RESTRICTED

International Commission for the Northwest Atlantic Fisheries

Serial No. 3546
(D.a. 74)

ICNAF Summ.Doc. 75/30

ANNUAL MEETING - JUNE 1975

USSR Research Report, 1974

by

K. G. Konstantinov
PINRO, Murmansk, USSR

and

A.S. Noskov
AtlantNIRO, Kaliningrad, USSR

The total Soviet catch of fish in the ICNAF Convention Area in I974 was II95899 tons (Table I), which is by 97866 tons less than in I973. The overall catch by the USSR in the North-West Atlantic Ocean in I974 ran into I2747I6 tons, which is by 82.640 tons less than in I973.

SUBAREA 0

A. Status of fisheries

In I974, the Soviet catch of fish was 3526 tons in this Subarea (Table I). As usual, the fishery was conducted in the second half of the year, mainly in the southern part of that Subarea at depths from 600 m up to 800 m. The bulk of catches was made up of Greenland halibut and grenadier *Macrurus rupestris* with a little admixture of redfish.

Table I. Species composition of catches by the USSR (in tons) in the North - Western Atlantic, I974.

Fish species	Nominal catches by statistical areas in I974							Total for Subareas I - 5		Total for Subareas 0 - 6	
	0	I	2	3	4	5	6	I973	I974	I973	I974
I	2	3	4	5	6	7	8	9	I0	II	I2
T O T A L	3526	I8247	I30629	4I892I	2509I0	377I92	7529I	I293765	II95899	I357356	I2747I6
Argentine	-	-	-	-	I7484	22688	-	369I	40I72	369I	40I72
Capelin	-	-	8280I	I28842	-	-	-	2I8036	2II643	2I8036	2II643
Atlantic halibut	-	-	-	2I8	-	-	-	72	2I8	72	2I8
Greenland halibut	86I	8650	6963	2687	-	-	-	II639	I8300	I2857	I9I6I
American plaice	-	I90I	66I	I5I66	9727	I20	25	25942	27575	25942	27600
Winter flounder	-	-	-	-	I428	II64	42	2479	2592	2522	2634
Summer flounder	-	-	-	-	-	-	-	22	-	22	-
Yellowtail flounder	-	-	-	6952	I37	248	I6	50II	7337	5208	7353
Witch	-	-	23I	II92I	I44I	I434	38	I3632	I5027	I3639	I5065
Cod	-	576	2424I	II43I9	32I6	27II	27	I2I366	I45063	I2I408	I45090
Haddock	-	-	-	I229	I67	I09	2	806	I505	806	I507
Pollock	-	-	-	I5	230I	-	47	3092	23I6	3092	2363
White hake	-	-	-	590	-	-	-	403	590	403	590
Red hake	-	-	-	-	2775	35569	I6255	48309	38344	63933	54599
Silver hake	-	-	-	255	9537I	II2I24	I567I	400285	207750	4II986	22342I
Grenadier	266I	6848	8340	22633	-	-	-	I8570	3782I	I9624	40482
Redfish	4	I92	I290	92I79	6696	I705	40	98470	I02062	985I2	I02I06
Wolffish	-	80	339	25I7	-	-	-	2788	2936	2788	2936
Sculpins	-	-	-	-	-	52I2	2937	4326	52I2	6443	8I49
Ocean pout	-	-	-	-	-	3357	I26	3I3I	3357	3I68	3483
Scup	-	-	-	-	-	5I	337	77	5I	475	388
Searobin	-	-	-	-	9208	5835	I754	604	I5043	I776	I6797
Angler	-	-	-	-	II758	8374	722	I6853	20I32	I6853	20854
Butterfish	-	-	-	-	-	I547	I025	I352	I547	2434	2572
Bluefish	-	-	-	-	-	I2	I5	-	I2	-	27
Atlantic saury	-	-	-	-	-	5094	-	2443	5094	2443	5094
Herring	-	-	-	-	23057	3I075	I3564	73357	54I32	83524	67696
Alewife	-	-	-	-	9I44	235	738	626	9379	I426	I0II7
Mackerel	-	-	-	-	2746I	I05324	I28I6	I49I0I	I32785	I62562	I4560I
Sharks	-	-	-	88	6822	9659	3875	II377	I6569	I424I	20444
Skates	-	-	-	I976	8876	8I23	-	I4808	I8975	I4808	I8975
All other finfish	-	-	5749	I73I7	9487	98I0	2336	23464	42363	24793	44699
Squid	-	-	I4	I7	34	56I2	2883	I7623	5677	I7969	8560
Other shellfish	-	-	-	-	4320	-	-	-	4320	-	4320

B. Special scientific investigations

I. Biological investigations

Grenadier Macrurus rupestris. Throughout the period from 3I July up to 2 August I974, a scouting BMRT accomplished a series of trawlings in the area 62°50' N, 6I°00' W. The catches fluctuated from 3 up to 6 tons and the grenadier from 57 cm up to 68 cm in length prevailed in the catches (Table 2). As usually, the males were much more representative than female for this fish species. All the individuals caught were immature, their stomachs content consisted of bathypelagic Crustacea.

SUBAREA I

A. Status of Fisheries

In the second half of I974, the Soviet fishery fleet worked mainly in the central part of the Subarea. Favourable meteorological and ice conditions allowed to conduct the fishery throughout all that period including December. The catches consisted of the Greenland halibut and the grenadier Macrurus rupestris, the total number of fish taken was I8247 tons (Table I).

B. Special scientific investigations

I. Environment

Observations for water temperature were accomplished at standard hydrological sections by some expeditional vessels. Data relating to the end of I974 are of a special interest as they allow to

Table 2. **Size** composition (%o) of the roundnose grenadier near the **Baffin Land in June - July,** I974.

