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A REPORT

ON

THE JAPANESE ALASKAN POLLOCK FISHERY

Canada. Marketing Services Branch,
Fisheries Service,
Dept. of the Environment.

MARCH 1972

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A REPORT ON THE JAPANESE ALASKAN POLLOCK FISHERY

1. INTRODUCTION

A Canadian study team comprising representatives drawn from government and industry visited Japan during March 4-15, 1972 to study the Japanese Alaskan Pollock fishery. The members of the team were:

Mr. G.L. Grant, Chairman, Fisheries Prices Support Board and Director, Marketing Services Branch, Fisheries Service, Department of the Environment.

Mr. A.J. Hemming, Chief, Fisheries Division, Agriculture, Fisheries and Food Products Branch, Department of Industry, Trade & Commerce.

Mr. P.P. Russell, General Manager, Bonavista Cold Storage Company Ltd., St. John's, Newfoundland.

Mr. H.D. Pyke, General Manager, Highliner Division, National Sea Products Ltd., Lunenburg, Nova Scotia.

Mr. Joshua John, Manager, Marketing Services Division, Fisheries Service, Department of the Environment.

The team visited Tokyo, Sapporo and Kushiro and held discussions with the representatives of the Japanese fishing industry at the primary, secondary and export levels. This report embodies the findings of the study team. It was prepared on behalf of the members of the study team by the Marketing Services Branch of the Fisheries Service.

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The study is, essentially, a part of the on-going assessment of the Marketing Services Branch, of the world supply and demand conditions for groundfish. Its objective is to investigate the extent to which the Japanese Alaskan Pollock fishery can help in meeting the growing supply shortage of cod blocks and fillets in major world markets and more particularly in the U.S.

In recent years, it has become increasingly evident that there is a growing world wide supply shortage of the traditional species of groundfish and more particularly of cod and haddock. For example, throughout 1971, the U.S. market has been experiencing a continuing shortage of cod blocks and fillets. The biologists are of the view that it is not possible to increase the landings of cod and other groundfishes to any significant degree. Therefore, the prospects for supply both in the short-term and long-term future do not appear to be very encouraging. The demand, however, continues to be strong in all markets. During 1970-1971, the prices of most groundfish products in the U.S. market underwent a sharp increase. In particular, the price of cod blocks at the wholesale processor level in the U.S. market has been on a steady and uninterrupted upswing since the summer of 1969, from 26.5 cents per lb. to 47.0 cents per lb. at present.

The major question which emerges is: how can the growing shortage in the supply of cod blocks and fillets be met? What, if any, are the alternative sources of supply and what are the potential substitutes for cod fillets and blocks?

During the past year, it has become increasingly apparent that the area which offers the greatest potential is the North Pacific with its vast resources of

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Alaskan Pollock[1] caught largely by Japan.

2. THE BIOLOGY[2] OF ALASKA POLLOCK

2.1 The Fish

The biological name for Alaska Pollock is Theragra Chalcogramma. It was first taken in British Columbia waters on August 2, 1881 at the head of Kingcove Inlet by Capt. H.E. Nichols, and recorded in the same year by T.H. Bean as Pollachius Chalcogrammus (Pallas). While the name Alaska Pollock has been used for this species, the term whiting is just as appropriate. (It may be noted that whiting of the U.K. and U.S. is not the same species, although belonging to the cod family). Northern and Southern Pollock Fishes of the Pacific Coast differ somewhat in the numbers of fin rays and have been given sub-specific names. Those of Northern British Columbia and Alaska have the higher fin ray counts and are referred to as T Chalcogramma Chalcogramma, while those of the Southern B.C. and Washington have the lower fin ray counts and are referred to as T Chalcogramma Fucencis. Undoubtedly, inter-grading forms occur along the coast of B.C. Generally speaking, Alaska Pollock migrates and rehabilitates itself.

2.2 Description

The body of Alaska Pollock is elongated and moderately compressed. Head is pointed, and mouth terminal and moderate. The lower jaw slightly projects. The eye is of a moderately large diameter in relation to the length of head which is 3.3" to 4.7". The lateral line is high anteriorly and then straight. Scales are cycloid and small. Colour is olive green to brown on dorsal surface, frequently

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1. South American Whiting may prove to be another potential substitute. This report, however, deals only with Alaskan Pollock.
2. This section is based on "Fishes of the Pacific Coast of Canada", Fisheries Research Board of Canada, Bulletin No. LXVIII, W.A. Clemens, and G.V. Wilby, PP. 130-131.

blotched or mottled; silvery on sides, lighter on ventral surface; dusky to black on fins. In young, two narrow light yellow bands along sides can be seen and occassionally a short third band.

The Alaska Pollock is distinguished by its three dorsal fins, the projecting lower jaw, the position of the anus below the interspace between the first and second dorsal fins and the minute barbel on the lower jaw, when present.

There is very little difference between Alaskan Pollock and Cod (both Atlantic and Pacific). From a distance, the fish looks like cod; tail section is slimmer and the snout is sharper. Fillets with the skin on look somewhat like haddock. The fillets are thin as compared with cod. The following pencil drawings of Alaska Pollock, Atlantic Cod and Atlantic Pollock would help in identifying the similarities and differences between these three species. The average length of a 4 year old fish (weight about 1.5 lbs.) is about 14" to 18".

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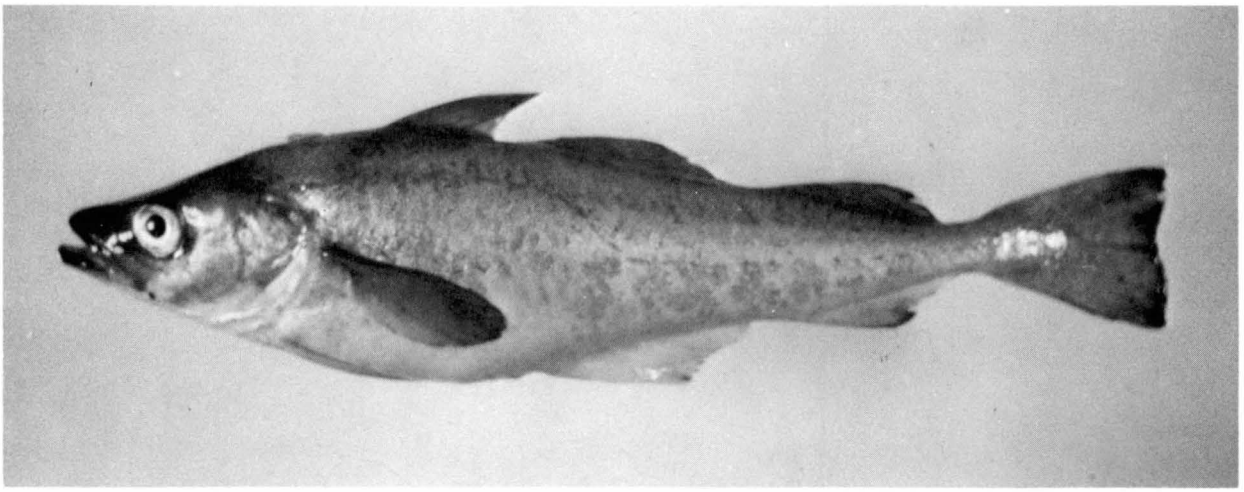
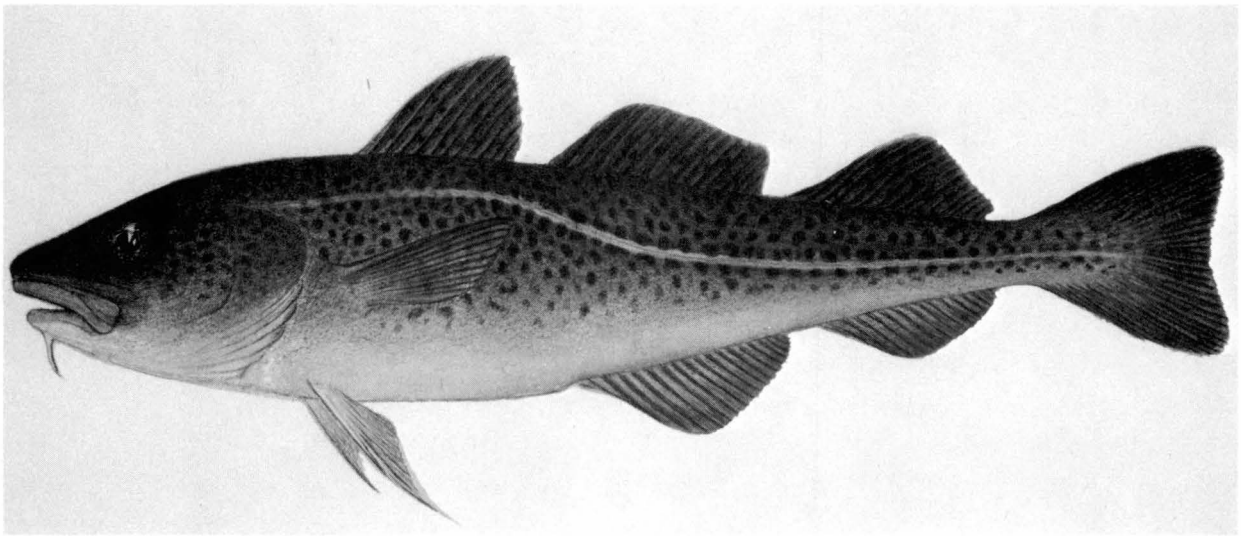


