitamin oil.

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ANTARTIC WHALING OPERATIONS, 1955: The Japanese 1955 Antarctic whaling season for baleen whales commenced January 7 and closed at midnight March 19 upon the attainment of the international total of 15,500 blue-whale units,[1/] states a U. S. Embassy dispatch (April 13) from Tokyo. The three Japanese whaling fleets took 2,772 blue-whale units as compared to a target of 2,150 blue-whale units, and an actual catch of 1,896 blue-whale units for the two fleets which operated in 1954.

Japanese Antarctic Whaling Operations, 1955

Catch		Products Produced	
Species:	No.	Product:	Metric Tons
Baleen whales:		Sperm oil	8,822
Blue	590	Baleen whale oil	53,555
Fin	4,220	Frozen meat	29,494
Humpback	179	Salted meat	10,745
Total baleen whales	4,989 1/	Liver oil	70
		Other	187
Sperm whales	967	Total	102,873

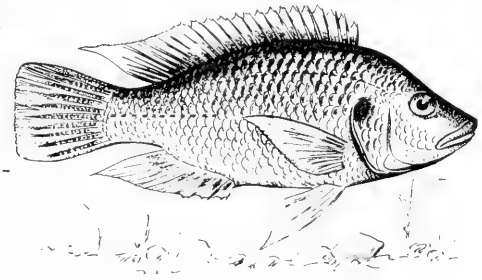
1/ Equals 2,771.6 blue-whale units.

The oil production increased 21 percent over 1954 and is valued at about US$10 million at current market rates.

1/ One blue-whale unit equals 2 fin whales, or 2½ humback whales, or 6 sei whales.

Republic of Korea

TILAPIA RECEIVED FROM THAILAND: A shipment of live tilapia recently arrived in Korea by air from Thailand through arrangements made by the United Nations Korean Reconstruction Agency, according to a May 10 release from that Agency. The fish are a gift of the Government of Thailand and, after being acclimated in a specially-designed aquarium and hatchery in Chinhae, will be let out into shallow ponds and rice paddies.



Tilapia (Tilapia mossambica)

The shipment consisted of 15 tanks containing 470 live fish. The consignment comprised 10 mother fish, each carrying approximately 200-400 eggs; 200 fry and 260 medium-sized fish of both sexes. It is estimated that the total yield after the eggs are hatched will be at least 3,000. A Thailand Department of Fisheries official planned to spend two weeks at the Chinhae Hatcheries so that he can instruct the Korean staff in the correct method of selecting and handling the fish for breeding purposes.

Tilapia mossambica have their original home in the tropical waters of South Africa where they supply an enormous quantity of food for the inhabitants. About 20 years ago a few of them were introduced into Indonesia where they grow so fast and reproduce so quickly that their culture has received special attention by the Indonesian Government authorities. After the war, news of the excellent qualities of tilapia spread through Southeast Asia and they have been transported to many other countries, particularly Thailand, where they have provided a rich new source of food for the people.

Tilapia grow well in shallow ponds where the water temperature remains warm. The fish reach maturity at four months and reproduce the year round at about 2-3 months' intervals. The total number of fish produced under good conditions by one pair may be as many as 10,000.

The present shipment is an experimental one since the climate in Korea is not as consistently warm as in most of the countries where the fish have thrived. It is hoped, however, that if the fish can be maintained in a warm aquarium during the extreme winter months they should be able to grow and breed fairly well in open ponds during the summer. The success of the experiment would contribute greatly to the food sources of the Korean people.

Mexico

FISHERIES TRENDS, APRIL 1955: The fishing industry apparently is not participating in the Mexican general economic recovery, but the fundamental causes are difficult to determine from the many claims and counterclaims, a May 11 U. S. Embassy dispatch from Mexico points out. The shrimp industry claims that production in the latest season was 40 percent under that of the previous season. Some sources blamed speculative activities of United States purchasers which resulted in unprofitable prices, while others claimed that the shrimp beds were being exhausted by improper exploitation. For example, a delegate of the Fishing Chamber in Mazatlan

claims that the shrimp which seek refuge in estuaries to reproduce are trapped there when they attempt to return to the sea.

While the Pacific Coast cooperatives argued among themselves about delimitations of fishing areas, the late Secretary of the Navy denounced two specific cooperatives as monopolies of wealthy men and added that all the other so-called cooperatives in the Pacific and Gulf coasts were no different.

Official prices are openly violated, and the press particularly attacked the sharp increases during Easter week. A group of Pacific Coast fishermen petitioned the Secretary of the Treasury for relief from allegedly high taxes on sharks and byproducts, claiming that shark fishing, once quite important, has now virtually been discontinued. Other factors cited in the decline of this industry were the discontinuance of sales of shark meat as "dried cod," and the competition from Japanese fishermen.

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REPORT ON THE GUAYMAS SHRIMP FISHERY: The Guaymas shrimp season was drawing to a close in mid-April. Landings were very light and catches per vessel were extremely poor, according to a brief report of a trip to that area by the Service's San Pedro (Calif.) Local Representative. Out of 8 established shrimp packing and freezing plants, only 2 were operating part time. The average catch of the shrimp draggers per trip of about 17 days ranged between 2,000-3,000 pounds. Guaymas ex-vessel prices for heads-off shrimp averaged about 33 U. S. cents per pound for white, and much less for the more prevalent brown shrimp.

Guaymas fishermen behead the shrimp on the grounds, and it was noted that they were well iced when unloaded. However, the composition of the catch on a vessel unloading on April 12 was less than 10 percent of good-sized white shrimp, with a large percentage of small brown shrimp. No mechanical aids are used in unloading shrimp boats. In the hold the shrimp are shoveled into wicker baskets holding about 25 pounds, which are then passed bucket-brigade style from the hold of the vessel to a truck backed up on the dock. About 10 men are used in this unloading operation. No unloading winches were observed on the docks.

In one packing and freezing plant about 80 women are employed to sort and pack the heads-off shrimp according to size. These shrimp are layer-packed in aluminum pans containing 5 pounds of shrimp to which is added about 3 pounds of water to form a glaze. The filled trays are then put in a sharp freezer with a temperature of about -10° F. where they are frozen for approximately 8 hours. The frozen blocks of shrimp are then removed from the trays and packed in waxed cartons labeled according to species and the size of individual shrimp blocks.

Most of the Guaymas frozen shrimp are shipped in refrigerator trucks destined either for Southern California or Tucson, Ariz. Tucson is now an important assembly point for frozen shrimp to be packed in rail carload lots for shipment to Chicago.

According to a leading Guaymas shrimp producer, the Mexican shrimp industry in the Gulf of Lower California appears to be undergoing advanced stages of depletion, especially for the more desirable large white shrimp. For some unknown reason considerable quantities of brown shrimp have moved in on the grounds formerly occupied by the white shrimp during the past year or two. Brown shrimp had not been observed before in these areas and there seems to be very little known as to the migration of brown shrimp.

The shrimp industry at Guaymas now presents a rather pitiful picture. Most of the plants are shut down, and the fleet of shrimp trawlers, which at the height of the industry numbered approximately 170 vessels, are now scattered in search of shrimp as

far south as Manzanillo. It is understood that Mazatlan and Topolobampo Bay have replaced Guaymas as the shrimp capital of Sonora, Mexico.

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MERIDA FISHERIES TRENDS, JANUARY-MARCH 1955: Shrimp: Exports of frozen shrimp from the Merida district of Mexico, through the ports of Ciudad del Carmen and Campeche, in January-March 1955 totaled about 1,313 metric tons (all to the United States), reports a U. S. consular dispatch (May 9) from Merida. This compares with 1,925 tons in the last quarter of 1954 and 1,086 tons in January-March 1954.

Prices for 15-20 count headless shrimp f.o.b. Brownsville, Tex., for the first 3 months of 1955 were 55, 59, and 58 cents a pound, respectively. For October, November, and December 1954 shrimp was quoted at 49, 49, and 52 cents a pound in the same city.

Although the market at the end of the quarter was described as sluggish--normal for just after Lent--conditions were reported to have improved considerably. The outlook is favorable for those whose business is geared to prevailing food prices.

Shark Fins: Merida exports of shark fins, as usual all to the United States, increased to 1.7 metric tons, 140 percent over the 0.7 metric tons leaving the area in the final three months of 1954. The increase over the preceding quarter is attributed to better fishing weather.

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MORE FREEZING PLANTS TO BE BUILT: The Mexican Navy Department is well satisfied with results of the Veracruz fish-freezing plant and will construct three additional plants in Ciudad del Carmen, Campeche; Mazatlan, Sinaloa; and Guaymas, Sonora; according to recent Mexican press reports. Still another plant may be set up in Tampico or Tuxpan, according to the Navy Secretary. The Veracruz plant has a capacity for 20,000 metric tons of fish daily, but capacities of the projected plants has not yet been announced.

A freezing plant for meat, fish, vegetables, and fruits is being constructed by the Federal District authorities in the suburbs of Mexico City, and it is scheduled for inauguration in July of this year.

Inasmuch as freezing-plant capacity in Mexico has been very limited up to the present, and the need of such plants is apparently well recognized, the above-mentioned plants probably herald the beginning of an important new industry in which Government agencies will assume a leading role, a May 2 U. S. Embassy dispatch from Mexico City points out.

* * * * *

JAPANESE MAY TRADE 150 FISHING VESSELS: An agreement is under discussion between Mexico and Japan whereby Japan would supply Mexico 150 fishing vessels in return for Mexican cotton and sugar, a May 15 U. S. Embassy dispatch from Mexico City reports.

Netherlands

FISH-OIL IMPORTS AND EXPORTS, 1954: Netherlands imports of fish oils in 1954 amounted to 51,258 metric tons as compared with 41,345 tons in 1953, according to an April 20 U. S. Embassy dispatch from The Hague. Imports of fish oils from the United States in 1954 totaled 9,734 metric tons as against 5,143 tons in 1953.

Netherlands exports of fish oils in 1954 amounted to 3,115 tons in 1954 as compared with a total of 8,500 tons in 1953. No fish oils were exported to the United States.

Norway

FISHERIES CATCH GOAL SET AT 2 MILLION TONS: Norwegian fisheries should be able to reach an annual yield of 2 million metric tons in the course of a few years, declared the Permanent Under-Secretary to the Norwegian Ministry of Fisheries. He pointed out that in 1954 Norway's total fish yield was almost 1.9 million tons, an output that broke all records. To insure an annual increased yield, bigger vessels and more deep-sea fishing boats must be built, reports the March 18 issue of The Fishing News, a British fishery magazine.

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LOFOTEN 1955 COD CATCH POOR: The annual cod fisheries in the Lofoten waters of North Norway turned out to be very disappointing again in 1955, reports a May 5 bulletin from the Norwegian Information Service. As of the official closing date, April 23, when government inspectors left their posts, the total catch was 43,580 metric tons, about the same as last year's record low. Estimated first-hand value of the 1955 catch was Kr43.1 million (US$6 million). Average earnings per fisherman, however, were well above last year because only about 14,000 participated, as against 20,000 in the 1954 season, and also because buyers paid somewhat higher prices.

