

# **The Fisheries of Japan**

**UNITED STATES DEPARTMENT OF THE INTERIOR**

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# The Philosophy of Science

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By

SIDNEY SHAPIRO

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# The Fisheries of Japan

By

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## ABSTRACT

Trends, developments, and statistical data are presented on important aspects of Japan's worldwide fisheries. Included are discussions of the principal types of fish and other aquatic products landed by the Japanese, areas in which species are caught, size and composition of the fishing fleet, fishermen's organizations, marketing methods, the main uses to which fishery products are put, trends in international trade, and the structure of the Japanese fishing industry. Information is also presented on Government support to the fisheries and on international fishery agreements to which Japan is a party.

## INTRODUCTION

Long the world's leading fishing nation, Japan lost its prominent position to Peru in 1962 and 1963, but only in regard to quantity of fishery products landed (table 1). In value, Japan continued to be foremost; its fishery catch of 6.7 million metric tons in 1963 was worth \$1.3 billion. By contrast, Peru's catch of 6.9 million tons--nearly all anchovy for reduction to meal and oil--was valued at \$70.7 million.

Japan is the foremost whaling nation in the world. In its Antarctic operations alone, it produced 46 percent of the total baleen whale oil produced in that area in 1963 as well as large quantities of whale meat and other products.

Japanese income from fishing has been going up rapidly. Nevertheless, because the country is becoming so heavily industrialized, the fisheries' share of the gross national income has been going down. In 1963 the fishing industry's income was 2.3 percent of the gross national income.

The Japanese consumption of fishery products has been rising steadily. On a live-weight basis, the Japanese consumed about 42 kilograms (92 pounds) of fishery products (including whale meat) per person in 1953. By 1962, consumption had risen to about 55 kg. (121 lbs.) per person. Although annual per capita consumption has increased more than 30 percent during the past decade, fishery products now supply only two-thirds of the animal protein in the Japanese diet. Formerly fishery prod-

ucts provided as much as 90 percent of the animal protein consumed. More milk, eggs, and meats have become available.

The Japanese fisheries are characterized by a diversity of operations, varying from the most primitive to the most modern. Coastal and nearby offshore waters contain an abundance of fish that are used primarily to feed the expanding Japanese population. Distant high-seas operations, especially for more valuable exportable fish and shellfish, have been extended into nearly every body of water in the world. Japan's fisheries now range over almost the entire Pacific Ocean, extending into the eastern Bering Sea and the Northeast Pacific off the coast of the United States. Operations are also carried on in the Indian Ocean, the tropical Atlantic Ocean, and the Northwest Atlantic. In addition, Japanese companies have many agreements with foreign governments and companies to conduct joint fishing operations.

Japan's leading exports are industrial products manufactured from imported raw materials, whereas fishery exports are prepared almost entirely from Japanese-caught raw materials. Spurred by the need to earn foreign exchange, Japan has energetically developed its fishery export trade. The country is the world's leading exporter in value of fishery commodities; Peru exceeds Japan in quantity exported. In 1962, Japanese fishery exports were valued at \$315.3 million, or nearly 7 percent of the value of all Japanese exports. Fishery exports dropped in 1963 to \$282.7 million, estimated to be between 5 and 6 percent of the value of total exports. At one time, the Japanese imported few fishery products; however, since 1960, imports have grown, principally to supply a heavy demand for fish

Note:--Statistical data in this report are presented in metric units. A metric ton equals 2,204.6 pounds; a kilogram equals 2.2 pounds.

Table 1.--Catches of five leading fishing nations, 1961-63

Country	1961		1962		1963	
	Quantity	Value	Quantity	Value	Quantity	Value
	<u>Thousand metric tons</u>	<u>Thousand U.S. dollars</u>	<u>Thousand metric tons</u>	<u>Thousand U.S. dollars</u>	<u>Thousand metric tons</u>	<u>Thousand U.S. dollars</u>
Peru.....	5,293.1	48,800	6,961.9	72,600	6,901.3	70,700
Japan.....	6,710.5	1,103,600	6,864.9	1,145,400	6,697.8	1,309,400
Communist China. <sup>1</sup>	5,000.0	( <sup>2</sup> )	<sup>1</sup> 5,000.0	( <sup>2</sup> )	<sup>1</sup> 5,000.0	( <sup>2</sup> )
U.S.S.R. ....	3,250.0	( <sup>2</sup> )	3,616.5	( <sup>2</sup> )	3,977.2	( <sup>2</sup> )
United States...	2,931.9	361,400	2,972.8	395,700	2,711.9	378,200

<sup>1</sup> Estimated.

<sup>2</sup> Not available.

Note: Quantities are in live-weight equivalents. With the exception of Japan, values are based on prices paid at the first sale of fish as landed by the fishermen; value data for Japanese fishery products are based on weighted annual average prices obtained at main fish markets.

Source: Food and Agriculture Organization, Yearbook of Fishery Statistics, 1963, vol. 16.

meal and frozen shrimp. Imports were valued at \$59.4 million in 1963.

Private enterprise and ownership prevail throughout the Japanese fisheries. The Government, however, contributes considerable financial support in the form of credits and operating loans to fishermen and processors, and also exercises complex controls over the industry. The number of vessels permitted to fish, even in distant high-seas areas, is controlled by elaborate licensing systems. Exports are marketed under Government control, and rigid quality standards are maintained so as to further Japan's long-term policy of expanding exports and to prevent opposition abroad to unrealistically large influxes of Japanese fishery products.

## AREAS OF OPERATIONS

The waters surrounding Japan are extraordinarily productive, although the Continental Shelf is narrow except off the northern and southern coasts (fig. 1). Oceanic currents are a key factor in this productivity and account in part for the diversity and abundance of the fish fauna in the waters off Japan. The Kuroshio (Black Current) originates in the Tropics, and its water masses move northeastward along the Pacific coast of Japan to meet sub-arctic waters carried southward by the Oyashio (a plankton-rich, cold current). Where these water masses meet, a zone of convergence exists and is rich in food organisms. The zone of mixing between cold and warm waters fluctuates seasonally, being about lat. 35° N.

during the winter and shifting northward to about lat. 40° N. during the summer. A similar zone exists off Japan's west coast at the latitude of northern Honshu. A branch of the Kuroshio--the Tsushima Current--enters the Sea of Japan and converges with the cold Liman Current flowing southward along the Asiatic mainland.

Large numbers of cold- and warm-water species move about in close association with the constantly shifting currents. This is especially true of pelagic species, which are most abundant at certain seasons of the year in the zone of mixing between cold and warm waters. Bottomfishes are more abundant where the Asiatic Continental Shelf is broad. Mollusks (including squid and octopus), crustaceans, sea urchins, sea cucumbers, and seaweed (fig. 2) abound in almost all surrounding waters.

Japanese operations on distant overseas grounds are generally concerned with species of high unit value. The Bering Sea and the Sea of Okhotsk are fished for king crab and bottomfishes; the North Pacific for salmon; the central and eastern Pacific, the Indian Ocean, and the tropical Atlantic for tunas; and the West African coast, the southwestern Pacific (off New Zealand and Australia), and the northwestern Atlantic (off Canada and the United States) for bottomfishes. Distant operations are by no means confined to these areas. Government-owned vessels and vessels of large companies are constantly searching, as they have in the past, for new grounds. Once a fishing ground has proven to be productive, large-scale commercial operations follow.

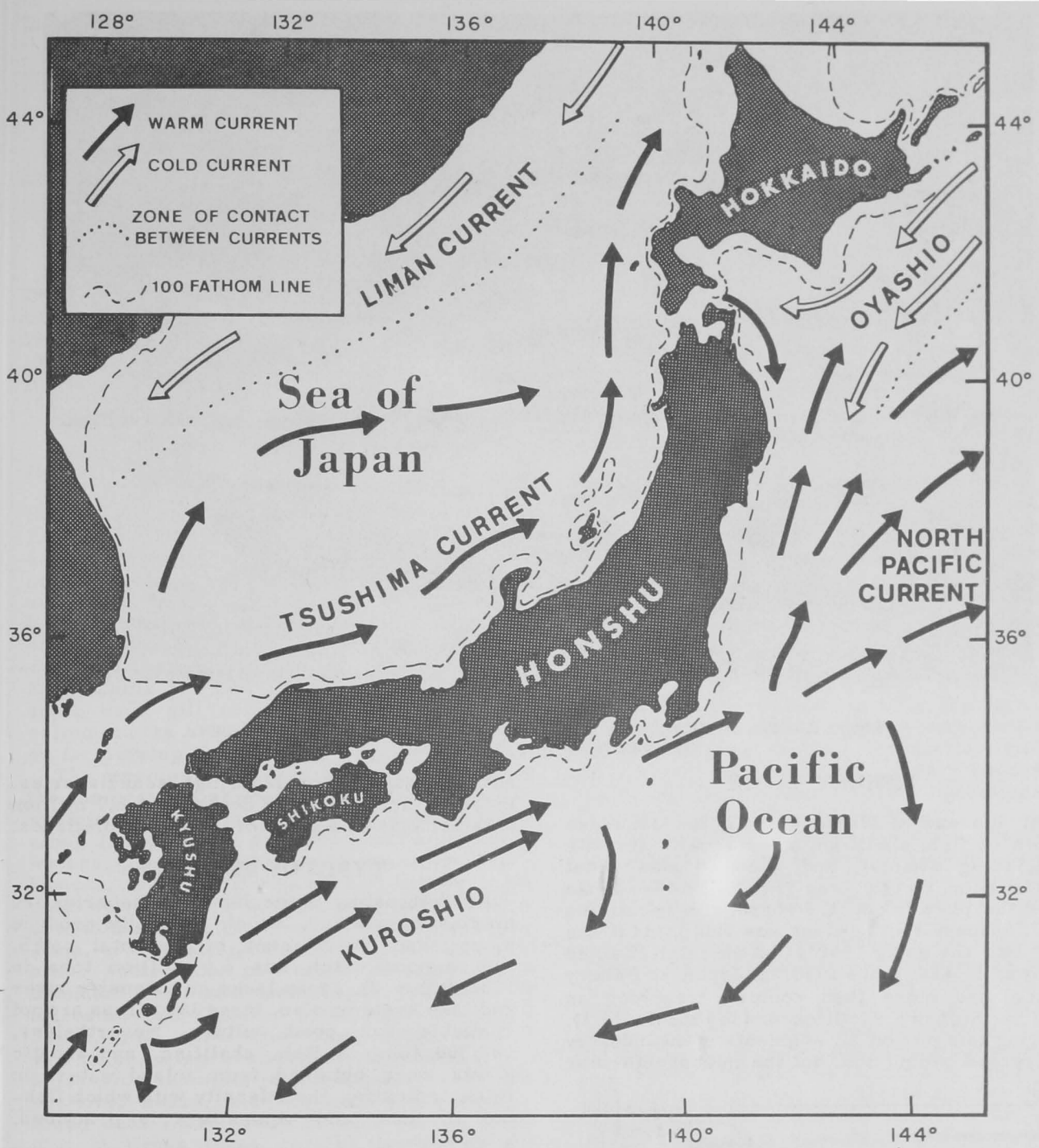


Figure 1.--Schematic representation of surface currents off Japan during summer months.



