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by

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The total Soviet catch of fish in the ICNAF Convention Area in I973 was I222556 x/ tons (Table I), which is by I77578 tons higher than in I972. The overall catch by the USSR in the North-West Atlantic Ocean in I973 ran into I295826 tons, which is by I54595 tons higher than in I972.

SUBAREA I

A. Status of Fisheries

In I973, the Soviet catch was 5727 tons in this Subarea (Table I). The bulk of catches made bluntnose ratnail *Macrurus rupestris* and Greenland halibut caught in waters of Greenland-Canadian Ridge (Div. I C) in autumn. American plaice ranked third in the catches.

B. Special scientific investigations

I. Environment

Observations for water temperature were accomplished from the research vessel "Artemida".

In September I973 water temperature was 0.I2° C, 0.08° C and 0.I2° C lower than in the same period I972 for the layers 0 - 50 m, 0 - 200 m, 200 - 500 m correspondingly, but, 0.5° - 0.7° C higher than in September I967 along the hydrological section II - A (area 63°34' N, 55°30' W, 64°0I' N, 52°36' W).

But, some lowering in water temperature in comparison with I967 was observed along the hydrological section 9 - A (area 67°30' N, 54°58' W - 67°I0' N, 57°00' W), see Table 2.

x/ According to preliminary data.

Table I. Species composition of catches by the USSR (in tons) in the North-Western Atlantic, I973 x/

Fish species	Nominal catches by statistical areas in I973: Baffin Land	I	2	3	4	5	6	Total for Subareas I – 5#: I972	I973	Throughout all the North – Western area: I972	I973
I	2	3	4	5	6	7	8	9	I0	II	I2
T O T A L	2I97	5727	I07706	347765	404I59	372525	6I272	I053I90	I237882	II50038	I030I35I
Argentine	-	-	-	-	I05I	2375	-	38I27	3426	38I27	3426
Capelin	-	-	5634I	I55933	-	-	-	66I76	2I2274	66I96	2I2274
Atlantic halibut								I2I		I2I	
Greenland halibut	II90	273I	4568	3I38	-	-	-	I0549	I0437	I9946	II627
American plaice	-	II94	I4I0	I090I	70II	47	-	25858	20563	25858	20563
Winter flounder								3I34		3I48	
Summer flounder								393		393	
Yellowtail flounder	-	-	-	2965	I0I5	333	I87	I7I9I	43II	I7252	4498
Witch	-	-	554	4466	77I4	I07	-	205I3	I284I	205I8	I284I
Cod	-	I46	27637	7I4I8	34II	2842	39	I7803I	I05454	I78083	I05493
Haddock	-	-	-	-	59	582	-	599	64I	599	64I
Pollock	-	-	-	-	282	II52	-	3555	I434	3555	I434
White hake								I749		I749	
Red hake	-	-	-	69I	I698	43226	I5476	580I7	456I5	7272I	6I09I
Silver hake	-	-	-	-	282747	I00464	II327	207925	3832II	2I5660	394538
Grenadier	I007	I56I	6285	8303	-	-	-	26I88	I6I49	3I765	I7I56
Redfish	-	-	9062	859I7	I0240	2690	I7	I29862	I07909	I29983	I07920
Wolffish								3705		3705	
Sculpins								42I7		6554	
Ocean pout								979		I07I	
Scup								3I4		673	
Searobin								283		3772	
Angler								6964		6964	
Butterfish								435		I848	
Bluefish								I		I	
Atlantic saury								34I5		34I5	
Herring	-	-	-	-	3III5	4224I	I0067	67725	73356	72289	83423
Alewife								4805		6853	
Mackerel	-	-	-	-	I6425	I29340	I2830	I09455	I45765	I39826	I58595
Sharks								I4938		23302	
Skates								I3568		I3568	
All other finfish	-	95	II22	3I39	32742	38838	II089	26I56	75936	3I676	87025
Squid	-	-	2	-	77I9	7605	I99	82I2	I5326	6807	I5525
Other shellfish								30		30	

Table 2. Mean water temperature registered along the hydrological section 9-A in September

Water layer (m)	1962	1963	1964	1967	1973
0 - 50	4,66	4,05	3,58	3,66	2,74
0 - 200	2,90	-	1,30	2,33	1,86

2. Biological investigations

a) Greenland halibut. Table 3 presents size composition of Greenland halibut taken with bottom trawl from board the research vessel "Artemida". A series of trawlings was completed along the southern slope of the Greenland - Canadian Ridge, approximately, at 64°30' N, 58°30' W, depth being within the range from 620 m up to 640 m.

As usually, Greenland halibut stomachs contained mostly bathypelagic fish species, i.e. bluntnose ratnail *Macrurus rupestris*, redfish, the juvenile of Greenland halibut, then, cephalopod.

Table 3. Greenland halibut size composition (%o), Div. I C, October 1973

Length (cm)	Males	Females	Total for males and females
33 - 35	-	1	1
36 - 38	2	-	2
39 - 41	2	2	4
42 - 44	22	7	29
45 - 47	34	20	54
48 - 50	69	17	86
51 - 53	55	27	82
54 - 56	24	18	42
57 - 59	33	24	57
60 - 62	51	16	67
63 - 65	38	25	63
66 - 68	47	29	76
69 - 71	23	27	50
72 - 74	13	31	44
75 - 77	4	41	45
78 - 80	5	44	49
81 - 83	-	62	62
84 - 86	-	38	38
87 - 89	-	49	49
90 - 92	-	38	38
93 - 95	-	16	16
96 - 98	-	18	18
99 -101	-	16	16
102 -104	-	7	7
105-107	-	2	2
108 - 110	-	2	2
111 -113	-	1	1
Relative number (%o)	422	578	1000
Mean length (cm)	57,03	75,13	67,49
Number of specimens measured	515	705	1220

b) American plaice. In February, March and April pre-spawning and spawning stocks of American plaice were observed at Lille Hellfiske Bank. Those concentrations were regularly fished by Soviet scouting trawler "Nikolay Kononov". In April, when the spawning season was over, those concentrations were scattered. The size composition of American plaice in catches taken with bottom trawl is given in Table 4.

It should be noted that previously any dense and stable concentrations of American plaice could not be found in Subarea I.

There is no doubt that appearance of those concentrations in I973 was caused by an extreme cooling of water mass in the northern part of Subarea I (Table 2). That cooling favoured a mass invasion of American plaice being a typical Arctic fish species into Subarea I. Simultaneously, that phenomena affected cod distribution throughout the area.

