アリューシャン海盆における日本のスケトウダラ漁業の経過と現状

Past progress and present condition of the Japanese pollock fishery in the Aleutian Basin

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我が国の漁獲統計資料にアリューシャン海盆におけるスケトウダラの漁獲が報告されたのは，北方トロール船，北転船ともに1980年が最初である。海盆のスケトウダラ漁業に関する1980年以前の記録はほとんどない。ここでは，漁獲統計資料に基づき1980年以降の漁業の経過についてその概要を報告するとともに，1987年1－3月に遠洋水産研究所の研究者2名が，オブザーバーとして北転船に乗船して入手した情報を報告する。なお，統計資料から海盆における操業データを抜き出すため，水深2,000 m以深の漁区における操業を海盆における操業と判断した（図1）。

海盆におけるスケトウダラ漁業は当初は魚卵の生産を目的としたもので，雄や卵を除去した雌はほとんど利用されなかったようである。しかし，近年小型船では魚を氷蔵で持ち帰る操業が盛んになるとともに，すり身プラントを備えた大型の北方トロール船が参入したことなどにより，資源の有効利用が図られている。

海盆で操業している日本の漁船は，主として小型の北方トロール船と北転船であったが，近年では大型の北方トロール船も操業している。漁具は中層トロール網を用いているが，その仕様は年々変わっており，漁獲効率の高い網の開発が進められている。

1. 漁獲努力量

アリューシャン海盆における日本漁船の努力量（ひき網時間）は，1982年以降年々増大しているが，1981－83年は努力量の多くが米国水域に投入されたのに対し，1984年以降は努力量の大部分は公海水域に投入されている（表1）。1986年にベーリング公海に投入された努力量は，前年までの水準を大幅に上回った。北方トロール船と北転船とでは，後者の方がより多くの努力量をアリューシャン海盆に投入している。

1986年12月から1987年3月までの間に公海で操業した漁船数は，合計148隻に達すると推定されている。国別には，日本が北方トロール船37隻，北転船54隻（このうち27隻は2月から操業）で計91隻に達し，全体の61％を占めた。その他に韓国船32隻，ポーランド船22隻，中国船3隻がそれぞれ操業したと推定された。

2. 漁　獲　量

アリューシャン海盆における日本漁船のスケトウダラの漁獲量は，1984年から急激に増大し，1986年にはさらに増大して702,662トンに達した（表2）。1981－83年は米水域からの漁獲が

多かったが，米国水域における漁獲割当量の削減に伴い，公海水域の比重が年々高くなった。1986年の漁獲量の99％は公海水域で漁獲された。

韓国の漁獲統計資料によれば（韓国水産庁，1985），ベーリング公海における韓国漁船の操業は，我が国と同様に1980年に始まり，1984年には27隻の漁船が操業し，80,317トンのスケトウダラを漁獲した（表3）。ポーランドと中国の漁船に関する情報は，入手されていない。

3. 漁期と漁場

海盆における日本漁船の操業は，11月頃から翌年の4－5月頃まで行われるが，盛漁期は1－2月である。1985年に北転船の一部は夏季にも公海で操業したが，6－8月における月別総漁獲量は400－500トン程度に過ぎなかった。1985年の統計資料によれば，公海における年間漁獲量の71％は1－2月に漁獲されている。

北方トロール船の漁場は，海盆全体でみると公海水域を含めた海盆南東部に主として形成され，1983年までは180度以西の水域にはほとんど形成されなかった（図2～5）。1984年と1985年には公海が主漁場となるとともに，180度以西のバワーズ・リッジの北側にも漁場が形成された（図6，7）。このように主漁場は年によって変わる傾向が見られるが，ソ連水域に接する公海の西部水域には漁場は形成されていなかった。しかし，1986年には公海の南西部に漁獲量の多い水域が出現するとともに，北西部にも漁場が拡大している（図8）。北転船の漁場も北方トロール船とほぼ同様であるが，北方トロール船が利用していないバワーズ・リッジの南西水域も利用していた。

4. 単位努力量当り漁穫量（CPUE）

海盆における我が国漁船のCPUEは，北方トロール船，北転船ともに年々上昇する傾向にあり，特に公海水域における北転船のCPUEは，1984年以降それまでの水準を大きく上回っている（表4）。また，公海水域における北方トロール船のCPUEは，1986年に前年より大幅に上昇した。米水域と公海水域とにおけるCPUEには，米水域で1980年と1985年の北方トロール船のCPUEが高かったことを除けば，大きな違いはみられない。また，一部例外はあるが北方トロール船のCPUEは，一般に北転船よりも高い。特に，1986年の公海における北方トロール船のCPUEは，北転船の2倍であった。このような違いは，大型の北方トロール船の操業が増えたことによるものと考えられる。

海盆のスケトウダラ漁業は，魚群探知機とソナーで魚群を探索し中層トロール網で漁獲するという極めて選択的な漁業である。したがって，単位努力当り漁獲量は資源豊度の有効な指標とはなり難い。また，中層トロール漁具は毎年新しいものが開発されており，漁船の能力によって仕様が異なるだけでなく，同一漁船でも漁獲効率は年々向上していると考えられる。さらに，中層トロールでは同じ仕様の網を使用してもエンジンの馬力等に起因するひき網能力が違えば，漁獲能力は漁船間で大きく異なる。これらの違いを補正し標準化することはほとんど不可能であろう。CPUEが年々上昇しているのは，漁場と魚群に関する知見が蓄積されたことと漁具漁法が年々改良されたこと

とによるものと考えられる。

5. 漁獲物の組成

商業船の漁獲物の組成に関する詳細な資料はまだ入手されていないが，調査船の中層トロール操業結果から類推できる（Okada，1986）。1977－1979年の夏季調査及び1983年の冬季調査で漁獲された生物は，魚類17種，イカ類4種，イルカ類1種及びクラゲ類であった。1977年は釣漁具しか使用していないので，スケトウダラしか漁獲されなかった。中層トロールの漁獲物組成は，夏も冬もスケトウダラが圧倒的に多く，全漁獲尾数の92.1－99.8％を占めた。特に冬季は漁獲される生物の種類数が夏季に比べて少なくなるため，スケトウダラがほぼ100％近くを占めている。夏季の調査によれば，スケトウダラ以外の魚類では，ホテイウオとカラフトシシャモが比較的多かった。

6. 1987年1－3月のベーリング公海におけるスケトウダラ漁業

1987年1月から3月にかけて，公海における我が国のスケトウダラ漁業の実態を把握すること及び標本魚の採集を目的に，遠洋水産研究所から2名の研究者が2隻の北転船に便乗した。1回目の便乗調査では佐々木喬が第51富丸（279トン，1,100馬力）に乗船し，2回目の調査では吉村拓が第52萬漁丸（279トン，1,350馬力）に乗船した。漁場滞在期間は，それぞれ1月24－25日，2月27－28日及び3月2日であった。

漁場は2回の調査ともに，180度以西のバワーズ・リッジの北側（北緯55－56度，東経178－179度）であった。同漁場には1月末にはおよそ50隻，2月末にはおよそ30隻の漁船が操業していたと推測された。1月末の操業では，半径6海里のレーダーの視野内に常に20隻前後の漁船が認められた。