Figure 2.--Women divers ready to gather tengusa seaweed, the source of agar. Shizuoka Prefecture, Japan, 1947.

### FISHERY CATCH

At the end of World War II, the Japanese catch of fish, shellfish, other aquatic animals (excluding whales), and seaweed was about 1.8 million metric tons (fig. 3), or less than half the prewar catch. Progress in rebuilding the Japanese fishing fleet was rapid, but it was not until the early 1950's that the catch attained prewar levels. Since 1950, the Japanese fishery catch has more than doubled, reaching an alltime high of 6.9 million tons in 1962 (table 1). During this period all segments of the industry increased production, but the most spectacular

advance was in the pelagic high-seas fisheries. In 1963 the total catch declined to 6.7 million tons because of a smaller take of bottomfishes.

### TYPES OF FISHERIES

Predominating in the Japanese fisheries are marine operations, which generally produce more than 98 percent of the total catch. The marine catch was 6.6 million tons in 1963 (table 2). Japan lacks an extensive river and lake system; also, large land areas are not available for pond culture. Nevertheless, 107,000 tons of fish, shellfish, and aquatic plants were obtained from inland waters in 1963, indicating the intensity with which fishing is done and aquaculture is practiced.

### Marine Fisheries

For statistical and operational purposes, Japan's marine fisheries are divided into three major categories--domestic fisheries, pelagic fisheries on the high seas, and aquiculture in shallow seas.

Domestic fisheries.--In 1963, the catch in the domestic fisheries was 5.5 million tons (table 3), or 84 percent of the total marine catch. Included in the domestic fisheries are operations conducted from shore or from small and large fishing craft based in Japan. The domestic fishing grounds are mainly

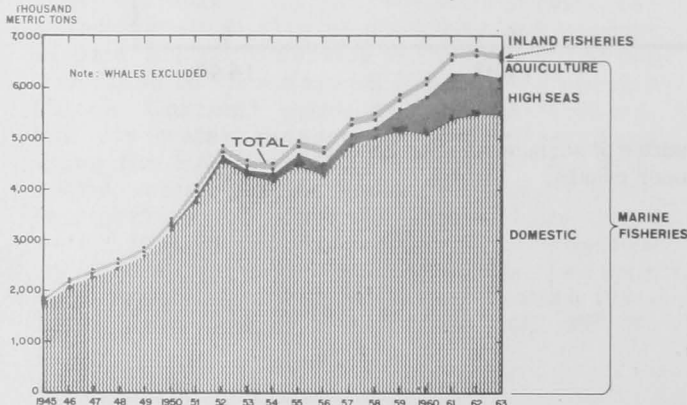


Figure 3.--Japanese fishery catch, by type of fisheries, 1945-63.



Table 2.--Japanese catch of fish, shellfish, and other aquatic products, by type of fisheries, 1950, 1955, and 1960-63

Year	Marine fisheries				Inland fisheries			Grand total
	Domestic	Pelagic high seas	Aquiculture	Total	Natural waters	Aquiculture	Total	
	<u>Thousand metric tons</u>	<u>Thousand metric tons</u>	<u>Thousand metric tons</u>	<u>Thousand metric tons</u>	<u>Thousand metric tons</u>	<u>Thousand metric tons</u>	<u>Thousand metric tons</u>	<u>Thousand metric tons</u>
1950.....	3,251	6	48	3,305	63	5	68	3,373
1955.....	4,475	185	154	4,814	82	11	93	4,907
1960.....	5,142	677	284	6,103	74	15	89	6,192
1961.....	5,403	887	322	6,612	81	18	99	6,711
1962.....	5,585	814	362	6,761	84	20	104	6,865
1963.....	5,511	689	391	6,591	84	23	107	6,698

Source: Japanese Ministry of Agriculture and Forestry, Annual Report of Catch Statistics on Fishery and Aquiculture, 1963.

the coastal and offshore waters around the Japanese islands. No definite outer limit exists, however, and some domestic vessels may fish in areas where pelagic high-seas vessels fish. For example, domestic vessels fish for tunas as far distant as the central and southern Pacific and the Indian Ocean; trawlers work on the Asiatic Continental Shelf in the East China Sea and the Sea of Okhotsk; and some drift gill netters from Hokkaido take salmon in the area of the North Pacific worked by factoryship fleets.

The species caught in largest amounts in the domestic fisheries are pelagic surface-swimming schooling types that migrate close along Japan's coast or through nearby offshore waters. Off eastern Hokkaido and northeastern Honshu, pelagic catches consist mainly of the cold-water saury, salmon, and squid; herring are taken along the west coast of Hokkaido. Tuna, mackerel, jack mackerel, anchovy, and other subtropical or temperate species are abundant off southern Japan. Where the Kuroshio and Oyashio meet off east-central Japan, both cold- and warm-water species are taken. Fish available in enormous quantities--for example, jack mackerel, mackerel, anchovy, saury, and skipjack--are generally found near shore where small craft can operate; at times these species move offshore where larger vessels are needed.

Bottomfishes are plentiful on the Continental Shelf around Japan but mainly off the northern and southern coasts. Alaska pollock, cod, Atka mackerel (a greenling), and rockfish predominate off Hokkaido. Croakers, sea breams, and a large number of miscellaneous species are taken from the East China Sea and the Yellow Sea.

Pelagic high-seas fisheries.--Included in this category are large-scale distant operations, not only for pelagic species but for bot-

tomfishes and crustaceans. Before World War II, the Japanese trawled in overseas areas and also pioneered and developed the use of floating factoryships for taking and processing salmon and crab. The largest prewar production from these high-seas activities was obtained in 1938 when about 65,000 tons were caught. After the war, operations were not resumed until 1950 and then only on a small scale. With the signing of the peace treaty in 1952, the high-seas fisheries expanded to reach a peak production of 887,000 tons in 1961. Production declined to 689,000 tons in 1963, mainly because of curtailed factoryship trawling operations for bottomfishes in the Bering Sea.

The pelagic high-seas fisheries consist of (1) operations in the Sea of Okhotsk and the Bering Sea for bottomfishes, using factoryships and catcher boats (trawlers mainly, but including gill netters, longliners, and Danish seiners); (2) trawler operations by single vessels (some based at overseas ports) in the Bering Sea, the South China Sea, the Northwest Atlantic, and in waters off western Africa, New Zealand, and northwestern Australia; (3) factoryship operations for salmon in the North Pacific; (4) factoryship operations for crabs in the Sea of Okhotsk and the Bering Sea (fig. 4); (5) worldwide tuna longline operations by single vessels based at overseas ports or by factoryship fleets operating in the Pacific, Indian, and Atlantic Oceans; and (6) pearling in the Arafura Sea.

Overseas fishery agreements for basing Japanese fishing vessels abroad have been negotiated by large companies as a means of reducing operating costs. The agreements have been negotiated for (1) supply, transshipment, and sales bases; (2) joint fishing and processing companies with capital furnished by Japanese and local people; (3) contract or concession fishing to supply fishery products to a local government or company;

Table 3.--Japanese marine catch, by principal species or groups, 1963

Species or group	Domestic fisheries	Pelagic high-seas fisheries	Total
<b>FISH</b>	<u>Metric tons</u>	<u>Metric tons</u>	<u>Metric tons</u>
Tunas and allied species.....	476,199	138,054	614,253
Alaska pollock and cod.....	480,333	132,693	613,026
Jacks, scads, and allied species.....	503,858	6,163	510,021
Herring and allied species.....	438,671	31,624	470,295
Mackerels.....	464,886	242	465,128
Saury.....	384,548	--	384,548
Flatfishes.....	134,967	97,702	232,669
Atka mackerel.....	150,393	--	150,393
Salmon.....	102,327	46,269	148,596
Croakers.....	103,050	249	103,299
Spearfishes (swordfish, marlins, and sailfish)..	63,974	18,331	82,305
Sharks.....	59,784	3,893	63,677
Rockfishes.....	23,451	39,408	62,859
Other.....	659,350	87,992	747,342
<b>Total fish.....</b>	<b>4,045,791</b>	<b>602,620</b>	<b>4,648,411</b>
<b>OTHER MARINE ANIMALS</b>			
Clams.....	203,465	--	203,465
Shrimp.....	54,212	32,379	86,591
King crab.....	6,377	25,176	31,553
Squid, cuttlefish, and octopus.....	703,718	27,313	731,031
Other.....	216,711	1,850	218,561
<b>Total other marine animals.....</b>	<b>1,184,483</b>	<b>86,718</b>	<b>1,271,201</b>
<b>SEAWEED</b>			
Tangle.....	151,820	--	151,820
Other.....	129,819	--	129,819
<b>Total seaweed.....</b>	<b>280,639</b>	<b>--</b>	<b>280,639</b>
<b>Grand total.....</b>	<b>5,510,913</b>	<b>689,338</b>	<b>6,200,251</b>

Note: Production from aquiculture in shallow seas was 391,000 metric tons (which included 240,100 tons of oysters and 144,500 tons of seaweed), bringing the total catch in the marine fisheries to 6,591,000 metric tons (see table 2).

Source: Japanese Ministry of Agriculture and Forestry, Annual Report of Catch Statistics on Fishery and Aquiculture, 1963.

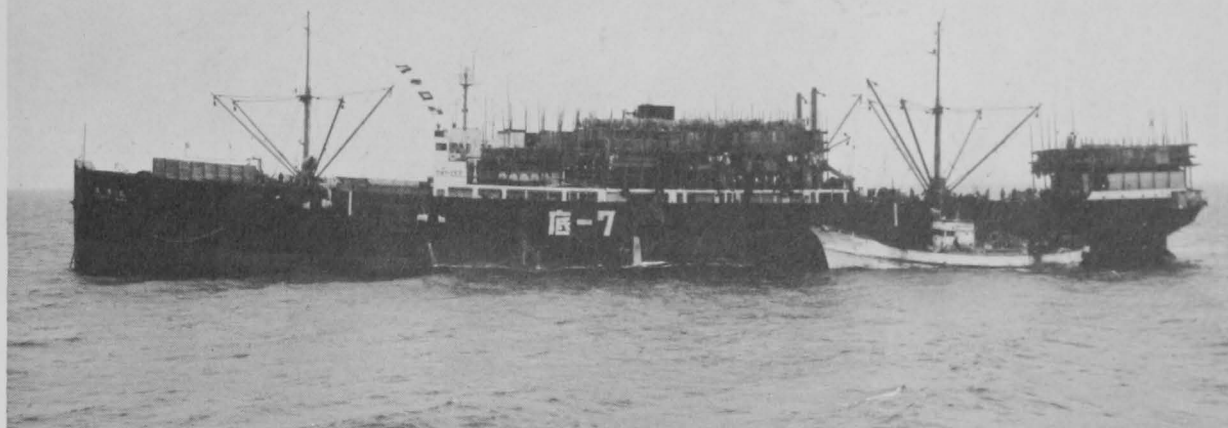


Figure 4.--Japanese crab factoryship operating in the Bering Sea. Racks for drying tangle nets are seen midship and on the stern, 1963.

and (4) technical assistance requested by a foreign government or company. Overseas agreements increased from 31 in 1956 to 78 in 1962. Trawling and tuna longlining are the principal types of fishing stipulated in the agreements. Data are not available on the catches made by the joint companies.