Length (cm)	Males	Females	Total for males & females
39 - 4I	II	3	I4
42 - 44	II	9	20
45 - 47	25	8	33
48 - 50	50	I4	64
5I - 53	48	I8	66
54 - 56	56	I7	73
57 - 59	II8	45	I63
60 - 62	I02	24	I26
63 - 65	IOI	32	I33
66 - 68	9I	32	I23
69 - 7I	52	22	74
72 - 74	35	I8	53
75 - 77	23	I2	35
78 - 80	II	IO	2I
8I - 83	I	I	2
Relative number (%o)	735	265	I000
Mean length (cm)	60.59	6I.74	60.89
Number of specimens measured	II24	404	I528

judge at some extent on the temperature conditions in the next calendar year owing to the inertia of some hydrological processes.

In October 1974, water temperature was about the long - time average in the layer from 200 m up to the surface in the area of the section 8 - A crossing the Atlantic (Irminger) component of the West - Greenland Current between 58°40' N , 46°12° W and 59°25' N , 44°30' W , but, the temperature was much lower than that rate in the layer from 500 m up to 200 m to the surface (Table 3). In November 1974, the temperature anomaly, namely too cool water was also observed in the layer 500 - 700 m in the northern part of the Subarea at the hydrological section II - A, between 63° 44' N, 54°27' W and 64°01' N, 52°20' W. One can suppose that early in 1975 temperature in deep water layers remains lower than the long - term average everywhere in Subarea I.

Table 3. Water temperature (° C) in the Atlantic component of the West--Greenland Current in 1962 - 1974, section 8 - A.

Depth, m	1962	1963	1964	1966	1968	1970	1972	1974	Normal water temperature, 1962 - 1974
0 - 200	6,12	5,45	6,53	6,27	5,70	4,11	5,24	5,57	5,62
200 - 500	5,04	5,26	5,39	5,60	4,78	5,07	4,64	4,64	5,04

2. Biological investigations

Grenadier. In July 1974, the scouting BMRT accomplished a series of trawlings in the central part of the Subarea. The bottom trawl was usually towed at depths 650 - 800 m. The size composition of the grenadier is given in Table 4.

Table 4. Size compbsition (‰) of the grenadier in the area 64° - 65° N , 57° - 59° W, June I974.

Length (cm)	Males	Females	Total for males & females
30 - 32	-	I	I
33 - 35	2	I	3
36 - 38	7	3	I0
39 - 4I	I8	I0	28
42 - 44	4I	I8	59
45 - 47	53	3I	84
48 - 50	6I	30	9I
5I - 53	63	30	93
54 - 56	67	26	93
57 - 59	75	29	I04
60 - 62	35	35	I20
63 - 65	76	33	I09
66 - 68	5I	24	75
7I - 69	33	2I	54
72 - 74	23	I3	36
75 - 77	II	7	I8
78 - 80	7	5	I2
8I - 83	3	3	6
84 - 86	I	2	3
87 - 89	-	I	I
Relative number (‰)	677	323	I000
Mean length (cm)	57,23	57,69	57,38
Number of specimens measured	384I	I828	5669

American plaice. In January - April I974, as well as in the same months of the previous year, concentrations of the American plaice at the pre - spawning and spawning stage were keeping in the Div. I C. On those concentrations the scouting BMRT completbed more than one hundred trawlings with the further measurement of fish caught (Table 5).

Table 5. Size composition (%o) of the American plaice in Div. I C in January - March I974.

Length (cm)	January Males	January Females	January Males & females	February Males	February Females	February Males & females	March Males	March Females	March Males & females
I6 - I7	-	-	-	3	-	3	6	-	6
I8 - I9	5	-	5	24	-	24	35	I	36
20 - 2I	I9	-	I9	38	-	38	55	I	56
22 - 23	35	-	35	56	-	56	60	2	62
24 - 25	52	-	52	56	-	56	58	4	62
26 - 27	57	I	58	68	2	70	64	7	7I
28 - 29	66	4	70	49	5	54	30	I3	43
30 - 3I	34	I5	49	23	I9	42	I5	33	48
32 - 33	I9	52	7I	I0	62	72	9	85	94
34 - 35	5	II3	II8	2	I08	II0	3	I0I	I04
36 - 37	-	I45	I45	I	I80	I8I	I	I72	I73
38 - 39	-	I82	I82	-	I4I	I4I	-	I20	I20
40 - 4I	-	97	97	-	94	94	-	73	73
42 - 43	-	6I	6I	-	42	42	-	34	34
44 - 45	-	30	30	-	I3	I3	-	I3	I3
46 - 47	-	6	6	-	3	3	-	5	5
48 - 49	-	2	2	-	I	I	-	-	-
Relative number (%o)	292	708	I000	330	670	I000	336	664	I000
Mean length (cm)	26,58	37,74	34,48	24,96	37,II	33,I0	24,03	36,28	32,I7
Number of measured specimens	I497	3627	5I24	4808	9749	I4557	2092	4I39	623I

During the whole three months the pre - spawning and spawning American plaice were keeping in the same area without performing migrations at great distances. The largest catches were taken by the bottom trawl from the depth of I40 - I80 m. Almost all the individuals investigated had empty stomachs; sometimes, scarce benthos volume was found in their stomachs.

In April, the spawning of the American plaice was over and their concentrations were scattered.

It should be noted here that the concentrations of the American plaice (a cold - water fish) became much more dense than previously in Subarea I. At the same time, the Arctic - boreal fish, namely, cod decreased considerably in their number. Apparently, now is gradually developing the process reversed to that one observed 50 years ago, when the warming of water masses began off the West Greenland.

Tagging of commercial fish species.

In 1974, there were tagged 795 specimens of the American plaice and 100 ones of the Greenland halibut.

SUBAREA 2

A. Status of Fisheries

In 1974, the Soviet catch of fish in Subarea 2 was 130.629 tons (Table I), including 82801 tons of capelin, 24241 tons of cod, 6963 tons of Greenland halibut, 8340 tons of grenadier and 1290 tons of redfish. In January - February 1974, the cod fishery conducted near Labrador gave no rich catches, that was partially caused by the decrease in number of cod and the shortening of their biomass, besides that - by bad hydrological conditions, that did not favour the formation of dense and stable concentrations in the near - bottom layer. Ice conditions were very hard that forced the fishery fleet to leave the Labrador area in February.