第51富丸が使用した中層トロール漁具は，ペンネットが196 m，袖網が約70 m，コッドが77 mで，ひき網中の網口の高さはおよそ45 mであった。カラー魚探とカラーソナーで魚群の大きさ，密度，水深，分布する方位などを調べて投網する。ひき網速度は3.5－5.0ノットであった。

魚群は1月末には230－320 mの水深に帯状に連続して分布しており，魚群層の厚さはおよそ100 m，最大で200 m近くに達していた。カラー魚探でみると特に濃密な魚群は魚群層のなかの上層部分に形成されており，トロール網は常にこの層をひくように操作された。2月末の観察では，魚群は350 mの水深にパッチ状に散在し，魚群層の厚さは100－150 mであった。ひき網1時間当りの平均漁獲量は，1月末には31.5トンであったが，2月末には4.2トンに低下した。魚群密度は比較的短期間のうちにかなり変化し，特に低気圧が接近すると魚が散るといわれている。1月末における観察では特に濃密な魚群にたまたま遭遇したため特に高いCPUEが記録されたが，このように高い値は通常は期待できない。漁獲物は，ほぼ100％スケトウダラであった。

漁獲されたスケトウダラの尾叉長の範囲は，1月末も2月末も変らず38－58 cmであったが（図9），48 cm以上の魚の割合が2月末には増えたため，平均体長は後半の方が大きかった。雄の体

長組成は雌より小さく（図10），1月末の平均体長は雄が45.6㎝，雌が46.9㎝であった。1983年の1－3月に海盆南東部の米水域で調査船が採集したスケトウダラの体長組成と比較すると（山口，1984），1983年も1987年もモードは44－48㎝にあって変らなかった。しかし，1983年の調査水域のなかで1987年とほぼ同じ場所で採集されたスケトウダラの組成をみると，モードは38－42㎝にあり（山口，1984），1987年の組成とは全く異なっていた。1983年の資料は3月中旬に採集されたもので，1987年より約2週間遅かった。したがって，両年における組成の違いが小型群の分布や出現豊度の年変動によるものか，時期的な違いによるものかは今後の調査に待たねばならない。

1月末と2月末に採集したスケトウダラの性比（雄と雌の100分率）は，それぞれ49：51，及び50：50で，ほぼ1：1であった。1月末には生殖腺は雌雄ともに半熟状態であったが，2月末にはほとんどが完熟か完熟に近かった。持ち帰った標本はまだ測定が完了していないので，年齢組成，生殖腺の状態，食性及び体長－体重関係などの生物学的情報については，別な機会に報告する予定である。

今回の便乗調査では，第51富丸の青木漁撈長，第52萬漁丸の小笠原漁撈長始め乗組員の方々に多大な御協力をいただいた。また，釧路機船漁業協同組合の柳川延之氏並びに金井漁業㈱及び本間漁業㈱の担当者の方々には乗船の便宜をはかっていただいた。これらの方々にお礼申し上げます。

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Table 1. Fishing effort (in hours) of Japanese trawlers operated in the Aleutian Basin.

Year	U.S. Waters			International Zone			Aleutian Basin Total		
	NPT	LD	Total	NPT	LD	Total	NPT	LD	Total
1980	2,400	2,880	5,280	647	6,100[a]	6,747	3,047	8,980	12,027
1981	3,491	1,342	4,833	0	792[a]	792	3,491	2,134	5,625
1982	4,392	5,058	9,450	0	2,561[a]	2,561	4,392	7,619	12,011
1983	5,043	11,741	16,784	1,367	2,666[a]	4,033	6,410	14,407	20,817
1984	2,343	5,461	7,804	13,481	11,931	25,412	15,824	17,392	33,216
1985	1,199	3,016	4,215	14,400	13,757	28,157	15,599	16,773	32,372
1986	18	860	878	30,391	50,922	81,313	30,409	51,782	82,191

a Including some efforts in the U.S. Waters.

Abbreviation NPT : North Pacific trawl fishery
LD : Landbased dragnet fishery

Table 2. Catch of pollock (in tons) of Japanese trawlers operated in the Aleutian Basin.

Year	U.S. Waters			International zone			Aleutian Basin Total		
	NPT	LD	Total	NPT	LD	Total	NPT	LD	Total
1980	2,273	1,028	3,301	280	2,121[a]	2,401	2,553	3,149	5,702
1981	2,429	836	3,265	0	221[a]	221	2,429	1,057	3,486
1982	7,171	3,171	10,342	0	1,298[a]	1,298	7,171	4,469	11,640
1983	6,921	10,275	17,196	2,811	1,285[a]	4,096	9,732	11,560	21,292
1984	6,720	33,711	40,431	40,756	60,143	100,899	47,476	93,854	141,330
1985	9,619	16,805	26,424	77,315	59,160	136,475	86,934	75,965	162,899
1986	161	4,534	4,695	375,026	322,941	697,967	375,187	327,475	702,662

a Including some catches in the U.S. Waters.

Abbreviation NPT : North Pacific trawl fishery
LD : Landbased dragnet fishery

Table 3. Number of vessels and catch of pollock (tons) of Korean trawlers operated in the international zone of the Bering Sea

Year	Number of vessels	Catch
1980	22	12,059
1981	0	0
1982	29	2,934
1983	28	66,558
1984	27	80,317

Table 4. Catch per unit of effort (ton per hour) for Japanese pollock fishery in the Aleutian Basin.

Year	U.S. Waters			International zone			Aleutian Basin Total		
	NPT	LD	Total	NPT	LD	Total	NPT	LD	Total
1980	0.9	0.4	0.6	0.4	0.3	0.4	0.8	0.4	0.5
1981	0.7	0.6	0.7	-	0.3	0.3	0.7	0.5	0.6
1982	1.6	0.6	1.1	-	0.5	0.5	1.6	0.6	1.0
1983	1.4	0.9	1.0	2.1	0.5	1.0	1.5	0.8	1.0
1984	2.9	6.2	5.2	3.0	5.0	4.0	3.0	5.4	4.3
1985	8.0	5.6	6.3	5.4	4.3	4.8	5.6	4.5	5.0
1986	8.9	5.3	5.3	12.3	6.3	8.6	12.3	6.3	8.5

