



**Northwest and
Alaska Fisheries
Center**

National Marine
Fisheries Service

U.S. DEPARTMENT OF COMMERCE

NWAFRC PROCESSED REPORT 85-02

Fishing Efforts
by Net Fisheries
in the
North Pacific Ocean
and Bering Sea
Since the 1950's

January 1985

NOTICE

This document is being made available in .PDF format for the convenience of users; however, the accuracy and correctness of the document can only be certified as was presented in the original hard copy format.

Inaccuracies in the OCR scanning process may influence text searches of the .PDF file. Light or faded ink in the original document may also affect the quality of the scanned document.

FISHING EFFORTS BY NET FISHERIES IN THE
NORTH PACIFIC OCEAN AND BERING SEA SINCE THE 1950's

By

R. A. Fredin

Natural Resource Consultants
4055 21st Avenue West
Seattle, Washington 98199

A contribution to cooperative agreement with
Resource Ecology and Ecosystem Simulation Task
Resource Ecology and Fisheries Management Division
Northwest and Alaska Fisheries Center

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northwest and Alaska Fisheries Center
7600 Sand Point Way N.E.
Building 4, BIN C15700
Seattle, Washington 98115

January 1985

FISHING EFFORTS BY NET FISHERIES IN THE NORTH
PACIFIC OCEAN AND BERING SEA SINCE THE 1950's

R. A. Fredin
Natural Resources Consultants
4055 21st Avenue West
Seattle, WA 98199
January 1985

ABSTRACT

A synthesis of data on the amount of fishing effort generated by a number of net fisheries in the North Pacific Ocean and Bering Sea since the 1950's is presented here so as to provide background information relevant to studies of the fate and impact of marine debris in the North Pacific Ocean. It is estimated that total trawl fishing effort in the Bering Sea-Aleutian Islands-northeast Pacific Ocean more than tripled between 1956-60 and 1971-75. Currently, overall effort remains near the high level of the early 1970's, but trends have differed between areas and fisheries. Gillnet effort by high seas salmon fisheries in the Bering Sea and central-western North Pacific Ocean currently is less than one-half of what it was in the late 1950's and early 1960's. A tanglenet fishery for crabs in southeastern Bering Sea was terminated in 1973, and a herring gillnet fishery in the Bering Sea was terminated in 1980. Peak effort for both fisheries had been in the mid-1960's.

INTRODUCTION

The history of commercial exploitation of fishery resources in the North Pacific Ocean and adjacent seas goes back more than a century, but it has only been within the past thirty years or so that a number of major net fisheries have developed for various species of fish. These include trawl fisheries for groundfish in the eastern and central Bering Sea, around the Aleutian islands, and in the northeast Pacific Ocean; gillnet and trawl fisheries for herring in the Bering Sea; a tanglenet fishery for crabs in southeastern Bering Sea; and drift gillnet fisheries for salmon in the Bering Sea and central and western North Pacific Ocean. Scale of development and duration of the various fisheries are indicated in published reports of catch statistics, but data on the amount of fishing effort generated by those fisheries over the years are not readily available in the literature. A synthesis of such data is presented here to provide background information relevant to studies of the fate and impact of marine debris in the North Pacific Ocean.

BERING SEA-ALEUTIAN ISLANDS REGION

Groundfish, Shrimp and Herring Trawl Fisheries

Post-World War II fishing by foreign trawlers in the Bering Sea-Aleutian Islands region (Figure 1) began in 1954 when Japanese vessels initiated a fishery for flatfish in waters east of 170°W. Fishing was largely exploratory in nature and limited in scale until 1959 when Soviet trawlers, after having conducted surveys of fishery resources in the region in 1954 and 1958, also

started fishing for groundfish (and herring) on a commercial scale in eastern Bering Sea. From that year through 1962, there was a marked increase in trawling by the two nations, judging from catches reported for Japanese and Soviet vessels and information on the numbers of mothership fleets and independent trawlers engaged in Japan's fishery (Forrester et al, 1978).

Overall growth of the Japanese and Soviet trawl fisheries during 1954-62 is indicated by annual catches of groundfish and herring, as given by Forrester et al:

Year	Groundfish Catch (1,000 m.t.)			Herring Catch (1,000 m.t.)	
	Japan	USSR	Total	USSR	
1954	13	-	13	-	
1955	15	-	15	-	
1956	25	-	25	-	
1957	24	-	24	-	
1958	46	5	51	-	
1959	159	62	221	10	
1960	435	96	531	10	
1961	533	154	687	80	
1962	476	140	616	150	

Since 1963, Japan has reported not only the catches taken by the various types of trawlers used in its groundfish fishery but also the number of hours fished annually or, in the case of Danish seiners, the number of sets made, which can be converted to hours of fishing (Appendix 1-A). Hours of fishing by Japanese shrimp trawlers have also been reported for each year of operation since 1963.

Fishing effort by Soviet groundfish trawlers during 1963-76 can be estimated from their annual catches and data on effort per unit catch (EPC) for Japanese trawlers, that is, the hours of fishing per ton of groundfish

caught (Appendix 1-B). Fishing effort by Soviet herring trawlers during 1963-76 can be directly estimated from catch and catch-per-unit-effort data provided by the USSR (Appendix 1-C). Since 1977, 1976, 1977, 1979 and 1980, in that order, the USSR, Republic of Korea, Taiwan, Poland and West Germany have reported the number of hours fished annually by their respective trawlers (Appendix 1-A). Fishing effort by U.S. trawlers engaged in domestic and joint venture groundfish fisheries in the region since 1980 can be estimated from catches reported for those fisheries and EPC data for foreign trawlers combined (Appendix 1-D).

Total annual trawl fishing effort for groundfish, shrimp and herring during 1963-83, as reported or estimated for foreign and U.S. vessels in the Bering Sea-Aleutian Islands region, is given in Table 1 and shown in Figure 2. Effort was about 340,000 and 400,000 hours in 1963 and 1964, respectively, but decreased to about 250,000 hours in 1965 and 1966, mainly because of sharp drops in flatfish and herring catches by Soviet vessels. Effort then rebounded as the pollock fishery developed during the late 1960's and peaked at approximately 500,000 hours in the early 1970's. Since then it has fluctuated around a level of about 450,000 hours annually.

Effort by U.S. trawlers has accounted for an increasing fraction of the total effort in recent years, from 3% in 1980 to 18% in 1983, displacing more and more of the foreign effort.

Pre-1963 fishing effort by Japanese and Soviet trawl fisheries for groundfish can be estimated by multiplying annual catches (text table, above) by 0.5, the average EPC for groundfish caught by Japanese trawlers during 1963-67, years when the average annual Japanese-Soviet catch was about the same as it was in 1962 (Appendix 1-B). Similarly, herring trawl effort by

Soviet vessels during 1959-62 can be estimated by multiplying their annual catches of herring by 0.6, the average EPC during 1968-73 (Appendix 1-C).

Resulting estimates of annual effort during 1954-62 are as follows:

<u>Year</u>	Estimates of annual trawl fishing effort (1,000 hr)			
	Groundfish		Herring	<u>Total</u>
	<u>Japan</u>	<u>USSR</u>	<u>USSR</u>	
1954	6	-	-	6
1955	8	-	-	8
1956	12	-	-	12
1957	12	-	-	12
1958	23	2	-	25
1959	80	31	6	117
1960	218	48	6	272
1961	266	77	48	391
1962	238	70	90	398

As indicated previously by catch data, there was a rapid buildup of trawl effort beginning in 1959. By 1961, it reached the level of the early peak (1963-64) shown in Figure 2.

The areal distribution of trawl fishing effort since 1963, as indicated by data from the National Marine Fisheries Service's Northwest and Alaska Fisheries Center (NWAFC Data File) for Japanese fisheries, which accounted for approximately three-fourths of the total trawl effort in the region during 1963-83, has been as follows:

<u>Years</u>	Ave. annual effort (1,000 hr)	Percent effort by area			
		<u>1</u>	<u>2</u>	<u>3+4</u>	<u>5</u>
1963-69	236	39	45	10	6
1970-76	370	24	56	14	6
1977-83	367	29	53	+	18

Effort shifted from Area 1 to Area 2 in the early 1970's as the pollock fishery developed, and the closure of the USSR 200-mile zone in 1977 led to a shift in effort from Areas 3 and 4 to Area 5 (the Aleutians area).

The distribution of Japanese fishing effort by vessel type (Appendix 1-A) has been as follows:

<u>Years</u>	Percent of average annual effort by vessel type					
	<u>Pair trawl</u>	<u>Side trawl-fish</u>	<u>Stern trawl-fish</u>	<u>Danish seine</u>	<u>Side trawl-shrimp</u>	<u>Stern trawl-shrimp</u>
1963-69	6	12	20	59	3	+
1970-76	11	+	63	25	+	+
1977-83	8	0	83	9	+	+

Danish seiners and side trawlers fishing for groundfish accounted for most of the fishing effort through most of the 1960's, but stern trawlers have since become the predominant type of vessel used in the region. They presently account for about 85% of the total annual effort.

Herring Gillnet Fishery-Japan

The Japanese herring gillnet fishery in the Bering Sea peaked in the mid-1960's (Table 2 and Figure 3), when practically all of the fishing effort was in Areas 3 and 4, near the U.S.S.R. coast. During the 1970's, practically all of the fishing was done east of 170°W (Area 1). At its peak in 1965, cumulative total effort during the year represented about 37,000 km of gillnet (one tan being a 46 m length of gillnet). The fishery was terminated in 1980.

Crab Tanglenet Fishery-Japan

Japan's crab tanglenet fishery in southeastern Bering Sea began in 1953 and terminated in 1973. Peak effort (Table 2 and Figure 4) was in 1963-64, representing a cumulative total of about 26,000 km of gillnet set during a season, one tan being a 40 m length of net in this instance.

NORTHEAST PACIFIC REGION

Foreign and Joint Venture Groundfish Trawl Fisheries

Foreign trawling for groundfish began in the northeast Pacific region (Figure 5) in 1962, when Soviet trawlers initiated a fishery for rockfish in the Gulf of Alaska. Japan started fishing in 1963. In 1966, both nations extended their fishing operations to waters off British Columbia and Washington and Oregon, Soviet vessels accounting for most of the effort by a wide margin. The Republic of Korea and Poland began fishing in the region in the early 1970's, and Canadian and U.S. vessels initiated joint venture fisheries with other nations in 1978.

