ATLAS OF CATCH AND FISHING EFFORT,

JAPANESE MOTHERSHIP SALMON FISHERY, 1956-70

by

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ABSTRACT

Presented in this atlas are illustrative charts depicting geographic distribution and magnitude of salmon catches and fishing effort by the Japanese mothership salmon fishery in the North Pacific Ocean and Bering Sea, 1956-70. For each of five species of salmon, text material briefly describes catch trend relative to deployment of fishing effort, seasonally and annually. Season begins in May and ends mid-July to early August when catch quota is filled. Catch, consisting of mixed species, is dominated by sockeye, chum and pink salmon. Sockeye originating from Bristol Bay exhibit cyclic fluctuations in abundance and availability. Most Bristol Bay sockeye are caught in eastern fishing areas, Asian sockeye in western areas, mainly from May to early July. Chum salmon, representing many stocks, are taken throughout the season (often together with sockeye), and in recent years peak catches were made in northern fishing areas in late season. Pink salmon, predominantly of Asian origin, are cyclic (catches in odd-numbered years tend to be larger than in even-numbered years) and are taken mostly in western fishing areas from mid-June to mid-July. Coho salmon catches, ranking fourth in numbers taken, are mostly from southern fishing areas in late season. Chinook salmon catches, much less in numbers, are largest in northern fishing areas from late June to mid-July (often with good chum salmon catches).
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INTRODUCTION

The post-war Japanese mothership salmon (*Oncorhynchus sp.*.) fishery, initiated in 1952, expanded rapidly in 1954-56 to encompass large sectors of the North Pacific Ocean, Okhotsk Sea, and Bering Sea. The eastern boundary of the fishing area was set at 175°W in 1953 by joint convention between the United States, Japan, and Canada. The western boundary was set by Japanese-Soviet agreement at 160°E in 1959, terminating 1955-58 mothership operations in the Okhotsk Sea and superseding other temporary changes in the western boundary. Figure 1 shows the mothership fishing area with boundaries in effect at the start of the 1959 fishing season.

Since 1956, annual quotas for the mothership fishery have been negotiated by Japan with the Soviet Union prior to the fishing season each year (Office of Foreign Fisheries, 1970). Quotas and catches, high in the late 1950's, were reduced considerably in the 1960's (Table 1). Catch each year fulfills quota, or nearly so. Even in 1964 when fishing was spotty, catch reached within 1/2 of 1% of quota. In no year has the mothership fishery reported a catch exceeding quota.

Quotas are set in metric tons of salmon, with no breakdown by species. Fishing strategy is planned essentially to fulfill the quota and end the fishing season as soon as practicable. Fishing effort is deployed in accordance with success of fishing and availability of the five species of salmon; effort is sometimes concentrated in one or more subareas and is sometimes dispersed freely over the broad mothership fishing area.
In the 1950's, chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), and sockeye salmon (*O. nerka*) catches, in that order, were the mainstay of the mothership fishery (160°E-175°W). In 1960-70, sockeye salmon\(^1\) represented 41% of the catch; chum salmon, 35%; pink salmon, 18%; coho salmon (*O. kisutch*), 5%; and chinook salmon (*O. tschawytscha*), 1% of the catch. Annual fishing effort, as well as catch, is given in Table 2.

**DISTRIBUTION OF CATCH AND FISHING EFFORT**

Distribution of catches of the five species of salmon (Figs. 2-6) and of fishing effort (Fig. 7) in the mothership fishing area is shown by time period, May-August (10-day periods in June and July), 1956-70. Area boundaries as defined in Figure 1 are used for all years. In the 1969 INPFC Annual Report (Peterson, 1971), contoured charts of salmon catches and fishing effort for the mothership fishery were based on averages for 1956-68. In the present report, charts show individual years. Catch-effort data by 2° x 5° statistical area, used to construct the contours, are from (1) Manzer et al. (1965) and (2) INPFC Statistical Yearbooks, 1961-70. Five grades of stippling show numbers of fish caught or tons of gillnet-effort fished.\(^2\) Chart legends are the same for all species, so that relative catches can be compared.