Despite the poor Lofoten result, Norway's total cod catch is well ahead of 1954, amounting to about 78,000 tons, as against 62,000 tons at the same time in 1954, and 65,000 in 1953. In the postwar seasons preceding 1953, mid-April totals varied between some 202,000 tons in 1947 and about 90,000 tons in 1949.

During the Lofoten cod fisheries, nylon nets firmly established their position as a superior gear, yielding from 5 to 9 times as much fish as nets made of cotton or other materials. Nylon also proved very effective in jigs and hand lines. In the opinion of the Chairman of the Norwegian Parliament's Fisheries Committee the nylon net is the gear of the future.

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Disposition of Norwegian Winter Herring Catch, 1955 and 1954

Disposition	1955	1954
	(Metric Tons)	
Exports as fresh or frozen	117,860	84,082
Cured	110,998	105,007
Canned	9,866	11,439
For meal and oil	703,676	883,884
Bait	3,699	3,258
Domestic Consumption	5,168	4,560
Total catch	950,267	1,092,230

WINTER HERRING CATCH AND DISPOSITION, 1955: The Norwegian 1955 winter herring fishery began on January 12 and ended April 6. The weather conditions were periodically stormy. The fleet is, however, efficient and the system of distribution well established, and the fishermen landed 950,267 metric tons, only 141,963 tons less than in the record season of 1954. The catch was

composed of 738,891 tons of sloe herring and 211,376 tons of spring herring (spawners and spents). The ex-vessel value amounted to 194.9 million kroner (US$27.3 million) against 201 million kroner (US$28.1 million) last year.

The disposition of the Norwegian winter herring catch for 1954 and 1955 is shown in the table.

Pakistan

FISHERY HARBOR CONSTRUCTION BEGUN: Work started in April on a fishing harbor at Karachi designed to make better quality fish available to the Pakistani people at cheaper prices, provide a higher standard of living to the fishermen, and increase the foreign exchange earnings of the country. The harbor will be completed in 1957 and will cost Rs 6-7 million (US$2 million); the project should improve the health of the masses by providing them with a more abundant cheap protein food, states an April 30 Foreign Operations Administration dispatch from Karachi.

The fishing harbor aims at constructing modern refrigeration and storage facilities, thus enabling more fish to reach the interior of Pakistan.

It plans the use of mechanized craft capable of fishing a wider range of the Arabian Sea where the potential catch is greater; and by providing service facilities for such mechanized craft.

With the increase of fish production and exports, an appreciable amount of foreign exchange should be added every year to the country's exchequer.

The Pakistan Government has earmarked Rs 4.3 million (US$1.3 million) for the project. The Foreign Operations Administration of the United States has agreed to provide Rs 2.4 million (US$0.7 million) in technical advice, construction materials, and plant and equipment not readily available in Pakistan.

When completed the harbor will consist of approximately 46 acres of land and 17 acres of water area.

The project is expected to be self-sustaining when completed. The proceeds on all auctioned fish--at auctioneer fees of five percent of the proceeds--are estimated to average Rs 720,000 (US$220,000) annually over a 30-year period. Annual depreciation, maintenance, and harbor management charges are estimated at Rs 327,000 (US$98,000) leaving an average annual return of Rs 393,000 (US$118,000) or 5.9 percent of the invested capital.

This project has been among the top priority development schemes of the Government for several years and its immediate implementation has been strongly urged by all who are conversant with the fishing industry in the Karachi area.

The FOA share of the financial plan comprises one fisheries advisor; one contract harbor engineer; all items of construction material and equipment that are unavailable from the local market or available only in quantities needed to support the present economy and its planned expansion.

Work items comprise dredging of the entrance and turning basin, reclamation of low lands with the dredged material, construction of a protective dike (bund), a longitudinal wharf, a jetty, two floating slips, a landing beach, a fish market, a fisheries laboratory, a boat repair shop, a fisherman's cooperative store building, net-drying racks, and the necessary gas supply, electric supply, water supply, sewage and paved road systems to serve the project.

An indication of the interest the FOA is displaying in the fisheries development plans of the country is the gift of a US$100,000 fishing boat Macchera to the Government of Pakistan recently. The 67-foot scientific boat is expected to play an important role in developing Karachi as one of the great fishing ports of Asia.

Peru

U. S. PROPOSAL ON 200-MILE TERRITORIAL-WATERS ZONE REJECTED: The Peruvian Foreign Office on April 13, 1955, delivered a reply to the United States note reserving its rights under the recent actions of the Peruvian Government taken pursuant to the Tri-partite Declaration of Santiago relative to the claim to jurisdiction over 200 miles of water seaward from the Peruvian coast. The Peruvian note rejected the United States position but it is understood that Peru will give consideration to a United States proposal to discuss the matter of conservation measures which are generally considered to be necessary, an April 26 U. S. Embassy dispatch from Lima states.

Portugal

PROCESS FOR BONELESS AND SKINLESS SARDINES: The boning and skinning of sardines in Portugal is accomplished entirely by hand, reports an April 12 U. S. Embassy dispatch from Lisbon. The process for preparing boneless and skinless sardines (a variety produced primarily for the United States market) is described briefly as follows:

When the fish reach the cannery they are beheaded, cleaned, and immersed in salt brine. The period of immersion varies with the size of the fish and the taste effect desired. After removal from the brine, the tail and vertebra are removed, usually by female workers, with the aid of a small knife. The fish are then placed in wire racks and steam cooked for 15 or 20 minutes. They then go to the can fillers who cut the sardines to a uniform size with a pair of scissors and place them in the can. The skin slips off easily during this operation. The cans are then filled with olive oil or tomato sauce, lidded, sealed, sterilized, checked, and boxed.

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FISHERIES TRENDS, DECEMBER 1954: Sardine Fishing: Portuguese sardine fishing in December 1954 continued to increase at the eight main fishing centers, reports the March Conservas de Piexe. Sardine production in December 1954 totaled 23,300 metric tons, valued at 42.8 million escudos (US$1.5 million), as compared with only 10,987 tons, valued at 23.1 million escudos (US$0.8 million) in December 1953.

The leading sardine fishing centers in December were Matosinhos, Peniche, Setubal, and Lisbon.

Other Fishing: Landings of other species at Portuguese ports in December totaled 5,858 metric tons, valued at 5.4 million escudos (US$0.2 million). Chinchard was the leading species landed (5,531 tons), followed by mackerel (254 tons), and tuna and tunalike species (51 tons).

Canned Fish Exports: Portuguese canned fish exports in December 1954 totaled 7,655 metric tons, valued at 114.2 million escudos (US$3.9 million), as compared

with 5,831 tons, valued at 88.3 million escudos (US$3.1 million) in the same month a year earlier, according to the March 1955 Conservas de Piexe (see table). Canned sardines in oil was again the leading item exported from Portugal in December, totaling 5,686 tons, valued at 97.0 million escudos (US$3.4 million).

Portuguese Canned Fish Exports, December 1954

Species	Dec. 1954		Nov. 1954	
	Metric Tons	1,000 US$	Metric Tons	1,000 US$
Sardines in oil or sauce	6,586	3,351	5,850	2,962
Sardinelike fish in oil or sauce	585	366	460	268
Sardines & sardinelike fish in brine	182	36	41	17
Tuna & tunalike fish in oil	175	131	140	108
Tuna & tunalike fish in brine	28	7	53	31
Mackerel in oil	99	56	122	72
Other fish	-	-	36	19
Total	7,655	3,947	6,702	3,477

Great Britain was the leading receiver of Portuguese canned fish in December with 21.9 million escudos or US$0.8 million (mostly sardines), followed by Germany with 14.9 million escudos or US$0.5 million (mostly sardines), and Italy with 11.6 million escudos or US$0.4 million (sardines and tuna). During December the United States received Portuguese canned fish valued at 1.4 million escudos or US$483,000 (principally sardines in oil or sauce 245 metric tons, and anchovies 188 tons).

Spain

VIGO FISHERIES TRENDS, MARCH 1955: Fish Canning: March is usually an off month in fish canning for the Vigo district and operations were virtually limited to the canning of a few low-priced varieties for the domestic markets and to the manufacture of containers in preparation for the sardine and albacore tuna runs during the coming months.

The recent 10-percent reduction by the Spanish Ministry of Commerce in the minimum export price of canned fish destined to the Western Hemisphere and reports that United States purchases of Japanese tuna during 1955 will be greatly reduced have had a salutary effect among Spanish canners, who hope to benefit by larger orders from the United States market. This possibility seems to be supported by the large number of requests for quotations being received. Canners expect good business if the coming albacore tuna season is at least as good as last year.

The Fish Canners Association of Galicia, whose membership comprises about 80 percent of the Spanish fish packers, has finally yielded to the demand of the Sindicatos (a syndicate) that the organization cease its independent activities and become a part of the official syndical machinery. Fish packers were reluctant to become involved in the Sindicatos claiming that their organization was a cooperative. But the pressure lately on the part of the official organizations has been so strong that in a recent meeting the Association agreed to appoint a commission to discuss with the syndical authorities conditions for their integration into the Syndicatos. Some of the packers hope that if the Association is integrated into the Syndicatos the Government will give more attention to the needs of the industry.

Fishing: Fishing activities in the Vigo District of Spain increased during March with the return of most of the vessels which had moved to southern ports during the winter, an April 14 U. S. consular dispatch from Vigo states. The small-range or

coastwise fleet was engaged in the seasonal fishing for "castaneta" (brama-raii) and catches were good. This season was approaching the end and many of the vessels would have to be tied up for a time because the closed season for sardines (the other species fished by the small-range fleet) would not terminate until April 30.

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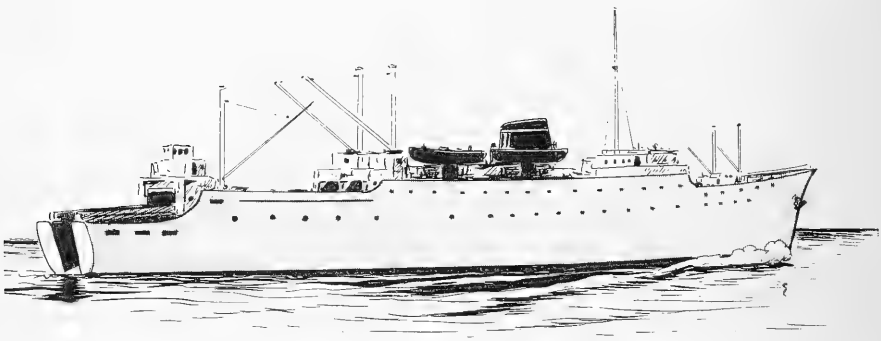
FISHING FLEET GRANTED LOAN CREDIT FOR MODERNIZATION: The granting of a credit of 25 million pesetas (US$1.1 million) to modernize the Spanish short-range fishing fleet of small vessels operating out of Vigo, El Grove, Marin, and Cangas was announced recently by the Marine Credit Bureau of Instituto Social de la Marina. Seventy percent of the grant was to be allocated during mid-May, reports a May 13 U. S. Embassy dispatch from Madrid.