Japan has reported the number of hours fished annually by vessels in its groundfish trawl fishery in the region since 1963, and the U.S.S.R., ROK and Poland since 1977 (Appendix 2-A). Effort in the Gulf of Alaska by trawlers of the latter three nations prior to 1977 can be estimated from their catches and EPC data for Japanese stern trawlers (Appendix 2-B). Effort by Soviet trawlers off British Columbia in 1966, when they targeted on rockfish, can be similarly estimated (Appendix 2-C). Trawl effort by the U.S.S.R. and Poland

off British Columbia during 1967-76 and off Washington-Oregon-California during 1966-76 can be estimated from the catches of hake by the two nations and EPC data for the Soviet hake trawl fishery (Appendices 2-C and 2-D). Effort by Canadian and U.S. trawlers involved in joint venture fisheries in different sectors of the region since 1978 can be estimated from their groundfish catches and EPC data for the combined trawl fisheries of Japan, U.S.S.R., ROK and Poland (Appendix 2-E).

Total annual trawl effort for groundfish by foreign and joint venture fisheries in the northeast Pacific region during 1962-83, as reported or estimated and excluding a relatively minor amount of effort by Japanese Danish seiners, side trawlers and shrimp trawlers in the mid-1960's, is given in Table 3 and shown in Figure 6.

Effort increased from slightly less than 15,000 hours in 1962 to nearly 170,000 hours in 1967, decreased to the 100,000-hour level during the next five years, and built up again to 180,000 hours in 1975. It then dropped to about 70,000 hours by 1978, and has since fluctuated between 80 and 100 thousand hours annually. Current level of effort is about 55% of the 1974-76 level.

Foreign trawl effort has declined markedly in the region as a whole since Canada and the U.S. established 200-mile fisheries jurisdiction zones. Effort by vessels engaged in joint venture fisheries has offset a substantial portion of the reduction in foreign fishing.

Trends in trawl fishing effort by foreign and joint venture vessels have varied in different sectors of the northeast Pacific region (Figure 7). In the Gulf of Alaska, the overall trend in effort has been upward, although the current level of effort is less than it was in 1975-76. Off British Columbia,

effort peaked at nearly 30,000 hours in 1969 and then declined over the next ten years. It has held at about 7,000 hours in recent years (through 1983). Off Washington-Oregon-California, the overall trend in effort has been downward. Effort in 1983 was less than one-third of the mid-1970's level and only one-sixth of the 1967 peak. Effort in joint venture fisheries in the Gulf of Alaska and off Washington-Oregon-California has increased markedly in the past three years.

Domestic Groundfish Trawl Fisheries - Canada and U.S.

Long before the advent of foreign and joint venture trawl fishing operations in the northeast Pacific region, Canada and the U.S. had domestic trawl fisheries for groundfish off British Columbia and Washington-Oregon-California. Annual effort by the domestic fisheries during 1956-83, as reported in publications of the International North Pacific Fisheries Commission or estimated in Appendix 3, is given in Table 4 and shown in Figure 8.

Total annual effort by the U.S. and Canadian domestic trawl fisheries for groundfish off British Columbia has been fairly stable since 1956. Effort off Washington-Oregon-California by the U.S. domestic trawl fishery also was fairly stable for about 15 years (1956-71), but it has since more than doubled.

JAPANESE HIGH SEAS SALMON GILLNET FISHERIES

Mothership Salmon Gillnet Fishery

Japan's post-World War II mothership salmon gillnet fishery began in 1952. Area of operation during 1959-76 is shown in Figure 9. Prior to 1959, some mothership fleets operated west of 160°E in the North Pacific Ocean and in the Okhotsk Sea. In 1977, the U.S.S.R. 200-mile zone was closed to high seas salmon fishing, and in 1978 waters east of 175°E and south of 56°N were also closed.

Annual fishing effort during 1952-82 in the area depicted in Figure 9 is given in Table 5 and shown in Figure 10. Effort is expressed in the cumulative number of tans of drift gillnet fished each year, one tan representing 50 m of net.

Peak effort was in 1956, at close to 9 million tans. It declined over the next 20 years to about 6 million tans in 1976. Areal closures in 1977 and 1978 resulted in cutting the level of effort to about 3 million tans, all west of 175°E or north of 56°N.

Landbased Salmon Driftnet Fishery

Japan's landbased salmon driftnet fishery also began in 1952. Area of operation before and after the closure of waters east of 175°E in 1978 is shown in Figure 9.

Data on annual fishing effort by large vessels in the fishery, which are licensed to fish throughout the landbased driftnet area (the smaller vessels

being restricted to waters west of 149°E) and account for approximately 85% of the total catch, are available for 1962 and 1972-82 (Table 6 and Figure 11).

The limited effort data for the landbased salmon driftnet fishery point to a reduction in effort over the years similar in scale and timing of the reduction in effort for the mothership salmon fishery.

OTHER HIGH SEAS GILLNET FISHERIES

Several new and major drift gillnet fisheries have developed in the central and western North Pacific Ocean within the past decade or so. These include driftnet fisheries by Japan, Republic of Korea and Taiwan for squid and a Japanese driftnet fishery for marlin and other species. Information on the amount of fishing effort generated by these fisheries is contained in documents submitted by T. Chen, Y. Gong and K. Ishima for the workshop in Fate and Impact of Marine Debris, held in Honolulu, Hawaii, in November 1984.

SUMMARY

Fishing by foreign trawlers in the Bering Sea-Aleutian Islands region began in 1954, but it was largely exploratory in nature and limited in scale until late in the 1950's. Between then and the early 1970's, there was a several-fold increase in fishing effort. During the past 10-12 years, the amount of effort has remained near the high level of the early 1970's, with effort by U.S. vessels engaged in domestic and joint venture fisheries accounting for an increasing fraction of the total effort in recent years.

In the northeast Pacific region, foreign trawlers began fishing for groundfish in 1962. Fishing effort by those vessels increased greatly in the mid-1960's, declined somewhat for a few years in the late 1960's, and then rose to a record high in 1975. It has since fallen off sharply, but fishing effort by U.S. vessels in joint venture fisheries, and to some extent by Canadian vessels engaged in similar fisheries off British Columbia, has offset a substantial portion of the reduction in foreign fishing. Current level of effort by the combined foreign and joint venture fisheries is about 55 percent of the 1974-76 peak reached by foreign trawlers.

Effort by Canadian and U.S. vessels in domestic trawl fisheries for groundfish from northern Washington to Dixon Entrance (INPFC's Charlotte and Vancouver areas) has been relatively stable since 1956. Farther south off the coast of Washington and off Oregon and California, the U.S. domestic trawl effort for groundfish also was fairly stable during 1956-71, but it has more than doubled since then.

Total trawl effort for (a) foreign and joint venture fisheries in the Bering Sea-Aleutian Islands and northeast Pacific regions and (b) U.S. and Canadian domestic trawl fisheries for groundfish from British Columbia to California has more than tripled since 1956. Estimates of annual average effort (Tables 1, 3 and 4) are as follows:

<u>Years</u>	<u>Ave. ann. effort-1,000 hr</u>
1956-60	234
1961-65	537
1966-70	641
1971-75	782
1976-80	764
1981-81	794

Fishing effort by the Japanese mothership salmon fishery, a high seas drift gillnet fishery in the Bering Sea and central-western North Pacific Ocean, currently is about one-half of what it was during 1960-76 and an even smaller fraction of the level of effort in the late 1950's. Limited data for the Japanese landbased driftnet fishery, another high seas net fishery for salmon in the North Pacific Ocean, point to a similar reduction in fishing effort by that fishery. There has been no high seas gillnetting for salmon in the USSR 200-mile zone since 1977 or east of 175°E longitude, south of 56°N latitude, since 1978.

Japan's tanglenet fishery for crabs in southeastern Bering Sea was terminated in 1973, after twenty years of operation, and Japan's herring gillnet fishery in the Bering Sea terminated in 1980. Peak effort for both fisheries had been in the mid-1960's.

LITERATURE CITED

- Berger, Jerald, Janet Wall and Russell Nelson, Jr. 1984. Summary of U.S. observer sampling of foreign and joint venture fisheries in the northeast Pacific Ocean and eastern Bering Sea, 1983. (Document submitted to the annual meeting of the International North Pacific Fisheries Commission, Vancouver, B.C., Canada, October 1984.) Northwest and Alaska Fisheries Center, National Marine Fish. Serv., NOAA, 2725 Montlake Blvd. E., Seattle, WA 98112. 209 pp.
- Forrester, C. R., A. J. Beardsley and Y. Takahashi. 1978. Groundfish, shrimp, and herring fisheries in the Bering Sea and northeast Pacific-- Historical catch statistics through 1970. Int. North Pac. Fish. Comm., Bull. 37. 147 pp.
- International North Pacific Fisheries Commission. Statistical Yearbooks for the years 1952-80. Vancouver, B.C., Canada. Various pagination.
- Leaman, J. E. 1983. Catch and effort statistics of the Canadian groundfish fishery on the Pacific Coast in 1982. (Document submitted to the annual meeting of the International North Pacific Fisheries Commission, Vancouver, B.C., Canada, September 1983.) Fisheries and Oceans, Nanaimo, B.C., Canada.

Manzer, J. E., T. Ishida, A. E. Peterson and M. G. Hanavan. 1965. Salmon of the North Pacific Ocean, Part V: Offshore Distribution of Salmon. Int. North Pac. Fish. Comm., Bull. 15. 452 pp.

Murai, Sueto, Harold A. Gangmark and Robert R. French. 1981. All-nation removals of groundfish, herring and shrimp from the eastern Bering Sea and northeast Pacific Ocean, 1964-80. NOAA Tech. Memo. NMFS F/NWC-14. Northwest and Alaska Fish. Ctr., NMFS, NOAA, 2725 Montlake Blvd. E., Seattle, WA 98112.

Pacific Marine Fisheries Commission. Annual reports for 1981-83. Portland, OR. Various pagination.

Pruter, A. T. 1976. Soviet fisheries for bottomfish and herring off the Pacific and Bering Sea coasts of the United States. Mar. Fish. Rev. 38(12):1-15.

Table 1. Trawl fishing effort for groundfish, shrimp and herring by foreign and U.S. fisheries in the Bering Sea-Aleutians region, 1963-1983 (thousands of hours).