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\(^1\) Sockeye is the highest-priced species. In 1970, salmon delivery prices paid to catcher boats unloading at motherships were 33.5 cents per pound for sockeye, 28 cents for coho and chinook, 26.6 cents for chum, and 17.8 cents for pink.

\(^2\) A tan of gillnet is about 50 meters (164 feet) in length. Mesh size must be either 121 mm (4.76 inches) or 130 mm (5.12 inches) stretched measure. The ratio of large mesh to small mesh nets must be 6:4 west of 170°25' E and may be 4:6 east of that line (Fukuhara, MS. 1971).
Sockeye salmon

Sockeye salmon are caught mainly from late May (May 21-31) to early July (July 1-10), when maturing sockeye of Kamchatkan and Bristol Bay origin are heading to their respective spawning grounds. Most sockeye salmon taken are of Kamchatkan (Asian) origin. The estimated proportion of Asian to Bristol Bay sockeye salmon caught by the mothership fishery over the 1956-70 period is about 2.6 to 1, based on tagging and racial data (data from Fredin and Worlund, In press). For individual years, this proportion varies greatly. The variation stems largely from fluctuations in abundance of Bristol Bay sockeye salmon and from changes in vulnerability of Bristol Bay fish to the mothership fishery. Peak catches of Bristol Bay sockeye salmon were taken in 1957, 1961, 1965, and 1970, whereas the catches of Asian sockeye showed a decline from 1957 to 1970 (Figure 8).

The Bristol Bay sockeye salmon run, dominated by the Kvichak River run, is noted for its cyclic fluctuations in abundance. In the years covered, peak years of abundance were 1956, 1960, 1965, and 1970, followed by subpeaks (peak years plus one) in 1957, 1961, and 1966. Off years were 1958, 1959, 1962, 1963, 1964, 1967, 1968, and 1969. Off year runs were relatively low in abundance except in 1969 when the run was larger than in some peak years plus one (R. A. Fredin, personal comm.). In the Asian sockeye salmon runs, I have been unable to discern any regular fluctuations in abundance.

Sockeye salmon (along with chum salmon) are the first fish to be caught in the mothership fishery. The fishery begins each year in May (late May 1959-70), with sockeye salmon catches (Figure 2) and fishing effort (Figure 7) centered southwest of the western Aleutians in all years except 1965 and 1970. In late May 1965, a very large catch was taken to the east between 175°E and 175°W. This catch was the vanguard of one of the largest Bristol Bay runs in
history, and fishing effort was concentrated in the east to intercept the large run. In late May 1970, the fleet again deployed to the eastward to exploit a peak Bristol Bay run, but catch was lower than in 1965. Fredin and Worlund (In press) point out that all maturing sockeye salmon east of 175°E can be considered to be of Bristol Bay origin.

The distribution of the sockeye salmon catch in June varied from year to year, generally in relation to the cycle of the Bristol Bay sockeye run. In most off-years of the Bristol Bay cycle (1958-59, 1962-64, and 1967-69), sockeye catches in June were concentrated off the western Aleutian Islands. In peak years of the cycle (1956, 1960, 1965, and 1970), sockeye catches during June were usually largest in the eastern sector of the mothership fishing area. In 1957 and 1961 (peak years plus one of the cycle), large catches of sockeye were also made in the eastern sector of the mothership fishing area in June. Sockeye catches in that sector during June in 1966 (also a peak year plus one of the cycle) were not as large, however.

From early July to the season's end, sockeye salmon were caught mainly off east Kamchatka and southwest of the western Aleutians in the western North Pacific Ocean and (some years) in the western Bering Sea (Figure 2). Years of exception when fairly good sockeye catches also were made south of the Aleutian Chain were: 1956, early July, when fishing was restricted west of 170°25'E by the Soviet Union; 1964, late July-early August; 1968-70, mid-July. Sockeye taken from late June to season's end south of the Chain are mainly immature fish.