ALASKA POLLOCK



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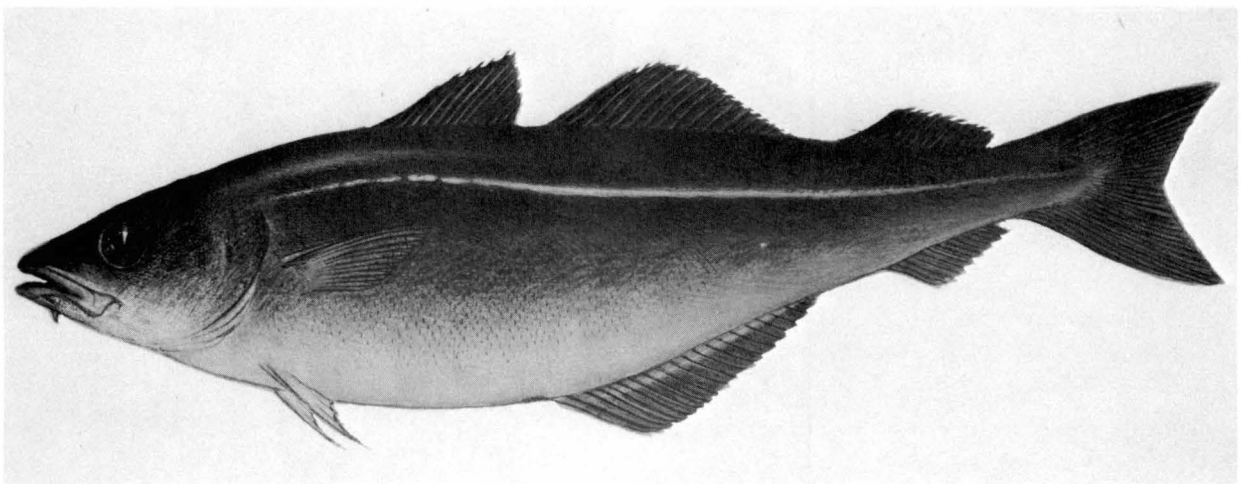
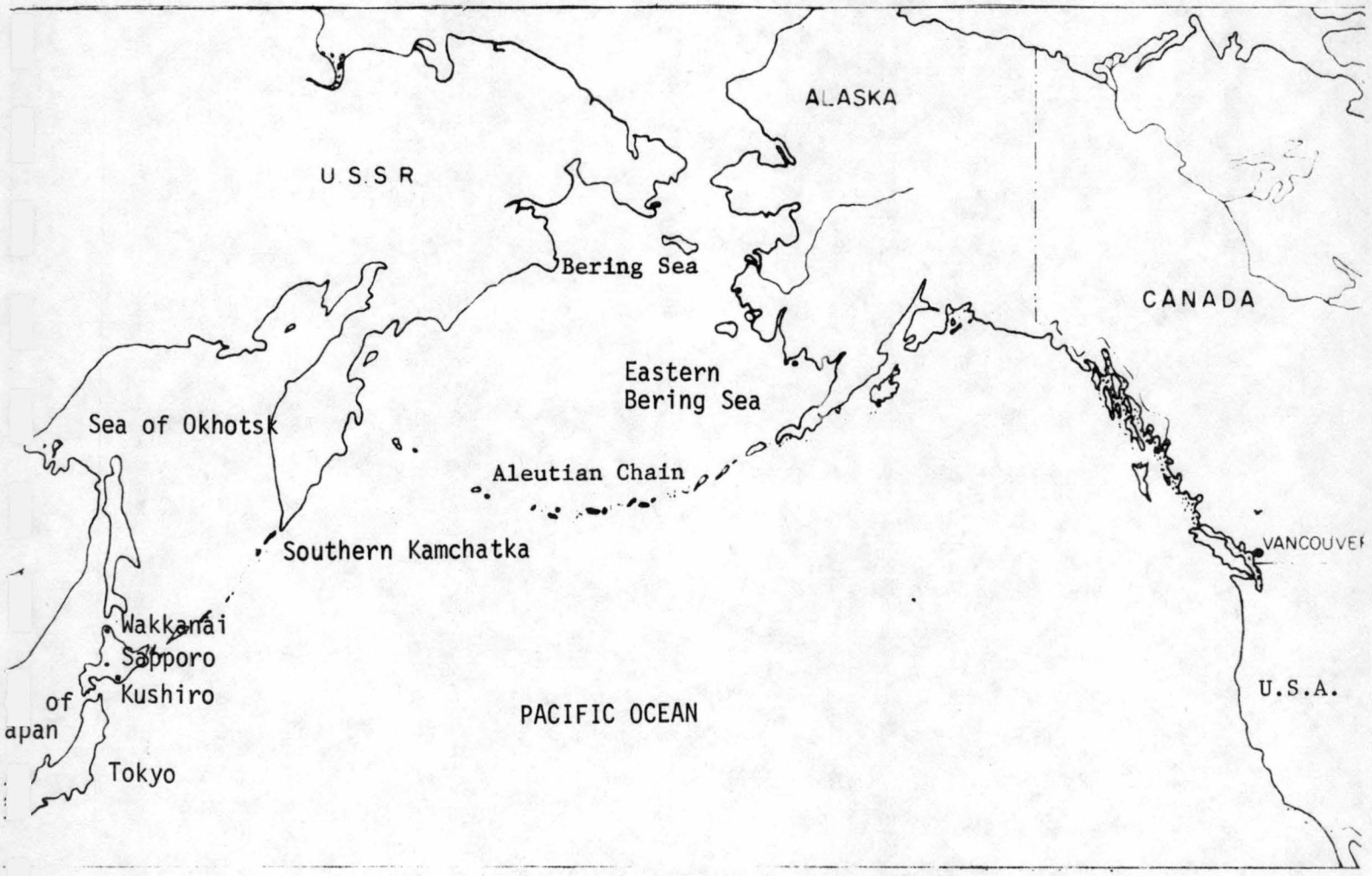


ATLANTIC POLLOCK

3. ALASKA POLLOCK FISHING GROUNDS AND CATCHES:

Alaska Pollock occurs abundantly along the North Pacific Coast. It is generally found in waters of moderate depth where it feeds upon crustacians plankton.



There are three main fishing grounds for Alaska Pollock: (a) the coastal areas of Japan, particularly the Northern Island of Hokkaido; (b) the Sea of Okhotsk and Kamchatka Peninsula and; (c) the Bering Sea and the Coasts of Alaska.

According to official Japanese statistics, the total landings of Alaska Pollock by Japan during 1969-1971 were as follows: (Catch represents quantities harvested; landings represent quantities landed on shore).

LANDINGS OF ALASKA POLLOCK

(Quantity[3] expressed in metric tons and price[4] in yens per kilogram)

	1969		1970		1971	
	(QUANTITY)	(PRICE)	(QUANTITY)	(PRICE)	(QUANTITY)	(PRICE)
January	127,520	23	139,012	N.A.	138,875	19
February	137,310	30	133,177	35	142,229	31
March	140,237	26	176,620	31	204,553	29
April	144,122	20	136,806	23	169,761	12
May	61,741	13	71,588	15	69,942	11
June	37,339	16	34,297	16	42,282	10
July	44,051	13	49,918	10	51,877	8
August	34,736	15	33,237	11	28,356	11
September	50,001	14	24,718	16	32,142	17
October	48,743	19	58,584	14	45,351	18
November	55,341	26	69,578	18	70,987	22
December	88,856	27	76,853	24	N/A	N/A
TOTAL LANDINGS:	969,997	22	1,004,388		996,354 (Jan-Nov)	
TOTAL CATCH:	1,944,320		2,346,710		2,500,000 (est.)	

3. Tonnage is for fresh Alaska Pollock, but also includes defrosted ones.
4. Prices are weighted averages of wholesale, auctioned at 84 fishing ports. Approximately, one U.S. dollar = 300 yens (1972).

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The 1970 Bering Sea total Bottomfish Catch by 10 Japanese mothership fleets reached a record high of 1.2 million metric tons, surpassing by about 40% the previous high catch of 855,000 tons in 1969. The largest gain was attributed to the increase in Alaska Pollock landings which accounted for 87% of the catch.

JAPANESE BOTTOMFISH CATCH IN THE BERING SEA, 1969-70

	1970	1969
	(metric tons)	
Alaska Pollock	1,031,000	678,000
Flat Fishes	89,000	106,000
Cod	47,000	39,600
Herring	9,000	11,000
Sablefish	3,000	4,000
Pacific Ocean Perch	2,000	11,000
Shrimp	2,000	4,000
Other	1,000	2,000
TOTAL	1,184,000	855,600

Detailed statistics on Japanese catches are given in Tables 1 to 6.

In general it can be stated that the Japanese landings of Alaska Pollock at the present levels are close to maximum sustainable yield. Under the Japanese licensing system, the number of vessels engaged in fishing are licensed for a period of five years. At the end of five years, the situation is reviewed. The number of vessels are controlled in order to (a) protect the resource;

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(b) protect the present industry; and (c) maintain supply and demand in balance. The prospects for increased landings especially in near waters are not bright.