Year	Japan		USSR		ROK	Taiwan	W. Ger.	Poland	Total	U.S.	Total
	Groundfish & herring	Shrimp	Groundfish	Herring			Groundfish		Foreign Nations	Domestic & Joint Venture	All Nations
1963	172	-	75	90	-	-	-	-	337	-	337
1964	203	-	90	105	-	-	-	-	398	-	398
1965	168	23	55	-	-	-	-	-	246	-	246
1966	182	18	44	-	-	-	-	-	244	-	244
1967	262	2	63	-	-	-	-	-	327	-	327
1968	301	7	44	13	-	-	-	-	365	-	365
1969	310	2	54	50	-	-	-	-	416	-	416
1970	369	4	58	76	-	-	-	-	507	-	507
1971	390	4	86	27	-	-	-	-	507	-	507
1972	402	-	87	13	-	-	-	-	502	-	502
1973	341	-	68	9	-	-	-	-	418	-	418
1974	374	-	107	12	-	-	-	-	493	-	493
1975	357	-	93	9	-	-	-	-	459	-	459
1976	354	+	82	10	56	-	-	-	502	-	502
1977	371	+		27	8	1	-	-	407	-	407
1978	380	-		53	17	2	-	-	452	-	452
1979	367	-		33	26	1	-	5	432	-	432
1980	391	-		1	38	2	2	13	447	13	460
1981	364	-		-	30	4	3	12	413	30	443
1982	358	-		-	29	6	3	-	396	45	441
1983	330	-		-	32	-	-	-	362	82	444

Data Sources:

Japan, ROK, Taiwan, West Germany and Poland: Appendix 1, Part A.

U.S.S.R.: Groundfish, 1963-76: Appendix 1, Part B; Herring, 1963-76: Appendix 1, Part C; Groundfish and herring combined, 1977-83: Appendix 1, Part A.

U.S.: Appendix 1, Part D.

Table 2. Gillnet fishing effort for herring in the Bering Sea, 1963-79, and tanglenet fishing effort for crabs in southeastern Bering Sea, 1953-72 (thousands of tans).

Year	Japan	
	Herring Gillnet Fishery	Crab Tanglenet Fishery
1953		106
1954		61
1955		99
1956		147
1957		84
1958		99
1959		78
1960		93
1961	NA	292
1962	NA	438
1963	225	642
1964	454	639
1965	816	452
1966	503	447
1967	556	440
1968	404	485
1969	174	272
1970	84	252
1971	134	28
1972	122	12
1973	131	Fishery Terminated
1974	96	
1975	46	
1976	128	
1977	53	
1978	-	
1979	9	
1980	Fishery Terminated	

Data Sources: Herring, 1963-70: INPFC Bull. 37; 1971-79: INPFC Stat. Yearbooks.

Crabs: INPFC Stat. Yearbooks.

Table 3. Trawl fishing effort for groundfish in the Northeast Pacific Region by Japanese, Soviet, ROK, Polish, Canadian joint-venture and U.S. joint-venture fisheries, 1962 to 1983, in thousands of hours.

Area	Year	Foreign				Total	Joint Venture			Total
		Japan	USSR	ROK	Poland		Can-JV	US-JV	Total	
Gulf of Alaska	1962	-	13	-	-	13	-	-	-	13
INPFC areas:	1963	2	27	-	-	29	-	-	-	29
Shumagin to	1964	3	35	-	-	38	-	-	-	38
Southeastern	1965	8	51	-	-	59	-	-	-	59
	1966	13	12	-	-	25	-	-	-	25
	1967	14	15	-	-	29	-	-	-	29
	1968	16	13	-	-	29	-	-	-	29
	1969	24	6	-	-	30	-	-	-	30
	1970	15	2	-	-	17	-	-	-	17
	1971	19	9	-	-	28	-	-	-	28
	1972	29	24	1	-	54	-	-	-	54
	1973	37	24	2	-	63	-	-	-	63
	1974	36	31	1	-	68	-	-	-	68
	1975	39	52	6	1	98	-	-	-	98
	1976	35	40	7	-	82	-	-	-	82
	1977	34	15	5	+	54	-	-	-	54
	1978	28	14	5	1	48	-	+	+	48
	1979	23	7	5	4	39	-	+	+	39
	1980	32	17	4	3	56	-	1	1	57
	1981	36	-	8	8	52	-	5	5	57
	1982	29	-	6	-	35	-	22	22	57
	1983	29	-	3	-	32	-	39	39	71
British Columbia*	1962	-	-	-	-	-	-	-	-	-
INPFC areas:	1963	-	-	-	-	-	-	-	-	-
Charlotte &	1964	-	-	-	-	-	-	-	-	-
Vancouver	1965	-	-	-	-	-	-	-	-	-
	1966	1	6	-	-	7	-	-	-	7
	1967	5	6	-	-	11	-	-	-	11
	1968	5	19	-	-	24	-	-	-	24
	1969	4	25	-	-	29	-	-	-	29
	1970	3	12	-	-	15	-	-	-	15
	1971	2	3	-	-	5	-	-	-	5
	1972	4	2	-	-	6	-	-	-	6
	1973	3	8	-	-	11	-	-	-	11
	1974	7	1	-	-	8	-	-	-	8
	1975	4	2	-	8	14	-	-	-	14
	1976	3	2	-	1	6	-	-	-	6
	1977	3	-	-	1	4	-	-	-	4
	1978	+	-	-	+	+	+	-	+	+
	1979	1	-	-	1	2	1	-	1	3
	1980	1	-	-	2	3	5	-	5	8
	1981	+	-	-	1	1	7	-	7	8
	1982	1	-	-	-	1	5	-	5	6
	1983	-	-	-	-	-	7	-	7	7

*Including waters off the U.S. Southern boundary of the Vancouver Area is 47°30'N, and the northern boundary of the Charlotte Area is 54°30'N.

Table 3.--Continued.

Area	Year	Foreign				Total	Joint Venture			Total
		Japan	USSR	ROK	Poland		Can-JV	US-JV	Total	
Washington-	1962	-	-	-	-	-	-	-	-	-
Oregon-Calif.	1963	-	-	-	-	-	-	-	-	-
INPFC areas:	1964	-	-	-	-	-	-	-	-	-
Columbia to	1965	-	-	-	-	-	-	-	-	-
Conception	1966	+	83	-	-	83	-	-	-	83
	1967	2	126	-	-	128	-	-	-	128
	1968	1	40	-	-	41	-	-	-	41
	1969	+	55	-	-	55	-	-	-	55
	1970	+	65	-	-	65	-	-	-	65
	1971	1	65	-	-	66	-	-	-	66
	1972	1	43	-	-	44	-	-	-	44
	1973	2	51	-	1	54	-	-	-	54
	1974	4	62	-	18	84	-	-	-	84
	1975	3	51	-	14	68	-	-	-	68
	1976	3	51	-	8	62	-	-	-	62
	1977	-	26	-	4	30	-	-	-	30
	1978	-	19	-	5	24	-	+	+	24
	1979	-	31	-	5	36	-	3	3	39
	1980	-	-	-	12	12	-	7	7	19
	1981	-	-	-	20	20	-	14	14	34
	1982	-	-	-	-	-	-	19	19	19
	1983	-	-	-	-	-	-	20	20	20
Total: Northeast	1962	-	13	-	-	13	-	-	-	13
Pacific Region	1963	2	27	-	-	29	-	-	-	29
	1964	3	35	-	-	38	-	-	-	38
	1965	8	51	-	-	59	-	-	-	59
	1966	14	101	-	-	115	-	-	-	115
	1967	21	147	-	-	168	-	-	-	168
	1968	22	72	-	-	94	-	-	-	94
	1969	28	86	-	-	114	-	-	-	114
	1970	18	79	-	-	97	-	-	-	97
	1971	22	77	-	-	99	-	-	-	99
	1972	34	69	1	-	104	-	-	-	104
	1973	42	83	2	1	128	-	-	-	128
	1974	47	94	1	18	160	-	-	-	160
	1975	46	105	6	23	180	-	-	-	180
	1976	41	93	7	9	150	-	-	-	150
	1977	37	41	5	5	88	-	-	-	88
	1978	28	33	5	6	72	+	+	+	72
	1979	24	38	5	10	77	1	3	4	81
	1980	33	17	4	17	71	5	8	13	84
	1981	36	-	8	29	73	7	19	26	99
	1982	30	-	6	-	36	5	41	46	82
	1983	29	-	3	-	32	7	59	65	98

Data Sources:

Japan, 1963-83: Appendix 2, Part A.

U.S.S.R., 1962-76: Appendix 2, Parts B, C and D; 1977-78, Appendix 2, Part A.

R.O.K., 1972-75: Appendix 2, Part B; 1976-83; Appendix 2, Part A.

Poland, 1973-76: Appendix 2, Parts B, C and D; 1977-83: Appendix 2, Part A.

Canada-JV and U.S.-JV: Appendix 2, Part E.

Table 4. Trawl fishing effort for groundfish by Canadian and U.S. domestic fisheries in the Northeast Pacific Region, 1956 to 1983, in thousands of hours.

Year	INPFC Areas				Total by Nation		
	Charlotte & Vancouver		Columbia-Conception		Canada	U.S.	Total
	Canada	U.S.	Total	U.S.			
1956	31	46	77	78	31	124	155
1957	26	41	67	83	26	124	150
1958	23	41	64	78	23	119	142
1959	22	49	71	74	22	123	145
1960	26	41	67	75	26	116	142
1961	23	40	63	74	23	114	137
1962	25	54	79	87	25	141	166
1963	23	48	71	72	23	120	143
1964	28	54	82	81	28	135	163
1965	29	50	79	87	29	137	166
1966	28	51	79	77	28	128	156
1967	26	46	72	71	26	117	143
1968	29	48	77	71	29	119	148
1969	33	53	86	74	33	127	160
1970	29	45	74	79	29	124	153
1971	31	41	72	85	31	126	157
1972	28	39	67	100	28	139	167
1973	24	37	61	106	24	143	167
1974	24	42	66	105	24	147	171
1975	34	44	78	122	34	166	200
1976	36	48	84	106	36	154	190
1977	35	47	82	112	35	159	194
1978	33	48	81	137	33	185	218
1979	38	52	90	148	38	200	238
1980	47	46	93	161	47	207	254
1981	39	46	85	179	39	225	264
1982	35	38	73	199	35	237	272
1983	35	39	74	174	35	213	248

Data Sources:

Canada, 1956-70: INPFC Bull. 37; 1971-80: INPFC Stat. Yearbooks; 1981: NWAFC Data File; 1982: Leaman, 1983; 1983: Assumed same as in 1982.

U.S., 1956-61: Appendix 3; 1962: INPFC Bull. 37; 1963, Charlotte & Vancouver Areas: Appendix 3; Columbia-Conception Areas: INPFC Bull. 37; 1964-70: INPFC Bull. 37; 1971-75: INPFC Stat. Yearbooks; 1976 & 1979, Charlotte-Columbia Areas: INPFC Stat. Yearbooks; Eureka-Conception Areas: Appendix 3; 1977-78 & 1980: INPFC Stat. Yearbooks; 1981, Charlotte-Columbia Areas: NWAFC Data File; Eureka-Conception Areas: Appendix 3; 1982-83: Appendix 3.

Table 5. Gillnet fishing effort by the Japanese salmon mothership fishery in the North Pacific Ocean, 1952 to 1982, in thousands of tans.

