Northwest Atlantic Fisheries Organization

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SCIENTIFIC COUNCIL MEETING – JUNE 2002

Russian Research Report for 2001

PART I

Research carried out by AtlantNIRO in NAFO Subarea 4

by

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A. Status of the Fisheries

In 2001 the Russian silver hake fishery was carried out at one large – tonnage vessel (BMRT) in March-April and in June-August. According to the information, kindly provided by PINRO, in March and April hake was fished at the depths of 400-500 m and 200-300 m, respectively. Catch per day often approached 30 tons and more, considerably exceeding the level of 2000. The total Russian catch amounted to 2 100 tons. The fishery was carried out southwards of SMGL mainly in Division 4W. Based on the data by PINRO observer in March-April hake of 21-41 cm in length was caught. Average length by days changed from 24.8 up to 27.2 cm, average weight – from 90 up to 120 g. By-catch of other species did not usually exceed 2-3%.

In 2003 there is the probability of hake fishing biomass decrease as compared to the level of 2002, since the results of oceanographic researches, carried out in AtlantNIRO, allow to assume, the conditions of this species year-classes formation in 2000-2001 were less favourable, than in the previous two years.

B. Special Researches

1. Environment researches

a) Hydrographic studies

In 2001, the monitoring of SST and water mass boundary dynamics at the surface in the area of Labrador and Gulf Stream current systems action was continued. The trends in SST fluctuations and hydrological fronts shift in the Northwestern Atlantic in 2000 and 2001 were revealed, which evidences continuation of the raised temperature background in Labrador Sea, on Labrador Shelf, on Flemish Cap Bank and on the northern Grand Bank. At the same time in some regions since 1999 there was the opposite process observed, i.e. SST decrease up to mean monthly values close to the mean long-term level, and in some months even below. These areas are Scotian Shelf, Slope water mass and Golf Stream water mass adjacent to the open sea. The basic reason of this decrease is the strengthening of Labrador water outflow and weakening of warm Slope water advection in the areas of New England and New Scotland shelves, evidenced by the shift of these water masses boundaries southwards after 1999. It is supposed that the specified processes have resulted in deterioration of silver hake spawning conditions on the shelf of New Scotland in 2000 and 2001.

Updating of retrospective series of water masses boundaries location indices in 1962-1981 was continued. As a primary material, microfilms of facsimile Canadian SST maps for this period were used. The updating included replacement of parameters obtained on the basis of a typical isotherm as

water mass boundary with SST gradient location as the boundary between different water masses. New mean monthly indices, long-term average and standard deviation were estimated.

C. **Miscellaneous Studies**

The researches of probable dependence between recruitment of some commercial fish populations in Northwest Atlantic and water temperature was the continuation of those commenced in 2000 (Rikhter, MS 2001). The comparative analysis of dynamics of nine fish populations and water temperature in NAFO Subareas 2-4 was carried out which has revealed correlation between occurrence of weak year-classes in Div. 2J + 3KL, 3NO, 4VsW cod, Div. 3LNO American plaice, Div. 4TVW haddock, Div. 4VWX + 5Zc pollock, Div. 4VWX silver hake and the periods strong and rather long-time cooling. At the same time in the specified periods strong year-classes of Div. 2J + 3KLMNO Greenland halibut and Div. 3LNO yellowtail flounder were observed. The attempt was made to provide a general idea of the trends in fishing and spawning biomass dynamics of the populations considered for the first decade of the new century on the basis of obtained results. The detailed description of the researches performed is present in SCR Doc. 02/1, Serial No. N4596, submitted to this session of the Scientific Council.

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Northwest Atlantic Fisheries Organization

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PART II

SCIENTIFIC COUNCIL MEETING – JUNE 2002

Russian Research Report for 2001

PART II – PINRO Research

by

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SUBAREAS 1 AND 2

A. State of Fishery

Greenland halibut. In 2001, Russian quota of Greenland halibut in the West Greenland area was 1 000 tons. Greenland halibut was fished in Div. 1ACD at 900-1 300 m depth from early July to mid-October.

The fishery was conducted by 2-3 trawlers and 1-2 longliners. Mean daily catch was 5-17 t for trawlers and 2-6 tons for longliners. Total catch was preliminarily estimated at 920 tons (Table 1).

Redfish. Russian fishery for beaked redfish in Div. 1F and 2HJ was conducted in August-September by 2-4 medium- and large-size trawlers in 150-350 m depth. The highest efficiency was observed in August when the catch of medium- and large-size trawlers made up respectively 18.5 and 11.0 tons/fishing day. In September, the efficiency of trawlers reduced to 5.4-5.9 tons/fishing day. Ca. 69% of the total redfish catch were taken in August in Div. 2J. By the preliminary data, the total catch of redfish was 1 414 tons (Table 1).

Other species. No direct fishery for other species was carried out. By-catch of roughhead and roundnose grenadier in Greenland halibut fishery made up 1-5%.

B. Special Investigations

No environmental research or oceanographic observations were done.

No assessment surveys of Greenland halibut were carried out.

In June-July 2001, Russia, Germany, Iceland and Norway conducted an international trawl acoustic survey (ITAS) of beaked redfish. The Russian research vessel "AtlantNIRO" assessed the pelagic redfish stock in the Labrador Sea in the period from 24 June to 7 July. Biological data were collected during the Greenland halibut fishery in Div. 1CD and beaked redfish in Div. 1F and 2HJ by PINRO scientists working as NAFO observers onboard equipped fishing vessels.

Greenland halibut. A total of 4 120 fish from trawl catches taken in October in Div. 1D was analyzed. This species was represented by fish of 33-106 cm length at age 4-20 years (Tables 2, 3). Mean length of males was 49.4 cm, of

females – 55.4 cm, sex ratio - 1.8:1.0. Catches were dominated by mature fish. Feeding was not active, with a mean stomach fullness index of 0.6.

The length of fish in longline catches taken in July and August ranged from 39 to 109 cm. Length composition was identified for 3 789 individuals. Catches were dominated by males of 50-57 cm and females of 56-63 cm length. Mean length decreased with depth. In quantitative sense, females were predominant, though the portion of males increased from July to August from 39 to 46%. The prevalence of mature fish in catches was observed. No marked spatial or temporal variations in feeding intensity were noted, mean stomach fullness index being about 0.1.

Redfish. ITAS in June-July 2001 showed that ca. 40% of the total biomass of beaked redfish were distributed in the NAFO Regulatory Area.

Analysis of Russian and international TAS survey results proves the assumption that pelagic redfish in Div. 1F and 2HJ are a part of the total commercial stock of beaked redfish in the Irminger Sea characterized by the same spawning and feeding areas, similar life and migration cycles and absence of temporal or spatial isolation (Melnikov, Shibanov *et al*., 2001). Large commercial aggregations of pelagic redfish in Div. 1F and 2HJ are occasional. They develop due to the movement of aggregations from the traditional feeding area in the Irminger Sea, caused by an increased advection of Atlantic water by the Irminger Current and warming of the sea surface.

Length was measured in 21 117 fish. Feeding and maturity were analyzed in 3 616 fish and 1 850 individuals were aged. Length of beaked redfish in catches taken in Div. 1F ranged from 20 to 45 cm and mean length was 33.3 cm (Table 5). The bulk of catches was made up by individuals of 33-36 cm length at age 12-15 years (Table 6). Male/female ratio was ca. 1.2:1. About 27% of fish were immature. Redfish had been actively feeding. Their diet consisted primarily of zooplankton – Calanus and Themisto.