Abbreviation NPT : North Pacific trawl fishery
LD : Landbased dragnet fishery

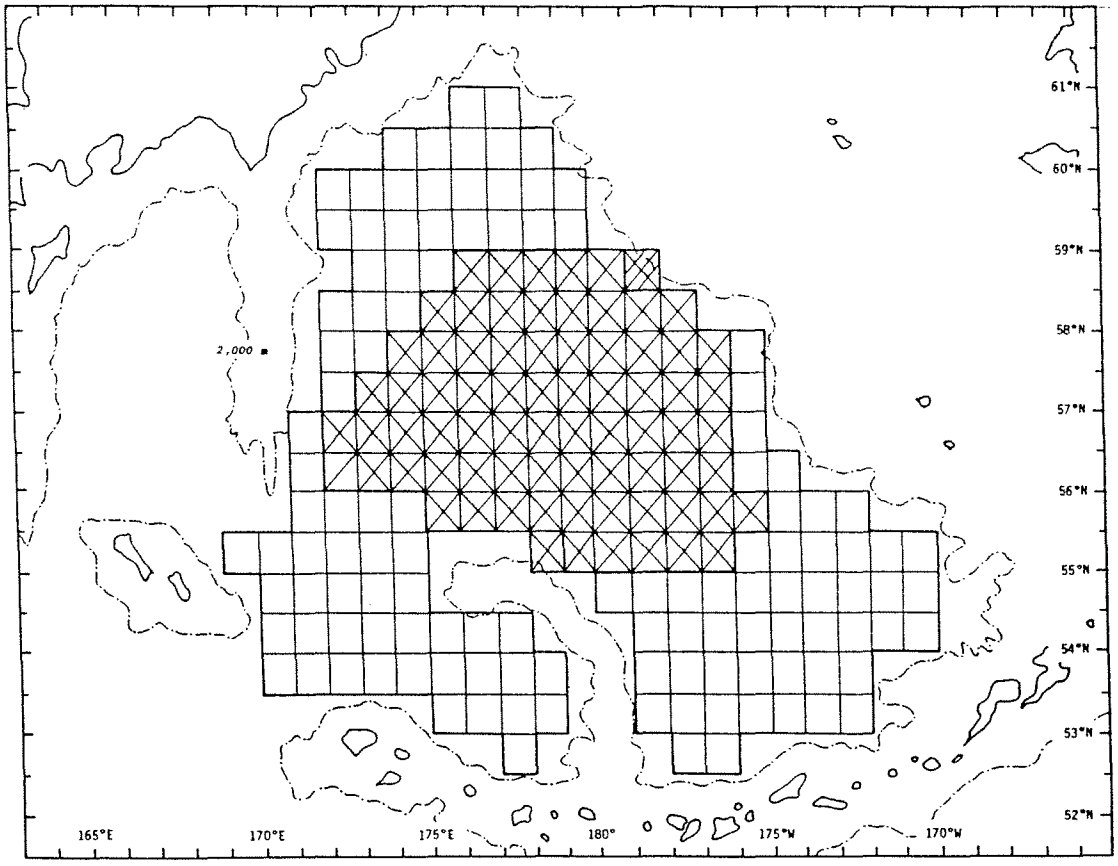

Fig. 1. Geographic definition of the Aleutian Basin of the Bering Sea in this report.

☐ U.S. and U.S.S.R. Waters of the Aleutian Basin.

☒ International Waters or doughnut hole area.

⊠ Catches of this block are not included in the Aleutian Basin, because those have been caught by bottom trawl until now.

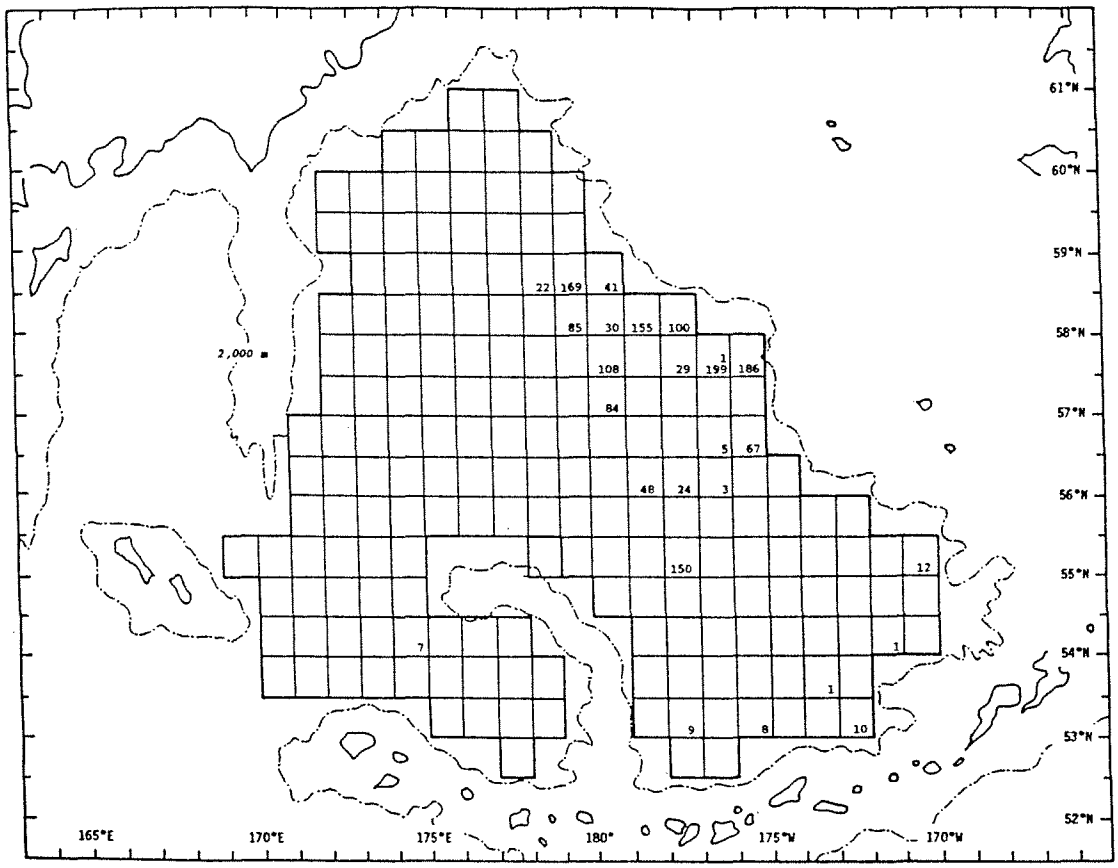

Fig. 2. Geographic distribution of pollock catches, in tons, by Japanese North Pacific trawl fishery in the Aleutian Basin, 1980.