Aquiculture in shallow seas.--Artificial cultivation in marine waters has a long history in Japan and is practiced widely in bays, coves, lagoons, and brackish-water lakes. The most successful efforts have been in the cultivation of oysters and edible seaweed (laver), although small amounts of fish, shrimp, spiny lobster, and blue crab have been raised from larval or juvenile stages. Production from aquiculture has been increasing steadily and is now almost four times that of the best prewar year. In 1963, about 391,000 tons were obtained--the main output being oysters (240,100 tons, shell weight) and laver (144,500 tons, wet weight).

#### Inland Fisheries

Fishing in natural waters and cultivation in artificial ponds have been contributing to a steadily increasing inland catch (table 2). In 1963, production reached a peak of 107,000 tons--84,000 tons from natural waters and 23,000 tons from aquiculture. The principal fresh-water species are carp, smelt, minnows, eel, sweet smelt (a relative of the trouts, known as ayu), clams, and aquatic plants. The sweet smelt is considered a table delicacy, and the quantity caught is second only to that of carp. Carp, rainbow trout, and sweet smelt

are the main species cultivated. Generally, eggs and fry are raised in small ponds and then transferred to large rearing ponds for growth to market size. Young eel and mullet are caught in rivers and estuaries and placed in ponds, where they are fed until ready for market.

### IMPORTANT MARINE SPECIES

#### Tunas and Allied Species

In terms of value, the tunas were the leading group of fishes taken by Japanese fishermen in 1963. The peak year of production was 1962, when 641,200 tons, valued at \$71,405,000, were caught. In 1963, production dropped to 614,253 tons, but the value of \$75,465,000 was higher; about 70 percent of this catch was taken in the domestic fisheries and the remainder in the pelagic high-seas fisheries. The 1963 tuna catch, by species, is shown in table 4.

The bulk of the Japanese tuna catch comes from coastal and nearby offshore waters. Since 1950, however, the trend has been toward building large vessels that can circle the globe. Tuna close to the Japanese islands are caught mainly with pole and line (fig. 5), but a variety of other gear are used, for example, fixed nets, longlines, and purse seines and other surrounding nets. In distant high-seas operations, longlines are used solely. Most tuna species are in great demand domestically. They also enter the export trade in large volume; this is especially true of those catches made in the high-seas fisheries.

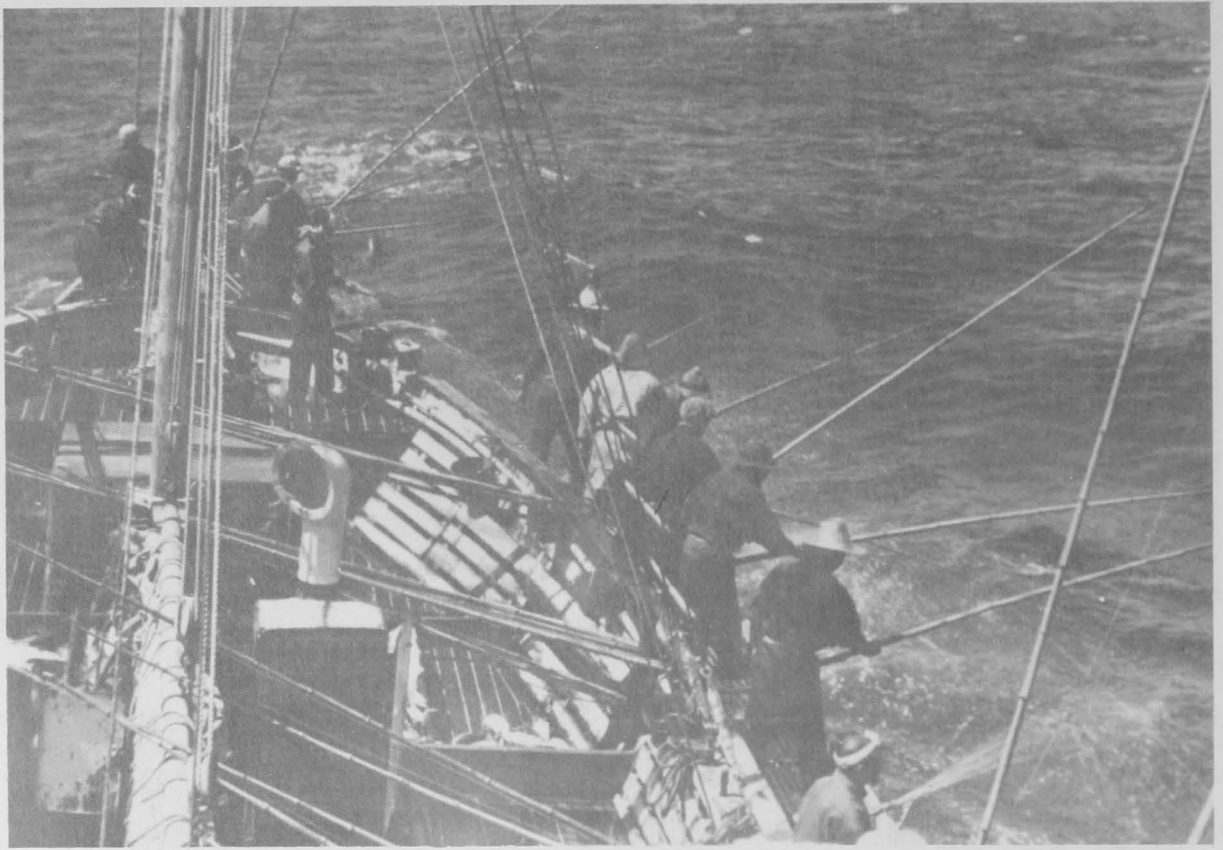


Figure 5.--Skipjack pole-and-line fishing with live bait off the coast of Honshu, Japan.

Table 4.--Japanese tuna catch, by species, 1963

Species	Domestic fisheries	Pelagic high-seas fisheries	Total
	Metric tons	Metric tons	Metric tons
Yellowfin tuna	78,453	52,421	130,874
Bigeye tuna...	107,181	22,509	129,690
Albacore.....	64,812	50,710	115,522
Skipjack.....	108,265	4,622	112,887
Bluefin tuna..	55,213	7,792	63,005
Frigate mackerels....	48,339	--	48,339
Young tuna....	13,936	--	13,936
Total.....	476,199	138,054	614,253

Source: Japanese Ministry of Agriculture and Forestry, Annual Report of Catch Statistics on Fishery and Aquiculture, 1963.

In 1963 the high-seas tuna operation consisted of:

1. Factoryships with catcher boats--Nearly 10,200 tons of tunas were taken in the Pacific Ocean by 2 factoryships (totaling 13,858 gross tons) accompanied by 112 catcher boats (totaling 12,488 gross tons). Also taken were 2,200

tons of spearfishes, 1,210 tons of sharks, and 370 tons of other fish.

2. Factoryships that carried small catcher boats on board--This type of operation (fig. 6), carried on mainly in the Indian and Atlantic Oceans, has been expanding rapidly. In 1961 longliners associated with four factoryships caught 4,675 tons of fish. By 1963 the fleet had been enlarged to 38 factoryships (totaling 39,293 gross tons), and the catch was 50,437 tons of tunas, 8,275 tons of spearfishes, 1,986 tons of sharks, and 852 tons of other species.

3. Tuna longliners based at foreign ports--The Japanese have been steadily increasing longline operations based at overseas ports in the Pacific, Indian, and Atlantic Oceans. In 1963 the take of the 299 overseas-based tuna craft was 87,424 tons, consisting of 77,432 tons of tunas, 7,856 tons of spearfishes, 696 tons of sharks, and 1,440 tons of other species. In the Pacific, most of the catch (15,716 tons out of a total of 28,017 tons) was landed at American Samoa. Other bases were Espiritu Santo, in the New Hebrides Islands, and Noumea, in New Caledonia. In the Atlantic, most of the catch (43,355 tons out of a total of 59,407 tons) was landed at African ports for transshipment to Europe (mainly Italy) and the United States (mainly Puerto Rico). Most of the spearfishes and sharks were presumably shipped to Japan, where they are in great demand.



Figure 6.--A 30-foot Japanese longliner bringing its morning catch to the tuna factoryship. This longliner can be carried on board the factoryship.

### Bottomfishes

The principal species or groups taken at or near the sea bottom are the Alaska pollock, cod, Atka mackerel, flatfishes, croakers, rockfishes, sharks, and sea breams. In 1963 these and other bottomfishes accounted for an estimated 1.6 million tons, or almost 25 percent of the total marine catch. The domestic catch of bottomfishes was about 1.2 million tons;

the pelagic high-seas catch, about 362,000 tons (table 5).

About two-thirds of the domestic bottomfish catch is taken with trawls (fig. 7). Other gear used are mainly lift nets, gill nets, lines, and beach and boat seines. In the pelagic high-seas fisheries, trawls are the principal gear, but Danish seines, drift nets, and longlines are also used.



Figure 7.--Medium two-boat trawlers used for fishing in the East China Sea. An icemaking plant is in the background, Kyushu, Japan, 1948.

Table 5.--Japanese catch of bottomfishes in the pelagic high-seas fisheries, 1963

Type of operation and area	Quantity
	<u>Metric tons</u>
Factoryships fleets:	
Bering Sea.....	250,714
Okhotsk Sea.....	24,240
Otter trawlers:	
Bering Sea.....	17,118
Off New Zealand.....	2,813
African coast.....	64,788
Northwest Atlantic.....	1,546
Other.....	379
Large trawlers:	
South China Sea.....	150
Total.....	361,748

Source: Japanese Ministry of Agriculture and Forestry, Annual Report of Catch Statistics on Fishery and Aquiculture, 1963.

The 1963 high-seas catch of bottomfishes was about 190,000 tons less than the 1962 catch of nearly 550,000 tons. Operations in the Bering Sea have been curtailed since 1961

when 33 factoryships and 380 trawlers were licensed. In 1964 the Japanese Government authorized operations of only 14 factoryships and 228 catcher boats in the Bering Sea. Increased catches of bottomfishes have been made in the Atlantic Ocean, especially off Africa, where further expansion is planned.