Mean length of redfish in Div. 2J was somewhat greater – 34.4 cm. The bulk of catches was made up by 13-15-year-old fish of 34-36 cm length. Male/female ratio was 1.3:1. The portion of immature fish was smaller – 17.4%. Feeding intensity was moderate with Calanus and Themisto prevailing in diet.

SUBAREA 3

A. State of Fishery

Greenland halibut. The Russian quota for 2001 in Div. 3LMNO was 3 779 tons. Direct fishery was conducted during the year by 1-18 vessels of different types. Greenland halibut occurred also as by-catch in fishery for redfish and skates. Russian catch of this species in 2001 was 3 759 tons (Table 1).

The vessels operated on the continental slope in the areas adjacent to the Flemish Pass (Div. 3L and adjacent areas of Div. 3M) in 670-1 500 m depth. Mean fishing efficiency was 0.4 t/hour. A total of 3 516 tons, i.e. 94% of the total Greenland halibut catch, were taken in that area. Catches contained grenadiers – 4%, redfish – 2%, American plaice – 1%, red hake - 1%, skates – 1% and other fish species – 1%.

Some vessels fished in Div. 3NO in 640-1 350 m depth. Mean fishing efficiency was 0.9 t/hour. 243 tons of Greenland halibut were caught. Present in catches were skates – 7%, redfish – 4%, haddock – 4%, American plaice – 3%, witch flounder - 3%, grenadiers – 2%, cod – 1% and other fish species – 1%.

Redfish. The fishery for redfish on the Flemish Cap Bank was conducted by medium-size trawlers (1000-2000 kW). From July to September, redfish was fished on the southern and south-western slopes of the bank in 300-600 m depth. Most of the catch was taken in August. Mean fishing efficiency during the period was 11.6 t/fishing day. The total catch of redfish in Div. 3M was preliminarily estimated at 1 288 tons (Table 1).

In Div. 3O, redfish was fished in 300-600 m depth by medium-size trawlers (1000-2000 kW) in the period from May to December. Fishing efficiency for the whole period was 17.5-19.8 t/fishing day depending on the vessel type. By the preliminary data, the total catch of redfish in Div. 3O made up 11 534 tons.

Skates. Direct fishery for skates in Div. 3NO was conducted by two medium-size trawlers (1000-2000 kW) in the period from May to October. Most (more than 97%) of the catch in Div. 3N was taken in 50-400 m depth. The main fishing object was thorny skate (*Raja radiata*). Fishing efficiency during direct fishery was 27.6 t/fishing day. The catch of skates in Div. 3NO made up 2 548 tons (Table 1).

In Div. 3LM, skates occurred only as by-catch in Greenland halibut fishery. By the preliminary data, the total catch of skates in Div. 3LMNO attained 2 540 tons.

Other species. No direct fishery for other fish species was conducted. Data on by-catch of these in Greenland halibut and redfish fishery in Div. 3M and 3O, as well as in skate fishery, are given in Table 1.

B. Special Investigations

In the period from 10 May to 4 June, a trawl assessment survey of demersal fish was carried out in Div. 3M by MG-1360 "Mozdok". The research covered the area of 15.8 sq. miles in 127-1 280 m depth and was performed according to the NAFO stratification of Divisions. Biological data were collected throughout the year mostly by PINRO observers working onboard fishing vessels.

During the survey in Div. 3M, 39 oceanographic stations at 130-1016 m depth were occupied (Fig.1). The obtained data on temperature and salinity were compared with long-term mean in conventional Subareas shown in Fig.2 (Drinkwater and Trites, 1986).

Data on vertical distribution of water in the section along 47^0N (Fig. 3) show that in 100-150 m depth, temperature was 3.0-3.5^{0}C, while the surface temperature attained 5.0-5.5^{0}C. Temperature in the near-bottom layer ranged from 3.3 to 3.8^{0}C. Salinity varied from 34.4 near the surface to 34.5 near the bottom to 150 m depth. In greater depths salinity varied from 34.5 to 34.8.

Temperature and salinity measured at oceanographic stations along 47^0N are largely in line with Canadian data from investigations conducted in spring 2001 (Colbourne, 2001). A certain difference in temperature (an increase to 5^{0}C) was observed in the 0-50 m layer. This can be related to different time of investigations.

Data on horizontal distribution of temperature and salinity from the surface to 300 m depth demonstrate the intrusion of warm water of North Atlantic Current to the western and southern slopes of the bank (Fig. 4). The highest temperature of these waters varies from 7^{0}C in 200-300 m depth to 12^{0}C near the surface. Maximum salinities varied from 34.9 to 35.3. The rest of the bank was occupied by mixed water with temperature and salinity of respectively 3.0-6.0^{0}C and 33.0 -34.4 near the surface and 3.3-3.7^{0}C and 37.7-34.8 near the bottom. Thermohaline frontal zone, which separates North Atlantic water from mixed water of the Flemish Cap Bank, can be traced down to 300 m depth in the southern part of the investigated area.

Collation of temperature data with long-term mean indicated that on the northern, western and southern slopes of the Flemish Cap and Flemish Pass down to 200-300 m depth, temperatures were warmer-than-normal with the maximum (to 2.4^{0}C) in the surface layer. In greater depths, temperatures showed only slight deviations from the long term mean. On the eastern slope and in the centre of the Flemish Cap Bank, temperatures were colder-than-normal by 0.2-0.4^{0}C.

Greenland halibut. Stock status was defined based on the assessment trawl survey in Div. 3M. Greenland halibut occurred in catches taken in 220-1 700 m depth. Abundance index in the investigated strata was 14.2 mill. individuals, biomass was estimated as 12.7 thousand tons. Catches contained fish of 13-90 cm length at age 1-17 years. The bulk of catches (46.7%) was made up by small immature fish of 43-48 cm length. Year-classes of 1994-1996 prevailed in number (78.8%).

In March-July and in December, comparative selectivity of trawl bags with 120, 130-135, 140-145 and 150-155 mm mesh size in Greenland halibut fishery was tested. Results of these investigations are given in the paper by Lisovsky *et al*., which will be presented at this meeting.

In commercial catches occurred individuals of 24-94 cm length at age 2-7 years (Tables 7, 8, 9). Mean length was 45.0 cm. Prevalent were fish of 42-47 cm length. Catches were dominated (37.2%) by 6-year-old fish from the year-class of 1995. By-catch of undersized (<30 cm) fish in Div. 3LMNO was below 0.1%.

Roughhead grenadier. This species occurred in large quantities as by-catch in Greenland halibut fishery. In Div. 3L occurred individuals of 21-87 cm total length, mean length being 42.8 cm (Table 10). Over the entire investigation period the bulk of catches was made up by fish of 39-44 cm length.

Redfish. Length of beaked redfish caught as by-catch in Greenland halibut fishery in Div. 3L ranged from 12 to 46 cm with the mean length of 29.0 cm (Table 11). Prevalent were fish of 28-30 cm length at age 9-10 years (Table 12).

By the results from the assessment trawl survey on the Flemish Cap Bank, the total abundance of *Sebastes* redfishes was estimated at 157.9 mill. individuals and the biomass of these – at 21 100 tons.