In 1976, the commercial stock will be recruited by a very poor year - class, as all the recruitments entered the stock after 1963 are small in abundance (see below Table 10). The commercial stock will be mainly formed of 1966, 1967 and 1968 year - classes of fish at the age of 10, 9 and 8 year old. The abundance of cod of these year-classes continues to decrease due to the natural and commercial mortality. Therefore, in 1976 the efficiency of the cod trawl fishery will be low in Subarea 2.

B. Special scientific investigations

I. Environmental studies

Water temperature determined on I November at the standard hydrological section 8 - A, between 53° 40' N, 55° 44' W and 54°50' N , 53°32' W (part AB) was lower than the average one for the long - term period and lower than the temperature of the last year in every water layer. At the B part of the same section, between 54° 26' N , 54° I9' W and 54° 50' N and 53°32' W, water temperature in the layer 200 - 500 m was lower than that one for the long - term period as well, but somewhat higher than in the last year (Table 6).

Table 6. Water temperature (° C) at the 8 - A hydrographic section through Hamilton - Bank (as per November I) in 1964-1974.

Part of the hydrographic section	Depth (m)	I964	I965	1966	I967	I968	I969	I970	I97I	I972	I973	I974	Rate for I964-I974
A B	0 - 50	0,98	I.30	2.4I	2,00	2.29	0.82	I.29	0.88	0.35	I.00	0.93	I.29
A B	50 -200	-0.I8	I.06	I.44	0.89	0.I8	0.36	0.32	0.43	-0.39	0.59	0.07	0.40
A B	0 -200	0.I7	I.I3	I.72	I.I9	0.50	0.50	0.60	0.57	-0.I7	0.72	0.3I	0.66
B	200 -500	I.99	2.59	3.97	I.54	I.42	I.5I	2.32	I.44	I.26	I.4I	I.84	I.94

Negative anomalies of water temperature in Subarea 2 (as well as in Subarea I, see above) allow to assume that the I975 year will be cold. The decrease in temperature will continue apparently even in I976, the periodicity in the temperature fluctuations observed every four years at the section 8 - A testifies on this fact (Table 6).

Thus, for example, in the layer 50 - 200 m at the part AB the negative water temperature is observed once four years, namely, in I964, I968 and I972. Apparently the I976 year will be the next one when the negative temperature is expected.

2. Biological investigations

C o d . As it was already mentioned, the young year-classes of the Labrador cod stock, i.e. those of I969, I97I and I972 were represented by a relatively small number of specimens. Cod of I965, I966, I967 and I968 year - classes prevailed in their number. That fact may be confirmed by the age samples taken off the South Labrador in May I974 (Table 7). It should be noted here that the mean length was considerable enough in the age samples, more precisely - 55 cm. Just the same mean length was observed at mass measurements of cod when more than 4 thousand specimens were measured near the South Labrador in May I974.

Table 8 shows that the mean age and the mean weight of the Labrador cod are gradually increasing and, simultaneously, this fish species are decreased in their number during the last four years. All these changes may be caused by the same reason, namely, by the fact that the commercial stock is very slowly recruited by the cod of the young year - classes, therefore, it is gradually "growing old".

Redfish Sebastes mentella. Investigations conducted in the Labrador area (as well as in other northern areas) confirmed that the fish species inhabiting these areas is characterized by large sizes, very slow growth rate and a long life duration. Thus, in February I974, about 2 thousand specimens of Sebastes mentella taken by the bottom trawl at the depths of 300 - 570 m were measured near the South Labrador. The mean length of males appeared to be equal to 34.98 cm, that one for females - 38.0I cm. Fish at the age of 8 - I2 years prevailed in their number in the age samples, their length ranged from 27 cm up to 34 cm.

The second peak of the variation range was represented by the individuals at the age of I5 - I8 years, their length varied from 37 up to 45 cm, those fish prevailed by their weight in commercial catches. The maximum age for males was 20 years, for females - 25 years.

Tagging of commercial fish species. In I974, 3507 cod individuals and 625 Greenland halibut ones were tagged in the Labrador Subarea.

Table 7. Age composition (%o) and mean length of cod near the South Labrador in May I974 (599 specimens).

Year - class	Age (years)	Number of specimens (%o)	Mean length (cm)
I	2	3	4
I969	5	33	43.60
I968	6	I4I	48.67
I967	7	322	52.48
I968	8	202	55.69
I965	9	I36	59.37
I964	I0	65	64.6I
I963	II	47	66.68
I962	I2	33	69.85
I96I	I3	8	74.20
I960	I4	I0	73.50
I959	I5	-	-
I958	I6	3	73.00
I969 - I958	3 - I6	I000	55.73

Table 8. Mean age, mean weight and the average cod number in the catch per one hour trawling off the South Labrador in the first half of 1971, 1972, 1973 and 1974 years.

Year	Mean age (years)	Mean weight(grams)	Average number of specimens in the catch per BMRT hour hauling
1971	6.6	1086	2136
1972	7.3	1295	2115
1973	7.4	1203	2012
1974	7.7	1435	1700

SUBAREA 3

A. Status of Fisheries

In 1974, total Soviet catch taken by commercial fleet in Subarea 3 amounted to 418921 tons, including 128842 tons of capelin, 92179 tons of redfish, 114319 tons of cod, 22633 tons of grenadier, 34039 tons of flounder (Table 1). The mean catch per one hour haul throughout the year in Subarea 3 taken by Murmansk commercial BMRT was 2.0 , that was higher than that one in 1968, 1969, 1970 and 1971, but lower than in 1966, 1967, 1972 and 1973.

B. Special Scientific Investigations

1. Environment

In May 1974, water temperature of the north-eastern slope of the Grand Newfoundland Bank was lower than in the same period of the previous year, but, it appeared to be almost the same as in the anomally cold 1972 (Table 9). The lowest temperatures throughout the period of the last three years were registered in 1973 for the waters of the south-eastern slope of the Grand Bank.