Sockeye salmon catches by the mothership fishery in Bristol Bay peak years and peak years plus one averaged 37% higher than in off years (from Table 2).
Chum salmon

Chum salmon, representing a great diversity of stocks, are taken during all parts of the season. The majority of chum salmon are considered to be of Asian origin, based on tagging data (R. A. Fredin, personal comm.). No cyclic fluctuations are evident in chum salmon catches on the high seas. Best yearly catches were made in 1955, 1956, and 1958.

During the 1950's and early 1960's, best chum salmon catches were taken from May to early July (most years) with good fishing (some years) extending into late July or early August. In later years, 1967-70, best chum salmon catches invariably were taken late in the season in mid-July. Late-season chum salmon consist of both maturing and immature fish.

Geographic distribution of chum salmon catches (Fig. 3) in May followed much the same pattern as sockeye catches. Catches centered southwest of the western Aleutians each year except 1965 and 1970 when catches were farther eastward. This similarity is, of course, related to deployment of fishing effort (Fig. 7).

In June, most years, catches of chum salmon and sockeye salmon followed somewhat similar patterns of geographic distribution, but relative magnitude of catches of the two species varied. In June, 1956, 1958, 1959, and 1969, chum catches were better than sockeye. In June, 1957, 1961, and 1965, sockeye catches greatly exceeded chum catches (in both eastern and western fishing areas); in 1962, 1963, and 1967, also, sockeye catches (western areas) were greater than chum catches. In other years, catches of the two species were about even in June.
From early July to end of fishing in all years, chum catches were mainly from two areas, one off southeast Kamchatka, the other in the northern Bering Sea; in 1967-70, best area was the Bering Sea. Additionally, chum salmon were taken in fair numbers south of the Aleutian Chain in late season, 1964 and 1970.

Pink salmon

Pink salmon are taken mainly from mid-June to mid-July in the mothership fishery. Nearly all pink salmon taken are considered to be of Asian origin, based on tagging data (Fredin, personal comm.). Pink salmon invariably consist of 2-year-old fish and fluctuate on a 2-year cycle of abundance. All pink salmon taken are maturing fish. Pink salmon catches in odd-numbered years averaged two times the catches in even-numbered years for 1956-70 (from Table 2). Pink salmon catches were especially good in 1957 and 1959. Pink salmon catches (Figure 4) showed a relationship to fishing effort (Figure 7) from late June to mid-July in years when pink salmon were abundant.

Considering even-numbered years first, 1956 pink salmon catches were very good from mid-July to early August off southeast Kamchatka. In 1958, excellent catches of pink salmon were made off southeast Kamchatka from mid-June to August. In subsequent even years, pink salmon catches were low and were taken mainly southwest of the western Aleutians from early June to mid-June and in the western Bering Sea from late June to early July.
Considering odd-numbered years, 1957 pink salmon catches were very good off southeast Kamchatka and fairly good in the Bering Sea from late June to mid-July. In 1959, excellent pink salmon catches were made from mid-June to early July off southeast Kamchatka and southwest of the western Aleutians; good catches were made in July in the western Bering Sea. In 1961, pink salmon catches were low and were taken mainly southwest of the western Aleutians from late June to mid-July. Sockeye salmon fishing was good in 1961, shortening the fishing season and lowering fishing effort on pink salmon. In 1963, pink salmon catches were taken mainly in June southwest of the western Aleutians and July in the western Bering Sea. In 1965 and 1967, pink salmon were taken mainly from mid-June to mid-July--at first southwest of the western Aleutians and later in the western Bering Sea. In 1969, pink salmon were caught mainly from mid-June to mid-July in the North Pacific Ocean and Bering Sea, peaking in mid-July in the western Bering Sea.

Coho salmon

Coho salmon are taken mainly in the latter part of the season from early July to early August (Figure 5). The majority of coho taken are thought to be of Asian origin, based on limited tagging data (Fredin, personal communication); nearly all are maturing fish. Coho salmon catches are predominantly from southern fishing areas, mainly south of 50°N corresponding to a southward shift of part of the fishing effort (Figure 7). No cycles are apparent in the mothership fishery catch.

