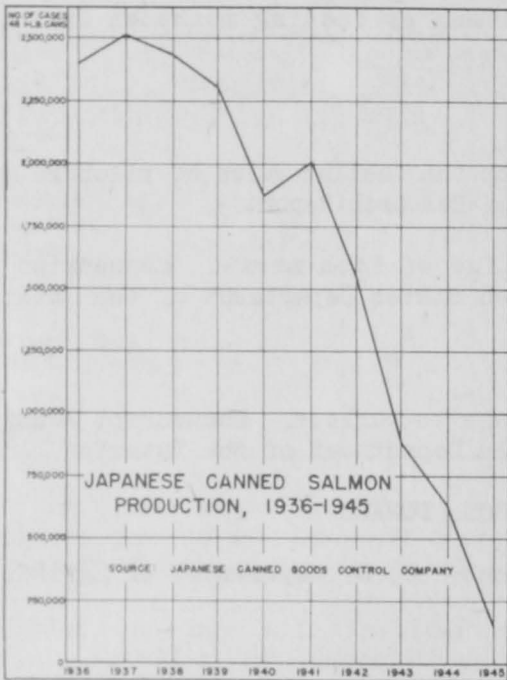
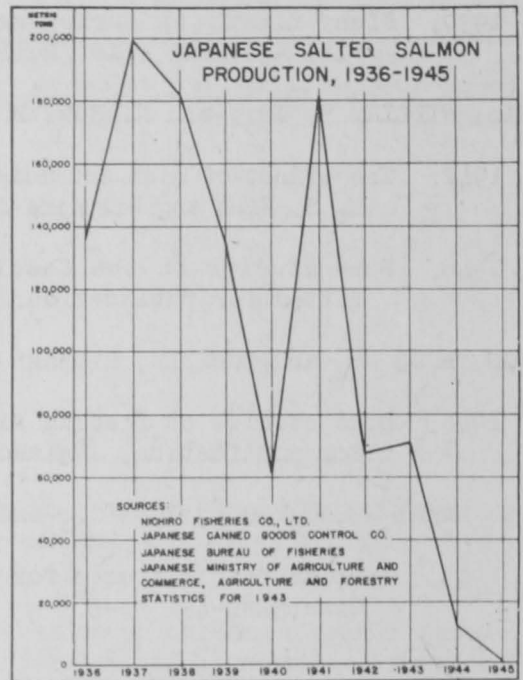


THE JAPANESE SALMON INDUSTRY*

The salmon industry was, at one time, of great importance to the economy of Japan. The Japanese salmon industry reached its peak in 1937 with a total output of canned salmon amounting to about 2,500,000 cases^{1/} valued at approximately 40,000,000 yen. In that same year the production of salted salmon was nearly 200,000 metric tons (Graphs 1 and 2). From 1937 until the outbreak of naval warfare in the Pacific prior to the 1942 season, Japan ranked second only to the United States in the production of processed salmon. About 87 percent of the exported canned salmon was sent to Great Britain, four percent to France, and most of the remainder to other European countries.



Graph 1



Graph 2

At the present time Hokkaido is the principal source of the greatly reduced salmon catch. Prior to 1945, the waters around Kamchatka, Sakhalin, and the northern Kuril Islands provided practically all of the salmon used for canning and salting (see Plates 1 and 2, pages 10 and 11).

Recently, because of the shortage of foodstuffs in Japan, and because Japan has been cut off from foreign trade, a marked increase in domestic consumption of canned salmon has taken place.

Because the Japanese floating canneries were sunk during the recent hostilities, and because Allied naval action disrupted communications with the canneries

*This article is taken from Natural Resources Section Report No. 31, which was based on information gathered and compiled by Captain Verne W. Broadbent of that Section, General Headquarters, Supreme Commander for the Allied Powers, Tokyo.

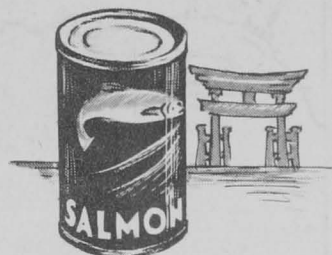
^{1/}One case - 48 pounds or 21.8 kilograms net weight.

in Kamchatka, Japanese salmon production has shown an enormous decrease since 1941 (Graphs 1 and 2, page 8). It is, therefore, necessary to base the statements in this report on conditions as they existed prior to 1942. Production data were obtained from many sources. Where discrepancies occurred, the most realistic figures were used.

Inasmuch as most of the Japanese salmon industry was centered in waters controlled by another nation, the industry was subject to numerous international agreements.

In 1875, when the treaty which provided for the exchange of Sakhalin for the Kurils was signed by Russia and Japan, the stipulation was made that Japanese vessels were to have the same privileges in the Okhotsk Sea as were the Russians.

