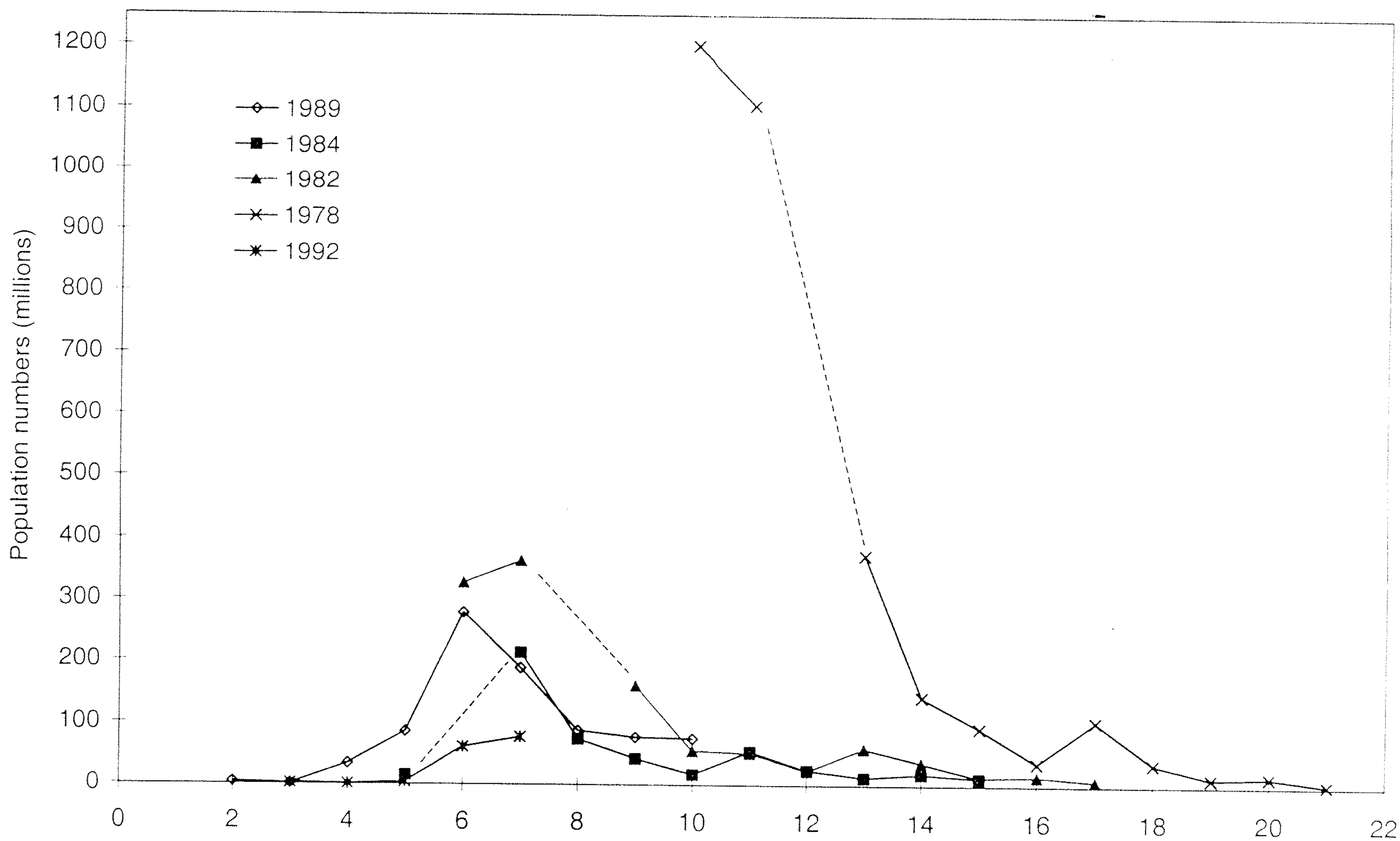

Figure 14. Population numbers at age for dominant year classes observed in winter echo integration-trawl surveys of Bogoslof area spawning pollock. Data are from surveys conducted in 1988-89 and 1991-1999. No survey was conducted in 1990 (dashed lines). U.S. surveyed '88-'98. Japan surveyed in '99.

Miller Freeman survey plans winter 2001

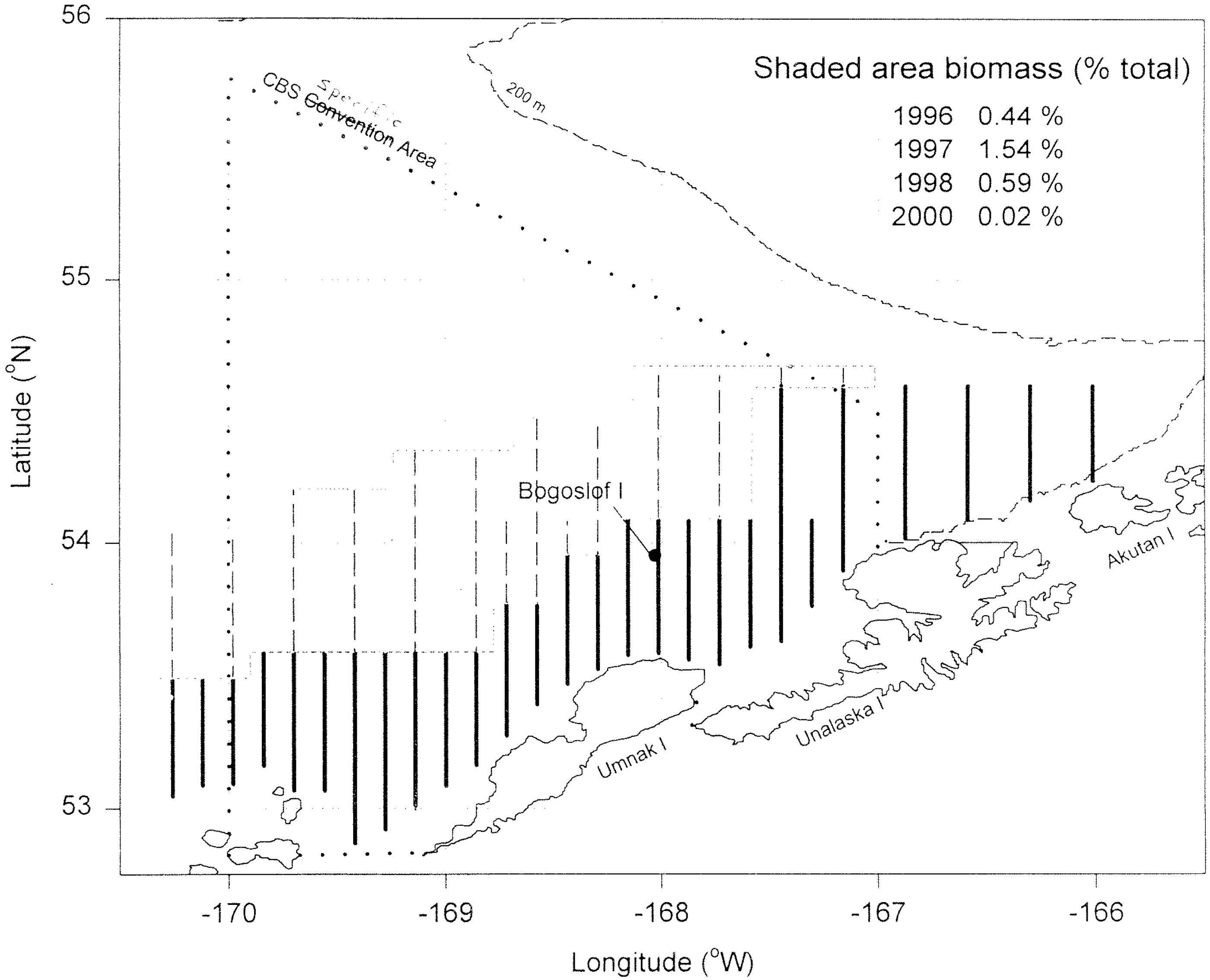

Figure 1. Proposed trackline (solid lines) for the winter 2001 echo integration-trawl survey of the Bogoslof Island area, March 1-11. The shaded area was surveyed historically, but will not be included in the 2001 survey trackline. The time saved is approximately 2 days.

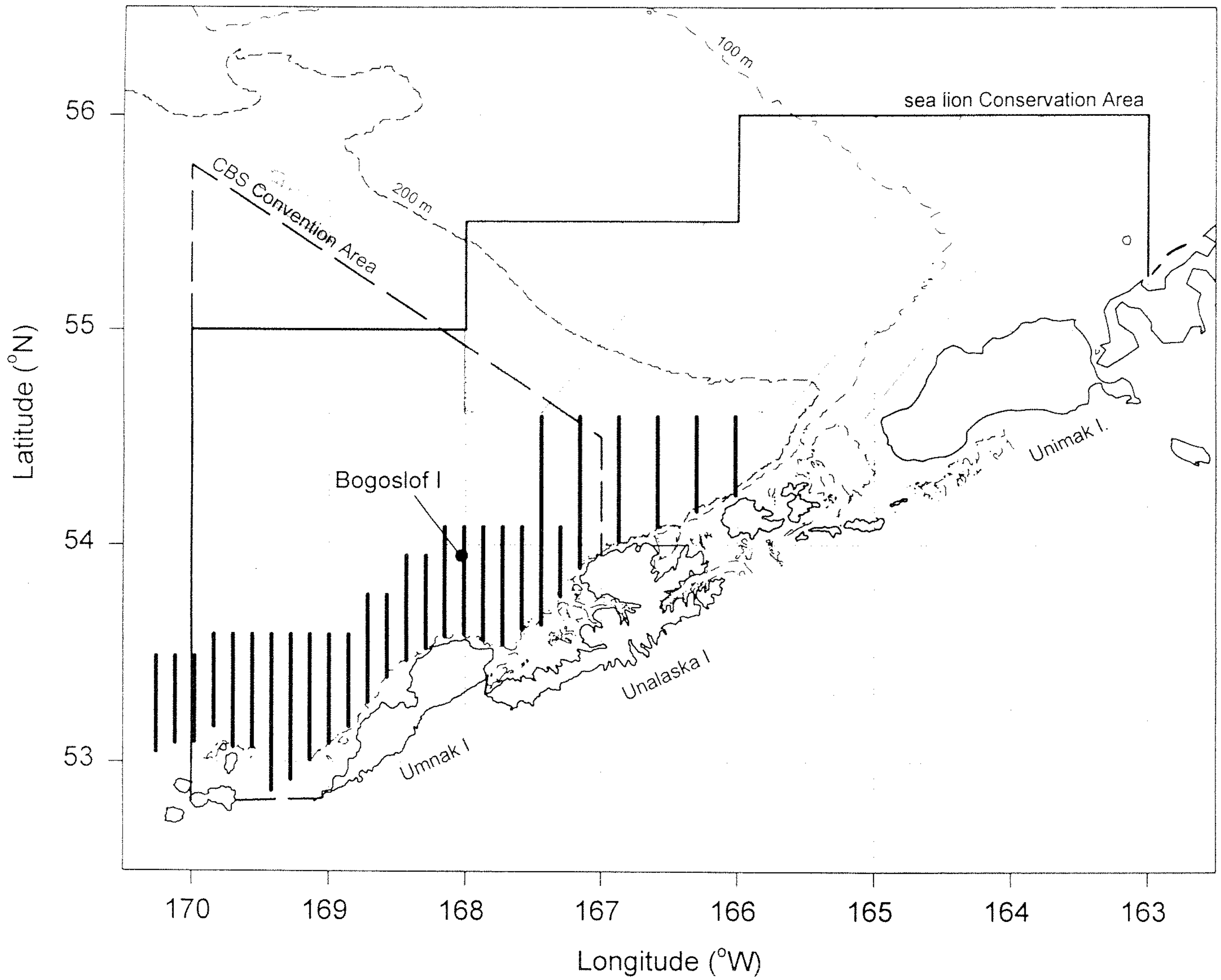

Figure 2. Proposed trackline for the winter 2001 echo integration-trawl survey of the Bogoslof Island area. Solid line indicates boundary of the sea lion Conservation Area, and dashed line outlines U.S. management area 518/Central Bering Sea convention area. ~~Shaded~~ Cross hatched region will be surveyed February 15-27. Survey [illegible] line is not yet decided.

Attachment 8

Pollock Stock Assessment Document

Submitted by

The Russian Party

For the

Meeting of the Science and Technical Committee

Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea

November 6-10, 2000

Shanghai, China

WESTERN BERING SEA POLLOCK STOCK

To assess the state and to forecast TAC of Western Bering Sea pollock the methodology proposed by Babayan et al. (1999) was added with elements of meta-analysis and harmonic analysis of time series. The analysis of the combined recruitment index for 4 Far East pollock stocks (East Okhotsk Sea, West Bering Sea, East Kamchatka, and North Okhotsk Sea) revealed a clear periodicity in deviations from the mean long-term level. Over the investigated time interval 3 periods were distinguished: period of low recruitment (until 1975), period of increased recruitment (from 1975 to 1989) and another period of low recruitment (from 1990 till now). The use of methods of time series analysis, including ARIMA, allows to suppose that the current period will continue till 2002-2005. Since that time a new period of increased recruitment will likely start. Thus, judging from the results obtained, a marked recovery of stocks is expected not earlier than middle or end of the first decade of XXI century.

Our calculations (with the use of biofishery data for 1970-1999) showed that in 1999 the Western Bering Sea stock biomass remained at a very low level. an estimate of total stock biomass (2+) was 185,000 t; spawning stock biomass – 87,000 t, and fishing stock biomass (4+)- 1000,000 t.

Forecast calculations show the further decline of total (down to 130,000 t), fishing (down to 73,000 t) and spawning (down to 24,000 t) Western Bering Sea stock biomass in 2000.

The estimates of TAC obtained with the use of modified management scheme (Fig.1) force us to talk about the necessity of fishery ceasing and transition to control catching of 5,000-15,000 t. The retrospective and forecast estimates of stock biomass and catches are shown in Fig.2 and Table 1.

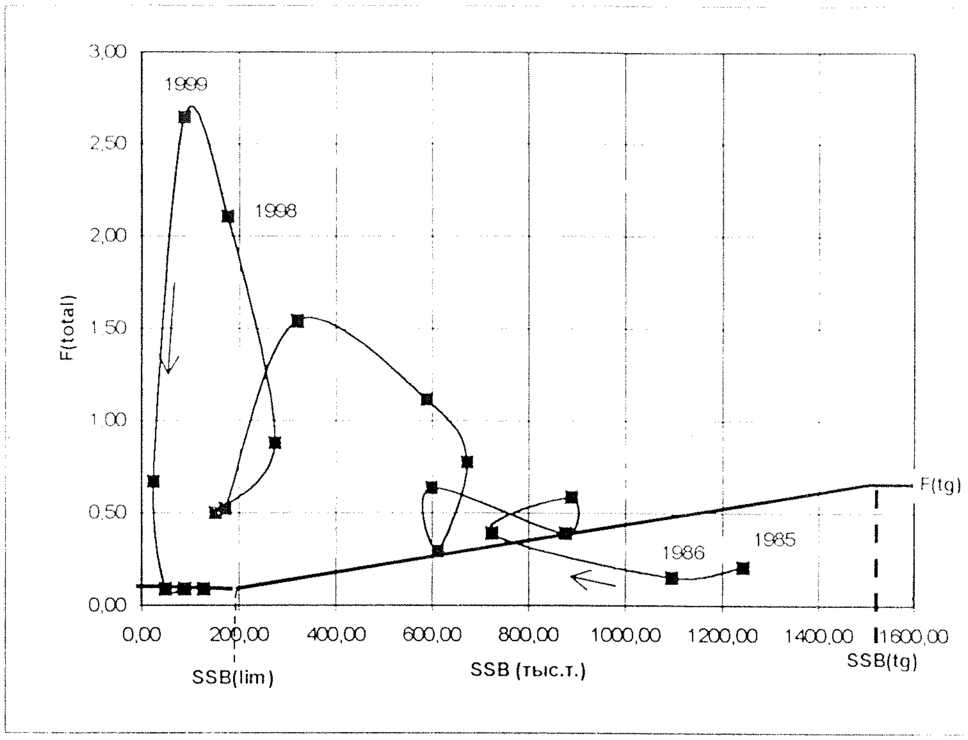

Fig 1 Management Scheme (precautionary approach)
SSB(tg)=SSB(max)=1500
SSB(lim)=SSB(loss)=200
F(tg)=F(max)*exp(-sigma)=0.66
Catch(2000) is assumed to be equal 20,000 t