Numbers of coho salmon taken show drastic annual fluctuations. In 1960-70, annual catches ranged from 0.2 million to 3.5 million fish.
Chinook salmon

Chinook salmon are taken mainly in June and July in relatively small numbers in various localities, with no obvious cyclic variation. It is believed that chinook salmon from North America represent a considerable part of the catches, based on very limited tagging data (Fredin, personal communication). Most chinook salmon taken are immature fish (R. L. Major, personal communication). Best catches (Figure 6) are made in the northern Bering Sea from late June to mid-July (usually in connection with good chum salmon catches) and to a lesser extent south of the Aleutians in July. Highest annual catches of chinook salmon were made in 1964, 1968, 1969, and 1970. Catches in 1957, 1958, and 1961 were very low and are not shown on charts.

SUMMARY

Trends in geographic distribution and in relative magnitude of the catches of five species of salmon and of fishing effort by the Japanese mothership fishery in the North Pacific Ocean and Bering Sea are shown by means of contoured charts according to time period each season, 1956-70.

At the beginning of the season in May, catches consisted predominantly of sockeye and chum salmon. In June, catches were also mainly of sockeye and chum salmon but with pink salmon making a strong showing. In July, sockeye, chum, and pink salmon predominated, and in some years coho salmon were also strong. Chinook salmon were taken mainly in June and July in limited numbers. The fishing season usually ended in July, but in some years (especially early years) extended into August.
Fishing effort and catches in May were centered in an area southwest of the western Aleutians in all years except 1965 and 1970. In 1965 and 1970, large catches of Bristol Bay sockeye salmon were taken in eastern fishing areas in late May, even though in 1970 the sockeye catches were below expectations. This eastward concentration of the fleet continued into June both years. In other years of good Bristol Bay runs, particularly 1957, 1960 and 1961, a major part of the fleet shifted to the east and northeast for varying periods in June. In Bristol Bay off years, most fishing effort in June remained centered southwest of the western Aleutians off southeast Kamchatka. In July (and to the end of the season), fishing effort was deployed mainly off southeast Kamchatka and in the Bering Sea for sockeye, chum, and pink salmon (pink salmon in the Bering Sea mainly in odd-numbered years). In certain years, a part of the fleet fished in southern fishing areas for coho salmon, making good catches in July and August. Chinook salmon were taken mainly in the Bering Sea and to a lesser extent south of the Aleutians.

ACKNOWLEDGMENT

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LITERATURE CITED


Fukuhara, Francis M.

International North Pacific Fisheries Commission.

Manzer, J. I., T. Ishida, A. E. Peterson, and M. G. Hanavan.

Office of Foreign Fisheries, Bureau of Commercial Fisheries.

Peterson, A. E.
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Table 2.--Salmon catches and fishing effort of the Japanese mothership salmon fishery, 160°E to 175°W, 1952-70.
Table 1.--Salmon quotas and catches of the Japanese mothership fishery in the North Pacific Ocean and Bering Sea, 1956-70.

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<thead>
<tr>
<th>Year</th>
<th>Quota</th>
<th>Catch</th>
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<td>*</td>
<td>76,823</td>
</tr>
<tr>
<td>1957</td>
<td>87,000</td>
<td>87,000</td>
</tr>
<tr>
<td>1958</td>
<td>*</td>
<td>85,119</td>
</tr>
<tr>
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<td>*</td>
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<td>53,975</td>
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<tr>
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<td>53,600</td>
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<td>44,665</td>
<td>44,601</td>
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<td>44,665</td>
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<td>45,478</td>
<td>45,429</td>
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<tr>
<td>1966</td>
<td>38,981</td>
<td>38,930</td>
</tr>
<tr>
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<td>42,635</td>
<td>42,542</td>
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<tr>
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<td>37,763</td>
<td>37,642</td>
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<td>40,400</td>
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<tr>
<td>1970</td>
<td>36,545</td>
<td>36,409</td>
</tr>
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*Quotas for 1956, 1958, and 1959 for the North Pacific Ocean and Bering Sea only (excluding Okhotsk Sea and Area A land-based gillnet fishery) were not available. Catches as shown, however, approximate quotas for the North Pacific Ocean and Bering Sea in those years.
Table 2.--Salmon catches and fishing effort of the Japanese mothership salmon fishery, 160°E to 175°W, 1952-70.