As a result of the Portsmouth Treaty following the Russo-Japanese War in 1905, southern Sakhalin (Karafuto) was ceded to Japan. Since that time a considerable amount of salmon fishing has been done by the Japanese in this territory. The Russian Government, at the same time, also conceded to Japan the right to fish along the Russian coastline in the Okhotsk, Bering, and Japan Seas. In 1907, the Russo-Japanese Fishery Pact was made to extend for a term of 12 years. This pact was drawn purposely to show in detail Japanese rights in fishing in these Russian territories.



In 1917, because of the downfall of the Romanoff Government in Russia, it was necessary for Japan to enter into an agreement with the Tomsk Government to maintain the existing position of Japan's fishery rights.

From 1920 to 1925 the Japanese placed all their fishery concessions under the protection of the Imperial Japanese Army. This was done following the Nicoloiivsky Affair, when all Japanese landing stations and canneries were destroyed by Russian partisans.

The Japanese found it necessary to enter into an agreement with the U.S.S.R. in 1928 after the whole of eastern Russia was taken under the control of the Soviet Government. The agreement gave Japan the right to fish on the entire coast of the far-eastern Soviet territory, except for a few specified ports.

Until 1928, Japanese fishing concerns had occupied 80 percent or more of the fishing grounds in eastern Russia. Between 1928 and 1931 Soviet interests practically reversed this situation. This was done by the State enterprise taking over the leases of the Japanese as they expired.

On April 2, 1939, a temporary agreement was signed which provided that the Fishery Convention of 1928 remain in force until the end of 1939.

At this time the Soviets established the principle that, even though the Portsmouth Treaty in 1905 had given Japan a right to fish in Russian waters, the Soviet Government still had the power to determine where the Japanese could fish and to make the terms for leasing these territories.

In January 1940, another provisional agreement was concluded. During the 1940 season, 142 Japanese vessels operated in Soviet waters, catching 332,000 metric tons of fish. Almost 20,000 men were employed.