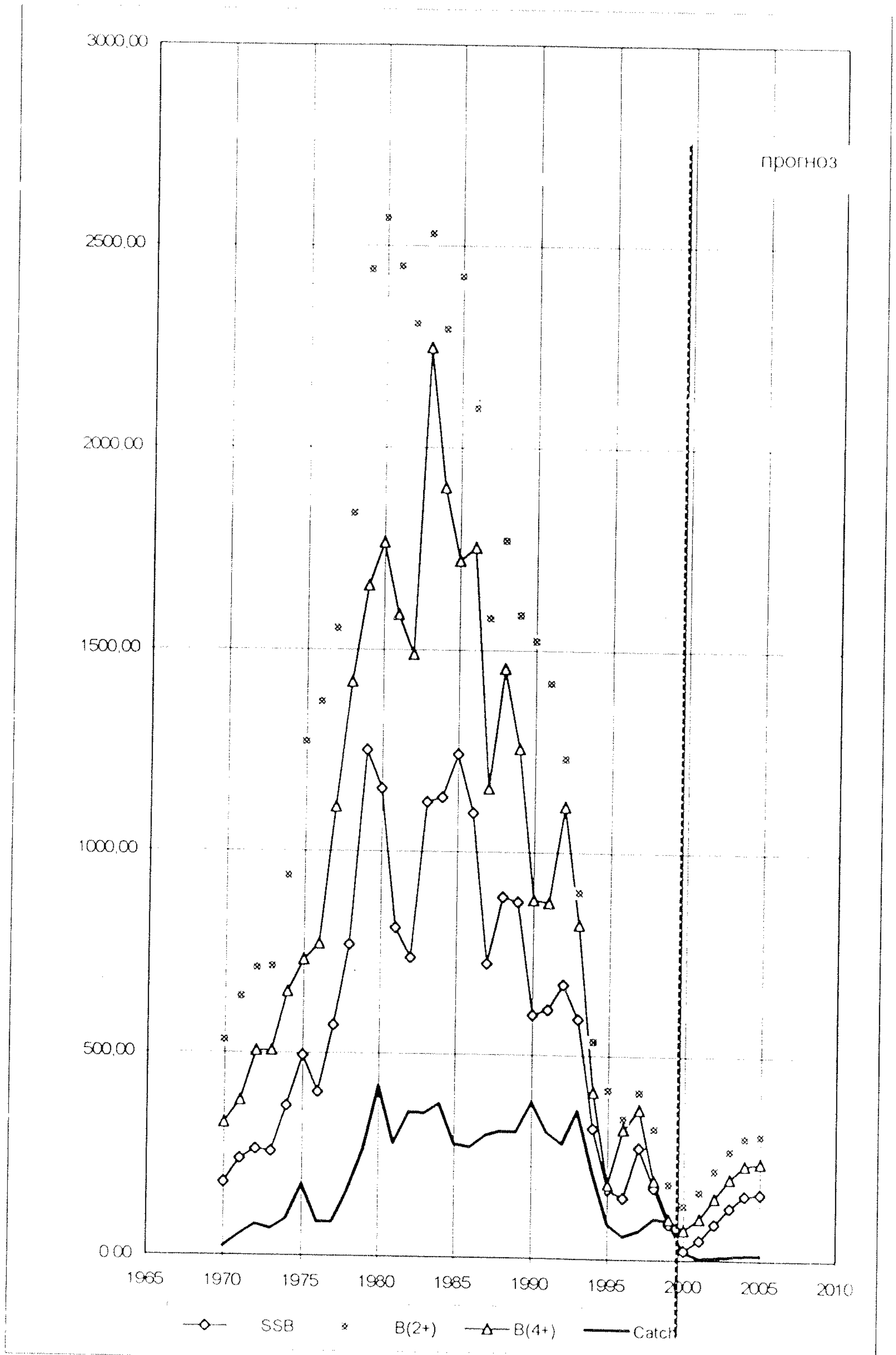

Fig 2 Estimations of Total (B(2+)), fishing (B(4+)) and spawning (SSB) stock biomass

Year	SSB	B(2+)	B(4+)	Catch	Ftotal
1970	180,10	529,19	326,68	22	0,09
1971	238,10	638,59	381,82	52	0,27
1972	261,48	709,59	504,59	76	0,06
1973	255,99	713,74	505,90	66	0,15
1974	369,20	937,94	651,36	90	0,09
1975	494,25	1270,29	730,74	176	0,24
1976	403,56	1370,10	770,44	83	0,13
1977	569,97	1551,14	1110,05	84	0,09
1978	769,03	1836,33	1420,12	161	0,20
1979	1250,38	2439,77	1657,38	261	0,17
1980	1155,76	2567,34	1765,03	419	0,39
1981	811,16	2448,46	1586,26	279	0,18
1982	736,97	2306,40	1489,35	356	0,27
1983	1123,40	2528,96	2247,82	353	0,28
1984	1135,29	2293,20	1901,43	376	0,31
1985	1242,16	2422,17	1719,39	278	0,21
1986	1097,01	2097,62	1752,95	271	0,15
1987	724,38	1577,68	1156,86	300	0,39
1988	889,07	1768,69	1454,58	310	0,59
1989	876,96	1585,69	1256,79	309	0,39
1990	598,20	1521,44	882,21	383	0,64
1991	611,14	1416,90	875,71	309	0,29
1992	673,35	1231,31	1113,35	281	0,78
1993	588,82	900,27	821,35	363	1,12
1994	319,89	533,33	409,73	210	1,54
1995	170,79	414,03	181,83	86	0,52
1996	150,94	343,95	318,90	56,2	0,50
1997	273,88	407,99	367,25	69,44	0,88
1998	175,59	319,17	194,80	100	2,10
1999	87,33	185,46	100,73	95,61	2,64
2000	23,7	132,4	73,4	20	0,67
2001	48,8	165,7	101,6	4,8	0,09
2002	88,2	217,9	152,4	8,3	0,09
2003	127,6	265,2	199,7	11,2	0,09
2004	158	298,1	232,5	13,3	0,09
2005	162,5	303,8	238,2	13,8	0,09

Table 1.
Western Bering Sea pollock. Retrospective estimates of stock biomass and forecast.
(in forecast: R=Rmean for 1995-1999)

THE PRESENT STATE OF NAVARIN POLLOCK STOCK

The present analysis is based on data of previous years and materials of expeditions conducted in the second half of the 1990s and in spring-autumn period, 2000, aboard Russian trawler "Novokievka" (Nakhodka) and Japanese trawler "Kayo maru 28".

During the spring-autumn season, 2000, pollock in the northwestern Bering Sea kept the depths down to 320 m. In the deeper areas, they were not found in catches. Pollock size ranged from 9 to 88 cm (fork length), being 53.9 cm on the average (without counting of juveniles captured during the survey with the use of small-mesh net). The average pollock size in scientific and fishery catches in 2000 was larger compared with the maximal annual size of Western Bering Sea pollock in previous years.

In the first half of summer pollock with weight from 3 to 3,750 g (1,220 g on the average) were noted in the catches. A female-to-male ratio in catches was 717:283, i.e. a share of males was somewhat lower than in 1999. This may be associated with a severe winter of 1999/2000. By this reason, pollock spawned later than usual. As it is known, males stay on the spawning grounds longer than females. Therefore, just after spawning feeding concentrations of pollock consist mainly of females.

The stomach fullness index was determined on a 5-step scale (0=empty stomach, 4=full stomach). An average stomach fulness equaled to 2.11 that was on 0.45 units higher than in 1999 and 1997. As in 1999, a diet of pollock of all age groups in 2000 was composed mainly of invertebrates – euphasiids and shrimps. An increase in feeding intensity and transition of older age groups from predation to feeding on invertebrates were associated with the climatic conditions of 2000 favourable for mass development of zooplankton against a background of concurrent decrease in abundance of fishes on which large pollock fed Physiological parameters also evidence favourable conditions for pollock feeding in the northwestern Bering Sea in summer 2000 (Table 1).

In the last years the abundance of pollock in the northwestern Bering Sea declined sharply concurrently with its decrease within the entire areal. Formerly continious pollock concentrations registered on the northwestern Bering Sea shelf from Karaginsky Bay to Gulf of Anadyr disintegrated in the end of 1990s. In the western Bering Sea the densest concentrations remained only in Navarin area However, a sharp decline of biomass occurred in this area from 1996 to 1999 also (Table 2). According to data of bottom trawl survey in the beginning of summer 2000, the biomass of Navarin pollock stock on the aquatory of 9,762 sq. miles was 254,000 tons (Table 2). Recalculations on the area of survey conducted in June 1999 showed that biomass remained at a low level of previous year Compared to 1997 (in 1998 the summer survey was not conducted), the biomass decreased by about 2.5 times. In autumn, 2000 the biomass of bottom pollock was 291,000 tons on the aquatory of 10,0006 sq.miles and that of pelagic pollock equaled to 111,000 tons (total area of 8,176 sq.miles). A slight increase in pollock biomass in September-October, 2000 resulted from the beginning of pollock return from the feeding to wintering grounds.

In late June of current year the main pollock concentration in the Navarin area was registered on the outer shelf edge at depths of 260-264 m. The formation of concentrations with increased densities in the southern part of the area was obviously associated with features of bottom relief. In this place continental slope forms an angle where individuals of pollock from Gulf of Anadyr proper and fish migrated from the southeastern and southwestern shelf are concentrated during the wintering and spawning periods. In the area of winter-spring concentration formation shelf is cut by two canyons. In the first half of summer pollock spread via these canyons to the shelf (2 "waves" on the map, Fig.1) concentrating with juveniles in the quasistationary gyre off Navarin Cape. According to surveys of previous years, with the warming of upper layer and development of zooplankton pollock concentrations off Navarin Cape become larger, while on the outer shelf edge they become smaller. With the beginning of autumn cocling pollock start to migrate backward to the wintering grounds, i.e. on the outer shelf edge

Size composition of Navarin pollock is shown in Fig.2. The catches consisted mainly of large pollock with indistinct modal groups of 56-57 cm and 63 cm. In contrast to 1999, the strong 1995 year-class was not clearly distinguished in catches. The average pollock length in the investigated area in July, 2000 was 56,4 cm with a range of 27-88 cm (Table 2). As usual, in summer, 2000 very large pollock with the average size of about 70 cm was found in shallow waters of Gulf of Anadyr north of 61°45' N. The average weight of Navarin pollock was 1,315±29 g with a range of 275-3,036 g.

The physiological state of Navarin pollock evidences that in 2000 their spawning, as in previous years, occurred later compared with other stocks. According to data of spring ichthyoplanktonic surveys and control trawlings, spawning of pollock was mainly completed by mid-May. 50% of females became matured at length of 44-45 cm and 50% of males – at length of 43 cm (Fig.3).

Euphasiids (36%) and shrimps (37%) prevailed among food objects of Navarin pollock in summer, 2000 (Table 1). In places of juvenile concentrations, juveniles become very important in the diet of adult pollock. Thus, north of 62°N the intensity of cannibalism (by occurrence in stomachs) reached 18-25% even in summer months (Table 3).

According to results of ichthyoplanktonic survey conducted in the Navarin area from 6 to 14 May 2000, the abundance of developing pollock eggs on the aquatory of 4,866 sq.miles was 4.546×10^{12}. This value corresponds to the total quantity of eggs counted in Karaginsky and Olyutorsky Bays, the main centers of Western Bering Sea pollock reproduction. In the Navarin area eggs at the 1st stage of development in some samples constituted 40-100%, eggs at the 2nd stage - 0-100%. Eggs of the 3rd stage were met rarely. On the average, in the first half of May, 2000, eggs at the 1st stage of development constituted 80%, eggs at the 2nd stage- 19% and those at the 3rd stage- 1% of the total egg number. Data of ichthyoplanktonic survey combined with results of other investigations prove that in the second half of the 1990s the importance of the northern (Navarin) spawning grounds of pollock in the Bering Sea increased essentially.

Intensification of pollock spawning in the Navarin area is confirmed by results of autumn-winter juvenile surveys in the northwestern Bering Sea. If in Karaginsky and Olyutorsky Bays number of 0+ pollock did not exceed 12-19 individuals per catch, in the Navarin area during the same period catches of juveniles ranged from 138 to 1357 individuals (372 individuals per trawling, on the average). Such high catches of 0+ pollock in the Navarin area are well agreed with the data of ichthyoplanktonic survey. The approximate survival from egg stage to 0+ pollock in autumn-winter was 0.0108 %. Such a low survival evidences that a part of fish at age of 0+ is not counted during the autumn-winter surveys. The underestimation of 0+ pollock is explained by 2 reasons: 1) Pollock at age 0+ have small size and a part of them slipped through mesh; 2) During the autumn-winter period, 2000 very severe ice conditions prevented the more extensive survey.

During the juvenile survey conducted in the Navarin area from 26-30 June on the aquatory of 8198 square miles with the use of small-mesh liner in the codend of standard trawl no individual of 2000 year-class was caught. This, as during the autumn-winter survey, is associated with a small size of 0+ pollock. By this reason, from the end of June until autumn they could not be caught by trawl with a small-mesh liner in the codend.

Pollock of age 1+ (1999 year-class) were represented by two main concentrations. The larger (by area) concentration was found in the northern part of the Navarin area between 62°N and 62°30'N, 180-178°W (Fig.4) at depths of 106-107 m. This concentration was located within Navarin quasistationary gyre which retained zooplankton, formimg favourable conditions for juvenile feeding. The second concentration was located on the outer shelf edge between 179°30' and 178°W. The total abundance of pollock of 1+ age was maximal among 3 investigated age groups and equaled to 1 bln 238 mln individuals (Table 4). Comparison with the long-term data showed that 1999 year-class in the Navarin area was middle. In late June length of 1+ pollock ranged from 9 to 17 cm with an average value of 12.99 cm and a modal value of 12 cm. Their average weight was 12.67 g (Table 5).

During the juvenile survey in the Navarin area 2 concentrations of 2+ pollock (1998 year-class) were registered (Fig.5). The core of the densest concentration was located in the point with coordinates: 61°N, 179°59' E at depth of 186-187 m. This concentration, as concentration of 1+ pollock, was recorded on the outer shelf edge. The second, less dense, concentration was found in the Navarin quasistationary gyre.

In late June the total abundance of 2+ pollock was 908 mln individuals. The survey carried out from 6-14 May 2000 at irregularly located stations showed that during the investigated period the 2+ pollock abundance was much higher and with recalculation on the same area (8,198 sq.miles) it was 4.5 bln individuals. Thus, during winter the juvenile abundance in the Navarin area increases (Table 4) and reaches maximal values in the period of maximal water cooling, i.e. probably in March-early May. Then, as for adult pollock, spring warming and development of food base result in beginning of feeding migrations toward the shallow areas. As a result, by the end of June a number of counted juveniles decreases significantly. According to the results of multiple surveys, both 1998- and 1999 year-classes may be considered as middle.

In the beginning of summer a length of 2+ pollock ranged from 18 to 24 cm, with an average length of 21.37 cm and a modal length of 22 cm (Fig 2, Table 5). Their average weight was 60.54 g.

In contrast to the younger age groups, 3+ pollock (1997 year class) in the Navarin area were concentrated only within the outer shelf edge. Unlike 1+ - and 2+ pollock, there was no the second, shallow-water concentration of 3+ pollock (Fig.6). The maximal catches were registered in the same area as for 1998 year-class pollock. In early June the abundance of 3+ pollock was minimal among juveniles. It was 321 mln individuals (Table 4). However, juvenile investigations of the last 2 years showed that 1997 year-class at age of 3+ had a higher abundance compared to 1996 year-class at the same age. As a result, the former grow slower than the latter. Thus, in the end of June, 2000, the length of 3+ pollock (1997 year-class) varied from 25 to 32 cm with an average length of 27.8 cm and weight of 138.11 g (Table 5). The same characteristics for 3+ pollock of 1996 year-class in late June, 1999 were: an average length- 28.93 cm with a range of 25-33 cm, an average weight- 154.67 g.

As mentioned above, Olyutorsky Bay is one of two main areas where the spawning grounds and fishing concentrations of Western Bering Sea pollock still remained. In July, 2000 pollock were fished at depth less than 260 m. The most successful trawlings were registered in the area between 59°36'-59°48' N, 166°36'-167°20'E at depths of 195-260 m. In August concentrations of Olyutorsky pollock moved deeper. In this month maximal catches were registered in the area restricted by coordinates: 59°52'N, 167°45'E; 59°52N, 168°44'E; 60°03'N, 167°45'E; 60°03'N, 168°44'E at depths of 250-290 m.

In the beginning of July the catches contained middle-sized pollock. They length was 49.8 cm, ranging from 27 to 73 cm. In July pollock with a length of 55-59 cm and 41-43 cm were most abundant in Olyutorsky Bay. In August with a shift of scientific and fishery trawlings to the deeper areas a length of pollock increased also. The average length was 52.3 cm, ranging from 33 to 71 cm. The values of modal length were 58-59 cm and 53-55 cm (Fig.6). The clear bimodal character of size composition is associated with combining data of two summer months with different depths of trawling in the same Figure.

An average pollock weight from this subarea was 1,056 g, varying from 290 to 3100 g, in July, and 1,178 g with a range of 480-2550 g in August (Table 1).

The curve of maturing shows that in 2000 50% of females from Olyutorsky Bay became mature at length 43-44 cm and 50% of males- at length of 42-43 cm. These characteristics were somewhat lower than for Navarin pollock (Fig.3).

Fishery concentrations of pollock were not registered on the Koryak shelf in summer 2000. On the southwestern Koryak shelf the average CPUEs of middle-tonnage vessels were 320 kg per hour trawling, ranging from 40 to 690 kg per hour trawling. The maximal pollock catch was noted in the area between 61°16'-60°52' N and 174°58'-174°08' E at depths of 250-270 m. In this area pollock size was maximal compared with that in all other areas of the northwestern Bering Sea. The average fork length was 58.2 cm, varying from 33 to 73 cm. Pollock with a length of 51-57 cm was most abundant (Fig.8). The average weight in this area was 1,386 g, ranging from 276 to 3,750 g (Table 2).

On the eastern Koryak shelf CPUEs of middle-tonnage vessels in summer, 2000 did not exceed 100 kg per hour trawling. The average length of pollock from this area was 52.8 cm with a range of 40-64 cm. Modal groups of 49-51 and 56-58 cm were not defined clearly (Fig.9). The average weight was 1,166 g, ranging from 590 to 2,200 g.