Table 9. Anomalies of water temperature (° C) in the layer 0 - 200 m at the hydrological sections 7 - A, 6 - A, 4 - A and 3 - A (as per I5 May, I972 - I974).

Section	I972	I973	I974
I	2	3	4
7 - A	- I.03	- 0.44	- I.0I
6-A, part G	- I.I7	0.00	- 0.82
4 - A	- I.I2	- 2.80	- I.67
3-A	- 0.86	- 0.96	- 0.86

Note: Part G of the section 6 - A passes through the deep water gut lying between the Grand Bank and the Flemish Cap Bank (so - called "path of icebergs").

2. Biological investigations

Counting of the juvenile cod and haddock.

As in the previous years, the counting of the young cod and haddock was completed in I974 from board the research vessel "Persey II" in all the subdivisions of Subarea 3. Bottom trawl with the capron net inserted into the cod - end was used as the fish - counting gear, its mesh size was equal to 8 mm (i.e. the distance between two next lying knots). The duration of each trawling was equal to an hour, the areas of trawling were strictly kept in time of the fish counting trips from year to year.

The average catch of the young cod at the age of three full years taken in waters of the North Newfoundland Bank (Division 3 K) allows to assess the strength of year-classes of the Labrador cod stock (Table IO). It is clearly observed that the I966, I967 and I968 year-classes were succeeded by the poor ones. As it was said above, the abundance of the Labrador cod stock will be gradually decreasing in the nearest future, while the average weight of one specimen will be increasing.

In I970, I97I and I972, there were formed cod year - classes possessing the mean strength or that one slightly less than the mean strength in the southern part of Subarea 3 (Divisions 3 N, 3 O and 3 P). Thus, the abundance and the biomass of southern populations of cod will be apparently kept at the same level.

In I968, a very strong year-class of cod was observed in waters of Flemish Cap Bank. In I972, cod of this stock reached commercial sizes and ensured an extremely high volume of catch. In I972, cod of Flemish Cap Bank was taken successfully by the fleet of Portugal. The strength of I97I year-class was registered as a very high one as well, and the counting data of fish aged I + show that a very strong year-class appeared in I973. Therefore, cod stocks may considerably increase on Flemish Cap Bank in the nearest future. This stock is completely isolated from the neighbouring ones, and the growing cod will not leave the waters of Flemish Cap Bank.

The abundance of haddock is always very low in the southern part of Subarea 3 and no tendency is observed to the restoration of this species stock there. The last I973 year-class registered at the age I + should be considered as a poor one (Table II).

Total trawl survey. Simultaneously with counting of young cod and haddock, the total trawl survey was completed at the same areas, all this allowed to assess the abundance and the biomass of all bottom fish species including non-commercial ones. The survey of such a kind was conducted in summer period for the fourth time in succession. The comparison of the results obtained revealed some tendencies in the fluctuation of the abundance of some commercial fish species (Table I2). Thus, the Labrador cod decreases in abundance according to catches of this fish species taken in Divisions 3 K and 3 L. Vice versa, cod and redfish, *Sebastes mentella* increased considerably in number in waters of Flemish Cap. The abundance of the American plaice is fluctuated now and there is no quite clearly expressed tendency to the falling or the decreasing of this species. As to the yellowtail flounder, it decreases in number. At last, white hake was lowering in number throughout the period from I97I up to I973, but, there appeared some signs in I974 testifying on the rebuilding of the population.

Redfish (Sebastes mentella). In I963, I964 and I965, strong year - classes of redfish were registered in the waters of Flemish Cap Bank. The theory "the autoregulation of species" being admitted, one can say that the appearance of strong year-classes may be considered as the effect of an intense fishery, when the fish stock is thinned down. Presently, three strong year-classes mentioned above recruited the commercial stock of redfish on Flemish Cap Bank. Mean age and mean length of redfish became somewhat less as the juvenile fish recruited the stock, the peak size for this fish species ranged from 27 cm up to 30 cm (Table I3), the data may be compared to those ones given in the "USSR Research Report, I966".

Sebastes mentella inhabiting the southern Subdivisions 3 N, 3 O and 3 P possess the quality of the very rapid rebuilding

Table IO. Mean catch (number of fish) of young cod (age I - 3 full years) per one hour haul by control trawl, the Newfoundland Subarea.

Year - class	I year 3 K	3 L	3 M	3 N	3 O	3 P	2 years 3 K	3 L	3 M	3 N	3 O	3 P	3 years 3 K	3 L	3 M	3 N	3 O	3 P
I958																		
I959													2I	2I		8	I	4
I960							5	2		3	0	3	II	6		I	2	5
I96I	I	I		I	I	6	3	4		4	3	6	20	28	6	5	I	6
I962	I	I		I	7	42	2	5	8	8	2	7	I5	40	26	I8	2	I2
I963	I	2	0	I	I	3	I	8	5	5	I	I3	36	3I	I0	30	I	I7
I964	I	I	0	4I	24	3I	3	I5	I	I37	I3	22	6	46		73	42	58
I965	I	I	2	I	I	5	I	I		I4	I2	2I	I5	I2	6	23	20	25
I966	0	0		2	I5	7	3	8	0	27	I7	32	27	43	I0	37	34	28
I967	0	I		0	2	0	8	II	5	3	4	20	34	26	I4	32	I4	I0
I968	I	I	II	6	I8	40	7	48	76	I09	28	66	34	84	4I	9I	23	64
I969	I	3	0	2	4	I5	2	22	I	II	6	50	I3	43	I	26	I2	25
I970	0	I	0	6	I	6	I	5	0	24	3	9	6	6	I	2I	I0	3
I97I	0	0	I6	4	2	5	0	I	62	36	I5	6	2	8	2	58	8	7
I972	0	0	2	5	2	4	0	2	I8	9	8	47						
I973	0	0	2I9	0	2	II												

I8.