#### Herring, Sardines, and Allied Species

Before World War II the group known collectively as *iwashi*, led in quantity of catch in the Japanese fisheries, accounting for about 1.3 million tons during peak years of production. *Iwashi* consist of four species--herring, sardine, round herring (a close relative of the sardine), and anchovy. Sardine landings have gone down sharply, but the group continues to be important. The principal *iwashi* is now the anchovy (320,600 tons caught in 1963), followed by the sardine (55,900 tons), herring (46,200 tons), and round herring (28,900 tons). With the exception of herring, these landings come from Japanese coastal and other nearby waters. In 1963, two-thirds of the herring catch (31,624 tons) was taken by vessels working with factoryship trawler fleets in the Bering Sea. Purse seines (fig. 8) take about 50 percent of the *iwashi* catch; other gear include drift gill nets, lift nets, trap nets, and beach seines.



Figure 8.--Small purse seiners surround a school of sardines at the mouth of Tokyo Bay, Japan, 1948.

### Salmon

In 1963 the Japanese catch of red, silver, chum, king, pink, and cherry (masu) salmon increased to 148,596 tons--102,327 tons from the domestic fisheries and 46,269 tons from the high-seas fisheries (table 3). The 1963 catch was nearly 30 percent more than the 1962 catch of about 116,000 tons. Almost entirely responsible for this increase were larger catches of pink salmon made in Japanese coastal waters by domestic fishermen. The cherry salmon is an Asiatic species. The other five salmon inhabit both sides of the North Pacific; the Asiatic and North American races of each species are distinct, although they intermingle in the central North Pacific.

Since 1953 the Japanese have not fished for salmon east of long. 175° W. (fig. 9), in accordance with the terms of the International Convention for the High Sea Fisheries of the North Pacific Ocean. This longitude was provisionally selected in an attempt to divide Asian and North American salmon stocks. Research has shown that this meridian bisects a large area of intermingling. In the area west of long. 175° W., annual quotas for Japanese salmon catches have been in effect since 1957 under a Japanese-Soviet fishery treaty (table 6). Until 1962 quotas were established only for waters principally north of lat. 45° N. (Area A). In 1962 the waters south of lat. 45° N. (Area B) were brought under regulation.

Japanese factoryship gill net operations are restricted to Area A. These are known as the pelagic high-seas operations. Within Area A, however, land-based gill netters from the domestic fisheries are licensed to fish in a corridor between lat. 45° N. and lat. 48° N.

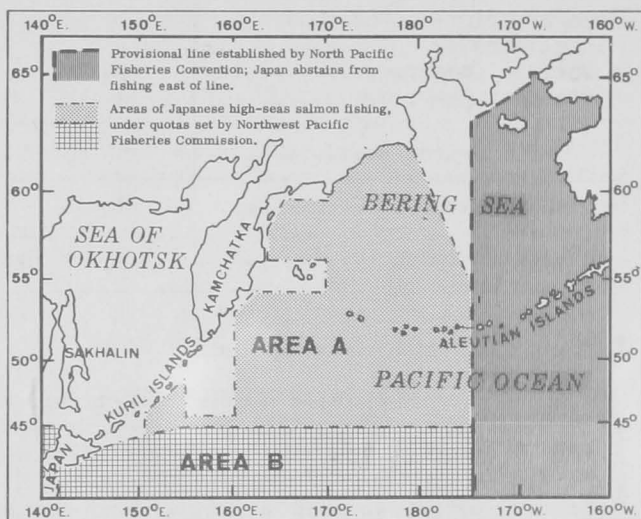


Figure 9.--Japanese high-seas salmon fishing areas in the North Pacific Ocean, 1963.

Table 6.--Japanese-Soviet treaty quotas for salmon, 1957-65

Year	Area A	Area B
	Metric tons	Metric tons
1957.....	120,000	No quota
1958.....	110,000	No quota
1959.....	85,500	No quota
1960.....	67,500	No quota
1961.....	65,000	No quota
1962.....	55,000	60,000
1963.....	57,000	63,000
1964.....	55,000	55,000
1965.....	56,000	59,000

The Japanese Fisheries Agency breaks down the treaty quota for Area A into quotas for factoryships and for gill netters. Only land-based gill netters and longliners can fish in Area B. Japanese coastal waters are not under treaty regulation. Small drift netters and longliners take most of the coastal salmon catch; a part of the catch is taken in fixed nets set near shore. Table 7 presents the catch of salmon in 1963 by areas and type of vessel.

Table 7.--Japanese salmon catches, by area and type of vessel, 1963

Type of operation	Quantity
Area A:	<u>Metric tons</u>
Pelagic high seas (11 factoryships and 369 drift netters).....	46,269
Land-based drift netters.....	10,347
Total Area A.....	56,616
Area B (drift netters and longliners):	
Pacific Ocean.....	38,864
Sea of Japan.....	4,708
Total Area B.....	43,572
Coastal waters.....	48,408
Grand total.....	148,596

### Jacks, Scads, and Allied Species

The jack mackerels (mainly *Trachurus japonicus*) are the principal species in this group, accounting for over 80 percent of the group catch of 510,021 tons in 1963 (table 3). Other important species are mackerel scads and the yellowtail (or amberjack). All are warm-water or temperate species taken along the Pacific and Sea of Japan coasts and in the East China Sea. One- and two-boat purse seines take most of the catch of jack mackerels and mackerel scads. Fixed (or set) nets take most of the yellowtail.

### Mackerels

In 1963 the mackerel catch was 465,128 tons (table 3), representing a steady increase over the catches of recent years. Mainly inhabiting warm currents, the Japanese mackerel and the southern (or spotted) mackerel are found along both coasts of Japan as far north as the zone of convergence between warm and cold currents. In the summer, large quantities are taken off southeastern Hokkaido. The

mackerel fishery is especially important in the waters between South Korea and southern Japan. Most mackerels are caught by one- and two-boat purse seines; other gear used are pole and line, fixed nets, and lift nets.

### Saury

Before World War II, the saury was considered by most Japanese to be an inferior fish eaten only by the poorer people. When food shortages were prevalent immediately after the war, the fish became widely acceptable, and landings increased rapidly. Recent annual catches have fluctuated sharply, being as high as 575,100 tons in 1958 and as low as 287,100 tons in 1960. The catch in 1963 was 384,548 tons (table 3). The saury, a cold-water species, migrates southward along the Kuril Islands to the east coasts of Hokkaido and north-central Honshu. Almost the entire catch is taken in September, October, and November with stick-held lift nets.

### Spearfishes

Included in this group--containing some of the largest fishes caught by Japanese fishermen--are the swordfish (1963 landings about 19,300 tons), the striped marlin (20,000 tons), the black and white marlins (37,200 tons), and the sailfish (5,800 tons). More than 75 percent of the total catch of about 82,300 tons was taken in the domestic fisheries (table 3), mainly with longlines; small amounts were taken in fixed nets and with harpoons (fig. 10). The high-seas catch of spearfishes was taken by the tuna longline fleet (see Tunas and Allied Species, above).

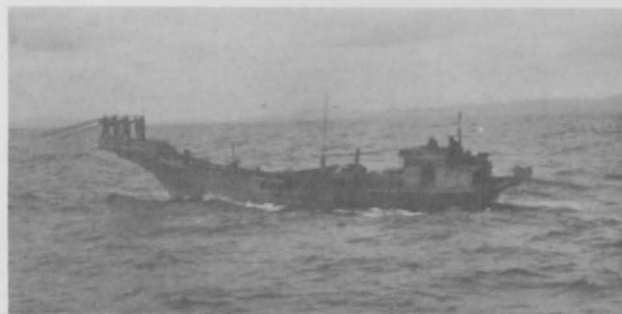


Figure 10.--Harpooning swordfish along the northeastern coast of Honshu, Japan, 1948.

### Squid, cuttlefish, and octopus

In recent years, the cephalopods have been the leading group in quantity caught by the Japanese fishermen. From a little over 100,000 tons in 1945, the annual catch has risen almost continuously to reach 731,031 tons in 1963--703,718 tons in the domestic fisheries and



27,313 tons in the high-seas fisheries (table 3). Over 80 percent of this catch is one species, the common squid, a cold-water form taken principally off eastern Hokkaido and north-eastern Honshu. The largest landings are made in late summer and fall by angling with jigs at night and using a light to attract the squid. The octopus is taken with longlines or in earthenware jugs set out on sandy bottom; when resting, the octopus seeks a dark hiding place and creeps into the jugs.

### Shrimp

Until 1961, shrimp were only caught by domestic fishermen from Japanese inshore and coastal waters and from the East China and Yellow Seas. Since then, high-seas trawlers, especially those associated with factoryship fleets in the Bering Sea, have been taking large quantities of shrimp--32,379 tons in 1963 (table 3). In this same year, the domestic fisheries took 54,212 tons, to make a total Japanese shrimp catch of 86,591 tons.

### King Crab

Although the amount taken is small in comparison with the take of other crustaceans, the king crab is of high unit value, and most of the catch is canned for export. In 1963, the domestic catch of king crab from deep waters off the northern coast of Hokkaido was 6,377 tons (table 3). In the pelagic high-seas fisheries, the catch was 25,176 tons, taken by 7 factoryships accompanied by 67 small and 30 large catcher boats. Two of the factoryship fleets worked in Bristol Bay in the eastern Bering Sea; four in the Sea of Okhotsk, off the west coast of Kamchatka; and one in the western Bering Sea, off the east coast of Kamchatka. Tangle nets set on the ocean bottom are mainly used to catch king crabs.

King crab fishing in the Sea of Okhotsk is regulated by the Japanese-Soviet fishery treaty.

In 1963 and 1964 the quota for each year was 252,000 cases (48 half-pound cans per case) for Japan and 378,000 cases for the U.S.S.R. In 1965 Japan's quota was reduced to 240,000 cases and the U.S.S.R.'s raised to 420,000 cases. Until 1965 the Japanese Fisheries Agency set a limit on the take of king crab from Bristol Bay. In 1963 and 1964 the limit authorized for each year was 235,000 cases. Under a United States-Japanese agreement on king crab fishing in the eastern Bering Sea, negotiated in 1964, the limit was reduced to 185,000 cases for 1965.

## WHALING

Japan has the largest whale fishery in the world. In 1963 it took 22,370 whales, of which 14,142 were caught by intensive pelagic factoryship operations in the Antarctic. Pelagic factoryship operations in the North Pacific took 4,757 whales; land-based operations off the Japanese coast took 3,471 whales. From the whales caught, 366,940 tons of baleen oil, sperm oil, frozen or salted whale meat, and other products were obtained (table 8).