From the analysis of results of investigations and fishery data for the second half of 1999 – spring-summer, 2000 it may be concluded that pollock stocks in the northwestern Bering Sea continue to be in depression. Because of this, Russia makes efforts to decrease fishing stress on pollock in this region. One of the undertaken measures is associated with a regular reduction of fishing efforts. Thus, in 1998 up to 110-115 large-tonnage fishing vessels (LTFV) were involved in pollock fishery. In 1999 maximal number of LTFV in the region did not exceed 61 units, in 2000 their number was reduced to 40-45 units. In 2001 a further reduction of fishing fleet is planned. In accordance with the reduction of a number of vessels, a decrease in annual catches in the western Bering Sea occurs: in 1997 680,000 t of pollock were caught, in 1998- 644,000 t, in 1999 – 596,000 t, and by October 25, 2000 only 311,100 t of pollock were caught.

To maintain and recover pollock stocks in the northwestern Bering Sea Russia, along with reduction of fishing efforts and total catch, takes the following regulation measures:

- Commercial size for captured pollock is established;
- Only trawls with mesh not less than 100 mm are permitted to use for the fishery;
- To decrease juvenile by-catches all trawls are outfitted with a selective cylindric liner between the codend and net;
- Along the border line between the Russian and US Exclusive Economic Zones a buffer guarded zone is introduced from the Russian side;
- During the spawning period the specialized fishery on pollock from Karaginsky Bay to the boundary of Russian EEZ on the east is banned.

Keeping in mind the above-stated, the measures on pollock fishery regulation taken by Russian side fully correspond to a precautionary approach. However, despite the undertaken efforts on pollock conservation the features of the present climatic regime in the North Pacific region do not allow rapid recovery of pollock stocks. The pollock biomass in the northwestern Bering Sea in the next 1-2 years will remain at a low level. As a result, pollock of these populations will not migrate into the deep Aleutian Basin.

Table 1 Characteristics of North-Western Bering sea pollock, July-August 2000

		Olutor bay		W Koryak	E Koryak	Navarin
		July	August	July-August	August	July
Average length, cm		49.8	52.3	58.2	52.8	56.4
Minimum -maximum		27-73	33-71	37-73	40-64	27-88
Mode		55-59, 41-43	58-59, 53-55	51, 57-59	49-51, 56-58	56-57, 63
Average weight, g		1056±54	1178±27	1386±42	1166±44	1315±29
Minimum -maximum		290-3100	480-2550	276-3750	590-2200	275-3036
Male portion, %		23.8	28.7	22.4	30.0	36.7
Predom stage gonadogenesis	females	VI-II(83)	VI-II(91)	VI-II(86)	VI-II(93)	VI-II(84)
	males	VI-II(70)	VI-II(86)	VI-II(68)	VI-II(100)	VI-II(91)
Average stomach filling		1.83	2.12	1.98	2.62	2.01
Predom food objects (%)		prawn(39) euph(44)	prawn(63) euph(52)	prawn(51) euph(52)	euph(60) myct(42)	prawn(37) euph(36)
Average cubic condition index		0.561± 0.002	0.612± 0.004	0.618± 0.005	0.594± 0.007	0.576± 0.003
Aver gonadosomatic index,%	females	2.20±0.10	2.10±0.11	2.19±0.17	1.90±0.20	2.69±0.23
	males	1.00±0.12	1.36±0.17	0.83±0.12	0.96±0.17	2.36±0.19
Aver hepatosomatic index,%	females	8.84±0.27	10.22±0.16	9.34±0.18	9.54±0.32	7.92±0.16
	males	6.89±0.19	8.58±0.23	9.06±0.36	6.97±0.35	5.76±0.15
Aver heartosomatic index,%	females	0.255± 0.009	0.259± 0.004	0.258± 0.005	0.245± 0.008	0.261± 0.005
	males	0.234± 0.005	0.251± 0.007	0.265± 0.009	0.228± 0.013	0.255± 0.005
Aver spleensomatic index,%	females	0.166± 0.007	0.205± 0.007	0.172± 0.005	0.153± 0.006	0.169± 0.006
	males	0.159± 0.009	0.215± 0.014	0.155± 0.011	0.150± 0.011	0.191± 0.010
Maximum gall-bladder index,%		0.46	0.46	0.47	0.32	0.52

Table 2 Biomass of Navarin pollock 1996-2000

	Date	Surface,sq miles	Biomass,ths t
	1996		
Bottom trawl survey	July-August	23119	2425
	September-October	26178	1098
	Novemb-Decemb	19002	804
Echo integration survey	July-August	23298	1018
	September-October	17500	270
	1997		
Bottom trawl survey	June-July	24522	1030
	September	17000	80
Echo integration survey	June-July	19931	259
	September	17000	410
Bottom trawl survey	1998		
	November	25000	400
Echo integration survey	November	5000	100
	1999		
Bottom trawl survey	June	7329	181
	August	9609(7329)	121(92)
	December	6707(7329)	282(308)
Bottom trawl survey	2000		
	June	9762(7329)	254(191)

Table 3 Navarin pollock cannibalism, June-July 2000

Latitude,N	Longitude,W	Numbers, %
$62^0 20$-$62^0 30$	$179^0 27$-$179^0 50$	25.0
$61^0 59$	$179^0 36$-$179^0 37$	25.0
$61^0 50$-$62^0 37$	$179^0 51$-$179^0 37$	18.3
$61^0 10$-$61^0 40$	$179^0 14$-$179^0 29$	8.3
$61^0 13$-$61^0 00$	$179^0 07$-$178^0 43$	6.7

Table 4 Numbers at age for the Navarin pollock fry (millions)

Date	Year	Surface, sq.miles	Generation 1997	Generation 1998	Generation 1999
26-30.06	2000	8198(11028)	321(431)	908(1222)	1338(1800)
11-16.12	1999	4947(11028)	1578(3518)	843(1880)	490(1092)
22-24.06	1999	11028	1037	146	-

Table 5 Characteristics of Navarin pollock fry, June 2000

		Generation 1999	Generation 1998	Generation 1997
Average length, cm		12.99	21.37	27.80
Minimum -maximum		9-17	18-24	25-32
Mode		12	22	26
Average weight,g		12.67	60.54	138.11
Male portion, %		55.4	21.1	53.7
Predom.stage gonadogenesis	females	I-II(100)	II(100)	II(100)
	males	I-II(100)	II(100)	II(60)
Average stomach filling		1.75	1.48	2.24
Predom. food objects (%)		copepods(77)	copepods(24) euphausiids(15) pollock(14)	copepods(80)
Average cubic condition index		0.487±0.009	0.503±0.007	0.546±0.006
Aver.gonadosomatic index,%	females	-	1.94±0.14	0.72±0.06
	males	-	1.01±0.17	0.66±0.15
Aver.hepatosomatic index,%	females	5.72±0.51	6.72±0.38	4.66±0.24
	males	6.24±0.72	4.57±0.56	4.90±0.29
Aver.heartosomatic index,%	females	-	0.366±0.011	0.297±0.011
	males	-	0.387±0.009	0.295±0.011
Aver.spleensomatic index,%	females	-	0.378±0.062	0.194±0.018
	males	-	0.246±0.013	0.190±0.022
Maximum gall-bladder index,%		-	0.67	0.37

Fig. 1. Distribution of Navarin pollock observed in the June 2000, based on the bottom trawl survey, m.t./sq. mile.

Fig.2 Length frequency of Navarin pollock observed in the June-July 2000, based on the bottom trawl and fry surveys data.

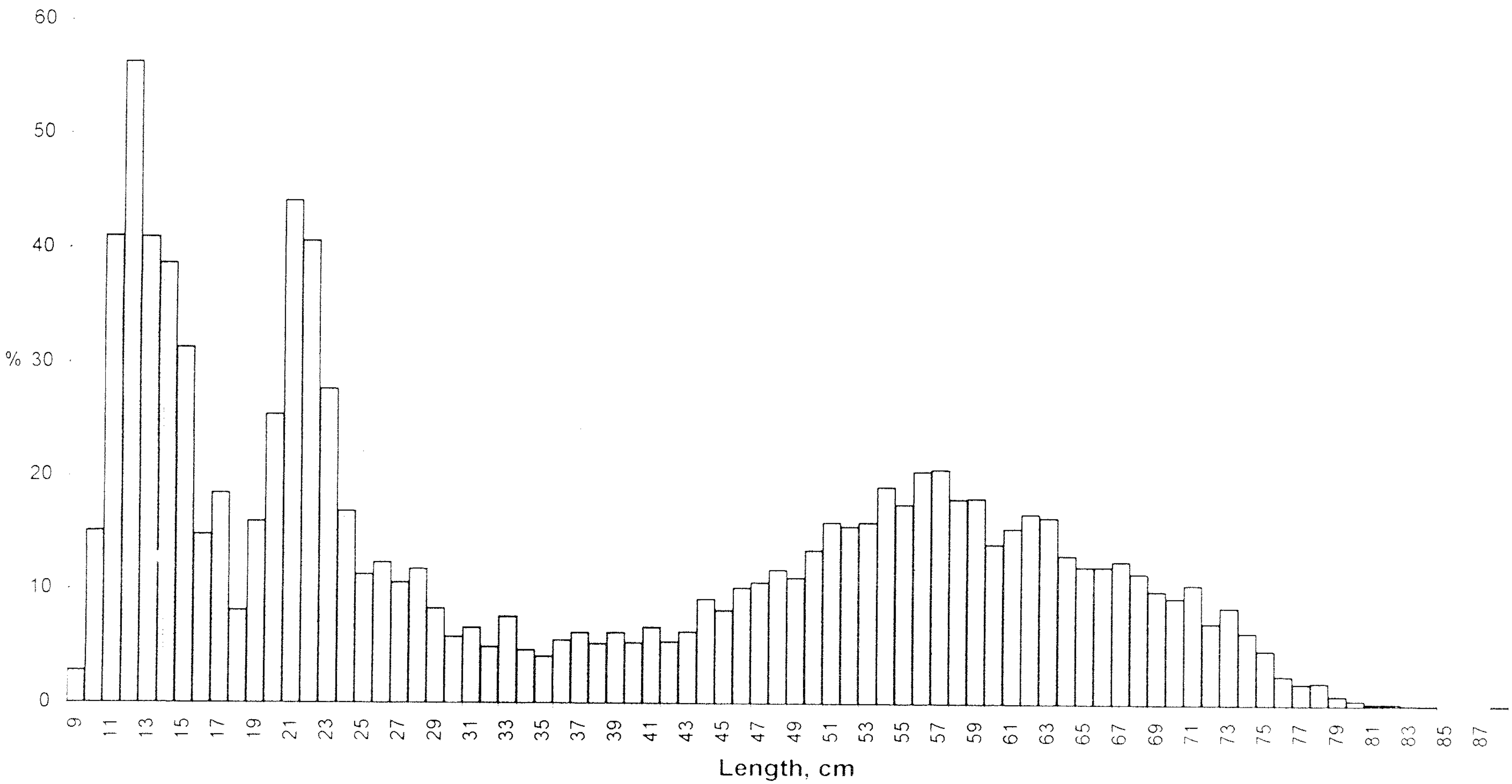

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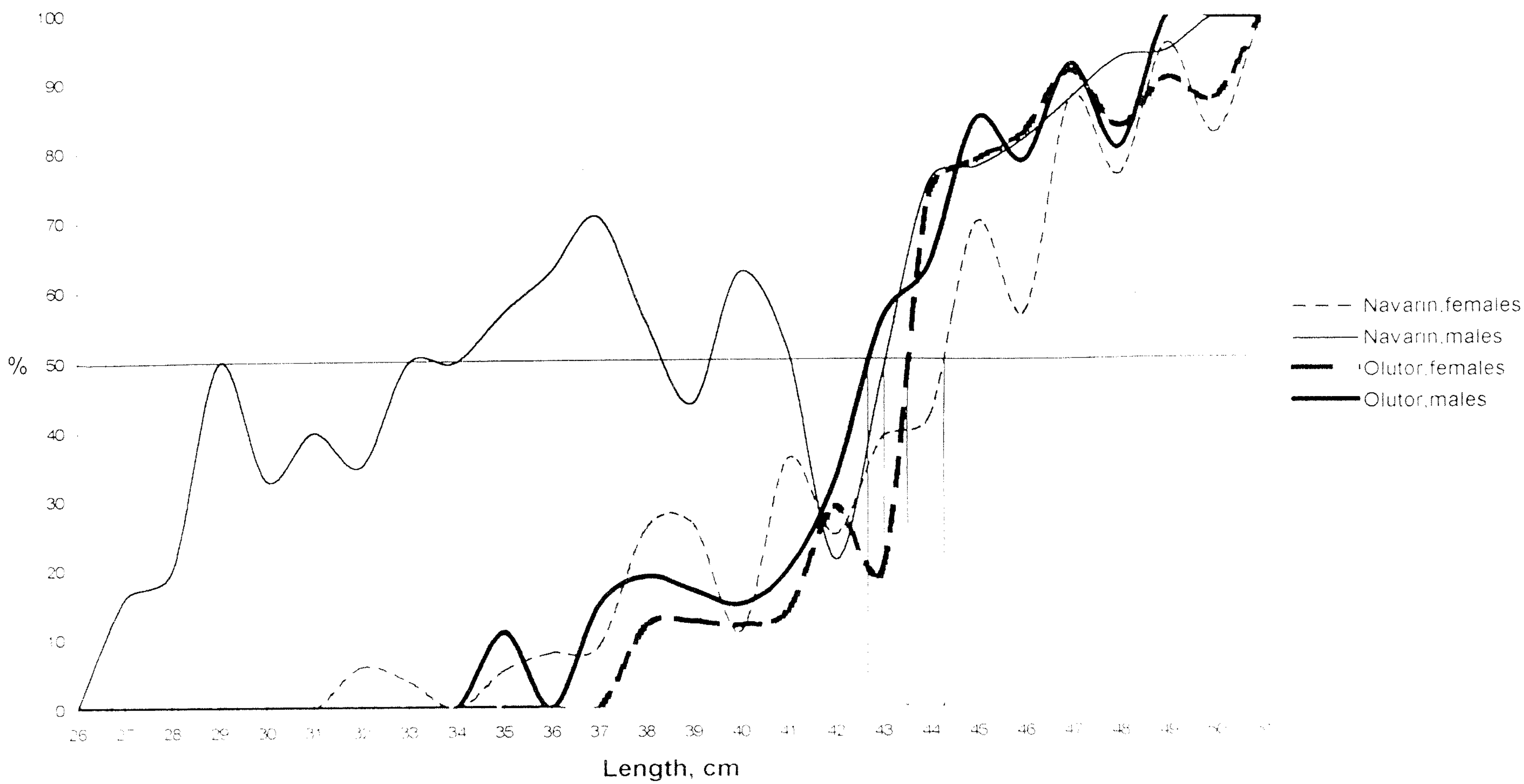
Fig.3 Maturation curve of Navarin and Olutor pollock observed in the June 2000



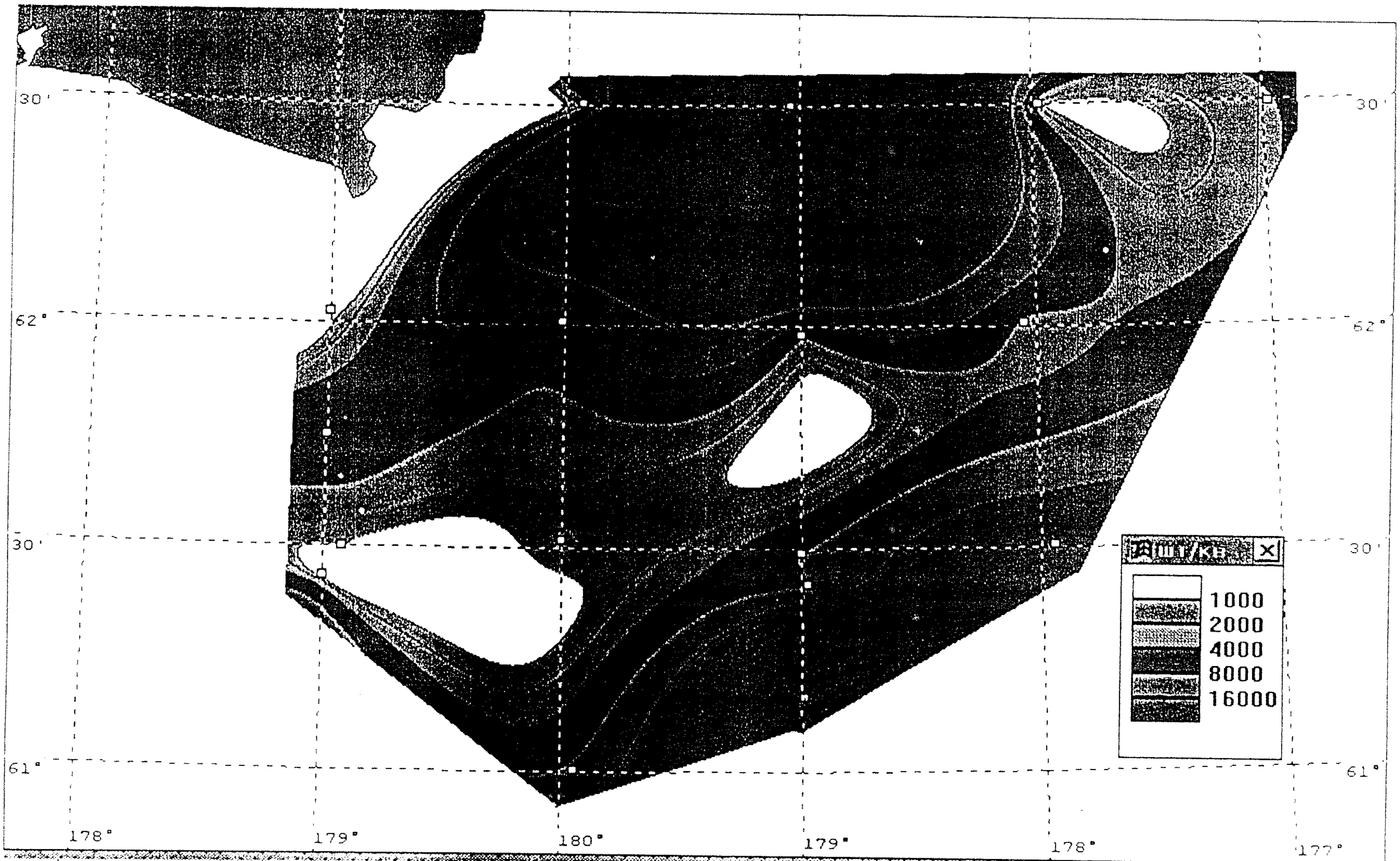


Fig.4. Distribution of Navarin pollock generation 1999 observed in the June 2000, based on the fry survey, thousands/sq.mile