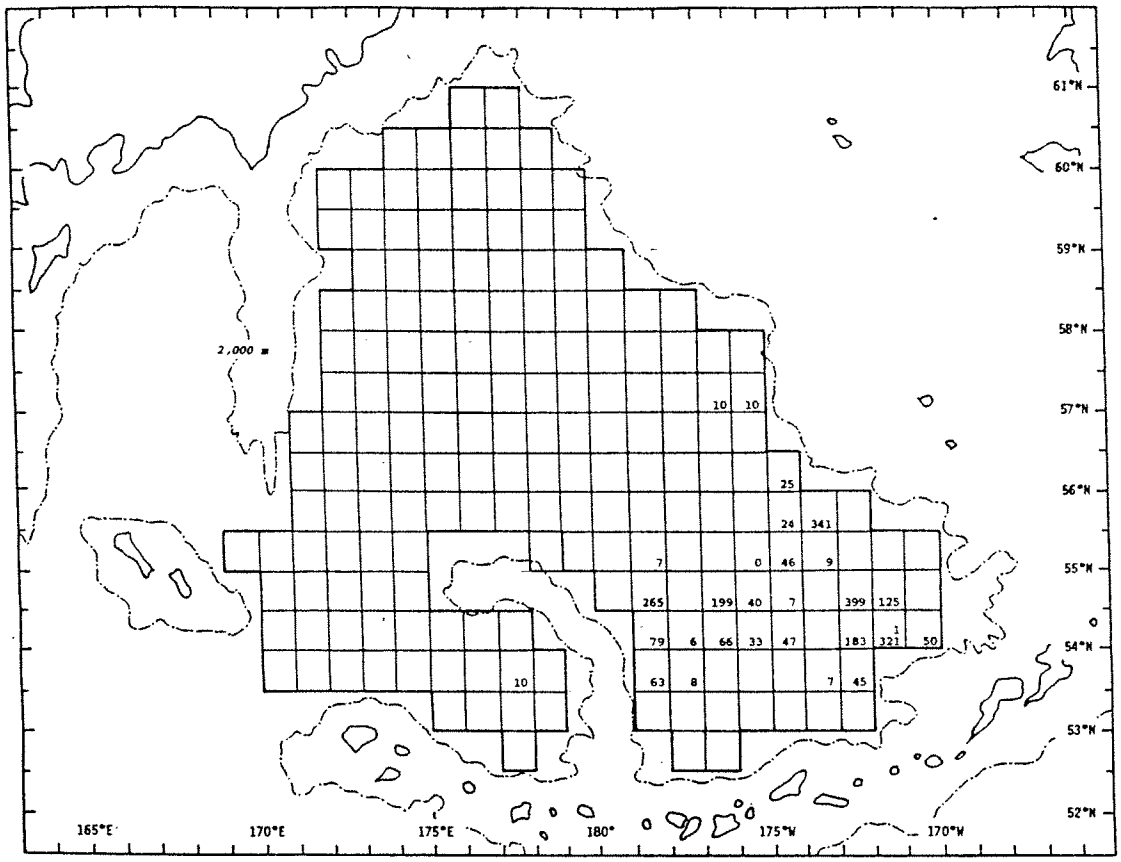

Fig. 3. Geographic distribution of pollock catches, in tons, by Japanese North Pacific trawl fishery in the Aleutian Basin, 1981.

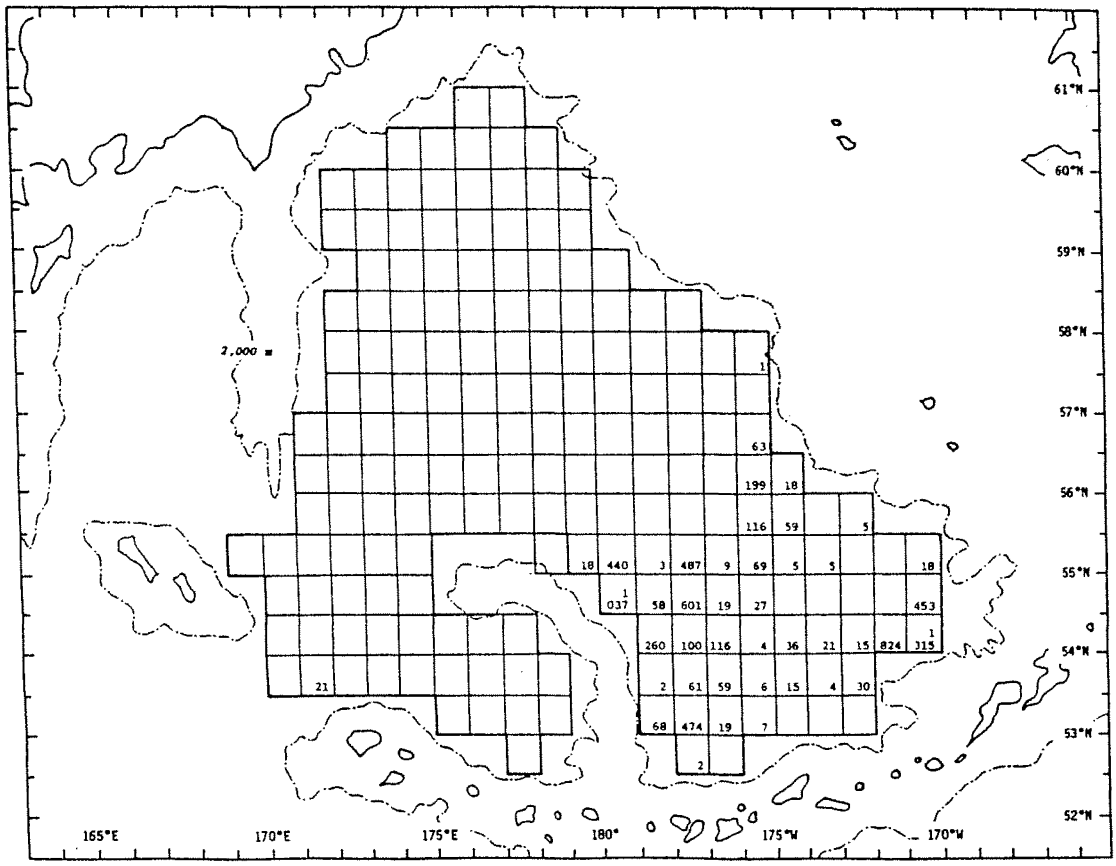

Fig. 4. Geographic distribution of pollock catches, in tons, by Japanese North Pacific trawl fishery in the Aleutian Basin, 1982.

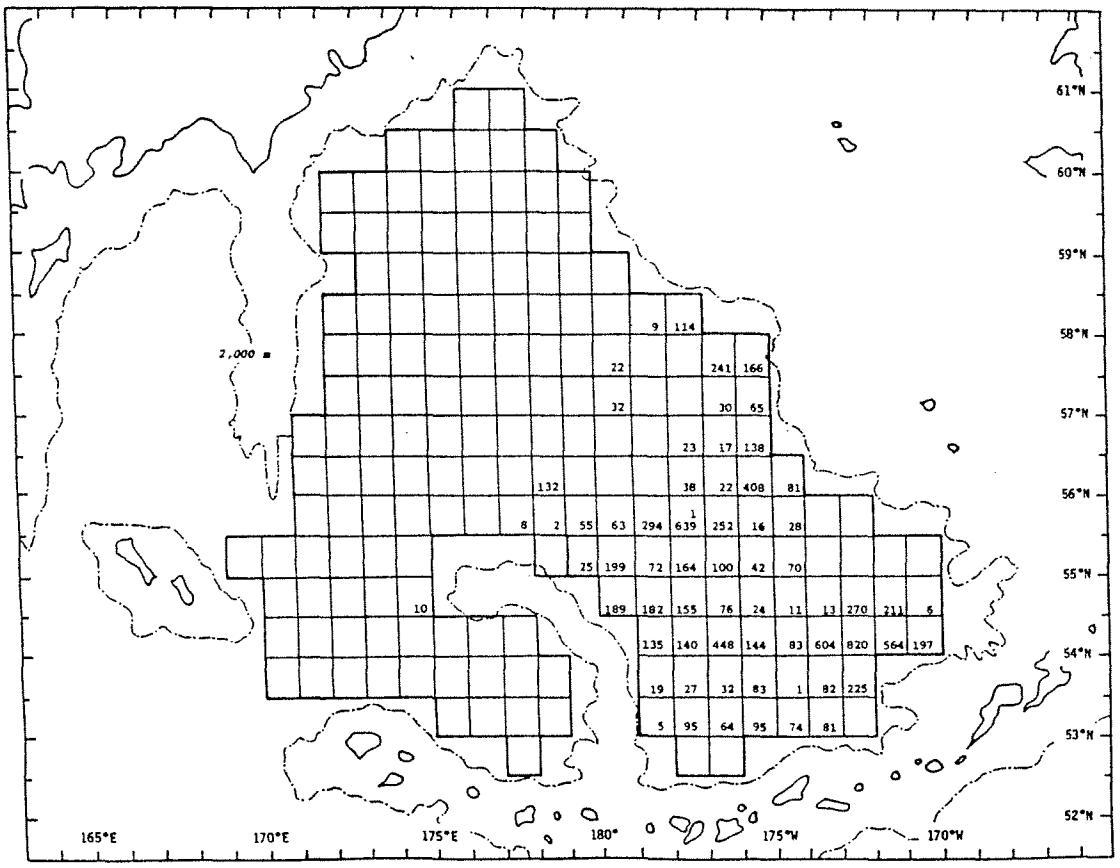

Fig. 5. Geographic distribution of pollock catches, in tons, by Japanese North Pacific trawl fishery in the Aleutian Basin, 1983.