The following is a rough breakdown of catch in 1970 in terms of fishing grounds:

(a)	Small scale shore operations in the coastal areas of Japan and particularly Hokkaido.	16% of total catch or 370,000 metric tons
(b)	Small scale as well as trawler operations in the Okhotsk and Kamchatka areas.	31% or 710,000 metric tons
(c) (i)	Trawler Operations in the Bering Sea	8% or 190,000 metric tons
(ii)	Mothership Operations in the Bering Sea	45% or 1.0 million metric tons
	TOTAL:	100% 2.3 million metric tons

South Korean fishermen who heretofore have been concentrating their efforts on the high seas tuna fishery appear to be focussing attention on the trawl fishery in the Sea of Okhotsk, Bering Sea and North Pacific Ocean. They are showing much interest in Alaska Pollock. Korea has about 20 multi-purpose vessels which could be deployed in the North Pacific for bottom and midwater trawling.

It is gathered that one Japanese firm purchased Alaska Pollock from Russian ships off Western Kamchatka during 1971. The Russian catch of Alaska Pollock in 1970 was over 500,000 metric tons.

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Basically, there are two types of fishing for Alaska Pollock, one being the trawlers that fish nearby grounds and the other being the mothership type of operation which fish the Bering Sea and the Coast of Alaska, both North and South of the Aleutian Chain.

During 1970, the Japanese started using mid-water trawl for Alaska Pollock in the Bering Sea because of rocky grounds and the fact that regular trawlers fish only during day.

In recent years, there has been some addition to the trawler fleet; independent trawlers of over 3,000 tons, equipped with surimi-meal plants have also been added. Current catch levels are causing concern for the Alaska Pollock stocks in waters south of the Probilof islands and on throughout the Aleutians. There is also concern over the stock of Alaska Pollock in the area south of Kamchatka Peninsula where offshore draggers, gill-net boats and the so-called "Northern-Trawlers" are fishing. Since the fall of 1970, the size of pollock has been smaller. This is also causing some concern. The general feeling is that the trawler fleets may move to other waters in order to help maintain stocks and to alleviate the concentration of fishing effort in the Probilof area.

3.1 The Coastal Areas of Japan

During the summer months, the trawlers fish the coastal areas of Japan, some 3 to 5 miles offshore. The pollock caught in this area during the summer appears to have a high degree of infestation which makes it not practical for filleting. The total catch in this area in 1970 was 37,000 metric tons.

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3.2 Sea of Okhtosk and Kamchatka Peninsula

During the winter months, (Oct-March) the trawlers fish the west side of Kamchatka Peninsula and the Sea of Okhtosk. From March to May, the trawlers fish the East side of the Peninsula; May-June is generally the repair season. The main landing ports for these grounds are located in the Northern Island of Hokkaido. This fish caught on these grounds is suitable for filleting on account of the relative nearness of the grounds to processing plants on Hokkaido. The distance from Kushiro to the fishing grounds is 2-3 days streaming at 12 knots. The total Hokkaido landings of Alaskan Pollock (inclusive of mothership landings) in 1971 were about 1 million tons.

The fishing trips to these grounds take on the average about 10 days. Therefore, only the fish caught on the last day and boxed is suitable for filleting. These boxed and iced fish reach the shore plant in 3-4 days time. The filleting that is presently carried out in Kushiro uses boxed fish caught on the last day of fishing in the Sea of Okhtosk and Kamchatka Peninsula.

The following is a rough listing of vessels fishing from Hokkaido:

CLASS SIZE		NUMBER OF VESSELS
300-350 tons	Trawlers	53
100-125 tons	Off Shore Trawlers	214
30-100 tons	Gill net	783
30-50 tons	Longliners	300

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The 300-350 ton class vessels came into operation during 1966-67. (These vessels have a gross tonnage of 800-1000 metric tons and have a carrying capacity of up to 500 metric tons.). They caught about 300,000 tons of pollock during 1971 (Dec. 70 to April 1971 period). Before 1967, only smaller vessels were in operation. These vessels operate in the East of Kamchatka and the Sea of Okhtosk. The smaller ships (125 tons and less) operate in the vicinity of Hokkaido. All these vessels together take about 500,000 to 600,000 metric tons per year. Wakkanai on the northern tip of the Hokkaido Island is another port around which a number of fishing plants operate.

3.3 The Bering Sea and the Coasts of Alaska

The factory (mothership) operations produce about 200,000 tons of surimi. This requires about 1 million tons of groundfish landings.

Normally, the mothership fishing in the Bering Sea is slow during May and June because the schools of pollock become dispersed. During 1971, fishing in the Bering Sea was spotty owing to the below zero temperature in the midwaters. The fleets, therefore, were continuously changing positions in search for good fish concentrations. Large fish (of 1.5 lbs. size) are frequently found in the catch when fishing is good but when the catch drops the fish sizes also become smaller.

In June 1971, a 5,000 ton factory stern trawler joined Japan's North Pacific fleet for fishing Alaska Pollock. The production target for this trawler in 1971 was 4,000 tons of surimi, 2,000 tons of meal, and 1,000 tons of frozen fish. The cost of the vessel was U.S. $4.72 million (366 ft. long with a beam of 55.8 ft. and is powered by a 5,700 hp. diesel engine and has a crew of 115).

Large vessels (over 2,000 metric tons) generally operate on a year-round basis. The motherships were originally devoted, mostly, to the production of fish meal. However, in recent years, they have been placing greater emphasis on surimi.

4. PRODUCTION OF SURIMI, KAMABOKO AND FILLET-BLOCKS:

4.1 Surimi and Kamaboko

The Japanese Alaskan Pollock fishery is over 12 years old. Up until a few years ago, the fish was used mostly as raw material for fish meal. In recent years, it has increasingly come to be processed into "surimi" (minced fish) for use as raw material in the production of "Kamaboko" (fish cake or sausage) and Chicua which are very popular in Japan. The best quality surimi is those produced at sea aboard the factory-ships and large factory trawlers which together produced about 200,000 metric tons of surimi in 1971. The modern surimi technique is about 10 years old.

Kamaboko is produced in various forms: cylindrical, squares, rectangular, etc. and utilize the latest designs in packaging films. Its main component is fish (surimi) up to 80% and 8 to 10% starch. The surimi block is thawed and mixed with various other additives such as spices, salt and starch.

Besides the factory ship operations, there are approximately 54 shore-based "surimi" plants[5]. Most of these are situated on Hokkaido at such fishing ports as Wakkanai, Monbetsu, Abashiri, Kushiro, and Otaru. During 1971, these shore plants produced about 113,000 metric tons of "surimi", while the plants located elsewhere in the country produced over 45,000 metric tons. The total Japanese production of surimi in 1971 was 321,000 metric tons. Generally speaking, about 50% of total mothership landings go to surimi and the rest to meal. The finished product would constitute about 23% of the total landings.

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5. The Soviet Union is reported to have bought seven "surimi" plants from Japan in 1971. The plants will be used for the Soviet surimi fleet to be organised in 1972. (Source: Suisan Keizai Shimbun, July 23, 1971).

The following is the utilisation of landings in the Hokkaido area:

(a) 70% goes to the production of surimi - (600,000 - 700,000 tons of landed fish);

(b) 15% goes to drying;

(c) 10% goes as whole fish to Kamaboko manufactures, in chilled form;

(d) 5% goes to meal.

If landings are high in any period, the proportion going to meal is increased.

The following figures on the production of frozen surimi are based on Japanese official statistics:

PRODUCTION OF FROZEN "SURIMI"

(in metric tons)

	1969	1970	1971 (prov.)
LAND BASE			
Hokkaido	82,444	94,147	112,411
Aomori & Iwate	3,000	11,593	12,298
Miyagi	2,500	7,789	7,918
Western Region	4,774	4,992	5,227
Sub-Total:	92,718	118,521	137,854
ON BOARD			
Mother-ships	71,972	101,899	116,155
Trawlers	31,638	40,903	67,379
Sub-Total:	103,610	142,802	183,534
GRAND TOTAL:	196,328	261,324	321,382

PRODUCTION OF FROZEN "SURIMI"

MONTHLY BASE FOR 1971

(in metric tons)

MONTH	LAND BASE FACTORIES	ON BOARD	(MOTHER-SHIP)	(TRAWLER)	TOTAL
January	15,465	5,808	2,157	3,651	21,274
February	17,697	6,394	2,210	4,184	24,092
March	22,111	15,844	10,000	5,844	37,955
April	17,478	20,327	14,844	5,482	37,805
May	8,057	19,556	14,561	4,995	27,614
June	7,059	19,177	12,948	6,228	26,237
July	6,692	24,494	15,645	8,849	31,187
August	4,310	28,539	20,134	8,404	32,850
September	6,556	23,917	16,781	7,135	30,474
October	8,425	8,084	3,007	5,076	16,510
November	12,085	5,928	2,066	3,862	18,013
December	11,905	5,460	1,798	3,662	17,365
TOTAL:	137,847	183,534	116,155	67,379	321,382

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SURIMI PRODUCTION COSTS

(yens per kilo)

An estimated breakdown of surimi production cost is as follows:

RAW MATERIAL	40
Roe Yield at 7-8% (400 yen per kilo) credit	-32
Net cost of fish	8
Labour Cost of Heading and Gutting	4
TOTAL	12
Raw Material Cost at 50% Recovery (12x2)	24
Only 60% of raw material can be utilised for surimi	approx. 40 yen per kilo
Processing costs (Transportation, additives: sugar, salt, etc.)	35-40 yen per kilo
TOTAL COST	75-80 yen per kilo

The cost of raw material has a primary role in the final cost of surimi or fillet blocks.