Japanese companies operated 7 whale factoryships and 79 catcher boats during the 1962/63 Antarctic whaling season. The factoryships ranged in size from 16,000 to 27,000 gross tons; the catcher boats averaged about 600 gross tons. Beginning with the 1962/63 season, an international quota system was adopted for Antarctic whaling. Japan received 41 percent of the baleen catch limit of 15,000 blue-whale units. Japanese factoryships produced their quota of 6,150 blue-whale units.

The total Antarctic baleen-oil quota for the 1963/64 season, also set by international agreement, was 10,000 blue-whale units; Japan's allotment was 4,600 units, or 46 percent of the total. Japan has been acquiring

Table 8.--Japanese output of whale products, 1963

Type of operation	Whale oil		Whale meat	Other products <sup>1</sup>	Total
	Baleen oil	Sperm oil			
	<u>Metric tons</u>	<u>Metric tons</u>	<u>Metric tons</u>	<u>Metric tons</u>	<u>Metric tons</u>
Antarctic pelagic whaling <sup>2</sup> ...	113,277	10,533	151,918	8,008	283,736
North Pacific pelagic whaling	11,994	20,715	24,271	264	57,244
Coastal whaling.....	2,267	6,502	10,312	6,879	25,960
Total.....	127,538	37,750	186,501	15,151	366,940

<sup>1</sup> Includes liver oil, edible blubber, bone meal, etc.

<sup>2</sup> December 1962 to April 1963.

Source: Japanese Ministry of Agriculture and Forestry, Annual Report of Catch Statistics on Fishery and Aquiculture, 1963.

## FISHING CRAFT

quotas from other countries. For example, in 1963 the last of United Kingdom's whale factoryships was sold to Japanese interests; Japan did not operate the factoryship but apportioned the newly acquired quota among seven Japanese factoryships. In 1964 a similar event occurred when the Japanese purchased the last of the factoryships operated by the Netherlands. Whale stocks in the Antarctic have been seriously depleted. For the 1964/65 season, the Antarctic quota informally adopted by the participating countries was reduced to 8,000 blue-whale units; Japan's share of this quota was 4,160 units. For the first time, Japan failed to meet its quota, producing 4,125 blue-whale units.

Japanese whaling in the North Pacific is conducted in much the same manner as is Antarctic whaling, but on a smaller scale. In 1963, 3 factoryships, averaging about 13,000 gross tons, and 21 catcher boats, averaging about 700 gross tons, took whales from the Bering Sea and the waters south of the Aleutian Islands. In contrast to Antarctic operations, where the take is principally baleen whales, North Pacific operations take mostly sperm whales.

Coastal whaling from land-based stations has a long tradition in Japan. In 1963 large whales were taken by 22 catcher boats operating from 15 land stations. The whales--blue, fin, hump-back, sei, and sperm--were similar to the species taken in the Antarctic and the North Pacific. Smaller species--minke, pilot, bird-beaked, and killer whales--were caught primarily by small craft (fig. 11) for their edible meat and blubber. In this small-boat coastal whaling, 19 craft were operated in 1963, the lowest number in many years.



Figure 11.--On board a small coastal whaler, Harpooner is getting set to shoot a whale. Off central Honshu, Japan, 1948.

Japan's fishing fleet is composed of a multitude of small wooden craft as well as of modern, steel fishing vessels and factoryships. In 1963 this fleet--the world's largest in number--consisted of 398,935 craft, totaling 2.1 million gross tons (table 9). More than half this fleet (202,820 craft) were nonpowered boats averaging less than 1 gross ton. Most of the powered craft were small; 171,278 were less than 5 gross tons, and only 24,837 were 5 tons or over.

The number of powered vessels over 5 gross tons has been declining, but their average and total gross tonnage has been increasing. Most of the increase since 1957 has been due to the building of about 300 new tuna vessels, including longliners of over 1,000 gross tons. Also, the fleet has many factory trawlers with stern ramps for bringing the net aboard and with equipment for freezing or processing fish; the exact number is not known, but in 1963 there were 105 otter trawlers (including stern trawlers) averaging over 800 gross tons, compared with 64 in 1962. Some of the new factory trawlers are 3,500 gross tons.

Factoryships also are increasing in number and size. In 1963 the Japanese operated 81 factoryships--11 for salmon, 7 for crabs, 23 for bottomfish, and 40 for tuna. Only 2 years previously (1961), 67 factoryships had been operated.

Despite their smaller number, vessels over 50 gross tons have accounted for more than half the gross tonnage in the Japanese fishing fleet. In 1963 these vessels--4,980 in number--were registered at 1.3 million gross tons. Not all were actual fishing vessels; many of the large vessels were support units, such as crab, salmon, tuna, bottomfish, and whale factoryships, refrigerated fish carriers, whale catchers, and Government survey ships. Actual fishing units over 50 gross tons, operating independently or as part of factoryship flotillas, numbered about 4,000 craft; they caught over 2 million tons of fish and shellfish. A large part of this catch was valuable tuna, shrimp, king crab, and bottomfishes.

Nonpowered craft (fig. 12), generally propelled by a two-piece sculling oar, are used principally for collecting seaweed and shellfish and for many types of inshore operations such as gill netting, beach seining, and simple pole and line fishing. Because many have been motorized recently, the number of nonpowered boats has been declining, whereas the number of powered boats under 5 gross tons has been increasing. Small nonpowered and powered craft are mostly operated by one or two men or a family group.

Table 9.--Number and gross tonnage of registered Japanese fishing craft, as of December 31, 1963

Type of craft	Nonpowered craft		Powered craft		Total		
	Number	Average tonnage	Number	Average tonnage	Number	Average tonnage	Total tonnage
INLAND							
Nontidal.....	17,624	0.5	3,600	1.3	21,224	0.6	13,661
Tidal.....	3,104	0.7	1,038	1.1	4,142	0.8	3,250
Total or average, inland....	20,728	0.5	4,638	1.3	25,366	0.7	16,911
MARINE							
Gill netters.....	9,936	1.0	17,850	5.6	27,786	4.0	109,825
Purse seiners.....	1,231	5.6	2,323	21.7	3,554	16.1	57,368
Fixed netters.....	8,289	3.0	4,746	3.4	13,035	3.2	41,283
Square netters <sup>1</sup> .....	1,511	1.6	3,799	6.3	5,310	4.9	26,233
Small trawlers.....	--	--	19,444	6.5	19,444	6.5	126,404
Medium trawlers (W. of 130° E.)	--	--	775	91.5	775	91.5	70,887
Otter trawlers.....	--	--	105	807.5	105	807.5	84,788
Drag netters.....	6,994	1.8	7,129	3.7	14,123	2.7	38,638
Skipjack pole-and-line and tuna longline craft <sup>2</sup> .....	--	--	2,321	141.2	2,321	141.2	327,729
Longliners (except tuna).....	3,461	0.8	17,350	5.7	20,811	4.9	101,850
Pole-and-line craft (except skipjack).....	28,609	0.7	55,374	2.5	83,983	1.9	156,959
Whale catchers.....	--	--	117	464.6	117	464.6	54,362
Government vessels.....	24	1.1	464	69.6	488	66.2	32,316
Fish carriers.....	688	1.3	3,507	29.3	4,195	24.7	103,452
Refrigerated carriers and factoryships.....	--	--	54	8,936.1	54	8,936.1	482,550
Miscellaneous, including shell- fish and seaweed craft.....	121,349	0.6	56,119	3.1	177,468	1.4	247,293
Total or average, marine....	182,092	0.8	191,477	10.0	373,569	5.2	2,061,937
Grand total or average.....	202,820	0.8	196,115	9.8	398,935	5.2	2,078,848

<sup>1</sup> Besides operating square nets, craft used lift nets and stick-held dip nets.

<sup>2</sup> Tuna factoryships are believed to be included under tuna longline craft.

Note: Craft registered in a fishery may operate in several fisheries, and sometimes a vessel may not operate in its registered fishery.

Source: Japanese Fisheries Agency, Statistic Tables of Fishing Vessels, General Report No. 16, as of the end of 1963.



Figure 12.--Typical nonpowered Japanese fishing craft in foreground, Chiba Prefecture, Japan, 1948.

## FISHERMEN

Full- and part-time fishermen and other workers in fisheries made up more than 2 percent of the total Japanese working force in 1962. The fishing population, however, has been declining steadily because fishermen, especially in the overcrowded coastal fisheries, have turned to other more remunerative occupations. Also, the number entering the industry has dropped. At one time fishermen numbered well over 1 million, but by 1962 the number had decreased to an estimated 870,000. The latter included about 670,000 full-time fishermen and about 200,000 part-time fishermen, who obtained less than half their income from fishing. Another 200,000 were engaged in processing and allied industries. A drop to 626,000 full-time fishermen was reported in 1963.

The fishing industry, which once could call on an abundance of cheap labor, is now faced with a shortage of workers. To cope with this situation, many companies are eliminating surplus crewmen, salaries have been increased, labor-saving devices have been introduced, and working conditions have been improved. Through these and other means, production per fisherman has increased, enabling the total Japanese fishery catch to remain at a high level.

## FISHING ORGANIZATIONS

### Management Units

In the Japanese fishing industry, management units are classified into three groups: (1) large fishing companies; (2) enterprises of

six or more people, designated as small or medium companies; and (3) fishing households.

Large companies engage in coastal and offshore fishing and also operate the fishing vessels and factoryship fleets that work in the distant high-seas fisheries. Considerable capital investment is required as well as extensive experience in the operation of integrated factoryship fleets. The large companies also have land-based facilities, such as freezing, cold-storage, and processing plants. Three of the largest fishing companies are among the leading 200 Japanese companies engaged in manufacturing, mining, and fisheries. A large part of the output of the large fishing companies, especially that from their high-seas and overseas-based operations, is exported.

Small- and medium-sized fishing enterprises use powered vessels, often of large size. This group provides the bulk of the catch taken in the domestic fisheries.

Fishing households are numerous--417,600 were reported in a 1962 census--but they operate in crowded coastal waters without boats or with small boats, many of which are not powered with engines. The average daily catch of the fishermen in this group is less than 5 kg. (about 11 lbs.), compared with over 100 kg. (200 lbs.) per day on large mechanized vessels.

### Fishery Cooperatives

The Fisheries Cooperative Association Law of 1948 led to the formation of many cooperatives. Almost all Japanese fishermen or shore workers not associated with large companies

are members of three types of cooperatives. Fishermen's cooperatives provide purchasing, marketing, and other services to fishermen. A second type, production cooperatives, conducts group fishing operations. The third type, processing cooperatives, provides services to processors of marine products. In 1959 there were 5,481 registered fishery cooperatives with a membership of over a million people. Besides services, cooperatives may extend credit to members and may engage in other activities connected with their principal business. For example, registered production cooperatives may also process fish.