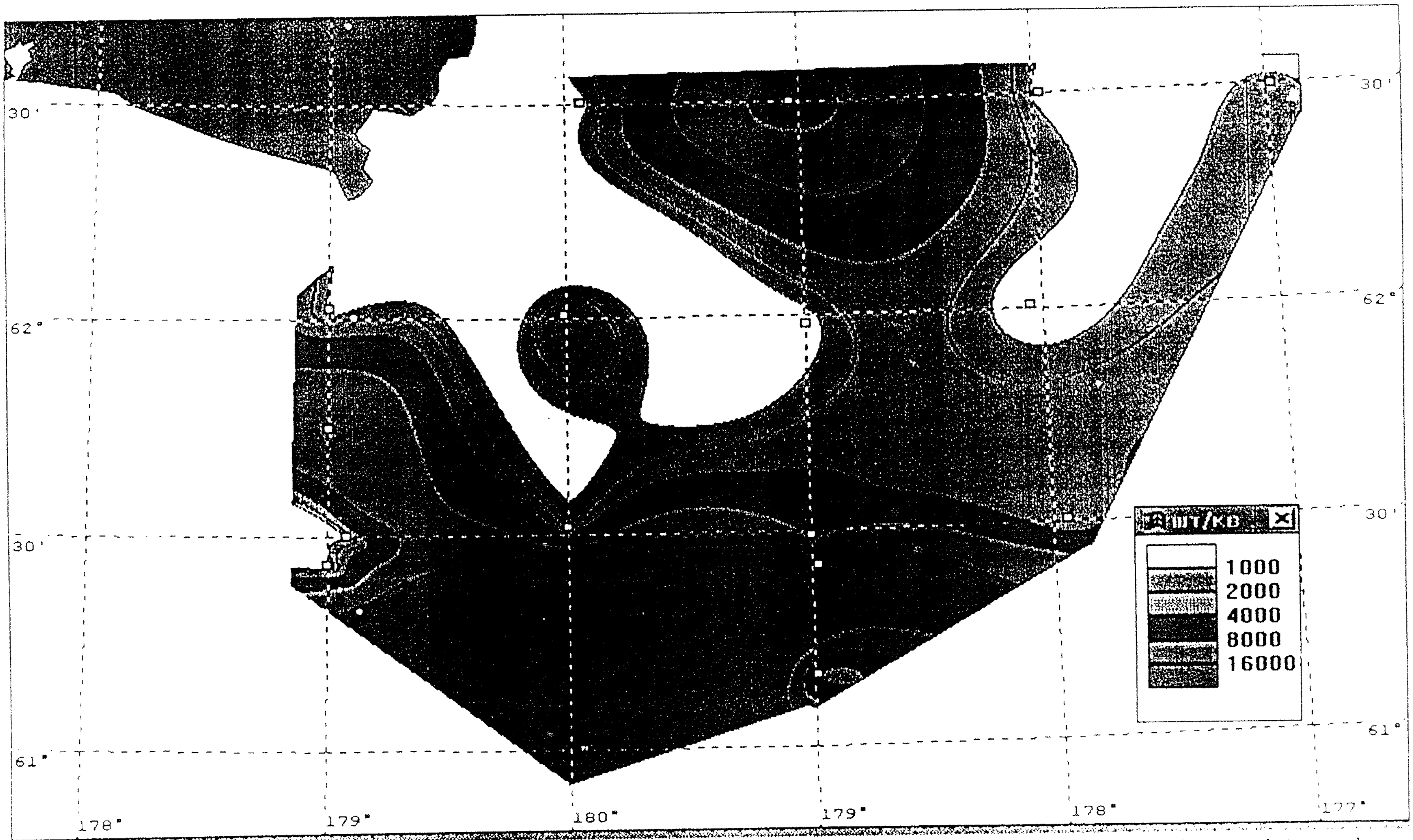


Fig. 5 Distribution of Navarin pollock generation 1998 observed in the June 2000, based on the fry survey. thousands/sq. mile

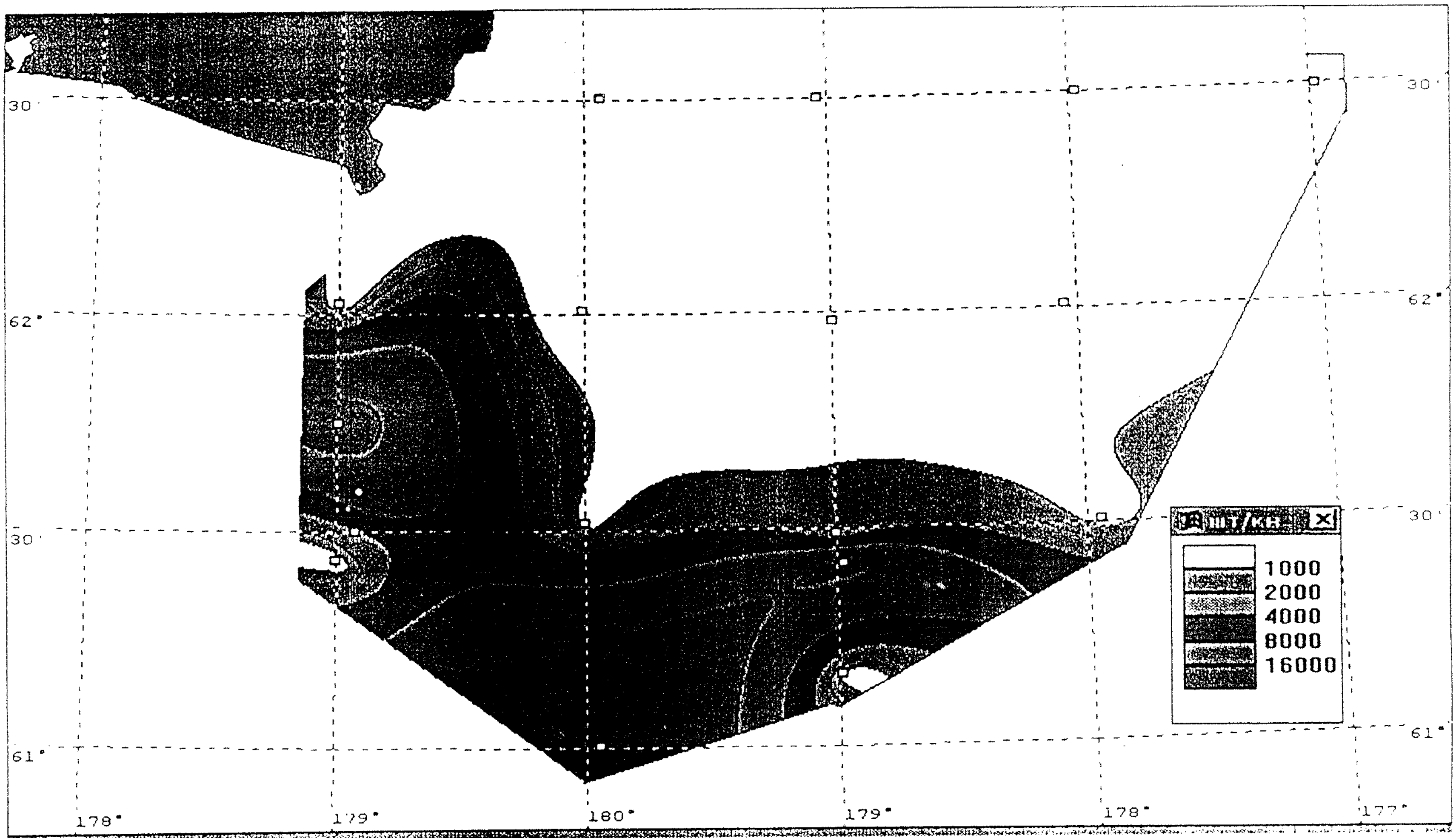


Fig. 6 . Distribution of Navarin pollock generation 1997 observed in the June 2000, based on the fry survey . thousands/sq. mile.

Fig.7 Length frequency of pollock from Olutor bay observed in the July-August 2000, based on the bottom trawl survey data.

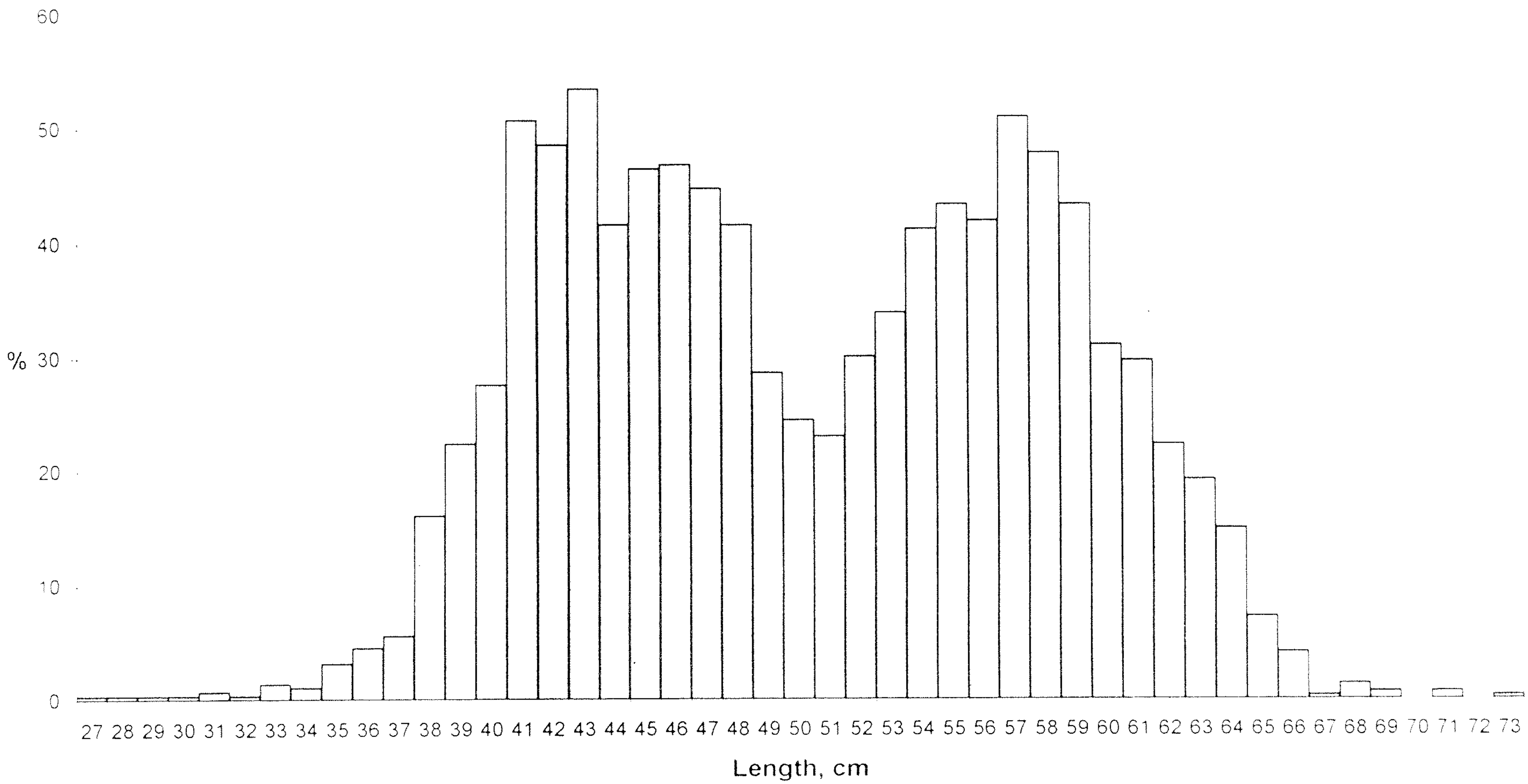


Fig.8 Length frequency of pollock from Western Koryak shelf observed in the August 2000, based on the bottom trawl survey data.

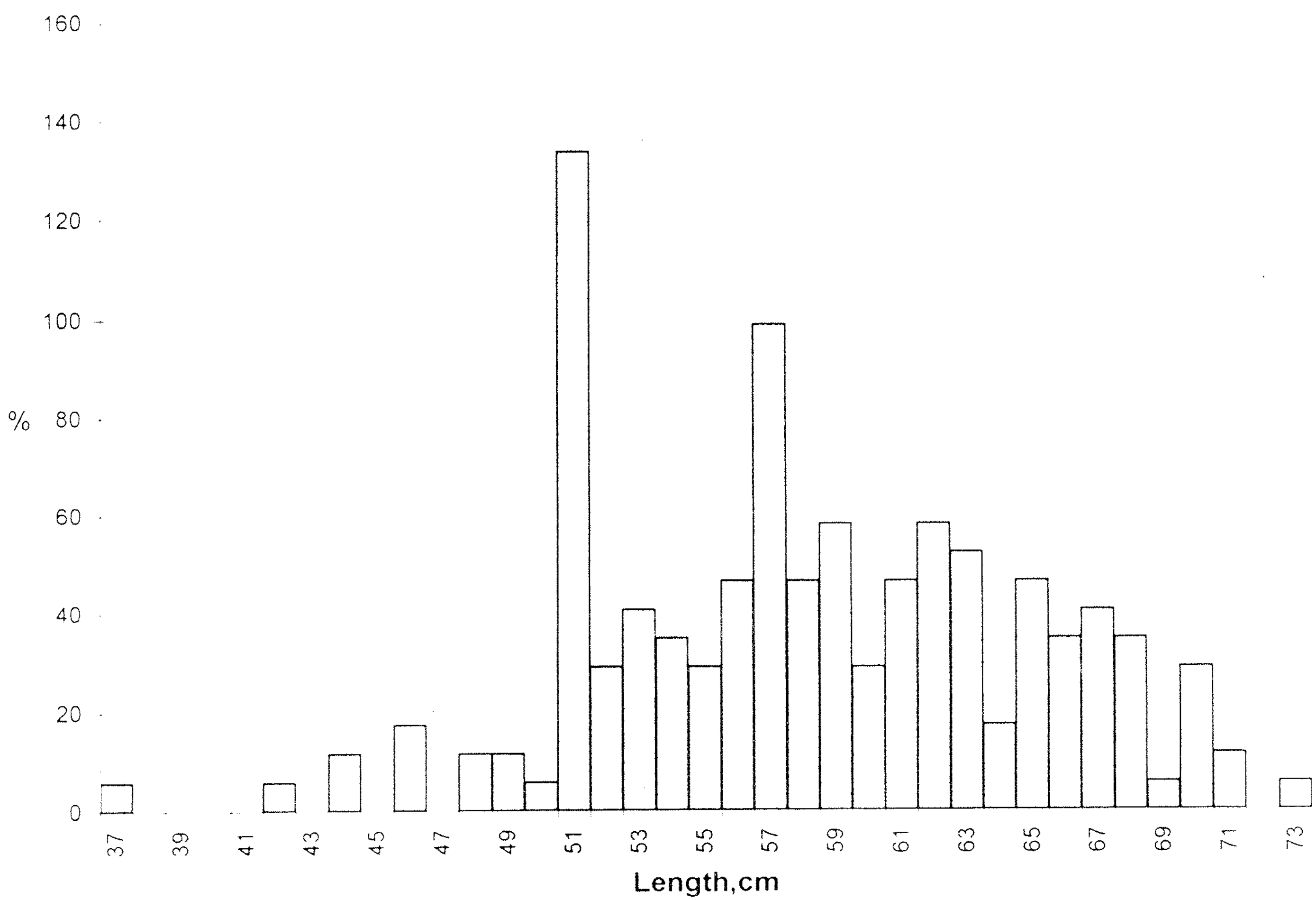
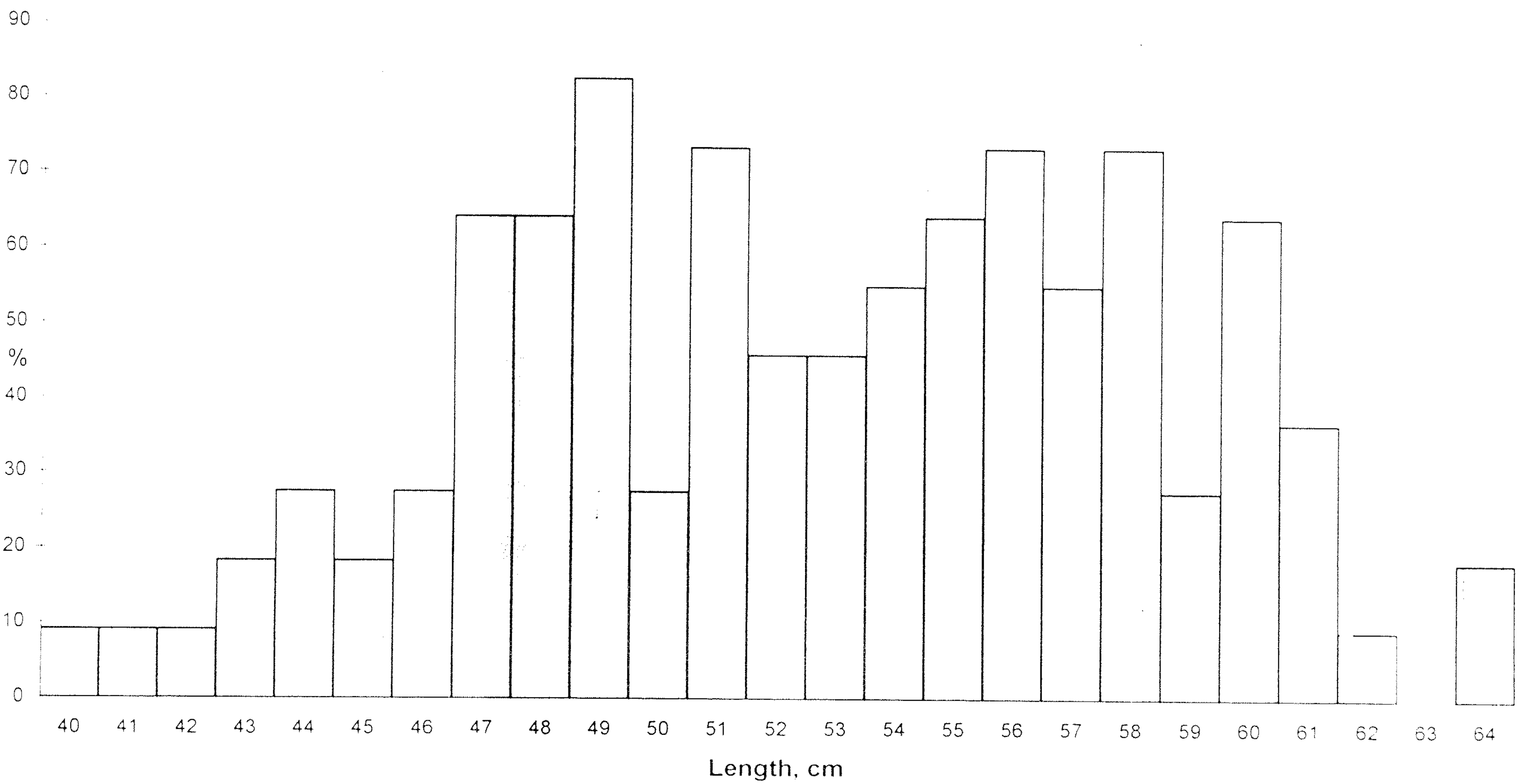