Tunisia

CANNED FISH EXPORTS, 1954: Tunisian exports of canned and preserved fish (including meat) during 1954 totaled 3,648 metric tons, valued at 756 million francs (US$2.1 million), reports an April 21 U. S. consular dispatch from Tunis. This is a decrease of 3 percent in quantity and 4 percent in value as compared with 1953 exports of 3,745 tons, valued at 787 million francs (US$2.2 million).

U.S.S.R.

GERMAN-BUILT FACTORYSHIP TRAWLER MAKES TRIAL TRIPS: The M. S. Pushkin, the first of 24 factoryship trawlers of 1,230 dead-weight tons ordered in



The M. S. Pushkin, the first of 24 factoryship trawlers ordered in East Germany by a Russian import firm.

East Germany by the Sudo Import Co. of Moscow, is making its trial trips, according to the German correspondent of Fiskets Gang (March 23), a Norwegian fishery periodical. A German crew and technicians will man the vessel accompanied by a number of experts from the Sudo Import Co. The 24 ships are to be delivered in 1955 and 1956, and will cost 200 million marks (about US$46 million).

The Pushkin was launched in December 1954. It measures 246 feet between perpendiculars, has a beam of 44 feet, and a draft of 17 feet. A 1,900-hp. motor guarantees a speed of 12.5 knots. There is a slipway on the poopdeck for hauling in the special trawl over the stern. Details of the trawl are still secret.

From the afterdeck the catch drops through two openings on port and starboard to the main deck where the processing equipment is installed. The fish are butchered at six stands and the waste directed to a fish-meal plant which can produce up to 20 metric tons of meal in 24 hours. The best fish livers are canned on the same deck while the remaining livers are processed into liver oil.

On both sides of the ship conveyors carry the fish to (Baader) heading and filleting machines and then to the packing room. Eight women pack the fillets in freezing trays which are placed in 4 freezing tunnels. The 7.7-pound blocks are water-glazed after removal from the trays and packed in cartons holding 66-77 pounds each. The cartons are stored at -20° C. (-4° F.) in a room which has a total capacity of 700 metric tons of frozen fish and fillets. The ship's maximum capacity is 20 tons of fillets, 10 tons of frozen fish, and 20 tons of fish meal each 24 hours. This requires a daily catch of 60 tons of fish, which hardly can be achieved on a permanent basis even on rich banks. The storeroom is amidships under the factory deck and served both by conveyors and an elevator.

The vessel has a crew of 98 including a number of women. Officers have single cabins on the bridge deck and the crew is accommodated in cabins for four.

Uruguay

FISH OIL AND FISH-LIVER OIL IMPORTS, 1954: Uruguayan imports of cod-liver oil in 1954 totaled 63 metric tons, arriving from Germany (40 tons), Norway (14 tons), United Kingdom (5 tons), and the United States (4 tons). Fish-body-oil imports in 1954 totaled 11 tons and came entirely from Germany. There is no production of fish oil and fish-liver oil in Uruguay, states a U. S. Embassy dispatch (April 12) from Montevideo.

Venezuela

SALE OF SARDINES TO BRITAIN FALLS THROUGH: A sale of 50,000 cases of Venezuelan canned sardines to Great Britain has fallen through, according to an April 22 U. S. Embassy dispatch from Caracas, because although fish quality was satisfactory, the price was not. The canners mourn the loss of a sale of 2,000 metric tons of fish and see no possibility of selling to the British unless the Government will give more favorable exchange rate for this particular transaction.

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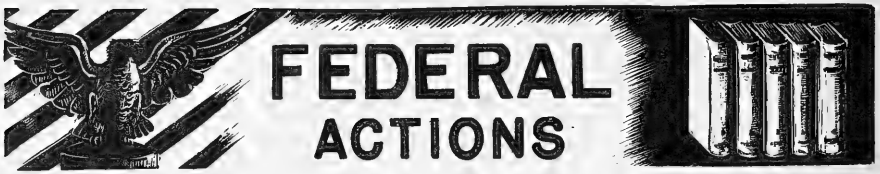


Department of the Interior

FISH AND WILDLIFE SERVICE

MARYLAND SHIFTED TO SOUTHEASTERN REGION FOR FEDERAL CONSERVATION WORK:

The Department of the Interior on June 23, 1955, approved the transfer of the State of Maryland from Region 5 to Region 4 for Federal fish and wildlife conservation purposes, Acting Secretary Clarence A. Davis announced June 23, 1955.

Effective July 1 this year, the transfer is the result of recommendations by the Fish and Wildlife Service, based on requests from officials of Maryland and a number of southeastern States.

The principal reason for the transfer is to coordinate Federal work in Maryland with that of southeastern States and especially Virginia, Maryland's neighbor, which is in Region 4 and concerned essentially with the same fish and wildlife conservation problems. Region 5 is considered a northeastern area.

While Maryland is frequently referred to as a "border" State, its major conservation interests are similar, for the most part, to those of Virginia and other southeastern States. Maryland and Virginia have interdependent interests in such important commercial and sport resources as fish, crabs, oysters, and waterfowl concentrations. Many of Maryland's resource management practices and regulatory policies resemble those of the States to the south. The recent acceptance by the State of Maryland of an invitation to join the Southeastern Association of Game and Fish Commissioners is further evidence that Maryland's fish and wildlife activities are related to those of the southeastern States.

In commenting on the transfer, the Director of the Fish and Wildlife Service, John L. Farley, said: "From the standpoint of concentrating in a single region those States which have similar conservation problems, the transfer is unquestionably logical and sound. This move, I am sure, will prove beneficial to the Service, the States of Maryland and Virginia, and the southeast in general."

* * * * *

NEW CHIEF OF EXPLORATORY FISHING AND GEAR RESEARCH SECTION APPOINTED:

Stewart Springer has been appointed Chief of the Exploratory Fishing and Gear Research Section in the Service's Branch of Commercial Fisheries, replacing Donald E. Powell who was transferred to Seattle to take charge of the Service's Exploratory Fishing Station there.

Springer was formerly in charge of the Exploratory Fishing and Gear Research Station at Pascagoula, Miss. Operation of the vessel Oregon from this station in the Gulf of Mexico has resulted in the recent discovery of a tuna resource there and deep-water red shrimp grounds. Springer has been with the Service for about seven years. Prior to that time he was engaged in various fishery enterprises and brings a wealth of experience to his new position as Chief of the Section.

Harvey Bullis will be Acting in Charge of the Pascagoula Station as a result of Springer's transfer.

Department of State

INTERNATIONAL NORTH PACIFIC FUR-SEAL TREATY PROPOSED:

The United States Government has issued invitations to the Governments of Canada, Japan, and the Union of Soviet Socialist Republics to attend a conference to negotiate a treaty for the conservation of the fur seals of the North Pacific Ocean. The conference is expected to open in Washington in the latter part of November 1955, the Department of State announced April 22.

The invitations were delivered by the U. S. Embassies at Ottawa, Tokyo, and Moscow.

* * * * *

ALLEN RESIGNS FROM INTERNATIONAL PACIFIC HALIBUT COMMISSION--MADSEN APPOINTED:

Edward W. Allen of Seattle has resigned as a member of the International Pacific Halibut Commission, the Department of State announced June 10. Allen has played an important role in the development of international fisheries commissions as a means of cooperation between nations in the conservation of high seas fishery resources. He will continue to represent the United States in the tripartite International North Pacific Fisheries Commission, but asked to be relieved of his duties on the Halibut Commission when a suitable successor could be found. Captain Mattias Madsen of Seattle was appointed to that post by the President on June 9.

Allen has served on the Halibut Commission--the oldest of the international fisheries commissions--since 1932. During 14 of those years he was also a Commissioner on the International Pacific Salmon Fisheries Commission. The work of these Commissions has been signally successful, both in the preservation of the natural resources and as outstanding examples of international cooperation in the solution of joint fisheries problems. To a very substantial degree this success has been due to Allen's continuing active interest and leadership.

Eighty-Fourth Congress (First Session)

JUNE 1955

Listed below are public bills and resolutions introduced and referred to committees or passed by the Eighty-Fourth 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 of the bills.

ASSISTANCE FOR ADJUSTMENTS DUE TO U. S. TRADE POLICY: H. R. 6717 (Dodd), introduced June 8. A bill to provide assistance to communities, industries, business enterprises, and individuals to facilitate adjustments made necessary by the trade policy of the United States; to the Committee on Ways and Means.

COMMERCIAL FISHERIES EDUCATION PROGRAM: S. 2379 (Payne for himself and 28 other Senators), introduced June 30, to promote the fishing industry in the United States and its Territories by providing for the training of needed personnel for such industry; to the Committee on Interstate and Foreign Commerce. The bill authorizes an annual appropriation of $550,000 for grants to public and nonprofit private colleges and universities for education and training of fishery technicians and teachers, and $375,000 for vocational education in secondary schools in the fishery trades and industry. The money would be apportioned among the states on an equitable basis, taking into consideration the extent of the commercial fishing industry within each state as compared with the total commercial fishing industry in the United States.

CUSTOMS SIMPLIFICATION ACT: The House on June 22 passed H. R. 6040, to amend certain administrative provisions of the Tariff Act of 1930 and to repeal obsolete provisions of the customs laws. A motion to recommit the bill was rejected by a rollcall vote of 143 yeas to 232 nays. The bill, in addition to repealing a number of obsolete provisions, would provide improved procedures for the valuation of imports and the conversion of foreign currency into dollars for the purpose of assessing customs duties.

Customs Simplification Act of 1955, House Report No. 858 (June 18, 1955, 84th Congress, 1st Session), 28 pp., printed. Reports that H. R. 6040 would provide improved procedures for the valuation of imports and the conversion of foreign currency into dollars for the purpose of assessing customs duties. This will bring about greater speed of administration, increased certainty, and commercial realism in our customs laws. The bill would also repeal a number of obsolete provisions in these laws.

Section 2 of the bill would make "export value" the preferred basis of valuation for the purpose of assessing duties. "Export value" is defined as the price at which merchandise is freely sold to purchasers in the usual wholesale quantities

in the ordinary course of trade for exportation to the United States with certain added charges. Present law provides that the higher of "foreign value" or "export value" shall be used as the preferred basis. In addition, the bill redefines certain terms used in the definitions of "export value," "United States value," "constructed value," and "American selling price."

Section 3 of the bill would simplify currency conversion procedures without major alteration in the existing statutory framework. The Secretary of the Treasury would be authorized to provide by regulations for the use of the foreign exchange rate first certified for a particular quarter of a year as long as the rate certified for the day of exportation does not vary by 5 percent or more from the certified rate. This would eliminate the effect of present law which requires each customs collector to check the daily rate for each day's importations.

Section 4 of your committee's bill repeals a number of obsolete provisions of the customs laws.

Also contains a brief report on the minority views.

TRADE AGREEMENTS: Conference report on H. R. 1, to extend the authority of the President to enter into trade agreements was filed on June 9 (H. Rept. 745).