4.2 Surimi and Kamaboko Prices

In the past few years, the prices of surimi and kamaboko seem to have levelled off. Given a stationary level of surimi and kamaboko prices, the relative increase in the price of cod and Alaska pollock blocks in the U.S. market is particularly noteworthy.

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The wholesale price of surimi has been holding steady for several years at 115-120 yens per kilogram (A grade surimi); and B grade surimi at 90-95 yens per kilogram. The price of surimi in Japan was slightly higher about 3 years ago, but due to the higher production of surimi, prices have declined.

However, there is a possibility for surimi prices to improve in the future. If Alaskan fillet block production increases markedly, this would divert substantial quantities of fish to filleting, thereby adversely affecting surimi production.

The kamaboko consumption in 1971 in Japan was 1.2 million metric tons. The consumption has been growing at an annual average rate of 10% during the last 3 years. This implies that the per capita consumption has been increasing at a fairly high rate. The higher consumption of kamaboko is partly attributable to the increased production of surimi in recent years and to the more ready availability of surimi.

Kamaboko prices (expressed in current yen) have remained steady, which means that in real terms prices have declined. This was the result of increasing rationalisation of production and higher productivity in surimi and kamaboko production operations.

4.3 Fillet-Block Production

The Japanese exports of Alaskan Pollock fillet blocks to the U.S. started in 1967-1968 when a trial shipment was made by the Hokkaido Federation of Fishery Cooperatives. The growing interest in the U.S. and other markets in this Japanese product stems primarily from the growing shortages of the supply of cod fillets and blocks from traditional sources.

The following is a list of Japanese processing firms producing fillet blocks. In all, there are about 60 plants that can potentially enter into the production of fillet blocks. Of these, about 20 may actually produce[6] fillet blocks in 1972. The 6 leading producers in 1972 are expected to be the following:

NAME OF COMPANY	REPORTED CAPACITY PER DAY (lbs.)	REPORTED PRODUCTION ESTIMATE FOR 1972 (metric tons)
1. Kitaichi Suisan (10 filleters and skin removers, 6 contact freezers (Affiliated with Hokkaido Fisheries Federation and Mrs. Paul's Kitchens).	30,000 lbs.	
2. Taichi Gyogyo	12,000 lbs.	
3. Nichiro Gyogyo (2 filleters, 1 contact freezer).	8,000 lbs.	
4. Kanai Gyogyo (affiliated with Taiyo Fishery) 5 filleters 5 skin removers.	12,000 lbs.	
5. Kotoshiro Gyogyo (affiliated with C. Itoh & CO.)	8,000 lbs.	
6. A new plant in Wakkanai.	60,000 lbs.	
TOTAL:		12,000 - 14,000

6. The average production period is 6 days per week (or 25 days per month) for 7 months of the year (or 175 days of operation per year).

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PROJECTED FOR FUTURE

NAME OF COMPANY	REPORTED CAPACITY PER DAY (lbs.)	REPORTED PRODUCTION ESTIMATE FOR 1972 (metric tons)
7. Kyokyo Co. Ltd.	2,000 lbs.	NIL
8. Nakamur Suisan	N.A.	NIL
9. Tobu Suisan (Wakkanai)	10,000 lbs.	NIL
10. Daito Suisan (Wakkanai)	10,000 lbs.	NIL
11. Tobu Bussar Boeki (Wakkanai)	N.A.	N.A.

The estimate is that in 1972 the total production of Alaska Pollock fillet blocks is likely to be 12,000 to 14,000 metric tons or 25-28 million lbs. This estimate assumes that certain plants that are currently being built or renovated will come into operation during 1972. Failing that, the production volume may reach only 20 million lbs. Assuming favourable product acceptability, price and cost conditions, the estimated potential production of Alaskan Pollock Blocks may run as follows:

1973	-	35-40+ million lbs.
1974	-	45+ million lbs.
1975	-	50+ million lbs.

4.4 Fillet-Block Production Costs

ALASKA FILLET-BLOCKS
COST PROFILE (1972)
(Yens per kilogram)

An estimated breakdown of the cost of fillet-block production is as follows:

RAW MATERIAL - Roundfish at 12 yens per kilo (equivalent to 28-36 yens per kilo, for gutted and headed Alaskan Pollock). During Jan-March, the

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price for gutted and headed pollock may range as follows:

January	36-40-46 yens per kilo
February	40-42-45 " " "
March	42-46-48 " " "

YIELD (a) 35% if filleted by hand, gutted and headed fish;

(b) 30% if by domestic filleting machine;

(c) 34-36% if filleted by German machine.

Therefore the cost of raw material will vary according to the price of fish and the percentage yield as follows:

	at 30%	
at 40 yens per kilo (gutted and headed)	Average yield	133 yens per kilo
	35% average yield	114 yens per kilo
at 30 yens per kilo (gutted and headed)	30% yield	100 yens per kilo
	35% yield	86 yens per kilo

PACKAGING MATERIALS — N.A.

(Some packers use Canadian made dimpled cartons; others use dimpled cartons made by Hoto Shiki).

BLOCK FREEZING, COD STORAGE, WATER & OTHER — 30 yens per kilo

LABOUR — 24-30 yens per kilo

The fob plant costs are estimated at 27-28 cents per lb. The cif Los Angeles price is estimated at 35 cents per lb. and Gloucester at 37 cents per lb.

The transportation cost (Kushiro to Los Angeles) is about $80 per metric ton, by charter ships. If containers are used, the transportation cost can be reduced considerably.

One important factor which reduces the cost of raw material in the production of Alaskan Fillet blocks is the yield of roe. The spawning pollock yields about 7-8% roe. The production of pollock roe (including cod roe) in Japan during 1967-69 was:

YEAR	METRIC TONS
1967	18,629
1968	24,669
1969	23,885
1970	32,500 (est.)
1971	38,000 (est.)

However, to the extent that spawning pollock is higher in price than regular pollock, this net advantage may not amount to much.

The following is the weighted average price (per kilo) for cod and Alaskan Pollock roe at the Tokyo Central Market (city wholesale).

1961	396 yens per kilo
1962	451 yens per kilo
1963	549 yens per kilo
1964	546 yens per kilo
1965	582 yens per kilo
1966	609 yens per kilo
1967	596 yens per kilo
1968	537 yens per kilo
1969	521 yens per kilo
1970	532 yens per kilo

This may be compared with the price of 420 to 470 yens at the producing point, in 1971.

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The important factors to consider in establishing the cost of fillet blocks are: (a) the basic cost of raw material; (b) the yield and price of roe and; (c) the recovery rate. Even if the prices of fillet-blocks do not increase, the yield and price of roe can have a major influence in the production of fillet blocks, via the cost of raw material.

When viewed against the block prices in the U.S. market, the production of Alaska fillet blocks seems to be a profitable operation. With a c.i.f. landed price of 36-37 cents on the U.S. East Coast and a fob plant cost of 27-28 cents in Japan, the viability of the operation is clear.

U.S. BLOCK PRICES

	JAN. 1966	JAN. 1969	JAN. 1970	JAN. 1971	JAN. 1972
Cod blocks	29.5	21.5	26.5	40.0	46.5
Haddock blocks	36.5	34.0	36.5	41.5	47.0
Ocean Perch blocks	27.0	25.5	30.5	38.5	38.5
Flounder Blocks	31.0	31.5	42.5	39.5	43.5
Atlantic Pollock Blocks	22.5	18.5	19.5	29.5	32.5
Whiting Blocks	23.7	22.0	22.5	29.0	33.0

4.5 Handling and Processing

(a description of length of trip, unloading, trucking, icing, boxing, etc.)

In order to manufacture fillet blocks according to the specifications of the U.S. market, it seems necessary to bring about some improvements in handling, processing and quality control. Some plants visited by the team would pass Canadian inspection standards, while others would fall short of it.

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The manner in which fish is unloaded at the port is quite rough so that quite a lot of fish gets crushed in the process. When fish is put in the hold of the boat, they place large nets down first and then the fish is placed on the top of these. These nets hold about 3,000 to 5,000 lbs. of fish. They are lifted and dumped into a truck on the pier. These are big stake trucks with a capacity up to 20,000 lbs. each. No divider boards or ice are used in the trucks.

Trawlers land about 400-500 tons per trip and they unload from 8:00 a.m. to 2:00 p.m., about 130,000 lbs. per hour. The ports, (eg. Kushiro) can handle 14 stern trawlers at the same time. Most stern trawlers fish 4 days and then have a 3 a day steam back to port with catches up to 400-500 tons. The last day's catch, about 100 tons is boxed and iced (in 40 lb. boxes) and used for filleting.

The U.S. processors appear to be increasingly offering technical assistance to Japanese processors in order to upgrade their processing standards. Only shore based operations seem to be economically viable for the production of fillet-blocks. Most of the old and existing plants do not meet the sanitary standards that are required to produce fillet blocks for the U.S. market. However, the plants that have been built recently and those that are underway should ensure quality production.