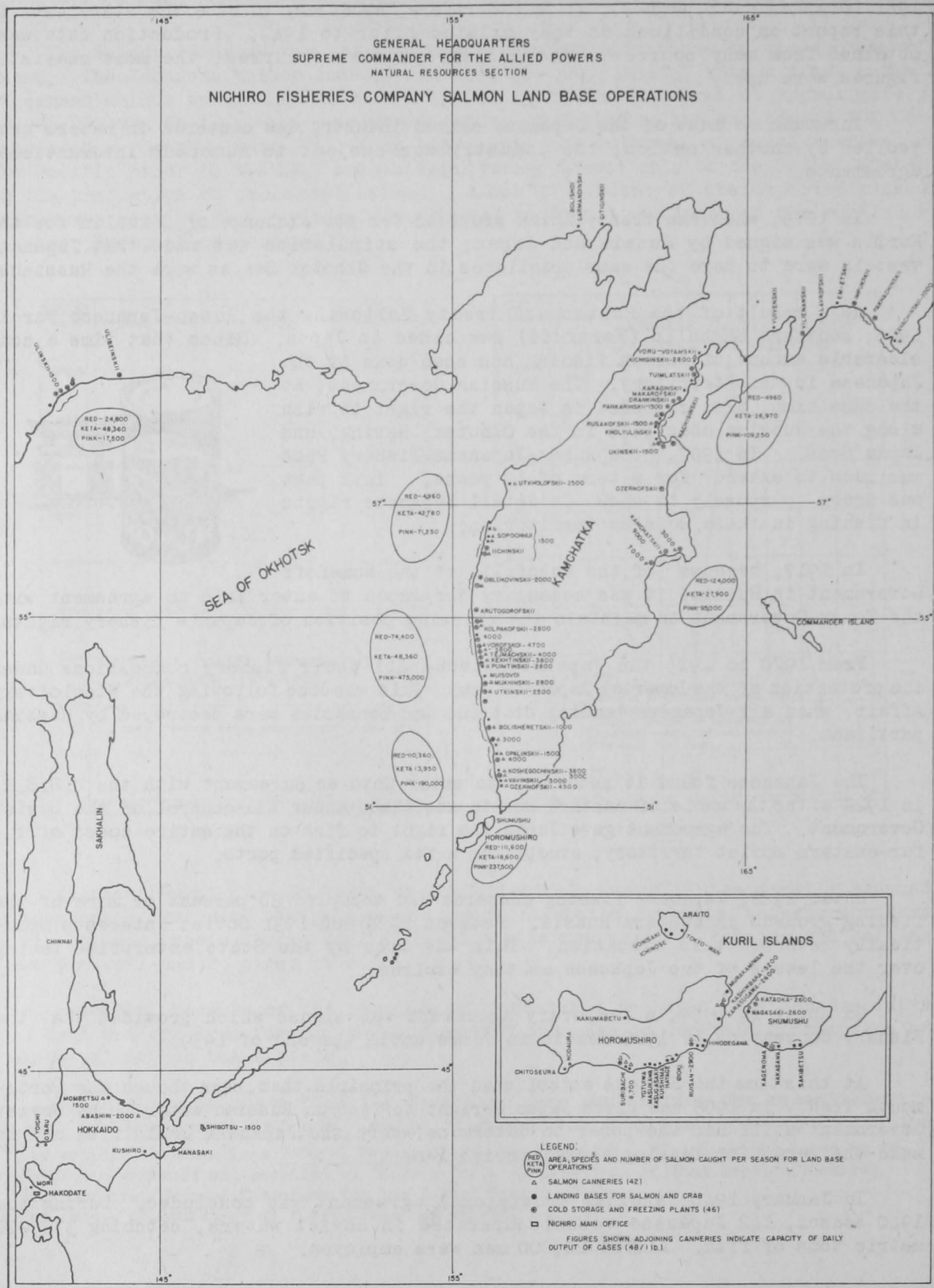
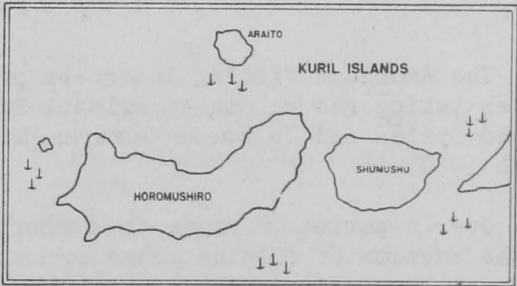
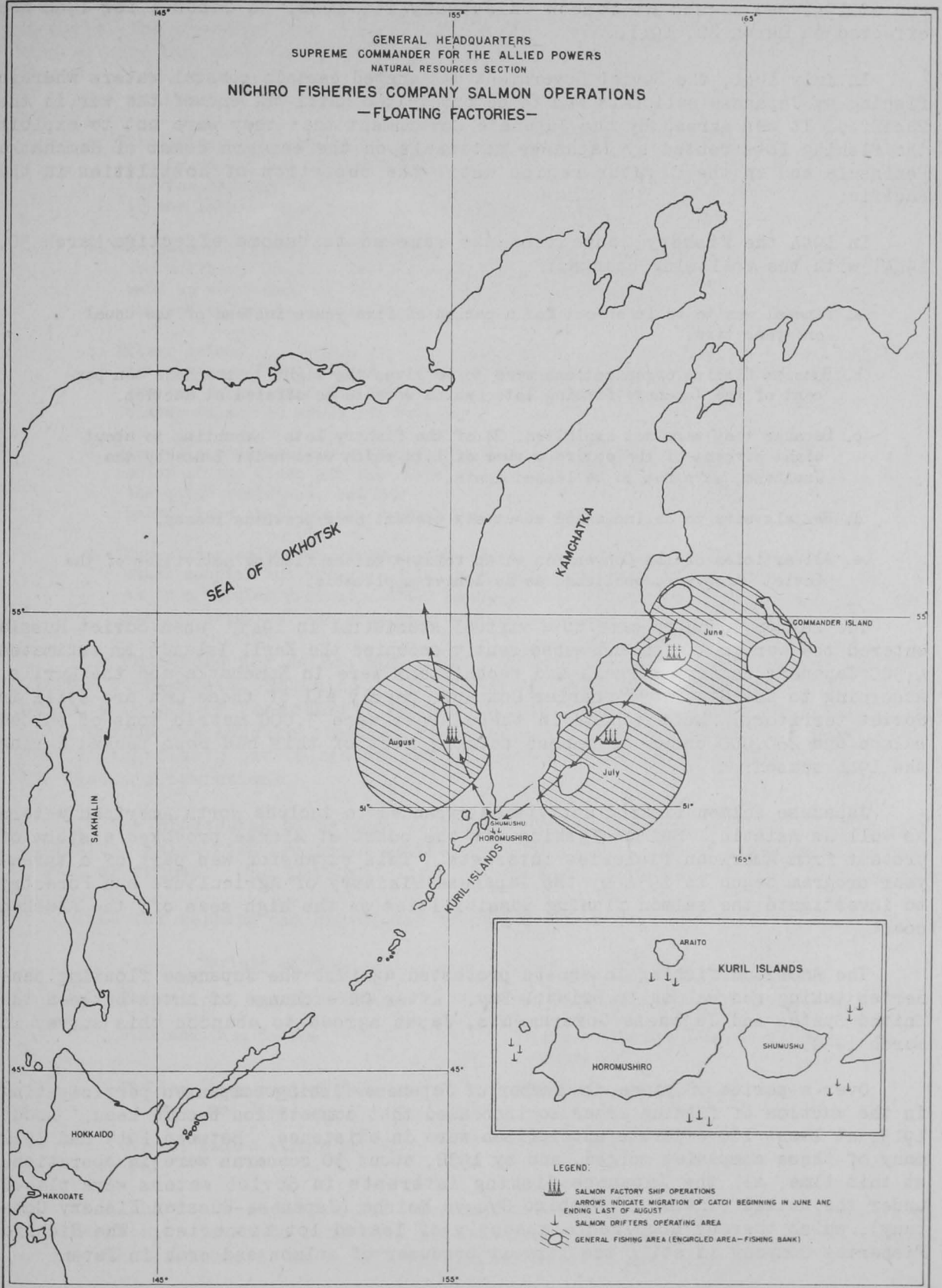