Table II. Mean catch (number of fish) of young haddock (age I - 3 full years) per one hour haul by control trawl the southern part of the Newfound - land Subarea.

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	I	I
I972	3	I25	I	4		
I973	2	7				

Table I2. Mean catch (number of fish) of some commercial fish species per one hour haul taken in the Newfoundland Subarea according to data of the total trawl survey, I97I - I974 .

Fish species	Year of survey	3 K	3 L	3 M	3 N	3 O	3 P
Cod	I97I	249	4II	77	226	44	I86
	I972	I58	205	66	I39	56	I45
	I973	4I	29	I08	I34	53	34
	I974	32	40	346	I85	30	93
Sebastes mentella	I97I	292	32	66	I298	2I4	I459
	I972	6I2	37	449	366	498	654
	I973	475	II3	434	645	884	884
	I974	796	3I4	3I4	733	560	2223
American plaice	I97I	94	778	64	333	360	334
	I972	74	5I6	4I	387	I67	2I3
	I973	I42	569	55	277	278	3I6
	I974	I77	67I	83	357	I58	284
Yellowtail flounder	I97I	-	2II	-	550	547	2I8
	I972	-	I26	-	326	I23	44
	I973	-	3I	-	206	I22	52
	I974	-	84	-	395	98	93
White hake	I97I	-	-	-	-	I30	6I
	I972	-	-	-	I	20	6
	I973	-	-	-	-	5	4
	I974	-	-	-	-	7	I6

their stock damaged by the fishery that may be explained by its relatively short life - cycle. The abundance of these populations of redfish is fluctuated and reveals no tendency to the decrease, that all ensures a constant high efficiency of the trawl fishery.

Ichthyoplankton studies. The catch of pelagic eggs and larvae of commercial fish species was completed in May - June five years running. The catch is conducted every year simultaneously with the hydrological observations at eight standard sections between 44° and 52° N. The cod eggs extruded in the Labrador area can be observed throughout all the area.

The results of treatment of all the samples collected showed that the average number of cod eggs per one vertical haul is fluctuated in different years from 2.9 up to I6.0 (Table I4). Let us suppose that the direct relationship may exist between the number of eggs developping and the strength of the Labrador cod year - class. In this case, in I974 the years - class strong enough may be formed in this area.

Capelin. To the end of May I974, the concentrations of the migrating adult capelin appeared in the area of their spawning, i. e. in the shallows of the south - eastern slope of the Grand Bank. The spawning began on I6 - 20 June, its peak was observed on 25 - 27 June. The age composition of capelin for that period is shown in Table I5.

The spawning being over, capelin migrated to the areas of feeding lying to the north. Throughout the period from August to October, capelin was intensively feeding on pelagic

Table I3. **Size composition (%o) of redfish *Sebastes mentella* on Flemish Cap Bank, March, February and April I974.**

Length (cm)	February Males	February Females	February Total for males and females	March Males	March Females	March Total for males and females	April Males	April Females	April Total for males and females
22	I		I						
23	5	2	7	2	I	3	I	I	2
24	I4	8	22	I3	7	20	4	2	6
25	34	2I	55	3I	I5	46	I6	9	25
26	54	30	84	48	27	75	25	2I	46
27	8I	40	I2I	92	46	I38	59	40	99
28	59	46	I05	99	69	I68	64	5I	II5
29	37	30	67	6I	47	I08	44	53	97
30	32	20	52	35	3I	66	36	47	83
3I	2I	I2	33	2I	I6	37	26	27	53
32	29	I4	43	24	I5	39	37	28	65
33	42	I6	58	26	I5	4I	54	23	77
34	53	I6	69	29	I7	46	38	24	62
35	38	25	63	23	I8	4I	32	32	64
36	23	22	45	I3	I8	3I	23	26	49
37	I7	3I	48	I3	26	39	I9	29	48
38	I0	39	49	9	29	38	9	35	44
39	3	29	32	7	20	27	3	2I	24
40		22	22	4	I3	I7	2	I8	20
4I		I2	I2	2	9	II		I0	I0
42		7	7		5	5		5	5
43		4	4		3	3		4	4
44		I	I		I	I		I	I
45								I	I
Relative number (%o)	553	447	I000	552	448	I000	492	508	I000
Mean length (cm)	30.08	32.62	3I.22	29.56	3I.67	30.5I	30.8I	32.46	3I.65
Number of individuales measured	3778	305I	6829	4485	3644	8I29	24I2	2490	4902

Table I4. Mean number of cod eggs per one vertical haul with eggs net at all the sections, I970 - I974.

Year	Dates of ichthyoplankton collections	Number of stations	Mean number of eggs per one haul
I970	6 - 25 May	84	8.2
I97I	5 May - 5 June	82	3.2
I972	I6 - 25 May	55	5.9
I973	I4 May - 23 June	II2	2.9
I974	I8 May - 6 June	7I	I6.0

Table I5. Age composition (%) of capelin in Subdivision 3 N, May - June I974.

Year class	Age (years)	May		June	
		Males	Females	Males	Females
I972	2	I	6	-	-
I97I	3	I22	I56	I90	I20
I970	4	200	I6I	232	I24
I969	5	I48	I89	I36	I77
I968	6	3	I4	2	I9
I972-I968	2-6	474	526	560	440
Number of specimens studied		679		49I	

crustacians in Subarea 3 K and 2 J . To the end of October the rate of fat condition for capelin reached 30%.

S U B A R E A   4.

A. Status of Fisheries

Silver hake. This fish species was successfully fished in the Sable Island area throughout the period from January up to October. In 1974, this fish species prevailed in number in the catches like it was in the previous years. The bulk of catches was made up by two year - classes, namely, that one of 1970, fish aged 2 - 29.3% and the year - class of 1971, fish aged 3 - 44.3%, see Table 16. The abundance indices testify to the fact that silver hake stocks increased in autumn 1974 in comparison to the same period in 1973 (Table 17). Therefore, one can expect that silver hake stocks will remain at the high level both in 1975 and 1976. The quota of 108 thousand tons was established to the USSR on silver hake inhabiting Subarea 4. Available silver hake stocks will allow to take this quota without any difficulties.