GREAT LAKES FISHERIES CONVENTION: The Senate on June 1 adopted resolution of ratification concerning Great Lakes Fisheries Convention between the United States and Canada.

INTERIOR DEPARTMENT APPROPRIATIONS: Conferees on June 6, reported H. R. 5085, making appropriations for the Dept. of the Interior (including Fish and Wildlife Service), and related agencies for fiscal year 1956 (H. Rept. 731).

The Senate on June 8 adopted conference report on, and cleared for President, H. R. 5085.

The President on June 16 signed H. R. 5085 (P. L. 78). The law provides funds to the Fish and Wildlife Service for the Investigation of Resources (including the Branches of Commercial Fisheries, Fishery Biology, and Wildlife Research) as follows:

"For expenses necessary for scientific and economic studies and investigations respecting conservation, management, protection, and utilization of fish and wildlife resources, including related aquatic plants and products; collection, compilation, and publication of information concerning such studies and investigations; and the performance of other functions related thereto; as authorized by law; $4,187,000."

Department of the Interior and Related Agencies Appropriation Bill, 1956, Conference Report No. 731 (June 6, 1955, 84th Congress, 1st Session), 9 pp., printed. In reporting an appropriation for the Fish and Wildlife Service Investigation of Resources, the report appropriates $4,187,000 as proposed by the Senate instead of $3,977,000 as proposed by the House.

MINIMUM WAGE INCREASE: The Senate Labor Subcommittee on June 3, in executive session, ordered favorably reported to the full Committee on Labor and Public Welfare certain proposals amending the Fair Labor Standards Act, including increasing the minimum hourly wage from 75 cents to $1, effective January 1, 1956, and certain proposals relating to minimum wages in Puerto Rico and the Virgin Islands. The committee agreed to postpone, until a later date, consideration of coverage of additional workers under the Fair Labor Standards Act.

The Senate Committee on Labor and Public Welfare on June 7, in executive session, ordered favorably reported a clean bill S. 2168, to amend the Fair Labor Standards Act of 1938 in order to increase the national minimum wage from 75 cents to $1, and for other purposes (S. Rept. 498).

The Senate on June 8 passed without amendment S. 2168.

H. R. 6821 (Widnall), introduced June 14. A bill to increase the national minimum wage to $1 an hour; to the Committee on Education and Labor.

Also H. R. 6665, introduced June 6, similar to H. R. 6821, except that the minimum wage proposed is $1.25 an hour.

Amending the Fair Labor Standards Act of 1938 in order to Increase the National Minimum Wage, Senate Report No. 498 (June 7, 1955, 84th Congress, 1st Session), 15 pp., printed. The report points out that the committee, on the basis of its study of the operation of the Fair Labor Standards Act and of the minimum wage presently provided for in the law, concluded that it should recommend to the Senate an increase in the minimum wage to $1 an hour, with corresponding adjustments in the various minimum-wage rates currently applicable to employees in Puerto Rico and the Virgin Islands by virtue of outstanding wage orders issued by the Secretary of Labor under the act.

CUSTOMS SIMPLIFICATION ACT: The House Committee on Ways and Means on June 18 reported H. R. 6040, to amend certain administrative provisions of the Tariff Act of 1930 and to repeal obsolete provisions of the custom laws (H. Rept. 858).

TRADE AGREEMENTS: Conferees, in executive session on June 7, agreed to file a conference report on the differences between the Senate- and House-passed versions of H. R. 1, to extend the authority of the President to enter into trade agreements.

The House on June 14 adopted the conference report of H. R. 1, and sent the legislation to the Senate. The Senate on June 15, adopted the conference report and cleared the bill for the President.

The President on June 21 signed H. R. 1 (P. L. 86).

WATER POLLUTION CONTROL: The Senate Committee on Public Works on June 13 in executive session ordered favorably reported, with amendments, S. 890, to extend and strengthen the Water Pollution Control Act (S. Rept. 543).

The Senate on June 17 passed S. 890, to extend and strengthen the Water Pollution Control Act, and cleared bill for President.

Extending and Strengthening the Water Pollution Control Act, Senate Report No. 543 (June 14, 1955, 84th Congress, 1st Session), 18 pp., printed. The report points out that among other provisions the bill would expand and strengthen the research and related activities of the Public Health Service in the field of water pollution control; broaden the existing authority with respect to grants to States and to interstate agencies for water-pollution control work, and would authorize grants to States and interstate agencies to cover part of the cost of their programs for the prevention and control of water pollution; and would change the enforcement provisions of the act so that a finding of interstate pollution would be issued after a public hearing held before a hearing board, rather than issued by the Surgeon General before the hearing is held.

CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

Legend:
1955
1954

MAINE

CUMULATIVE DATA
5 MOS. 1955 - 41.9
5 " 1954 - 59.7
12 " 1954 - 283.9

MASSACHUSETTS

CUMULATIVE DATA
4 MOS. 1955 - 100.4
4 " 1954 - 107.2
12 " 1954 - 496.2

FLORIDA

CUMULATIVE DATA
4 MOS. 1955 - 31.3
4 " 1954 - 40.1
12 " 1954 - 131.0

LOUISIANA[1/]

CUMULATIVE DATA
6 MOS. 1955 - 30.2
6 " 1954 - 31.8
12 " 1954 - 68.5

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

NEW JERSEY

CUMULATIVE DATA
5 MOS. 1955 - 52.0
5 " 1954 - 58.9
12 " 1954 - 402.8

TEXAS

CUMULATIVE DATA
5 MOS. 1955 - 27.0
5 " 1954 - 24.7
12 " 1954 - 311.8

CALIFORNIA[2/]

CUMULATIVE DATA
6 MOS. 1955 - 232.4
6 " 1954 - 216.6
12 " 1954 - 641.9

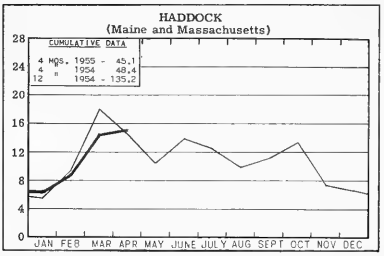
OREGON

CUMULATIVE DATA
5 MOS. 1955 - 14.8
5 " 1954 - 18.1
12 " 1954 - 42.4

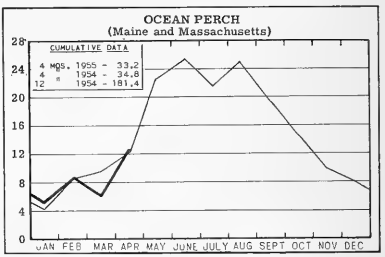
2/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

CHART 2 - LANDINGS for SELECTED FISHERIES

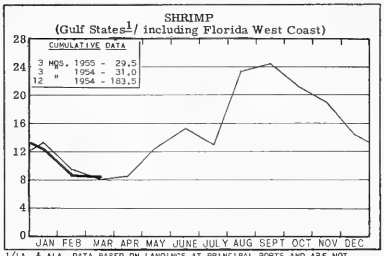
In Millions of Pounds



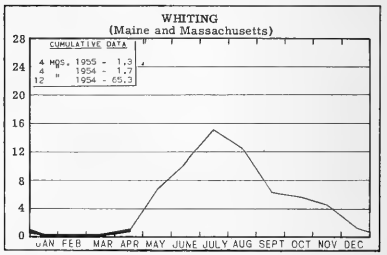
Legend:
1955
1954



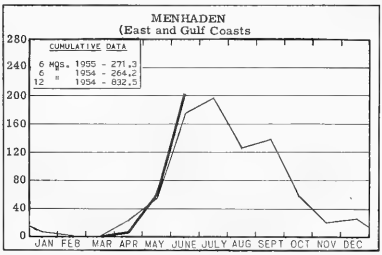
In Millions of Pounds

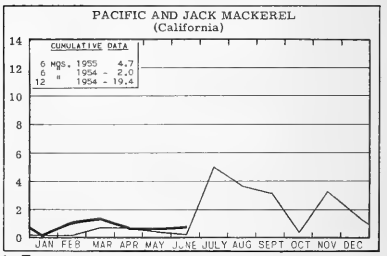


1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

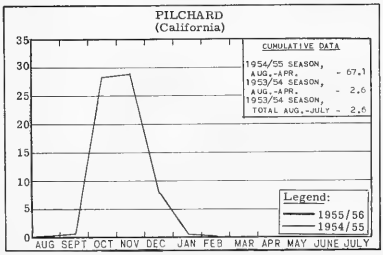


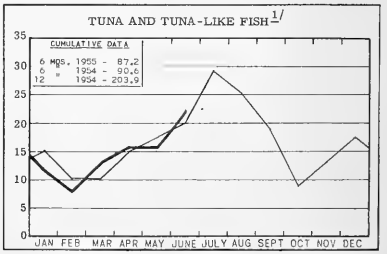
In Thousands of Tons





In Thousands of Tons

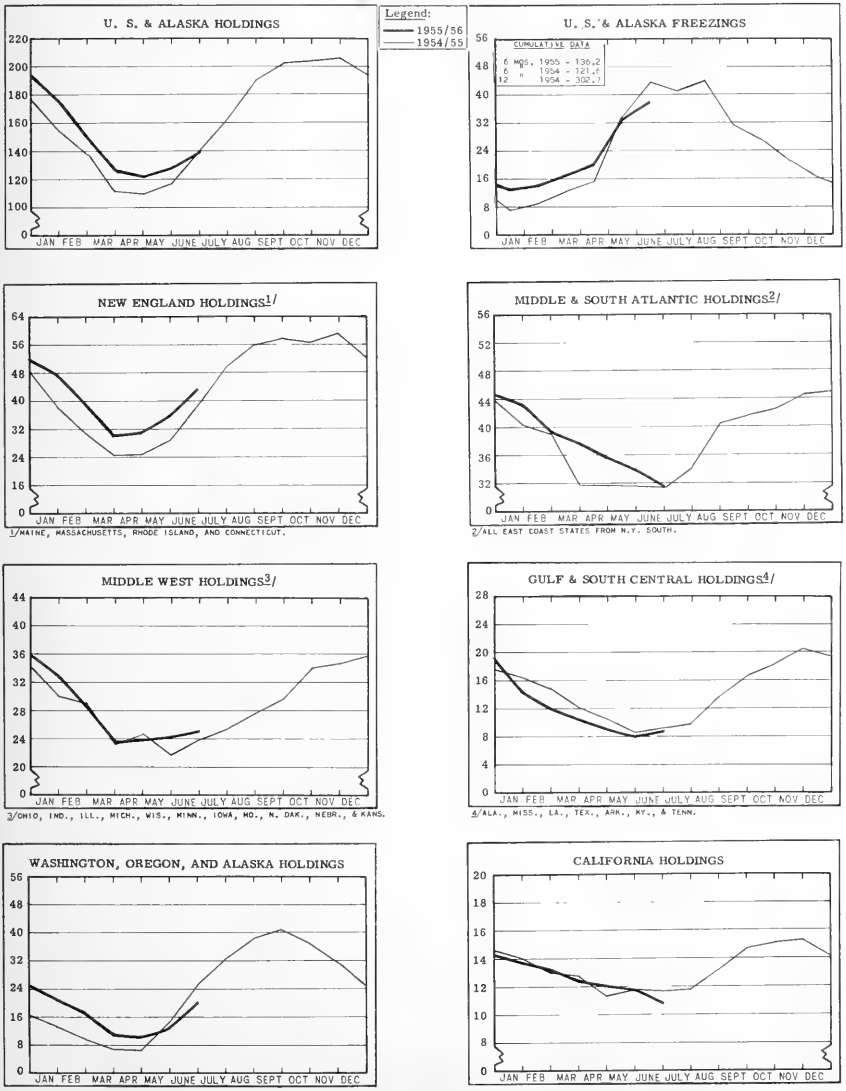




1/ RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

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.