Several attempts were made to manufacture blocks on board the factory ships. These attempts were not successful. It is exceedingly difficult to increase crew in mother-ships except at an enormously high labour cost. The nominal wages of labour on mother-ships are about 2½ times the shore rates. The cost of converting mother-ship to fillet lines is another factor; investment in motherships cost about 1 billion yens and it is difficult to switch from one process to another without a relatively good estimate of profitability and markets. Labour costs in fish processing have, in recent years, been increasing at an annual average rate of 18% (the shore and crew labour costs combined). Bigger firms do not necessarily have any advantage

over smaller firms in the manufacture of fillet blocks. In fact, the smaller firms may have some decided advantages over larger firms.

4.6 Export Organisation

Exports of Alaska Pollock fillet-blocks are generally carried out, as in the case of other fishery products from Japan, by trading houses. Presently, the major exporters of fillet-blocks to the U.S. are:

(a) Mitsubishi Corporation;
(b) Pan Asia Trading Company; and
(c) Toshoku Co.

As production of fillet-blocks expands in Japan, other exporters may emerge. Any trading company can enter the export field; no licenses are required.
It is gathered that as exports of Alaskan Pollock blocks increase in volume, a joint export council is likely to be formed in Japan in order to set minimum prices for export and to carry out exporting in an orderly manner.

In this connection, it is interesting to note that the export marketing system in Japan for fishery products (eg. canned salmon and crab) consists of the following elements:

- Packers and processors;
- Packers' Association;
- Joint Export Sales Organisation; and
- Export Trading Houses.

It may be noted that the Packers' Association owns the Joint Export Sales Organisation. This body sets export targets and minimum prices for the packers. The actual exporting is carried out by the trading houses.

4.7 Factors Influencing the Production and Exports of Alaskan Pollock Fillet-Blocks

A major factor which influences the production of fillet-blocks is the demand for groundfish blocks in major export markets and particularly in the U.S. The following table and chart indicates the rough magnitudes of the U.S. demand for blocks during 1965-71 with a projection for the 1972-75 period.

U.S. IMPORTS OF BLOCKS

	TOTAL U.S. BLOCK IMPORTS (1)	TOTAL U.S. COD BLOCK IMPORTS (2)	TOTAL U.S. OTHER* BLOCK IMPORTS (3) (1-2)	FLATFISH	HADDOCK	ATLANTIC POLLOCK	OTHER	TOTAL OTHER	ALASKA POLLOCK
				(in millions of lbs.)					
65	215	132	83						
1966	207	132	75						
67	190	117	73						
68	261	176	85	15	23	8	39	85	NIL
1969	267	192	75	15	20	8	32	75	NIL
70	273	195	78	12	20	21	25	78	NIL
1971	311	193	118	22	29	27	38	116	2
T.									
72	330	200	130					**105	25 +
1973	350	205	145					**110	35
74	371	205	166					**121	45 +
1975	393	210	183					**133	50 +

* Refers to flatfish, haddock, Atlantic Pollock and other (whiting, ocean perch and turbot) blocks.

** The level of imports that can be maintained at the assumed Alaska Pollock Block import levels.

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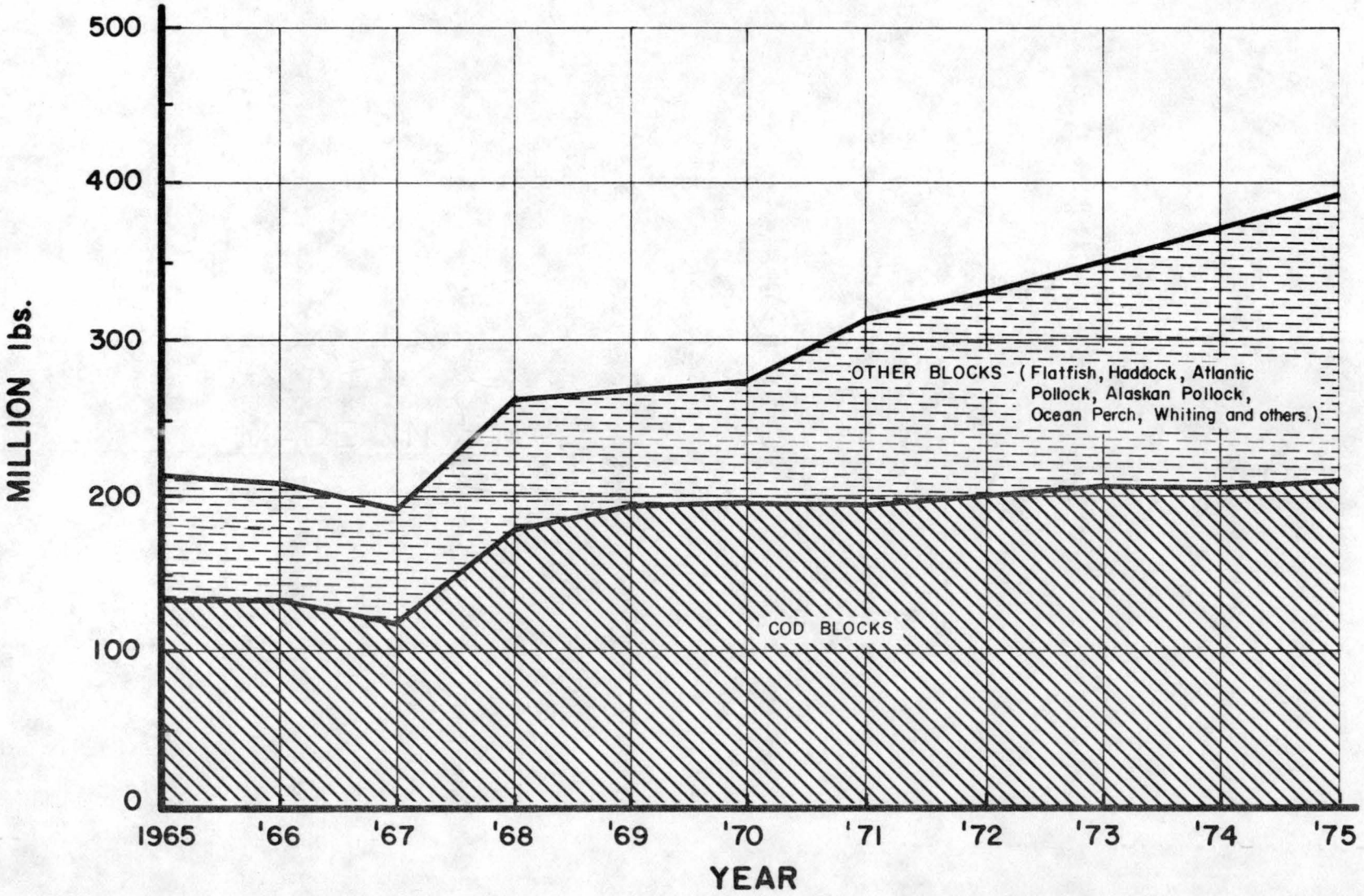
U.S. IMPORTS OF FROZEN BLOCKS AND SLABS 1965–1975



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It will be noted from the table that the U.S. block market (assumed for the purposes of this discussion to comprise of imports) is increasing at an annual average rate of about 6%. Given the inflexible nature of cod block supplies and the projected expansion in the production of Japanese pollock blocks, it is obvious that there is not much scope for expanding the supplies of 'other' blocks (flatfish, haddock, Atlantic pollock, ocean perch and whiting). The increasing U.S. block market offers an incentive for the production of Alaskan Pollock blocks. However, if the production of other blocks increase hand in hand with the production of Alaskan Pollock blocks, there is likely to be an excess supply in the U.S. market, with repercussions in terms of depressed prices for almost all varieties of blocks including cod blocks.

In this connection it will be relevant to note the U.S. imports of Alaskan Pollock blocks during 1971.

U.S. IMPORTS OF ALASKAN POLLOCK BLOCKS

FROM JAPAN, 1971

('000 lbs.)

January	-
February	-
March	-
April	148
May	-
June	30
July	138
August	257
September	274

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October	446
November	399
December	158
TOTAL:	1,850

The price of Alaskan Pollock blocks at 37 cents before the re-alignment of currencies and about 41 cents at present has been a strong incentive to Japanese exporters.

Some institutional factors also tend to have a favourable influence on the production of fillet blocks.

Faced by a world wide shortage of cod blocks, the producers of fish sticks and portions in the U.S. are under pressure to offer attractive terms including forward purchase contracts to producers of substitutable products and particularly to those who can guarantee regular supplies to keep their production lines running smoothly. For example, some U.S. companies are in the process of affiliating (Joint Ventures) with Japanese producers financially, as well as technologically. Technical know-how is being transmitted to enable production to conform to U.S. standards. Forward contracts to purchase is another form inducement. The buyers in other markets eg. U.K., Eastern and Western Europe also seem to be offering attractive terms. As Alaska Pollock blocks gain greater acceptance in the market with the processors and consumers, it will be possible to expand its production. Several Japanese export trading houses have come to perceive the opportunities and profits in the new business and are providing assistance (financial and others) and inducements to plants to enter into the processing of fillet-blocks.