Table 4. Size composition (%o) of American plaice in Div. I C, I973

Length (cm)	February		March		April	
	Males	Females	Males	Females	Males	Females
20 - 2I	2	-	40	I	53	-
22 - 23	I5	I	65	-	83	-
24 - 25	I6	4	8I	I	I06	-
26 - 27	28	4	72	2	82	-
28 - 29	20	I4	38	7	44	-
30 - 3I	I0	47	2I	22	I2	I5
32 - 33	6	II2	I0	70	3	6I
34 - 35	2	I79	I	II4	-	I20
36 - 37	3	233	-	209	-	225
38 - 39	-	I4I	-	I29	-	II3
40 - 4I	-	90	-	65	-	50
42 - 43	-	46	-	39	-	24
44 - 45	-	I2	-	I0	-	8
46 - 47	-	7	-	2	-	I
48 - 49	-	I	-	I	-	-
Relative number (%o)	I02	898	328	672	383	6I7
Mean length (cm)	27,II	36,37	25,24	36,72	24,72	36,66
Number of specimens measured	I36	I20I	I054	2I62	I28I	2067

A 6

c) <u>Tagging of Commercial Species.</u>

In I973, I808 specimens of cod and 706 specimens of American plaice were tagged.

SUBAREA 2

A. Status of Fisheries

In I973, the Soviet catch of fish in Subarea 2 was I07704 tons (Table I), including 27637 tons of cod, 5634I tons of capelin, 9062 tons of redfish, 4568 tons of Greenland halibut, 6285 tons of grenadier, I4I0 tons of American plaice, 554 tons of witch and a small amount of wolffish and other bottom species. Cod fishery was greatly hampered by an extremely hard ice condition, and, abready early in February the trawl fleet had to leave Subarea 2. Large ice deposits did not allow to determine the degree of accuracy of fishery forecasting for I973.

During a short period (mainly in January), when cod. was fished by trawl fleets, the results of the fishery confirmed the availability of highly abundant cod concentrations and their great density. Extremely low water temperature registered in winter I972 - I973 favoured accumulation of cod in water over the continental slope (the regularity of that phenomena was discussed earlier, see "Report of Soviet Investigations, I969", ICNAF Redbook, I970, part II).

In I974, the Labrador cod number remained to be at a high level, but, hydrological conditions did not favour accumulation of this species.

In I975, the commercial stock will be recruited by cod of a relatively poor year - classes (I969 and I970). The commercial stock abundance and its biomass will decrease slightly, whereas mean length, weight and age of a single cod specimen will be greater somewhat. The bulk of catches as previously will make cod of rich I967 and I968 year-classes.

Taking into account the four - year periodicity of hydrologic processes, it is possible to assume that I974/75 winter will be hydrologically warm. Thus, in January - May I975 the efficiency of cod trawl fishery will be apparently lower versus the same months of some previous years.

B. Special scientific investigations

I. Environmental studies

The standard hydrographic section 8 - A was completed on November I - 2, I973. At the AB part of this section, between 53°40' N, 55°44' W and 54°50' N, 53°32' W, water temperature in the layer 0 - 200 m was approximate to the average one for the long-term period of I964 - I972. Water temperature in the layer 200 - 500 m was lower than that one at the part B of the same section, namely, between 54°26' N, 54°I9' W and 54°50' N, 53°32' W.

Table 5. Mean water temperature (°C) at the 8 - A hydrographic section through Hamilton Bank (as per November I)

Part of the hydrographic section	Water layer (m)	I964	I965	I966	I967	I968	I969	I970	I97I	I972	I973	Anomaly of temperature, I973
AB	0-50	0,98	I,30	2,4I	2,00	2,29	0,82	I,29	0,68	0,35	I,00	-0,37
AB	50-200	-0,I8	I,06	I,44	0,89	-0,I8	0,36	0,32	0,43	-0,39	0,59	+0,I7
AB	0-200	0,I7	I,I3	I,72	I,I9	0,50	0,50	0,60	0,57	-0,I7	0,72	+0,03
B	200-500	I,99	2,59	3,97	I,54	I,42	I,5I	2,32	I,44	I,I9	I,4I	-0,59

2. Biological investigations

a) Cod. Data on size and age cod composition in Div. 2J are given in Tables 6 and 7. Cod of 40 - 60 cm related to I964, I965, I966 and I967 year - classes prevailed in number in commercial catches taken with bottom trawl. Two last year - classes relate to strong ones (see further Table 8) that was concluded according to data on counting the young cod of the Labrador stock in Div. 3K.

Table 6. Size composition (%o) of cod in Div. 2J, I973

Length (cm)	January	March
I	2	3
30–32	5	–
33–35	30	I
36–38	IOI	I5
39–4I	I49	39
42–44	I95	89
45–47	I74	II5
48–50	III	I3I
5I–53	6I	III
54–56	53	II9
57–59	42	III
60–62	30	8I
63–65	20	68
66–68	I7	45
69–7I	7	30
72–74	3	I8
75–77	I	I3
78–80	–	II
8I–83	I	2
84–86	–	–
87–89	–	I
Number of specimens measured	262I	3245
Mean length (cm)	46.33	54.28

Table 7. Age composition and mean length of cod in Div. 2J, I973

Year-class	Age	March: Number of specimens (%o)	March: Mean length (cm)	May: Number of specimens (%o)	May: Mean length (cm)
I969	4	3	37,00	43	32,85
I968	5	27	40,75	77	37,39
I967	6	224	44,93	404	44,76
I966	7	24I	50,04	250	50,I2
I965	8	I94	55,62	I33	54,70
I964	9	II4	57,9I	30	59,67
I963	I0	37	6I,82	20	62,00
I962	II	70	64,I4	20	66,00
I96I	I2	44	6I,92	3	58,00
I960	I3	27	65,88	I3	70,75
I959	I4	I3	69,25	7	73,00
I958	I5	-	-	-	-
I957	I6	3	70,00	-	-
I956	I7	-	-	-	-
I955	I8	3	76,00	-	-
Number of specimens studied		299		300	

Tagging of Commercial Species

In Div. 2J (South Labrador), I808 cod specimens and 706 ones of American plaice were tagged. The return of some individuals allowed to survey seasonal migrations typical for those fish species. Thus, cod 39 cm long with tag N 257222 was released from board the Soviet scouting trawler at 5I°30' N, 50°45' W on March 3I, and it was recaptured by Canadian fishermen at 49°40' N, 54°40' W on July I6. Cod 50 cm long with tag N 2I52II tagged at research vessel "Persei III" at 54°26' N, 53°28' W on 23 December 1972 was recaptured by bottom trawl of the Soviet commercial vessel at 53°I0' N, 52°I5' W on January 27, I973. That fish migrated with an average speed of 2.5 miles per day.