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<th>Pink</th>
<th>Coho</th>
<th>Chinook</th>
<th>Total fishing effort</th>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Millions of fish</td>
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<td>0.7</td>
<td>+</td>
<td>+</td>
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</tr>
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<td>2.9</td>
<td>0.3</td>
<td>+</td>
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</tr>
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<td>8.3</td>
<td>2.7</td>
<td>0.7</td>
<td>0.1</td>
<td>15.2</td>
</tr>
<tr>
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<td>+</td>
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<tr>
<td>1964</td>
<td>7.1</td>
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<td>1965</td>
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<td>1.2</td>
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<td>1966</td>
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<td>19.2</td>
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<td>1967</td>
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<td>1969</td>
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</tr>
<tr>
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<td>1.7</td>
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<td>109.0</td>
<td>23.1</td>
<td>3.0</td>
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<td>30.6</td>
<td>4.9</td>
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<tr>
<td>% (1960-70)</td>
<td>41.1</td>
<td>34.9</td>
<td>17.7</td>
<td>5.2</td>
<td>1.1</td>
<td>100.0</td>
</tr>
</tbody>
</table>

+ = less than 50,000 fish.

1/ A tan of gillnet is about 50 meters (164 feet) in length.
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Figure 1.--Salmon fishing area of the Japanese mothership fishery.

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Figure 2.--Catch of sockeye salmon by the Japanese mothership fishery, 1963.
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Figure 2.--Catch of sockeye salmon by the Japanese mothership salmon fishery, 1970.
Figure 3.--Catch of chum salmon by the Japanese mothership fishery, 1956.
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Figure 3.--Catch of chum salmon by the Japanese mothership fishery, 1962.
Figure 3.—Catch of chum salmon by the Japanese mothership fishery, 1963.
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Figure 3.--Catch of chum salmon by the Japanese mothership salmon fishery, 1969.
Figure 3.—Catch of chum salmon by the Japanese mothership salmon fishery, 1970.
Figure 4.--Catch of pink salmon by the Japanese mothership fishery, 1956.
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Figure 4.—Catch of pink salmon by the Japanese mothership fishery, 1958.
Figure 4.—Catch of pink salmon by the Japanese mothership fishery, 1959.
Figure 4.--Catch of pink salmon by the Japanese mothership fishery, 1960.
Figure 4.--Catch of pink salmon by the Japanese mothership fishery, 1961.
Figure 4.--Catch of pink salmon by the Japanese mothership fishery, 1962.
Figure 4.--Catch of pink salmon by the Japanese mothership fishery, 1963.
Figure 4.—Catch of pink salmon by the Japanese mothership fishery, 1964.
Figure 4.—Catch of pink salmon by the Japanese mothership fishery, 1965.
Figure 4.—Catch of pink salmon by the Japanese mothership fishery, 1966.
Figure 4.—Catch of pink salmon by the Japanese mothership fishery, 1967.
Figure 4.--Catch of pink salmon by the Japanese mothership fishery, 1968.
Figure 4.--Catch of pink salmon by the Japanese mothership salmon fishery, 1969.
Figure 4.—Catch of pink salmon by the Japanese mothership salmon fishery, 1970.
Figure 5.--Catch of coho salmon by the Japanese mothership fishery, 1956.
Figure 5.--Catch of coho salmon by the Japanese mothership fishery, 1957.
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Figure 6.—Catch of chinook salmon by the Japanese mothership fishery, 1956.
Figure 6.—Catch of chinook salmon by the Japanese mothership fishery, 1959.
Figure 6.--Catch of chinook salmon by the Japanese mothership fishery, 1960.
Figure 6.--Catch of chinook salmon by the Japanese mothership fishery, 1962.
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Figure 6.--Catch of chinook salmon by the Japanese mothership salmon fishery, 1970
Figure 7.--Fishing effort by the Japanese mothership fishery, 1956.
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Figure 7. -- Fishing effort by the Japanese mothership fishery, 1970.
Figure 8.--Estimated catches of Asian and Bristol Bay sockeye salmon by the Japanese mothership fishery, 1956-1970.