PLATE I

GENERAL HEADQUARTERS
 SUPREME COMMANDER FOR THE ALLIED POWERS
 NATURAL RESOURCES SECTION
NICHIRO FISHERIES COMPANY SALMON OPERATIONS
 —FLOATING FACTORIES—







LEGEND:
 SALMON FACTORY SHIP OPERATIONS
 ARROWS INDICATE MIGRATION OF CATCH BEGINNING IN JUNE AND ENDING LAST OF AUGUST
 SALMON DRIFTERS OPERATING AREA
 GENERAL FISHING AREA (ENCIRCLED AREA—FISHING BANK)

PLATE 2

A provisional agreement to extend the Fishery Convention of 1928 until the end of 1941 was signed at Moscow on January 20, 1941. A renewal for 1942 was effected on March 20, 1941.

In July 1941, the Soviet Government designated certain coastal waters wherein fishing by Japanese nationals was to be prohibited until the end of the war in the Pacific. It was agreed by the Japanese Government that they were not to exploit the fishing lots rented by Japanese nationals on the eastern coast of Kamchatka Peninsula and in the Olyutor region until the cessation of hostilities in the Pacific.

In 1944 the Fishery Convention was renewed to become effective March 30, 1944, with the following changes:

- a. Renewal was to be in effect for a period of five years instead of the usual one-year term.
- b. Russian fishing organizations were to be given the right to purchase ten percent of the Japanese fishing lots, which were to be offered at auction.
- c. Because they were not exploited, 24 of the fishery lots, amounting to about eight percent of the entire number of lots which were under lease by the Japanese, were not to be leased again.
- d. Rentals were to be increased about six percent over previous leases.
- e. All articles of the Convention which related to the fishing activities of the Soviet Union were abolished as no longer applicable.

The salmon industry came to a virtual standstill in 1945. When Soviet Russia entered the war in August and subsequently occupied the Kuril Islands, an estimated 4,500 Japanese cannery workers and technicians were in Kamchatka and the Kurils. According to the Nichiro Fisheries Company, nearly all of these men are still in Soviet territory. Left behind in these areas were 3,000 metric tons of salted salmon and 260,000 cases of canned salmon; most of this had been packed during the 1944 season.

Japanese salmon fishing activities expanded to include North American waters as well as Asiatic. Salmon fishing off the coast of Alaska provoked a storm of protest from American fisheries interests. This expansion was part of a three-year program begun in 1936 by the Japanese Ministry of Agriculture and Forestry to investigate the salmon fishing possibilities on the high seas off the Alaskan coast.

The American fishing interests protested against the Japanese floating canneries taking red salmon in Bristol Bay. After an exchange of notes between the United States and Japanese Governments, Japan agreed to abandon this survey in March 1938.

Over a period of years, the number of Japanese fishing companies participating in the auction of fishing areas so increased that competition became keen. About 1915, at least 100 separate enterprises were in existence. Between 1915 and 1932 many of these companies merged, and by 1932, about 30 concerns were in operation. At this time, all the Japanese fishing interests in Soviet waters were placed under the united control of Nichiro Gyogyo Kaisha (Japanese-Russian Fishery Company), which thereby acquired a monopoly of leased lot fisheries. The Nichiro Fisheries Company is still the largest producer of salmon and crab in Japan.

The canned goods that were packed in the Russian territory, either at Japanese land stations or by floating canneries, were shipped directly to foreign markets. The proceeds from these products were listed under the head of "Revenue," and so were not entered in the returns of the foreign trade of Japan.

The following five species of salmon are used by the Japanese for processing:

- a. King salmon (Oncorhynchus tshawytscha): The flesh is of medium texture with plenty of oil and a fine flavor. The king salmon was at one time the most popular for canning, but recently, much of the catch has been marketed frozen. This is the largest species of salmon, ranging in weight from 20 to 80 pounds.
- b. Red salmon or sockeye (O. nerka): This species is caught around Kamchatka and the northern Kurils. It is the most desirable species for canning, and formerly made up about half of the salmon export trade of Japan. The average weight of the red salmon is eight pounds.
- c. Silver salmon (O. kisutch): This species is caught mostly around Kamchatka and the northern Kuril Islands. The silver salmon is of a less firm texture than the red salmon, and the meat is light red in color. The average weight of the silver salmon is about six pounds.
- d. Pink salmon or humpback (O. gorbuscha): This species derives its names from the color of the flesh and the shape of the fish. It is not so firm in texture as the other varieties, but has a good flavor and is an economical food. The pink salmon is a small species, weighing on the average only about four pounds.
- e. Chum or dog salmon (O. keta): The meat of the chum salmon is not so firm as other species but because of its nice color, distinctive flavor, and low price, it is a popular product. After canning, the flesh is a light yellow color. The average weight of the chum salmon is eight pounds.

The home base for salmon and trout fishing operations in northern waters is located at Hakodate, Hokkaido. Transport vessels, after being loaded with the season's supply of foodstuffs, materials for repair, and equipment sailed for their respective landing stations or canneries toward the end of May each year. The fishing fleets put to sea as soon as shore stations were placed in repair for the season's operations.

