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THE EASTERN HOKKAIDO LAND-BASED SALMON FISHERY OF JAPAN

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SPECIAL NOTE

The International North Pacific Fisheries Commission, established in 1953 by the International Convention for the High Seas Fisheries of the North Pacific Ocean, coordinates the research of the member nations: Japan, Canada, and the United States. The resulting investigations provide data to the Commission for use in carrying out its duties in connection with fishery conservation problems in the North Pacific Ocean. Publication of this scientific report has been approved by the United States Section of the Commission.

United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner
Bureau of Commercial Fisheries, Donald L. McKernan, Director

THE EASTERN HOKKAIDO LAND-BASED SALMON FISHERY OF JAPAN

by

Lorry M. Nakatsu
Fishery Research Biologist

Contribution No. 14 to research conducted with the approval of the United States Section of the International North Pacific Fisheries Commission.

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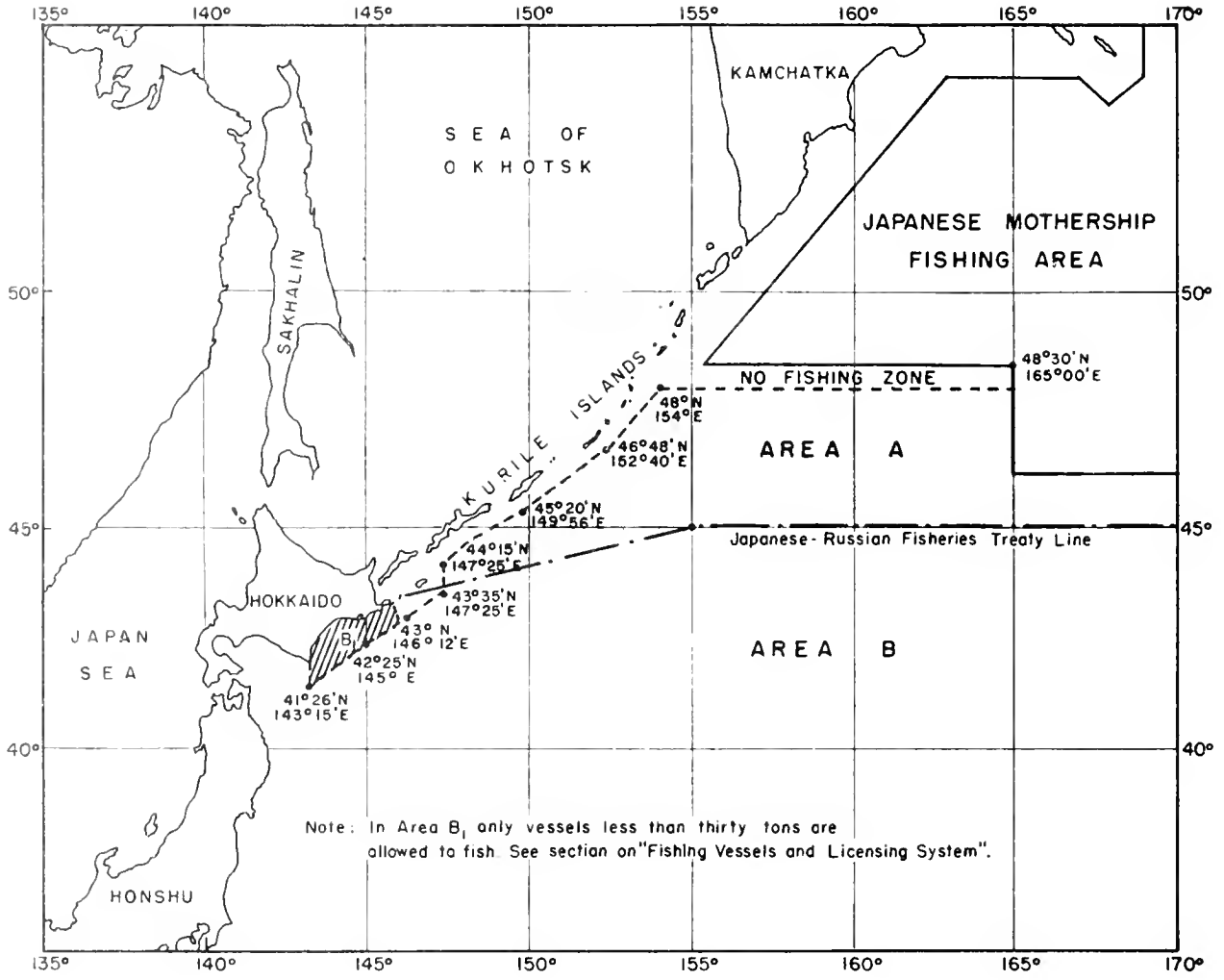