SUBAREA 3

A. Status of Fisheries

In 1973 total Soviet catch in Subarea 3 amounted to 347765 tons, including 85917 tons of redfish, 155933 tons of capelin, 71418 tons of cod, 18332 tons of flounder (Table I).

In 1975, the northern part of Subarea 3, the area of cod distribution mainly of the Labrador stock, will be exploited in the same way as it is expected to be in the very Labrador area (sea above Status of Fisheries, Subarea 2). Commercial cod stock inhabiting the southern part of Grand Newfoundland Bank and St. Pierre Bank will be mainly represented by poor year-classes or by those characterized by an average abundance. Strong 1968 year-class practically will disappear from catches, thus, cod fishery will have as its base mainly year-classes 1971 and 1972 (Table 8). As previously, the abudance of haddock will remain at a very low level in waters off Grand Bank, and it may be somewhat higher off St.Pierre Bank (Table 9).

It may appear that redfish and flounder abundance and biomass will not undergo any essential fluctuations by 1975.

B. Special Scientific Investigations

I. Environment

In 1973, hydrological surveys were carried out on R/V "Persei III" (May - September). Significaut negative anomalies in the water temperatures were observed almost in the entire are area of Subarea 3, as it was in case of an extremely cold year 1972. The peak of cooling was observed in the layer from 50 m up to 200 m in the neucleus of the Labrador Current, whereas in 1972 an extreme cooling of water masses was observed in the layer 0-50 m.

In April 1973, there was registered an increased inflow of warm Atlantic waters to the southern slope of the Grand Bank (Fig. I). Waters with temperature exceeding 10° C were observed at depth of 100 m quite close to the slope, but, in May, an intense inflow of cold waters of Labrador Current has been started that caused cooling in the water temperature below 0° C along the hydrological section. The water temperature of shelf waters became lower in the shallow water of Grand Bank as compared to 1972, and it raised along the slopes.

In June, there was observed the minimum for the last 6 years temperature in the layers 0 - 200 m and 200 - 500 m in the Cabot Strait and in the southern part of the Grand Bank (see Res. Report by Burmakin V.V.).

2. Biological Investigations

a) Count of young cod and haddock

In summer 1973, the count of young fish was executed from board the R/V "Persei III" in all the Divisions of Subarea 3. Bottom trawl with capron net of 8 mm mesh size (between two knots) inserted into the cod - end was used as a fish counting instrument.

Each trawling lasted one hour, the trawlings were made at usual standard points of the area investigated.

Mean catch of three - year old cod in Division 3K allowed to come to some conclusions on strength of the next year-class of the Labrador cod stock.

According to data given in Table 8, it is possible to note that the year - classes 1966, 1967 and 1968 were stronger than they could be at the mean level, and two successive year-classes, i.e. those of 1969 and 1970 were much poorer. The practical meaning of those data has been already discussed in the section giving description to Subarea 2. It should be noted here that the abundance fluctuations of the Labrador cod are in inverse correlation to those of the Barents Sea cod (see Fig. 2). The correlation factor for that correlation estimated for the period 1964 - 1970 is equal to 0.95.

The abundance of 1970 and 1971 year - classes of cod inhabiting the southern part of Subarea 3 (Divisions 3 N, 3 O, 3 P), is near the average long-term level.

Table 9 presents some results of haddock juvenile counting. Commercial meaning of those results was discussed above while giving the forecast for 1975 (see section "Status of Fisheries")

b) Trawl survey. The trawl survey or the total counting of all bottom fish taken by trawl including noncommercial species was completed in summer 1973 simultaneously with counting of cod and haddock youngs throughout all the Divisions of Subarea 3. The results of work showed that haddock in Div. 3 P, cod in Div. 3 M, redfish (S. mentella) and American plaice in Divisions 3 N, 3 O and 3 P increased in their number, but, the white hake in Divisions 3O and 3 P, cod - in all the Divisions with the exception of 3 M, yellowtail flounder in Divisions 3 L and 3 N vice versa decreased in abundance in comparison to 1973.

Table 8. Mean catch (number of fish) of young cod (age I - 4 years) per one hour haul by control trawl

Year class	I year				2 years				3 years				4 years			
	3 K	3 N	3 O	3 P	3 K	3 N	3 O	3 P	3 K	3 N	3 O	3 P	3 K	3 N	3 O	3 P
I958													I0	I	0	2
I959									2I	8	I	4	I5	I	I	I
I960					5	3	0	3	II	I	2	5	II	I	0	.I
I96I	I	I	I	6	3	4	3	6	20	5	I	6	27	4	I	I
I962	I	I	7	42	2	8	2	7	I5	I3	2	I2	24	6	I	2
I963	I	I	I	3	I	5	I	I3	36	30	I	I7	I7	7	3	4
I964	I	4I	24	3I	3	I37	I3	22	8	73	42	58	28	I6	7	I0
I965	I	I	I	5	I	I4	I2	2I	I5	23	20	25	22	60	9	9
I966	I	2	I5	7	3	27	I7	32	27	37	34	28	40	I0	4	4
I967	I	I	2	I	8	3	4	20	32	32	I4	I0	I2	2	2	6
I968	I	6	I8	40	7	I09	28	66	40	9I	23	64	26	28	5	I3
I969	I	2	4	I5	4	II	6	50	I3	26	I2	25	6	8	4	2
I970	I	6	I	6	I	24	3	9	6	2I	I0	3				
I97I	0	4	2	5	I	36	I5	6								
I972	0	5	2	4												

Table 9. Mean catch (number of fish) of young haddock (age I - 3 years) per one hour haul by control trawl

Year class	I year		2 years		3 years	
	3 N O	3 P	3 N O	3 P	3 N O	3 P
I963					2	I7
I964			4	55	6	I53
I965	I	I3	I	4I	I	4
I966	3	II0	8	I9I	I	20
I967	I	I83	I	I6	I	2
I968	4	25	8	I0	I	4
I969	4	35	4	38	I	5
I970	I	32	I	8	I	I
I97I	9	2	3	I		
I972	3	I25				

The results and the methods of total trawl survey are given in more detailed form in the report by V.A. Chekhova.

c) Collection of ichthyoplankton. As previously, in I973 the collection of drifting eggs and larvae was performed. Work was completed on board R/V "Procion" with help of egg net with 80 cm in diameter of the trawl mouth. The whole number of stations was I25, the number of ichthyoplankton samples collected was 369. Eggs and larvae caught were fixed in the formalin solution and later they were investigated in an inshore laboratory, where the species and the development stage were determined.

In I973, mean number of cod eggs (2.9 specimens appeared to be the least one for the last period of four years (thus, in I970 it was 7.6 specimens, in I97I and I972 - 3.2 and 6.0 specimens correspondingly).