In the processing of salmon, the first operation is one of grading. Grading determines which fish are to be packed in cans, and which are to be salted, smoked, dried, or frozen. The freshest fish of the best quality are used for canning.

Fish for canning are segregated according to variety and quality, as follows:

<u>Variety of Fish</u>	<u>Grades</u>
Red, Silver, and King Salmon	Fancy, Standard, and Non-exportable
Pink and Chum Salmon	Choice, Standard, Passed and Non-exportable
Titbits (neck meat of Red, Silver, and King)	"A" grade and Non-exportable
Sliced, smoked salmon in olive oil	Passed grade

Fish which are rejected for canning purposes are either sold on the fresh fish markets or put into reduction plants with the offal from the canning operations. This residue is made into fertilizer or fish meal and oil.

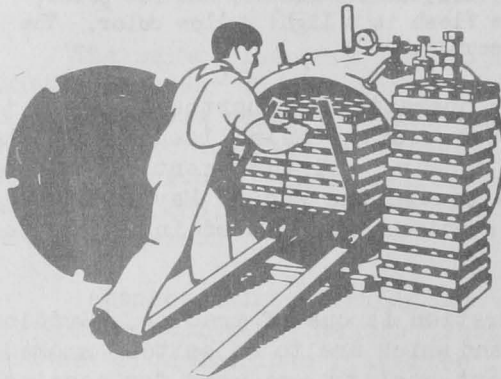
Briefly, the canning process is as follows: Fish are unloaded from the boat onto the cannery wharf; after sorting, they are conveyed into the plant, cleaned, cut to size, and packed in cans; the cans are exhausted and sealed, or vacuum sealed without the exhaust cook; the cans are then given the final sterilizing cook in pressure retorts.

Formerly it was thought that, in order to improve the pack, fish should stand 12 to 24 hours after being landed. Often fish were held too long and spoilage occurred. Hence this practice has been discontinued.

Most of the land and floating canneries are equipped with cutting machines commonly known as "guillotines" and "iron chinks." These machines cut off the heads, fins, and tails, split the bellies, and remove the viscera and slime. Other plants are equipped with somewhat different sliming machines. The fish are then cleaned and cut into lengths, depending on the size of the can.

Most of the cans are filled by machine, but it has been proved that hand-packing results in a far superior product. After the cans are packed and the weights are checked, the cans are either run through an exhaust box and then sealed or sealed by a vacuum-sealing machine without the exhaust cook. In plants which use an exhaust box, cans are first run through a clincher which puts the lids on loosely. The exhaust process takes 15 to 30 minutes at a temperature of 210° F.

After the cans are run through a washer, they are cooked in retorts to sterilize the contents. The retorting is done in large steel, horizontal, cylindrical tanks capable of holding from 45 to 90 cases of one-pound cans each or twice that amount of half-pound cans. The one-pound tins which have been given an exhaust cook are cooked under steam pressure for 80 minutes at a temperature of 240° F. Half-pound cans are cooked for 60 minutes; quarter-pound cans for 45 minutes. Vacuum-sealed cans are retorted for an additional 10-minute period.



Following the cooling, cans are labelled and cased, and are ready for shipment.

At one time, the Japanese Canners' Association was actively engaged in the inspection of canned salmon. The inspection covered the color of meat, amount of skin, oil, liquid and salt, texture, odor, and taste of the fish, amount of vacuum, head space, weight, and thoroughness of cook. Lately, little inspection, if any, has been made. In many cases, it has been found that during the cooking process the temperature was allowed to drop one or two degrees below the prescribed minimum with no correction or recook being made.

All species of salmon may be salted or smoked, but the most desirable varieties for these purposes are the pink and chum salmon.

Salted salmon comes in two grades. The excellent, or first grade, is called "aramaki," and the ordinary grade is known as "kairyō." The difference between

the two grades is determined by the quality and condition of the fish and also by the process of preparation.

First grade salmon are salted and packed individually in boxes. As soon as the fish are caught, they are cleaned thoroughly and washed. They are then drained of all water. After salt has been put in the gill slits and bellies, the fish are placed in wooden boxes of about 15 to 20 fish each. The boxes are kept in cold storage until the fish are to be used.

Ordinary grade salted salmon is prepared either by salting in tanks or by mass salting. In the tank method, the fish are placed in tanks of either wood or concrete after they have been cleaned and drained. They are salted thoroughly by layers. The top layer is heavily salted, and the tank is covered with canvas. After seven days the fish are put in wooden boxes for shipment. In the mass method, fish are piled on mats and salted heavily. After being kept covered with salt and protected by canvas for a period of 20 days, the fish are packed in wooden boxes.

