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USSR Research Report for 1989

PART I - PINRO Research Activities in NAFO Convention Area in 1989

by

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PART II - Report on the Soviet Research in NAFO Subarea 4 in 1989

by

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PART I

Subareas 0 and 1

A. Fisheries status

In August 1989 USSR fishing vessels attempted trawl fishery for halibut in Div. 0B but due to poor catches it was stopped. According to the preliminary data the total Soviet catch in Div. 0B amounted to 33 tons of which 32 t were Greenland halibut and 1 t roundnose grenadier (Table 1).

B. Special studies

1. Environmental studies

Hydrographic observations in the Davis Strait were made on RV "Kapitan Shaitanov" in October 1989 south of 66°N within the fishing zone of Canada. Temperatures and salinities were measured at standard depths in 43 random and 15 standard casts on 34-A and II-A (Cumberland) transects (Table 2).

Comparative analysis of the temperature and salinity fields for 1989 and 1988 showed an average increase of 0.5°C and 0.15 PSU in the upper 30-50 m layer within a narrow inshore zone off Baffin Island caused by considerable radiation heating in the spring-summer period. A great lack of heat was noted in the bottom layers on the Baffin Island shelf. The mean temperature of the Baffin Island Current waters in 50-200 m on Cumberland transect was 0.4°C colder than in 1988. The cold intermediate

layer was more developed vertically than in 1988. As a result, the greater part of the Baffin Island shelf had waters with negative near-bottom temperatures.

In the distribution area of transformed Atlantic waters the mean water temperature in 0-200 m was 1.2°C and in 200-500 m 0.6°C colder than in 1988. The negative anomalies of the near-bottom temperatures exceeded-1°C on the greater part of the Baffin Island shelf.

2. Biological studies

Greenland halibut (0B). The trawl survey for Greenland halibut in 1989 was conducted only in Div. 0B. As in earlier years, the trawlings were made with standard sampling trawl with small-mesh liner in the codend during 1 hour at a speed of 3.0 knots. Trawling sites had been chosen using random-selected set technique with subsequent corrections, if any, with respect to sediment type, depth, wind direction etc. 73 trawlings were made at 200-1500 m from 28 September to 13 October.

Greenland halibut occurred in catches taken by the RV almost over the whole Div. 0B except for stratum N 8 with depth range of 201-300 m (Table 3). In other strata with the same depths the catches comprised individual halibuts of 20-38 cm in length.

The catches from 300-500 m did not exceed 30-50 kg and mainly consisted of immature fish of 28-50 cm in length. The largest catches of halibut were taken at 750-1250 m.

The total abundance of Greenland halibut in the area accessible for bottom trawl fishing increased in Div. 0B from 71.3×10^6 fish in 1988 to 91.8×10^6 fish in 1989, and the biomass from 54.6×10^3 t up to 83.6×10^3 t respectively.

The Greenland halibut catches basically comprised 36-54 cm fish at age 5 to 8. Taking into account the declining trend which has shown in water heat content on the Div. 0B shelf and the fact that the strong 1984-1985 year classes will enter the fishery allows assumption that conditions for Greenland halibut trawl fishery will be more favourable in 1991 than in 1986-1989.

Roundnose grenadier. Biological material on this species was collected during the trawl survey in Div. 0B (28 September-13 October 1989). The trawl survey results evidence that the basic concentrations of grenadier occurred at depths out of reach of the trawl fishing. The occurrence of individual grenadiers began in catches taken at 800 m. Grenadier catches from 800-1100 m were not above 100 kg and came up to 200-300 kg at depths greater than 1100 m. The mean length of males in the catches was 50.1 cm, and that of females 53.9 cm.

Subareas 2 and 3

A. Fishery status

Greenland halibut. According to the preliminary data, the USSR catch of Greenland halibut was 915 t in 1989 compared to 1053 t in 1988 (Table 1). In September - first half of November mixed concentrations of halibut and roundnose grenadier were found along the Labrador continental slope (2GHJ) at depths 800-1400 m. Roundnose grenadier were the bulk of the catches (about 80%). The catches from 2 hour trawlings ranged from 0.5 to 8 tons with those of halibut varying from 0.2 to 1 t. The densest concentrations of Greenland halibut were found at depths 950-1200 m.

During the second half of November and in December BMRT-type vessels (large refrigerator trawlers) fished mostly on Greenland halibut concentrations on the continental slope of the Central Labrador with harvesting productivity of 0.5 t per hour trawling.

Roundnose grenadier. According to the preliminary data, the USSR catch of roundnose grenadier was 2552 tons in 1989 which is 662 t more than in 1988 (Table 1). The grenadier-directed fishery with 10-20% halibut bycatch started in about mid-July in Div. 3K at depths 930-1250 m. In July as well as in the first and second ten-day periods of August the fishing conditions for the grenadier fishery in Div. 3K were good with catches ranging from 4 to 10 t per 4-8 hour trawling at depths 980-1350 m. In the third ten-day period of September the grenadier concentrations started moving into greater depths (1300-1500 m) and the fishing conditions became worse with catches going down to 1-4 t per 4-8 hour trawling.