Year	West of 175°E	East of 175°E		Total	Total
		South of 56°N	North of 56°N		
1952	311	160	-	160	471
1953	1124	221	-	221	1345
1954	3225	83	-	83	3308
1955	6944	46	-	46	6990
1956	6377	2215	137	2352	8729
1957	5134	654	425	1079	6213
1958	7098	16	-	16	7114
1959	6607	218	271	489	7096
1960	4842	1029	646	1675	6517
1961	3496	1473	24	1497	4993
1962	5285	565	-	565	5850
1963	5051	535	367	902	5953
1964	5016	1483	1021	2504	7520
1965	3564	1707	840	2547	6111
1966	3785	952	459	1411	5196
1967	4165	626	443	1069	5231
1968	4118	788	1020	1808	5926
1969	3241	2013	964	2977	6218
1970	1943	2332	1754	4086	6029
1971	3261	1160	1418	2578	5839
1972	3391	639	1889	2528	5919
1973	3852	1534	462	1996	5948
1974	2870	1885	680	2565	5435
1975	3081	1903	652	2555	5636
1976	3030	1973	808	2781	5811
1977	1753	1367	862	2229	3982
1978	2562	-	158	158	2720
1979	2459	-	338	338	2797
1980	2604	-	543	543	3147
1981	2512	-	390	390	2902
1982	2451	-	485	485	2936

Data Sources: 1952-59: Manzer et al., 1965; 1960-80: INPFC Stat. Yearbooks;
1981-82: NWAFC Data File.

Table 6. Gillnet fishing effort by large vessels of the Japanese landbased salmon fishery in the North Pacific Ocean, 1962 and 1972-82.

Year	West of 175°E	East of 175°E	Total
1962	6865	-	6865
1963-71	DATA NOT AVAILABLE		
1972	3331	1825	5156
1973	4583	1169	5752
1974	5226	794	6019
1975	4933	1057	5990
1976	5436	511	5947
1977	3186	533	3719
1978	3372	-	3372
1979	3219	-	3219
1980	3144	-	3144
1981	3234	-	3234
1982	2962	-	2962

Data Sources: 1962: INPFC Circ. Letter, 21 Oct. 1963; 1972-74: Fisheries Agency of Japan (Pers. Comm.); 1975-76: INPFC Sec.; 1977: Fisheries Agency of Japan (Pers. Comm.); 1978-82: NWAFC Data File.

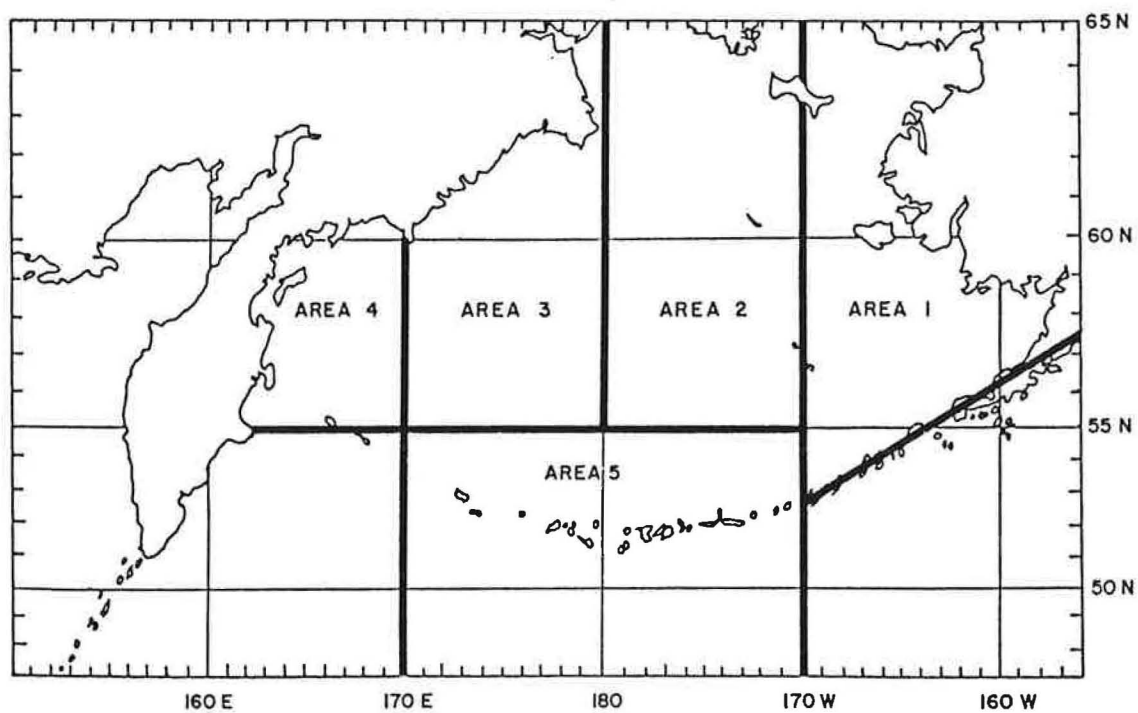


Figure 1. The "Bering Sea region" as defined by the International North Pacific Fisheries Commission, and its areal divisions.

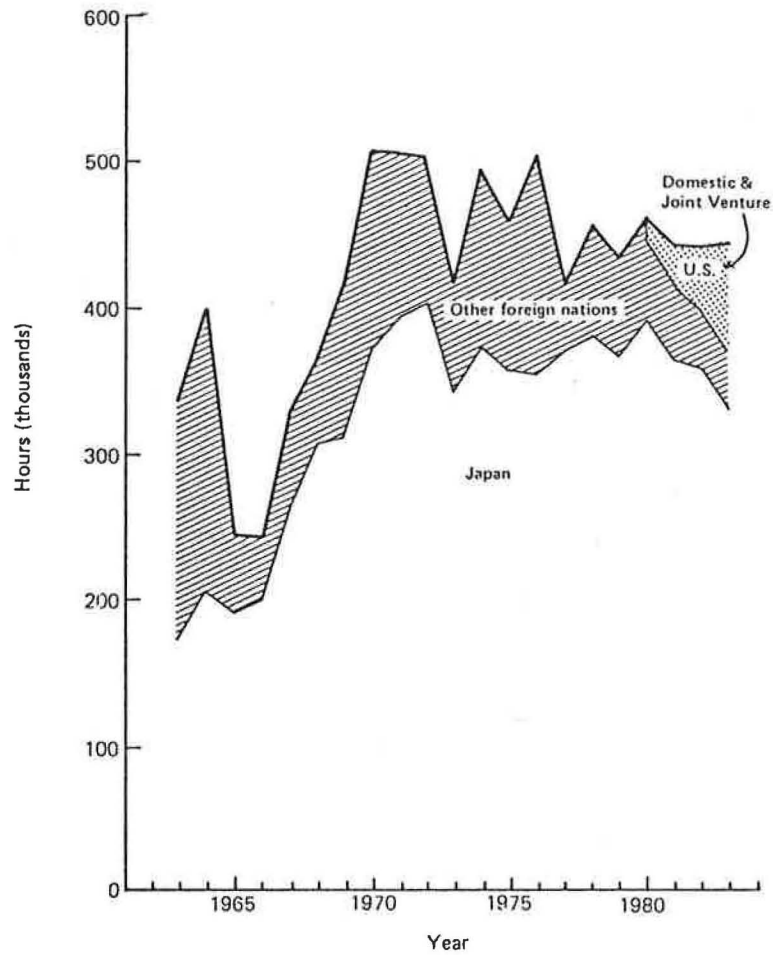


Figure 2. Trawl fishing effort for groundfish, shrimp and herring by foreign and U.S. fisheries in the Bering Sea-Aleutians region, 1963-1983.

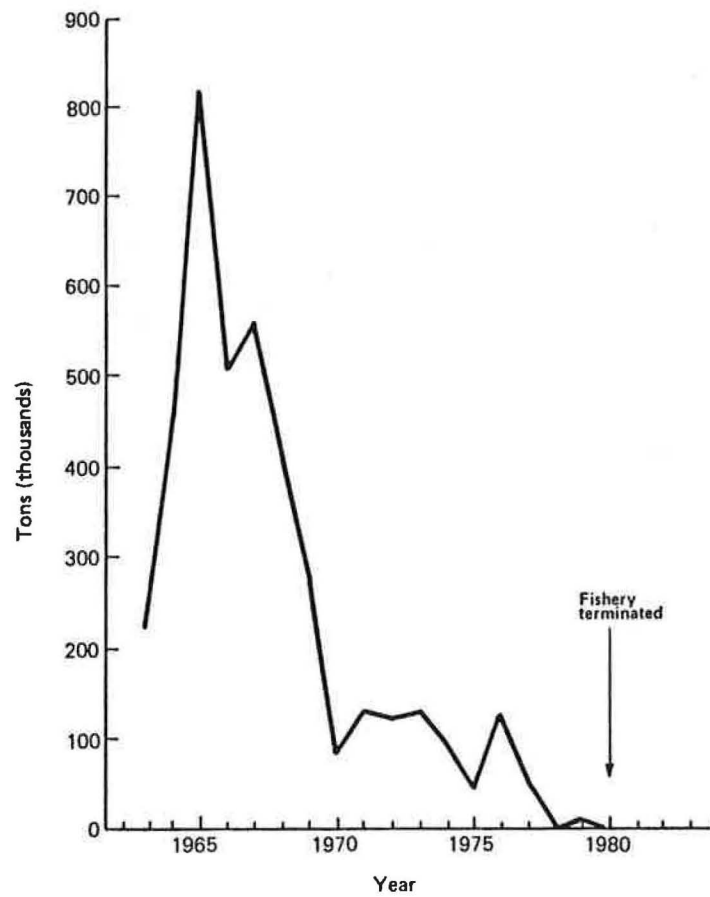


Figure 3. Gillnet fishing effort for herring by Japan in the Bering Sea, 1963-1983.

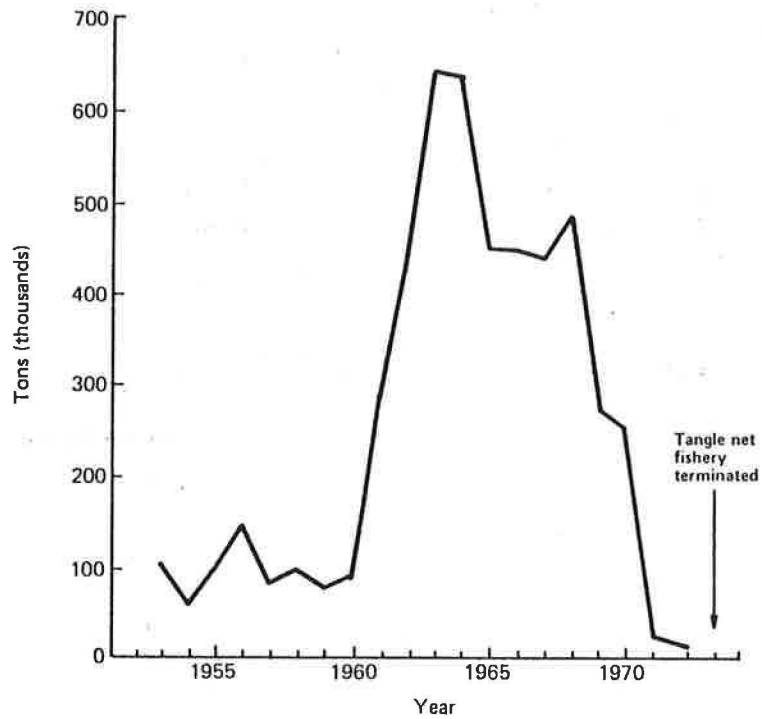


Figure 4. Tanglenet fishing effort for crabs by Japan in the southeastern Bering Sea, 1953-1972.