Figure 1. --Eastern Hokkaido land-based salmon fishing area.

THE EASTERN HOKKAIDO LAND-BASED SALMON FISHERY OF JAPAN

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U. S. Fish and Wildlife Service
Seattle, Washington

Japanese biologists have shown, through tagging experiments, that the large land-based salmon fleet operating off eastern Hokkaido fishes some of the populations of salmon bound for the Okhotsk Sea. The chum and pink salmon (Oncorhynchus sp.) appearing in this fishery are known to migrate to the Okhotsk Sea and the surrounding area, including western Kamchatka, the northern Okhotsk Sea Coast, Sakhalin, and the South Kurile Islands.

The need for sampling Siberian stocks of salmon was discussed at the annual meeting of the International North Pacific Fisheries Commission, involving Japan, Canada and the United States, at Vancouver, B. C., Canada, in November 1957. In the spring of 1958 I was assigned to sample this fishery at Kushiro, Hokkaido, where I remained until the end of the fishing season in mid-August.

FISHING AREA AND SEASON

The land-based salmon fishery of eastern Hokkaido covers the North Pacific Ocean east to approximately 165° E. longitude and south from 48° N. latitude to generally 40° N. latitude. The southern boundary is not fixed as its limits are governed only by the availability of salmon. The fishing area can be divided into two major subareas and for purposes of convenience they are designated as Area A and Area B (fig. 1).

Area A is bounded on the east, west, and north by lines established by the Japanese Fishery Agency, separating the area of operation of the Hokkaido land-based salmon fleet from that of the mothership fleet. Its southern limit is defined by the Japanese-Russian Fisheries Treaty Line. Lying within treaty waters, this area has a catch restriction. In 1958, the quota was established at 18,333 metric tons.1/

Area B covers the waters to the south of the treaty line, lying entirely south of 45° N. latitude. It has no definite southern limit, as explained above, and no catch restrictions.

In these two areas, the fishing seasons vary according to the gear. Longline fishing began on April 20 and closed on July 31. The gill-net season opened on April 1 and closed on August 10, all vessels required to be in port by August 15 to land their catches. Despite the early season opening, fishing does not usually commence full scale until late April because of inclement weather.

FISHING VESSELS AND LICENSING SYSTEM

The fishing vessels, mostly of a wooden type, are classified into three categories: (1) less than 5 tons, (2) more than 5 tons but less than 30 tons, and (3) more than 30 tons but less than 75 tons.

1/ At the Japanese-Russian fisheries negotiations held in Moscow in the spring of 1958, a quota of 110,000 metric tons was set for the Japanese high-seas salmon fleet. Of this amount, 6,498.4 metric tons were allocated to the Okhotsk Sea mothership fleet, 85,168.6 metric tons to the North Pacific mothership fleets and 18,333.0 tons to the Hokkaido land-based fleet.

Vessels of less than 5 tons, which do not require fishing licenses, are marked on their bows with a vertical band of red paint about 6 inches wide, which indicates their classification. These vessels usually have a complement of 6 men.