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The relative abundance of the resource (in sheer volume itself) provides a fairly strong base to develop a strong filleting operation. There are,of course,serious limitations to this in terms of the domestic requirements for surimi and kamaboko.

While there are a number of factors that favour the production of Alaskan fillet-blocks, there are also a number of constraints. eg. parasites; lack of an adequate supply of 'fresh' fish; demand for surimi and kamaboko; rising labour costs and inadequate plant facilities.

Parasites

The larger the fish, the more the parasites; the smaller the fish, the less. The older the fish (more than 4 years) the more the degree of parasite infestation.

Investigations were carried out by biologists on 227 specimens of Alaska Pollock from the Pacific Ocean and the Okhotsk Sea near Kamchatka. Twenty-seven species of herminths (parasites) were found in the investigated material (including the previously recorded parasitic worms, there are in all 31 species of herminths). Differences in the degree of infestation of these fishes with different species of parasites were noted. The fact supports the hypothesis of the existence of local shoals of fishes of this species at the shores of Kamchatka. The most pathogenic parasites for these fishes are the larval states or Anisakis, and Nybellinia. These parasites damage the outward appearance of the fish. The larvae are concentrated only in the muscles of the abdominal wall. In the preparation of these fishes for the food industry, the abdomen must be cut away, leaving only the spinal part of the body, which practically does not contain any parasites.

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In general, the summer coastal fishery seems to have a greater degree of infestation than the winter fishery. The parasite problem is, thus, geographical and seasonal, because of migrations of stocks of pollock.

Another laboratory test indicated that most fillets tested included translucent, white blunt ended, and flattened worms. The frequency of occurence was 1-6 worms per fillet with the majority of the worms buried at various depths in the flesh and a few on the surface.

The cost of candling is not unduly high. In a plant of 75 employees, there were 5 candlers. The wage is about $4-5 per 8 hour day for females, and $8 per day for the male. Fringe benefits may cost an additional 30%.

One of the most serious limitations on the production of fillet blocks is the lack of an adequate supply of 'fresh' fish suitable for filleting. Associated with it is the problem of the decreasing size of fish. Unfortunately, the catch available from the inshore fishery (during the summer months) appear to suffer from a high degree of parasite infestation. The catches from distant waters as well as the sea of Okhotsk areas are not fresh enough for filleting purposes. Only that portion of the catch that is caught on the last day and boxed and iced is fit for filleting. In the absence of a steady supply of 'fresh' fish, it is difficult to operate processing plants economically.

As stated earlier, it would be increasingly difficult to divert fish from the production of surimi and Kamaboko on account of the rising demand for these products in the domestic market. Japan is increasingly becoming a net importer of fishery products. The domestic market for fishery products is expanding.

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It is gathered that fish and vegetable prices are rising faster than meat prices in Japan. Due to the limited land available, meat production is not likely to expand. The volume of meat production as well as meat prices are under control.

The big Japanese companies have established customers for their traditional products and it is difficult for them to switch production suddenly from their traditional concentration on pasted products such as Surimi and Kamaboko.
Further, efforts are also likely to be made in the not too distant future to develop a Japanese market for fish sticks and portions and also to develop the Japanese institutional market.

Rising Labour Costs

Labour costs in Japan are increasing at a rapid rate. During 1967-68, the average per capita labour charges in primary fishing operations increased from 1.46 million yens to 1.65 million yens (including fringe benefits).

TREND OF WAGE (ANNUAL PER CAPITA) CLASSIFIED

BY SIZE OF FISH OPERATION

(Primary Fishing)

(Unit Y'000)

	1964	1965	1966	1967	1968	1969
Average	453	545	605	658	707	858
10--30 M/T	261	316	377	374	406	403
30-50	376	433	519	554	627	806
50-100	415	515	575	608	635	839
100-200	501	593	691	701	721	925
200-500	548	668	746	795	861	1,017
500	697	796	781	918	965	1,168

ANNUAL WAGE COMPARISON BETWEEN MFG INDUSTRIES

AND SMALLER FISHERIES OPERATION

Unit Y'000

MFG INDUSTRY (AVERAGE)	1964	1965	1966	1967	1968	1969
(A) No. of Employees 5-29	357	401	440	497	596	687
Ratio to previous year	144	123	97	130	199	153
(B) No. of Employees over 30	492	532	596	674	776	904
SMALLER FISHERIES (AVERAGE)						
(C) (harvesting)	453	545	605	658	707	858
(C)/(A)	1269	1359	1375	1324	1186	1249
(C)/(B)	921	1024	1015	976	911	949

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5. SUMMARY AND CONCLUSIONS

(a) The Japanese Alaskan pollock fishery, at its present level is capable, subject to some constraints, of producing a sizeable volume of Alaska pollock fillet-blocks in order to meet the shortages that may continue to arise on account of the declining cod resource. The following is the likely level of fillet-block exports that may be attained during the 1972-1975 period:

1972	-	25-28 million pounds
1973	-	35-40 + " "
1974	-	45 + " "
1975		50 + " "

(b) The present catch of Alaska pollock by Japan is estimated at 2.5 million metric tons. About 50% of the catch goes into meal production and the rest into the production of surimi. Only a fraction of the total catch is presently utilized for the production of fillet-blocks.

(c) According to Japanese biologists, the present catch levels are close to the maximum sustainable yield in the middle and near waters. However, there is scope for expansion in the distant waters (the Bering Sea). In recent years, the size of Alaska pollock has been decreasing. This is causing some concern. The Japanese government controls the fishing effort through a system of licenses, extending over a period of five years. This is designed to conserve the resource and also to ensure a balance between supply and demand. At the end of five years, the situation is reviewed and licenses are either extended for another five years or withdrawn.

(d) The Russian catch of Alaska pollock (primarily in the Bering Sea) amounts to about 500,000 metric tons. The Russians are increasingly turning to the Alaska Pollock resource as a source of fish protein. The Russians have bought several surimi plants from Japan during 1970-71. The north Koreans are also getting interested in the Alaskan pollock resource. Therefore, it is most unlikely that the Japanese catch of Alaska pollock will undergo any sizeable increase in the years ahead.

(e) The main fishing grounds for Alaska pollock are:

(i) coastal areas of Japan, particularly the Northern Island of Hokkaido;

(ii) the sea of Okhotsk and the Kamchatka Peninsula; and

(iii) the Bering Sea.

There are two main types of fishing for Alaska Pollock: the small trawlers (up to 1,000 gross tons) and the mothership type of operations.

The fishery in the coastal waters is, primarily, a summer fishery. The catch is not suitable for filleting because of the high degree of parasitic infestation. Most of the catches in the Bering Sea are utilized for the production of surimi and fish meal. This means that only the fish caught (and landed in a 'fresh' state on shore) from the Sea of Okhotsk and the Kamchatka Peninsula are suitable for fillet-block purposes. Here the problem is to land the fish on shore in a 'fresh' state and in sufficient quantities to make filleting a profitable operation. The round trip takes about 10 days and only the fish caught on the last day of the trip (boxed and iced) is generally used for filleting. Thus, one of the real constraints to the production of fillet-blocks at the present time, is the supply of 'fresh' fish suitable for filleting.

(f) Because of the highly labour oriented nature of the filleting operation, only a shore plant operation is likely to be economically viable. It is exceedingly difficult to fillet on board the factory ships because of the large increase in the amount of labour required, the high labour costs associated with it and the space requirements. Attempts were made in the past to freeze fillet-blocks on board the factory ships. These attempts were not successful.

If indeed the Japanese could become successful in freezing fillet-blocks on board, it would dramatically increase the volume of production. Generally, the production season for blocks is October to March. "Otoshimi" blocks (made from chipped fillets) and surimi blocks are frozen on board factory ships at present. However, this product is not acceptable in export markets.

(g) Alaskan pollock, because of its close similarity to cod, can be an effective substitute for cod fillets and blocks. The fish is white fleshed and the blocks look almost like cod blocks. Alaskan pollock belongs to the whiting family and does not bear any resemblance to Atlantic pollock. The fish is rather small in size- about 14"-18" in length (a 4 year old fish) and weighs about 1.5 lbs. Consequently, the fillets are rather thin.

(h) The parasite problem is both geographical and seasonal because of migration. The fish caught in the Sea of Japan and coastal areas during the summer appears to have a high parasitic count, because of higher temperatures. However, the winter fishery does not seem to have as much of a problem with parasites. The parasites are, generally, confined to the belly flap.

(i) There are in all, about 60 plants in Japan that can potentially enter the production of Alaska fillet-blocks. Most of these are located on the Northern Island of Hokkaido. In 1972, about 20 plants may actually be producing fillet-blocks. In general, it can be stated that the existing old plants are not adequate for the production of fillet-blocks for export as they do not meet sanitary standards. Some new plants have been built during 1970

and 1971 and others are under construction, for the production of fillet-blocks, for export purposes.

(j) The f.o.b. plant costs of producing Alaskan fillet-blocks are about 27-28 cents per lb. The landed cost of blocks on the U.S. - East Coast, would be around 37 cents and on the West Coast about 35 cents. The current price of the block is reported to be about 40 cents at the wholesale processor level in the U.S. as compared with 47 cents for cod blocks.