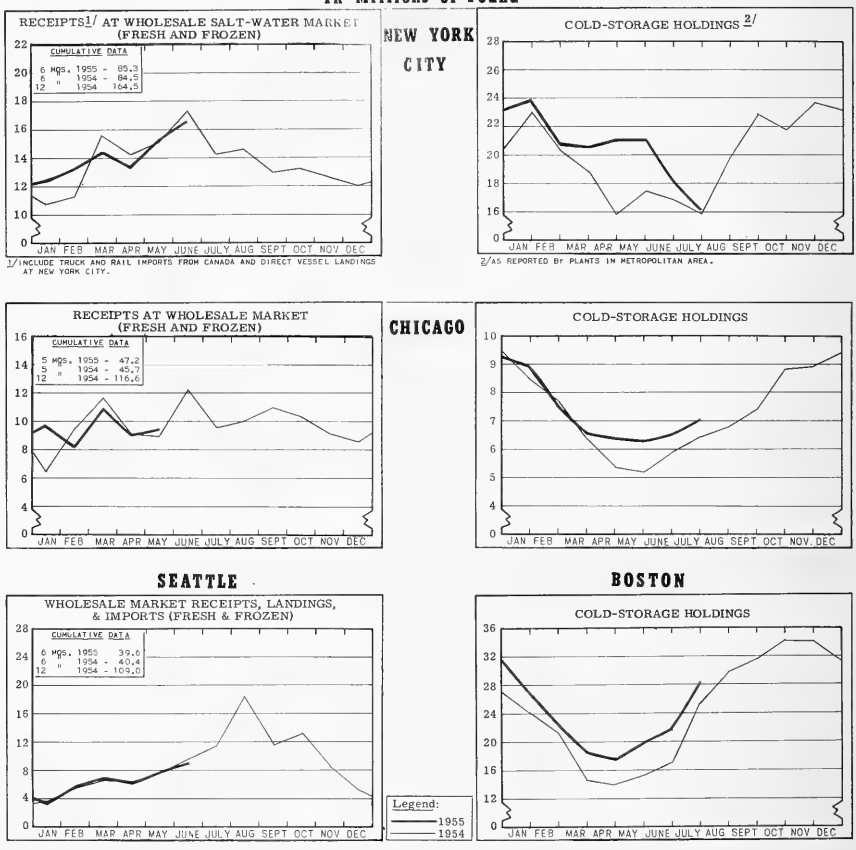
3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR., & KANS.

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 Pound



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

2/ AS REPORTED BY PLANTS IN METROPOLITAN AREA.

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

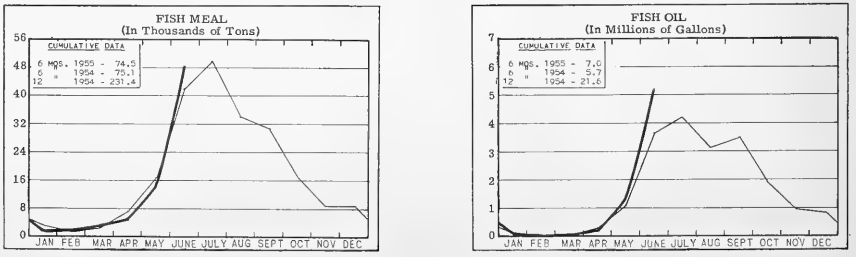
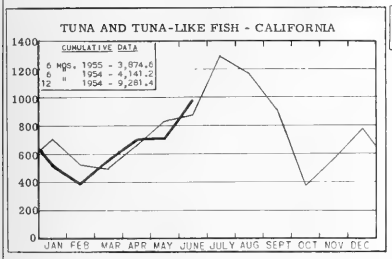
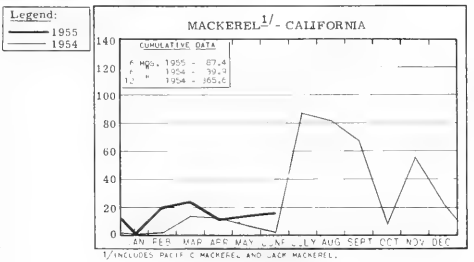


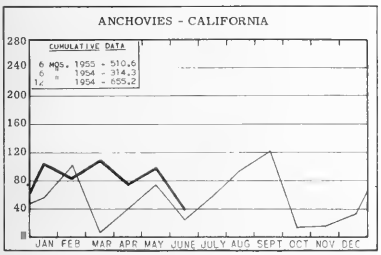
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

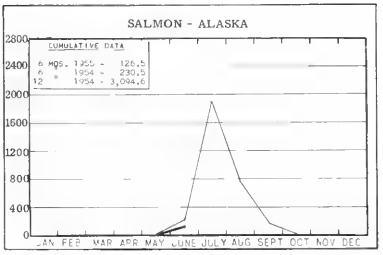
In Thousands of Standard Cases

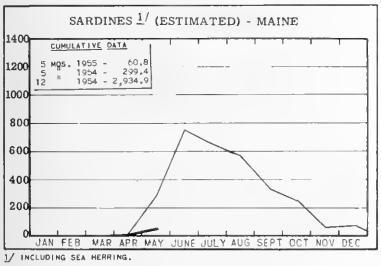




1/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



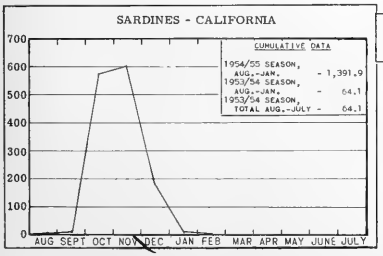




1/ INCLUDING SEA HERRING.

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.



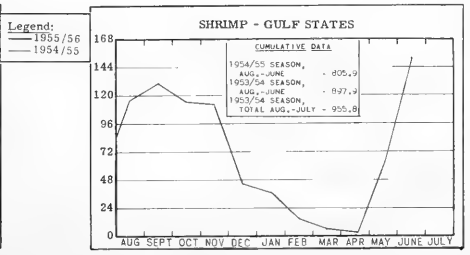
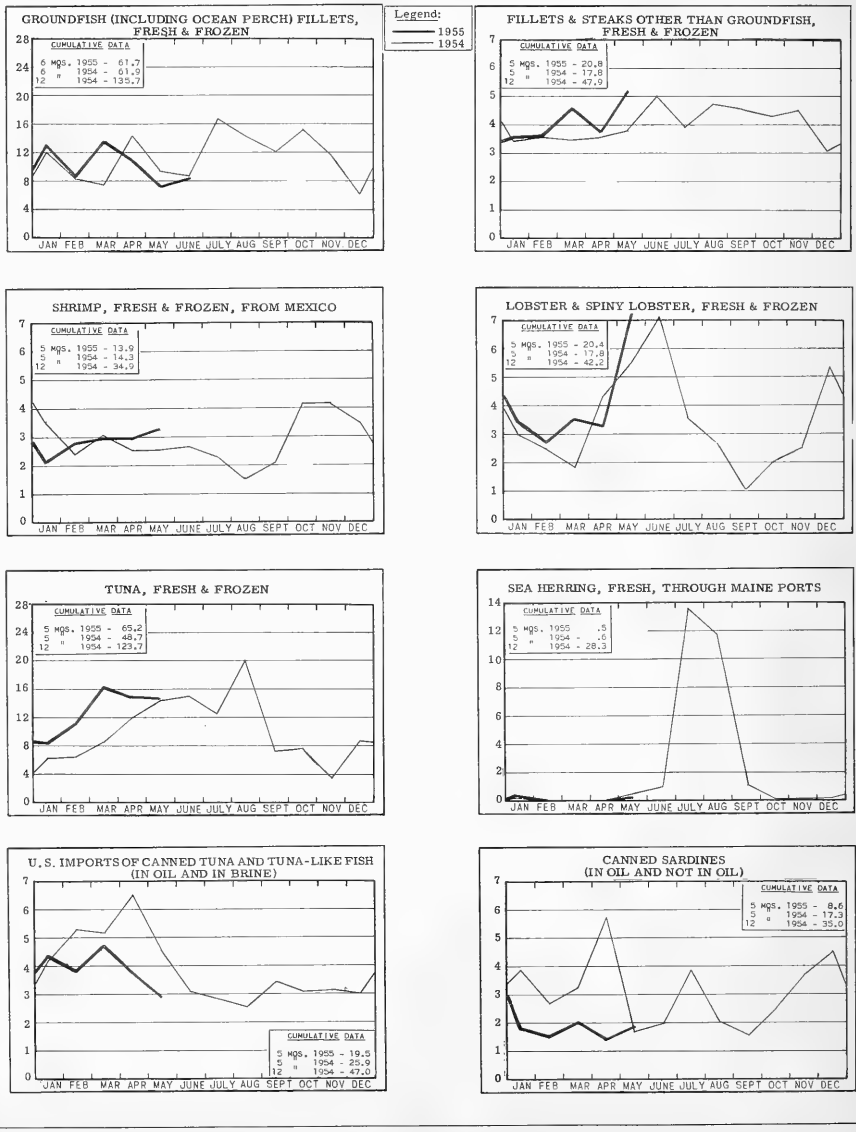
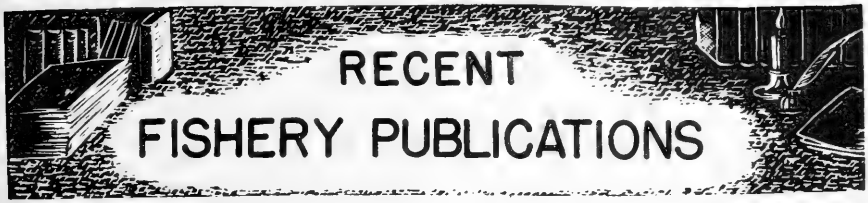


CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

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.
SL - STATISTICAL SECTION LISTS OF DEALERS IN AND PRODUCERS OF FISHERY PRODUCTS AND BYPRODUCTS.
SSR.-FISH - SPECIAL SCIENTIFIC REPORTS--FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1093 - Alabama Landings, November 1954, 2 pp.
CFS-1102 - Florida Landings, January 1955, 6 pp.
CFS-1117 - Maine Landings, Annual 1954, 6 pp.
CFS-1118 - New York Landings, February 1955, 5 pp.
CFS-1122 - New Jersey Landings, February 1955, 2 pp.
CFS-1128 - Frozen Fish Report, March 1955, 8 pp.
CFS-1132 - Fish Sticks, January-March 1955, 2 pp.
CFS-1133 - Massachusetts Landings, January 1955, 4 pp.
CFS-1134 - Massachusetts Landings by Ports--Annual 1954, 16 pp.
CFS-1135 - Florida Landings, February 1955, 6 pp.
CFS-1136 - Texas Landings, March 1955, 3 pp.
CFS-1137 - Lake Fisheries, 1953 Annual Summary, 6 pp.
CFS-1141 - Fish Meal and Oil, March 1955, 3 pp.
CFS-1144 - New Jersey Landings, March 1955, 2 pp.
CFS-1145 - Maine Landings, March 1955, 4 pp.
CFS-1146 - Massachusetts Landings, 1954--By Gear & Subarea, 16 pp.