More detailed results of ichthyoplankton studies are given in the report by A.I. Postolsky.

d) Redfish (Sebastes mentella). Some decrease in mean length of Sebastes mentella was observed in commercial catches by bottom trawl in the area of Flemish Cap Bank (Table IO). This phenomena may be explained by more abundant recruitment of stock with growing young specimens than usually.

e) Capelin. Size and age composition of capelin caught by trawl with small mesh in its cod - end is represented in Tables II and I2.

Table IO. Size composition (%o) of redfish Sebastes mentella on Flemish Cap-Cap Bank in March I975

Length (cm)	Males	Females	Males and Females
20	-	I	I
2I	2	3	5
22	7	9	I6
23	I8	2I	39
24	34	37	7I
25	6I	6I	I22
26	69	65	I34
27	58	59	II7
28	44	46	90
29	27	28	55
30	22	23	45
3I	2I	I2	33
32	I8	I2	30
33	I7	I3	30
34	I6	I2	28
35	24	I5	39
36	I9	I2	3I
37	I8	I4	32
38	I3	I5	28
39	6	I0	I6
40	4	I2	I6
4I	I	9	I0
42	I	5	6
43	-	3	3
44	-	2	2
45	-	I	I
Relative number (%o)	500	500	I000
Mean length (cm)	28,95	29,22	29,08
Number of specimens measured	5705	5696	II40I

Table II. Size composition of capelin in Div. 30, May I973

Length (cm)	Males	Females	Males and Females
II	-	I	I
I2	-	8	8
I3	-	73	73
I4	5	I79	I84
I5	29	233	262
I6	II5	I28	243
I7	I43	4I	I04
I8	39	3	42
I9	3	-	3
Relative number (%o)	334	666	I000
Mean length (cm)	I6.62	I4.84	I5.44
Number of specimens measured	5I67	I0282	I5449

Table I2. Age composition of capelin in Div. 30, May I973

Year class	Age	Males	Females	Males and Females
I97I	2	-	2	2
I970	3	I5	63	78
I969	4	320	483	803
I968	5	46	69	II5
I967	6	-	2	2
Relative number (%o)		38I	6I9	I000
Number of specimens investigated		206	334	540

f) Tagging of commercial species. Number and species of fish tagged are given in Table I3.

In I973, cod with tag N I469 was recaptured among other fish, it spent at sea more than eleven years. This fish was tagged on board the Soviet vessel at 5I°37' N, 50°30' W on January 9, I962, then it was recaptured by Canadian fishermen at 49°08' N, 53°22' W on August 2, I973. Such facts testify on the reliability of hydrostatic tags used nowadays.

Table I3. Number of commercial fishes tagged in Subarea 3, I973

Fish species	Division					Total in Subarea 3
	3 K	3 L	3 N	3 O	3 P	
C o d	I7II	237	I	5	2	I956
American plaice	-	I27	II	243	II3	494
Yellowtail flounder	-	75	9	II	9	I04
Witch	-	I	-	-	I	2
Other fish	-	6	-	-	-	6
T O T A L	I7II	446	2I	259	I25	2562

SUBAREA 4

A. Status of Fisheries

Silver hake. During the last years catches of silver hake were high due to stock recruitment by a series of rich year-classes of I967-I970. In I973, the catches increased and reached 282747 tons due to dense concentrations of this species and to its intense fishery, those catches prevailed the level of I97I and I972, when I28.633 and II3.774 tons were taken correspondingly. Silver hake was exploited beginning from March up to the end of the year. The slopes of banks and shelf in the area of Sable Island (4 W) served as base for the fishery. The bulk of catches made individuals of 25 - 33 cm body length at the age from 2+ up to 5+ (see Tables I4, I5). According to the results of trawl survey completed in autumn I973 in the Emerald Deep, I97I year-class turned out to be an abundant one and I972 year- class proved to be poor (see Table I6). In I974, the bulk of catches will consist of rich year-classes of I969-I97I, and in I975 the fishery will be based both on abundant I970 and I97I year-classes and on a poor I972 one. Therefore, in I974 silver hake stocks will be at an extremely high level, and, in I975 some decrease in stocks will be observed. Available silver hake stocks allow without any difficulties to take the quota of I00 thousand tons established for I974.

Table I4. Length composition of silver hake in Div. 4 W, I97I - I973 (%).

Length (cm)	I97I	I972	I973
	Years		
8- 9	-	-	+
I0-II	-	-	+
I2-I3	-	+	0,2
I4-I5	-	0,4	0,3
I6-I7	-	I,I	0,4
I8-I9	-	3,6	0,9
20-2I	-	6,8	2,2
22-23	I,4	5,8	4,3
24-25	I6,I	II,3	9,8
26-27	25,9	I9,6	24,7
28-29	2I,4	I8,2	27,6
30-3I	22,2	I6,3	I7,0
32-33	9,6	9,9	6,5
34-35	I,9	5,I	3,I
36-37	0,4	I,3	I,5
38-39	0,2	0,3	0,7
40-4I	0,I	0,I	0,4
42-43	0,3	+	0,2
44-45	0,I	+	0,I
46-47	0,I	+	0,I
48-49	0,2	+	+
50-5I	0,I	0,2	+
52-53	-	+	+
54-55	-	+	+
56-57	-	+	+
58-59	-	+	+
60-6I	-	+	+
62-63	-	-	+
64-65	-	+	-
Mean length	28,4	27,2	28,I
Number of fish measured	3300	I84II7	I48684

Table I5. Age composition of silver hake in Div. 4 W, I97I - I973 (% %).

Age	1971	1972	1973
0	-	-	0,2
I	-	7,0	4,I
2	8,8	27,0	5,4
3	43,2	33,3	44,6
4	36,8	2I,4	3I,8
5	8,8	I0,0	I0,4
6	I,2	0,9	2,4
7	0,5	0,2	0,8
8	0,5	0,I	0,2
9	0,2	0,I	0,I
I0	-	-	+
II	-	-	+
I2	-	-	+
I3	-	-	+
Mean age	3,6	3,2	3,50

Argentine. In I973, the argentine fishery was not intense at all. That can be explained by the fact that there was was not observed the fish mass migration out of limits of a zone introduced in Browns Bank for banning the haddock fishery, whereas in March and April I972 argentine left the closed for haddock fishery area and it was successfully exploited.
In I973, argentine catch made I05I tons as compared to 54I2 tons in I972. The bulk of catches on Browns Bank made individuals with body length of 33-38 cm and 8 - II years of age (see Table I7).

Two separate assessments "F" and "M" were made for Browns Bank stock, thus, they gave values 0.80 and 0.26 correspondingly. The total stock number was assessed as I00 thousand tons, the possible total catch in this case was estimated as 26 thousand tons at the optimum intensity.