One of the factors that help to reduce the raw material cost in the production of fillet-blocks is the yield of roe - about 7-8% of round fish. This is, of course, a seasonal factor, from November to March. Roe prices are about 400 to 470 yens per kilogram (60-70 cents U.S. per lb.). The greater the yield of roe and the higher the price of roe, the lower the cost of raw material for filleting.

For some sectors of the industry, fillet-block manufacturing is a more profitable operation than surimi and fish meal. If the market prices for blocks continue to increase, and if the production, raw material and transportation costs do not undergo any major increases, there will be an added incentive to produce Alaskan fillet-blocks for export purposes.

There is no domestic market for fillet blocks in Japan. However, it is gathered that in the foreseeable future, efforts will be made to develop the fish sticks and portions as well as the institutional market in Japan.

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(k) The demand for Kamaboko (made from surimi) in Japan is increasing at an annual average rate of over 10%. This implies that if substantial quantities of Alaska pollock catch are diverted to the production of fillet-blocks, then surimi and Kamaboko production in Japan may be affected adversely. If this happens, there is a possibility that Japan may acquire cheaper fish such as hake and whiting for the domestic requirements of surimi.

(l) Some U.S. buyers have offered purchase contracts to Japanese producers of fillet-blocks. Some have also offered assistance in terms of technical know-how in order to enable production in accordance with U.S. quality standards.

(m) Presently, the exports of Alaskan pollock fillet-blocks from Japan are channeled through 3 export trading houses, eg. Mitsubishi, Pan-Asia trading Co. and Toshoku. As production for exports increases, other exporters may emerge. It is gathered that as export trade develops, the Japanese packers may organize a joint export organization on the same lines as their canned salmon and canned crab export organization, in order to ensure orderly marketing.

(n) The prospects for the entry of Canadian west coast fishermen into the Alaskan pollock fishery are not very good. The difficulties facing the Canadian West Coast fishermen are:

(i) the distance - about 2,000 miles from the port to the fishing grounds (Bering Sea);

(ii) the lack of a fleet of factory ships;

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(iii) the lack of a ready market for surimi and meal. Japan, which is by far the most important market for surimi is not open to Canada as there are severe import restrictions respecting surimi and meal;

(o) In summary, the Japanese Alaskan Pollock fishery is potentially capable of supplying substantial quantities of fillets and blocks to the export markets. However, in the short term, there are some real difficulties stemming from:

(i) the lack of adequate supplies of 'fresh' fish;

(ii) the lack of proper plant facilities; and

(iii) the parasite problem.

However, given time, these difficulties can be overcome. The major incentive for Japanese producers is the rising U.S. market for blocks and the attractive market price. This makes fillet-blocks, relatively speaking, a more profitable operation as compared with surimi and meal.

CATCH OF THE JAPANESE MOTHERSHIP BOTTOMFISH FISHERIES IN THE BERING SEA BY MAJOR SPECIES, IN METRIC TONS (ROUND WEIGHT), 1960-69.[1][2]

	SPECIES									
YEAR	TOTAL	HALIBUT	OTHER FLOUNDERS	PACIFIC COD	POLLOCK	BLACKCOD	PACIFIC OCEAN PERCH	SHRIMP	HERRING[3]	OTHERS
1960	457 387	-	374 895	6 523	25 769	-	430	-	-	49 770[4]
1961	622 743	11 141	456 191	6 834	24 398	26 182	13 075	10 225	73 901	796
1962[5]	509 922	9 931	350 145	10 822	62 117	28 424	13 540	21 012	10 077	3 854
1963[6]	313 950	9 669	64 672	15 487	113 696	21 499	25 456	31 612	31 624	235
1964	414 534	2 275	101 037	19 147	175 326	6 619	44 688	20 487	42 600	2 355
1965	384 971[7]	1 585	41 642	15 683	231 046	3 322	46 446	8 839	35 557	854
1966	430 293	863	67 202	17 360	262 351	6 713	43 691	2 757	27 500	1 856
1967	742 386	1 287	90 015	30 430	549 851	6 426	25 529	3 288	32 879	2 681
1968	810 145	1 113	52 460	47 152	666 028	1 514	10 172	8 755	22 878	73
1969[2]	807 847	249	87 640	34 550	655 868	3 116	11 139	4 412	10 333	540

1) DATA FOR 1960-63 ARE FROM "FISHERIES STATISTICAL YEARBOOK" PUBLISHED BY STATISTICAL DIVISION, MINISTRY OF AGRICULTURE AND FORESTRY. DATA FROM 1964 ARE CALCULATED BY THE FISHERIES AGENCY BASED ON CATCH REPORTS. DATA FOR 1954 THROUGH 1959 HAVE BEEN REPORTED IN PREVIOUS YEARBOOKS.

2) FOR 1969, FIGURES ARE FOR JANUARY THROUGH OCTOBER.

3) INCLUDES GILLNET CATCH ONLY UP TO 1962.

4) SPECIES UNKNOWN.

5) ONE FLEET WITH FIVE CATCHERS OPERATED HERRING GILLNETS AND CAUGHT 19 TONS IN THE GULF OF ALASKA.

6) ONE FLEET WITH THREE CATCHERS OPERATED BLACKCOD GILLNETS AND CAUGHT 1,560 TONS IN THE GULF OF ALASKA.

7) DISCREPANCY BETWEEN TOTAL GIVEN AND ACTUAL SUM OF BROKEN-DOWN FIGURES IS DUE TO ROUNDING.

SOURCE: FISHERIES AGENCY, JAPANESE GOVERNMENT.

Annual Japanese catch (m.t.) by species taken by the mothership fishery, the North Pacific trawl fishery, and the North Pacific longline-gillnet fishery in the Bering Sea Region, 1968-70 [a] (Doc. 1302 and 1406). (Excluding the landbased dragnet fishery.)

Species	1968	1969	1970
Total catch	863,666	1,077,915	1,426,661
Yellowfin sole	28,277	67,078	62,875
Turbot	16,496	13,413	9,636
Halibut	1,403	939	297
Other flatfish	13,453	16,266	32,964
Blackcod	6,811	8,653	6,063
Pacific cod	51,393	43,721	60,946
Pacific pollock	667,185	840,981	1,202,894
Pacific ocean perch	44,944	25,200	17,645
Herring	18,022	50,656	25,480
Pink shrimp	12,198	9,484	6,010
Others	3,479	1,525	1,854

a) Figures are from November of the previous year through October.

TABLE 3

Preliminary data on the Japanese catch (m.t.) in the Bering Sea Region, by area, during January-July 1971 by the mothership fishery, North Pacific trawl fishery, [illegible] North Pacific longline-gillnet fishery (including the landbased dragger fishery [illegible]). Total catch [illegible] in January-July 1970 are shown in parentheses ([illegible]).

Species	D([illegible])	D(e)	C	A	B	E	[illegible] 175°W	[illegible] 170°E	Total
Total catch[a]	32,131	79,038	313,702	581,974	4,292	144,596	9,872	12,879	1,178,485 ([illegible])
Yellowfin sole	1,446	2,006	13,208	12,695	33	24,741	45	-	54,253 (45,322)
Rock sole	556	2,103	3,862	3,321	11	6,233	1	-	16,086 (7,870)
Halibut[b]	1,612	5	-	-	-	-	-	-	1,617 (191)
Pacific cod	2,134	900	5,633	12,046	277	769	207	283	22,249 (45,987)
Pollock	13,312	66,331	275,778	535,832	3,623	98,540	5,358	10,959	1,009,733 (892,283)
Blackcod	1,184	22	672	1,277	157	84	243	187	3,829 (5,472)
Pacific ocean perch	1,161	-	704	1,000	13	63	3,052	904	6,897 (9,140)
Herring	1,713	5,480	1,620	12	-	4,172	33	348	13,377 (13,529)
Shrimps	2,576	-	-	-	-	-	-	-	2,576 (5,853)

a) Includes other species.
b) Round weight

FISHING EFFORT BY TYPE OF GEAR, AND CATCHES (IN METRIC TONS) OF MAJOR SPECIES BY 5-DEGREE BANDS AND BY TYPE OF GEAR, JAPANESE MOTHERSHIP BOTTOMFISH FISHERIES IN THE BERING SEA, 1968.