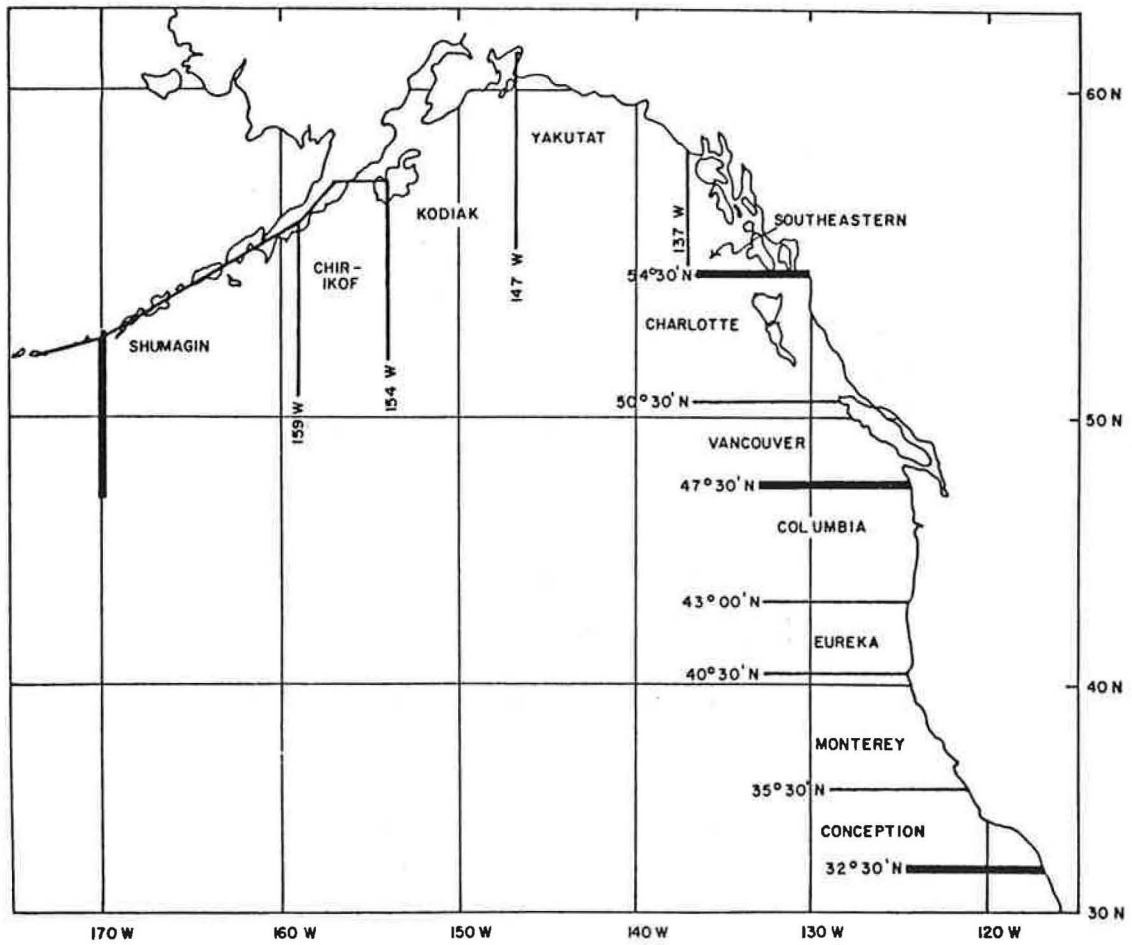


Figure 5. The "Northeast Pacific region" as defined by the International North Pacific Fisheries Commission and its areal divisions.

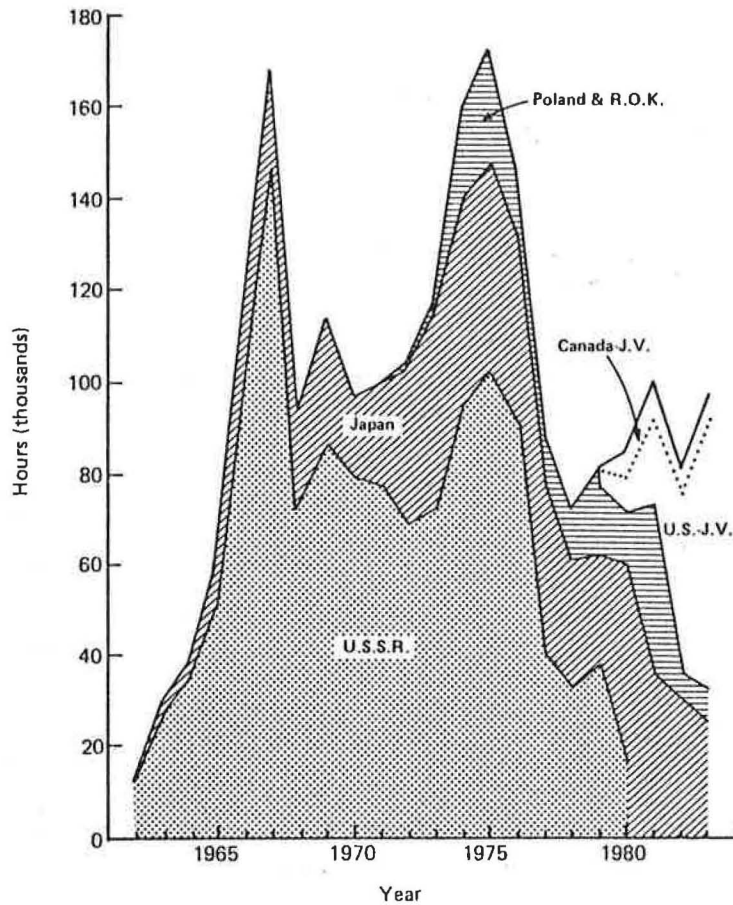


Figure 6. Trawl fishing effort for groundfish in the northeast Pacific region by Japanese, Soviet, R.O.K., Polish, Canadian Joint-venture and U.S. Joint-venture fisheries, 1962-1983.

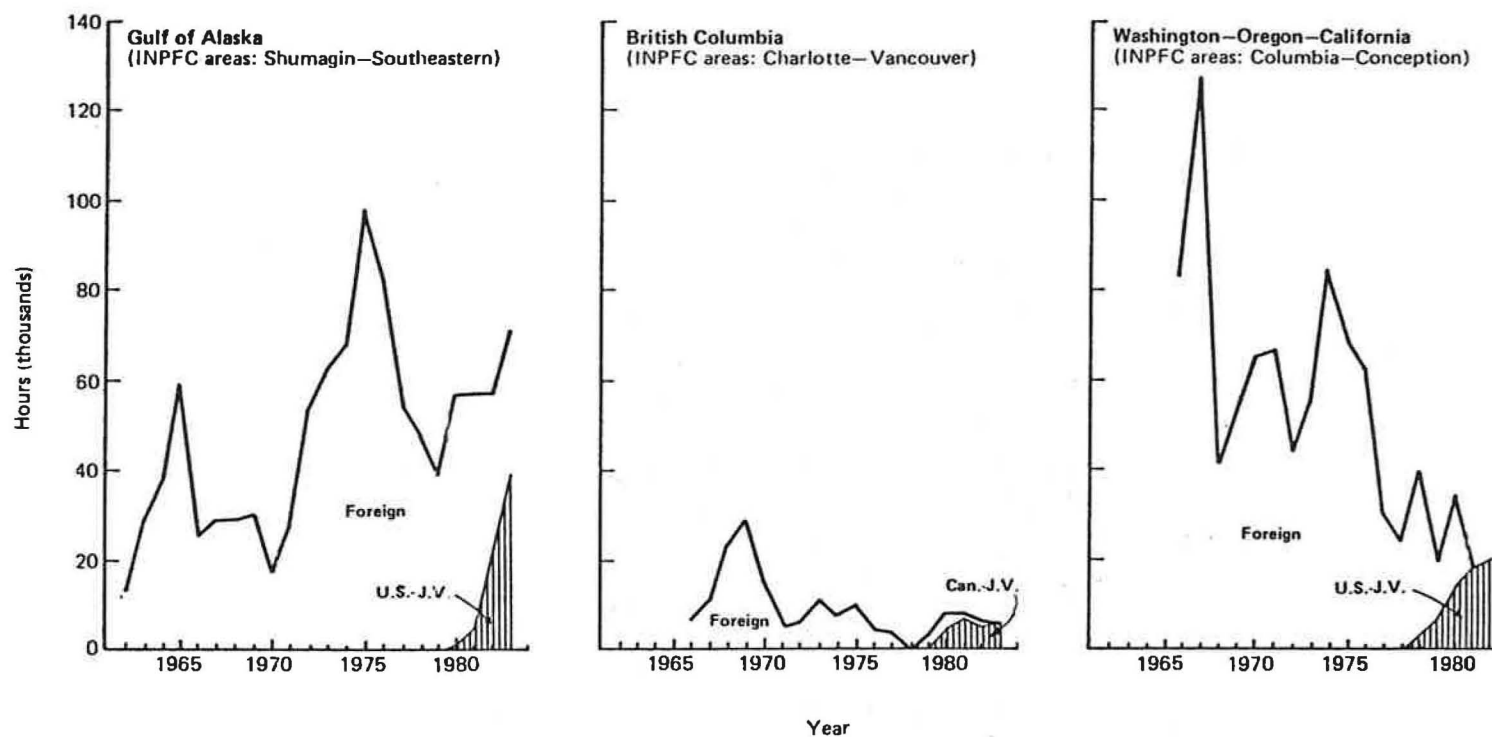


Figure 7. Trawl fishing effort for groundfish in different sectors of the Northeast Pacific region by foreign and joint-venture fisheries, 1962-1983.