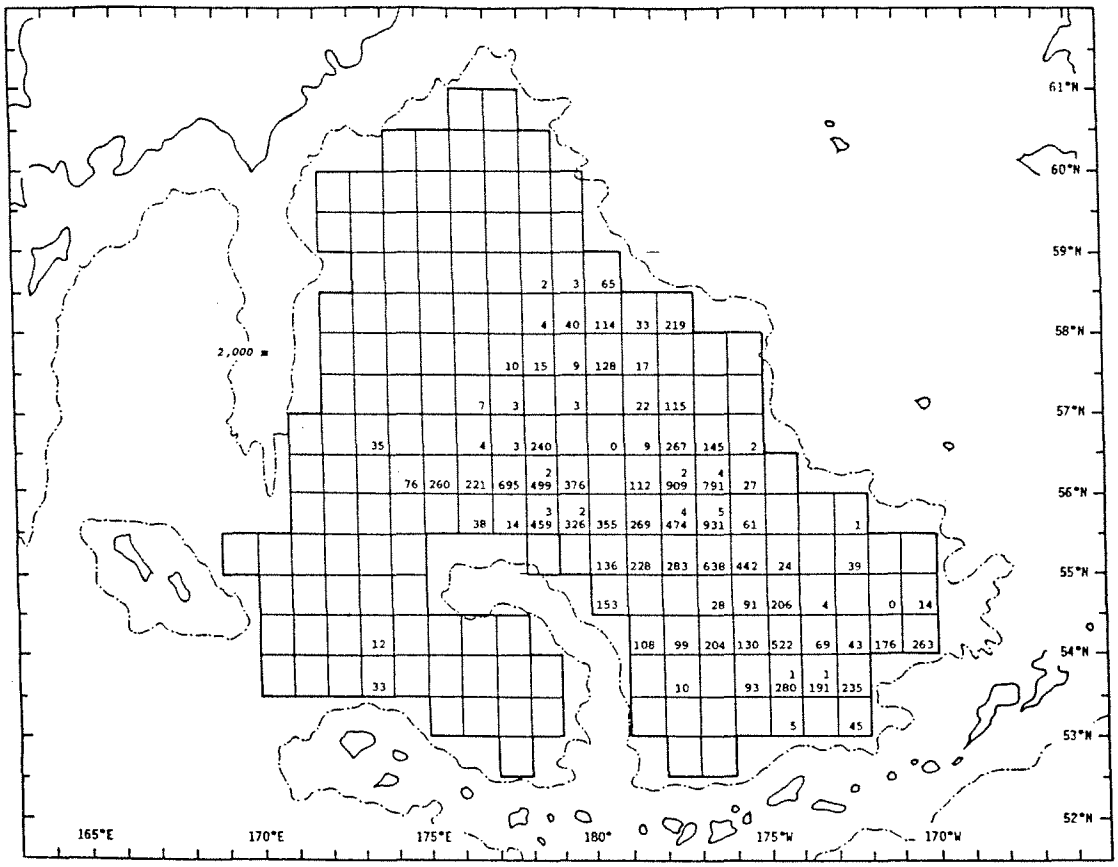

Fig. 6. Geographic distribution of pollock catches, in tons, by Japanese North Pacific trawl fishery in the Aleutian Basin, 1984.

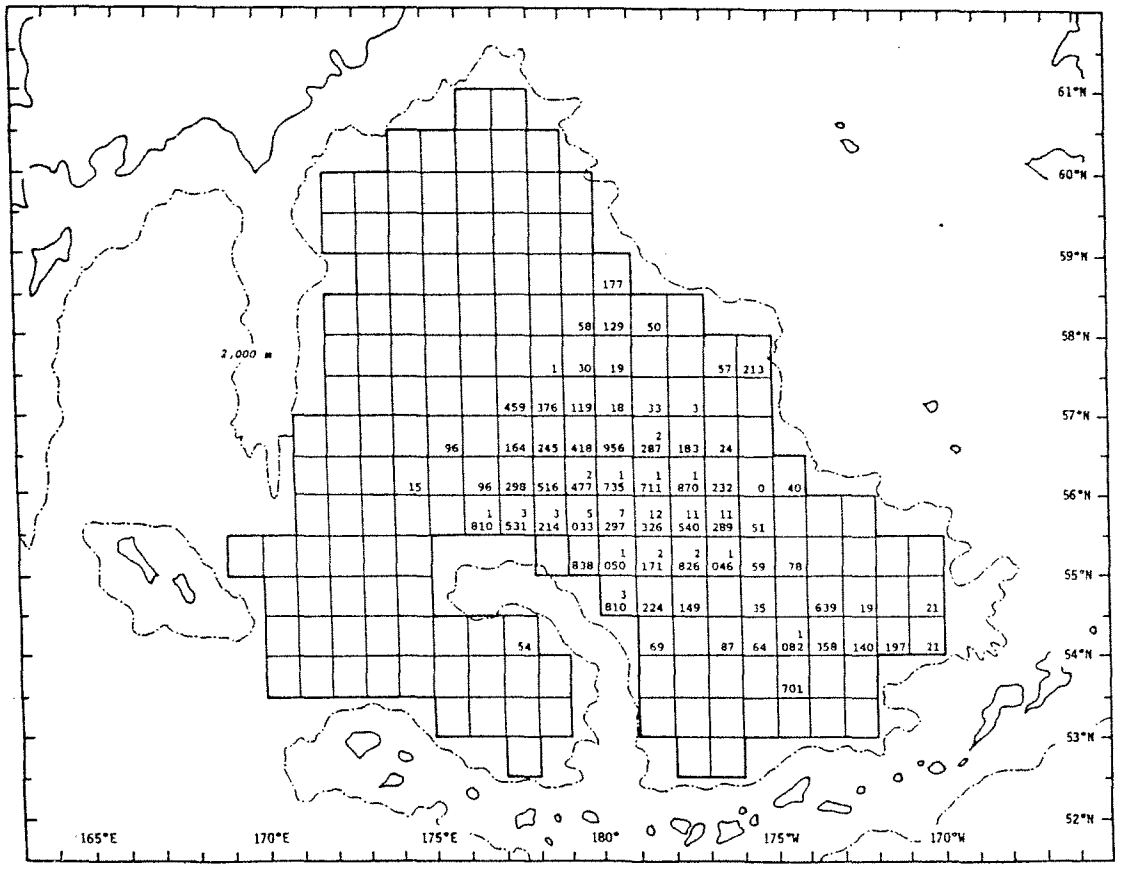

Fig. 7. Geographic distribution of pollock catches, in tons, by Japanese North Pacific trawl fishery in the Aleutian Basin, 1985.