Supervision of fishery cooperatives is highly centralized. Local cooperatives are organized into prefectural (state) and national federations. In 1959 there were 218 federations whose activities were similar to those of the local cooperatives, except that they could not provide credit services. The federations have great political and economic influence. For example, in 1964 the Japan National Federation of Fishermen's Cooperative Associations (Zengyoren) signed a 3-year agreement with the Soviet Union to buy 356 million gallons of fuel oil.

Credit federations, subsidized by the Government's Central Cooperative Bank for Agriculture and Forestry, provide financial assistance to about half the fishery cooperatives.

### Fishing Unions

Labor organizations play a small role in the Japanese fisheries, but their influence can be expected to grow. Unions now exist among fishermen working for the large companies. Most of these fishermen are members of the All-Japan Seamen's Union (Kaiin Kumai). In the coastal fisheries, where most of the boats are privately owned or are operated by relatives, unionization has made no progress.

## DISTRIBUTION AND MARKETING

### Landing Facilities

Practically every coastal city, town, or cove in Japan is a fishing port. More than 2,700 such ports are in use. Many are natural harbors, but the Japanese Government, under authorization of the Fishing Port Law of 1950, has been able to improve them by adding jetties, piers, and breakwaters. The 20 principal fishing ports are shown in figure 13. About 1.8 million tons of fishery products were landed at these ports in 1963 by domestic fishermen.

Wakkanai (in northern Hokkaido) and Nagasaki (in western Kyushu) are the leading ports in quantity of fish landed. Bottomfishes

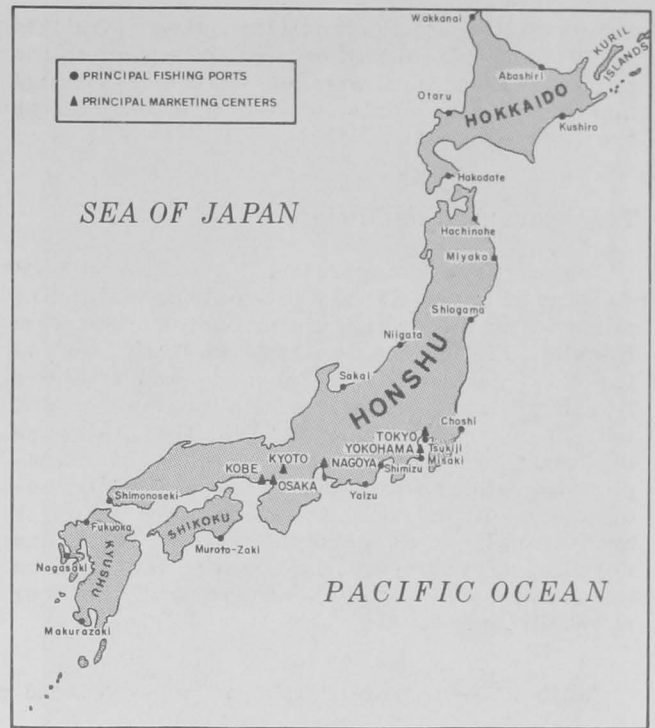


Figure 13.--Principal Japanese fishing ports and marketing centers, 1963.

predominate in landings at Wakkanai. Pelagic species, such as jack mackerels and anchovy, are landed at Nagasaki, as well as bottomfishes caught in the East China and Yellow Seas.

Hakodate, Kushiro, Abashiri, and Otaru (all in Hokkaido) are the major bases for factory-ship operations in the North Pacific, including the Sea of Okhotsk and the Bering Sea. The principal tuna ports are Misaki, Yaizu, Shioyama (on Honshu), and Makurazaki (in southern Kyushu). Shimonoseki (on the southwest tip of Honshu) and Fukuoka (in Kyushu) are leading home ports for trawlers working south of Japan.

### Wholesale Markets

Most fishery products channel directly from fishermen to central wholesale markets in consuming areas. Fishery products may also be distributed to central wholesale markets by cooperatives and shipping associations. Some fishermen consign their catches directly to wholesalers at fishing ports, who in turn may distribute the fish to the central wholesale markets or sell to retailers or processors.

Central wholesale markets have been established under the Central Wholesale Market Law. The law authorizes the establishment of 41 central wholesale markets by public bodies or corporations in cities with populations of over 150,000. By 1960 markets had been established in 16 cities. The six largest (fig. 13)--Tokyo, Yokohama, Nagoya, Kyoto, Osaka, and

Kobe--distribute about half the fishery products in Japan. Competitive auctions determine prices. The central markets have cold-storage and icemaking plants for handling and storing fresh or processed fish.

### Icemaking, Refrigeration, and Freezing Facilities

### Transportation Facilities

Japan has a complex rail, truck, and boat system to carry fishery products from landing ports to the major consuming centers in central Honshu. Fish come to these centers from as far away as northern Hokkaido and southern Kyushu. Boats, known as fish carriers, and rail cars, operated by the National Railways of Japan, are the principal means of transportation over long distances. About three-quarters of the rail shipments are made in mechanically refrigerated freight cars, the rest in freight cars using crushed ice. Trucks are used mainly to haul fishery products over short distances.

The Japanese have made great strides in the handling of fresh, frozen, or cured fishery products. Icemaking, refrigeration, and freezing facilities have been expanding to keep pace with (1) increasing domestic consumption of fresh and frozen fishery products and (2) expansion in shipments abroad of frozen products.

About 15 percent of the Japanese fishery catch is now frozen for domestic and foreign markets. Nearly 50 percent of this amount is frozen on board fishing vessels. The Japanese people are not partial to frozen fish, but the amounts used have been increasing. In 1963 the production of frozen fish and shellfish was 1,124,100 tons (net product weight), compared with 434,700 tons in 1957 (table 10). Distribution

Table 10.--Japanese output of preserved and processed fishery products, 1957, 1962, and 1963

Type of product	1957	1962	1963
FISH AND SHELLFISH	<u>Metric tons</u>	<u>Metric tons</u>	<u>Metric tons</u>
Frozen.....	434,700	1,013,700	1,124,100
Cured:			
Boiled, dried, dry-salted, wet-salted, or smoked.....	457,200	478,600	507,700
Fish sausages and hams.....	35,900	142,400	158,700
Fishcake.....	386,900	498,800	514,100
In soy sauce.....	74,500	64,800	61,100
Canned.....	171,600	233,300	219,800
Meal:			
For human consumption.....	700	3,200	2,800
For animal feed or fertilizer.....	155,400	390,900	328,400
Oil, body and liver.....	29,200	20,400	31,300
Miscellaneous.....	17,400	22,400	32,600
Total fish and shellfish.....	1,763,500	2,898,500	2,980,600
SEAWEED			
Dried seaweed.....	61,200	81,500	( <sup>1</sup> )
Other (agar, seaweed in soy sauce, etc.).....	56,500	49,500	( <sup>1</sup> )
Total seaweed.....	117,700	131,000	( <sup>1</sup> )
Grand total.....	1,881,200	3,029,500	<sup>2</sup> 2,890,600

<sup>1</sup> Not available.

<sup>2</sup> Total only of fish and shellfish.

Note: Whale products are not included.

Source: Food and Agriculture Organization, Yearbook of Fishery Statistics, 1962, vol. 15, and 1963, vol. 17.

of frozen fish locally is hampered by lack of refrigeration facilities in retail outlets, especially in rural areas. Part of the amount frozen is surplus fish caught during peak seasons and kept for processing later when catches are negligible. In a 1959 survey, it was reported that Japan had freezing plants with a daily capacity of over 10,000 tons. Recent data are not available, but this capacity is believed to have doubled. Also additional freezing capacity has been built into large vessels.

Since 1950 refrigeration and freezing facilities have been installed on many vessels, mainly tuna longliners and large trawlers. Vessels of less than 300 gross tons usually have refrigeration equipment for chilling fish and for keeping them just above the freezing point. Some longliners and trawlers over 300 gross tons have both freezing and refrigeration equipment. Factoryships (3,000 to 10,000 gross tons or larger) have both types of equipment. Refrigerated fish carriers (generally about 1,000 gross tons), working with the factoryship fleets, have only equipment for storing frozen fish.

An estimated 5 million tons of ice is manufactured annually in about 2,000 plants. Between 60 or 70 percent of this quantity is used in the fishing industry by fishing boats, fish carriers, and wholesale and retail establishments. Almost all Japanese fishing craft carry ice; the larger vessels that operate on extended trips to offshore fishing grounds add minute amounts of chlorotetracycline, an antibiotic, to help preserve catches.

### Processing

The Japanese fish processing and preservation industry is undoubtedly the most diversified in the world. Excluding freezing, about 60 percent of the Japanese catch is cured, canned, or reduced to meal and oil. Salting, drying, boiling, or smoking, or a combination of these methods, is practiced much as it is in other countries and produces a variety of cured products, mostly for domestic use. Other cured products, such as fishcake and dried skipjack stick (fig. 14), are traditional and typically Japanese in origin. More recent in origin are fish sausages and hams. Seaweed is mainly dried or seasoned in soybean sauce. Agar is manufactured from seaweeds, known as tengusa (fig. 15). Canned products are prepared principally for export, but increasing amounts are being consumed domestically. Fish meal for use as feed or fertilizer is prepared by simple outdoor drying (fig. 16), as well as by the most modern techniques used on factoryships. Almost all segments of the processing industry have been increasing production (table 10).

The output of boiled, dried, dry-salted, wet-salted, or smoked products increased from 457,200 tons in 1957 to 507,700 tons in 1963.



Figure 14.--Dried skipjack stick (katsubushi) is sun-dried as a final stage in its preparation. Shavings of the stick are used to flavor soups and other foods. Japan, 1947.



Figure 15.--Bales of dried tengusa seaweed ready for manufacture into agar. Shizuoka Prefecture, Japan, 1948.

Many of these cured products are staples in the Japanese diet, often prepared by small-sized establishments of the cottage-industry type. Boiling, followed by open-air drying, is a favorite method used by households and small plants. Larger plants handle mainly dried skipjack stick and salted products. The principal species used are sardines, anchovy, saury, Atka mackerel, and squid, landed seasonally in amounts too large to be absorbed by the fresh-fish market.



Figure 16.--Waste, obtained from preparation of dried skipjack stick, being dried for use as fertilizer. Yaizu, Japan, 1947.

Production of fishcake has shown sustained growth in recent years. Fishcake which is ground-up fish, seasoned, and then steamed, boiled, broiled, or fried, is mostly made in thousands of small plants. Bottomfish--such as Alaska pollock, sharks, croakers, lizard fishes, and sharp-toothed eel--are the principal species used. Production increased from 386,900 tons in 1957 to 514,100 tons in 1963 (table 10). Fishcake decomposes rapidly; the use of chlorotetracycline is permitted to inhibit spoilage.