Table I6. Silver hake catches for 30 min. trawling in the Emerald Deep, autumn of I972 and I973 (in specimens)

Years	Length (cm)																						To-tal
	4	6	8	I0	I2	I4	I6	I8	20	22	24	26	28	30	32	34	36	38	40	42	44	46 and more	
I972	I	I7	37	39	6	I	2	4	83	2I6	244	I05	67	65	48	I5	9	4	-	-	-	- -	963
I973	-	3	4	-	-	-	I	I2	65	I67	I26	7I	I25	I63	76	25	I2	6	6	5	3	3 -	873

Table I7. Age composition of argentine in Div. 4 X, I97I - I973 (% %).

Age	Years		
	I97I	I972	I973
I	-	-	-
2	-	-	-
3	0,5	-	-
4	I,9	-	0,6
5	I6,4	-	0,3
6	38,8	-	I,7
7	33,3	2,I	3,7
8	9,I	I2,I	I6,6
9	-	27,8	34,4
I0	-	25,5	24,5
II	-	I7,4	I2,7
I2	-	9,I	3,5
I3	-	4,6	I,7
I4	-	I,I	0,2
I5	-	0,3	0,I
Mean age	6,29	9,97	9,96

Herring. In I973, herring was taken in a restricted number in the Browns Bank area as the concentrations of this fish species were not found, and the catch made only 73 tons. Therefore, there was no possibility to collect data on the stock assessment.

Herring catches in the Nova Scotian Shelf stock were very poor as compared to the previous years, that may be explained by the absence of fish concentrations. In summer, this stock was fished on Browns Bank. In I973, the total catch made 3I.II5 tons. The catches consisted mainly of individuals with body length of 24 - 27 cm at age 4 - 5 years relating to year-classes of I968 - I969 (see Table I8).

Table I8. Age composition of Atlantic herring (in %, %) in 4 V, 4 W in I97I - I973.

Age	4 V		4 W		
	I97I	I972	I97I	I972	I973
I	2	3	4	5	6
I	-	-	-	-	-
2	-	-	-	-	0,5
3	0,I	-	4I,4	2,5	8,2
4	I,4	2,I	I2,0	I7,9	I6,2
5	5,0	5,5	20,4	24,9	I4,4
6	6,8	7,3	9,2	I5,3	9,2
7	I6,5	I3,0	8,2	I5,9	I0,3
8	I3,9	I5,8	4,8	II,8	I2,5
9	I3,9	20,0	2,4	7,7	II,0
I0	I9,3	I2,2	0,8	I,8	7,8
II	I4,2	9,9	0,2	2,0	5,4
I2	6,6	9,I	0,6	0,2	2,6
I3	I,8	4,8	-	-	I,7
I4	0,3	0,3	-	-	0,I
I5	0,2	-	-	-	0,I
Mean age	8,78	8,84	4,64	6,I3	6,82

SUBAREA 5

A. Status of Fisheries

Silver hake. In I973, silver hake was successfully fished from March to August, in I973 its catches reached I00.464 tons, as against the I972 figure of 94.I5I tons. The catches consisted for the main part of fish with length body of 25 - 30 cm (the mean length - 28.I cm) at age 3 - 5, year-classes of I969 and I970 (see Table I9). In I974, silver hake stocks will be recruited by rich year - class of I97I, thus, they will keep a high I972 level.

Table I9. Age composition of silver hake (%%) in 5 Ze and 5 Zw + 6 New England area

A g e	5 Ze			5 Zw + 6	
	I97I	I972	I973	I972	I973
I	0,I	-	0,3	-	-
2	4,9	-	2,6	-	-
3	36,6	II,7	44,2	22,8	I,I
4	27,6	42,2	35,5	54,4	22,3
5	I7,7	2I,0	9,8	20,3	42,9
6	6,9	8,8	3,I	2,5	I7,2
7	2,5	8,5	2,3	-	I4,8
8	2,2	3,6	I,5	-	0,9
9	I,3	I,4	0,5	-	0,7
I0	0,I	I,7	0,I	-	0,I
II	0,I	I,I	0,I	-	-
I2	-	-	+	-	-
Mean age	4,I3	4,92	3,82	4,03	5,28

Red hake. The catches of this fish species were high due to its dense concentrations: In I973, its total catch stood at 43.226 tons in comparison to 56.629 tons in I972. Of total number 43.226 tons, 24.406 tons were caught in 5 Ze and I8.8I6 tons - in 5 Zw. The bulk of the red hake catches was provided by fish with length body of 30 - 39 cm at age of 3 - 5 (see Table 20). In I974 its stocks will be recruited by a relatively rich I97I year - class. The calculations showed that in I974 the value of allowable for catch red hake will approximately be equal to 45 thousand tons westerner 69°, and 20 thousand tons-easterner that position.

Yellowtail flounder. This fish species was taken by Soviet vessels as by-catch while conducting fishery for other fish species in the area of Georges Bank and in the southern part of New England. In I973, its catch made 333 tons as compared to 4.8I5 tons in I972.

Stock assessment and calculations of allowable catches for both above mentioned stocks showed that in I974 the catch may be equal to 40 thousand tons. The quota is not determined for the USSR, therefore, yellowtail flounder will be taken in insignificant number while fishing for other species.

Mackerel. Mackerel is one of the mass commercial fish species. In I973 the USSR catches reached I29.340 tons (progress information). The stocks of this fish are at good condition. Its catches consisted mainly of individuals with body length of 32 - 35 cm. Year - classes of I967 (20.4%) and I969 (25.9%) prevailed in catches (see Table 2I). In I974, some decrease in mackerel stocks may occur, as the abundance of the rich I967 year-class will reduce due to natural and fishing mortality. In November I973, the calculations of some versions determining stocks and their possible catches in I974 as well were made by the USSR, PPR, GDR, PRB specialists at the meeting of the Working Group in Moscow. The fishing stock of mackerel in I974 is estimated as I.0 - I.5 million tons, and the allowable catch - from 320 up to 430 thousand tons.