Because they are small, these vessels fish in areas close to shore, most of them making overnight trips only and landing their catch fresh. When good weather prevails they sometimes remain out for 2 days. The fishing period of these vessels is limited to the months of May and June, when fish are available close inshore.

Vessels of more than 5 tons but less than 30 require licenses from the Governor of Hokkaido. Their complements range from 5 to 15 men.

Vessels greater than 30 tons but less than 75 require licenses from the Minister of Agriculture and Forestry. The crews range from 13 to 20 men. These vessels remain on the fishing grounds for as long as 3 weeks, bringing in their catch salted.

Table 1 shows the crew composition of the different size vessels, as well as the number of "tans" (shackles) of gear set by these vessels.

Table 1.--Crew composition and average number of "tans" of gear set by commercial vessels of different sizes.

Vessel size	Crew	"Tans" or shackles per set
Less than 10 tons	6	150
" " 20 "	10	180
" " 30 "	13-15	230
" " 40 "	18-20	270
" " 50 "	18-20	300
" " 60 "	18-20	330

FISHING GEAR

Three types of gear used in the fishery are gill nets, longlines, and traps. As the traps take few salmon in this fishery, only the gill nets and longlines will be described in this paper.

The gill nets fished by the catcher boats of the mothership fishery have been described by Fukuhara (1955). In the eastern Hokkaido salmon fishery, shorter gill nets are used but the trend has been toward the adoption of longer shackles, like those used in the mothership fishery.

Three different lengths of shackles are used, 200, 250, and 300 feet, with 3.8 "sun" (4.53 inches stretched measure) and 4.0 "sun" (4.77 inches stretched measure) mesh sizes most commonly fished. The 200- to 250-foot shackles are hung 50 meshes deep, with light buoys attached every 10 shackles. The 300-foot shackles are hung 60 meshes deep.

The nets are mainly nylon (Amilan). Spongex-type floats have largely replaced wooden floats, although wooden floats are still used.

The gear is usually set in the afternoon around 4 p.m. and retrieved at midnight. The setting normally takes an hour, and hauling requires 5 to 6 hours for the larger sets.

At the end of the fishing season, many vessels consign their nets to net-mending companies to be mended and stored until the start of a new season. The nets are stripped completely and each component carefully examined, repaired if necessary, and then rehung. Women do most of this work.

Longlines are used by many vessels. The unit of gear of the longline is the "hachi" (skate). A hachi is usually from 300 to 400 feet long, containing 49 to 60 hooks attached at intervals of approximately 7.5 feet. The main line (float line) is of heavy manila twine, and the leaders are of nylon.

Each hachi is coiled separately in a flat circular bamboo basket; the hooks are lightly embedded on the edges and arranged in a manner to prevent entanglement. For bait the fishermen most commonly use lightly salted anchovies (Engraulis sp.) and occasionally sand eels (Ammodytes sp.).

An average set consists of 120 to 150 hachi. At time of setting, wooden floats are tied every 5 hooks apart and light buoys every 10 hachi. When sea conditions

are bad, the light buoys are placed every 30 hachi to eliminate drag.

Setting the longlines around 10 p.m. requires about 2 hours. Before each set, water temperatures and currents are carefully noted and the lines are made up into suitable lengths (strings), which are then set parallel or diagonal to each other. Retrieving the lines, which begins at midnight, takes about 6 hours. Figure 2 shows the makeup of a longline and the methods of baiting.

FISHING TREND AND CATCH COMPOSITION

At the beginning of the fishing season, the fishing vessels operate off the coast of northern Honshu and southern Hokkaido, with many of the larger vessels fishing in the area east of 155° E. longitude between 43° N. and 45° N. latitude.

As the season progresses, the salmon fleet gradually works northward. In June fishing is concentrated off the coast of Hokkaido between 42° N. and 45° N. latitude and extends east to 160° E. longitude. In July and August, the best areas of fishing are found off the central Kurile Islands between 46° N. and 48° N. latitude. Figure 3 shows the general trend of the fishery for the past 2 years and the catch composition of the different areas by time.