The most spectacular advance in the Japanese processing industry has been in the production of fish sausages (fishcake with a casing) and hams. The process was developed in the 1950's; by 1963 production was 158,700 tons (table 10). Large modern plants have been established, some with a daily output of 600,000 pieces of sausage or ham. Tunas and allied species are the principal ingredients; whale or livestock meats often are added to the mixture.

Production of canned fishery products reached a peak of 256,000 tons (net product weight) in 1961, and thereafter declined to 233,300 tons in 1962 and 219,800 tons in 1963 (table 11). Responsible for this decline were smaller packs of salmon and of tuna flakes or chunks. The industry is primarily geared to produce for export. Products of high unit value--canned tuna, salmon, and crab meat--are mainly shipped to United States and European markets. Those of lower unit value--canned mackerel, sardines, and saury in oil or tomato sauce--go mainly to Asian and African markets. For home use, canned fishery products are usually seasoned with soy sauce or other condiments.

In 1963 Japan was the second largest producer (after Peru) of fish meal in the world. Production of 328,400 tons came from many sources. Surplus landings of saury, herring, and anchovy were used to produce most of the fish meal. About 200 large reduction plants, located mainly in Hokkaido and along the

Table 11.--Japanese production of canned fishery products, 1957 and 1963

Canned product	1957	1963
	<u>Metric tons</u>	<u>Metric tons</u>
Tuna (including skipjack):		
In oil.....	10,500	15,300
In brine.....	18,200	24,500
Flakes or chunks.....	21,700	20,400
Total tuna.....	50,400	60,200
Salmon.....	40,500	32,600
Mackerel.....	14,100	46,700
Sardines.....	24,000	4,500
Crab meat.....	6,200	7,200
Oysters.....	1,700	4,400
Squid and cuttlefish.....	4,600	9,600
Other.....	30,100	54,600
Grand total.....	171,600	219,800

Source: Food and Agriculture Organization, Yearbook of Fishery Statistics, 1962, vol. 15, and 1963, vol. 17.

east coast of Honshu, accounted for most of the production. Also, thousands of small plants and households made a sizable contribution. In the late 1950's, factoryship trawler fleets in the Bering Sea began to produce large amounts of fish meal. Production reached a peak of 68,468 tons in 1961 and then declined as licenses to operate were withdrawn.

In 1963 the two factoryship fleets permitted to produce fish meal in the Bering Sea were given a production target of 17,800 tons. Their production and those of other fleets producing fish meal from offal and waste totaled 29,031 tons in that year. Another factoryship fleet licensed to operate off Angola during the 1962/63 winter produced 3,500 tons. Japanese curtailment of high-seas fish meal operations is attributed to inability to compete in world markets at prevailing prices. Japan now imports large quantities of fish meal from Peru and South Africa to supplement its production and enable it to supply the domestic demand for mixed feeds in poultry raising.

## INTERNATIONAL TRADE

### Exports

After World War II, Japanese exports of fishery products (including whale oil) increased steadily to reach a peak in 1962 of 506,559 tons, valued at \$315.3 million. In 1963 fishery exports dropped to \$282.7 million (fig. 17), mainly because of curtailed shipments



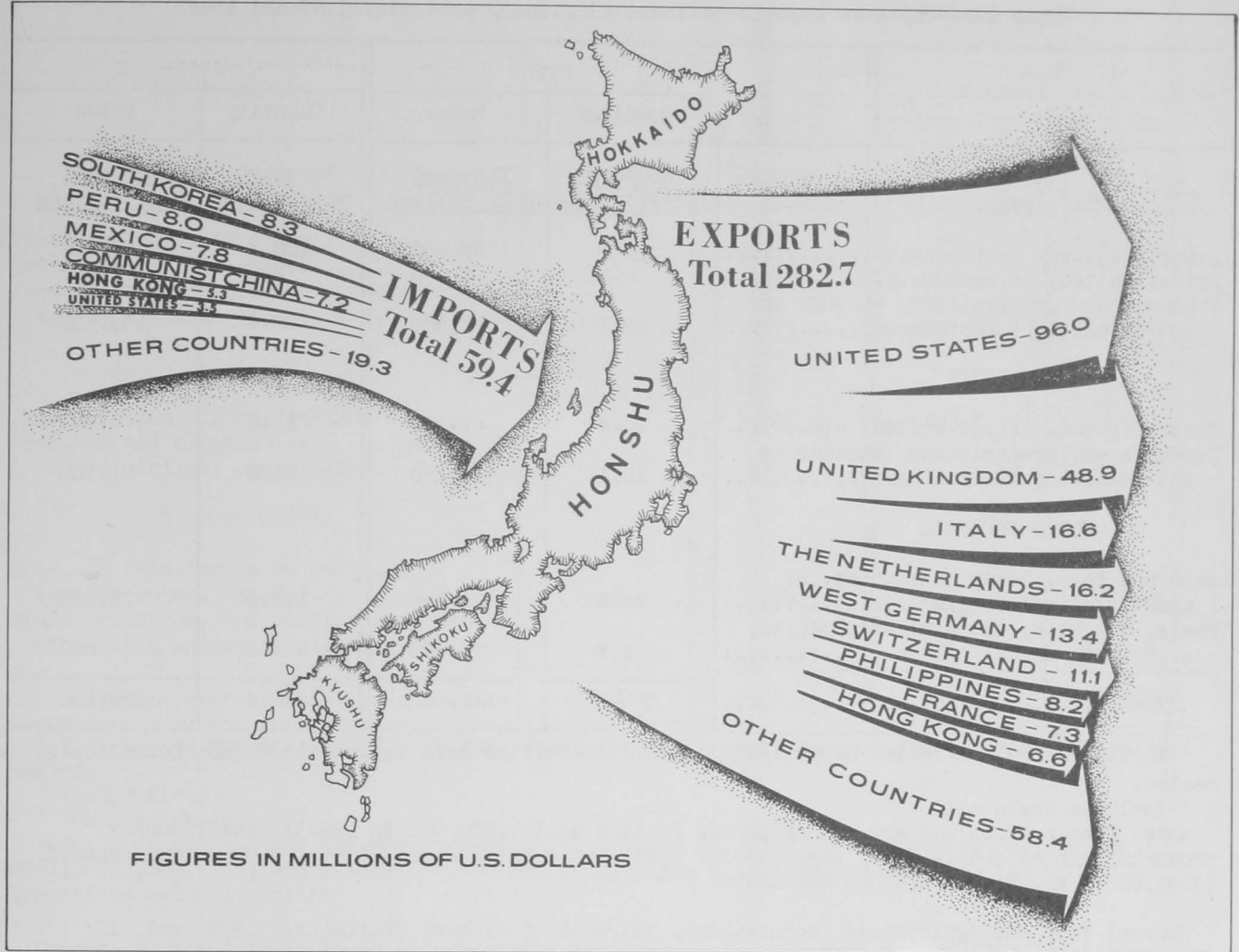


Figure 17.--Japanese foreign trade in fishery products, in value by origin and destination, 1963.

of canned salmon to the United Kingdom and frozen tuna to the United States. Data on exports of selected fishery products in 1957 and 1963 are given in table 12.

Items of high unit value, shipped mainly to the United States and Western Europe, have become the backbone of the Japanese export trade in fishery products. Four of these products--frozen tuna and canned salmon, tuna, and crab meat--accounted for 60 percent of the value of all fishery exports in 1962. This figure dropped to about 50 percent in 1963. Frozen tuna goes mostly to the United States and to Italy, the latter a market outlet first developed in the late 1950's with tuna caught in the Atlantic by Japanese longliners. Canned tuna in brine goes almost entirely to the United States, and canned tuna in oil mainly to West Germany and other newly developed markets in Europe. The United Kingdom is the principal market for canned salmon. Canned crab meat goes mainly to the United States and the United Kingdom.

Items of low unit value, shipped mainly to Asiatic countries, have decreased in importance in the export trade. Products shipped to these countries, though still sizable in quantity, are mostly cured fish and shellfish, canned mackerel and saury, and seaweed. Oils and fats go mostly to European countries, the Netherlands and the United Kingdom being the principal buyers. In 1963 oils and fats accounted for nearly 10 percent of the value of all fishery exports.

Cultured pearls earned \$47.3 million in 1963, or about 17 percent of the value of all fishery exports.

Semiofficial associations organized by processors and exporters control the flow of most Japanese fishery exports. Prices and quotas, often adjusted to prevent disruption of overseas markets, are set by the associations, subject to the approval of the Ministry of International Trade and Industry. Subsidy funds obtained from an excise tax on imported sugar can be used to support exports of fishery

Table 12.--Japanese exports of selected fishery products, 1957 and 1963

Product	1957		1963	
	Quantity	Value	Quantity	Value
	<u>Thousand metric tons</u>	<u>Thousand U.S. dollars</u>	<u>Thousand metric tons</u>	<u>Thousand U.S. dollars</u>
FISH				
Fresh, chilled, or frozen.....	82.9	28,500	208.1	65,400
Dried, salted, or smoked.....	6.1	2,400	2.1	2,400
Products and preparations, whether or not in airtight containers <sup>1</sup> .....	99.2	71,600	132.4	105,100
SHELLFISH				
Fresh, frozen, dried, salted, etc.....	10.2	5,500	11.4	6,900
Products and preparations, whether or not in airtight containers <sup>1</sup> .....	10.1	14,100	16.0	21,700
OTHER PRODUCTS				
Oils and fats, crude or refined, of aquatic animal origin <sup>2</sup> .....	74.8	22,600	172.8	26,600
Meals, solubles, and similar products, of aquatic animal origin.....	2.8	300	3.6	500
Total.....	286.1	145,000	546.4	228,600

<sup>1</sup> Mostly canned and sealed hermetically; small quantities were in containers not hermetically sealed.

<sup>2</sup> Includes whale oil.

Note: Does not include exports of pearls (valued at \$47,300,000 in 1963); miscellaneous products such as shells, frog legs, oyster spat, and coral (valued at \$6,400,000); and seaweed (\$392,000). Quantities are not available.

Source: Food and Agriculture Organization, Yearbook of Fishery Statistics, 1963, vol. 17; Japan, Ministry of Agriculture and Forestry, Fishery Statistics of Japan, 1963.

commodities that have difficulty in competing in world markets. Exports of whale oil, canned sardines, vitamin oil, and agar have been subsidized with these funds.