Table 20. Age composition of red hake (%%) in Division 5 Z

Age	5 Ze 1971	5 Ze 1972	5 Ze 1973	5 Zw 1971	5 Zw 1972	5 Zw 1973
I	0,7	-	-	0,5	-	-
2	27,8	13,4	5,7	39,3	49,0	3,5
3	41,6	40,6	21,3	28,6	36,2	17,3
4	16,6	23,0	44,1	21,6	12,5	40,9
5	9,6	11,8	15,5	9,1	1,9	19,9
6	3,0	6,5	7,4	0,9	0,4	8,4
7	0,5	3,9	4,2	-	-	5,7
8	0,2	0,6	1,7	-	-	4,0
9	-	0,2	0,1	-	-	0,3
Mean age	3,19	3,72	4,18	3,02	2,68	4,47

Table 21. Age composition of mackerel (%%) in Subarea 5

Age	Years 1971	Years 1972	Years 1973
0	-	0,3	-
I	4,5	1,7	3,7
2	17,6	9,4	8,1
3	8,5	29,8	21,5
4	43,3	22,2	25,9
5	20,2	28,4	16,1
6	3,6	5,8	20,4
7	0,9	1,0	3,0
8	0,4	0,4	0,7
9	0,4	0,8	0,3
10	0,4	0,2	0,2
11	0,2	-	0,1
Mean age	3,8	3,9	4,2

Herring. In 1973, herring was caught in large number due to some increase of their concentrations. The commercial catches grew as they were recruited by rich 1970 year-class. At an average, three-year old specimens of that abundant year-class made 53.7% in 1973 catches (see Table 22). As three-year old specimens prevailed there, the mean age decreased from 5.7 in 1972 up to 3.7 in 1973, and, the mean body length shortened from 30.3 cm up to 25.8 cm.

Table 22. Age composition of herring in Subarea 5 in I972 and I973 (%%)

Years	Age									Total	Mean age
	2	3	4	5	6	7	8	9	I0		
I972	I,2	I,8	5,5	42,2	25,9	I5,9	5,7	I,4	0,4	I00,0	5,7
I973	-	53,7	33,4	8,5	2,2	2,0	0,2	+	-	I00,0	3,7

Squids were caught in great number while conducting fishery for silver hake and for other species, in I973 their catch was equal to 7.605 tons. Their special fishery was conducted in restricted number. The bulk of the USSR catches made shortfinned squids Illex illecebrosus. Their stocks are not exploited yet intensively enough. The results of trawl surveys conducted by R/V "Argus" in the Georges Bank area show showed that in June I97I their minimum biomass was determined to be equal to 85 thousand tons, and in I972-I45 thousand tons. Taking into account the fact that squids were fished only partially, it can be supposed that the possible annual catch may be equal to I00 - I50 thousand tons.

B. Special Investigations

I. Environment

Oceanography. In order to study water currents and their effect on environmental conditions in plankton and fish habitats, the calculation of geostrophic circulation was made with help of data obtained as result of echological surveys of R/V "Argus" in I97I and I972, when oceanographic observations were completed simultaneously with trawl plankton and inhthyoplankton surveys, as well as hydrochemical and other ones. A detailed circulation scheme was obtained as result, that was of great importance for understanding the distribution of phytoplankton, zooplankton and inhthyoplankton and, especially, for determination the areas, terms and conditions for spawning.

It appeared that in June and July the zones of upwelling water masses were developped on southern slopes of Georges Bank in the areas of an intensive silver hake and red hake spawning, and, those zones were not more observed in August, when spawning was completed, as well as some later in September and October. The upwelling zones were registered on northern slopes of Georges Bank in August - October. It should be noted here that in August silver hake spawned on north-western slopes, and in September and October strong prespawning and spawning herring concentrations were formed in the northern part of the Bank. It can be concluded here that, apparently, the zones of outflow of deep waters serve as original orientor for choosing the area and time of fish spawning and they are of great importance for the efficiency of spawning.

Hydrochemistry. In 1973, the collection of samples relating to hydrochemistry was performed on board the fishery refrigerator trawler (RTM) "Belogorsk" during plankton and ichthyoplankton surveys. The treatment and the analysis of hydrochemical investigations relating to the ecological surveys of 1971 and 1972 was completed. It was found that in June - August the oxygen content fluctuated within the ranges from 5.3 up to 7.4 ml/l in the surface layers, its higher saturation was registered in the northern waters of Georges Bank and a lower one - in its southern part. A relative oxygen content in the upper 20 m layer was higher than 100%, and in the near bottom one it was in the ranges from 67% up to 75%. The oxygen content raised in October and it appeared to be more homogeneously distributed.

In June 1971, the phosphate concentration in the photic layer was at the level limiting the photosynthesis (17,5 mkg/l, according to Riley). In June 1972, the phosphate content in the surface layers was much higher, thus to the west of 68^{0}W, it was 5 - 10 mkg/l, and some easterner the phosphate concentration reached 20 - 45 mkg/l, whereas in the near - bottom layers they ran up to 12 - 30 mkg/l and 28 - 60 mkg/l in the western and the eastern parts correspondingly.

The content of nitrates in the surface layer was close to zero, and in the layer of 30 - 50 m their concentration made 2 - 4 mkg/l, sometimes it reached 8 mkg/l.

Zooplankton. In 1973, the collection of zooplankton samples was continued on board RTM "Belogorsk" during the surveys in the silver hake and herring spawning grounds that was made according to the international program. There were completed four plankton surveys on Georges Bank using Bongo plankton - collector with nets of gauze N 38, 68. The total number of stations completed was 283, and 338 samples were taken there.

712 samples collected in 1972 were treated in laboratory conditions. While preparing atlas on distribution, abundance and biomass of zooplankton, there were made 274 maps covering the observations for the period from 1964 up to 1970.

Ichthyoplankton. In the current year observations for the distribution and the number of eggs and larvae for silver hake, red hake and herring were continued. Presently, the treatment of samples collected in 1972 and 1973 is completed by us in laboratory conditions. Preliminary results showed that in October 1973 the number of herring larvae was five times higher than that one in October 1972. In 1972, spawning was mainly observed in the northern part of Georges Bank, and in 1973 an intensive spawning was registered in its western portion as well.

The analysis of data on counting eggs and larvae of silver hake and red hake showed that the peak of spawning of these fish species was observed in June. Eggs and larvae were drifting beyond the shelf in insignificant number. Their further treatment will allow to compare this year abundance to that one of the previous year.

Nutrition studies of herring and silver hake larvae. Surveillance for the period of 1965 - 1972 showed that herring larvae inhabiting near Georges Bank fed mainly on those of mollusks, and silver hake larvae preferred to feed on nauplia and Copepodae. The feeding of silver hake larvae was the most intensive in I970 and I97I. For that period, 85 - 90% made larvae possessing intestines filled with food, their share was only 55 - 65% during the last years. Feeding of herring larvae was the most intensive in I969 and I972.

2. Studies of nutrition and food relations.

The fish community is represented by mass populations of plankton - eaters in the Western Atlantic, namely, by herring, mackerel, round herring, butterfish, alewife, the youngs of silver hake, cod, haddock and others. Besides those, it includes the benthophages (haddock, ocean pout, yelloutail flounder, skates) and the predators (spiny dogfish, angler, adult silver hake, cod, saithe and others). Squids are of great importance in the food chain. Due to an intensive fishery, the abundance of some fish species reduced considerably, their age composition changed as well.