According to the preliminary data, the BMRT daily catch averaged: 11.3 t in July, 13.4 t in August. In September - first half of November 1 to 4 BMRTs periodically fished for grenadier and halibut as bycatch on the slope off the northern, central, and southern Labrador (2GHJ) as well as on the continental slope in Div. 3K.

In general, the fishing conditions were unstable, the fishery was hindered by frequent storms which also accounted for frequent occurrence of gear damage. Like in earlier years, the roundnose grenadier catches taken in the Labrador area mostly consisted of immature fish of 45-60 cm in length weighing 0.2-0.5 kg (age 6-10); in Div. 3K the length range was 35-50 cm, the weight range 0.1-0.4 kg at age 4-8.

Redfish. In 1989 the USSR fishing vessels predominantly fished for redfish outside the 200-mile zone of Canada in the Flemish Cap area (3M), on the Grand Newfoundland Bank slopes (3LNO) and also inside the Canada zone (2J+3K).

According to the preliminary data, the USSR catch of redfish in NAFO Area was 29966 tons, i.e. 1286 tons less than in 1988

(Table 1). From January to September the vessels owned by "Sevryba" and "Zapryba" periodically fished for redfish on Flemish Cap at 350-680 m. The catches taken in pelagic trawls ranged from 2 to 6 tons per hour trawling. In the first quarter the fishery was complicated due to stormy weather. The fishing time losses caused by unfavourable weather conditions amounted to 21-32%.

From January to October "Sevryba" and "Zapryba"'s vessels used bottom and midwater trawls to fish for redfish on the southern slopes of the Grand Bank (3NO) outside the 200-mile fishing zone at depths 160-650 m. The harvesting productivity was close to the 1988 value.

In September-November the USSR vessels (1 to 3) fished with bottom trawls for redfish at 370-550 m off the Southern Labrador and in Div. 3K. The catches were 0.5 to 2 t per trawling.

Capelin. The USSR vessels fished for capelin from 13 to 28 May in Divs. 3NO and from 12 September to December in Divs. 2J+3K. The total capelin catch was 3384 t and 22512 t respectively (Table 1).

The USSR vessels started the capelin fishery immediately after the first commercial concentrations migrating from Div. 3L to spawn had been detected, and ended it by order of Canadian observers when the prespawning fish had attained the maturity criterion established by the Canada Department of Fisheries as a regulatory measure for the reproductive part of the stock (when 20% of females have gonad ripeness coefficient of 15%).

The harvesting efficiency of BMRTs in May in Divs. 3NO was tentatively estimated as 42.8 t per boat/day of fishery. In several catches there was considerable (up to 30%) bycatch of sandeel. The harvesting efficiency of BMRTs was 42.5 t in September, 52.2 t in October, and 52.4 t in November per boat/day.

Other fishes. Other fishes were taken in Subareas 2 and 3 as bycatch in directed fishery for redfish, halibut, roundnose grenadier, and capelin (Table 1).

B. Special studies

1. Environmental studies

a) Hydrographic observations in Subarea 2

Hydrographic observations in Subarea 2 were made on the Labrador shelf and continental slope in September-November on RV "Kapitan Shaitanov". Temperatures and salinities were measured at the standard depths in 30 random casts and 17 casts on 8-A and 38-A transects (Table 2).

In the fall 1989 a marked radiation heating in the upper 100 m

on the Labrador shelf and a considerable lack of heat in the near-bottom layer on the shelf and throughout the whole water column in the Irminger component of the Labrador Current were observed. The mean water temperature in the cold component of the Labrador Current in 0-200 m was about the long-term (1964-1986) mean and 0.2°C colder than in 1988. The temperature in the same depth range in the Irminger component was 0.6°C below normal and 0.5°C warmer than in 1988. In 200-500 m and 500-1000 m the temperature anomalies were 0.3° and 0.5°C respectively.

b) Hydrographic observations in Subarea 3

Hydrographic observations in Subarea 3 were made from March to June on RV "Persey-III", and in September, November-December on RV "Kapitan Shaitanov". Temperature and salinity measurements were performed during the trip of RV "Persey-III" in 440 random casts on the Newfoundland shelf and Flemish Cap (Table 2).

The hydrographic survey data were used to calculate the near-bottom temperatures in cross points of the half-degree grid on the Newfoundland shelf and to estimate anomalies against the long-term (1972-1986) background (Borovkov and Tevs, 1988).

The estimates show that in March-May 1989 near-bottom temperatures were below normal and the 1988 level over the greater part of the Newfoundland shelf. The largest negative anomalies (more than 2°C) were found on the south-western and southern slopes of the Grand Bank. The positive anomalies in the near-bottom temperatures occurred within a fairly narrow inshore zone and on the northern slope of the Grand Bank.