Pink salmon form the bulk of the total catch, being found in great abundance in areas relatively close to shore at the beginning of the season. In early May, in the vicinity of 44° N. latitude and 157° E. longitude, pinks constitute approximately 30 percent of the catch, red salmon 20 percent, and chum salmon 50 percent. A month later, in June, pink salmon make up 80 percent of the catch in this same area, and chums 20 percent.

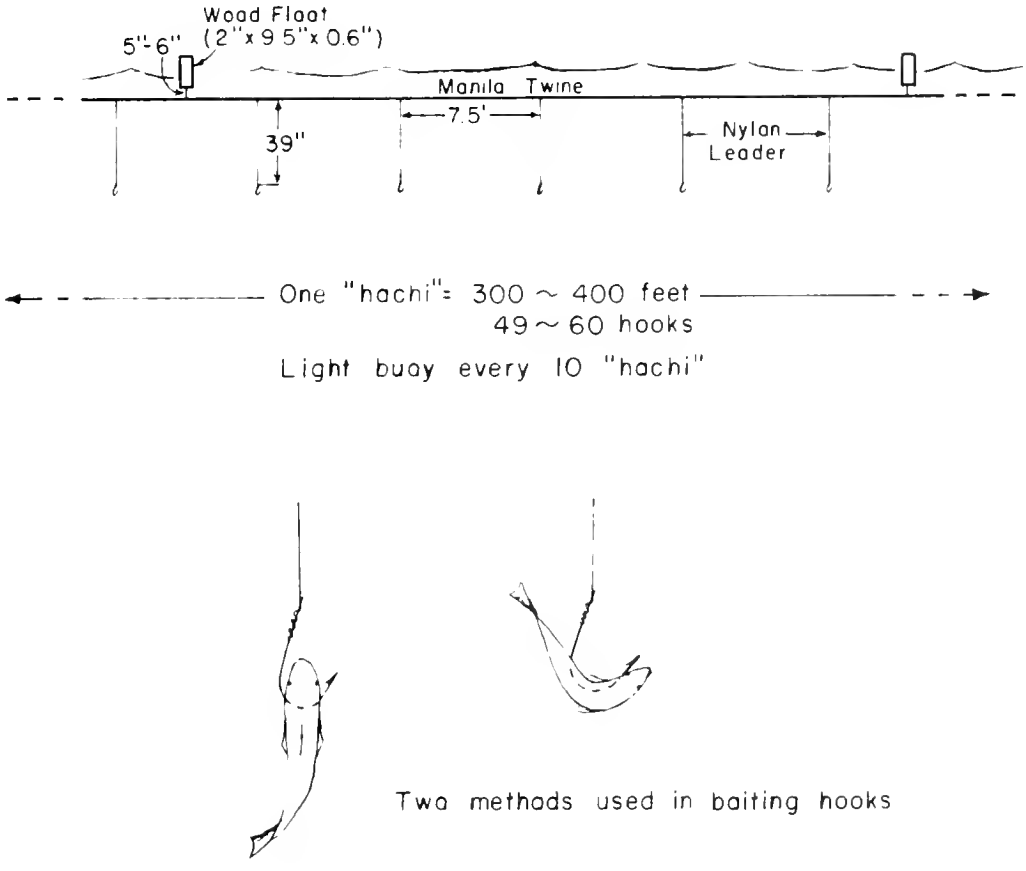

Figure 2.--Longline-gear arrangement and baiting methods.

Pink salmon are caught in large numbers in all years. However, according to the conclusions of some Japanese biologists, in the Urakawa area off the southern coast of Hokkaido, pinks are abundant only in even years.

Chum salmon rank next to pink salmon in total numbers landed. Chums are present in greatest numbers during the early part of the fishing season, especially in the area east of 155° E. longitude and between 42° N. and 45° N. latitude. After June the percentage of chums caught in Area A drops off and they constitute less than 10 percent of the total catch in July.