In Div. 3M, length distribution of redfish caught as by-catch and in direct fishery, included fish of 16-43 cm length at age 4-17 years. Fish of 28-29 cm length at age 9-10 years made up the bulk of catches.

Redfish of 24-25 cm length dominated by-catches in Greenland halibut fishery in Div. 3N.

Redfish length in Div. 3O ranged from 15 to 46 cm with the mean length of 24.2 cm. Catches contained mainly fish of 23-24 cm length at age of 7-8 years.

American plaice. This species occurs most frequently in Greenland halibut fishery by-catches taken in Div. 3LMN at 700-1 200 m depth, as well as in the direct fishery for skates in Div. 3N at 50-400 m depth. By-catches of this species occasionally exceeded 25%, which made fishery more difficult.

Length distribution of American plaice in Div. 3L contained fish of 22-56 cm length. Catches comprised mainly individuals of 34-37 cm length.

Length of fish in Div. 3M varied from 24 to 52 cm, mean length being 40.4 cm.

Length distribution of American plaice taken as by-catch in skate fishery in Div. 3N was from 18 to 78 cm with the mean length of 49.8 cm (Table 13). Catches were dominated by fish of 34-35 and 54-55 cm length.

In Div. 3O occurred American plaice of 30-72 cm length.

An increase in mean length from Div. 3L to 3N was observed.

Witch flounder. The length of fish caught in Div. 3L ranged from 14 to 58 cm with the mean length of 39.1 cm (Table 14). Fish of 36-41 cm were predominant in catches. In Div. 3MNO, only a small number of fish were investigated.

Yellowtail flounder. Biological data were gathered in Div. 3N. The length of caught fish ranged from 18 to 58 cm with the mean length of 36.5 cm (Table 15). Fish of 34-37 cm made up the bulk of catches.

Cod. The length of cod caught in the direct fishery for Greenland halibut in Div. 3L varied from 36 to 101 cm, the age of caught fish was 3-12 years. Mean length was 58.1 cm (Table 16). Catches comprised mainly mature (4-5-year-old) fish of 51-53 cm length (Table 17).

On the Flemish Cap Bank, cod of 15-102 cm length were caught in small quantities in redfish fishery.

The largest cod was observed in Div. 3N. Length distribution included fish from 33 to 132 cm length at age 3-20 years with the mean length of 98.5 cm.

The length of cod in Div. 3O ranged from 30 to 105 cm with the mean length of 55.4 cm. The bulk of catches was made up by 4-year-old individuals of 51-53 cm length.

Red hake. This species occurred as by-catches at 700-1 400 m depth. The length of examined fish in Div. 3L ranged from 21 to 51 cm with the mean length of 33.7 cm (Table 18). Catches were dominated by fish of 33-38 cm length.

The length of fish in Div. 3M was 15-45 cm.

White hake. This species was mainly caught in Div. 3O under redfish fishery. The length of white hake varied from 21 to 96 cm with the mean length of 48.4 cm (Table 18). Predominant length of caught fish - 39-45 cm.

Thorny skate. Skate occurred in catches in all divisions in a wide depth range. In Div. 3L fish of 27-78 cm total length occurred in catches, mean length being 51.6 cm (Table 19).

A small number of fish from Div. 3M were examined. The length of fish caught there varied from 12 to 66 cm.

Thorny skate is one of the most abundant species in Div. 3NO (60-400 m depth) where it develops commercial aggregations. The length of individuals caught in Div. 3N ranged from 24 to 90 cm with 59.6 cm mean length. Catches contained mainly fish of 51-57 cm length. In Div. 3O, length of fish in catches was 39-90 cm with the mean length of 60.2 cm.

Black dogfish. This is an abundant shark species which is frequently caught in deepwater fishery for Greenland halibut and redfish. The length of fish in Div. 3L was 42-84 cm with the prevalent length of 63-66 cm (Table 20).

Other species. Catches by fisheries and research vessels contained common and roundnose grenadiers, catfishes, spiny eels (*Notacanthus* sp), blue antimora (*A. rostrata*) and other species. A small amount of biological material on these was gathered.

SUBAREA 4

A. State of Fishery

Silver hake. In March-April, a large-size trawler fished silver hake on the commercial quota of a Canadian company. The vessel operated in Div. 4WX in 220-560 m depth. Mean daily catch was 22.5 tons. The portion of hake in catches attained 95-100%. Red hake, haddock, cod and skates occurred in by-catch. The catch of silver hake in Div. 4WX was preliminarily estimated as 2028 tons (Table 1).

B. Special Investigations

No environmental research or hydrographic observations were conducted.

Biological data in Div. 4WX were collected by a PINRO observer working onboard a fishing vessel.

Silver hake. The length of silver hake in Div. 4WX ranged from 20 to 41 cm. Prevalent length was 26-27 cm in males and 27-28 cm in females. Mean length was respectively 25.9 and 26.7 cm. The fishery was based on aggregations of mature fish, the percentage of which was 80-90%.

References

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TABLE 1. Preliminary data on catch taken by Russian trawlers in the NAFO Div. 1ACDF, 2HJ, 3LMNO and 4WX in 2001.

Species	Division	Catch, t
Greenland halibut	1ACD	920
	3L	3409
	3M	107
	3N	134
	3O	109
	3LMNO	3759
American plaice	3L	82
	3M	4
	3N	125
	3O	47
	3LMNO	258
Yellowtail flounder	3L	3
	3N	146
	3O	2
	3LNO	151
Witch flounder	3L	31
	3N	16
	3O	18
	3LNO	65
Roughhead grenadier	3L	134
	3M	2
	3N	6
	3O	8
	3LMNO	150
Redfish spp.	1F	122
	2J	1284
	2H	8
	3L	102
	3M	1288
	3N	56
	3O	11534
Skate	3L	22
	3N	2490
	3O	58
	3LMNO	2570
Atlantic cod	3N	113
	3O	125
	3NO	238
Silver hake	4WX	2028

TABLE 2. Greenland halibut length composition (no. of individuals) of the Russian trawlers catch in the NAFO Div. 1D in 2001.

Length, cm	Males	Females	Total
32-33	1	1	**2**
34-35	4		**4**
36-37	4	1	**5**
38-39	19	1	**20**
40-41	79	14	**93**
42-43	166	41	**207**
44-45	291	88	**379**
46-47	482	183	**665**
48-49	450	181	**631**
50-51	343	195	**538**
52-53	332	142	**474**
54-55	194	115	**309**
56-57	117	66	**183**
58-59	45	56	**101**
60-61	38	62	**100**
62-63	28	45	**73**
64-65	13	38	**51**
66-67	19	37	**56**
68-69	7	32	**39**
70-71	10	35	**45**
72-73	5	27	**32**
74-75		8	**8**
76-77		16	**16**
78-79	1	20	**21**
80-81		16	**16**
82-83		11	**11**
84-85		12	**12**
86-87		5	**5**
88-89		6	**6**
90-91		8	**8**
92-93		2	**2**
94-95		6	**6**
96-97		1	**1**
98-99			
100-101			
102-103			
104-105			
106-107		1	**1**
Fish measured	**2648**	**1472**	**4120**
Av. length, cm	**49.41**	**55.39**	**51.54**

TABLE 3. Greenland halibut age composition of the Russian trawlers catch in the NAFO Div. 1D in 2001.