Fig.9 Length frequency of pollock from Eastern Koryak shelf observed in the August 2000, based on the bottom trawl survey data.



Cruise Plan for Mid-water Trawl Survey on Pollock in the International Waters of the Bering Sea, 2000

Fisheries Agency of Japan

Ⅰ. Objectives

The objectives of the 2000 autumn cruise are to:

① Collect information about pollock distribution in the international waters in the Bering Sea, in Autumn.

② Collect biological information of pelagic pollock in the International Waters in the Bering Sea, in Autumn.

Ⅱ. Institution

Hokkaido National Fisheries Research Institute (HNF)
116, Katurakoi, Kushiro, Hokkaido, 085-0802, Japan
Tel: +81-543-92-1716
Fax: +81-543-91-9355
Groundfish Biology Section
Akira Nishimura (anishimu@hnf.affrc.go.jp)

Ⅲ. Research Vessel

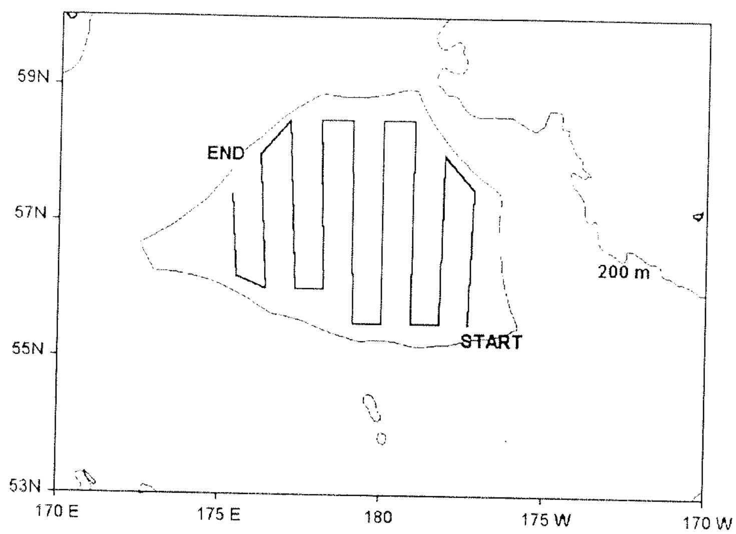
Name:	No.11 Daitoku Maru (279ton)
Call Sign:	7KLV
INMARSAT:	001-872-120-1567

Ⅳ. Itinerary (Tentative)

Date	Item
Oct. 19	Leave Kushiro
Oct. 19-27	Transit to Donut Hole
Oct. 28-Nov.6	**Survey in Donut Hole**
Nov. 7-15	Voyage to Shiogama
Nov. 15	Arrive Shiogama

V.Survey areas

International waters of the Bering Sea (Donuts Hole; Fig. 1).



VI. Scientific Personnel

Researcher: Koutarou Ono (Fisheries Agency of Japan)

VII. Research Items

1) Collection of the information about pollock distribution in the Donut hole by using vessel equipped acoustic system.

Fish distributions will be observed by vessel equipped echo sounder system (not quantitative system) continuously along the transects (Fig. 1). When significant echo sign appears, trawl haul will be conducted to identify the echo sign and to provide biological data for these organisms. Ship speed is expected to average 8 knots in favorable weather.

2) Collection of the biological samples by using mid-water trawl net. Duration of each trawl haul should be kept to minimum time necessary to ensure an adequate sample size (600-1000 kg). The following biological data will be collected from the samples.

Species composition and weight / numbers of each species.

Pollock length frequencies of each trawl haul.

Age composition from otolith reading.

Growth analysis and bio-chemical analysis.

VIII. Data

All data will be analyzed at HNF. The data and results of analysis will be submitted to the annual meeting of the Convention.

Central Bering Sea Pollock Workshop
(Seattle NOAA Sand Point Facility, 17-21 July 2000)

Results from the 2000 Echo Integration and Midwater Trawl Survey on the Bering Sea Walleye Pollock by the *R/V Tamgu 1*

Seok Gwan CHOI, Jin-Yeong KIM, Yeong-Seung KIM,
Joo-il KIM, Jong Bin KIM and Hyun Su JO

National Fisheries Research and Development Institute

1. Introduction

The National Fisheries Research and Development Institute (NFRDI) conducted an echo-integration and midwater trawl survey of walleye pollock from the Bogoslof Island area to the Donut Hole area in the Bering Sea by the Korean *R/V Tamgu 1* during February~April 2000. The purposes of the survey were to determine the geographical distribution of walleye pollock, to collect echo integration data and biological information of walleye pollock to estimate the biomass, to collect the oceanographic and biological environments during the winter in the survey area.

The itinerary of the *R/V Tamgu 1* was as follows;

Feb. 10~17, 2000 : Departure from Pusan port and navigation of *R/V Tamgu 1*
Feb. 18~19 : Anchor near the Attu Islands and Sphere Calibration
Feb. 20~29 : Change the survey plan due to the bad weather
Mar. 1~4 : Inport Dutch Harbor and supplies
Mar. 5 : Transfer to the Captain Bay and confirm sphere calibration
Mar. 6~27 : Acoustic-midwater trawl surveys from the Bogoslof Island area to the Donut Hole area
Mar. 28~Apr. 4 : Navigation of *R/V Tamgu 1* and arrival in Pusan port

2. Materials and Methods

1) Research vessel and fishing gear

The *R/V Tamgu 1* is a stern trawler with 90.2 m long, 2,550 gross tonnage, and 7,500 horsepower. Midwater trawl net was employed to identify the detected echosigns and to collect biological samples. The codend mesh size of midwater trawl net was 100 ㎜. Both head-ope and footrope lengths were 53.2 m, respectively.

2) Survey area, oceanographic and biological environments

The survey areas in the Bering Sea were covered from the Bogoslof Island area to the Donut Hole area (Fig. 1). A total of 37 research stations were selected to collect oceanographic and biological environments. Water temperature and salinity profile data were collected from surface to 500 m in the stations with a CTD system. Bongo net was used for collection of fish larvae and zooplankton samples from surface to 100 m layer in each stations. Seawater samples for chlorophyll *a* determination were collected at sixth layer (0, 25, 75, 100, 200, 400 m) with a Losette Sampler.

3) Echo intergration

Scientific quantitative echo-sounding system, Simard EK500, was used in acoustic data collection (Bodholt et al. 1989). Data from the SIMRAD EK500 sounder were stored and processed using a SIMRAD BI500 Integrator with the graphic workstation, SUN sparc 5 workstation compatible with the SUN workstation, installed an echo integration and target strength data analysis software (Foote et al.1991).

Transects were spaced 5 or 10 nautical miles in the Bogoslof Island area and 50 or 60 nautical miles in the other areas apart in parallel north-southward. The survey cruise was started from near Dutch Harbor and proceeded to the westwards with speeds of 8~12 knots. Echo integration data were logged each 1 nautical miles in the Bogoslof area and 5 nautical miles in the other areas during the survey.

Echo integrator output, S_a, was reintegrated with a SV threshold of -69 dB currently used in the Alaska Fisheries Science Center. To convert S_a into absolute density, the above equations were used in length-target strength relationship (TS= 20 log FL- 66; Traynor 1996).

4) Midwater trawl and biological sampling

Midwater trawl hauls were made to identify fish species and biological sampling at the selected location where a good echosign was encountered in day time. In each trawl haul, all species caught were counted and weighed. Samples of walleye pollock were treated to analyze sex ratio, maturity stage (five stage), gonad weight, fork length and body weight. Lengths were measured on the measuring board with a caliper scaling in 1 mm and body weight was scaled in gram. At the same time, otoliths, female gonad, and stomach were collected.

3. Results

1) Standard sphere calibration

Calibration procedures were conducted in the near the Attu Islands. The values of the split beam target strength were corrected repeatedly to find the known value of -33.6 dB/-40.5 dB and the TS transducer gain parameter. The values of the echo integration for the sphere were corrected repeatedly to find the value identical to the theoretical value and the Sv transducer gain parameter. Transducer beam pattern characteristics (longitudinal offset, transversal offset and

3 dB beam width of the beam) were used to obtain the values from EKLOBES software. Calibration results and overall system parameters were presented in Table 1.

2) Oceanographic conditions

The surface water temperature was 0.7~3.8℃ in the whole survey areas. It was higher than 2.6 ℃ in the Bogoslof Island area and lower than 2.0℃ in the Donut Hole area. Water temperature was little changed from surface to 120 m layer, increased rapidly from 120 m to 210 m, and variated a little over 210 m. In spring 1999, there was a cold water mass of 1.0 ℃~3.0 ℃ at the 50~180 m layer from the Donut Hole area through the Bogoslof Island area. It can be suggested that the cold water mass is isolated at 50~180 m due to increase the surface water temperature and air temperature as the season is transformed winter into summer. It may influence the distribution of walleye pollock in the Central Bering Sea by intensity of the cold water mass.

Salinity was fluctuated from 31.93 to 34.75 PSU in the survey area. It was presented about 33.2 PSU at the 20~120 m layer and increased as deeper as depth at over 120 m layer (Fig. 2).

3) Catch and CPUE

A total of 7 hauls were made in the cruise; six hauls in the Bogoslof island area, one haul in the Continental Shelf area. The total catch and Catch Per Unit Effort (CPUE ; kg/hour) of walleye pollock was 14,789.4 kg and 5,153.1 kg. The CPUE of pollock was larger than 4,000 kg/hour in Bogoslof island area except the haul station 3 was conducted to identify the fish species of non-pollock echo sign. The highest CPUE of pollock was obtained from haul station 4 (Table 2).

4) Length and weight of pollock

Fork length compositions of walleye pollock were described in Figure 3. Two modes of 34 cm and 42 cm in FL were shown in the east of Bogoslof Island area (east of W167°), one mode of 55 cm in the west of Bogoslof Island area (west of W167°), and one mode of 35 cm in the Continental Shelf area. The large sized group, over 55 cm, were distributed in the west of Bogoslof Island area in winter. The mean fork lengths of female and male were 56.6 cm and 54.2 cm in the west of Bogoslof Island area, 40.6 cm and 39.4 cm in the east of Bogoslof Island area, and 35.7 cm and 34.8 cm in the Continental Shelf area.

The patterns of weight compositions of pollock were similar with the fork length compositions (Fig. 4). The mean body weights of female and male were 1,526 g and 1,192 g in the west of Bogoslof Island area. In the Continental Shelf area it was smaller than that in the Bogoslof Island area.

Relationships between fork length and body weight by area were expressed as follows (Fig. 5);

Female of east Bogoslof Island area : $BW = 0.0111 \times FL^{2.8714}$ (r^2=0.93)
Male of east Bogoslof Island area : $BW = 0.0067 \times FL^{3.0052}$ (r^2=0.97)
Female of west Bogoslof Island area : $BW = 0.0239 \times FL^{2.7326}$ (r^2=0.71)

Male of west Bogoslof Island area : $BW = 0.0128 \times FL^{2.8615}$ (r^2=0.65)
Female of Continental Shelf area : $BW = 0.0133 \times FL^{2.7934}$ (r^2=0.92)
Male of Continental Shelf area : $BW = 0.0043 \times FL^{3.1076}$ (r^2=0.82)

where, FL is fork length in cm and BW is body weight in g.

5) Sex ratio and maturity of pollock

Data from 6 hauls showed that female percentages by area was 53.8 % in the east of Bogoslof Island area, 59.6% in the west of Bogoslof Island area, and 53.5 % in the Continental shelf area. Haul station 4, located at the edge of high-density aggregation of spawning pollock, had a percentage of female pollock that was 35.9%.

Maturity composition data revealed differences among three area (Fig. 6). Maturity for females were 90.7% immature/developing/pre-spawning in the east of Bogoslof Island area, 99.4% pre-spawning/spawning/post-spawning in the west of Bogoslof Island area, and 98.5% immature/developing in the Continental shelf area. Maturity for males were very similar to females. In the west of Bogoslof Island area, maturity for females were 46.8% pre-spawning, whereas males were 56.2% post-spawning.

6) S_a distribution and biomass estimation

Density (S_a) distribution of pollock was presented in Figure 7. Higher density was observed the inshore of the survey area from W164° 55′ to W166° 5′ , the east of Umnak Island, and an area between Umnak Island and Islands of Four Mountains. The highest density of the pollock echo sign was distributed in the area between Umnak Island and Islands of Four Mountains. Vertical distribution of pollock echo sign was dense at 300~600 m depth layer in the area of over 200 m bottom depth, at 80~150 m depth layer in the area of below 200 m bottom depth. Pollock echosigns were never appeared in the Central Bering Sea and middle area between Bogoslof area and Central Bering Sea except the Continental shelf area.

The results of pollock biomass was shown in Table 3. Biomass of pollock in the whole survey areas was 487 thousand tons; 455 thousand tons in the Bogoslof Island area, 32 thousand tons in the Continental Shelf area. Inside the area 518/CBS convention area, pollock biomass was 257 thousand tons and pollock numbered 192 million.