Red salmon are caught during April and May in the areas far offshore, mainly east of 155° E. longitude in the vicinity of 44° N. latitude. At this time, they make up as much as 50 percent of the total catch in the vicinity of 165° E. longitude. In June the red salmon disappear from the fishery, few being caught. In July and August practically none are caught.

Silver salmon appear in the fishery from mid-July in Area A, gradually increasing in numbers in early August. In August silvers are second to pinks in landings in some areas but the total catch of this species for the entire season is not large.

King salmon appear in the fishery throughout the fishing season but in very small numbers. For each set, an average of one or two kings is estimated to be caught.

Masu salmon (O. masu), a species indigenous only to Asian waters, is caught in very small numbers. This species is not

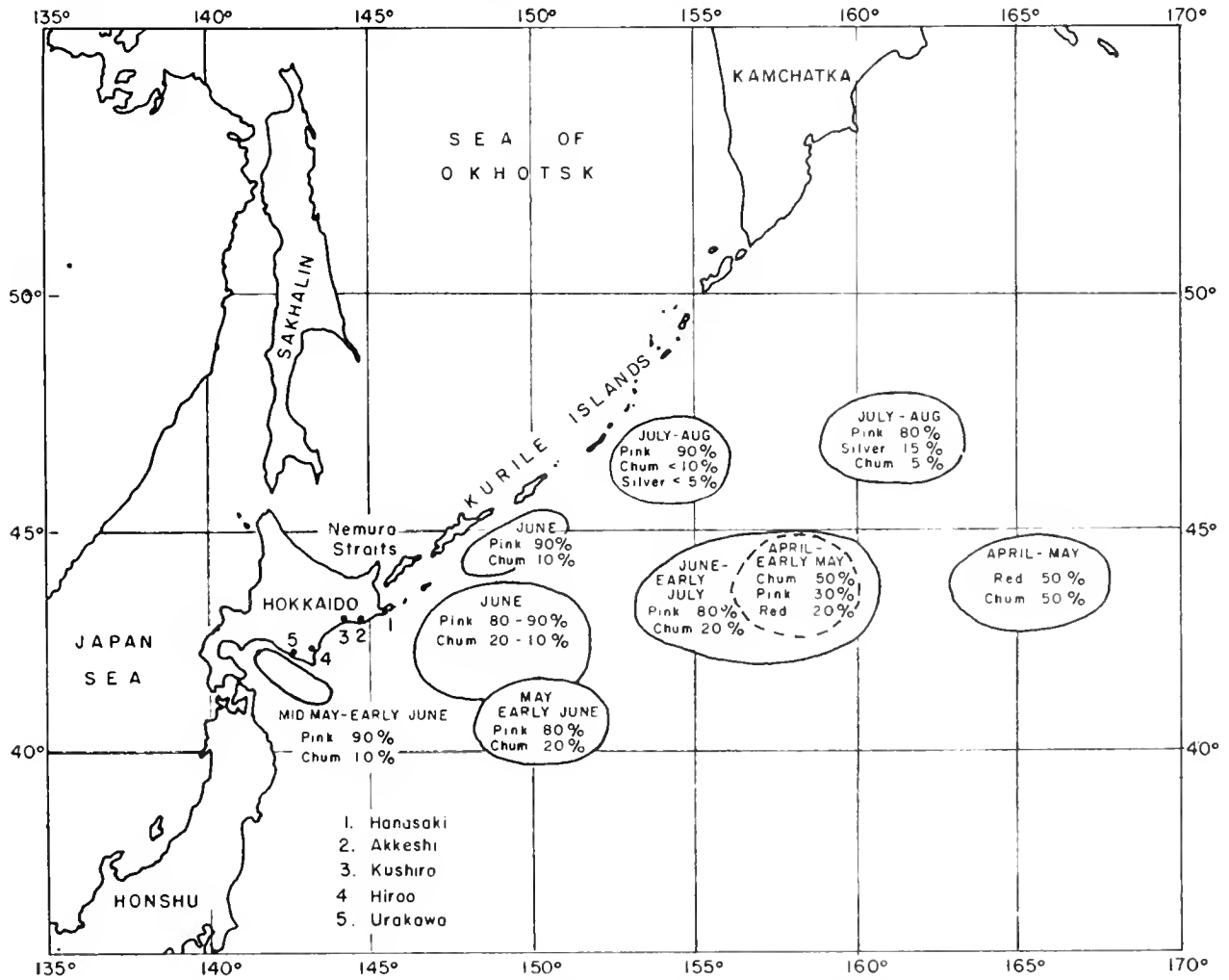

Figure 3.--Average catch composition by area and time, 1957-58.

separated in the catch and is grouped with the pink salmon.

Japanese biologists estimate that in recent years gill net-caught fish have comprised 75 percent to 80 percent of the total commercial landings and longline-caught fish from 25 percent to 20 percent in the eastern Hokkaido fishery. Table 2 shows the total annual catch of salmon in percentages by gear and by species for all shore fisheries, such as the eastern Hokkaido salmon fishery, Japan Sea pink salmon fishery, and the Okhotsk Sea coastal fishery. It