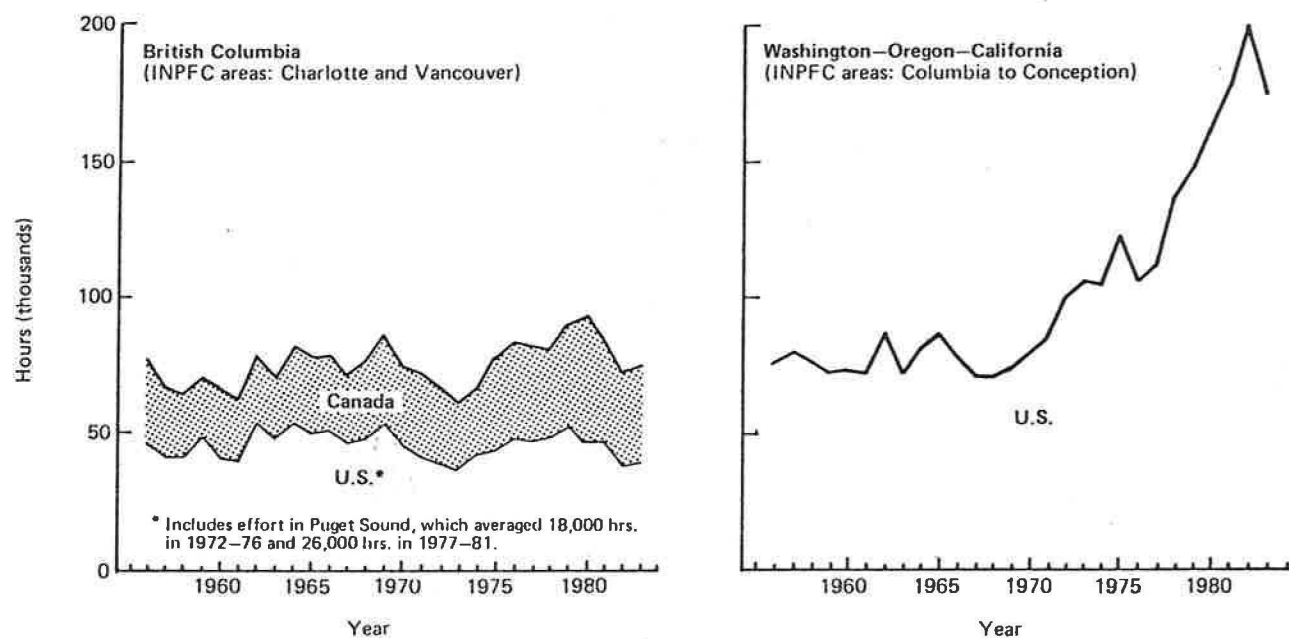


Figure 8. Trawl fishing effort by Canadian and U.S. domestic fisheries in the British Columbia and Washington-Oregon-California sectors of the Northeast Pacific region, 1956-1983.

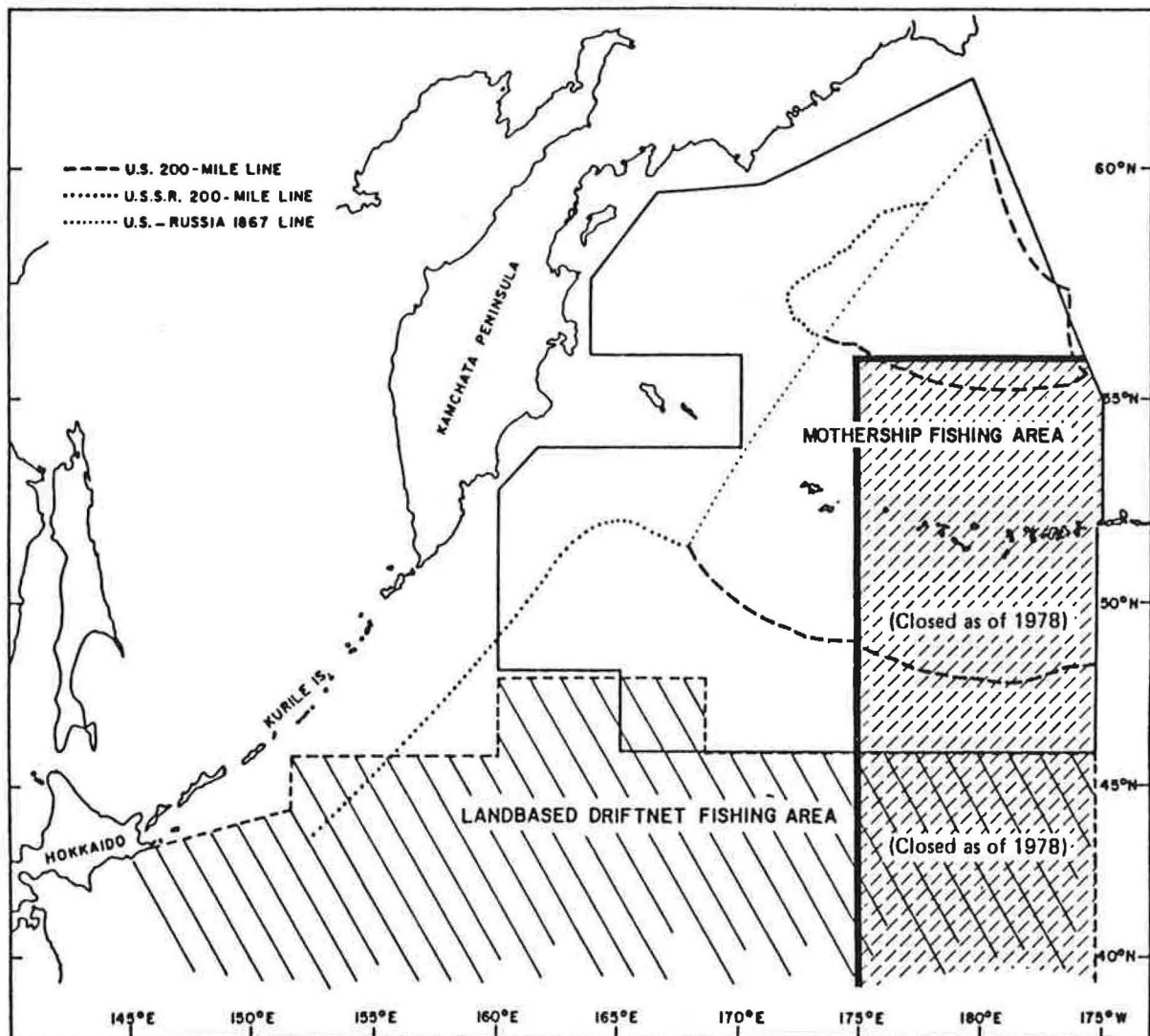


Figure 9. Japanese high seas salmon gillnet fishing areas.

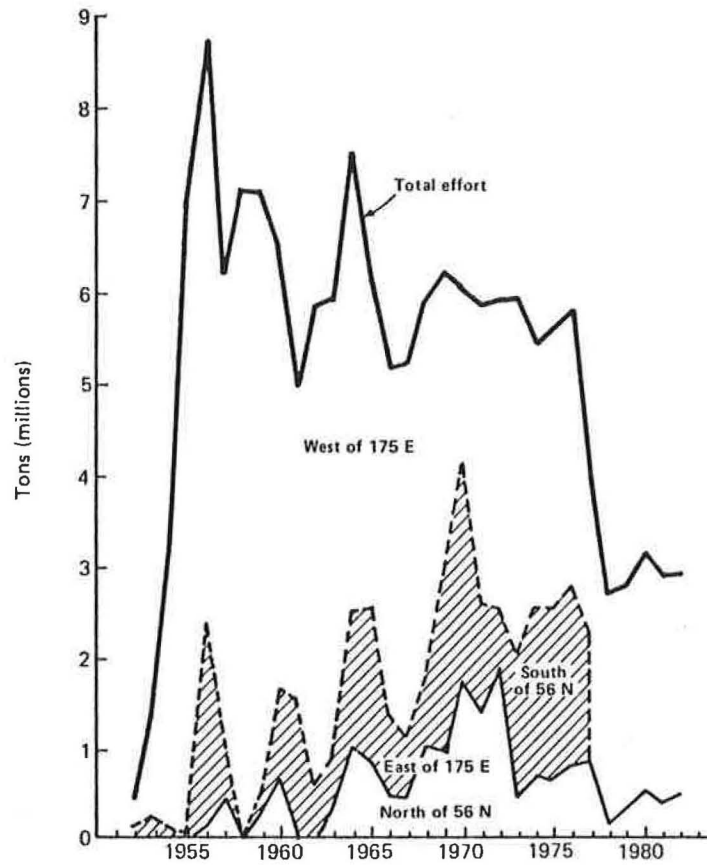


Figure 10. Gillnet fishing effort for salmon by the Japanese mothership salmon fishery in the North Pacific Ocean, 1952-1982.

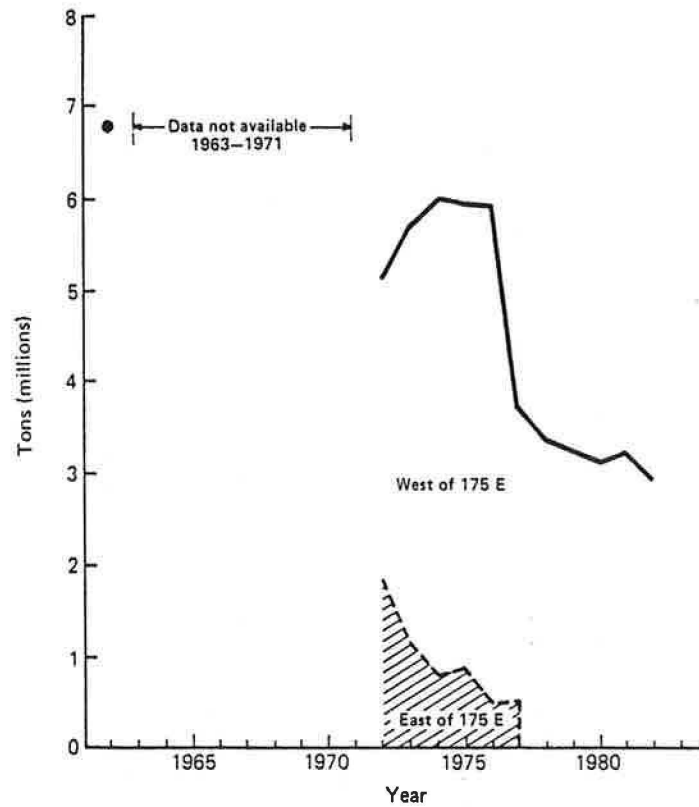


Figure 11. Gillnet fishing effort for salmon by the Japanese landbased salmon fishery in the North Pacific Ocean, 1962 and 1972-1982.