The mean water temperature in Divs. 3NO was 1.0°C and in Divs. 3KL 0.2°C below normal for the 1972-1986 period. In 1989 in Divs. 3N and 30 the area with water temperatures categorized as "below normal" and "far below normal" was almost twice as large as in 1988 and covered about 70% of the total area of Divisions. In Div. 3K such area had grown, compared to 1988, from 33% to 54%. Such a large area with negative near-bottom temperatures only occurred in the colder periods (1973-74, 1976, and 1985).

56 random casts were made in the fall period on the Newfoundland shelf. Comparative analysis revealed a drop in temperatures (by 0.5°- 0.8°C on the average) from 1988 towards 1989 in the northern Divs. 3N,30 and in the northern and eastern parts of Div. 3L as well as a certain warming on the southern Grand Bank and on its north-eastern slope.

2. Biological studies

In 1989, like in earlier years, the main attention was paid to commercial fish stock studies through trawl and acoustic

surveys. Brief information on amount of works and times of these surveys is given in Table 4. The trawl survey for bottom fishes was conducted using stratified-random design adopted in NAFO.

To estimate the abundance and biomass of fish in the pelagic layer, i.e. out of reach of the bottom trawl, the trawl survey in Subarea 3 was backed up by acoustic assessment.

Roundnose grenadier (2+3K). Biological data on roundnose grenadier were collected during the trawl survey for Greenland halibut (from 28 October to 11 November) on RV "Kapitan Shaitanov". Trawlings were made at depths of 400-1500 m. Roundnose grenadier were found at depths greater than 500 m in transformed Atlantic waters with near-bottom temperatures ranging from 3.4 to 3.5°C. The denser concentrations occurred at 1100-1300 m where the catches were 0.4-3.0 t per hour trawling with a bottom research trawl. The catches were dominated by 45-60 cm fish at age 6-10.

A number of trawlings with bottom research trawl at depths 500-1300 m were made from 13 to 18 September in Div. 3K to study vertical distribution of halibut and roundnose grenadier and their ratio in catches. The grenadier catches were not above 0.3 t per hour trawling, yet an increase in portion of this species in catches from 900-1200 m compared to earlier years should be noted.

The measurements show that the mean grenadier length in the catches was 51.9 cm and mean age 8.6. Like in earlier years, an increase in fish length with increasing depth of fishing was observed. For example, the mean lengths of males and females in the catches from 700-800 m were 43 cm and 42 cm respectively, and in case of 1300-1400 m they were 59 cm (males) and 62 cm (females) (SCR Doc. 90/Savvatimsky).

Greenland halibut (2GH,3K). Trawl survey for Greenland halibut off northern and central Labrador (2GH) was carried out by RV "Kapitan Shaitanov" from 28 October to 11 November 1989, and in Div. 3K by RV "Persey-III" from 5 to 19 June 1989. Off northern and central Labrador the trawl survey covered depths of 400-1500 m (Table 5). The largest catches were taken at 1000-1250 m. The total halibut abundance was estimated as 33.0×10^6 fish, and the biomass as 43.3×10^3 tons. Comparison of the abundance and biomass estimates by stratum from the 1988 and 1989 trawl surveys shows that the mean catches per hour trawling and the total stock estimates in 1989 were by far higher than in 1988.

Males of 12-71 cm and females of 12-105 cm occurred in research trawl catches. The catches were basically comprised of 48-49 cm males and 52-53 cm females at age 7-8 from the 1982 and 1983 year classes. In Div. 3K the trawl survey was conducted at depths of 200-1000 m. The total halibut biomass in 1989 was estimated at 80.8×10^3 tons, and abundance at 182.6×10^6 fish which is about 30% less than in 1988 (Table 6). The age composition of

the Greenland halibut catches (Table 7) suggests good recruitment to the stock from the strong 1985-1988 year classes of which the 1985 year class (males and females at age 4) predominates in the catches. Peak halibut catches (629 kg per 30 min trawling) were taken in stratum 627 at 440-480 m.

14-61 cm males and 14-82 cm females occurred in catches in Div. 3K. The catches basically consisted of 36-39 cm fish at age 4-5.

Redfish (3M). In 1989 the fishable part of the population on Flemish Cap mostly comprised 24-29 cm fish at age 8-10 from the 1979-1981 year classes. The trawl survey corroborated the good stock recruitment by juveniles at age 3-4 from the strong 1985-1986 year classes revealed in 1987.

The July 1989 trawl survey showed a marked increase, compared to the preceding year, in abundance and biomass indices (Tables 9,10) It seems to be attributable to the fact that in 1989 about 87% of fish were distributed pelagically, i.e. out of reach of the bottom trawl, and in 1988 this figure was about 90%.

The 1988 and 1989 trawl-acoustic surveys showed an increase in the total redfish abundance from 1815.2 x 10^6 to 2231.0 x x 10^6 fish, and a drop in biomass from 379.0 x 10^3 to 365.9 x x 10^3 tons (Table 10).

The biomass and abundance estimates derived using VPA show an increase in abundance and biomass from 1988 towards 1989 (SCR Doc. 90/Vaskov et al.).