Age	Males				Females			
	No.	**‰**	**Av. length, cm**	**Av. weight, g**	**No.**	**‰**	**Av. length, cm**	**Av. weight, g**
4	1	0.04	34.00	220.0	1	0.07	33.00	270.0
5	60	2.27	37.20	416.0	5	0.34	39.50	497.5
6	414	15.63	41.88	593.8	143	9.71	42.55	631.8
7	810	30.59	46.29	810.0	345	23.44	47.21	885.4
8	643	24.28	51.00	1112.1	323	21.94	51.31	1160.0
9	543	20.51	54.38	1321.3	180	12.23	55.36	1471.1
10	89	3.36	59.83	1817.5	128	8.70	58.85	1770.8
11	40	1.51	63.09	2212.7	89	6.05	63.23	2354.6
12	18	0.68	66.00	2853.8	85	5.77	66.73	2989.3
13	29	1.10	69.35	3574.7	50	3.40	71.08	3823.3
14	1	0.04	78.00	4600.0	54	3.67	77.55	4463.6
15					33	2.24	81.17	5347.8
16					21	1.43	86.33	6812.0
17					11	0.75	92.75	8905.0
18					3	0.20	94.67	9806.7
19								
20					1	0.07	106.00	10550.0
Total	**2648**	**100**			**1472**	**100**		

TABLE 4. Greenland halibut length composition (no. of individuals) of the Russian longline catch the NAFO Div. 1D in 2001.

Length, cm	Males	Females	Total
38-39	1		**1**
40-41	8	5	**13**
42-43	38	6	**44**
44-45	67	16	**83**
46-47	127	44	**171**
48-49	153	36	**189**
50-51	218	75	**293**
52-53	245	89	**334**
54-55	208	86	**294**
56-57	186	121	**307**
58-59	113	97	**210**
60-61	76	102	**178**
62-63	72	116	**188**
64-65	38	98	**136**
66-67	28	109	**137**
68-69	20	81	**101**
70-71	12	104	**116**
72-73	9	96	**105**
74-75	6	82	**88**
76-77		81	**81**
78-79	1	76	**77**
80-81	1	82	**83**
82-83		114	**114**
84-85		76	**76**
86-87		82	**82**
88-89		71	**71**
90-91		57	**57**
92-93		47	**47**
94-95		34	**34**
96-97		30	**30**
98-99		17	**17**
100-101		13	**13**
102-103		8	**8**
104-105		5	**5**
106-107		4	**4**
108-109		2	**2**
Fish measured	**1627**	**2162**	**3789**
Av. length, cm	**53.80**	**70.40**	**63.20**

TABLE 5. Length composition of Redfish (no. of individuals) in catches by Russian trawlers in the NAFO Div. 1F, 2J in 2001.

Length, cm	Division 1F			Division 2J			Total		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
20	-	1	**1**	-	-	**-**	-	1	**1**
21	-	1	**1**	-	-	**-**	-	1	**1**
22	1	1	**2**	2	-	**2**	3	1	**4**
23	4	2	**6**	7	3	**10**	11	5	**16**
24	5	7	**12**	14	22	**36**	19	29	**48**
25	2	5	**7**	37	39	**76**	39	44	**83**
26	7	9	**16**	52	71	**123**	59	80	**139**
27	16	10	**26**	113	117	**230**	129	127	**256**
28	17	13	**30**	182	177	**359**	199	190	**389**
29	34	24	**58**	340	311	**651**	374	335	**709**
30	33	42	**75**	451	407	**858**	484	449	**933**
31	49	34	**83**	599	440	**1039**	648	474	**1122**
32	63	22	**85**	759	528	**1287**	822	550	**1372**
33	88	38	**126**	1358	547	**1905**	1446	585	**2031**
34	119	80	**199**	2057	729	**2786**	2176	809	**2985**
35	100	84	**184**	2142	1032	**3174**	2242	1116	**3358**
36	65	79	**144**	1442	1278	**2720**	1507	1357	**2864**
37	33	47	**80**	938	1180	**2118**	971	1227	**2198**
38	16	26	**42**	492	829	**1321**	508	855	**1363**
39	5	19	**24**	304	483	**787**	309	502	**811**
40	2	9	**11**	88	183	**271**	90	192	**282**
41	-	2	**2**	29	91	**120**	29	93	**122**
42	-	-	**-**	7	21	**28**	7	21	**28**
43	-	-	**-**	-	1	**1**	-	1	**1**
44	-	-	**-**	-	-	**-**	-	-	**-**
45	1	-	**1**	-	-	**-**	1	-	**1**
Total	**660**	**555**	**1215**	**11413**	**8489**	**19902**	**12073**	**9044**	**21117**
Av. length., cm	**33.1**	**33.6**	**33.3**	**34.1**	**34.7**	**34.4**	**34.0**	**34.6**	**34.2**

TABLE 6. Redfish age composition in the NAFO Div. 1F, 2J in 2001, %.

Age, years	Division 1F			Division 2J			Total		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
6	0.3	0.7	**0.4**	+	0.0	**+**	**0.1**	**+**	**+**
7	2.5	2.9	**2.7**	0.5	0.9	**0.7**	**0.7**	**1.1**	**0.8**
8	2.6	2.5	**2.5**	0.9	1.5	**1.1**	**1.0**	**1.6**	**1.2**
9	4.5	4.0	**4.3**	1.8	2.8	**2.2**	**2.0**	**2.9**	**2.4**
10	6.4	8.0	**7.1**	3.4	5.0	**4.0**	**3.6**	**5.2**	**4.3**
11	9.8	9.1	**9.6**	6.6	7.2	**6.9**	**6.8**	**7.4**	**7.0**
12	16.0	5.6	**11.3**	12.1	6.6	**9.7**	**12.4**	**6.5**	**10.0**
13	25.8	16.5	**22.0**	26.1	11.1	**20.2**	**26.0**	**11.6**	**20.3**
14	17.1	21.7	**18.9**	22.1	19.0	**21.1**	**21.8**	**19.2**	**20.8**
15	11.4	18.9	**14.5**	17.5	24.5	**20.5**	**17.1**	**24.0**	**19.9**
16	2.3	6.3	**3.9**	4.7	13.1	**7.8**	**4.5**	**12.5**	**7.7**
17	1.1	3.7	**2.4**	3.6	7.3	**5.1**	**3.4**	**7.0**	**4.9**
18	0.0	0.2	**0.1**	0.3	0.8	**0.5**	**0.2**	**0.7**	**0.4**
19	0.0	0.0	**0.0**	+	0.1	**+**	**+**	**0.1**	**+**
20	0.0	0.0	**0.0**	0.0	0.0	**0.0**	**0.0**	**0.0**	**0.0**
21	0.0	0.0	**0.0**	0.0	0.0	**0.0**	**0.0**	**0.0**	**0.0**
22	0.0	0.0	**0.0**	0.0	0.0	**0.0**	**0.0**	**0.0**	**0.0**
23	0.3	0.0	**0.2**	0.3	0.0	**0.2**	**0.3**	**0.0**	**0.2**
24	0.0	0.0	**0.0**	0.0	0.0	**0.0**	**0.0**	**0.0**	**0.0**
Total	**659**	**555**	**1214**	**8697**	**5712**	**14409**	**9356**	**6267**	**15623**

TABLE 7. Greenland halibut length composition (no. of individuals) of the Russian trawlers catch by months in the NAFO Div. 3LM in 2001.