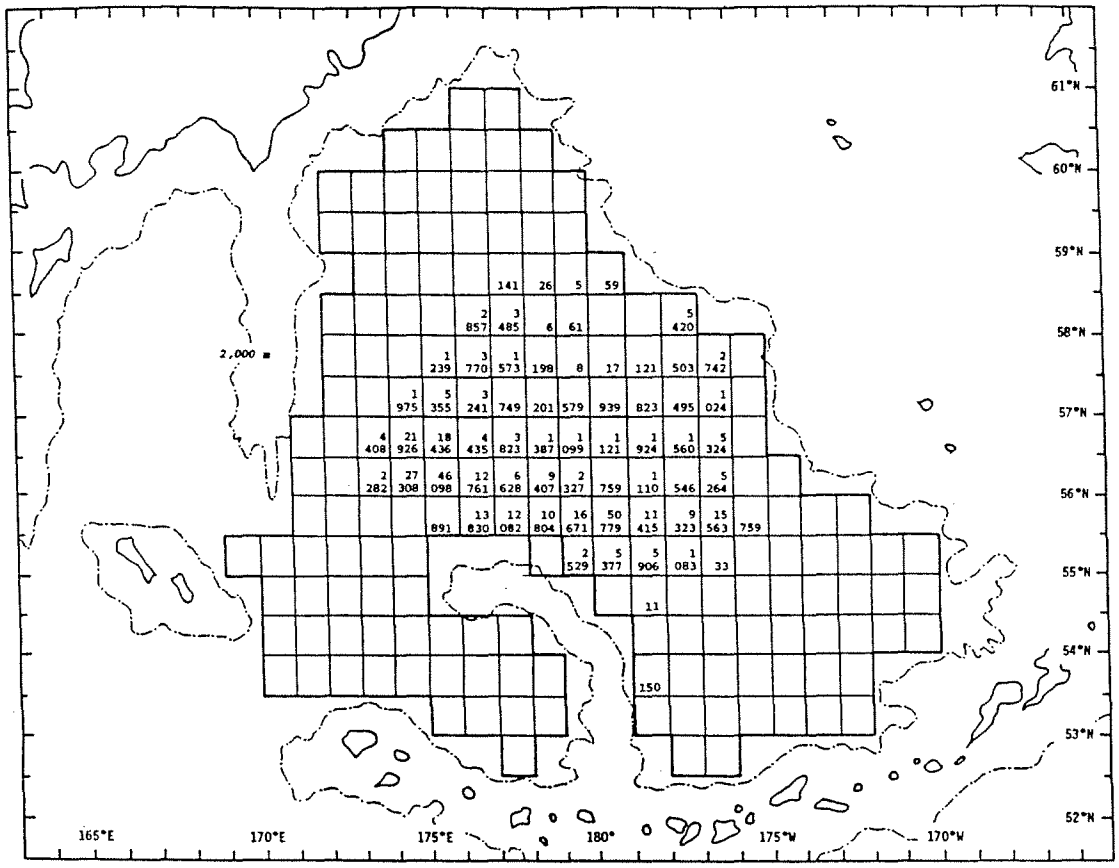

Fig. 8. Geographic distribution of pollock catches, in tons, by Japanese North Pacific trawl fishery in the Aleutian Basin, 1986.

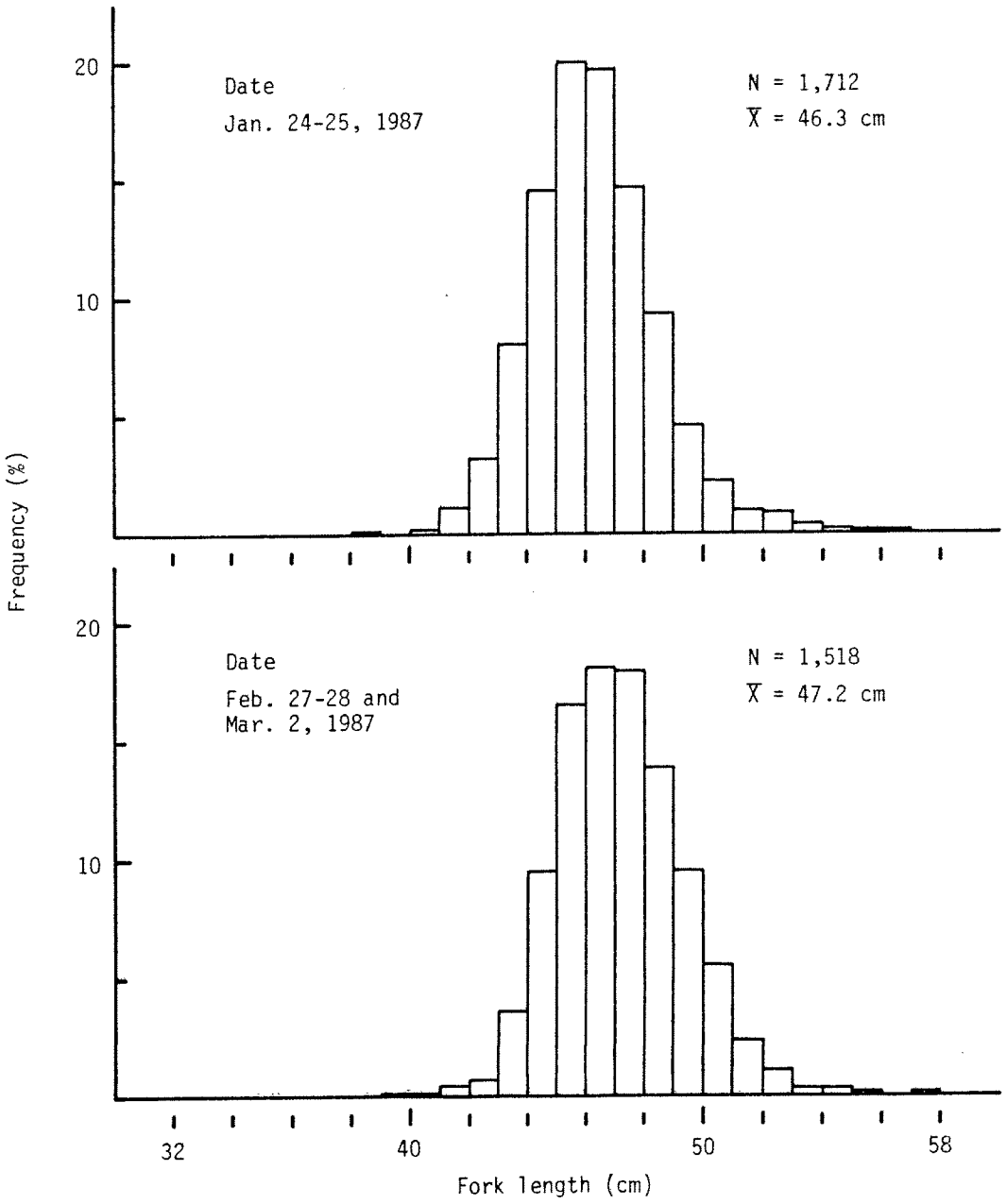

Fig. 9. Length frequency distribution of pollock catches by landbased dragnetters in the International Waters of the Bering Sea in 1987.