Redfish (3LNO). The trawl survey data for redfish stocks on the Grand Bank as well as the data from commercial vessels indicate that most of commercial stock consisted of 21-28 cm fish at age 7-10 from the 1979-1982 year classes. The estimates of redfish abundance and biomass from the 1989 trawl and trawl-acoustic surveys on the Grand Newfoundland Bank (3LNO) suggest a marked decline in commercial stock (Tables 8,9,10).

In our view, this assessment does not reflect the actual status of the redfish stock in this area.

The estimates of commercial stock obtained using VPA suggest a relatively stable redfish stock in Div. 3LN in recent years (SCR Doc. 90/Vaskov et al.).

Redfish (3K). The 1989 trawl survey estimated the redfish biomass within the reach of bottom trawl at 34.5 x 10^3 tons and abundance at 68.5 x 10^6 fish (Tables 8,9). The abundance and biomass estimates coupled from the trawl and acoustic surveys were 596.7 x 10^6 fish and 162.5 x 10^3 tons respectively (Table 10). These stock indices are below the long-term averages derived solely from the 1983-1986 trawl surveys (834.9 x 10^6 fish and 356.5 x 10^3 t). The given redfish stock indices in Div. 3K do not seem to adequately show the stock dynamics but may be indicative of a declining trend in abundance and biomass despite

the fact that the fishery intensity in this area is too low to be the reason for this.

Fish of 12-48 cm in length at age 4-20 occurred in research trawl catches. In 1989 the catch of commercial and research vessels was mainly comprised of 22-34 cm redfish at age 10-15 from the 1973-1978 year classes.

Cod (3M). The cod stock was assessed from trawl survey (Tables 8,9) and acoustic survey conducted annually since 1987 at the same time with trawl surveys along the vessel track.

In 1989 the cod stock on Flemish Cap was somewhat above the long-term average for the 1977-1989 period. The fish abundance and biomass as estimated from the trawl-acoustic survey were 159.1 x 10^6 fish and 78.0 x 10^3 t respectively (SCR Doc. 90/ Kuzmin). The cod abundance and biomass calculated only from the trawl survey data were 86.5 x 10^6 fish and 43.5 x 10^3 t (Tables 8,9). During the trawl survey about 50% of the total cod stock (54.4% by abundance and 55.7% by biomass) were found to be distributed pelagically, i.e. those fish were out of reach of the bottom trawl sampling.

Cod (3NO). The trawl-acoustic survey estimated the total cod abundance on the Newfoundland shallows at 18.3 x 10^6 fish and biomass 107.5 x 10^3 t; the trawl survey provided 13.4 x 10^6 fish and 81.5 x 10^3 t. Comparing to the results from the earlier surveys shows a decreasing trend in the cod abundance and biomass since 1986. The age composition analysis of the catches from research vessels suggests that poor recruitment to the stock from the weak 1983-1988 year-classes is the major reason of decline in the Div. 3NO cod stock (SCR Doc. 90/Bulatova).

Cod (3KL). In 1989 the cod abundance and biomass indices from the trawl-acoustic survey were close to or slightly above the corresponding 1988 values (Tables 8,9). The trawl surveys results indicate a drop in fish abundance from 395.6 x 10^6 down to 353.0 x x 10^6 ,and a rise in biomass from 490.6 x 10^3 t up to 547.7 x x 10^3 t. According to the trawl-acoustic survey, in 1989 the total abundance dropped within one year from 819.3 x 10^6 down to 651.7 x 10^6 fish, and the biomass came up from 857.7 x 10^3 t to 944.7 x 10^3 t.

The surveys conducted evidence a relatively large and stable stock of the Labrador cod during 1984-1989 (SCR Doc.90/Bulatova).

American plaice (3K,3LNO,3M). The 1989 trawl survey estimated the biomass of American plaice on Flemish Cap (3M) at 5.0 x 10^3 t and abundance at 8.3 x 10^6 fish which is below the preceding year stock indices by 23% and 17% respectively (Tables 8,9). The catches were dominated by fish of 34-40 cm in length.

A significant reduction in American plaice abundance and biomass was noted in Div. 3K. During the last seven years the biomass of American plaice in this Div. had dropped from 64.5 x x 10^3 t in 1983 down to 5.9 x 10^3 t in 1989, i.e. by a factor of more than ten (Table 9).

In the Grand Newfoundland Bank area (3LNO) the abundance of American plaice had come from 458.6 x 10^6 in 1988 up to 708.5 x x 10^6 fish in 1989, and the biomass from 160.0 x 10^3 t up to 244.6 x 10^3 t respectively (Tables 8,9).

During the trawl survey fish of 6 to 74 cm occurred in catches with predominance of 22 to 30 cm length range.