Table 16. Age composition of silver hake catches in Division 4 W, the Sable Island (%%).

Age	Years		
	1972	1973	1974
0	-	0.2	-
1	7.0	4.1	4.3
2	27.0	5.4	11.9
3	33.3	44.6	44.3
4	21.4	31.8	29.3
5	10.0	10.4	7.2
6	0.9	2.4	1.6
7	0.2	0.8	0.8
8	0.1	0.2	0.5
9	0.1	0.1	0.1
Total	100.0	100.0	100.0
Mean age	3.2	3.50	3.34

Table I7. Mean catch of silver hake for 30 min. trawling with trawl "Silver hake - 8I5" in the Emerald Deep, I972 - I974.

Years	I972	I973	I974
Number of specimens	963	873	I342

Herring. In I974, there were not observed commercial concentrations of herring in the area of Banquereau Bank. The catches taken by scouting vessels consisted mainly of individuals aged 3 to 6 years. In summer, herring of the Nova Scotia stock were taken in large number in the waters of Browns Bank. The bulk of catches made individuals with the body length of 27 - 34 cm and 4 - 6 years of age (see Table I8).

Table I8. Age composition of herring catches in Division 4 X (in %)

Years	Age							
	3	4	5	6	7	8	9	Total
I973	I6.2	75.I	7.5	0.8	0.4	-	-	I00.0
I974	0.3	9.6	64.6	25.0	0.3	0.I	0.I	I00.0

Argentine. In I974, the argentine fishery was not intense at all like in I973 as this fish species did not migrate out of limits of a zone introduced to 4 X during their spawning period. The bulk of catches taken in the waters of Browns Bank made individuals from 6 to I3 years of age and those taken on the Emerald Bank consisted mainly of fish aged 5 to I4 years (Table I9).

Taking into account the fact that a complex age structure is proper to argentine and that the fishery of this fish was not intense during the last years, one can suppose that the argentine stocks will keep their previous level even in I975 and I976.

Table I9. Age composition of argentine in Subarea 4, %.

Age	I972	I973	I974	I973	I974
	Browns			Emerald	
I	2	3	4	5	6
I	–	–	–	0.I	–
2	–	–	–	I5.5	–
3	–	–	0.2	I9.6	–
4	–	0.6	0.7	36.0	–
5	–	0.3	2.0	5.8	7.6
6	–	I.7	I4.3	0.8	I7.4
7	2.I	3.7	I2.77	I.0	II.6
8	I2.I	I6.6	I0.9	8.0	8.8
9	I7.8	34.4	6.6	7.9	4.6
I0	25.5	24.5	2.9	4.4	I.6
II	27.4	I2.7	I0.5	0.8	6.4
I2	9.I	3.5	I8.2	0.I	I6.8
I3	4.6	I.7	I0.9	–	I5.8
I4	I.I	0.2	4.8	–	7.I
I5	0.3	0.I	3.7	–	2.2
I6	–	–	I.5	–	0.I
I7	–	–	0.I	–	–
Mean age	9.97	9.98	4.78	4.97	9.63

B. Special investigations

Oceanography. In 1974, special investigations of the long - term fluctuations in the heating background proper to shelf waters were continued. The picture of the heating background may be represented by comparing the indices characterizing depth at which the 5° C isotherm is passing in the waters of the Emerald Bank (Fig. I a), the minimum temperature of the cold intermediate layer at the Halifax section (Fig. I b) and the minimum temperature of that one in Eastern Channel (Fig. I c). Those indices studied in their development throughout many years (Fig. I) show to the existence of a relative warming and cooling of shelf waters in the Nova Scotia and New England areas.

Thus, the I962 and I963 years were relatively warm, the period from I964 up to I966 was that one of a relative cooling, and in I967 some warming of water masses was firstly registered and it continues there nowadays, but data obtained allow us to suppose that the period of water masses warming will be ceased soon for the Nova Scotia area (Fig. I a, b) and will yet be continued in the New England area (Fig. I c).

S U B A R E A 5

A. Status of Fisheries

Mackerel. Early in the year, mackerel was caught in the Southern New England and in the Norfolk Area. In April, the catch of the migrating mackerel was conducted in the southern part of Georges Bank. In summer, the concentrations of this fish were mainly fished on Georges Bank. The individuals aged from 2 to 7 years were found in the catches. The year - class of I97I prevailed in the catches,it made 29.3% (Table 20).

Herring. The herring fishery was conducted from April up to October. In April, the vessels conducted the fishery near Nantucket, in May - in the north-east and north-west of Georges Bank. In June - August, herring was fished within the area from the eastern up to the western part of Georges Bank, and in September - October it was conducted in its northern part. Herring was represented in catches by the specimens aged 2 to 8 years, and the rich 1970 year - class prevailed in catches, it made up to 80% of catches on the average.

Table 20. Age composition of mackerel in the New England Area, in %x/.

Age	Years		
	1972	1973	1974
0	0.3	-	-
1	1.7	3.7	2.8
2	9.4	8.1	19.6
3	29.8	21.5	29.3
4	22.2	25.9	8.7
5	28.4	16.1	10.9
6	5.8	20.4	11.8
7	1.0	3.0	12.4
8	0.4	0.7	3.1
9	0.8	0.3	0.7
10	0.2	0.2	0.2
11		0.1	0.2
12			0.2
Total Mean age	3.9	4.2	4.1

x/ Age composition is represented according to data submitted by the USSR, Poland, GDR and Bulgaria.

Silver hake in habiting Subareas 5 and 6 is represented by two stocks (the Georges Bank stock - 5 Z e and the Southern New England stock - 5 Z w + 6). The first stock was intensively fished in spring and summer. The second stock was not exploited intensively owing to a number of limitations to fishery.