Table 1. The results from the standard sphere calibration conducted in the near Attu Island in February 18~19, 2000 for echo integration and midwater trawl survey by the *R/V Tamgu 1* in the Bering Sea

CALIBRATION REPORT EK500

VESSEL : R/V TAMGU 1 DATE : Feb. 19, 2000
PLACE : Near Attu Island BOTTOM DEPTH : 43.8 M
SST : 2.1 ℃. SALINITY : 33.18 PSU. SOUND VELOCITY: 1,460 M/SEC

FREQUENCY	38	120	kH
ABSORPTION COEFFICIENT	10 dB	38 dB	dB/km
TRANSDUCER	ES38B	ES120-7	Sensor type
ANGLE SENSITIVITY	21.9	21.0	
PING INTERVAL	1.0	1.0	sec
TRANSMIT POWER	Normal	Normal	
MAX. POWER	2000	1000	W
PULSE LENGTH	Medium	Medium	
BANDWIDTH	Wide	Wide	
TS OF SPHERE	-33.6	-40.4	dB
DEFAULT TS TRANSDUCER GAIN	26.5	26.5	dB
MEASURED TS	-32.1	-42.0	dB
ADJUSTED TS TRANSDUCER GAIN	27.21	25.32	dB
CALIBRATED TS	-33.6	-40.4	dB
DEFAULT EQUIVALENT 2-Way Beam Angle	-20.6	-20.8	dB
Transducer Data 2-Way Beam Angle	-20.6	-20.8	dB
Depth to Sphere	28.2	25.3	m
Default Sv Transducer Gain	26.5	26.5	dB
Theoretical Sa	2,721	721	m^2/nm^2
Measured Sa	3,079	439	
Calibrated Sv Transducer Gain	26.79	24.90	dB
Calibrated Sa	≒2,747	≒712	m^2/nm^2
Default -3dB Beamwidth Fore-Aft*	7.1	7.1	degrees
Default -3dB Beamwidth Athwart*	7.1	7.1	degrees
Calibrated -3dB Beamwidth Fore-Aft*	7.01	7.40	degrees
Calibrated -3dB Beamwidth Athwart*	6.79	7.62	degrees
Fore - Aft. Offset*	-0.11	-0.90	degrees
Athwartship Offset*	-0.04	-0.27	degrees

Table 2. The summary of midwater trawl results for walleye pollock form the survey of *R/V Tamgu 1* in the Bering Sea during March 2000

Haul No.	Date (LST)	Haul				Catch			
						Total		Pollock	
		Position	Duration time (min.)	Vessel speed (knots)	Depth (m)	Catch (kg)	CPUE (kg/hr)	Catch (kg)	CPUE (kg/hr)
1	Mar. 8	N54° 41.8′ W166° 05.4′	45	4.4	170	3,034.0	4,045.3	3,034.0	4,045.3
2	Mar. 10	N53° 33.9′ W167° 42.4′	5	4.0	400	3,778.5	45,360.1	3,628.0	43,710.8
3	Mar. 11	N53° 45.3′ W168° 32.1′	35	4.2	300	1.4	2.4	-	-
4	Mar. 12	N53° 05.8′ W169° 23.6′	1	3.5	430	1,647.6	98,658.7	1,640.0	98,203.6
5	Mar. 13	N53° 12,.1′ W169° 32.9′	5	3.7	420	757.9	9,098.4	746.4	8,960.4
6	Mar. 14	N54° 26.5′ W165° 36.5′	41	4.0	100	4,059.0	5,940.3	4,059.0	5,940.3
7	Mar. 17	N56° 48.3′ W172° 40.7′	40	3.9	130	1,682.0	2,521.7	1,682.0	2,521.7
Total			172			14,960.4	5,212.7	14,789.4	5,153.1

Table 3. Estimated biomass of walleye pollock from the survey of *R/V Tamgu 1* in the Bering Sea during March in 2000

Item	Bogoslof area	CBS 518 area	Middle areas (including C. Shelf)
Area swept (n.mile^2)	1,119	699	56,002
Transect length (n.mile^2)	10,755	6,555	31,350
Mean Sa (m^2 /n.mile^2)	417	371	8
Population (x10^6)	563	192	108
Biomass (thousand tons)	455	257	32

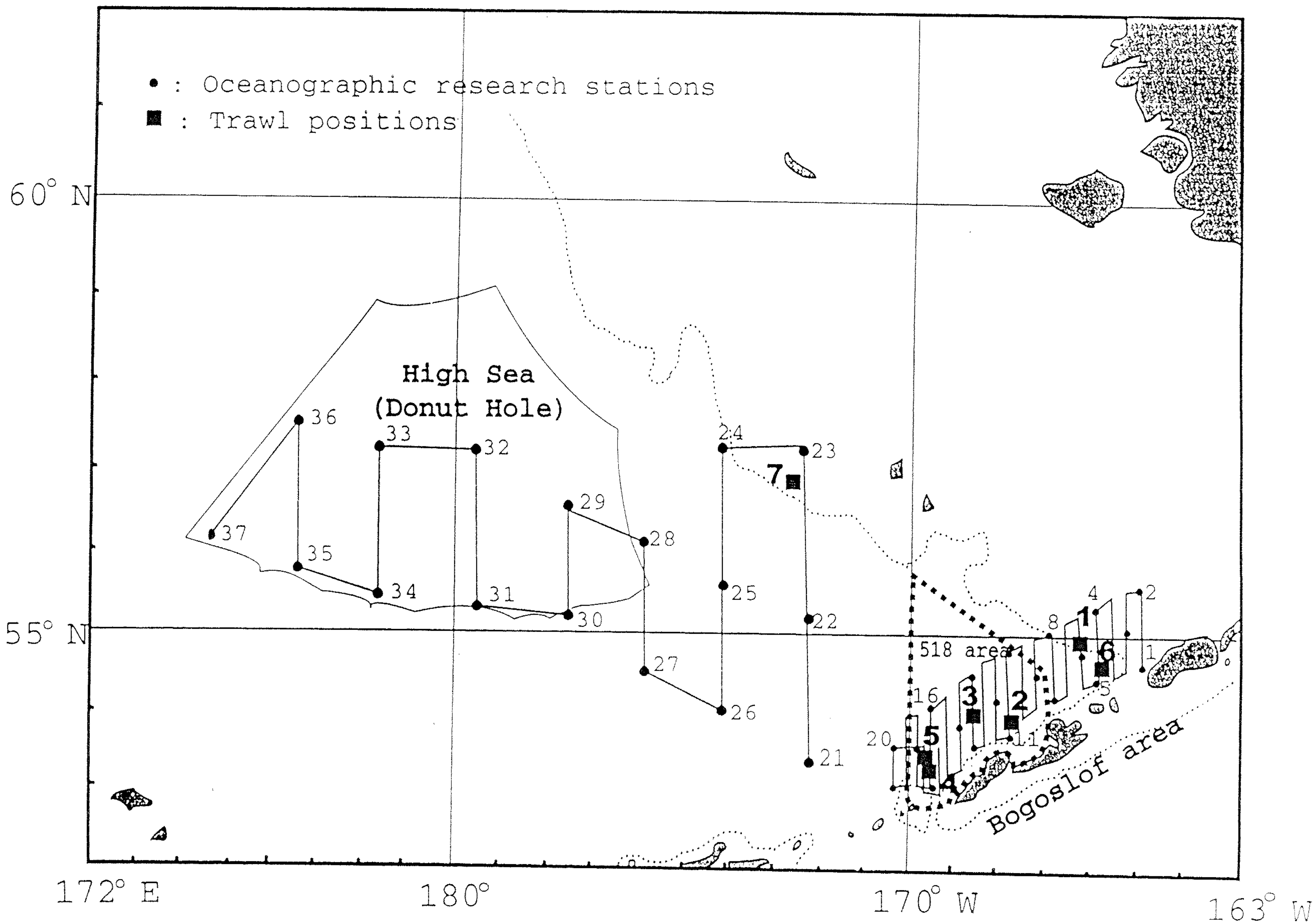


Fig. 1. Trackline and oceanographic research stations for the Echo Integration and Midwater trawl survey on the Bering Sea walleye pollock by *R/V Tamgu 1* during March in 2000.

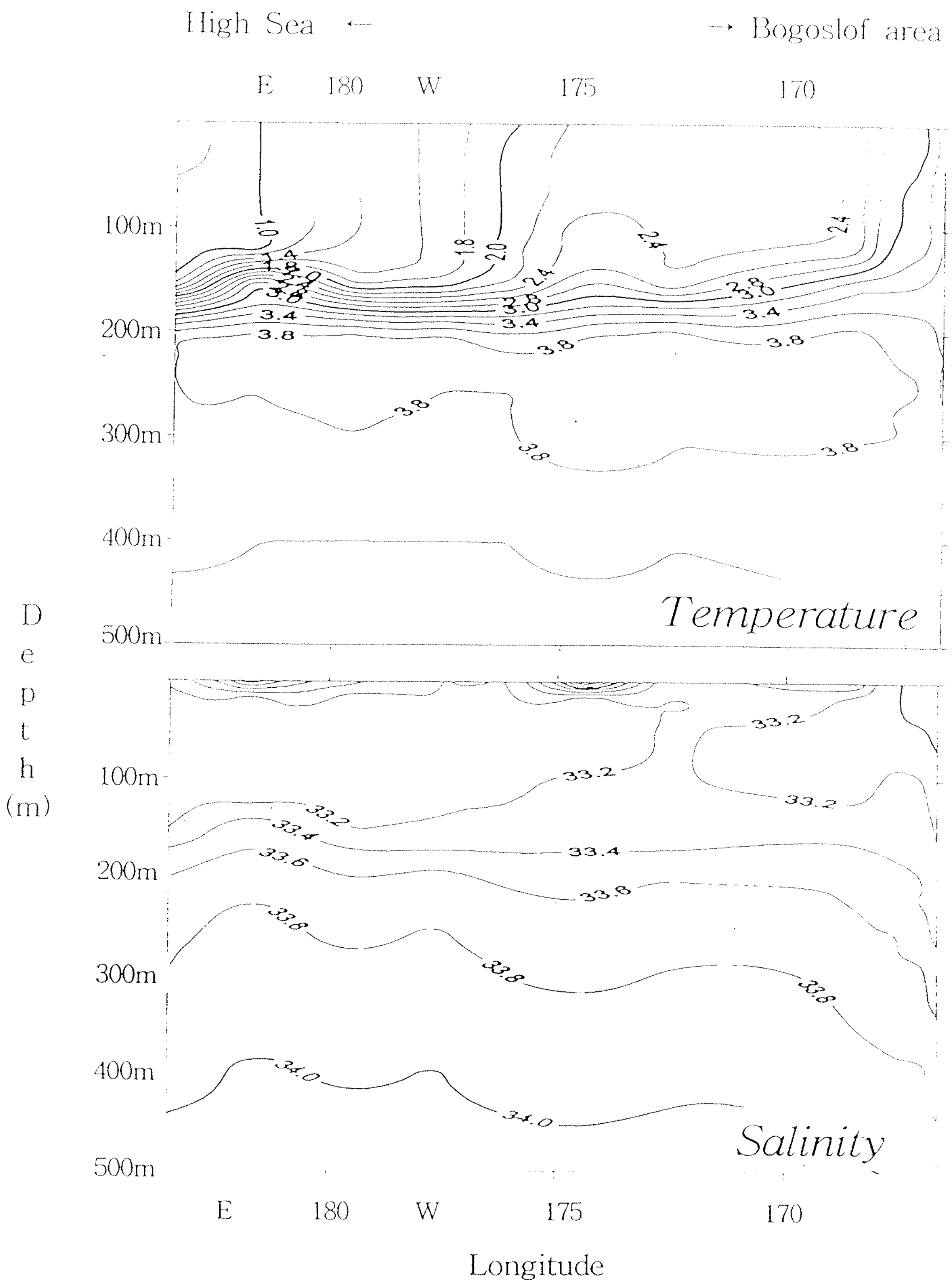


Fig. 2. Vertical distribution of Water temperature and Salinity in the Bering Sea during March in 2000.

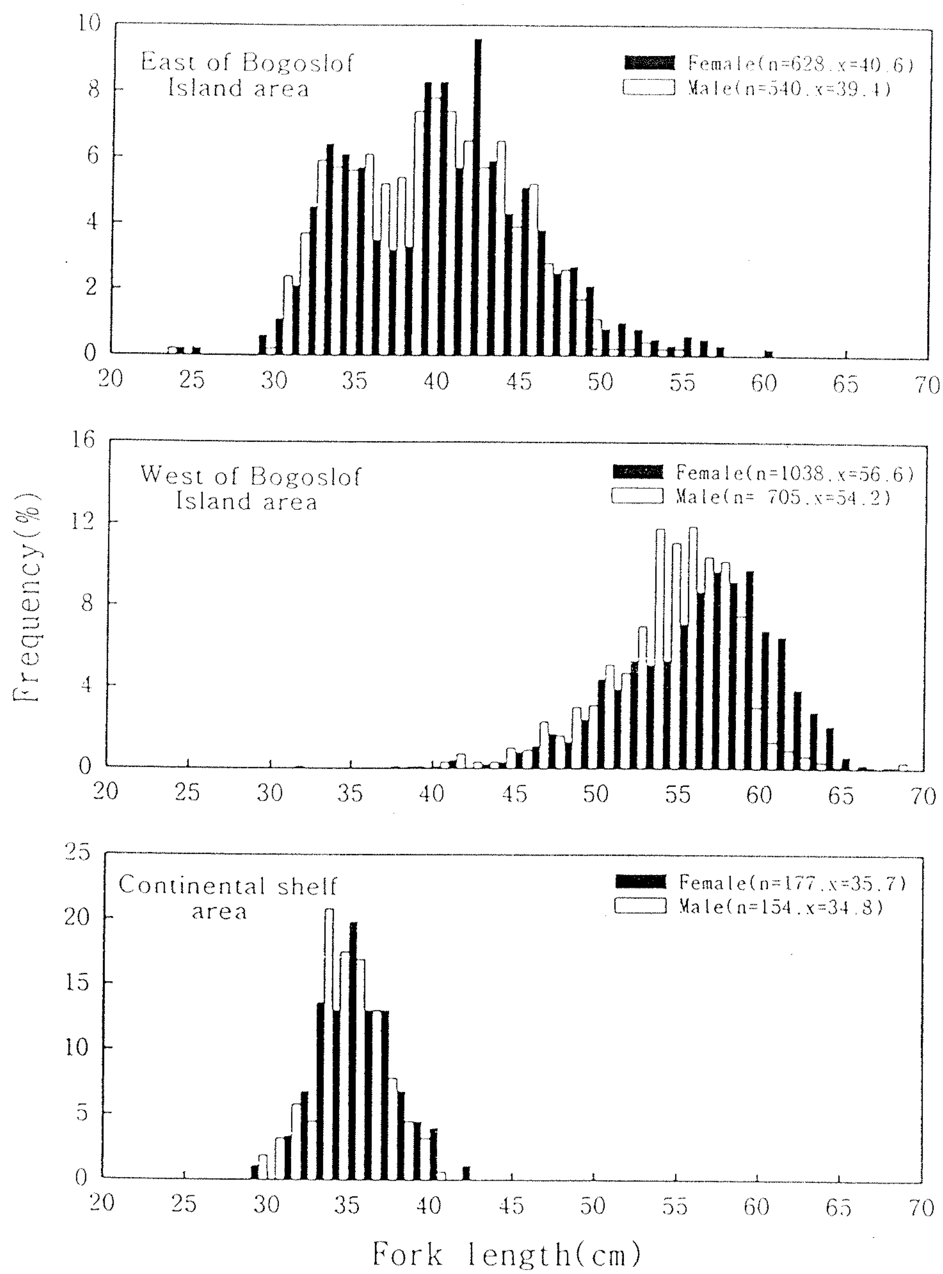


Fig. 3. Length composition of walleye pollock caught by midwater trawl in the Bering Sea during March in 2000.

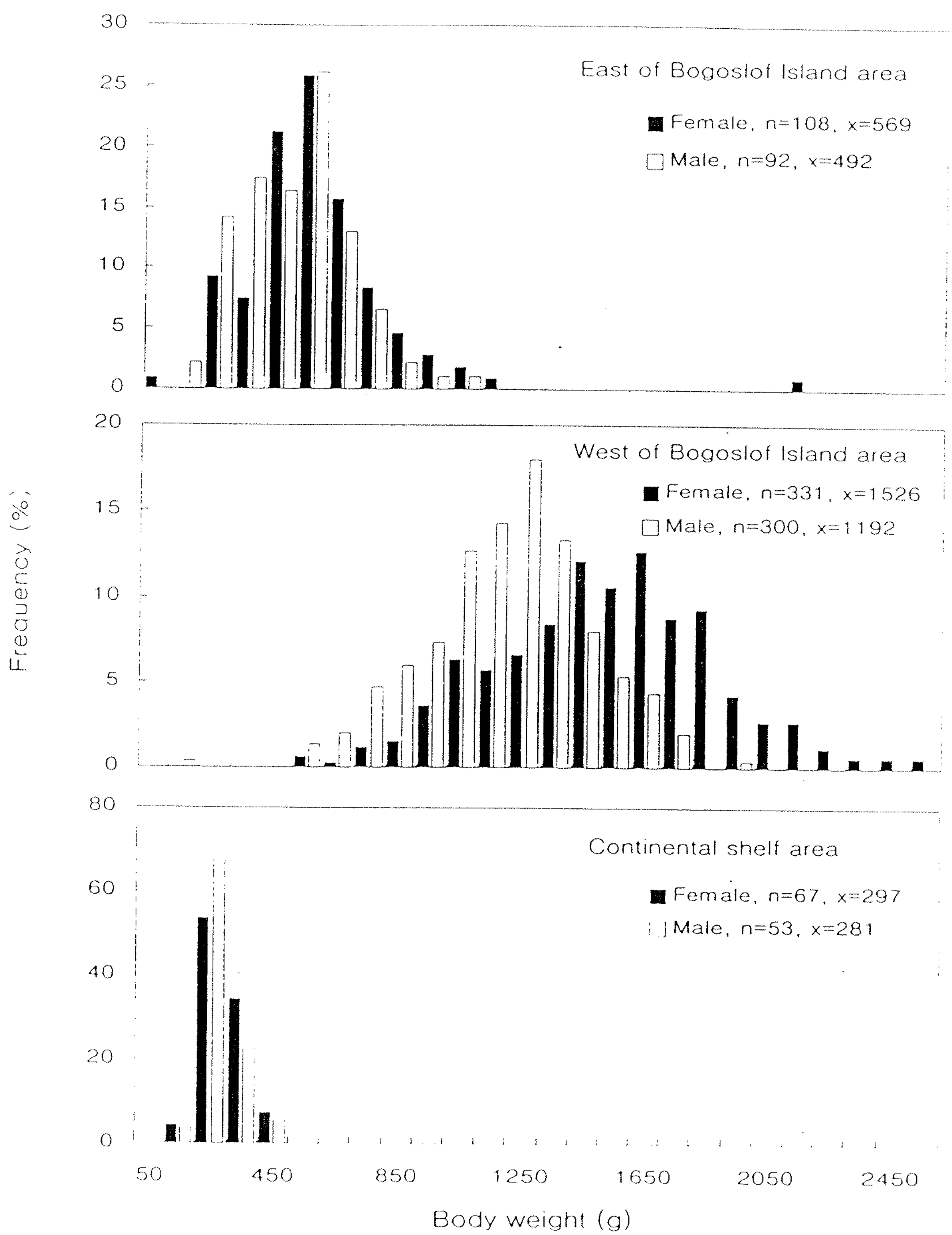


Fig. 4. Body weight composition of walleye pollock caught by midwater trawl in the Bering Sea during March in 2000.