can readily be seen from this table that the percentages of salmon taken by longline gear show significant increases over a 6-year period, 1952 to 1957: pink salmon from 4.8 to 24.5 percent, chum salmon from less than 1 percent to 8.3 percent, and all species from 3.6 to 20.4 percent.

Table 2.--Annual catch of salmon in percentages of total catch by species and by gear for all shore fisheries, 1952-1958 [1/]

Year	Percentages of total caught by: Gill net	Trap	Longline	Other	Unknown	Total (1,000 lbs.)
Pink and masu salmon [2/]						
1952	89.1	5.5	4.8	< 1.0	< 1.0	53,837
1953	85.4	10.5	3.7	< 1.0	-	38,592
1954	83.6	7.1	8.6	< 1.0	-	39,526
1955	88.5	8.1	3.3	< 1.0	-	81,220
1956	74.2	5.6	19.9	< 1.0	-	104,310
1957	72.8	2.2	24.5	< 1.0	-	133,860
Chum, red, silver and king salmon [3/]						
1952	22.2	71.5	< 1.0	3.6	2.3	18,213
1953	36.6	62.9	< 1.0	< 1.0	-	23,818
1954	42.6	56.7	< 1.0	< 1.0	-	36,848
1955	61.1	38.2	< 1.0	< 1.0	-	38,170
1956	50.4	46.3	2.9	< 1.0	-	24,550
1957	48.5	41.4	8.3	1.8	-	45,900
All species						
1952	72.2	22.2	3.6	< 1.0	< 1.0	72,050
1953	66.8	30.5	2.3	< 1.0	-	62,410
1954	63.8	31.0	4.4	< 1.0	-	76,374
1955	79.7	17.7	2.3	< 1.0	-	119,390
1956	69.7	13.3	16.7	< 1.0	-	128,850
1957	66.6	12.3	20.4	< 1.0	-	179,760

1/ Data from International North Pacific Fisheries Commission's Statistical Yearbooks, 1952-1957, Vancouver, B.C., Canada.

2/ Mostly pink salmon.

3/ Mostly chum salmon.

Table 3.--1952-57 eastern Hokkaido land-based fishery salmon landings in pounds by species and by months.[1]