WHOLESALE DEALERS IN FISHERY PRODUCTS:

SL - 2 - New Hampshire, 1954, 1 p.
SL - 14 - South Carolina, 1954, 2 pp.
SL - 15 - Georgia, 1954, 2 pp.

FL-298 (Revised April 1955) - Employment Possibilities in the Alaskan Fishing Industry, 4 pp. This leaflet outlines the possibilities for employment on vessels, in shore plants, and in canneries. Current prevailing wage rates are listed for craftsmen, outside crews, cannery and culinary workers, and fishing vessels. The leaflet points out that during World War II there was a serious shortage of manpower in the fishing industry in the Pacific Northwest and Alaska; however, that condition no longer exists. As a result, inexperienced personnel must now compete for jobs with experienced workers whose capabilities are known to the employers. Obviously, applicants with special skills stand a better chance of obtaining jobs than do inexperienced ones. Hiring in nearly all cases is done on a personal interview basis at Seattle. This applies both to cannery help and to help on fishing vessels. Because of this fact, applicants should not come to Alaska seeking work but should arrange for an interview with the company selected at their Seattle headquarters. If an applicant wishes to take a chance on coming to Alaska to find work, sufficient funds should be available to make the return trip if work is not available. An applicant coming to Alaska should remember that in addition to the expensive transportation, the cost of food and lodging is from 25 to 30 percent higher than similar necessities in the States.

SSR-Fish. No. 141 - Creel Census and Expenditure Studies, Missouri River Basin, 1947-52, by A. J. Nicholson and H. Milton Borges, 31 pp., illus., processed, March 1955. Thirteen creel-census and sport fisherman-expenditure studies were conducted under a variety of conditions in the Missouri River Basin during 1947-52. This paper summarizes data on fisherman use, yield to the fisherman, and fisherman's expenditures. Methods used in the studies are briefly described. Principal characteristics are given for each area, together with information on type and period of coverage, period of estimates, and manner of handling expenditure data.

SSR-Fish. No. 144 - Vertical Distribution of Zooplankton in Central Equatorial Pacific, July-August 1952, by Thomas S. Hida and Joseph E. King, 25 pp., illus., processed, April 1955.

SSR-Fish. No. 149 - Oceanographic Observations in West Coast Florida Waters, 1949-52, by Kenneth T. Marvin, 34 pp., illus., processed, May 1955.

Sep. No. 402 - Experimental Farming of the Soft-Shell Clam, Mya arenaria, in Massachusetts, 1949-1953.

Sep. No. 403 - Gulf of Maine Bluefin-Tuna Exploration--1954.

Sep. No. 404 - Development of Voluntary Federal Standards of Grade for Fresh and Frozen Fishery Products.
Literature Review of Factors That May Affect Processed Feeds Quality.
Federal Specifications for Fresh and Frozen Fish Issued.

THE FOLLOWING SERVICE PUBLICATION IS FOR SALE AND IS AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D.C.

Eggs and Larvae of the Pacific Hake MERLUCCIUS PRODUCTUS, by Elbert H. Ahlstrom and Robert C.

Counts (From Fishery Bulletin 99 of the Fish- and Wildlife Service, vol. 56), 38 pp., illus., printed, 30 cents, 1955.

THE FOLLOWING SERVICE PUBLICATION IS AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED IN THE REVIEW.

Oyster Bulletins, processed. (Available free from the Fishery Biological Laboratory, U. S. Fish and Wildlife Service, Milford, Conn.) As in previous years, a series of bulletins are issued during the summer with information of practical importance and interest to the oyster growers of Long Island Sound. These bulletins describe the progress of accumulation and quantity of spawn in oysters during the prespawning and spawning periods, report on the intensity of spawning of the oyster population at different depths of Long Island Sound, and report on the beginning and intensity of setting in different sections of Long Island Sound. Also included is information on the survival and rate of growth of recently set oysters, growth of oysters with damaged shell edges, and other facts that may be of interest to oyster culturists.

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.

"Biloxi Shrimp Festival--1955," by Walter F. Fountain, article, Mississippi Game and Fish, vol. 18, no. 10, May 1955, pp. 3 and 8, illus., printed. Game and Fish Commission, Jackson, Miss. Describes the annual shrimp festival at Biloxi, which features the blessing of the fleet--a colorful and impressive ceremony.

(California) Statistical Report of Fresh, Canned, Cured, and Manufactured Fishery Products--Year 1954, Circular No. 29, 15 pp., printed. Marine Fisheries Branch, Department of Fish and Game, Sacramento 14, Calif. This is the 29th consecutive statistical report of fresh and processed fishery products produced in California. The first report was published in 1927 as Circular No. 1. Primary interest in the earlier years centered around the seasonal sardine production. In recent years, due to the failure of the sardine fishery, some of the tables relating to sardines have been eliminated and, to keep pace with the expansion of the industry, separate tables on other fishery products have been included. Preliminary figures on total commercial fisheries catch are also presented. Through the annual publication of these figures, the State Legislature, commissioners, members of the industry, sportsmen and other interested individuals and groups can obtain a picture of trends and developments. The tables are basically the same as in previous years. The list of canning and reduction plants has been slightly modified. Previously, plants which were capable of but did not can or reduce fish were included in the list. In this report only those plants actually operating in 1954 are listed. Plants curing and manufacturing fishery products by means other than canning or reducing to meal and oil are also included, whereas, those plants handling only fresh fish or shellfish are omitted. Landings of fish in California by the commercial fishing fleet are shown. The catch of each species is separated by region of landing; shipments are not included. The general origin of the commercial catch and the volume of shipments are shown. Shipment figures primarily represent fish received for canning and processing. Total case pack is given for each variety of fish and separated according to container size and type of pack. The pack is listed for the Los Angeles and the San Diego districts and for Central California. The latter includes areas north of the San Luis Obispo County line to the State's northern boundary. Most of the canning reported in the Central California category, however, is from Monterey and the San Francisco Bay area. Other fishery products processed in California are listed. The San Francisco district includes areas north of Santa Cruz County. Information for all production tables was obtained from monthly and annual reports submitted by the industry. Sardine landings and the products produced are shown for a 20-year period. Tables give the total annual case pack of anchovy, tuna, bonito, and yellowtail. Various sizes of containers have been equated to the most common pack size for each variety of fish.

(Canada) Tenth Annual Meeting Fisheries Council of Canada, April 18-20, 1955, 55 pp., illus., printed. Fisheries Council of Canada, P. O. Box 547, Ottawa, Canada. Contains a detailed program of the tenth annual meeting of the Fisheries Council of Canada. Also contains the following articles of particular interest; (1) "The Fish Stick Story," by J. N. Lewis; (2) "A Few Points Regarding Quality," by S. A. Beatty; (3) "The 1954 Fisheries," by W. C. MacKenzie and (4) "Fisheries--A Great B. C. Natural Resource," by P. E. Paulson.

Commercial Fishing Gear and Fishing Methods in Florida, by J. B. Siebenaler, Technical Series No. 13, 47 pp., illus., printed. State Board of Conservation, Tallahassee, Fla. A description in considerable detail of the principal as well as minor commercial fishing gears used in Florida. The fishing gears are classified as entangling, encircling, impounding, dragged, hook and line, and miscellaneous gears. While this is an arbitrary classification of Florida gears, the method of capturing fish has been the main criterion for classification. The author hopes "That a clearer understanding of the construction and the method of fishing of the important types of Florida fishing gear will assist in the framing of better conservation laws. It is further expected that enforcement of the regulations will be improved by the information contained in this bulletin, since enforcement agents and courts will have a better concept of the intent of the regulations, and will have a better legal basis for conviction of infractions with this information at their disposal."

The Conservationist, vol. 9, no. 3, December-January 1954/55, 43 pp., illus., printed, single copy 25 cents. The New York State Conservation Department, Arcade Bldg., Albany 1, N. Y. Among the articles in this issue are: (1) "The Great Lakes Fisheries," by W. Mason Lawrence;

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(2) "Shiners," by John R. Greeley; and (3) "The Bait Fish Business," by John L. Forney and W. Mason Lawrence.

"Costs of Metal Unit Pen Fish Holds," by W. A. MacCallum, article, Progress Reports of the Atlantic Coast Stations, no. 61, March 1955, pp. 13-20, printed. Fisheries Research Board of Canada, Ottawa, Canada. The results of an economic study showing (1) the costs of wood construction for "wet" fish holds; (2) costs of aluminum alloys (unit-pen construction) installed in "wet" fish holds (maximum use of movable metal boards); and (3) estimated total annual cost of pen boards (based on 1,000 boards). The author states that "the conclusions concerning the costs of refrigerated metals in fish holds are: (1) Information available as to costs of installation and operation of each type of hold indicates that the additional cost of a metal-unit pen-type fish hold may be as little as C$50 per year to own and operate than the conventional wood-lined hold. Advantages more difficult to assess are the greater ease of handling and cleaning, less labor, and improved quality of the catch. The costs of insulation and mechanical refrigeration of the two holds are about the same. (2) In general, pen boards of extruded aluminum alloy are considerably less expensive than of wood when one considers the high cost of upkeep and of replacement of the wood boards."

Diseases of Fishes of the Western North Atlantic (III. Mortalities of Sea Herring (CLUPEA HARENGUS) Caused by Larval Trematode Invasion), by Carl J. Sindermann and Aaron Rosenfield, Research Bulletin No. 21, 16 pp., illus., printed. Department of Sea and Shore Fisheries, Vickery-Hill Building, Augusta, Maine, November 1954.

Economic Factors in Catch Fluctuations, by H. Scott Gordon, 8 pp., printed. (Reprint from J. Fish. Res. Bd. Canada, vol. 12, no. 1, 1955, pp. 85-92.) Fisheries Research Board of Canada, Ottawa, Canada. Correlation methods were employed in a statistical analysis of the relation between catch fluctuations and economic factors for the principal Canadian commercial species of the Atlantic and Pacific coasts. The results indicate that the major part of catch fluctuations are ascribable to economic factors in the cases of Atlantic herring, "sardines," cod (tentative), and Pacific herring. Economic factors appear to have had no significant effect on the catches of Atlantic lobsters and Pacific halibut and salmon.