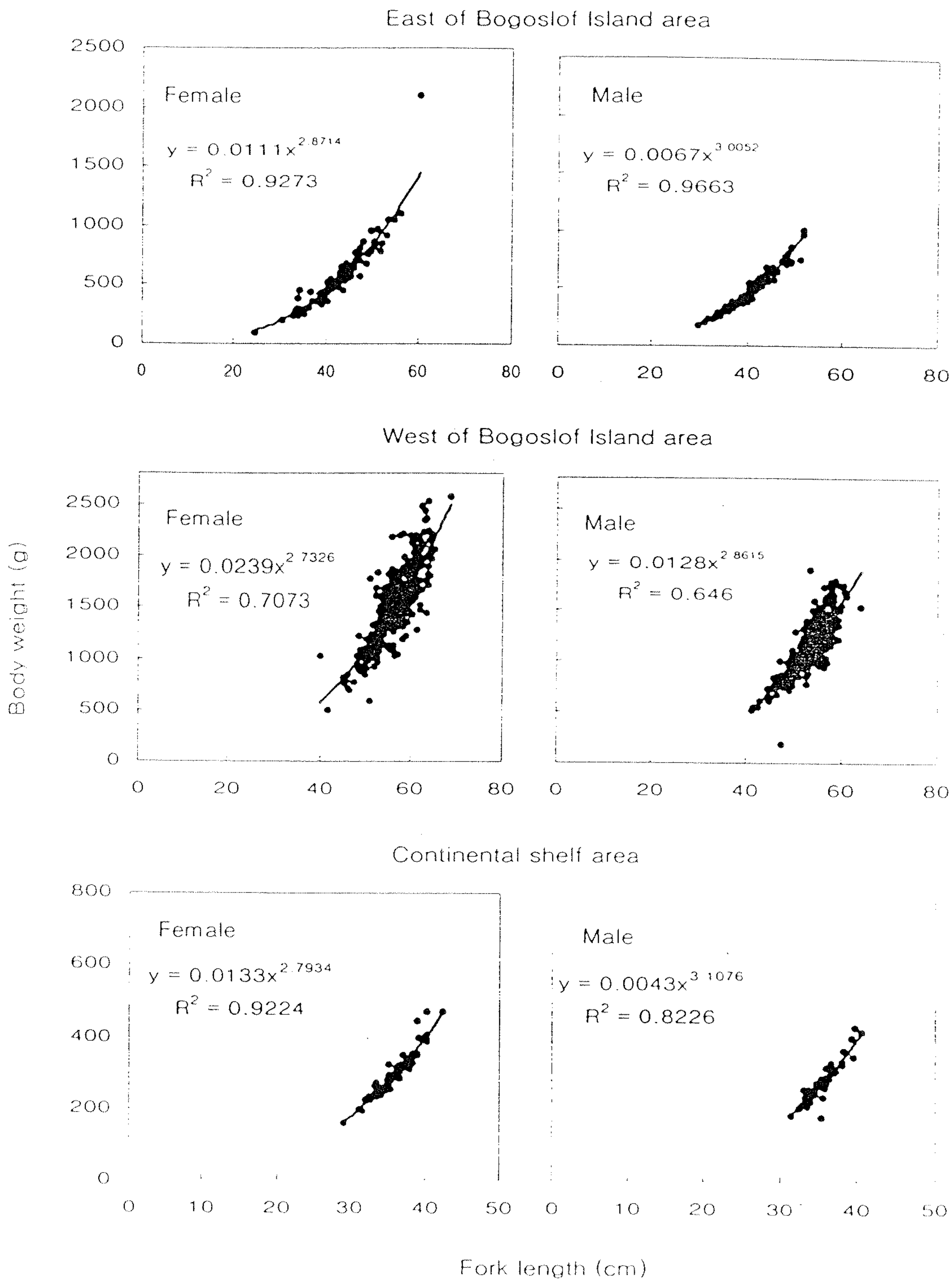


Fig. 5. Relationship between fork length and body weight of walleye pollock caught by midwater trawl in the Bering Sea during March in 2000.

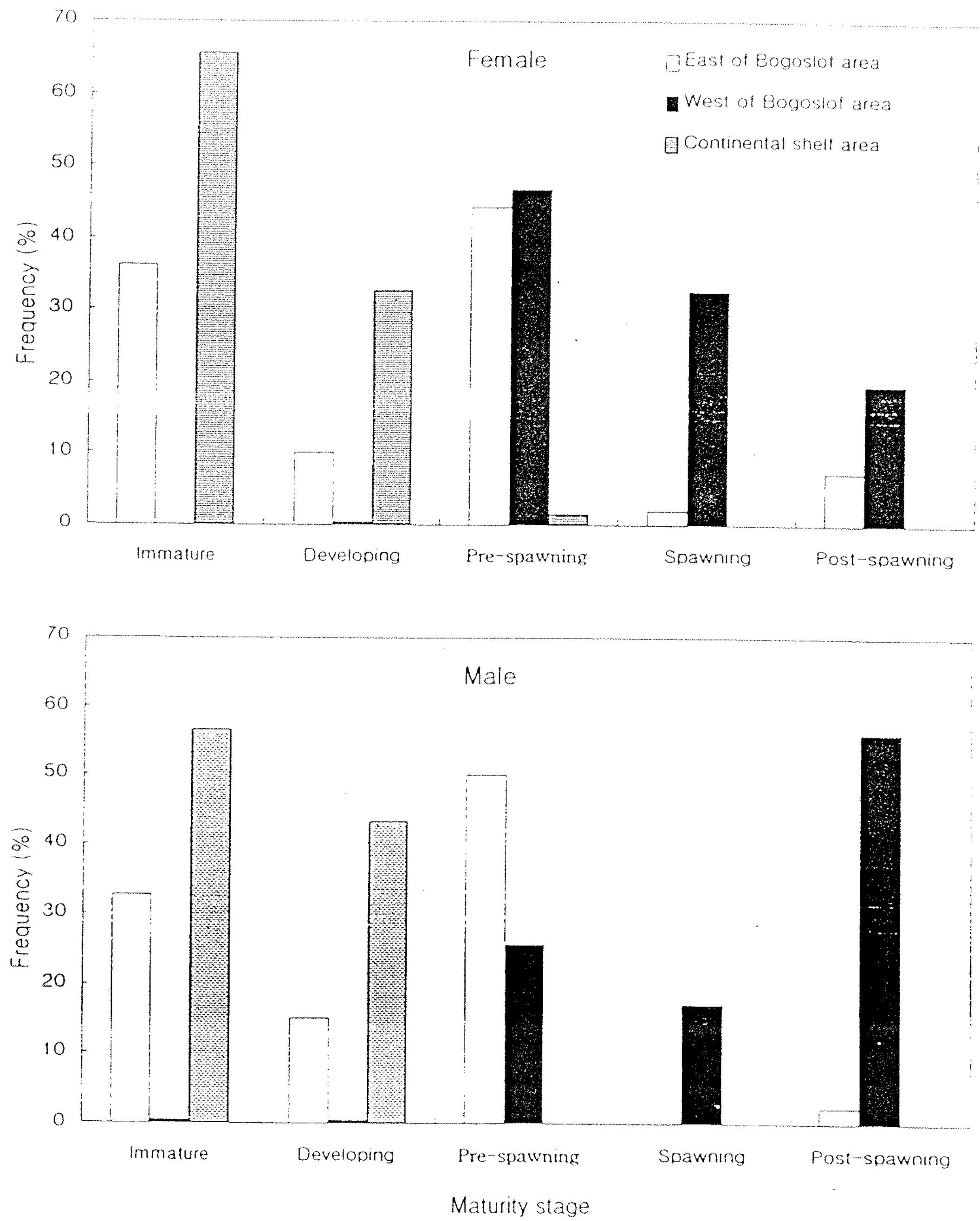


Fig. 6. Maturity stages of pollock observed from the survey of *R/V Tamgu 1* in the Bering Sea during March in 2000.

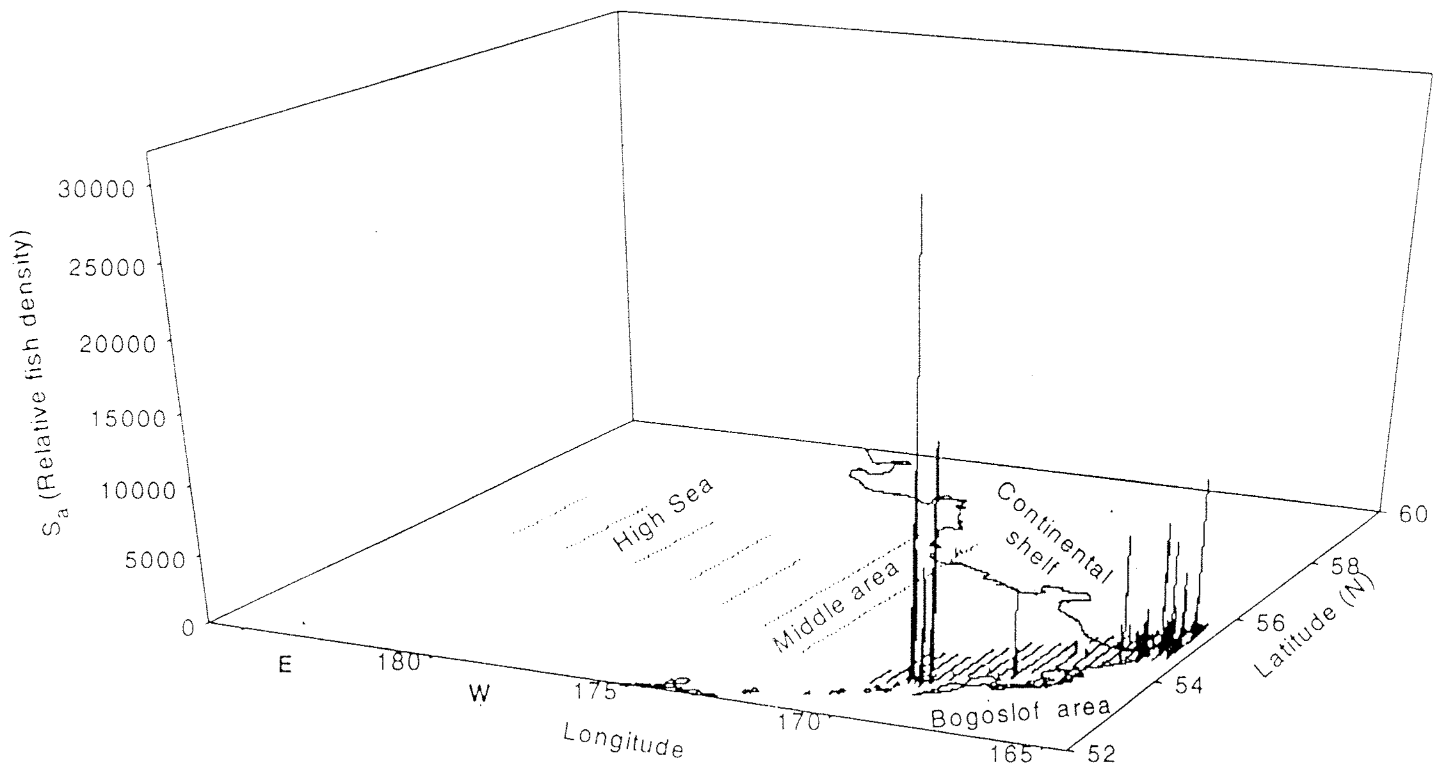


Fig. 7. Relative density of walleye pollock along trackline from the echo integration and midwater trawl survey by R/V Tamgu 1 in the Bering Sea during March in 2000.

Excerpt From: **CENTRAL BERI NG SEA POLLOCK WORKSHOP**
17-21 JULY 2000
SEATTLE, WASHINGTON

3. Effects of the moratorium and its continuation

Dr. SungKwon Soh (Korea) chaired this session. Dr. Soh reviewed the history of fishing and the fishing moratorium in the CBS. He reminded participants that there has been no directed commercial pollock fishing in the CBS since 1993, but despite this action, pollock stocks have still not recovered. He called on participants to provide their economic and ecological or natural resource perspectives on the effects of the moratorium on their countries.

Mr. Ichiro Kanto presented Japan's viewpoints on this issue (Attachment 10). Japan classified the effects of the moratorium into biological, economic, and social categories. Biological effects include the fact that the moratorium has not produced an improvement in stock conditions. Japanese fishermen and persons in related industries expected to see the stocks begin to recover after 4-5 years of the moratorium. Consequently, Japan's fishing industry has been economically damaged. Socially, Japan's fishing and related industries have begun to lose their trust in the existing framework of the Convention.

The United States delegation reminded participants that it has taken some fisheries many years to recover. The California sardine fishery has taken 70 years to recover, and it is still at a much lower level than it was originally.

Dr. Low reviewed the effects of the moratorium on the United States. He reiterated that U.S. fishermen have foregone fishing on the Bogoslof Island pollock spawning concentrations for many years, even though the area is within U.S. waters. U.S. fishermen have also stopped pollock fishing in the Aleutian Basin area because of potential impacts on marine mammal populations. He said that, in economic and conservation terms, the United States may have suffered more than any of the Parties.

Dr. Radchenko (Russia) said that Russian fishermen also suffered large pollock harvest losses from the time of the moratorium (mostly due to overfishing in the CBS area)--approximately 600,000 t annually. Russia has made a significant effort to manage pollock stocks in the WBS in such a way as to support the recovery of these stocks. He mentioned a number of management measures Russia has taken, such as the use of pelagic trawls with mesh size in the codend no less than 110 mm, the introduction of square mesh before the codends of trawls to allow juveniles to escape, increasing the minimum size of pollock in the catch from 34 cm to 37 cm in 2001, prohibition of fisheries in areas of high juvenile concentrations, and prohibition on bottom trawling. The Russian Government also plans to prohibit directed pollock fishing in the WBS westward of 178°E in 2001. The pollock quota for the small boat groundfish fishery in the coastal zone will be capped at 30,000 t.

Mr. Tae-Won Kim (Korea) presented a Korean industry perspective on the moratorium (Attachment 11). Bering Sea fishing industries in Korea suffered tremendous economic losses when they could no longer fish in the CBS. Since 1992, the number of fishing companies and fishing vessels has been reduced to 15 and 32, respectively, from a total of 20 companies and 46 vessels prior to moratorium. Mr. Kim said that from 1993 to 1998, 10 fishing companies have been dishonored or bankrupted due to the moratorium. Other results of the moratorium include a greater dependence on foreign imports to meet domestic demand, a decrease in price of domestically produced pollock due to the cheaper imports, and loss of a major source of protein for the Korean people.

There was some discussion over whether the hardships suffered by Asian fishing companies could be attributed solely to the decline of the CBS pollock fishery and the moratorium. A number of other factors had significant impacts on the economic situation in Asia, such as the stock market crash in Asia and exclusion of foreign fishing vessels from the U.S. and Russian zones.

Dr. Janusz reported that Polish companies suffered the same hardships as the other countries. Approximately 30 Polish fishing vessels were displaced from the CBS when the pollock fishery failed.

Dr. Kotenev (Russia) commented that the social consequences of the moratorium are difficult to separate from other problems. Approximately 78 percent of Russian fishing companies have a negative balance. Although the Russian Government has been supporting these companies, in the next few years a decision will be made to allow them to go bankrupt if they do not show a positive balance. Dr. Kotenev also noted a trend in migration of the population away from coastal areas, largely due to the decrease in pollock fishing.

Participants agreed that all Parties suffered economically from the moratorium on fishing and that a shared goal is to resume pollock fishing in the CBS. They also agreed that the moratorium has not been successful in restoring pollock stocks in the CBS and that other factors must also be affecting the recovery. These factors could include predator-prey interactions and oceanographic variability.

Dr. Low (United States) observed that for a recovery to take place, three things are needed: (1) adequate spawning biomass, (2) good oceanographic conditions, and (3) a reappearance of the pelagic pollock type. Unfortunately, neither the optimum spawning biomass nor the parameters for "good conditions" are known. The spawning biomass responsible for the strong 1978 year class was relatively small--perhaps 2 million t. By this standard, there would appear to be an adequate spawning biomass for pollock recovery when environmental conditions are favorable.