Year and month	Pink and masu salmon[2]	Chum, red silver[3] and king salmon	Total
1952			
April	1,306,000	50,000	1,356,000
May	4,497,000	1,257,000	5,754,000
June	24,116,000	3,820,000	27,936,000
July	20,677,000	331,000	21,008,000
August	1,066,000	83,000	1,149,000
Total	51,662,000	5,541,000	57,203,000
1953			
April	926,000	25,000	951,000
May	4,216,000	3,646,000	7,862,000
June	14,840,000	3,919,000	18,759,000
July	15,328,000	1,984,000	17,312,000
August	959,000	446,000	1,405,000
Total	36,269,000	10,020,000	46,289,000
1954			
April	2,323,000	50,000	2,373,000
May	4,390,000	1,298,000	5,688,000
June	9,392,000	4,382,000	13,774,000
July	15,228,000	7,697,000	22,925,000
August	6,754,000	2,579,000	9,333,000
Total	38,087,000	16,006,000	54,093,000
1955			
April	1,410,000	40,000	1,450,000
May	6,070,000	2,310,000	8,380,000
June	22,930,000	8,600,000	31,530,000
July	31,000,000	7,010,000	38,010,000
August	16,630,000	6,140,000	22,770,000
Total	78,040,000	24,100,000	102,140,000
1956			
April	3,740,000	50,000	3,790,000
May	9,910,000	4,350,000	14,260,000
June	32,530,000	7,640,000	40,170,000
July	38,300,000	1,300,000	39,600,000
August	16,110,000	700,000	16,810,000
Total	100,590,000	14,040,000	114,630,000
1957			
April	2,000,000	40,000	2,040,000
May	8,040,000	2,610,000	10,650,000
June	27,170,000	6,810,000	33,980,000
July	40,530,000	7,320,000	47,850,000
August	7,780,000	2,350,000	10,130,000
Total	85,520,000	19,130,000	104,650,000

1/ International North Pacific Fisheries Commission Statistical Yearbook 1952-1957, Vancouver, B. C. Include small landings from other coastal fisheries. See text.

2/ Mostly pink salmon.

3/ Mostly chum salmon.

The large percentages of chum salmon taken by trap gear reflect mainly the catches of the trap fishery along the Okhotsk Sea coast and Nemuro Straits. The eastern Hokkaido salmon fishery is primarily a gill-net and longline fishery, and the percentages of chum salmon taken by gill nets and longlines in this fishery are actually larger than are shown in the table.

ANNUAL LANDINGS BY SPECIES AND MONTHS

The annual landings in pounds by species and months are shown in table 3. The 1952-56 landings include catches from the Japan Sea pink salmon gill-net and longline fishery and the Hokkaido Island local fishery, primarily a trap fishery along the coastal regions of the Nemuro Straits and the Okhotsk Sea. However, the total catch of these fisheries for the months shown in the table is rather small. The total catch of the Japan Sea pink salmon fishery, which usually starts in February and terminates in June, does not appear to exceed 10 million pounds. This fishery peaks in early May. The trap fishery along the Nemuro Straits and the Okhotsk Sea peaks in October but takes some pinks in late August.

The 1957 landings include total catches off Honshu and the Pacific coast of Hokkaido. The Honshu landings are believed to include catches from the Japan Sea pink salmon fishery. However, this amount is very small, for, as stated earlier, the total landings of this fishery are estimated not to exceed 10 million pounds annually and by far the greater part of this total is landed on the Japan Sea coast of Hokkaido, which is not included in this table.

Figure 4 shows the 1952-57 salmon landings in graphic form based on figures from table 3.