## Imports

From a once insignificant amount, Japanese imports have grown recently, reaching a value of \$28.8 million in 1962 and then more than doubling to \$59.4 million in 1963 (fig. 17). Frozen shrimp--valued at \$23.5 million and obtained mainly from Mexico, Communist China, and Hong Kong--was the most important item in 1963. Fish meal imports, chiefly from Peru and lesser amounts from South

Africa, have been expanding since 1960, when 19,400 tons were bought. By 1963 the amount had reached 84,300 tons, valued at \$11.1 million. (Preliminary data for 1964 indicate a further increase in Japanese fish meal imports to 102,277 tons, valued at \$13.7 million.) A large number of miscellaneous items were also imported in 1963, for example, whale meat principally from Norway, shells principally from the United States, dried seaweed and fresh or frozen fish from South Korea, and pearls from Hong Kong. On imports of some fishery products (principally fish meal, cuttlefish, and fish roe), the Japanese maintain quantitative controls in the form of quotas. Data on imports of selected fishery products in 1957 and 1963 are given in table 13.

Table 13.--Japanese imports of selected fishery products, 1957 and 1963

Product	1957		1963	
	Quantity	Value	Quantity	Value
FISH	<u>Thousand metric tons</u>	<u>Thousand U.S. dollars</u>	<u>Thousand metric tons</u>	<u>Thousand U.S. dollars</u>
Fresh, chilled, or frozen.....	3.2	1,200	19.4	5,500
Dried, salted, or smoked.....	1.1	500	1.7	1,400
Products and preparations, whether or not in airtight containers <sup>1</sup> .....	.1	100	.7	1,000
SHELLFISH				
Fresh, frozen, dried, salted, etc. ....	2.6	1,600	14.1	24,500
Products and preparations, whether or not in airtight containers <sup>1</sup> .....	( <sup>2</sup> )	( <sup>2</sup> )	.1	100
OTHER PRODUCTS				
Oils and fats, crude or refined, of aquatic animal origin <sup>3</sup> .....	.3	200	.1	200
Meals, solubles, and similar products, of aquatic animal origin.....	--	--	84.3	11,100
Total.....	7.3	3,600	120.4	43,800

<sup>1</sup> Most canned and hermetically sealed; small quantities were in containers not hermetically sealed.

<sup>2</sup> Insignificant.

<sup>3</sup> Includes whale oil.

Note: Does not include imports of pearls (\$1,200,000 in 1963); dried seaweed (\$1,200,000); shells (\$2,900,000); whale meat (\$2,100,000); and other miscellaneous products (\$8,200,000). Quantities are not available.

Source: Food and Agriculture Organization, Yearbook of Fishery Statistics, 1963, vol. 17; Japan, Ministry of Agriculture and Forestry, Fisheries Statistics of Japan, 1963.

## GOVERNMENT SUPPORT TO THE FISHERIES

The Japanese Government exerts considerable supervision over the fishing industry and through its Fisheries Agency (a bureau in the Ministry of Agriculture and Forestry) administers fishing laws. The Government also has fostered programs to assist fishermen, especially those in the overcrowded coastal fisheries where small- and medium-sized enterprises are encountering financial difficulties. Among the many fishery laws and programs in effect are the (1) Fisheries Cooperative Association Law of 1948; (2) Fisheries Law of 1949, which reformed the archaic fishing-rights system; (3) Central Wholesale Marketing Law, enacted in 1923 and revised

in 1956; (4) compulsory insurance program covering accidents, sicknesses, and unemployment; (5) labor laws specifically for fishermen; (6) special law providing insurance that compensates fishermen captured by other countries; and (7) Law to Promote Coastal and Other Fisheries, enacted in August 1963.

Long-term loans and subsidies for the construction or conversion of powered vessels to high-seas operations are granted by the Agriculture, Forestry, and Fisheries Finance Corporation, a Government-supported bank. Loans are also made for building icemaking, cold-storage, and freezing plants.

Subsidies and Government credit furnish financial support to fishermen. Commercial bank credit is used mainly by large companies. The Government-sponsored Central

Cooperative Bank for Agriculture and Forestry provides credit at low cost to fishermen by making loans to local cooperatives. Fishermen can borrow funds for operating expenses from the local cooperatives at 11 to 15 percent interest--rates far less than those charged by private sources of credit.

A Government reinsurance program absorbs 90 percent of the risk on insured fishing craft under 1,000 gross tons. It also reduces the cost of insurance issued through local fishery cooperatives by the Fishing Boat Insurance Association. About three-quarters of the total gross tonnage of the Japanese fleet is insured against vessel damage and loss.

The Fisheries Agency's Research Division has comprehensive programs of biological research, resource development, and improvement of fishing and processing techniques in the domestic and high-seas fisheries. The Division operates 9 regional research stations and 19 branch stations. Including local or prefectural stations, Japan has about 100 fishery research laboratories. Also, a number of colleges and the laboratories of large fishing companies engage in fishery research.

## INTERNATIONAL RESTRICTIONS AND AGREEMENTS

In certain areas, Japanese fishing has been curtailed by unilateral action of a foreign country, or Japanese fishing craft have been seized for violation of territorial waters. The Rhee Line, proclaimed in 1952 by South Korea, has prohibited Japanese fishing within an average distance of about 70 miles from the Korean coast. Japan never recognized this claim, and efforts to ameliorate this controversy were fruitless until recently. In June 1965 Japan and South Korea signed a fishery treaty which, when ratified by the two countries, will eliminate the Rhee Line. Under the new agreement, both nations may establish exclusive fishing zones 12 nautical miles off their coasts for their respective fishermen.

Most seizures of Japanese vessels have been made by South Korea and the U.S.S.R. The Soviet seizures have been made mainly off northeastern Hokkaido, in the vicinity of the Kuril Islands, which were taken from Japan by the U.S.S.R. at the end of World War II. Of 104 Japanese vessels and 1,016 crewmen captured by foreign countries in 1962, the Soviet Union took 72 vessels and 506 men; South Korea, 15 vessels and 116 men. During the past several years, Japanese fishing vessels have been seized for violation of territorial waters by Ecuador, Spain (off its African possessions), and the United States (off Alaska).

With its fisheries so widespread and in many areas in competition with those of other countries, Japan has necessarily become a party to international agreements established to con-

serve stocks of fish used by two or more countries. Three of the four treaties to which Japan is a party are concerned with the fisheries in the North Pacific. Another is the worldwide whaling treaty. An unofficial agreement exists between Communist China and Japan on fishing in the East China and Yellow Seas.

## International Convention for the High Seas Fisheries of the North Pacific Ocean

The North Pacific Convention came into force in June 1953 between Japan, the United States, and Canada and established the International North Pacific Fisheries Commission to deal with the conservation of fish stocks in the North Pacific and adjacent seas. Under a new principle, known as abstention, the Japanese agreed not to fish for North American halibut and herring and for salmon east of a provisional line established at long. 175° W. (fig. 9). The abstention principle provides that when one or more countries are utilizing a resource and have it under study and scientific management, the other country or countries shall refrain from fishing that resource. In 1959 certain stocks of herring in the eastern Pacific were removed from the abstention list. In May 1963 halibut in the Bering Sea was also removed because the United States and Canada could not demonstrate that they were utilizing fully the species in that area. Salmon research has shown that the provisional line bisects an area of mixing between North American and Asiatic stocks. Efforts to move this line westward so that Japanese fishermen do not take North American salmon have failed.

In 1963 Japan gave notice to the United States and Canada that it desired to revise the convention and eliminate the abstention principle. Three meetings have since been held, but agreement has not been reached.

## Northwest Pacific Fisheries Convention

Japanese high-seas fishing in the Northwest Pacific, including the western Bering Sea and the Sea of Okhotsk, is controlled by an agreement signed in 1956 with the Soviet Union. So far, the Japanese-Soviet Commission established to promote research and to formulate conservation regulations has dealt mainly with salmon, king crab, and herring. The Soviets, exerting considerable pressure on the Japanese, have managed to end completely Japanese salmon fishing in the Sea of Okhotsk and in the coastal zone off eastern Kamchatka. In the treaty zone for salmon fishing in the Northwest Pacific (fig. 9), salmon quotas are established each year for pelagic operations conducted by the Japanese. Japanese king crab

fishing in the Sea of Okhotsk has been limited to four factoryship fleets permitted to operate only in certain designated areas. Since 1963 two areas in the treaty zone have been closed to all fishing; these are both east of the Kuril Islands. The Soviet's continuing pressure to reduce Japanese catches of salmon and king crab in the Northwest Pacific is a factor entering into the present negotiations between Japan, Canada, and the United States for revision of the North Pacific Convention.

### Interim Convention on Conservation of North Pacific Fur Seals

North Pacific fur seals were exploited nearly to extinction before protection was given them beginning in 1911. The present treaty between the United States, Canada, Japan, and the U.S.S.R. provides for management and investigation of the fur seal resources. Special emphasis is being placed on a coordinated study of the effectiveness of land versus pelagic sealing and their relation to conservation and management. Meanwhile the convention prohibits pelagic sealing. At one time, Japan had a widely spread pelagic seal fishery in the North Pacific.

Fur seal herds breed in the summer on the Pribilof Islands in the eastern Bering Sea, and then most migrate southward along the Pacific coast of North America; a part of the herds migrate into the western Pacific to waters off Japan. Smaller herds breed on the Soviet-controlled Commander Islands (in the northwestern Bering Sea) and Robben Island (off eastern Sakhalin). At present, Japan and Canada each receive from the U.S.S.R. 1,500 skins a year, and from the United States a 15 percent share each of the skins from the annual commercial kill on the Pribilof Islands. In 1964 each country received 9,630 skins from the United States.

### International Convention for the Regulation of Whaling

Japan is a party to the whaling convention that entered into force in 1946 and to which 17

countries now belong. The International Whaling Commission, established by the convention, holds annual meetings to review research findings, recommend new programs, fix whaling areas, set whaling seasons, and limit the number of whales that can be killed.

So far, the efforts of the Commission have been unsuccessful in preventing depletion of Antarctic whale stocks (see Whaling, above). At its June 1964 meeting, however, the Whaling Commission approved a total quota of 4,500 blue-whale units for the 1965/66 Antarctic season. It was also recognized that this quota, although considerably lower than those in the past, would not reduce the catch of baleen whales below sustainable yields as shown by scientific evidence. To enable the pelagic whaling countries to adjust to the even lower quotas that will be required, the Commission considers the 1965/66 quota as transitional. Members of the Whaling Commission agreed that they will recommend to their governments further reductions for the 1966/67 and 1967/68 seasons and that by the 1967/68 season, they will recommend a quota that will be below the scientifically established sustainable yield of baleen whales.

### Japan-Communist China Fisheries Agreement

Because of Communist China's harassment and seizures of Japanese fishing craft in the East China and Yellow Seas, Japanese fishing companies signed an unofficial 1-year agreement with Communist Chinese authorities in 1957. This agreement expired in 1958, and a new agreement was not renegotiated until 1963. This 2-year agreement reestablishes six restricted areas (about 60 miles off the Chinese mainland), where limited numbers of fishing craft from each country are permitted to fish at certain seasons of the year. Although not stipulated in the agreement, Communist China apparently has exclusive fishing rights up to the 60-mile line.

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