Appendix 1. Part A: Trawl fishing effort reported for foreign fisheries in the Bering Sea-Aleutians Region, 1963-1983, in number of hours (from NWAFC Data File).

Year	Japanese Fisheries					Other Foreign Trawl Fisheries							
	Groundfish and Herring				Total	Shrimp		Total	Groundfish				
	Pair Trawl	Side Trawl	Stern Trawl	Danish Seine*		Side Trawl	Stern Trawl		USSR	ROK	Taiwan	W. Germany	Poland
1963	15,646	33,115	0	123,218	171,979	0	0	0	SEE PART B OF APPENDIX	No Fishing	No Fishing	No Fishing	No Fishing
1964	11,799	40,003	1,884	148,958	202,644	0	0	0					
1965	6,960	30,410	4,043	126,856	168,269	23,163	0	23,163					
1966	11,800	39,817	6,345	123,970	181,932	17,543	0	17,543					
1967	20,626	32,421	48,719	160,616	262,382	1,730	206	1,936					
1968	15,242	9,756	130,623	145,852	301,473	4,666	2,105	6,771					
1969	13,889	10,241	137,459	148,438	310,027	0	2,094	2,094					
1970	31,262	4,958	166,199	166,128	368,547	48	4,433	4,481					
1971	42,868	2,989	219,012	124,660	389,529	44	4,413	4,457					
1972	46,322	1,734	248,854	104,896	401,806	0	0	0					
1973	46,961	0	197,649	96,708	341,318	0	0	0					
1974	46,931	0	261,634	65,222	373,787	0	0	0					
1975	42,337	0	268,284	46,334	356,955	0	0	0					
1976	39,651	0	273,830	40,220	353,701	0	347	347					
1977	35,727	0	296,797	38,500	371,024	0	244	244	26,811	7,782	1,280		
1978	32,254	0	312,723	34,842	379,819	0	0	0	53,395	17,495	1,699		
1979	33,004	0	299,908	34,422	367,334	0	0	0	32,726	26,323	1,014	4,643	
1980	34,737	0	319,250	37,074	391,061	0	0	0	651	38,176	2,104	1,718	13,105
1981	29,272	0	303,183	31,092	363,547	126	0	126	0	29,536	3,694	3,469	12,115
1982	28,595	0	305,396	24,296	358,287	0	0	0	0	29,083	6,321	3,094	0
1983	24,167	0	285,029	21,114	330,310	0	0	0	0	31,579	0	0	0

*Hours fished by Danish seiners is estimated from number of drags reported, at 2 hours/drag.

Appendix 1. Part B: Estimates of USSR trawl fishing effort for groundfish in the Bering Sea-Aleutians Region, 1963-1976, in number of hours.

Year	Japan: Trawlers (fish net) and Danish seiners--groundfish and herring			USSR: Trawlers--Groundfish	
	Effort (hours) ^{a/}	Catch (M.T.) ^{b/}	Hours per ton	Catch (M.T.) ^{c/}	Est. effort (hours) ^{d/}
1963	171,979	211,581	.8128	92,000	74,778
1964	202,644	350,663	.5779	155,000	89,574
1965	168,269	350,561	.4800	115,000	55,200
1966	181,932	414,521	.4389	100,000	43,890
1967	262,382	747,052	.3512	177,662	62,395
1968	301,473	916,979	.3288	133,975	44,051
1969	310,027	1,072,132	.2892	186,700	53,994
1970	368,547	1,477,219	.2495	231,881	57,854
1971	389,529	1,802,880	.2161	397,477	85,894
1972	401,806	1,913,897	.2099	412,896	86,667
1973	341,318	1,752,331	.1948	347,969	67,784
1974	373,787	1,526,183	.2449	435,052	106,544
1975	356,955	1,299,261	.2747	338,417	92,963
1976	353,701	1,210,629	.2922	279,697	81,727

^{a/} From Part A, App. 1.

^{b/} From INPFC Bull. 37 and INPFC Stat. Yearbooks. Groundfish catch by pair trawl, side trawl (fish net), stern trawl (fish net) and Danish seines.

^{c/} From INPFC Bull. 37 (Table 1) for 1963 and from Murai et al. for 1964-76.

^{d/} Hours per ton for Japanese vessels times USSR catch.

Appendix 1. Part C: Estimates of USSR trawl fishing effort for herring in eastern Bering Sea, 1963-1976, in number of hours.

Year	Catch (M.T.) ^{a/}	No. of tows ^{b/}	No. of hrs At 3.4 hr/tow ^{c/}	Hours per ton	Effort (hours)
1963	150,000	NA	-	(0.6) ^{d/}	(90,000)
1964	175,000	NA	-	(0.6) ^{d/}	(105,000)
1965	-	-	-	-	-
1966	-	-	-	-	-
1967	-	-	-	-	-
1968	22,255	3,885	13,209	.5935	13,209
1969	94,491	14,762	50,191	.5312	50,191
1970	117,202	22,236	75,602	.6451	75,602
1971	23,000	8,008	27,227	1.1838	27,227
1972	54,000	3,805	12,937	.2396	12,937
1973	34,361	2,536	8,876	.2583	8,876
1974	19,800	NA	-	(0.6) ^{d/}	(11,880)
1975	14,206	NA	-	(0.6) ^{d/}	(8,523)
1976	16,812	NA	-	(0.6) ^{d/}	(10,087)

^{a/} From Murai et al. (1981).

^{b/} From catch and CPUE data (by vessel class) provided by USSR during US-USSR fisheries meetings.

^{c/} From data provided by USSR for 1974 for eastern Bering Sea. (Average hours per tow for three vessel classes: BMRT-7; SRTM-6; and SRTR-6.)

^{d/} Rounded average of 1968-73 data.

Appendix 1. Part D: Estimates of trawl fishing effort for groundfish by the U.S. domestic and joint venture fisheries in the Bering Sea-Aleutians Region, 1980-1983, in number of hours.

	1980	1981	1982	1983
1. Estimated no. of hours of trawling by foreign nations, including Danish seine drags (Japan) converted to hours at 2 hrs/drag. ^{a/}	446,815	412,487	396,785	361,889
2. Foreign catch of groundfish by trawlers. ^{b/}	1,282,114	1,258,347	1,178,050	1,111,003
3. U.S. trawl catch of groundfish ^{c/}				
a. Domestic landings	5,858	14,187	24,800	41,368
b. Joint venture landings	32,668	78,535	108,603	211,155
c. Total	38,526	92,722	133,403	252,523
4. Hours per ton of catch for foreign trawlers (1 ' 2)	.3485	.3278	.3368	.3257
5. Estimated equivalent number of hours trawled by U.S. vessels in the domestic and joint venture fisheries (4 x 3).	13,426	30,394	44,930	82,247
6. Estimated total hours of trawling by U.S. and foreign vessels for groundfish.	460,241	442,881	441,715	444,136

^{a/} From Part A, Appendix 1.

^{b/} Data from R. Nelson, NWAFC (with longline catch subtracted) (Pers. Comm.).

^{c/} Data from R. Nelson, NWAFC (Pers. Comm.).

Appendix 2. Part A: Trawl fishing effort for groundfish as reported for foreign nations in the Northeast Pacific Region, 1963-1983, in number of hours. (Canadian vessels and Japanese Danish seiners and shrimp trawlers excluded.)

Year	Gulf of Alaska: Shumagin-Southeastern Areas				B.C.: Charlotte-Vancouver Areas			WA-OR-CA: Columbia-Conception Areas		
	Japan	USSR	ROK	Poland	Japan	USSR	Poland	Japan	USSR	Poland
1963	2,275				0	0	0	0	0	0
1964	2,507				0	0	0	0	0	0
1965	7,789				0	0	0	0	0	0
1966	12,560				923	See Part C	0	92	See Part D	0
1967	13,925				4,564	" " "	0	1,823	" " "	0
1968	16,042		No Fishing		5,457	" " "	0	803	" " "	0
1969	23,789	See Part B for 1962-76 estimates		No Fishing	3,829	" " "	0	236	" " "	0
1970	14,704				2,641	" " "	0	210	" " "	0
1971	18,808				2,141	" " "	0	599	" " "	0
1972	29,013		See Part B		4,377	" " "	0	1,142	" " "	0
1973	37,297		" " "		3,306	" " "	0	2,414	" " "	See Part D
1974	36,342		" " "		7,056	" " "	0	3,925	" " "	" " "
1975	38,894		" " "	See Part B	4,190	" " "	See Part C	2,678	" " "	" " "
1976	34,715		6,523	0	3,226	" " "	" " "	2,667	" " "	" " "
1977	33,651	14,967	4,797	374	2,716	0	1,484	0	26,036	3,785
1978	27,842	14,317	5,315	702	362	0	141	0	19,473	5,415
1979	22,884	7,360	4,869	3,917	556	0	848	0	31,448	5,209
1980	31,694	17,247	3,901	2,663	502	0	1,556	0	0	12,302
1981	36,195	0	8,499	8,223	298	0	1,183	0	0	19,796
1982	29,080	0	6,406	0	581	0	0	0	0	0
1983	28,665	0	3,162	0	0	0	0	0	0	0

Data Sources: Japan, 1963-70 - INPFC Bull. 37; 1971-80 - INPFC Stat. Yearbooks. All other data are from NWAFC Data File.

Appendix 2. Part B: Estimates of trawl fishing effort for groundfish by the USSR, ROK and Poland in the Gulf of Alaska (Shumagin-Southeastern Areas), 1962-1976, in number of hours. (Estimates are based on catch rates by Japanese trawlers.)

Year	Japanese Trawlers			Catch (M.T.) ^{c/}			Est. effort (hours) ^{d/}		
	Effort (hours) ^{a/}	Catch (M.T.) ^{b/}	Hours per ton	USSR	ROK	Poland	USSR	ROK	Poland
1962	-	-	-	50,000	-	-	(12,655) ^{e/}	-	-
1963	2,275	8,989	.2531	108,000	-	-	27,335	-	-
1964	2,507	16,347	.1534	230,000	-	-	35,282	-	-
1965	7,789	51,512	.1512	340,000	-	-	51,408	-	-
1966	12,560	84,004	.1495	83,000	-	-	12,408	-	-
1967	13,925	72,852	.1911	76,937	-	-	14,703	-	-
1968	16,042	72,518	.2212	59,422	-	-	13,145	-	-
1969	23,789	82,521	.2883	20,015	-	-	5,770	-	-
1970	14,704	64,429	.2282	9,336	-	-	2,130	-	-
1971	18,808	66,259	.2839	30,719	-	-	8,721	-	-
1972	29,013	84,851	.3419	68,864	4,042	-	23,545	1,382	-
1973	37,297	91,402	.4081	59,522	4,332	-	24,291	1,768	-
1974	36,342	90,715	.4006	77,942	2,237	-	31,224	896	-
1975	38,894	70,851	.5490	95,465	11,800	2,132	52,410	6,478	1,170
1976	34,715	69,678	.4982	79,873	34,348	-	39,793	See Part A -	

^{a/} From Part A, App. 2.