Factors Affecting the Efficiency of Restrictive Regulations in Fisheries Management. II--Bag Limits, by K. Radway Allen, (Reprinted from New Zealand Journal of Science and Technology, Section B, vol. 36, no. 4, pp. 305-334, January 1955), illus., printed. Fisheries Laboratory, Marine Department, Wellington, N. Z. The imposition of a limit on the number of fish that may legally be taken by one angler in one day is one of the commonest methods of controlling the exploitation of sporting fish. This paper examines the ways in which it is possible for bag limits to affect fish stocks and angling catches, and considers briefly the extent to which these effects actually occur in typical New Zealand trout fisheries.

"The 'Fairtry' Story is Told," by W. Lochridge, article, World Fishing, vol. 4, no. 2, February 1955, pp. 55-59, illus., printed, single copy 2s. 6d. (35 U. S. cents). John Trundell Ltd., Temple Chambers, London, E. C. 4. A detailed account of Britain's first fully-equipped factory trawler, Fairtry, especially built to carry out the complex duties involved in the catching and processing of fish at sea on the distant fishing grounds. The general operational details, quick-freezing methods, and trawling operations are discussed. The ship operated off Newfoundland and Greenland, and from the very beginning it was considered "a good fishing ship."

The Family Circle Fish and Poultry Cookbook, 147 pp., illus., printed, $1. The Family Circle, Inc., 25 W. 45th St., New York 36, N. Y., 1955. An excellent and very beautifully illustrated cookbook giving directions for cooking fish fillets and fish sticks, fresh-water and salt-water fish, shellfish, poultry and game, and sauces. It also discusses the nutritive value of fish and shellfish, and gives the market forms and a buying guide for fish and shellfish. Many other useful instructions are given, such as the home care of fish and shellfish, and how to broil, fry, deep-fat-fry, stuff and bake, poach, plank, and steam fish.

"Fish--a Neglected Protein Food," by Ida Bailey Allen, article, Today's Health, vol. 33, no. 2, February 1955, pp. 26-27, 62-67, illus., printed, single copy 35 cents. American Medical Association, Chicago 10, Ill. Discusses the nutritive value of fish and shellfish and shows how an average serving of fish or shellfish supplies enough animal protein to satisfy the requirements of the meal. Also discusses the use of fish in special diets, and gives many suggestions as to the preparation of this food which is as rich in high-quality proteins as meat and as easy to prepare.

The General Agreement on Tariffs and Trade (GATT), Department of State Publication 5813, Commercial Policy Series 147, 34 pp., printed, 20 cents. Department of State, Washington, D. C. (For sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C.) A brief explanation, in laymen's language, of each article of the General Agreement on Tariffs and Trade as it now stands, and proposed amendments. The GATT is an international agreement among virtually all the important trading nations of the free world, including the United States.

The GATT is the principal instrument through which the United States cooperates with major trading nations of the free world in an effort to reduce trade barriers. It consists, first, of schedules or lists of "concessions" (i. e., products on which tariffs have been reduced or bound against increase), and second, a code of agreed rules or "general provisions," under which the import and export trade of the participating countries will be conducted. Third, through periodic meetings of representatives of the participating countries, GATT provides a forum for the discussion and settlement of mutual problems concerning international trade.

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Thirty-four countries participate in the GATT, including, besides the United States, the countries of the British Commonwealth, most of the countries of Western Europe, and some Latin American and Asiatic countries. These countries together account for about 80 percent of the international trade of the whole world.

There have been many important changes in economic conditions since 1948 when the GATT was first put into effect. After more than 7 years operation it seemed to many participating countries that the time had come for a thorough review of the substantive and organizational provisions of the GATT. This review has just been completed in Geneva after several months of intensive negotiations between representatives of the countries participating in the Agreement. This review has resulted in proposed amendments to strengthen the Agreement and to provide a permanent organization to administer it.

The amendments to GATT will come into operation after approval by the participating governments. In the United States the organizational provisions, as renegotiated at Geneva recently, will be submitted to Congress for its approval.

How to Price a New Product, by Joel Dean, Management Aids for Small Manufacturers no. 62, 4 pp., processed. Small Business Administration, Washington 25, D. C., April 1955.

(Institute of Seaweed Research) Annual Report for 1954, 44 pp., illus., printed. Institute of Seaweed Research, Inveresk, Midlothian (Available from The Central Press (Aberdeen) Ltd., Scotland), 1955. The annual Director's report of progress at the Institute on the research and development of the seaweed of the British Isles, includes the following principal developments:

Another of the repeated surveys to determine the seasonal and cyclical changes undergone by the Laminaria (brown seaweed) sublittoral beds of the coast of Northern Scotland, and adjacent islands was completed. A few of the interesting observations may be cited here. A five-year survey of both seaweed density and cover indicated considerable decrease from the time of the first survey to that of the second in each area and, thereafter, the trend was reversed or halted. Sampling surveys with the belt harvester were conducted at 2 to 5 fathoms to determine their commercial feasibility. Concrete slabs laid seven months previously in North Arran were supporting a large number of young plants of Laminaria at the exceptionally high density of 50-60 tons per acre. This indicated that only about one percent survive to reach maturity.

In the field of microbiology of seaweeds, studies reported included the isolation of cell-free extracts of enzymes capable of hydrolyzing laminarin and the alginates, identifying various organisms isolated from seaweed, bactericidal effect of propylene oxide and sodium ethyl mercurithiosalicylate, and marine algae as a source of antibiotics and as a substrate for the growth of microorganisms.

Studies in plant physiology included the culture of marine micro algae free of bacteria and analyses of Porphyridium (red algae) grown in aerated tanks, having a crude protein content of 43.6 percent.

Harvesting equipment investigations revealed that by slightly modifying a motor fishing vessel fitted with twin belts, the capacity of a single harvesting ship would exceed 5,000 tons of fresh Laminaria per year.

Several improvements were made in the suction-type harvester studied in scale model. However, much remains to be done before this system can be translated to full scale.

Harvesting ship studies indicated that specially-designed ships were not necessary, for slightly modified conventional motor fishing vessels proved to be adequate for this purpose.

Additional experiments in process development consisted of improving methods of extracting the algal chemicals, alginic acid, mannitol, laminarin, and fucosterol. Drying of seaweed was tested using thermal method alone, and in combination with a grinding machine. Fundamental studies of liquid-solid extraction for the separation of constituent products from seaweed were also begun.

Chemical studies included pigment and vitamin assay, proximate analyses, techniques for the extraction and separation of algal chemicals, the chemistry of seaweed constituents, use of algal chemicals in medicine, and the mode of concentration of radioactive material by marine algae.

No significant effect on milk yield or fat percentage could be demonstrated in dairy cows fed ensiled seaweed.

Feeding a 5-percent seaweed meal to chicks as the sole source of vitamins A and D was found to supply their requirements up to the 16 weeks' stage.

Inconclusive results were obtained on the benefits of seaweed meal as a top dressing for turf and in seed beds.

A list of publications of staff members and collaborators totaling some 26 articles in print and 7 in press is included.

--E. A. Pachtman

(International Pacific Salmon Fisheries Commission) Annual Report 1954, 44 pp., illus., printed. International Pacific Salmon Fisheries Commission, New Westminster, Canada, 1955. A report of the Commission, an international agency appointed under a convention between Canada and the United States for the protection, preservation, and extension of the sockeye salmon fisheries in the Fraser River system. Discussed in this report are the various activities of the Commission during 1954: the regulations, the United States fishery, the Canadian fishery, Indian catch statistics, escapement, the 1955 cycle, rehabilitation of barren areas, watershed protection, and general investigations.

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Investigation of the Lee County Bay Scallop Fishery, by James F. Murdock, Preliminary Report 55-13, 12 pp., processed. The Marine Laboratory, University of Miami, Coral Gables, Florida, March 1955. The results of an investigation in 1953 to obtain information on the biology of the commercial bay scallop in Lee County, the fishing and handling methods, and the economics of the fishery. It contains information on the spawning, growth, and length of life of the bay scallop; a brief history of the fishery; production statistics for 1928-53; gear; boats; fishing methods; number of fishermen; processing and handling; and management of the fishery. The ultimate purpose of the survey was to assist the State Board of Conservation in deciding whether regulation of this fishery is desirable.

Investigations Under The "Escape Clause" of Trade Agreements (Outcome or Current Status of Applications Filed with the United States Tariff Commission for Investigations under the "Escape Clause" of Trade Agreements, as of May 12, 1955), 33 pp., processed. U. S. Tariff Commission, Washington 25, D. C., May 1955.

Investigations Under the "Peril Point" Provision (Investigations Conducted by the United States Tariff Commission under the Provisions of Section 3 of the Trade Agreements Extension Act of 1948 and Section 3 of the Trade Agreements Extension Action of 1951, as of April 15, 1955), 8 pp., processed. U. S. Tariff Commission, Washington 25, D. C., April 1955.

(Japan) Scientific Reports of the Hokkaido Fish Hatchery, vol. 9, No. 1, 2, 207 pp., illus., printed. Hokkaido Fish Hatchery, Nakanoshima, Sapporo, Japan, Dec. 1954. Among the articles included are: (1) "Some Observations on the Natural Spawning of the Spring Herring in the Western Coast of Hokkaido. II. Observations Made by Diving into Water on the Natural Spawning Ground of the Herring," by Tadashi Tamura, Shyoichi Okueo, Tadas-hi Fujita, and Takeo Watabe; (2) "The Affinity of the Spawning Type of Salmon, Oncorhynchus keta Walbaum, Which are Found in the Rivers of Hokkaido," by Yoshinobu Oya; (3) "Investigations on the Numbers of Salmon Fry Produced by Means of Artifical Hatching. I. The Loss of Salmon Eggs. II. Estimation of Number of Salmon Eggs Adopted," by Eiichi Sakano; (4) "On the Common Names of the Salmonoid Fishes and Their Related Forms Found in Northern Japan and Its Adjacent Waters," by Toyohiko Hikita; and (5) "On the Herring Found in Akkehi Bay," by Eiichi Sakano.

Ninth Census of Canada, 1951, Fisheries, vol. 9, 160 pp., illus., printed, C$3.00. Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa, Canada, 1954. This report deals with the first Canadian census of the fisheries since 1911. It includes the number and status of fishermen; type and size of fishing craft; inventory of fishing gear and shore equipment; landings, value, and disposition of fish and shellfish; revenues and expenditures. Data are given for Canada and for each province.

Noise Analysis with a Heterodyne-Type Sonic Analyzer, by J. D. Richard, Jr., P. F. Smith, and F. H. Stephens, 6 pp., illus., printed, Marine Laboratory, University of Miami, Coral Gables, Fla. (Reprinted from Transactions of the I.R.E. Professional Group on Audio, vol. AU-3, no. 2, March-April 1955, pp. 37-42.)