Length,	3L					3M				
cm	I	II	III	VII	Total	I	II	VII	VII	Total
24	1				**1**	1				**1**
26	4	1			**5**	14				**14**
28	37	20			**57**	40				**40**
30	209	73	1		**283**	83	1			**84**
32	597	341	4		**942**	104	5		5	**114**
34	1100	698	14		**1812**	138	17		16	**171**
36	2043	1472	48		**3563**	165	34	2	37	**238**
38	3617	2518	153		**6288**	171	36	10	116	**333**
40	4999	4045	337		**9381**	209	42	14	179	**444**
42	5455	5501	584	1	**11541**	168	62	44	238	**512**
44	4872	6890	873	2	**12637**	106	60	35	265	**466**
46	3589	7103	951	5	**11648**	45	77	37	254	**413**
48	2436	5150	961	8	**8555**	31	41	38	222	**332**
50	1184	2989	485	2	**4660**	23	18	28	191	**260**
52	517	1316	228	3	**2064**	16	4	11	137	**168**
54	272	626	135	2	**1035**	9	6	11	76	**102**
56	184	358	86	3	**631**	9	4	13	47	**73**
58	100	211	80		**391**	8	1	4	38	**51**
60	75	95	51	1	**222**	2	1	2	23	**28**
62	43	88	31		**162**	1	1	2	18	**22**
64	30	35	25		**90**	3			5	**8**
66	16	36	26		**78**	2			4	**6**
68	17	14	14		**45**	3			3	**6**
70	19	17	9		**45**				1	**1**
72	14	16	9		**39**		2		1	**3**
74	12	9	5		**26**	1	1		1	**3**
76	9	11	4		**24**	1	1			**2**
78	16	9	5		**30**					
80	5	3	3		**11**					
82	4	5	2		**11**		1			**1**
84	2	1	3		**6**					
86			1		**1**		1			**1**
88	1	4	1		**6**	1				**1**
90		1	2		**3**	14				**14**
92		1			**1**					
94		1			**1**					
Total	**31479**	**39658**	**5131**	**27**	**76295**	**1353**	**416**	**251**	**1877**	**3897**
Av. length, cm.	**42.9**	**44.9**	**47.3**	**50.0**	**44.3**	**43.2**	**48.0**	**51.1**	**50.7**	**47.8**

TABLE 8. Greenland halibut length composition (no. of individuals) of the Russian trawlers catch by months in the NAFO Divs. 3NO and total of Div. 3LMNO in 2001.

Length,	3N	3O								3LMNO
cm	II	II	VI	VII	VIII	IX	X	XI	Total	Total
24										**1**
26										**5**
28	**1**	2							**2**	**61**
30	**15**	4							**4**	**316**
32	**8**	18							**18**	**1008**
34	**11**	25		1		3			**29**	**1936**
36	**16**	62	3	13		4			**82**	**3775**
38	**39**	80	14	34		13	1		**142**	**6640**
40	**40**	58	39	67	1	29	6		**200**	**9859**
42	**31**	21	68	120	1	59	12	1	**282**	**12187**
44	**43**	13	68	122	5	81	15		**304**	**13428**
46	**27**	6	62	140	1	95	21	1	**326**	**12513**
48	**15**	3	50	117	2	91	18	2	**283**	**9319**
50	**9**	1	34	91	2	81	15	1	**225**	**5307**
52	**7**		22	54	5	85	18	1	**185**	**2588**
54	**3**		13	45	3	47	10		**118**	**1416**
56	**2**		6	25	1	40	9	1	**82**	**883**
58	**8**		3	18	1	34	8		**64**	**565**
60	**3**		2	9		39	7		**57**	**355**
62	**4**		1	7		22	12		**42**	**259**
64	**1**			3	2	21	5		**31**	**150**
66	**3**			2		16	3		**21**	**124**
68	**2**			3	1	19	2		**25**	**80**
70	**3**			1		12	2		**15**	**69**
72	**1**					9	2		**11**	**57**
74	**1**			2		11	1		**14**	**42**
76			1			6	3		**10**	**37**
78	**2**				1	2			**3**	**38**
80				1		1			**2**	**15**
82			1			1			**2**	**13**
84										**6**
86										**2**
88										**6**
90										**4**
92										**1**
94										**1**
Total	**295**	**293**	**387**	**875**	**26**	**821**	**170**	**7**	**2579**	**83066**
Av. length, cm.	**43.9**	**38.4**	**46.2**	**47.3**	**52.6**	**52.1**	**52.7**	**49.4**	**48.1**	**45.0**

TABLE 9. Age composition of Greenland halibut catches by the NAFO Div. 3LMNO in 2001, %.

Age	Division				
	3 L	3 M	3 N	3 O	3 LMNO
2	+				+
3	0.60	0.51	4.73	0.31	**0.61**
4	4.62	3.41	8.11	2.71	**4.52**
5	23.35	13.34	27.70	15.51	**22.65**
6	38.03	27.14	29.73	28.96	**37.21**
7	23.26	25.37	14.53	23.42	**23.33**
8	7.54	18.26	5.41	14.70	**8.26**
9	1.57	7.08	3.04	6.01	**1.97**
10	0.45	2.54	2.03	3.06	**0.64**
11	0.26	1.46	2.03	2.56	**0.40**
12	0.15	0.51	1.69	1.55	**0.21**
13	0.07	0.15	0.68	0.58	**0.09**
14	0.04	0.10	0.34	0.39	**0.06**
15	0.03	0.08		0.19	**0.04**
16	0.01	0.03		0.04	**0.01**
17	+	0.03			+
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 10. Length composition (no. of individuals) of roughhead grenadier in catches by Russian trawlers by the NAFO Div. 3LMO in 2001.

Length,	Division			
cm	3L	3M	3O	Total
12		1		**1**
15		2		**2**
18		4		**4**
21	2	7		**9**
24	2	9		**11**
27	20	12	1	**33**
30	55	12		**67**
33	139	49		**188**
36	319	74	2	**395**
39	548	113	1	**662**
42	541	97	1	**639**
45	365	90	2	**457**
48	203	76		**279**
51	78	38	1	**117**
54	41	24	2	**67**
57	29	13	1	**43**
60	19	14		**33**
63	14	17		**31**
66	14	10	1	**25**
69	5	10		**15**
72	6	4		**10**
75	4	1		**5**
78	1	1		**2**
81	1	1		**2**
84	1	1		**2**
87	1			**1**
Total	**2408**	**680**	**12**	**3100**
Av. length., cm	**42.8**	**44.4**	**47.1**	**43.2**

TABLE 11. Length composition (no. of individuals) of redfish in Russian trawlers catches by NAFO Div. 3LMNO in 2001.

Length, cm	Division			
	3L	3M	3N	3O
12	1			
13	4			
14	11			
15	23			2
16	58	10		36
17	56	74		62
18	28	216	1	273
19	9	116	2	649
20	34	105	4	2048
21	58	178	6	4207
22	79	307	16	7948
23	88	522	49	11222
24	144	575	73	10161
25	279	617	96	9030
26	468	1248	57	6819
27	626	2428	54	4331
28	862	3090	41	2455
29	825	2738	40	1303
30	867	2223	39	790
31	644	1093	43	391
32	593	538	38	296
33	312	175	24	205
34	222	104	14	151
35	142	26	4	101
36	94	14	7	53
37	65	8	6	15
38	35	9	3	11
39	20	2	8	10
40	10	5	2	6
41	10	1	5	2
42	4	2	2	1
43	3			1
44	6		1	
45	2			1
46	1		1	1
Total	**6683**	**16424**	**636**	**62581**
Length aver., cm	**29.0**	**27.7**	**27.7**	**24.2**

TABLE 12. Age composition of redfish catches by the NAFO Div. 3LMO in 2001, %.