Several delegations pointed out that when the Parties consider rebuilding the AB pollock biomass, they must also consider the management of pollock stocks surrounding the Basin. Intensive fishing in areas adjacent to the AB may impact pollock recovery. The U.S. delegation reminded the participants that U.S. EEZ pollock stocks are dominant stocks and little is known about how much they contribute to the AB area. U.S. fishery scientists believe there is a tendency for the stocks to remain in "good condition" areas. They do not believe that the CBS is such an area; it is not a preferred feeding area for pollock. Pollock may only use the CBS as a migration route or as a "spillover" area from the EBS shelf. They don't believe that the "spillover" effect is a common occurrence.

Attachment 12

CBSPC meeting in Shanghai Nov.,2000

Japanese proposal for the ABC of 2001 in the Convention area

Fisheries Agency of Japan

1. Japan tried to calculate the ABC in the Convention area for the year 2001 in case of which the pollock biomass in the Specific Area is less than one million tons.

2. The estimated values of ABC in the Specific area are as follows:

$$3,768 \text{ t} \leq ABC_{2001} \leq 33,150 \text{ t}$$

3. Base of estimation of ABC

Operational definition: Summary of the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan 1997, published by North Pacific Fishery Management Council.

ABC estimates in the Specific Area were calculated by using Tier 3 and Tier 5.

<u>Tier 3</u>

(1) With considering the lowest biomass estimate in 2000, we do not expect the newly recruitment for the year 2001.

(2) Natural mortality rate of M=0.2 gives a projected biomass of B_{2001}=221,000 t for 2001.

(3) The values of B40%, and F40% were estimated 2,000,000 t, and 0.27, respectively.

$$F_{ABC}=F_{40\%} \text{ x } (B_{2001}/B_{40\%} - 0.05)/(1-0.05) = 0.017$$

(4) ABC for 2001 in the Specific area is

$$ABC_{2001}=B_{2001} \text{ x } (1 - e^{0.017}) = 3,768$$

<u>Tier 5</u>

(1) ABC for 2001 in the Specific area is

$$ABC_{2001}=B_{2001} \text{ x } M \text{ x } 0.75 = 33,150$$

4. Estimation of ABC in the Convention area

We tried to calculate the ABC in the Convention area taking into consideration the provisions of the Annex part I(b) of the Convention that the pollock biomass for the Specific Area shall be deemed to represent 60% of the Aleutian Basin biomass.

(1) ABC_{2001} in the Convention area from Tier 3:

$$ABC_{2001} = 3,768 / 0.6 = 6,279 \text{ t}$$

(2) ABC_{2001} in the Convention area from Tier 5:

$$ABC_{2001} = 33150 / 0.6 = 55,250 \text{ t}$$

Precautionary approach as New AHL (KOREA)

All Parties agree that the moratorium has not been successful in restoring pollock stocks at a level of the resumption of fishing operation in the Central Bering Sea. According to the Convention, the level of the resumption of the pollock fishing is 1.67 million tons. The estimated biomass of pollock stocks in 1995 was about 1.70 million tons. However, it was a temporary phenomenon due to a "spillover" area from the EBS shelf and other reasons. During the period of 8 years of the fishing moratorium except for 1995, the pollock biomass has never been closed to the level of 1.67 million tons.

As we are aware, the Convention was established by politics in a negotiation manner of member parties and 1.67 million tons threshold was not based on scientific data. Since then, our fishermen have been suffering economically from a cessation of commercial fishing. At those days, fishermen believed that the pollock fishing will be resumed and the moratorium will not be long. They don't care what the Convention said. Fishermen do care for only their shared goal of resuming fishing operation as soon as possible.

Clearly, there ~~is~~ is not any sign to indicate the recovery of pollock stocks (not even in the near future) It is difficult to predict when the stock status of pollock is restoring at a reasonable level in a scientific manner because the current criteria of 1.67 million tons is established in a non-scientific manner. Anyway, it will takes many years to recover pollock stocks. In this regard, member Parties should take a step to compromise such ~~un~~reasonable criteria which will give fishermen a hope for the re-opening of the pollock fishing.

Korea would like to emphasise a need for implementing the Precautionary Approach, in particular for the sustainability of pollock stocks. The Precautionary Approach is a relatively new concept in fisheries management. However, the Precautionary Approach is a clue to reduce uncertainty in stock assessment we faced such as a biomass estimate, an appropriate fishing mortality rate, the migration route and so on. It also contributes to more precisely quantify biological information to guide our management decisions.

Korea reiterates the importance of the establishment of a cautionary AHL on the basis of the current biomass. A cautionary AHL is possibly too small to operate the pollock fishery but it gives fishermen a hope for the resumption of fishing activity ~~as soon as possible~~ someday. Korean fishing companies are willing to install square mesh with ~~less~~ greater than 110 mm codend in a trawl to protect juveniles when a cautionary AHL is established.

Russian Delegation Precautionary Approach to Conservation and Management of Pollock in the CBS

In accordance with the New York 1995 UN Agreement, States are widely applying the precautionary approach to the conservation, management, and utilization of straddling stocks and highly migratory species in order to protect living marine resources and to conserve the marine environment (Article 6.1 of the UN Agreement).

> *"Two types of precautionary reference points should be used: conservation, or limit, reference points and management, or target, reference points. Limit reference points set boundaries which are intended to constrain harvesting within safe biological limits within which the stocks can produce maximum sustainable yield. Target reference points are intended to meet management objectives."* (Annex 11.2)

Does the Central Bering Sea Pollock Convention (CBSPC) correspond to these provision? Comparison of catches in the CBS and the biomass in the Bogoslof areas (see table below) indicate that the border point criteria of the Convention (1.67 mmt) was established in full accordance with the New York 1995 UN Agreement. When the Bogoslof biomass is 1 mmt, the Aleutian Basin biomass reaches 1.67 mmt and the catch should be at the level of 130,000 mt. This fully corresponds to the past situation in the CBS in the 1980's and early 1990's as shown in the table below.

Year	Biomass in Bogoslof Region (million metric tons)	Catch in the CBS (million metric tons)
1988	2.4	1.40
1989	2.1	1.45
1990		0.92
1991	1.3	0.29
1992	0.88	0.01
1993	0.68	0.002

(Table reproduced from page 11 of CBS Workshop Report July 2000)

Provisions of the CBSPC allowing for trial fishing (2 vessels from each Party), which enables to monitor the stock level and fishing conditions in the CBS, also correspond to the precautionary approach principles.

Establishment of an allowable biological catch (ABC) or AHL when the stock level is lower than 1.67 mmt contradicts the New York 1995 UN Agreement and does not take into account scientific data both on the state of the pollock stocks and the state of marine ecosystems of the Bering Sea in recent years.

Outline of cruise plan for echo integration and mid-water trawl survey on pelagic pollock in the Bering Sea (Tentative Plan)

Fisheries Agency of Japan

1. Cruise description and objectives

Hokkaido National Fisheries Research Institute (HNF) will conduct an echo integration mid-water trawl survey of walleye pollock (*Theragra chalcogramma*) in the southeastern Aleutian Basin and eastern Bering Sea shelf area aboard the R/V *Kaiyo Maru* of Fisheries Agency of Japan. The primary objectives of the survey are:

1) To determine the geographical distributions of the walleye pollock in the southeastern Aleutian basin area and in the southern part of the eastern Bering Sea shelf.
2) To collect echo integration data to determine the biomass of walleye pollock in the area.
3) To collect biological information on walleye pollock in the basin and shelf area.
4) To collect the information on the oceanographic and biological environments during the winter in the area.

This survey will be a cooperative survey between HNF and Alaska Fisheries Science Center (AFSC). Detailed survey plan will be discussed between the institutions and all data and information will be exchanged freely among the different agencies. The survey results will be used to determine biomass in the Specific Area that is defined in the Annex Part1-b in the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea.

2. Research Vessel

Name:	*Kaiyo Maru* (Fisheries Agency of Japan, Tokyo)
Type:	Stern trawler
Length:	93.01 meters
Tonnage:	2,630 tons
Hull color:	White

Radio call sign: JNZL

3. Crew and researchers on board

1) Crew:

2) Japanese Researchers

Preliminary survey

Akira Nishimura, Hokkaido National Fisheries Research Institute (HNF)
Takashi Yanagimoto, HNF
Yoshimi Takao, NRIFE
Atsushi Nanami, NRIFE

Main survey

Japanese researchers
Akira Nishimura, HNF, (Chief scientist; biology)
Takashi Yanagimoto, HNF, (Acoustic and oceanography)
Undecided

4 Assistant researchers Undecided
Foreign researchers Undecided

4. Vessel Itinerary (Tentative)

Preliminary survey (in the adjacent waters of Tokyo)

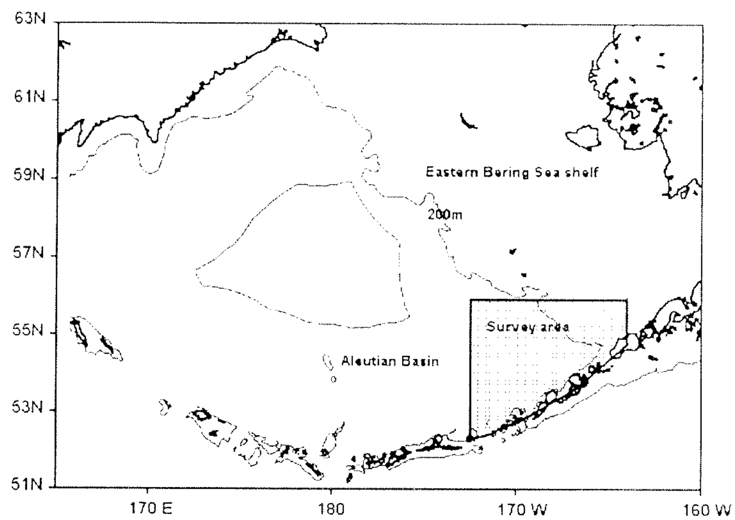
Dec. 15, 2001	leave Tokyo
Dec. 16-20	Acoustic system calibration
Dec. 21	arrive Tokyo

Main survey (in the Bering Sea)

Feb. 13, 2002	leave Tokyo
Feb. 16-19	Kushiro
Feb. 19	Leave Kushiro
Feb. 27-28	System calibration in the Captain's Bay
Mar. 1-12	Leg 1 survey
Mar. 19	arrive Kushiro
Mar. 22	leave Kushiro
Mar. 25	Arrive Tokyo

5. Research area

Southeastern part of the Aleutian Basin. All of the survey areas are included in the U.S. EEZ. Acoustic system calibration and pollock sampling by hook and line will be carried out in the Captain's Bay of Unalaska Island, inner 12-miles territorial limit seaward. We also plan to conduct our survey in the Specific Area (Bogoslof area) that is defined by the Annex Part 1 of the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea. To get the accurate biomass estimates of walleye pollock in the Specific Area, it is necessary to conduct a survey within 3-mile of the coast including trawling.



6. Research items

1) Preliminary survey (Dec. 15-21, 2001)

- Check of the acoustic systems
- Calibration of transmitter and receiver system
- Noise measurements
- Determination of standard parameters for acoustic systems
- Calibration between two systems (KFC3000 and EK500)

2)Main survey (Feb. 13-Mar. 25, 2002)

① Acoustic survey

- Calibration of acou_tic system
- Target strength estimation by split-beam method
- Abundance estimation of walleye pollock by echo integration

- Inter-system calibration between KFC3000 and EK500
- Analysis of relationship between behavior of walleye pollock and echo strength

②Midwater trawl survey

- Weight and number measurement of catch by species
- Body length, weight measurement and collect biological data from gonad, otolith, stomach, and DNA sample.
- Collection of frozen samples of walleye pollock.

② Biological operation

- At selected stations, adult pollock will be collected by hook and line.
- Double NORPAC nets (0.154 and 0.333 mm mesh size) sampling
- Continuous counting of zooplankton and monitoring of surface environment by EPCS (Electric Plankton Counting System)

④Oceanographic observation

- CTD casts and water sampling will be conducted at selected stations.
- Vertical profile of water temperature will be observed by XCTD system.
- Collection of satellite data (NOAA HRPT)

7. Other measurements and observation for weather and sea conditions will be recorded.

Comprehensive Survey Planning for Central Bering Sea Pollock Resource Assessments

At the 17-21 July 2000 Central Bering Sea Workshop, the Parties agreed to from a subgroup consisting of the organizers of the Bering Sea Pollock Workshop (Loh-Lee Low, Boris Kotenov, Vladimir Radchenko, Ichiri Kanto, Tokimasa Kobayashi, Chong-Guk Park/SungKwon Soh, Jerzy Janusz, and Liu Xiaobing) to develop a comprehensive plan to survey the central Bering Sea pollock resources. This subgroup will be charged with developing a research plan to address the following two questions:

(1) What are the pollock spawning locations in the Aleutian Basin?, and
(2) What are the migration patterns and geographical distribution of pollock stocks?

The use of both industry (commercial fishing vessels) and government resources would be considered in the development of this plan. These resources would be used to comprehensively survey the Aleutian Basin. During the process of conducting such a survey, emphasis would be placed on the collection of both data that would provide information on biomass and distribution, as well as biological samples, such as otoliths, scales, and other measures that would help the Parties better define the biological characteristics of the stocks.

The goal of the subgroup is to have a draft research plan available for the introduction and discussion at the 4th Annual Conference in Shanghai, China, in November 2000. Dr. Loh-Lee Low has been given the lead to develop this research plan.

Here are some ideas that are being suggested about the surveys:

1. It is probably not practical to consider organizing such a comprehensive survey until such time that data suggest the Aleutian Basin stock is rebuilding to pre-moratorium levels. In the event that such rebuilding does occur, substantial amount of time and effort will be required for the national Parties to plan and obtain necessary resources to conduct the surveys. While comprehensive planning would be premature at this stage, preliminary planning would establish a framework for possible comprehensive planning efforts in the future.

2. The area of sampling within the Aleutian can essentially be divided into 3 zones -- the international central Bering Sea zone (donut hole area), the Russian EEZ, and the U.S. EEZ. Special research permission will have to be obtained from the respective Governments for the research vessels to survey in the Russian and the U.S. EEZs. It is anticipated that only government-authorized research vessels will be permitted to survey the EEZs while "trial fishing vessels" would be confined to survey the international central Bering Sea zone only.

3. There are five Government research vessels that could potentially be available to conduct surveys: the *Miller Freeman* (U.S.-NMFS), the *Kaiyo Maru* (Japan - FAJ), *Tamgu I* (Korea - NFRDA), the *Kagonosky* (Russia - TINRO), and *Bei Dou* (China - YSFRI). In the event that the condition of the stock merit comprehensive survey activities at some time in the future, extensive planning and coordination will be necessary. Not all the five vessels may be available to survey

the Aleutian Basin at the same time. It is anticipated that at least three vessels would be needed to provide a comprehensive survey of the entire Aleutian Basin. The timing of the survey would best be the mid-February to mid-April period when spawning pollock are anticipated to be present in the survey area.. Survey track design and station locations will have to be determined among the Parties. It will also be necessary to carry out inter-ship calibrations studies.

4. The commercial fishing vessels that would also be engaged in "trial fishing" will likely be confined to survey the international central Bering Sea area (donut hole area). The maximum number of vessels that could participate is currently 2 vessels per Party, or 12 total. Since the donut hole area has been virtually devoid of fish the past few years, there should be little need to have too many vessels survey the area.

Attachment 17

U.S. Department of Transportation

United States Coast Guard

Commander
Seventeenth Coast Guard District

P.O. Box 25517
Juneau, AK 99802-5517
Staff Symbol: p
Phone: (907) 463-2226
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16214

JUL 19 2000

Honorable Delegates,
Convention for the
Central Bering Sea Workshop,
Seattle, Washington

Dear Esteemed Colleagues,

A recent policy change by Inmarsat Company requires government agencies to provide written permission from the vessel owner and Inmarsat equipment owner, if different, at the time such agencies request access to Vessel Monitoring System information (transponder data).

For your convenience I am providing each of you with a sample authorization letter developed in consultation with Inmarsat Company. This letter should be completed by the owner of a trial fishing vessel and provided to their respective government officials. Parties should transmit such letters when they provide notification of intent to conduct trial fishing operations. Parties receiving such notification will then be able to include the authorization letters in their request to an Inmarsat Service Provider for transponder data.

Use of these procedures will ensure Parties meet their obligations under the Convention to provide transponder data from their vessels operating in the Convention Area. I hope this simple change meets with your approval. If your have any questions or comments about this procedure please contact me by phone, fax, or e-mail; all are provided on my attached business card.

In closing I would like to thank you all for your continued spirit of cooperation in working with me to implement the provisions of this important Convention.

With Great Respect,

J.V. O'Shea

J.V. O'Shea
Captain, U.S. Coast Guard
Chief, Planning and Policy Division
Seventeenth Coast Guard District
By direction of the District Commander

Encl: Sample Authorization Letter

Date

Company Name
Address
Contact numbers

To Whom It May Concern,

1. This letter hereby authorizes government officials from People's Republic of China, Japan, the Republic of Korea, the Republic of Poland, the Russian Federation, and the United States of America to obtain real time satellite position information by polling the Inmarsat C terminal(s) listed below. This authorization is only for the period of time our vessels are involved in Trial Fishing for Pollock in the Central Bering Sea as designated below or by the government agency responsible for managing fishing in the Central Bering Sea:

Vessel Name	Call Sign/ Official Number	Terminal Number (9 digit IMN)	Terminal Manufacturer	Primary Reporting Ocean Area	Start Date	Stop Date

Terminal Owner ______________________ Date ____________________
(signature)

Vessel Owner ______________________ Date ____________________
(signature)