EFFORT, SPECIES AND TYPE OF GEAR	160°E-165°E	165°E-170°E	170°E-175°E	175°E-180°	180°-175°W	175°W-170°W	170°W-165°W	165°W-160°W	160°W-155°W	TOTAL
EFFORT										
PAIR TRAWL, FISH NET (HOURS)	-	-	-	-	1 100	4 456	5 886	3 799	-	15 241
DANISH SEINE, FISH NET (SETS)	-	-	-	-	9 130	20 255	23 202	13 971	-	66 558
SIDE TRAWL, FISH NET (HOURS)	-	-	118	56	2 498	5 368	1 475	230	1	9 746
LONGLINE (HACHI X10)	-	-	-	-	110	28	165	-	-	303
GILLNET (TANS X10)	149	36 935	106	52	40	1 128	921	862	222	40 415
STERN TRAWL, FISH NET (HOURS)	-	-	264	4 160	4 469	12 477	9 260	649	-	31 279
SIDE TRAWL, SHRIMP NET (HOURS)	-	-	-	-	4 614	52	-	-	-	4 666
STERN TRAWL, SHRIMP NET (HOURS)	-	-	-	-	434	1 010	-	-	-	1 444
CATCH--GRAND TOTAL	2	5 174	609	6 367	79 000*	264 109*	341 204*	113 629*	51	810 045*
YELLOWFIN SOLE	-	-	250	-	29	1 042	8 786	15 566	1	25 674
PAIR TRAWL, FISH NET	-	-	-	-	11	134	3 207	4 291	-	7 643
DANISH SEINE, FISH NET	-	-	-	-	-	608	4 720	10 168	-	15 496
SIDE TRAWL, FISH NET	-	-	250	-	6	56	415	240	1	968
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	-	12	244	444	867	-	1 567
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
TURBOT	-	-	-	-	1 720	4 465	6 830	43	-	13 058
PAIR TRAWL, FISH NET	-	-	-	-	338	1 635	995	27	-	2 995
DANISH SEINE, FISH NET	-	-	-	-	1 303	2 382	1 784	12	-	5 481
SIDE TRAWL, FISH NET	-	-	-	-	1	21	429	-	-	451
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	-	78	427	3 622	4	-	4 131
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-

*INCLUDES OTHER SPECIES

CONTINUED..

CONTINUED

EFFORT, SPECIES AND TYPE OF GEAR	160°E-165°E	165°E-170°E	170°E-175°E	175°E-180°	180°-175°W	175°W-170°W	170°W-165°W	165°W-160°W	160°W-155°W	TOTAL
FLATHEAD SOLE	-	-	-	-	272	1 976	6 828	1 265	-	10 341
PAIR TRAWL, FISH NET	-	-	-	-	162	943	2 806	471	-	4 382
DANISH SEINE, FISH NET	-	-	-	-	75	755	3 313	746	-	4 889
SIDE TRAWL, FISH NET	-	-	-	-	4	57	97	25	-	183
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	-	31	221	612	23	-	887
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
HALIBUT	-	-	-	-	1 113	-	-	-	-	1 113
PAIR TRAWL, FISH NET	-	-	-	-	-	-	-	-	-	-
DANISH SEINE, FISH NET	-	-	-	-	-	-	-	-	-	-
SIDE TRAWL, FISH NET	-	-	-	-	404	-	-	-	-	404
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	-	709	-	-	-	-	709
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
BLACKCOD	-	-	-	142	562	475	335	-	-	1 514
PAIR TRAWL, FISH NET	-	-	-	-	-	-	-	-	-	-
DANISH SEINE, FISH NET	-	-	-	-	4	8	-	-	-	12
SIDE TRAWL, FISH NET	-	-	-	-	183	143	25	-	-	351
LONGLINE	-	-	-	-	29	7	63	-	-	99
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	142	346	317	247	-	-	1 052
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
PACIFIC COD	-	-	-	1	6 113	24 406	14 367	2 265	-	48 152
PAIR TRAWL, FISH NET	-	-	-	-	703	6 267	3 037	763	-	10 770
DANISH SEINE, FISH NET	-	-	-	-	4 904	16 524	8 008	1 362	-	30 798
SIDE TRAWL, FISH NET	-	-	-	0	139	174	312	30	-	655
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	1	367	1 441	3 010	110	-	4 929
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-

CONTINUED..

CONCLUDED

EFFORT, SPECIES AND TYPE OF GEAR	160°E-165°E	165°E-170°E	170°E-175°E	175°E-180°	180°-175°W	175°W-170°W	170°W-165°W	165°W-160°W	160°W-155°W	TOTAL
POLLOCK	-	-	-	-	58 971	213 406	301 134	92 517	-	666 028
PAIR TRAWL, FISH NET	-	-	-	-	12 267	57 225	63 894	36 027	-	169 413
DANISH SEINE, FISH NET	-	-	-	-	41 536	108 795	121 361	55 348	-	327 040
SIDE TRAWL, FISH NET	-	-	-	-	156	3 093	10 760	553	-	14 562
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	-	5 012	44 293	105 119	589	-	155 013
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
PACIFIC OCEAN PERCH	-	-	359	6 224	1 911	943	735	-	-	10 172
PAIR TRAWL, FISH NET	-	-	-	-	-	-	-	-	-	-
DANISH SEINE, FISH NET	-	-	-	-	75	3	4	-	-	82
SIDE TRAWL, FISH NET	-	-	-	64	430	246	51	-	-	791
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	359	6 160	1 406	694	680	-	-	9 299
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
HERRING	2	5 174	-	-	-	16 697	677	278	50	22 878
PAIR TRAWL, FISH NET	-	-	-	-	-	150	-	-	-	150
DANISH SEINE, FISH NET	-	-	-	-	-	12	51	-	-	63
SIDE TRAWL, FISH NET	-	-	-	-	-	4 279	97	8	-	4 384
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	2	5 174	-	-	-	197	298	270	50	5 991
STERN TRAWL, FISH NET	-	-	-	-	-	12 059	231	0	-	12 290
SIDE TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, SHRIMP NET	-	-	-	-	-	-	-	-	-	-
PINK SHRIMP	-	-	-	-	8 304	451	-	-	-	8 755
PAIR TRAWL, FISH NET	-	-	-	-	-	-	-	-	-	-
DANISH SEINE, FISH NET	-	-	-	-	-	-	-	-	-	-
SIDE TRAWL, FISH NET	-	-	-	-	-	-	-	-	-	-
LONGLINE	-	-	-	-	-	-	-	-	-	-
GILLNET	-	-	-	-	-	-	-	-	-	-
STERN TRAWL, FISH NET	-	-	-	-	-	-	-	-	-	-
SIDE TRAWL, SHRIMP NET	-	-	-	-	7 622	13	-	-	-	7 635
STERN TRAWL, SHRIMP NET	-	-	-	-	682	438	-	-	-	1 120

SOURCE: FISHERIES AGENCY, JAPANESE GOVERNMENT.

JAPANESE BOTTOMFISH FLEETS AND INDEPENDENT VESSELS OPERATING IN THE BERING SEA, 1960-69.[1)2)3)4)]

YEAR	MOTHERSHIPS		CATCHERS		INDEPENDENT VESSELS	
	NO. OF VESSELS	TOTAL TONNAGE	NO. OF VESSELS	TOTAL TONNAGE	NO. OF VESSELS	TOTAL TONNAGE
1960	13	104 434	190	18 358	-	-
1961	33	164 434	380	32 423	3	3 418
1962	25	130 136	306	36 388	2	2 925
1963[5)]	20	92 047	258	26 934	5	9 421
1964	14	94 681	224	23 660	2	2 925
1965	14	103 962	214	22 530	2	6 799
1966	14	105 400	169	21 899	2	4 872
1967	14	120 010	184	32 392	13[6)]	12 531[6)]
1968[4)]	12	111 915	226	35 500	30	48 991
1969[4)]	12	97 296	226	42 066	42	93 608

1) DATA FOR 1960-63 ARE FROM "FISHERIES STATISTICAL YEARBOOK" PUBLISHED BY STATISTICAL DIVISION, MINISTRY OF AGRICULTURE AND FORESTRY.

2) CATCHERS INCLUDE OTTER TRAWLERS, PAIR TRAWLERS, DANISH SEINERS, AND LONGLINE-GILLNETTERS.

3) NO FISHERIES PRIOR TO 1954. DATA FOR 1954 THROUGH 1959 ARE REPORTED IN PREVIOUS YEARBOOKS.

4) LICENSED NUMBER.

5) INCLUDES ONE FLEET WITH THREE CATCHERS WHICH OPERATED GILLNETS FOR BLACKCOD IN THE GULF OF ALASKA.

6) AFTER SEPTEMBER SOME MOTHERSHIPS AND CATCHERS WERE CHANGED INTO INDEPENDENT VESSELS.

SOURCE: FISHERIES AGENCY, JAPANESE GOVERNMENT.

NUMBER AND TOTAL TONNAGE OF JAPANESE VESSELS OPERATING IN THE NORTHEAST PACIFIC REGION, BY TYPE OF FISHING, 1963-69.

YEAR	DANISH SEINE		SIDE TRAWL		STERN TRAWL		GILLNET & LONGLINE		TOTAL	
	NO. OF VESSELS	TOTAL TONNAGE	NO. OF VESSELS	TOTAL TONNAGE	NO. OF VESSELS	TOTAL TONNAGE	NO. OF VESSELS	TOTAL TONNAGE	NO. OF VESSELS	TOTAL TONNAGE
1963	-	-	2	1 024	1	1 454	4	1 414	7	3 892
1964	-	-	2	843	3	6 460	-	-	5	7 303
1965	5[1]	1 678	3	1 221	6	15 848	-	-	14	18 747
1966	2	589	3	1 450	14	32 099	-	-	19	34 138
1967[2][3]	1	299	1	549	29	49 940	22	7 280	53	58 068
1968[2][3]	1	299	1	549	29	49 940	22	7 280	53	58 068
1969[2]	-	-	-	-	42	93 608	22	8 029	64	101 637

[1] INCLUDES ONE MOTHERSHIP WHICH DID NOT FISH.

[2] LICENSED NUMBER.

[3] FIGURES GIVEN PREVIOUSLY ARE CORRECTED.

SOURCE: FISHERIES AGENCY, JAPANESE GOVERNMENT.