In 1974, the bulk of catches on Georges Bank made individuals with body length from 27 cm up to 35 cm, at the age from 3 to 5 years, their share made 82.5% in the total catch (Table 21).

Table 21. Age composition of silver hake in Subareas 5 and 6 in %%.

Age	Georges Bank			Southern New England		
	1972	1973	1974	1972	1973	1974
1	-	0.3	3.6	-	-	4.2
2	-	2.6	7.5	-	-	3.2
3	11.7	44.2	30.4	22.8	1.1	21.4
4	42.2	35.5	35.7	54.4	22.3	32.5
5	21.0	9.8	16.4	20.3	42.9	21.3
6	8.8	3.1	3.7	2.5	17.2	10.2
7	8.5	2.3	1.6	-	14.8	3.8
8	3.6	1.5	0.7	-	0.9	1.8
9	1.4	0.5	0.2	-	0.7	1.2
10	1.7	0.1	+	-	0.1	0.2
11	1.1	0.1	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0
Mean age	4.92	3.82	3.76	4.03	5.28	4.27

Fish of 3 through 5 years prevailed in number in the Southern New England as well (75.4%). The results of trawl survey completed in autumn 1974 showed that this fish species slightly decreased in number on Georges Bank and considerably reduced in the Southern New England (Table 22).

Table 22. Indices of silver hake abundance (catches for 30 min, trawling in pounds).

Area	Years			
	I971	I972	I973	I974
Georges Bank	2.9	5.4	4.6	3.I
Southern New England	I0.0	8.0	7.2	2.7

Red hake. This fish species was exploited on Georges Bank throughout the spring period up to October. In the Southern New England the fishery was conducted only in the first half of the year and was not intense. Fish at the age of 2 - 5 prevailed in the catches taken on Georges Bank, those aged 2 through 4 - in the catches taken to the west of the Bank area (Table 23). Data of trawl survey of this year showed to a sharp decrease of the red hake stock in the Southern New England. The abundance of red hake remained at the level of the previous year on Georges Bank. In I976, the quota equal to 26 thousand tons may be established to fish on Georges Bank owing to some increase in red hake stocks.

Table 23. Age composition of red hake catches, the New England area, in %%

Age	Georges Bank			Southern New England		
	I972	I973	I974	I972	I973	I974
I	-	-	-	-	-	0.3
2	I3.4	5.7	II.0	49.0	3.5	35.7
3	40.6	2I.9	23.9	36.2	I7.3	29.5
4	23.0	44.I	37.0	I2.5	40.9	26.6
5	II.8	I5.5	I5.7	I.9	I9.9	2.9
6	6.5	7.4	6.3	0.4	8.4	3.5
7	3.9	4.2	4.9	-	5.7	I.2
8	0.6	I.7	0.9	-	4.0	0.3
9	0.2	0.I	0.3	-	0.3	-
Total	I00.0	I00.0	I00.0	I00.0	I00.0	I00.0
Mean age	3.72	4.I8	4.02	2.68	4.47	3.I3

Squids. In I974, the commercial concentrations of squids were observed during the period from May up to the autumn. Concentrations of shortfin squids were not stable. Therefore, this year the conditions of their fishery were worse than in I972 and I973.

In the summer period the bulk of catches was made up by shortfin squids of from 6 cm up to 25 cm in length, their mean length was I9 cm - 20 cm, and in the autumn period these squids were from I5 cm up to 28 cm in length, their mean length was equal to 20 cm - 22 cm.

The squids stocks were exploited not so intensively. The possible annual catch may be more than IOO thousand tons in Subareas of Nova Scotia, New England and Norfolk according to data of trawl surveys.

B. Special investigations

I. Environment

Oceanography. Basing on calculations of data obtained as the result of seven oceanographic surveys of I972 and I973 covering the summer - autumn seasons, the principal scheme of the geostrophic circulation was obtaihed for the area of Georges Bank (Fig. 2). The scheme given here represents the stationary and the quasistationary cycles of water typical for the summer and autumn periods, and the upwelling areas are designated as I on the scheme and the areas of the sinking water mass as 2. Stationary upwelling areas are registered in the Eastern and Southern Channels and the areas of sinking water mass - in the central part of the Bank and the Nantucket shallows. Quasistationary areas of the up welling water mass are found along the southern slopes of the Bank in June - July, and some later, in August - September these areas are formed along the northern slopes. It should be noted here that these areas are formed in the spawning grounds of silver hake, red hake and herring, and the formation of these areas coincides in time with the spawning period of fish species mentioned above.

Hydrochemistry. In 1974, the collection of samples used for determination of biogen content was continued in August and October. The samples were taken from board SRTM - 8015 and RTM "Belogorsk" in time of performing the ecological surveys. Samples taken in 1973 are completely treated and analysed to the present moment. In August 1973, phosphate content in the waters of Georges Bank fluctuated in the surface layers within the range from 0.5 up to 1.0 mkg atom per litre. In October, the phosphate content decreased and made 0.2 - 0.5 mkg atom per litre. The phosphates are brought to Georges Bank with Gulf Stream waters, besides, those matters appear as the result of atmospheric processes.

In August 1973 the nitrite concentration in the surface layer was equal to the analytical zero and in October it made 0.2 - 0.3 mkg atom per litre.

In August, the nitrate content in the surface waters of Georges Bank was equal to 2 - 3 mkg atom per litre, in October it fluctuated from 0.5 up to 0.3 mkg atom per litre.

The silicon was observed in a great volume in the surface water layers of Georges Bank.

The analysis of the content of the biogen elements in 1973 confirmed the conclusion made by Riley and others on a greater limit role of nitrates on primary production in comparison to the other biogen elements.

Zooplankton. In 1974, the collection of zooplankton samples was continued on board R/V "Chronometer", SRTM - 8015 and "Belogorsk". 540 zooplankton samples collected in 1972, 1973 and partially in 1974 were treated in the laboratory conditions. Presently, maps of seasonal distribution of seston and of feeding zooplankton forms are almost completed, data for the period 1962-1973 were used in the maps. The results of 1962 - 1973 investigations were used there.