Age	Division		
	3L	3M	3O
4		1.0	+
5	+	1.8	2.5
6	2.3	2.5	13.5
7	6.4	7.6	34.7
8	16.7	13.2	31.3
9	23.1	37.4	12.4
10	20.2	25.2	3.6
11	13.1	7.9	0.7
12	7.7	2.0	0.8
13	5.2	0.9	0.3
14	2.2	0.3	0.2
15	1.8	0.1	+
16	0.9	0.1	
17	0.3	+	
18	0.1		
19	+		
Total	**100.0**	**100.0**	**100.0**

TABLE 13. Length composition (no. of individuals) of American plaice in catches by Russian trawlers by the NAFO Div. 3LMNO in 2001.

Length,	Division				
cm	3L	3M	3N	3O	Total
18		1	2		**3**
20			4	2	**6**
22	3		20	2	**25**
24	23	1	39	2	**65**
26	50	2	23		**75**
28	95	1	39	6	**141**
30	166	1	53	14	**234**
32	194	2	107	46	**349**
34	264	3	214	61	**542**
36	202	5	125	85	**417**
38	189	9	79	83	**360**
40	136	5	79	86	**306**
42	95	13	86	96	**290**
44	64	3	112	76	**255**
46	24	5	167	91	**287**
48	7	6	181	43	**237**
50	5	3	277	25	**310**
52	4	1	384	18	**407**
54	2		437	7	**446**
56	1		380	10	**391**
58			281	6	**287**
60			169	4	**173**
62			94		**94**
64			81	1	**82**
66			65		**65**
68			28		**28**
70			15		**15**
72			2	1	**3**
74			3		**3**
76					
78			1		**1**
Total	**1524**	**61**	**3547**	**765**	**5897**
Length ave r., cm	**35.6**	**40.4**	**49.8**	**41.6**	**45.0**

TABLE 14. Length composition (no. of individuals) of witch flounder in Russian trawler catches by the NAFO Div. 3LMNO in 2001.

Length,	Division				
cm	3L	3M	3N	3O	Total
14	1				**1**
16	1				**1**
18	1				**1**
20	3				**3**
22	13				**13**
24	7	1			**8**
26	2	1			**3**
28	5	3			**8**
30	12	1		1	**14**
32	17			2	**19**
34	44	5		4	**53**
36	136	3		4	**143**
38	138	5		8	**151**
40	137	3		3	**143**
42	77	4	1	5	**87**
44	35	5	1	1	**42**
46	39	2		3	**44**
48	15				**15**
50	6				**6**
52	12				**12**
54	1		1		**2**
56					
58	1				**1**
60			1		**1**
62			2		**2**
Total	**703**	**33**	**6**	**31**	**773**
Length aver., cm	**39.1**	**37.8**	**54.8**	**38.9**	**39.1**

TABLE 15. Length composition (no. of individuals) of yellowtail flounder in catches by Russian trawlers by the NAFO Div. 3MNO in 2001.

Length, cm	Division			
cm	3M	3N	3O	Total
18		3		**3**
20		3		**3**
22		17		**17**
24		31		**31**
26		58		**58**
28		89		**89**
30		157		**157**
32		208		**208**
34		309		**309**
36		318		**318**
38		230		**230**
40		197		**197**
42		134		**134**
44		96		**96**
46		83	1	**84**
48	1	35	1	**37**
50		15	1	**16**
52		8	2	**10**
54		3	1	**4**
56		2		**2**
58		1		**1**
Total	**1**	**1997**	**6**	**2004**
Length aver., cm	**48.0**	**36.5**	**50.7**	**36.6**

TABLE 16. Length composition of c?d (no. of individuals) in catches by Russian trawlers by the NAFO Div. 3LMNO in 2001.

Length, cm	Division				
	3L	3M	3N	3O	Total
15		1			**1**
18		6			**6**
21		3			**3**
24					
27					
30		1		2	**3**
33		2	1	15	**18**
36	2	8	1	56	**67**
39	20			216	**236**
42	39		1	346	**386**
45	52			467	**519**
48	52			618	**670**
51	71	2	1	907	**981**
54	38	1	1	691	**731**
57	40	2	5	451	**498**
60	43	3		272	**318**
63	45	1	2	176	**224**
66	28	2	1	82	**113**
69	32	2		59	**93**
72	20	7	2	78	**107**
75	19	3	3	61	**86**
78	15	1	9	90	**115**
81	6	2	13	76	**97**
84	5	2	16	81	**104**
87	4	1	10	65	**80**
90	4		16	45	**65**
93	1		17	19	**37**
96	1		19	15	**35**
99	1	1	14	11	**27**
102		1	18	1	**20**
105			13	1	**14**
108			13		**13**
111			15		**15**
114			13		**13**
117			9		**9**
120			9		**9**
123			4		**4**
126			4		**4**
129			6		**6**
132			2		**2**
Total	**538**	**52**	**238**	**4901**	**5729**
Length aver., cm	**58.1**	**54.5**	**98.5**	**55.4**	**56.5**

TABLE 17. Age composition of catches (no. of individuals) of cod by the NAFO Div. 3LNMO, 2001.

Age	Division							
	3L		3M		3N		3O	
	Number	%	Number	%	Number	%	Number	%
1			5	10.9				
2			6	1.3			1	0.4
3	14	2.6	10	21.7	1065	22.8	2	0.8
4	143	26.7	1	2.2	2188	46.8	6	2.5
5	138	25.7	2	4.3	917	19.6	4	1.7
6	100	18.6	5	10.9	137	2.9	1	0.4
7	63	11.7	5	10.9	211	4.5	39	16.3
8	34	6.3	12	26.1	126	2.7	58	24.5
9	30	5.6			27	0.6	26	10.8
10	4	0.8					15	6.4
11	6	1.1					31	13.2
12	5	0.9			1	0.1	28	11.7
13							12	4.9
14							6	2.6
15							4	1.7
16							1	0.4
17							1	0.4
18							1	0.4
19								
20							2	0.8
Total	**536**	**100.0**	**46**	**100.0**	**4672**	**100.0**	**238**	**100.0**

TABLE 18. Length composition (no. of individuals) of red hake and white hake in catches by Russian trawlers by the NAFO Div. 3LM in 2001.

Length,	Red hake			White hake
cm	3L	3M	Total	3O
15		4	4	
18		3	3	
21	2	2	4	1
24	17	6	23	1
27	103	4	107	4
30	223	11	234	
33	524	18	542	4
36	511	11	522	31
39	464	7	471	50
42	254	2	256	60
45	60	1	61	48
48	5		5	38
51	1		1	46
54				31
57				29
60				20
63				9
66				4
69				3
72				1
75				1
78				1
81				
84				
87				2
90				
93				
96				1
Total	**2164**	**69**	**2233**	**385**
Length aver., cm	**36.7**	**31.8**	**36.6**	**48.4**

TABLE 19. Length composition (no. of individuals) of thorny skate in catches by Russian trawlers by the NAFO Div. 3LMNO in 2001.