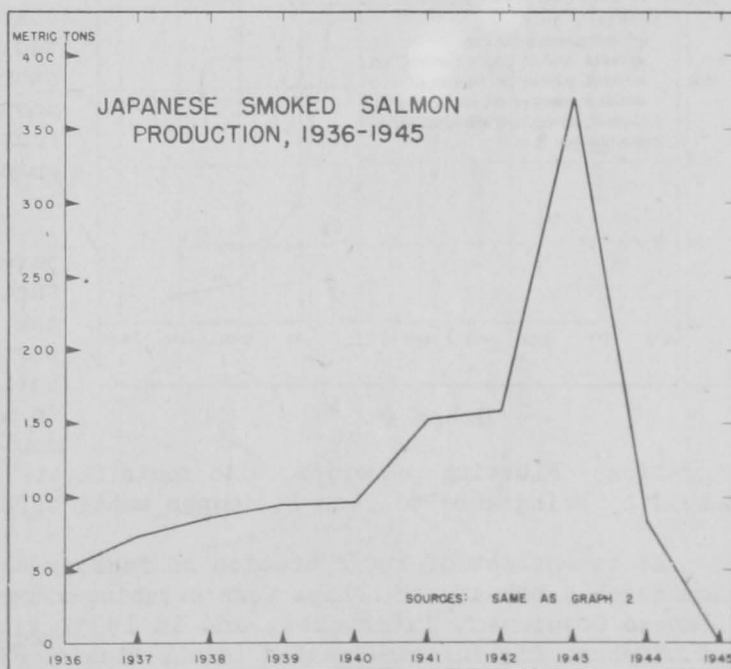
Large quantities of salt are required in the preparation and packing of salted salmon. The amounts of salt used, expressed as a percentage of the weight of the raw fish, are as follows:

<u>Type of Salting</u>	<u>Percentage of Weight</u>
Aramaki	18 to 20
Tank	20
Mass	32

Additional salt in the amount of 8 to 16 percent of the weight of the fish is needed for repacking in boxes after the initial process.

Salted salmon may be kept for as long as one year without spoiling if stored in a cool place.

The salted fish are soaked in fresh water for one or two days in order to remove some of the salt. They are then cut lengthwise, separating the backs from the bellies. The sections are dried in the shade for one day; they are then hung in the smokehouse by the tail and subjected to the smoke of some type of hardwood, such as white oak, along with sawdust. The sections are smoked for about 10 hours daily for 18 to 21 days consecutively at temperatures ranging from 60° to 80° F.



Graph 3

Nichiro Fisheries Company has one salmon-smoking factory which is in condition for immediate operation. This plant is located at Oiwakecho, Kamiise Gun,

Hokkaido. The six buildings of the factory have a floor space of 14,565 square feet and contain 20 smoking chambers. The capacity of this factory is 60,000 smoked red salmon per month (Graph 3, page 15).

Methods for preserving salmon and other marine products by means of cold storage and freezing have undergone many changes since 1918, when Mr. Ihei Kuzuhara first started a freezing business using an air sharp-freezing process. In 1923, the Hayashikane Company adopted the Ottesen quick-freezing process, which at that time was considered the best method for fish freezing.

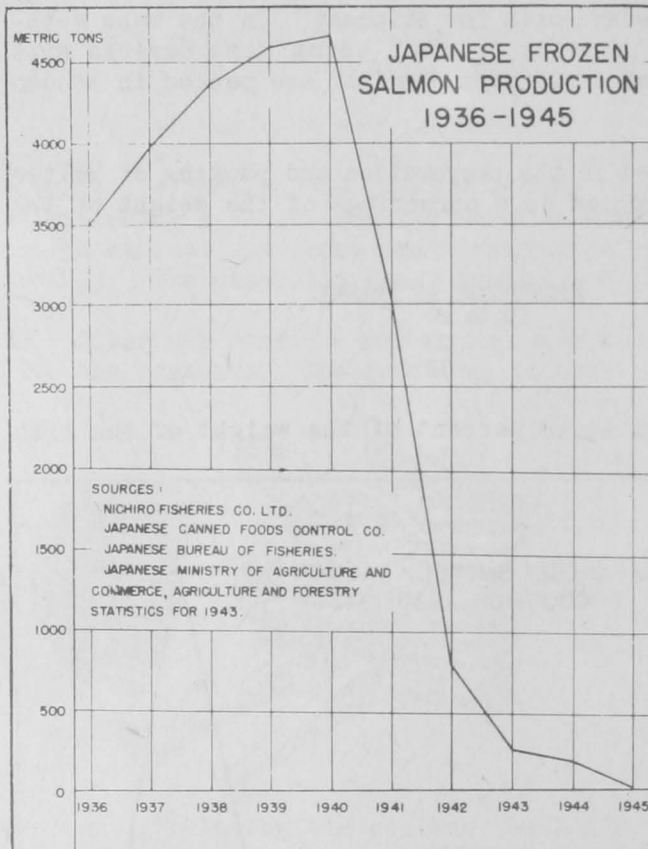
Some varieties of fish are more suitable for freezing than others, salmon being one of the best. The most desirable species are red and pink salmon. Ex-

tensive developments have been made in Kamchatka and Hokkaido, both at land stations and on fishing and factory vessels, toward better methods of freezing.

Frozen salmon were first shipped to England and other European countries headed and gutted, but recently the producers have adopted methods of freezing fillets or steaks for export. Removing the inedible portions of the fish reduces shipping costs.