Ichthyoplankton. In 1974, standard observations for the distribution and the number of eggs and larvae for silver hake and red hake were continued, that was done on board SRTM - 8015 in July, August and early in September. In October the counting of herring larvae was made on board RTM "Belogorsk" according to the International Program. The first collection of ichthyoplankton samples was performed on board the R/V "Chronometer" in February and March of the current year.

The samples taken in 1973 and 1974 were treated in laboratory conditions. The analysis of data obtained will be completed after the collections will be finally treated in the beginning of 1975.

Studies of nutrition of herring, silver hake and red hake larvae

In 1974 the treatment of silver hake, red hake and herring larvae was continued. In total, 161 specimens of silver hake larvae and 195 of red hake ones collected in summer 1973 were treated. The content of intestines of herring larvae was analysed to 1965 specimens collected in autumn 1972 and 1973. As result, one can make the conclusions as follows: in July and August herring larvae were mainly fed on copepodites, and red hake larvae fed on nauplia and Gladocera. Copepodites prevailed in number in the food taken by herring larvae. In 1972 the intensity of feeding of these three species larvae was lower than in 1972.

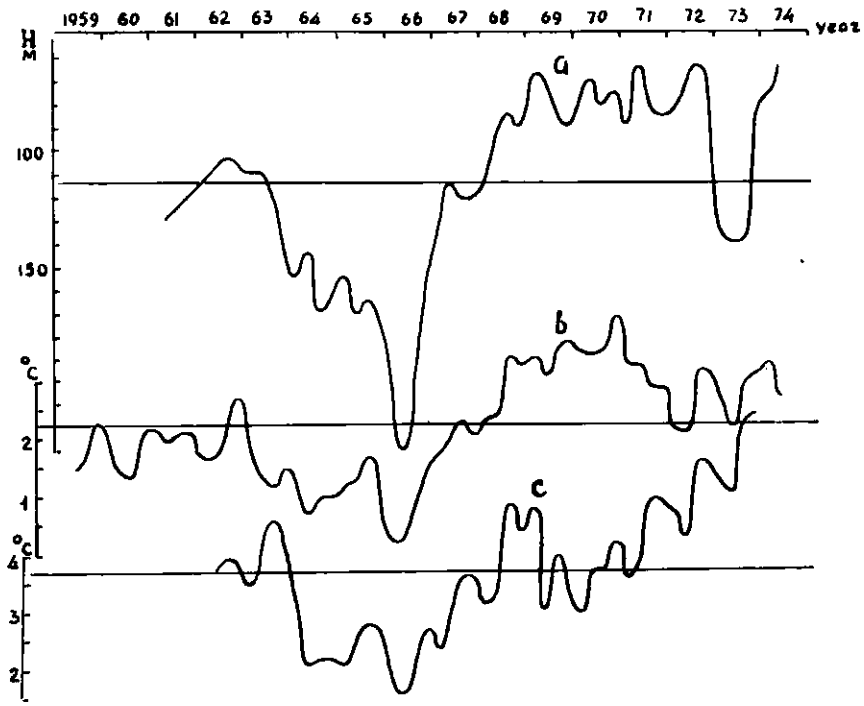

Fig. I. Fluctuation curves of the indices characterising the heating background of waters in the Nova Scotia and New England areas for the period from 1959 up to 1974.

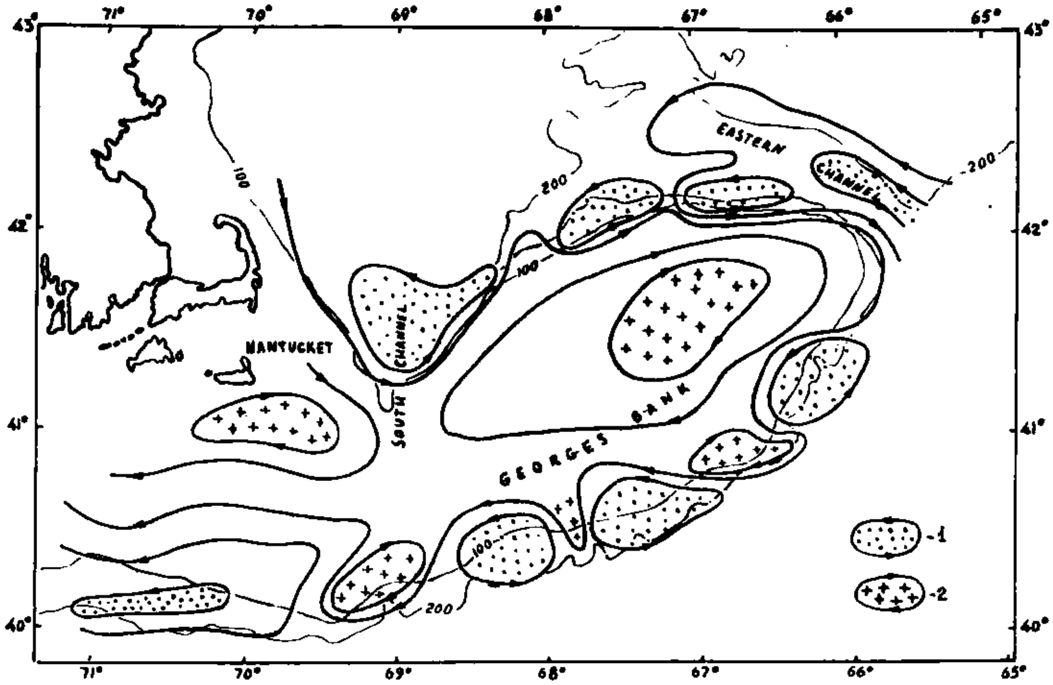

Fig. 2. Principal scheme of the geostrophic circulation in the Georges Bank area for the summer- autumn period.