Length, cm	Division				
	3L	3M	3N	3O	Total
12		1			**1**
15		2			**2**
18		1			**1**
21					
24			1		**1**
27	1	1	1		**3**
30		1	3		**4**
33	5	3	10		**18**
36	19	6	39		**64**
39	40	7	96	2	**145**
42	63	6	175	3	**247**
45	63	3	261	18	**345**
48	55	7	404	17	**483**
51	49	3	483	22	**557**
54	44	2	501	24	**571**
57	23		480	19	**522**
60	12	3	422	13	**450**
63	14	1	365	4	**384**
66	23	3	276	16	**318**
69	16		280	10	**306**
72	12		258	11	**281**
75	8		210	14	**232**
78	6		147	5	**158**
81			89	5	**94**
84			38	2	**40**
87			21		**21**
90			8	1	**9**
Total	**453**	**50**	**4568**	**186**	**5257**
Length aver., cm	**51.6**	**43.5**	**59.6**	**60.2**	**58.8**

TABLE 20. Length composition (no. of individuals) of Black Dogfish in catches by Russian trawlers in the NAFO Div. 3L in 2001.

Length, cm	Division 3L		
	Males	Females	Total
42	2	1	**3**
45	1	1	**2**
48	4	3	**7**
51	1	2	**3**
54	2	6	**8**
57	6	6	**12**
60	11	3	**14**
63	11	9	**20**
66	11	12	**23**
69	8	8	**16**
72	1	6	**7**
75		7	**7**
78		1	**1**
81		1	**1**
84		2	**2**
Total	**58**	**68**	**126**
Length aver., cm	**61.8**	**65.3**	**63.7**

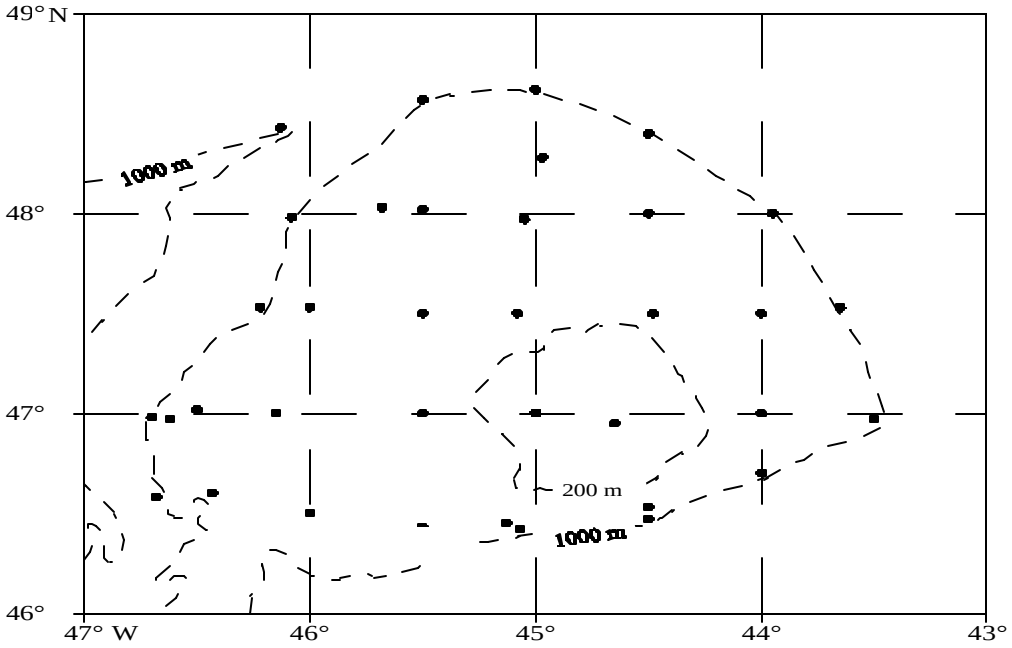
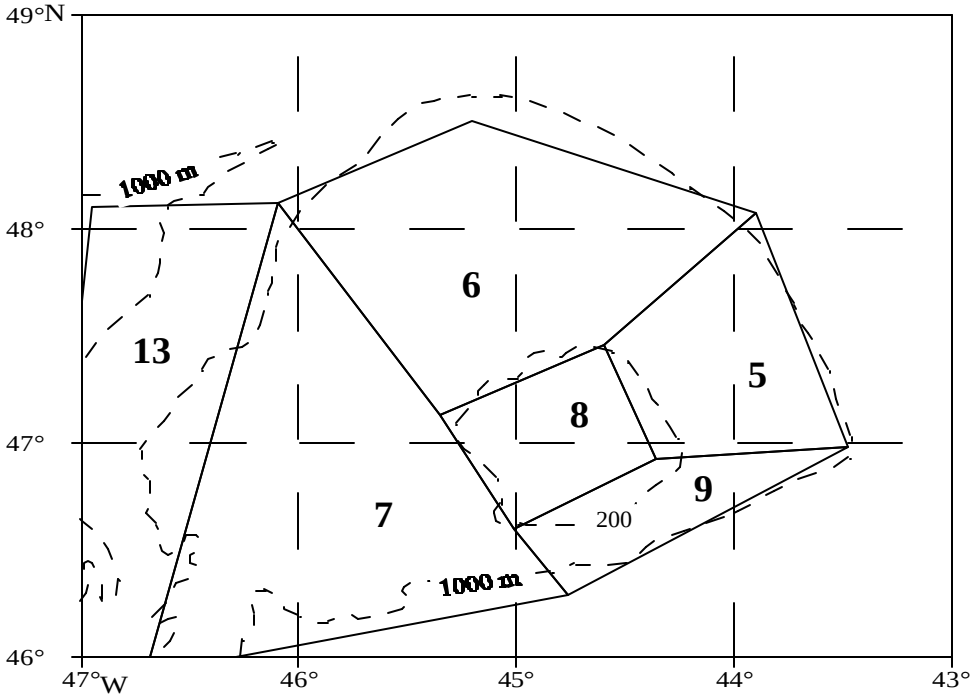


Fig. 1. Positions of oceanographic stations.



5- Flemish Cap (eastern slope)
6- Flemish Cap (northern slope)
7- Flemish Cap (western slope)
8- Flemish Cap (centre)
9- Flemish Cap (southern slope)
13- Flemish Pass

Fig. 2. Subareas on the Flemish Cap Bank for which mean temperatures and salinities were calculated (Drinkwater and Trites, 1986).