^{b/} From INPFC Bull. 37 and INPFC Stat. Yearbooks.

^{c/} From Pruter (1976) for 1962-63. From Murai et al. (1981) for 1964-76.

^{d/} Hours per ton for Japanese trawlers times catch by indicated nation.

^{e/} Hours per ton for Japanese trawlers in 1963 times USSR catch in 1962.

Appendix 2. Part C: Estimates of trawl fishing effort for groundfish by the USSR and Poland off British Columbia (Charlotte-Vancouver Areas), 1966-1976, in number of hours. (Except for 1966, estimates are derived from data for the USSR hake fishery.)

Year	USSR				Poland	
	Hake Catch (M.T.) ^{a/}	No. of tows ^{b/}	Effort (hours) ^{c/}	Hours per ton	Hake catch (M.T.)	Est. effort (hours)
1966	0	N.A.	(5,861) ^{d/}	-	0	0
1967	11,260	2,458	6,145	.5457	0	0
1968	35,804	7,708	19,270	.5382	0	0
1969	52,792	10,050	25,125	.4759	0	0
1970	25,491	4,701	11,752	.4610	0	0
1971	5,021	1,028	2,570	.5119	0	0
1972	5,816	931	2,328	.4003	0	0
1973	13,840	3,101	7,752	.5601	0	0
1974	1,799	403	1,003	.5575	0	0
1975	3,493	N.A.	(1,768)	(.5063) ^{e/}	15,704	(7,951)
1976	3,918	N.A.	(1,983)	(.5063) ^{e/}	2,054	(1,040)

^{a/} From Murai et al. (1981). No hake catch in 1966, but total groundfish catch of 33,000 M.T.

^{b/} From catch and CPUE data (by vessel class) provided by USSR during US-USSR fisheries meetings.

^{c/} At 2.5 hours/tow, as derived from data for 1974 for B.C., WA, OR & CA.

^{d/} Hours/M.T. for Japanese trawlers (923 hrs/5,198 M.T., or 0.1776) times 33,000 M.T. (USSR groundfish catch).

^{e/} Average for 1967-74. Used to estimate effort.

Appendix 2. Part D. Estimates of trawl fishing effort for groundfish by the USSR and Poland off Washington-Oregon-California (Columbia-Conception Areas) in the Northeast Pacific Region, 1966-1976, in number of hours. (Estimates are derived from data for the USSR hake fishery.)

Year	USSR				Poland	
	Hake Catch (M.T.) ^{a/}	No. of tows ^{b/}	Effort (hours) ^{c/}	Hours per ton	Hake catch (M.T.) ^{a/}	Est. effort (hours) ^{d/}
1966	128,000	N.A.	(82,432) ^{e/}	-	0	0
1967	195,092	50,346	125,636	.6440	0	0
1968	67,896	16,054	40,135	.5911	0	0
1969	109,225	21,893	54,733	.5011	0	0
1970	200,754	25,825	64,562	.3216	0	0
1971	146,726	26,157	65,392	.4457	0	0
1972	111,269	17,277	43,192	.3882	0	0
1973	139,060	20,566	51,415	.3697	2,220	821
1974	156,708	24,725	62,175	.3968	44,354	17,600
1975	155,405	N.A.	(51,066) ^{f/}	(.3286) ^{g/}	41,542	13,650
1976	154,129	N.A.	(50,646) ^{g/}	(.3286) ^{g/}	23,668	7,777

^{a/} From Murai et al. (1981).

^{b/} From catch and CPUE data provided by USSR for 1967-73. Data on no. of tows and hours fished in 1974 provided by USSR.

^{c/} At 2.5 hours/tow, as derived from data provided by USSR for 1974.

^{d/} Catch times hours/ton for USSR fishery.

^{e/} Based on hours/ton for 1967.

^{f/} Estimated from average hours/ton in 1974 and 1977.

^{g/} Average for 1974 and 1977. Hours/ton in 1977 derived as follows: Hours fished - 26,036; hake catch - 99,938 M.T.; hours/ton - 0.2605.

Appendix 2. Part E: Estimates of trawl fishing effort for groundfish by the U.S. joint venture and Canadian joint venture fisheries in the Northeast Pacific Region, 1978-1983, in number of hours.

Area	Year	Japan-USSR-ROK-Poland Combined			U.S.-J.V.		Canada-J.V.	
		Effort (hours) ^{a/}	Catch (M.T.) ^{b/}	Hours per ton	Catch (M.T.) ^{c/}	Est. effort (hours) ^{d/}	Catch (M.T.) ^{e/}	Est. effort (hours) ^{d/}
Gulf of Alaska Shumagin- Southeastern Area	1978	48,176	151,468	.3181	48	15		
	1979	39,030	130,787	.2984	1,522	454		
	1980	55,505	163,598	.3393	1,911	648		
	1981	52,917	198,942	.2660	16,966	4,512		
	1982	35,486	121,546	.2920	74,450	21,739		
	1983	31,827	115,950	.2745	142,984	39,249		
British Columbia Charlotte- Vancouver Areas	1978	503	3,952	.1273			1,814	231
	1979	1,404	8,310	.1690			4,233	715
	1980	2,058	5,676	.3626			13,210	4,790
	1981	1,481	3,840	.3857			18,400	7,097
	1982	581	2,421	.2400			20,051	4,812
	1983	-	-	(.2569) ^{f/}			27,715	(7,120)
WA-OR-CA Columbia- Conception Areas	1978	24,888	99,028	.2513	856	215		
	1979	36,657	124,065	.2955	8,834	2,610		
	1980	12,302	48,505	.2536	27,537	6,983		
	1981	19,796	61,203	.3234	43,557	14,086		
	1982	-	-	(.2810) ^{g/}	67,465	(18,958)		
	1983	-	-	(.2810) ^{g/}	72,100	(20,260)		

a/ From Part A.

b/ From NWAFC Data File.

c/ From Berger, Wall and Nelson (1984).

d/ Catch times hours/ton for Japan-USSR-ROK-Poland.

e/ Data for 1978-80 are from INPFC Stat. Yearbook for 1980. Data for 1981-83 are from PMFC Ann. Rpts. for 1982-83.

f/ Average for 1978-82.

g/ Average for 1978-81.

Appendix 3. Trawl fishing effort for groundfish by the U.S. domestic fishery in the Charlotte-Vancouver and Columbia-Conception Areas of the Northeast Pacific Region, 1956-1983, as reported or estimated, in number of hours.

Year	Charlotte-Vancouver			Columbia-Conception			Columbia Only		
	Effort (Hours)	Catch (M.T.)	Hours per ton	Effort (Hours)	Catch (M.T.)	Hours per ton	Effort (Hours)	Catch (M.T.)	Hours per ton
1956	(46,489)	21,826	2.13 ^{a/}	(78,302)	27,571	2.84 ^{b/}			
1957	(41,137)	19,313	2.13 ^{a/}	(82,894)	29,188	2.84 ^{b/}			
1958	(41,460)	19,465	2.13 ^{a/}	(78,276)	27,562	2.84 ^{b/}			
1959	(48,743)	22,884	2.13 ^{a/}	(73,931)	26,032	2.84 ^{b/}			
1960	(41,369)	19,422	2.13 ^{a/}	(74,985)	26,403	2.84 ^{b/}			
1961	(40,479)	19,004	2.13 ^{a/}	(74,476)	26,224	2.84 ^{b/}			
1962	53,972	20,504	2.63	86,982	28,727	3.03	35,216	14,405	2.44
1963	(47,612)	22,353	2.13 ^{a/}	71,782	29,035	2.47	12,535	13,373	0.91
1964	53,769	19,472	2.76	81,128	27,489	2.95	28,500	13,205	2.16
1965	49,878	24,154	2.06	87,110	30,605	2.85	27,065	14,454	1.87
1966	50,580	30,861	1.64	77,437	28,220	2.74	22,114	11,844	1.87
1967	45,787	28,362	1.61	71,173	31,444	2.26	19,431	16,303	1.19
1968	47,932	27,327	1.75	71,092	23,097	3.08	19,825	7,148	3.08
1969	52,611	26,929	1.95	74,048	25,494	2.90	20,882	7,993	2.61
1970	44,595	22,552	1.98	79,155	26,048	3.04	23,052	7,576	3.04
1971	41,081	19,045	2.16	84,729	28,975	2.92	25,278	9,600	2.63
1972	39,217	19,065	2.06	99,745	35,569	2.80	26,279	8,982	2.93
1973	36,855	18,275	2.02	105,562	36,565	2.89	24,090	8,081	2.98
1974	42,108	19,476	2.16	105,374	40,902	2.58	25,858	9,633	2.68
1975	43,661	17,257	2.53	131,895	38,392	3.18	33,771	10,143	3.33
1976	48,118	19,237	2.49	(105,769)	43,348	2.44 ^{c/}	34,851	14,298	2.44
1977	47,319	22,428	2.11	112,503	50,376	2.23	29,431	14,297	2.06
1978	47,612	23,271	2.05	136,904	64,999	2.11	46,740	23,563	1.98
1979	51,923	26,110	1.99	(148,053)	79,173	1.87 ^{c/}	72,195	38,693	1.87
1980	46,065	21,948	2.10	160,531	83,703	1.92	58,870	42,010	1.40
1981	46,141	18,565	2.49	(178,505)	88,369	2.02 ^{d/}	77,335	29,134	2.65
1982	(38,240)	19,120 ^{e/}	2.00 ^{f/}	(199,388)	99,694	2.00 ^{f/}			
1983	(38,990)	19,495 ^{e/}	2.00 ^{f/}	(173,670)	86,835	2.00 ^{f/}			

a/ Average for 1962 and 1964-81. Used to estimate total effort.

b/ Average for 1962-75. Used to estimate effort.

c/ Hours per ton for Columbia Area. Used because of similarity of rates after 1967.

d/ Average for Columbia Area in 1980-81.

e/ 50% of Washington landings assumed to have been fish taken in the Vancouver Area.

f/ Assumed value.

Data Sources: Catch: 1956-70, INPFC Bull. 37; 1971-80, INPFC Stat. Yearbooks; 1981, Charlotte-Vancouver-Columbia Areas, NWAFC Data File; 1981, Washington-Oregon-California landings, PMFC Ann. Report; 1982-83, WA-OR-CA landings, PMFC Ann. Rpts.; Effort (Reported): 1962-70, INPFC Bull. 37; 1971-80, INPFC Stat. Yearbooks; 1981 - NWAFC Data File.