Yellowtail flounder (3NO). The 1989 trawl survey estimated the abundance of yellowtail flounder on the Newfoundland shallows at 128.2 x 10^6 fish, and the biomass at 43.8 x 10^3 t which means an increase in the stock compared to 1988 (45.4 x 10^6 and 20.8 x x 10^3 t). During the last seven years the peak abundance and biomass of yellowtail flounder occurred in 1983 and 1984 (abundance 257.0 x 10^6 and 261.0 x 10^6 fish; biomass 113.0 x 10^3 and 97.0 x x 10^3 t respectively). After a consistent declining trend observed in the yellowtail flounder stock indices from 1983 to 1988, for the first time there showed a reverse process (Tables 8,9). In 1987 and 1988 the catches taken by research vessels were dominated by 35-42 cm fish, in 1989 - by 36-39 cm individuals.

Capelin (2J+3K, 3LNO). In May-June 1989 there was an acoustic survey for the capelin stocks in Div. 3LNO, and in November-December a trawl survey for capelin pre-recruits. The survey results are decribed in detail in SCR Doc. 89/Bakanev, Vaskov, Petrov). The total capelin biomass in May-June in Div. 3LNO was 2460 x 10^3 t and abundance 188.4 x 10^9 fish. The strong 1986 year-class was predominant in catches by abundance and biomass. Compared to the 1988 survey results, in 1989 the capelin stock was 43.3% by abundance and 37.8% by biomass smaller. There is evidence to assume that there was no reduction in the capelin stock (SCR Doc. 90/Bakanev et al.).

The ichthyoplankton survey for capelin pre-recruits conducted in Div. 3LNO from 19 November to 9 December 1989 on RV "Kapitan Shaitanov" found the 1988 and 1989 year-classes to be close, in terms of year-class strength, to the strongest 1983 year-class. Therefore, a good recruitment to the capelin stock from the strong 1988 and 1989 year-classes may be expected in 1991-1992.

Table 1

The USSR catch in Subareas 0, 2, 3, 4 in 1987-1989

Species	Area	1987	1988	1989*
Cod	2GH	4	-	-
	2J+3KL	87	11	25
	3NO	764	2590	5
	3M	706	34	-
	4VWX	25	106	182
Haddock	4VWX	207	385	470
	3NO	6	-	-
S. mentella	2+3K	3229	821	483
	3LN	18851	11723	10879
	30	7089	5207	4517
	3M	19875	13501	13892
	4VWX	92	68	195
Roundnose grenadier	0+1	-	120	1
	2+3	2725	1890	2552
American plaice	2+3K	77	14	1
	3M	501	228	105
	3LNO	46	64	-
	4VWX	14	-	-
Witch flounder	2J+3KL	725	4	-
	3NO	1425	1005	3
	4W	41	-	-
Greenland halibut	0+1	-	53	32
	2+3KL	4092	1053	915
Capelin	2J+3K	31131	16825	22512
	3NO	36	4736	3384
Silver hake	4VWX	41329	64685	72696
	3NO	-	-	-
Pollack	4VWX	314	1054	1782
Yellowtail flounder	3LNO	-	-	-
Herring	4VW	38	920	1212
Mackerel	3+4	49	654	311
Argentine	4VWX	25	315	105
Squid-illex	3+4	345	352	1656
Others		16464	128	37
Total		150312	128546	137952

* - preliminary data

Table 2. Inventory of hydrographic observations made by PINRO in NAFO Subareas in 1989

Ship name	NAFO Sub-area	NAFO STANDARD SECTION				OTHER SETS						TYPE STD or Bottle
		Date span	Name	Parameters (T,S,O_2,etc)	Tot. sets	Seasons JFM	AMJ	JAS	OND	Parameters (T,S,O_2etc)	Tot. set	
Persey-III	3	-	-	-	-	30	384	26		T,S	440	Bottle
Kapitan Shaitanov	2	22 Sep.	38-A	T,S	6	-	-	-	-	-	-	Bottle
	0	09 Oct-10 Oct.	Cumber-land	T,S	8	-	-	-	-	-	-	Bottle
	0	13-14 Oct.	34-A	T,S	7	-	-	-	-	-	-	Bottle
	2	23-24 Oct.	8-A	T,S	11	-	-	-	-	-	-	Bottle
	2	-	-	-	-	-	-	1		T	1	MBT
	2	-	-	-	-	-	-	4	25	T,S	29	Bottle
	3	-	-	-	-	-	-	13	43	T,S	56	Bottle
	0	-	-	-	-	-	-	11	18	T,S	29	Bottle
	1	-	-	-	-	-	-	-	14	T,S	14	Bottle

Table 3. Results from trawl survey for Greenland halibut in Div. 0B in October 1989.