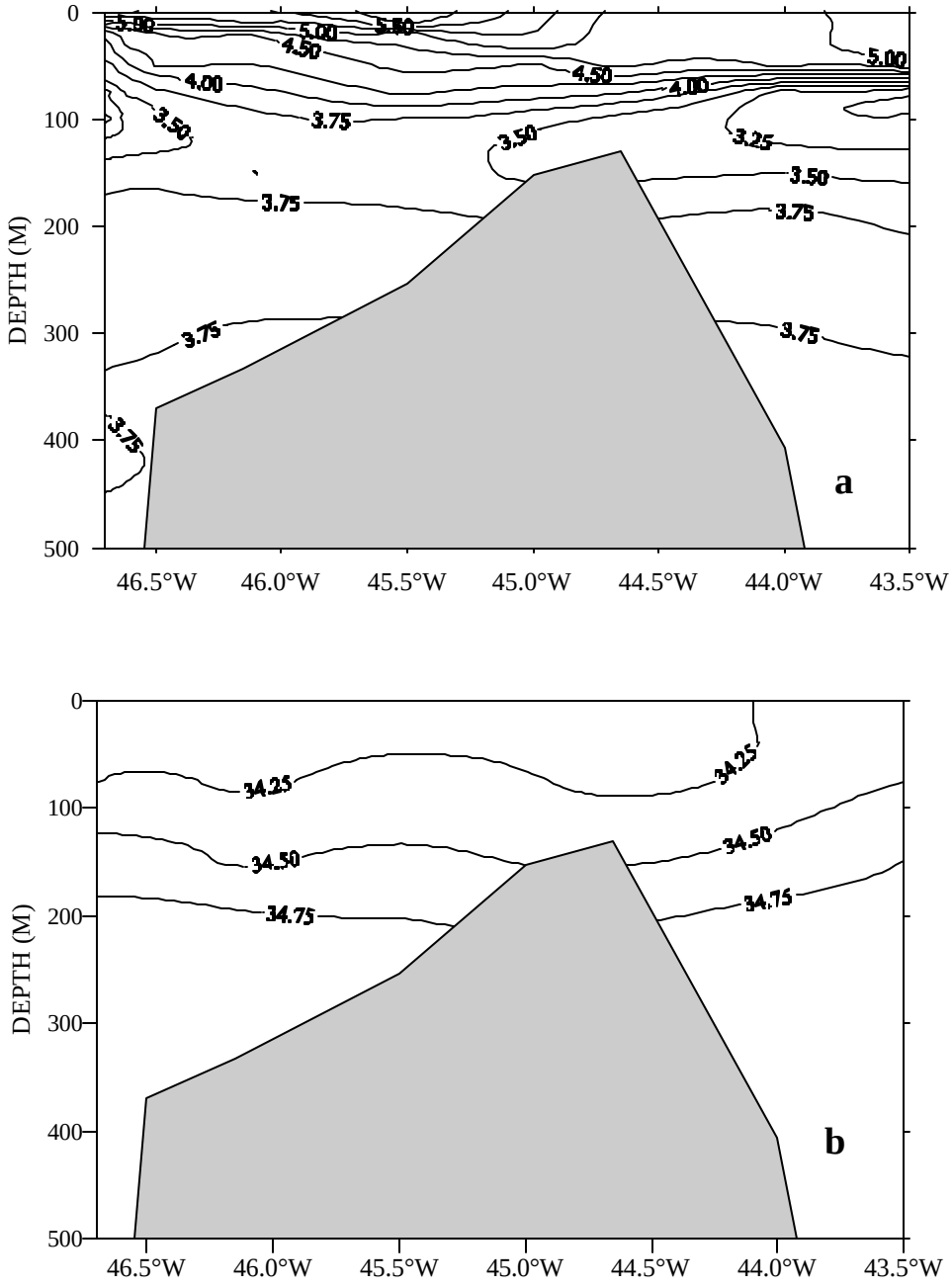


Fig. 3. Vertical distribution of temperature (°?) (a) and salinity (b) on the Flemish Cap Bank (along 47°N) in spring 2001.

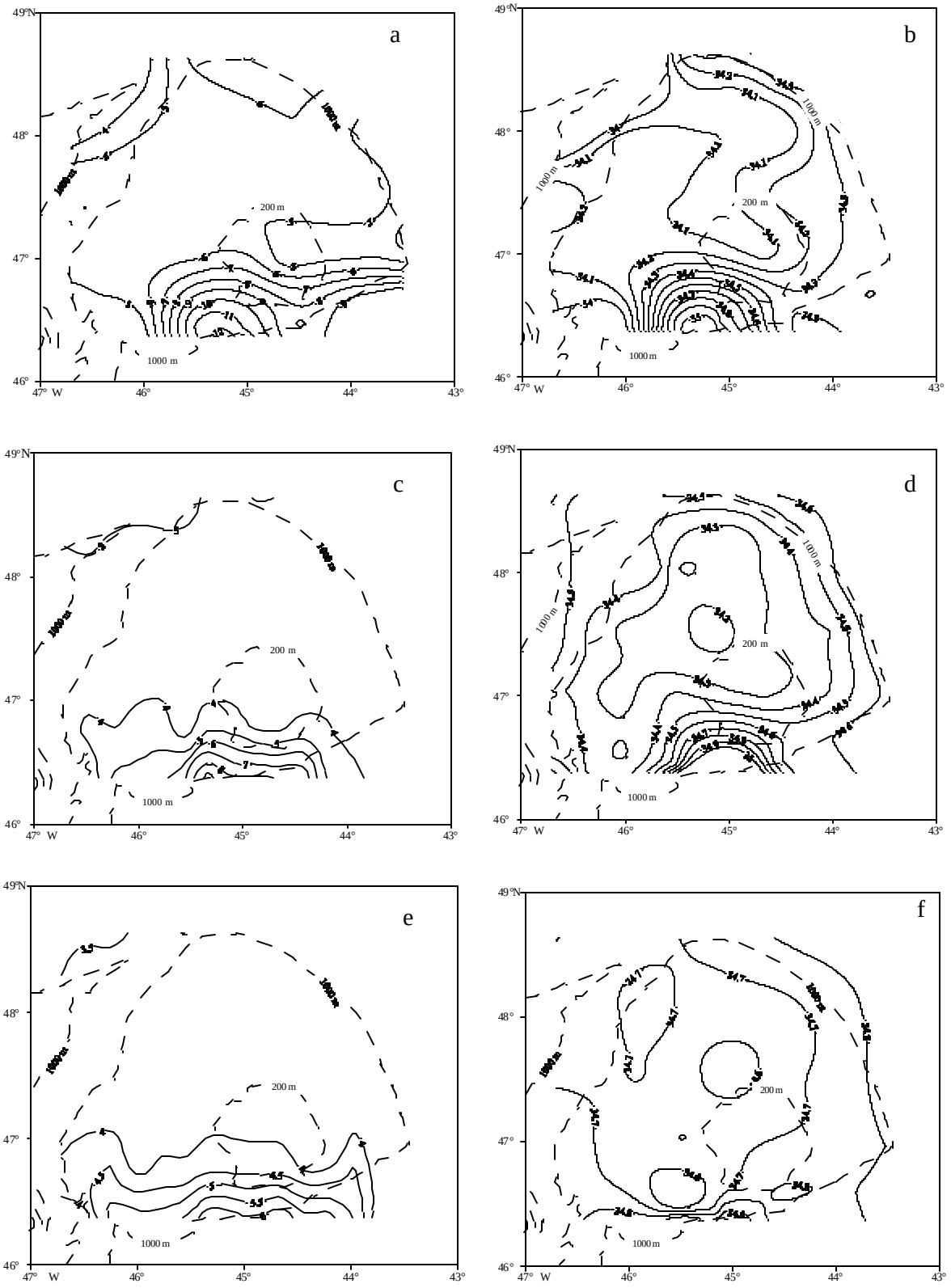


Fig. 4. Temperature (°?) and salinity distributions ? ????????? in the surface (a,b), 100 m (c,d) and 200 m (e,f) layer on the Flemish Cap Bank in spring 2001.