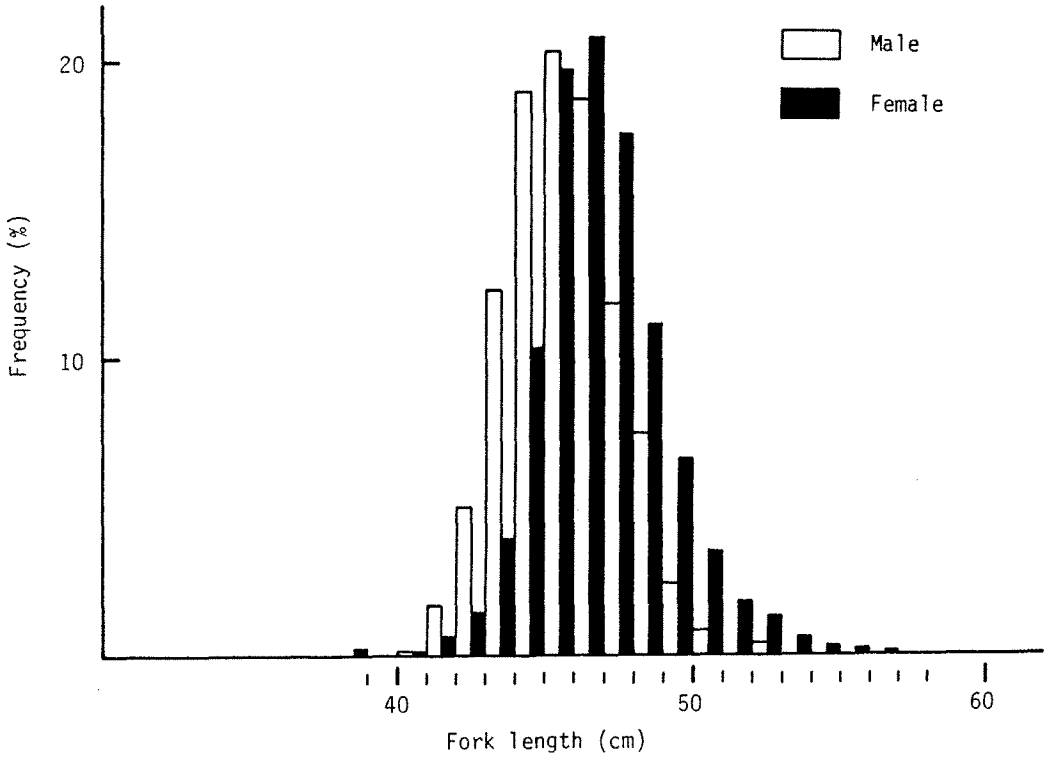

Fig. 10. Length frequency distribution of pollock by sex sampled in the International Waters of the Bering Sea in the late January and the late February-early March of 1987.

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TRANSLATION

PAST PROGRESS AND PRESENT CONDITION OF THE JAPANESE POLLOCK FISHERY IN THE ALEUTIAN BASIN

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Introduction

The catch of pollock by North Pacific trawlers and land-based trawlers in the Aleutian Basin was reported in Japanese catch statistics for the first time in 1980. There is almost no information on the pollock fishery in the Aleutian Basin before 1980.

In this report, an outline of the progress of the fishery since 1980, based on catch statistics, will be given. Information obtained by two scientists from the Far Seas Fisheries Research Laboratory, who embarked on land-based trawlers as observers from 1987 January to March will also be reported here. In order to extract data on fishing operations in the Basin from the total catch statistics, we assumed that operations in the statistical area with depths of 2,000 m or deeper were operations done in the Aleutian Basin (Fig. 1).

The pollock fishery in the Basin area aimed at roe production in the early stages and appeared to barely utilize males and carcasses of females after the roe was removed. However, effective utilization of the pollock stock in this area has been brought about by the fact that recently the operation prevailing among the small-sized vessels is to return all the catches of pollock by refrigeration with ice. In addition large-sized North Pacific trawlers installed with surimi plants have participated in this fishery.

The Japanese fishing vessels operated in the Aleutian Basin were mainly small-sized North Pacific trawlers and land-based trawlers. However, large-sized North Pacific trawlers equipped with surimi plants, have also been operating in recent years. They have been using midwater trawl nets, but net specifications have been modified year by year, resulting in the development of nets with higher fishing efficiency.

1. Fishing Effort

The fishing effort (hours trawled) by Japanese fishing vessels in the Aleutian Basin, has been increasing annually since 1982. However, most fishing effort in 1981-1983 was expended in U.S. waters, while in contrast, most of the fishing effort has been in international waters since 1984 (Table 1). Fishing effort expended in international waters in the Bering Sea in 1986 significantly exceeded the level of effort in previous years. Comparison of the fishing effort for North Pacific trawlers and land-based trawlers shows that the latter expended more fishing effort in the Aleutian Basin areas.

A total of 148 fishing vessels were estimated to be engaged in the pollock operation in international waters during the period of 1986 December to 1987 March. A total of 91 Japanese vessels, including 37 North Pacific trawlers and 54 land-based trawlers (of which 27 were engaged in this fishery from 1987 February), accounted for 61% of the total vessels. In addition to these Japanese vessels, it was estimated that 32 Korean, 22 Polish and three Chinese vessels participated in this fishery.

2. Catch

The catch of pollock by Japanese fishing vessels in the Aleutian Basin has greatly increased since 1984, with a major increase to 702,662 t in 1986 (Table 2). Although the majority of pollock catch was from U.S. waters from 1980 to 1983, the proportion of the total catch taken from international waters has increased year by year, with the reduction in the catch quota for the U.S. waters. Ninety-nine percent of the total catch in 1986 was caught in international waters.

According to Korean catch data (Fisheries Agency of Korea 1985), operations by Korean fishing vessels in international waters of the Bering Sea, began in 1980, the same year Japan's fishery began there. Twenty-seven Korean fishing vessels were operated in 1984, and their pollock catch was 80,317 t (Table 3). No information was obtained for fishing vessels from Poland and China.

3. Fishing seasons and fishing grounds

Fishing operations were carried out by Japanese fishing vessels in the Aleutian Basin, from around November to around April or May of the following year, although the peak of the fishing season is in January and February. Some land-based trawlers were operated in international waters in the summer of 1985, but the total catch for each month from June to August was only about 400-500 t. According to statistical data for 1985, 71% of the annual catch in international waters was made in January and February.

In the Aleutian Basin, the fishing grounds for North Pacific trawlers consist mainly of the southeast section, including the international water area, with almost none in the area west of 180° through 1983 (Figs. 2 to 5). The main fishing grounds were in international waters in 1984 and 1985 and grounds were also fished on the north side of the Bower's Ridge area west of 180° (Figs. 6 and 7). Although the location of the main fishing ground tends to vary with year as described above, no fishing ground was formed on the west side of the international waters, adjacent to U.S.S.R. waters. However, in 1986, areas where pollock catch was high appeared in the southwestern part of international waters and the fishing ground also expanded to the northwestern part of the international waters (Fig. 8).