First of all skates and anglers, cod and haddock became less in their number, that fact allowed us to suppose the existence of great changes in the food chain and in the total production of fish and squids.

Besides that, the studying of food relations is of some importance for understanding the population dynamics in order to make clear the degree of competition between different species of fish and squids, as well as of mammals and birds. For that purpose, in I97I and I972 material characterizing feeding of all fish species and squids was collected during the ecological surveys. At present, the treatment of samples is completed in the laboratory conditions, the calculation of table and the map drawing are almost finished, the results obtained are analysed only partially.

The results of studying fish feeding for typical plankton - eaters, i,e. mackerel, herring, alewife, round herring, butterfish and argentine showed that,in general, the composition o of plankton used as food is different enough. 45 plankton species were found in intestines contents. But, Calanus funmarchicus, Pseudocalanus elongatus and euphausids at larvae stages of development are of the greatest importance in their feeding. One of characteristic features of these fish species feeding is their extremely low selection in relation to the most of mass species of zooplankton that allow us to suppose the existence of a sharp food competition. Therefore, one can conclude that the increase in abundance of some plankton - eaters is restrained by other ones. In this case, at a relatively uniform zooplankton production, the increase in number of some species should be accompanied by the decrease of others.

Thus, we are of the opinion that mackerel increase in their number simultaneously with the decrease in number of herring. Mackerel is apparently represented by one stock in the Western Atlantic, and fish migrate from Chesapeake Bay up to St. Lawrence Bay and Newfoundland. Several herring stocks inhabit in thes large area. The ruducing in herring number in the Western Atlantic was observed at the background of a sharp increase in mackerel number during the last years. Taking the alove conclusion as a true one, one can suppose that the herring abundance will attein a high level of I960 - I968 only in case, when mackerel have a sharp decrease their number. Therefore, the problem of food relations between herring and mackerel stocks should be thoroughly studied.

Preliminary results of investigations relating to feeding of I6 bottom fish species allow to come to the conclusions given below.

Spiny dogfish and angler feed on fish and squids; silver hake, cod, saithe, red and white hake use as their food crustaceans, fish and squids (the youngs feed on crustaceans, the adults - on fish and squids); redfish and longhorn sculpin use exclusively crustaceans; flounders, haddock and skates feed, mainly, on organisms inhabiting near ground or burried into the ground. The stomachs were filled mainly with the rests of fishes such as silver hake, mackerel, red hake and longhorn sculpin; herring, redfish, haddock and other were observed in fish stomachs content in a less number. Two squids species could be found among the rests of food in fish stomacks, they are a shortfin and a longfin ones.

Thus, predators observed in great number among fishes inhabiting the area of Georges Bank and juxtoposed waters are spiny dogfish and a large - sized silver hake(with length body of more than 35 cm). Owing to a rich biomass, the both predators effect greatly the abundance of other fish species, and silver hake - the abundance of their own fries. Therefore, if the number of spiny dogfish decrease, it will be possible to wait for the increase in catches of non - predatory fish species including silver hake of mean size. Besides, that fact will favour to keep alive fries of other fish species, for example, of haddock. But, such a conclusion needs to be thoroughly studied as it is difficult to predict the consequences of a sharp reducing in abundance for predators. Partiwularly, it is not known, at what stock abundance the epizootic may occur that will cause a mass fish mortality.

3. Identification of herring and mackerel stocks.

In I973, the immuno - serological and biochemical studies of the Atlantic herring were conducted in three areas of the North - Western Atlantic, namely, in the USA shelf area (6 and 5 Zw), in the waters of Georges Bank (5 Ze) and of Nova Scotian Shelf (4 W).

The blood-group frequency was investigated for 600 herring individuals (500 specimens - from Divs. 5 Zw and 5 Ze and I00 ones - from Div. 4 W) and 900 samples of frozen muscle tissues were undergone to the biochemical treatment.

Data obtained as result of immunoserological and biochemical investigations show that immature and mature herring are homogeneous and belong to the same population of Georges Bank. Genetic analysis of populàtion confirm this conclusion according to frequency of genes of "rapid" esterases ($x^2 = 0{,}8898$; $P = 0{,}05$).

Herring form a separate population in the area of Nova Scotian Shelf, that population truly distinguishes from herring population of Georges Bank according to the frequency of blood groups and of genes of "rapid" esterases ($x^2 = 10.052$, $P = 0.01$).

Those data are confirmed as well by those of parasitological investigations conducted by B.A. Umnova. Extensiveness of immature herring contamination with nematode larvae, genus <u>Anisakis</u> makes I2%, that of mature one - 25% in Subarea 5 and Stat. Area 6, and in the Nova Scotia waters - 43%.

Identification of mackerel stocks.

Parasitological investigations of mackerel inhabiting the Georges Bank area (500 specimens) and Nova Scotia (300 specimen mens) showed that there is no difference in the intensity and the extensiveness of their contamination with nematode larvae. The nematode larvae frequency in mackerel from the area of Georges Bank made 33%, that one in mackerel from Nova Scotia - 40%. The intensity of contamination made I - 4 specimens in the first area, I - 5 specimens - in the second one. Thus, it can be supposed that one mackerel stock inhabit the both areas.

Hydroacoustic survey of pelagic fish stocks.

In winter I973, an experimental hydroacoustic survey was conducted by R/V "Argus" in the area of the Norfolk Shelf.

The results of analysis of data collected allowed to appro ve the method of stocks counting. The density of rarefied concentrations was determined by an immediate fish counting, and in dense stocks - according to echo-signals of stocks density. The abundance of separate concentrations of herring and alewife was determined. The results of survey testify on the possibility of the assessment of absolute stocks of pelagic fishes inhabiting this area.

STAT. AREA 6

Status of fisheries.

In I973, the total USSR catch in the Statistical Area 6 decreased up to 6I.272 tons as compared to 8I.64I tons in I972. The decrease in catches was the result of less fishery intensity for mackerel. Their catches dropped from 30.37I tons in I972 up to I2.830 tons in I973. The catches of other fish species had any essential changes.

Stock assessment of herring, mackerel, silver hake and red hake was the same as for the Subarea 5, as the same stocks inhabit those areas.

No special investigations, except for autumn trawl survey according ICNAF program, were conducted.