"Occurrence of Choline in the Shellfish, Callista Brevisiphonata Carpenter," by Motokazu Asano, article, The Tohoku Journal of Agricultural Research, vol. 4, no. 3-4, March 1954, pp. 239-250, illus., printed. Faculty of Agriculture, Tohoku University, Sendai, Japan.

Offshore and Newfoundland Scallop Exploration, by L. M. Dickie and L. P. Chiasson, General Series Circular No. 25, 4 pp., illus., printed. Fisheries Research Board of Canada, Atlantic Biological Station, St. Andrews, N. B., March 1955. This circular gives details of scallop explorations on the banks off Nova Scotia and Newfoundland in 1953. It shows the good fishing beds found, as well as areas explored where scallops were not found in commercial quantities. It also describes areas which, although not worth fishing now, seem worth watching. The authors state that, "From the results of these explorations we must conclude that scallops are not abundant on the offshore Nova Scotian and Newfoundland banks. The development of a large offshore scallop fishery in the near future is therefore unlikely. The boats left the offshore St. Pierre Bank about July 1954 when they were still catching more than 1,500 pounds of scallop meat per day, because fishing was better inshore in Port au Port Bay. But the known inshore Newfoundland beds are small and catches will soon drop. A continuation of the fishery will therefore depend on a combination of the inshore and offshore areas. However, results are not entirely discouraging and further expansion is possible through new discoveries or new sets of young scallops on areas such as Sable Island."

Outcome or Current Status of Investigations Conducted by the United States Tariff Commission Under the Provisions of Section 332 of the Tariff Act of 1930, Since January 1, 1952, as of March 1, 1955, 9 pp., processed. United States Tariff Commission, Washington 25, D. C., March 1955. This compilation summarizes information on the investigations that the United States Tariff Commission has conducted under the provisions of section 332 of the Tariff Act of 1930, since January 1, 1952. Section 332 of the Tariff Act of 1930 directs the Tariff Commission to place at the disposal of the President, the Committee on Ways and Means of the House of Representatives, and the Committee on Finance of the Senate, whenever requested, all information at its command. It also directs the Commission to make such investigations and reports as may be requested by the President, by either of the above-mentioned committees, or by either House of Congress. A report on the 1952-53 tuna investigation is included.

A Prototype Instrument for the Automatic Measuring and Recording of Conductivity and Temperature

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Versus Depth in Oceanic and Estuarian Waters, Preliminary Report 55-14, January 1955, 31 pp., illus., processed. The Marine Laboratory, University of Miami, Coral Gables, Florida.

(Scotland) Observations on the Recaptures of Tagged Lobsters in Scotland, by H. J. Thomas, Scottish Home Department Marine Research No. 2, 14 pp., illus., printed, 2s. 6d. (35 U. S. cents). Her Majesty's Stationery Office, Edinburgh, Scotland, 1955. Lobster fishing is of considerable importance over large areas of the Scottish coast. In view of this and of the revision in the legislation governing the landing of lobsters in Britain, which came into force in 1951, special tagging experiments were carried out from the Marine Laboratory at Aberdeen. A design for tagging experiments to estimate the annual fishing mortality, particularly in regard to length and class of lobster and season of tagging, is described. The annual fishing mortalities off the southeast Scottish coast in the seasons 1950/51 and 1951/52 were about 50 percent. Returns of tags suggest an over-all annual fishing mortality of about 15 percent for the areas investigated off the Scottish west coast and of about 16 percent around Orkney. In areas of limited fishing intensity, the marked nonmigratory habits of the lobster may result in wide local differences in mortality within relatively small areas.

(Scotland) Report on the Fisheries of Scotland, 1954, Scottish Home Department Cmd. 9416, 67 pp., printed, 2s. 6d. net (35 U. S. cents). Her Majesty's Stationery Office, Edinburgh, Scotland. This is a report of Scotland's fisheries, with statistical data for the year 1954. Contains total production figures by species and by port (both comparative and historical), and information on the number of boats, personnel, and methods of capture. Production and value of lobsters, mussels, oysters, and scallops, and fishery byproducts are also included. Sections are also devoted to discussions of the herring, white fish, and salmon fisheries, marine fisheries law enforcement, scientific investigations, and harbor maintenance.

Studies on Fish Parasites of Lake Huron and Manitoulin Island, by Ralph V. Bangham, 12 pp., printed. (Reprinted from The American Midland Naturalist, vol. 53, no. 1, pp. 184-194, January 1955.) University of Notre Dame Press, Notre Dame, Ind.

Survey of the Oyster Beds (CRASSOSTREA VIRGINICA) in the Sheepscot River and its Tributaries, 1954, by Louis N. Taxiarchis, Robert L. Dow, and Frederick T. Baird, Jr., Sheepscot Area Report No. 1, 14 pp., illus., printed. Department of Sea and Shore Fisheries, Augusta, Maine, December 1954. This report of the Sheepscot River oyster beds survey (1954) is the first of several papers covering various phases of the cooperative ecological study of the Sheepscot area being carried on by the U.S. Fish and Wildlive Service, the Atlantic Sea Run Salmon Commission, the Maine Department of Inland Fisheries and Game, and the Maine Department of Sea and Shore Fisheries. In addition to a summary of survey results with accompanying map and graph, a brief historical outline of other oyster surveys and experiments in Maine waters from the early 1900's to date is included.

"The Technique of Ring-Netting," article, World Fishing, vol. 4, no. 4, April 1955, pp. 144-146, illus., printed, single copy 2s. 6d. (35 U. S. cents). John Trundell Ltd., Temple Chambers, Temple Avenue, London, E.C. 4.

The Tohoku Journal of Agricultural Research, vol. 5, no. 1, 72 pp., illus., printed, September 1954. Faculty of Agriculture, Tohoku University, Sendai, Japan. Contains, among others, the following articles: "Breeding of the Olympia Oyster in Tanks and Culture Experiments in Japanese Waters," by Takeo Imai, Seiichi Sakai, Hiroshi Okada, and Tetsuzo Yoshida; and "A New Color Test for the Measurement of Freshness of Fish by Volatile Bases Estimation," by Yasuhiko Tsuchiya and Mitsu Kayama.

"Your Guide to Electrical Fishing," by J. G. Gattley, article, World Fishing, vol. 4, no. 3, March 1955, pp. 125-127, illus., printed, 2s. 6d. (34 U.S. cents) per copy. John Trundell Ltd., Temple Chambers, Temple Avenue, London, E.C. 4, England. One of 3 articles specially written to add to the industry's practical knowledge of electrical fishing.

"Your Guide to Electrical Fishing," by J. G. Gattley, article, World Fishing, vol. 4, no. 4, April 1955, pp. 166-169, illus., printed, single copy 2s. 6d. (35 U.S. cents). John Trundell Ltd., Temple Chambers, Temple Avenue, London, E.C. 4. Part 2 of a 3-part article.

"Your Guide to Electrical Fishing," by J. G. Gattley, article, World Fishing, vol. 4, no. 5, May 1955, pp. 202-205, illus., printed, single copy 2s. 6d. (35 U.S. cents). John Trundell Ltd., Temple Chambers, Temple Avenue, London, E.C. 4. Part 3 of a 3-part article.

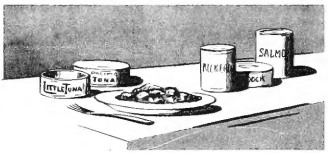
CONTENTS, CONTINUED

INT.-DUP. SEC., WASH., D.C. 84389

CANNED FISH AND BYPRODUCTS--1954

Canned Fish and Byproducts - 1954, C.F.S. No. 1127, was issued recently by the Service's Branch of Commercial Fisheries. This publication presents data on the United States, Alaska, Hawaii, Puerto Rico, and American Samoa pack of canned fish and shellfish. The number of plants canning or producing products and byproducts is also given by area and by State, and historical statistics are included for certain major packs by species.

The pack of canned fishery products in the United States, Alaska, American Samoa, Hawaii, and Puerto Rico in 1954 amounted to 868 million pounds, valued at $331 million to the packers. This was an increase of 10 percent in volume and 8 percent in value as compared with the previous year. Increased packs of tuna, Maine and Pacific sardines, salmon, and fish packed for pet food were responsible for the gain in production. Record packs of tuna and pet food were canned during the year. During 1954, canned fishery products were packed in 400 plants in 25 States and the four territories mentioned above.

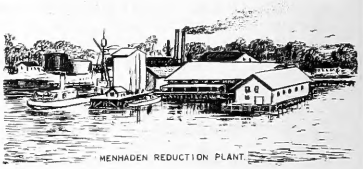


The pack of tuna and tunalike fishes exceeded that of any other item in both volume and value in 1954. The canned production of these fish amounted to 10.9 million standard cases (214.4 million pounds), valued at $142.1 million. This was an increase of 1.3 million standard cases and $15.9 million compared with 1953. During 1954 tuna was packed in 7 States, American Samoa, Hawaii, and Puerto Rico. This was the first year tuna was canned in American Samoa.

The 1954 pack of canned salmon amounted to 4.2 million standard cases (199.8 million pounds), valued at $92.3 million to the canners. This was the largest pack of sockeye salmon in the Puget Sound area since 1913, and an unusually large pack of chum salmon in southeastern Alaska was responsible for the gain.

Pacific sardines returned to southern California waters in 1954 after an almost complete absence the previous two years. The catch of 133 million pounds was used to produce a pack of 1.3 million standard cases (60 million pounds), compared with less than 64,000 cases in 1953. Had there been a market for additional supplies of canned sardines, it is estimated that the pack could have been doubled.

The pack of Maine sardines amounted to 2.9 million standard cases (59.6 million pounds), valued at $18.2 million to the packers. Compared with the previous year, this was an increase of 5 percent in volume and 7 percent in value.


MENHADEN REDUCTION PLANT

The 1954 production of fishery byproducts in the United States, Alaska, American Samoa, and Puerto Rico was valued at $81.6 million--10 percent more than in the previous year. The production of fish meal amounted to 256,915 tons, valued at $32.7 million--a new record. The production of meal was nearly 18,000 tons more than in the previous year, and 13,000 tons above the previous 1936 record production. The production of menhaden meal in 1954 amounted to 183,091 tons--a new record. A total of 6,513 tons of Pacific sardine meal was produced during the year--6,369 tons more than in the previous year, but only 5 percent of the record yield of this meal (121,739 tons) which occurred in 1936 when the sardine fishery was at its peak. In addition to the fish meal produced for animal feed, 57.9 million pounds of homogenized condensed fish and 172.2 million pounds of condensed fish solubles were also manufactured for use in mixed animal feeds.

The production of marine animal oils in the United States and Alaska during 1954 amounted to 22.1 million gallons, valued at $13.1 million to the producers. This was an increase of 9 percent in volume compared with 1953, but was only 55 percent of the record 1936 production when 39.9 million gallons of oils were produced.

Other important byproducts produced during the year were marine pearl-shell, oyster-shell, and fresh-water products valued at $15,843,000. Byproducts were produced in 227 plants in 25 States, Alaska, American Samoa, and Puerto Rico during 1954.

Copies of this bulletin, C.F.S. No. 1127, are available free upon request from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C.