Nichiro Fisheries Company, which controls the salmon industry, operated nine freezing plants and 37 cold-storage plants in Kamchatka and the northern Kuril Islands. Most of the factory ships were also equipped with quick-freezing plants (Graph 4).

Since 1927, the Japanese have developed the operation of floating factory ships to such an extent that the industry has become of great importance to the fisheries of Japan. Until 1927, salmon were caught close to the coast as they approached the mouths of rivers on their spawning



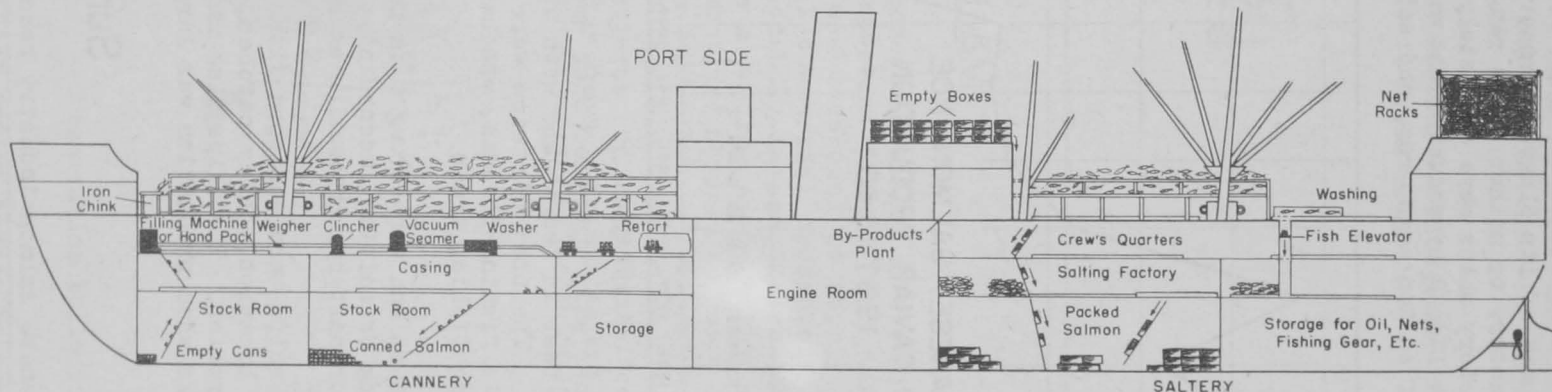
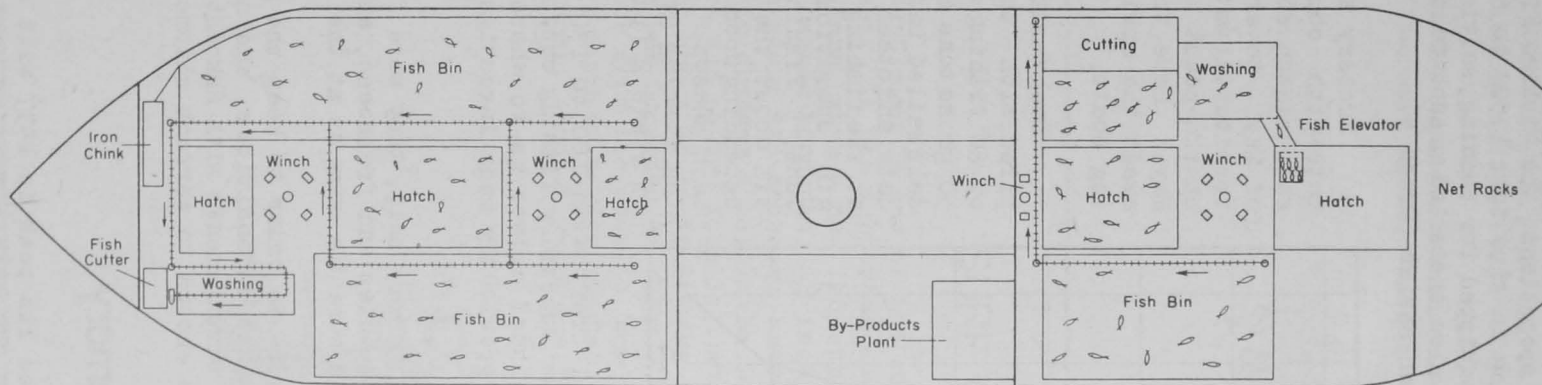
Graph 4

migration. Floating canneries, with their fleets of fishing vessels, changed this method by being able to fish in deeper water offshore.

At the outset of the operation of factory ships, coastal fishermen suffered considerably because the ships were catching a large majority of the salmon. The Japanese Government intervened, and in 1935, virtual control over both coastal and offshore fishing was granted to the Nichiro Fisheries Company. Japanese regulations prohibited the operation of salmon mother ships south of 51 degrees North Latitude to protect the coastal fisheries of Hokkaido, Karafuto, and the Kuril Islands.