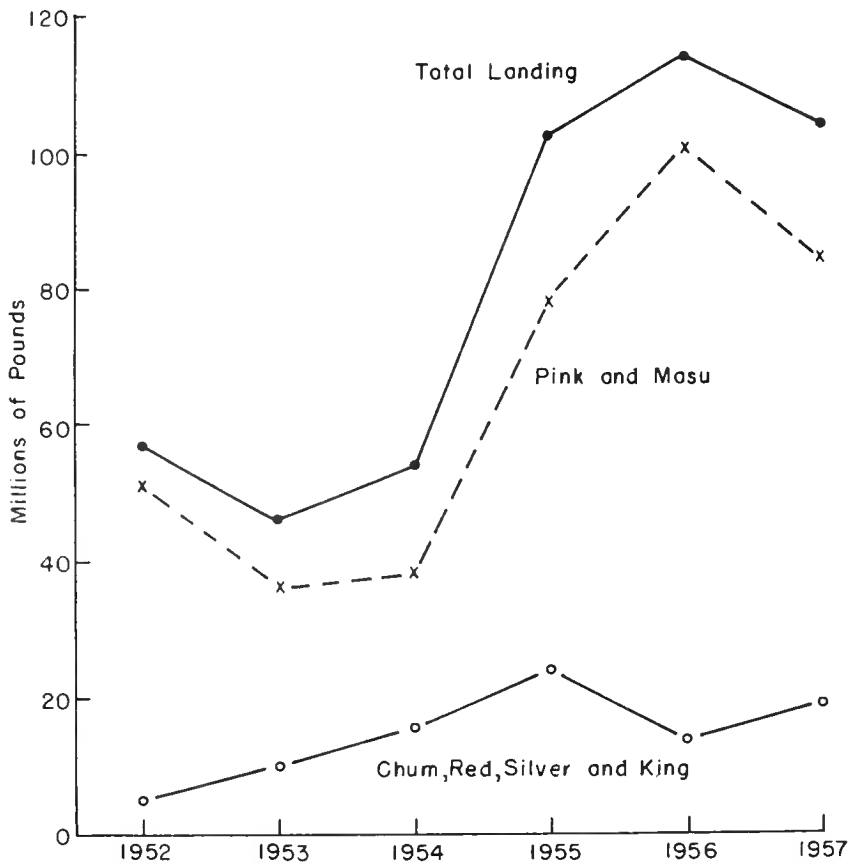

Figure 4.--Salmon landings in pounds for the months April to August inclusive, 1952-57.

Figure 5.--Women sorting salted salmon by species, removing excess salt and segregating damaged fish.

PRINCIPAL PORTS OF LANDING AND MARKETING PRACTICES

The catches are landed mainly in four major ports: Hanasaki (on the outskirts of Nemuro), Kushiro, Akkeshi, and Hiroo (sometimes referred to as Biroo). Of these ports, Kushiro and Hanasaki lead in landings. Salmon are also landed in many of the smaller towns and villages along the coast, but such landings are restricted to the catches of vessels of less than 5 tons, which do not require licenses, and to trap-caught fish. Vessels over 5 tons are required to land their catches at the four ports mentioned above.

At each of these ports, the salted fish are sorted by species at time of landing. Excess salt is removed from every fish, and damaged fish are segregated (fig. 5). The fish are then weighed and stacked neatly in piles where they are examined by prospective buyers and brokers.

The salted salmon are sold at auctions which are held several times a day. The bidding system is unique in that the auctioneer will start with a high price and gradually come down in price. Thus, the buyer first to voice his intention of buying at the price quoted by the auctioneer gets to purchase the lot.

The salted fish are re-examined for quality, sorted, and washed with fresh water in large wooden vats to remove the old salt completely. Fresh salt is applied and the fish are packed in wooden boxes as "aramaki." Women do most of this work.

The fresh salmon are also sold by auction, usually to canneries. On occasion, by prior agreement made between a fishing vessel and a cannery, fresh fish are sold directly to a cannery. Owing to the scarcity of these fish during July and August when fishing activity has moved far offshore, canneries often freeze and stock fresh salmon during the peak of fresh salmon landings, mainly in June.

ACKNOWLEDGMENT

From June to mid-August I was stationed at Kushiro sampling the land-based fishery. During this period, I worked closely with the members of the Kushiro Branch, Hokkaido Regional Fisheries Laboratory, under the direction of Motohiro Sakurai. Through the excellent cooperation and assistance given me by members of his staff, I was able to complete my assignment successfully.

My sincere gratitude goes to the staff of the Japanese Fishery Agency in Tokyo; Kohei Ogaki, Director, Hokkaido Regional Fisheries Research Laboratory; Motohiro Sakurai, Chief, Kushiro Branch of that station; officials of the different fishing cooperatives and fisheries high schools; and many others who have given most generously of their help.

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