The fishing ground for land-based trawlers was almost the same as for North Pacific trawlers, although the land-based trawlers utilized the southwestern area around Bower's Ridge, which the North Pacific trawlers did not.

4. Catch per Unit of Effort (CPUE)

The CPUEs for Japanese North Pacific trawlers and land-based trawlers fishing in the Aleutian Basin show a tendency to increase annually. In particular, the CPUE values in and after 1984 for the land-based trawlers operated in the international waters greatly exceeded those for years before 1984 (Table 4). In addition, the CPUE in international waters for North Pacific trawlers in 1986 increased considerably from the level for the previous year. No significant differences are observed in the CPUE values between U.S. waters and international waters except for high values recorded in 1980 and 1985 for North Pacific trawlers operated in U.S. waters. The CPUE values for North Pacific trawlers were generally higher than those for land-based trawlers with some exception. In particular, the CPUE values in international waters in 1986 for the former were twice as high as those for the latter. This difference is assumed to result from the fact that operations by large-sized North Pacific trawlers have increased.

The fishing method used in the pollock fishery in the Aleutian Basin, employs echo sounders and sonar to find fish schools, and uses midwater trawl nets for the catching. Therefore, the CPUE can hardly be considered an effective index of stock abundance. In addition, the fact that new midwater trawl gear has been developed every year has brought about not only differences in gear specifications according to the power of the fishing vessels, but also yearly improvement in fishing efficiency, even for the same fishing vessels.

Also, even when midwater trawling is done using trawl nets with identical specifications, the fishing efficiency varies greatly between individual fishing vessels, because of their different towing abilities according to their engine power, etc. It is almost impossible to rectify these differences, for standardization. The annual increase of CPUEs is considered to be a result of the accumulation of knowledge and understanding of the seasonal and geographical distributions of fish schools, and also of the improvements made each year in the fishing gear and fishing methods.

5. Composition of catch

Detailed data relating to the composition of catches from commercial vessels, have not yet been obtained. These data can, however, be estimated from the results of midwater trawl fishing done by the research vessels. Living creatures caught by the surveys in the summers of 1977-1979, and by the survey in the winter of 1983, totalled 17 species of fish, 4 species of squid, 1 species of porpoise, and some species of jellyfish (Okada, 1986). The survey done in 1977 used only angling gear, and the catch therefore consisted only of pollock. The composition of the catch from midwater trawling consisted almost entirely of pollock. In these surveys, pollock were 92.1% to 99.8% of the total catch by number, in both winter and summer. The number of species of creatures caught was relatively smaller in winter, so pollock were almost 100% of the winter catch. In the summer surveys, smooth lumpsucker and capelin were relatively common among the species other than pollock.

6. Pollock fishery in international waters of the Bering Sea from January to March 1987

Two research personnel from the Far Seas Fisheries Research Laboratory went aboard two land-based trawlers, for the purpose of collecting samples of fish and determining the actual situation of the Japanese pollock fishery on the international waters. Takashi Sasaki was on board the Tomi maru No. 51 (279 t 1,100 hp) for the first survey, and Taku Yoshimura was on board the Manryo maru No. 52 (279 t 1,350 hp) for the second survey. For both surveys, the vessels remained on the fishing grounds on January 24 and 25 for the first survey, and on February 27 and 28, and March 2 for the second survey.

The fishing ground was located in international waters on the north side of the Bower's Ridge area between 55° and 56°N, and 178° and 179°E for both surveys. It was estimated that approximately 50

fishing vessels were operating on this fishing ground in late January and approximately 30 in late February. During the operations in late January, some 20 fishing vessels were always observed on the radarscope within a six-mile radius.

The midwater trawl fishing gear used by the Tomi maru No. 51, consisted of 196 m of pen net, about 70 m of wing net, and 77 m of cod end. The height of the mouth opening during net towing, was roughly 45 m. The size, density, depth, and direction of distribution, etc. of fish schools, were investigated using a color echo sounder and color sonar before the net was cast. The net-towing speed was 3.5 to 5.0 knots.

Fish schools were distributed in a continuous belt shape at depths between 230 and 320 m, in late January. The average thickness of this fish layer was roughly 100 m, and maximum fish school size reached almost 200 m. Observation of fish schools with the color echo sounder showed that fish were particularly concentrated in the upper section of the layer of fish schools, so trawling was operated to catch the fish in this layer. Observations in late February showed fish schools scattered in patches around the 350 m depth, with schools being around 100 m to 150 m thick. The average catch per hour of trawling was 31.5 t in late January, decreasing to 4.2 t in late February. It is said that the density of fish schools fluctuates within a relatively short time, and fish scatter particularly quickly when low atmospheric pressure moves closer to this area. During the observations in late January, we encountered particularly concentrated fish schools. Ordinarily, we cannot expect such high CPUE values.

The catch was almost 100% pollock, with the fork lengths for the pollock caught being between 38 and 58 cm. There was no change in the range of fork lengths between late January and late February (Fig. 9). However, the number of fish which had fork lengths of 48 cm or greater, increased in late February, so that the average fork length was greater for the latter survey.

The length composition of male fish was smaller than that of females (Fig. 10), with the average lengths in late January being 45.6 cm for males and 46.9 cm for females. Comparison of the above-stated average lengths with the lengths of pollock collected by the research vessel in January-March 1983, in the southeastern section of the Aleutian Basin (Yamaguchi 1984), showed no evident change, since the modes were between 44 and 48 cm in both 1983 and 1987. The 1983 survey results, however, for length compositions of pollock collected from almost the same location as in 1987, showed a mode very different from the 1987 mode. In 1983, the mode was 38 to 42 cm (Yamaguchi 1984). The 1983 data was collected in mid-March, about two weeks later in the season than the collection done in 1987. The determination of the cause of this difference in length compositions in these two years, whether due to the difference in the season, or to annual fluctuations in the distribution, appearances or abundance of small-sized fish, must wait for future surveys.

The ratio of male to female pollock, per 100 fish, for those collected in late January and those collected in late February, was 49:51 in January, and 50:50 in February, almost a 1:1 ratio.

The gonads of both males and females were in a premature stage in late January. However, in late February, most were either fully mature or almost mature.

We have not yet done biological measurements for the frozen samples of fish brought back to the laboratory. Therefore, information on age composition, condition of gonads, feeding habits, and the relationship between body length and body weight, etc., is scheduled to be reported in the future.

In the on-board survey in 1987, we received great cooperation from crew members, including Fishing Master Aoki of the Tomi maru No. 51 and Fishing Master Ogasawara of the Manryo maru No. 52, Mr. Nobuyuki Yanagawa of the Kushiro Trawl Fisheries Cooperative Association, and those in charge of the Kanai Fisheries Co., Ltd. and of the Homma Fisheries Co., Ltd., who facilitated the boarding. We wish to express our most sincere gratitude to them all.

REFERENCES, TABLES 1 TO 4, AND FIGS. 1 TO 10
ARE IN ENGLISH IN THE JAPANESE DOCUMENT