Stratum	Depth, m	Nos of tows	Mean catch per hour tow		Abundance, fish($x10^{-3}$)	Biomass, t
			fish	kg		
I	20I-300	4	I	0.4	I02	38
2	30I-400	4	52.8	I5.0	4229	I20I
3	40I-500	3	76.0	65.4	8644	7442
4	50I-750	6	59.0	62.5	II8I3	I2690
5	75I-I000	6	79.3	97.5	7I40	8780
6	I00I-I250	6	I22.0	I77.8	I0476	I5266
7	I25I-I500	4	50.3	70.3	3585	50I7
8	20I-300	4	0.0	0.0	0	0
9	30I-400	5	27.6	8.0	4822	I404
I0	40I-500	5	67.2	43.0	4575	2924
II	50I-750	5	II4.6	92.6	II5I5	9304
I2	75I-I000	3	99.0	II8.0	4059	484I
I3	I00I-I250	3	I96.3	342.6	2928	5I09
22	20I-300	3	0.3	0.07	32	6
23	30I-400	3	I22.3	27.7	4973	II26
24	40I-500	4	87.0	33.0	548I	2079
25	50I-750	5	80.2	69.4	7427	6429
Total	20I-I500	73	7I.9	7I.6	9I802	83656

Table 4

INVENTORY OF BIOLOGICAL SURVEYS, 1989

Sub-area	Division(s)	Month(s)[1]	Type of survey[2]	Nature of survey	No. of sets
3	3KLNO	4-6	S	Groundfish, temperature, salinity	469
	3LNO	5	O	Capelin, temperature, salinity	25
	3M	6-7	O	Eggs, larvae, temperature, salinity	33
	3M	6-7	S	Groundfish, temperature, salinity	170
0	0B	9-10	S	Greenland halibut, grenadier, temperature, salinity	78
2	2GH	10-11	S	Greenland halibut, grenadier, temperature, salinity	73
	2G	9	O	Myctophidae, temperature, salinity	2
3	3K	9	O	Grenadier, greenland halibut, temperature, salinity	25
	3LNO	11-12	O	Larvae of capelin, temperature, salinity	40

[1] Use number from 1 to 12 for months.
[2] Insert S for stratified-random and O for other surveys.

Table 5. Results from trawl survey for Greenland halibut in Div. 2GH in October-November 1989.

Stratum	Depth, m	No.of tows	Mean catch per hour tow		Abundance,	Biomass,
			fish	kg	fish($\times 10^3$)	t
903	401-500	3	84.3	23.9	293	83
913*	401-500	-	48.2	17.7	130	48
922	401-500	3	12.0	11.4	97	92
928	401-500	3	58.3	35.7	1986	1216
904	501-750	4	157.5	85.2	1048	567
914*	501-750	-	122.8	86.8	603	426
921	501-750	3	88.0	88.3	543	545
929	501-750	3	102.3	103.5	5611	5673
905	751-1000	3	184.7	139.1	1317	992
915*	751-1000	-	195.2	210.8	815	880
920	751-1000	4	205.8	282.4	1539	2112
906*	1001-1250	3	198.0	238.9	1971	2379
916	1001-1250	-	283.0	455.2	1796	2890
919	1001-1250	3	368.0	671.6	5056	9227
907	1251-1500	3	54.0	91.5	845	1433
917*	1251-1500	-	86.0	175.9	617	1262
918	1251-1500	3	118.0	260.3	2642	5828
960	401-500	3	36.7	18.5	171	86
942	401-500	1	18.0	8.9	43	21
941	501-750	3	47.3	41.2	183	159
961	501-750	3	39.0	21.5	358	198
940	751-1000	3	144.7	140.5	610	593
962	751-1000	3	63.7	60.3	670	635
939	1001-1250	3	273.0	377.6	1543	2134
963	1001-1250	3	108.0	137.1	1244	1580
938	1251-1500	3	86.3	136.7	717	1135
964	1251-1500	3	38.7	77.2	575	1148
Total	401-1500	65	119.5	146.1	33023	43342

* Data are obtained using mean values for neighbouring strata with equal depths

Table 6. Abundance and biomass of Greenland halibut in Div. 3K in 1981-1989 (from trawl surveys)

Year, month	Area surveyed, nm^2	No.of tows	Abundance, (10^6)	Biomass, t (10^3)
I98I, January	9479	34	57.I	62.3
I98I, July	20755	48	II0.2	62.5
I982, July	23030	53	I54.9	98.4
I983, January	I9954	67	I20.2	96.7
I983, July	27926	94	587.8	I22.6
I984, July	3II85	II3	288.6	2I6.7
I985, July	I90I2	53	I27.I	72.9
I986, June	3II85	I22	266.4	I74.8
I987, May-June	28470	I08	I29.7	66.9
I988, April-May	28470	I07	303.I	II2.3
I989, June	27886	I08	I82.6	80.8

Table 7. Age composition of Greenland halibut in Div. 3K in 1985-1989 (from trawl surveys), per thou.