In northern waters, the floating salmon canneries operating outside the three-mile limit were in direct competition with both Japanese and Soviet shore can-

SKETCH OF FLOATING SALMON FACTORY*

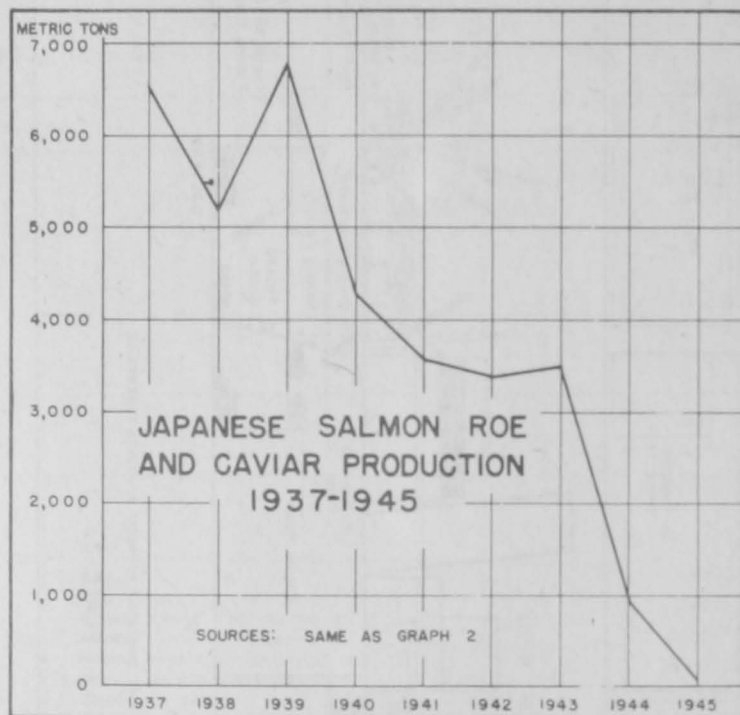


DRAWING ADAPTED FROM ILLUSTRATION FURNISHED BY NICHIRO FISHERIES CO.

PLATE 3

neries on the leased lots. It has been said that the Japanese used the threat of engaging more factory ships to compete with Russian shore stations in order to secure better terms in the negotiations for renewal of fishing lot privileges.

At the peak of its floating cannery operations, the Nichiro Fisheries Company owned nine factory or mother ships ranging in size from 1,500 to 6,200 gross tons each. The factory ships were completely equipped for canning, salting, and freezing (Plate 3, page 17). A byproducts plant was also installed on each factory ship for the processing of salmon eggs, roe, and salmon caviar (Graph 5).



Graph 5

The mother ship provided each small craft with 100 to 130 drift gill nets of about 180 feet in length and with other necessary fishing equipment, fuel oil, and supplies. The boat captains were issued orders as to where to fish by the factory ship's fishing foreman, who had previously made investigations as to the most promising fishing areas.

When the salmon were brought to the factory ship, they were first sorted for either canning or salting, according to species and freshness, and dispatched to the cannery or saltery. Processing methods were the same as at the shore stations.

Factory ships were equipped with radio in order to keep the main office informed as to location, daily catches, weather conditions, and needs for repair parts and supplies. The ships also made arrangements with Hakodate for transshipment of stocks when production was large enough to warrant shipment.

Summary

The Japanese salmon industry reached its peak in 1937 with a production of 2,500,000 cases of canned salmon and 200,000 metric tons of salted salmon. Be-

Factory ships left Hakodate with complete equipment each season about the middle of May, to arrive outside of territorial waters off the Kamchatka coast near the end of May. Here they anchored to await the arrival of the fishing boats.

Each factory ship was supplied with the catches of 50 or 60 fishing craft of 30 to 50 gross tons each. These vessels sailed in fleets from Hakodate and other bases to arrive at the fishing grounds and begin operations the first of June. Fishing continued until about the end of August, depending upon the run of fish each season. The location of the fishing grounds is shown in Plate 2 (page 11).

cause of wartime conditions, the output of this industry had shrunk to 100,000 cases of canned salmon and 600 metric tons of salted salmon in 1945.

Most of the Japanese salmon catch was made in Kamchatka and the northern Kuril Islands. About 20,000 Japanese were employed in the land and floating canneries and in fishing activities.

The bulk of the Japanese canned salmon production was exported prior to 1940; an estimated 87 percent of the exports went to Great Britain.



SURF CLAM

The surf clam is one of the commonest shellfish of the Middle Atlantic Coast. It has supported an important fishery only during the past two years, when a new industry was developed to supply wartime needs for canned products. Principal commercial operations are now carried on along the southern shore of Long Island, where the clams are taken in dredges a half mile to a mile from shore. Some are sold fresh, part are canned locally, but most are shipped to Maine for canning. With about 25 boats fishing for surf clams in 1945, average daily production was reported as about 2,000 bushels. The clams live on exposed coasts from Labrador to Cape Hatteras, burying themselves in the bottom to a depth of several inches. They spawn in the spring and throughout the summer. About 5 years are required to reach a length of $4\frac{1}{2}$ inches.