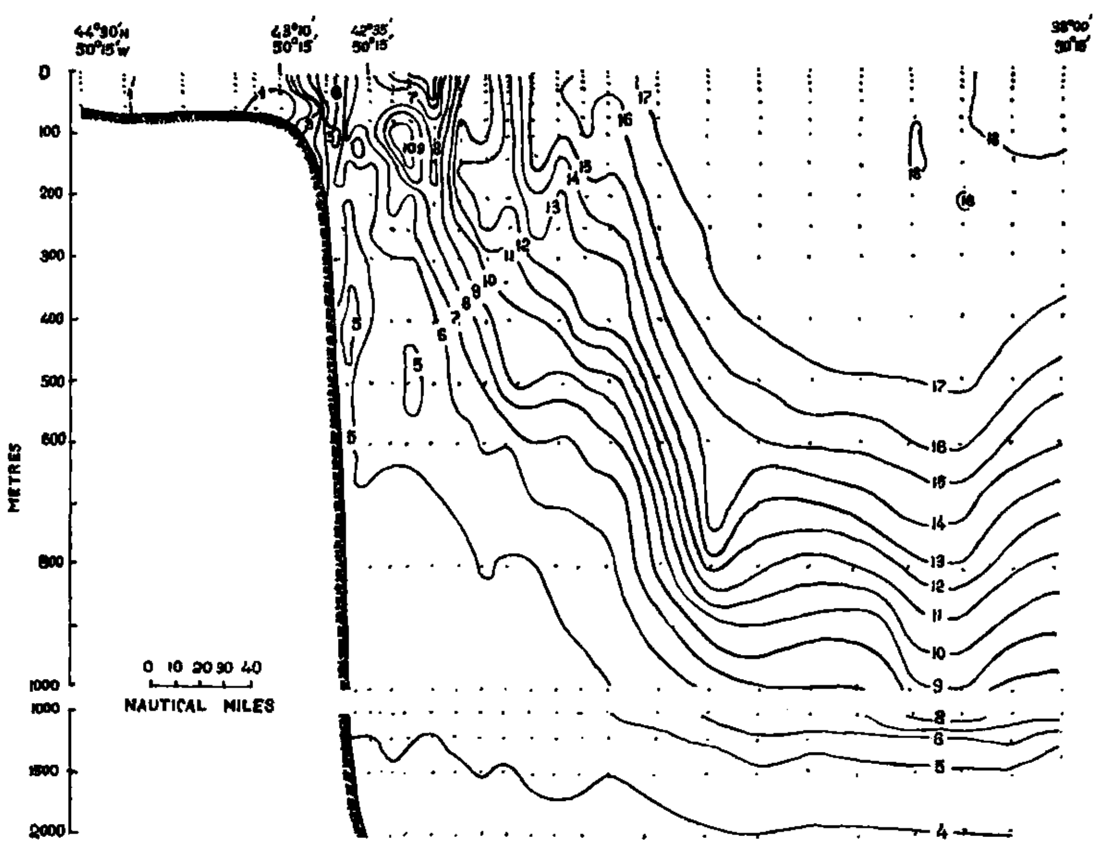

Fig. 1. Vertical distribution of temperature (°C) at the hydrological section 2A across the southern slope of the Grand Bank along the meridian 50°15'W, 10-14 April 1973.

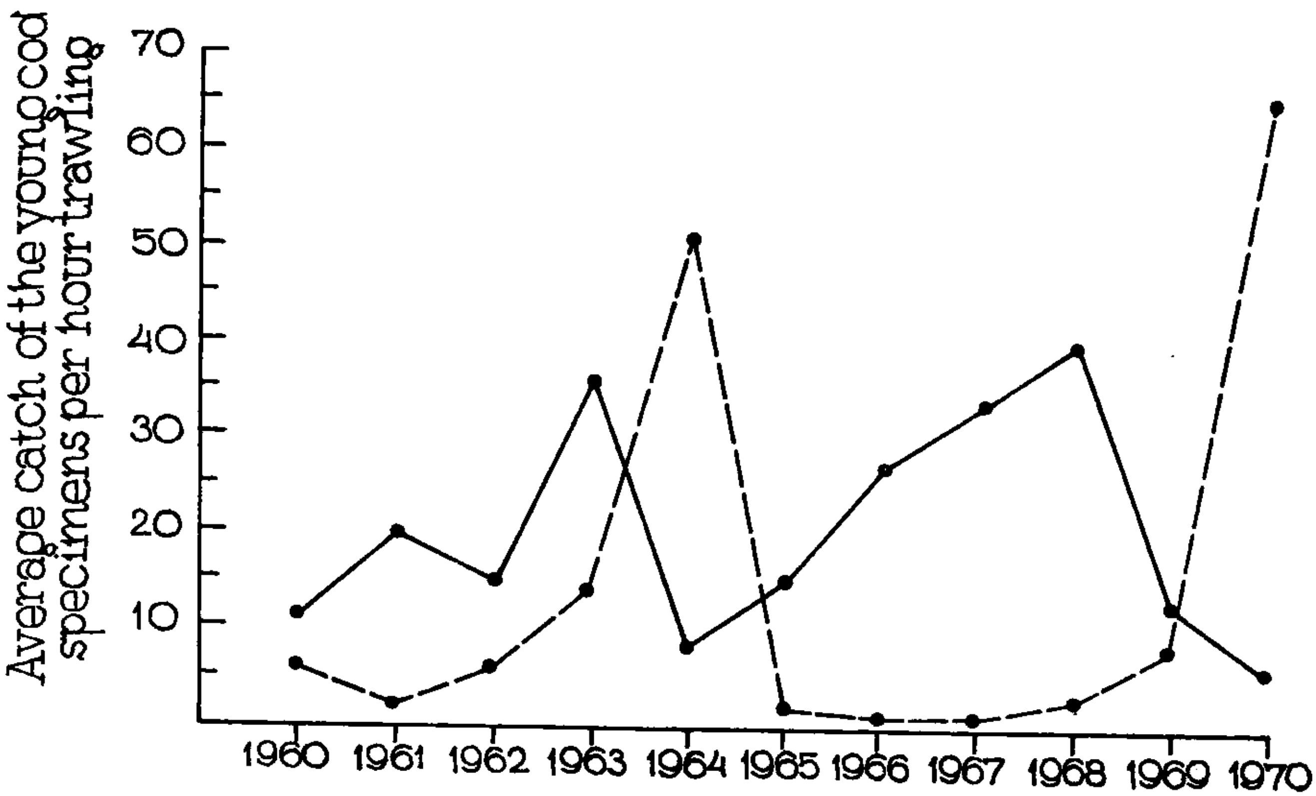

Fig. 2. Mean catch of the young cod of different year-classes per hour trawling taken with fish-counting trawl: fish at the age 1+ and 2+ inhabiting the southern part of the Barents Sea (dotted line) and at the age of full three years inhabiting the northern part of Newfoundland Bank (solid line).