Age, years	Males					Females				
	I985	I986	I987	I988	I989	I985	I986	I987	I988	I989
I	-	2	4	2I	2	-	3	-	32	I0
2	I7	38	85	I24	9I	53	6I	I02	I23	I27
3	74	97	I77	325	I76	I0I	II4	I58	263	I72
4	220	I50	I09	I47	262	I84	I38	II6	I56	250
5	289	236	I47	I9I	I76	230	2I3	I2I	I83	I96
6	22I	258	245	I22	202	I95	237	I99	I44	I65
7	II8	I56	I86	4I	77	I28	I4I	202	59	56
8	44	45	26	2I	7	60	50	47	27	I0
9	I4	I5	I7	5	6	30	2I	25	8	6
I0	2	3	3	2	I	I3	I0	9	3	3
II	I	-	2	-	+	3	3	8	I	I
I2	-	-	+	-	-	2	3	5	I	2
I3	-	-	-	-	-	I	3	4	I	I
I4	-	-	-	-	-	+	I	I	-	-
I5	-	-	-	-	-	+	I	-	-	I
I6	-	-	-	-	-	-	I	I	-	-
I7	-	-	-	-	-	-	+	2	-	-
I8	-	-	-	-	-	-	+	-	-	-
I9	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-
No.of fish	I334	7006	33II	4424	2558	2626	8I65	4030	4983	2897
Mean age	5.24	5.32	5.05	4.04	4.52	5.32	5.34	5.3I	4.23	4.37

Table 8. Abundance of bottom fishes in Subarea 3 from the 1983-1989 trawl surveys, fish x 10^6

Species	Div.	I983	I984	I985	I986	I987	I988	I989
Cod	3K	35.2	295.9	286.0	270.4	I32.9	306.2	229.9
	3L	I2I.5	3II.9	I80.7	297.0	73.4	89.4	I23.2
	3NO	I37.3	259.3	520.7	269.8	54.2	55.4	I3.4
	3M	65.5	60.7	37.I	37.2	36.8	26.7	70.4
Redfish	3K	964.3	749.I	8I0.3	8I6.I	I54.6	44.I	68.5
	3LN	428.9	720.3	245.I	I33.4	I82.I	I67.3	44.7
	3O	II87.8	763.8	I232.4	750.7	99.4	348.8	I70.4
	3M	644.0	376.7	I77.3	I200.2	463.2	I83.I	283.8
Am. plaice	3K	I44.7	93.3	48.8	48.3	44.4	56.9	I7.6
	3LNO	I440.2	I295.6	693.8	826.8	604.3	458.6	708.5
	3M	20.4	26.5	I5.8	33.4	I6.5	I0.0	8.3
Yell. flounder	3NO	257.4	26I.0	I94.0	89.6	64.8	45.4	I28.2
Witch flounder	3K	8.5	I6.2	28.4	22.I	8.3	5.5	4.9
	3LN	2.4	I2.6	I5.3	7.5	6.3	3.0	4.6
	3O	2.8	4.3	6.6	II.8	6.0	I0.3	5.I

Table 9. Biomass of bottom fishes in Subarea 3 from the 1983-1989 trawl surveys, t x 10^3

Species	Div.	I983	I984	I985	I986	I987	I988	I989
Cod	3K	56.0	355.3	243.6	27I.3	I30.5	33I.2	352.2
	3L	202.3	383.3	I77.I	437.2	I32.9	I59.4	I95.5
	3NO	I82.8	266.8	457.7	425.4	289.8	II0.2	8I.5
	3M	23.I	3I.2	28.I	26.I	I0.2	7.7	36.5
Redfish	3K	376.6	3I9.8	356.9	372.8	69.5	I3.8	34.5
	3LN	I25.0	I99.4	85.9	46.8	60.8	40.0	I0.9
	3O	I27.4	I08.7	I29.0	I09.4	I9.2	34.5	27.9
	3M	I54.9	I32.3	5I.9	309.5	I06.4	47.0	83.3
Am. plaice	3K	64.5	52.7	I7.9	I8.9	I8.4	I3.9	5.9
	3LNO	533.8	642.I	325.6	348.6	225.8	I60.4	244.6
	3M	8.9	7.5	7.8	20.2	9.3	6.5	5.0
Yell. flound.	3NO	II3.3	96.9	84.5	39.5	26.5	20.8	43.8
Witch.flound.	3K	6.2	I3.0	I9.8	I4.5	5.0	3.I	3.2
	3LN	2.0	9.3	I2.2	6.2	4.7	I.9	3.I
	3O	I.3	2.5	3.4	5.9	3.9	6.8	2.9

Table 10. Results of trawl-acoustic survey for redfish in Subarea 3 in 1988-89

Div.	Acoustic survey				Trawl-acoustic survey				Percentage of fish (by biomass in pelagic layer %	
	Abundance, 10^6		Biomass, t x10^3		Abundance, 10^6		Biomass, t x 10^3			
	I988	I989	I988	I989	I988	I989	I988	I989	I988	I989
3K	548.9	528.2	I99.0	I28.8	593.0	596.7	2I2.8	I63.3	93.5	78.9
3LNO	223I.0	394.8	288.2	65.5	2747.I	609.9	362.7	I04.3	79.4	62.8
3M	I632.I	I947.3	332.0	282.6	I8I5.2	223I.0	379.0	365.9	87.6	77.2

PART II

A.FISHERY STATE.

In 1989 experimental silver hake fishing started late in March. Concentrations were found at the depth of about 400m. Catches reached 40 or more tons per fishing day. By April silver hake already moved towards the north and were mainly found at the depth between 200 and 300m. Fishery situation in April and May was as in 1988 favourable one. Concentrations were stable in the area to the south of SMGL. Late in June, as it was observed in previous years, concentration densities began decreasing as the result of silver hake migration from the fishing ground. Short-term improvement of fishery situation took place early in July, being observed a sharp subsequent worsening. In the middle of July the fleet left Nova-Scotian Shelf. USSR silver hake catches per fishing day and trawling hour are represented by years in Table I. The data cited suggest that silver hake stock kept in 1989 at higher level of previous years, since 1984. The quota, inclusive the additional one, was totally taken. Silver hake catch totaled 72.7 thousand tons.

Silver hake of 27-34cm in length dominated in catches. Mean size and weight almost did not change as compared to the previous year (Table 2). However, young fish of 25cm or less in length resulted to be found much more frequently than in 1988. Silver hake age composition was characterized by an evident predomination of 2-4 year-old specimens of 1985-1987 year-classes (Table 3). The former two are strong by the data of young and adult hake trawl surveys, being the latter at a moderate level. However, 1989 fishing season results indicate that the 1987 year-class assessment by survey data was possibly underestimated.

In 1990 2-4 year-old individuals will serve as a base for fishery. By survey data 1986 and 1988 year-classes are considered to be strong and that of 1987 is believed to be a moderate one. One may hope that silver hake stock will also remain in a good state in 1990, being fishery situation about the same as in the previous year.

B.SPECIAL RESEARCHES

In October through November annual trawl survey of silver hake young specimens was carried out according to the Joint Soviet-Canadian Program on board SRTM-K MALTSEVO. Water temperature measurements were made at each trawl station. According to the preliminary estimate mean weighed catch per trawling of 0-class fish was 75.5 individuals. In December young hake vertical distribution investigations were realized.

Table 1 USSR silver hake catches per effort unit by years, tons

Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Catch per fishing day	31.3	23.5	27.4	20.9	26.6	37.2	30.5	38.4	38.9	44.3	32.6	36.8	40.7
Catch per fishing hour	2.26	1.98	2.26	1.44	2.00	3.74	2.30	3.18	2.63	3.54	2.98	2.97	3.07

Table 2 Silver hake size composition of USSR commercial catches by years, %

Length, cm	Years				
	1985	1986	1987	1988	1989
1	2	3	4	5	6
12	-	+	-	-	-
13	-	+	+	+	+
14	+	+	+	-	+
15	+	+	+	-	0.2
16	+	0.3	0.1	-	0.4
17	0.1	0.6	0.3	+	0.5
18	0.2	1.1	0.3	+	0.5
19	0.4	1.2	0.3	+	0.4
20	0.7	1.6	0.2	+	0.5
21	0.8	1.4	0.1	+	1.3
22	1.0	1.0	0.2	+	1.7
23	1.1	0.8	1.2	0.1	1.7
24	1.2	0.6	5.5	0.5	1.6
25	1.8	0.8	12.2	1.8	3.0
26	4.2	2.0	15.2	4.9	4.8
27	8.8	4.5	13.2	10.9	5.2
28	11.4	8.2	9.0	17.5	7.3
29	11.0	13.1	7.2	19.8	11.6
30	11.3	16.9	7.3	16.2	15.2
31	11.2	14.8	6.9	11.8	15.0
32	9.8	12.8	6.7	7.0	12.2
33	8.3	8.7	4.9	4.0	7.5
34	5.9	4.5	3.4	2.7	4.0
35	4.0	2.4	2.2	1.3	2.2
36	2.5	1.4	1.3	0.7	1.2
37	1.5	0.6	0.8	0.3	0.8
38	0.9	0.4	0.5	0.1	0.4
39	0.7	0.2	0.3	0.1	0.3
40	0.4	0.1	0.2	+	0.2
41	0.3	+	0.1	+	0.1
42	0.2	+	0.1	+	0.1
43	0.1	+	+	+	0.1
44	0.1	+	+	+	+
45	0.1	+	+	-	+
46	+	+	+	-	+
47	+	+	-	-	+
48	+	+	-	-	+
49	+	+	-	-	+
50	-	+	-	-	+
51	+	+	-	-	+
52	+	-	-	-	-
Average length	30.1	29.8	28.4	29.4	29.6
Average weight, kg	0.198	0.189	0.161	0.190	0.188

Table 3 Silver hake age composition of USSR commercial catches by years, %

Age	Year				
	1985	1986	1987	1988	1989
1	5.4	7.4	1.6	+	5.0
2	33.7	12.9	59.3	42.4	31.7
3	29.9	45.1	21.0	41.3	38.1
4	21.8	28.8	14.5	13.8	20.2
5	7.7	5.3	2.8	2.4	4.1
6	1.2	0.4	0.6	0.1	0.8
7	0.3	0.1	0.2	+	0.1
8	+	+	-	+	+
9	+	+	-	-	+
10	-	+	-	-	-
Average age	3.0	3.1	2.6	2.8	2.9