RESTRICTED

INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

Serial No. 1656
(D. a. 65)

ICNAF Res. Doc. 66-39

ANNUAL MEETING - JUNE 1966

USSR Research Report, 1965

by K. G. Konstantinov and A. S. Noskov

The total catch obtained by the USSR fleet in the ICNAF area in I965 was 853,097 metric tons (Table I) which was 235,784 tons higher than in I964.

The increase in catches may be attributed to an increase both in the total fishing effort and the efficiency of fishery.

The catches of silver hake were, as previously, dominant in catches (39.3% in I964 and 38.8% in I965).

The catches of redhake, haddock, redfish and flounders increased, whereas catches of herring declined. The catches of cod and argentine remained approximately on the same level.

The share of other fish species was insignificant in the total catch.

Table I.

Species composition of USSR catches in the Convention Area, I965.

Species	tons	percentage
Herring	42,295	5.0
Argentine	I5,064	I.8
Cod	I49,02I	I7.5
Haddock	I28,756	I5.0
Pollock (saithe)	3,07I	0.4
Silver hake	33I,4I8	38.8
Red hake	67,97I	8.0
Redfish	63,3I8	7.4
Wolffish	2,288	0.3
Mackerel	2,862	0.3
Flounders	25,285	3.0
Halibut	I,I9I	0.I
Other and unidentified species	20,557	2.4
Total	853.097	I00.0

SUBAREA I

A. Status of Fisheries

In January, one Soviet trawler fished in Subarea I, mainly in Division I C. Besides, some research and scouting vessels operated in Subarea I.

The total catch of groundfish was I.456 tons including I.25I tons of cod.

B. RESEARCH WORK

I. Environmental studies

Oceanography. In Subarea I research vessels conducted investigations in June, July, August and December (see the Table below). Along with standard sections, R/S "Sevastopol" accomplished hydrological observations in different points, mainly before the trawling operations started.

Name of research vessel	Month	Number of standard sections	sections code numbers	object of investigation
"Topseda"	July	5	8-A, I4-A, I3-A, II-A IO-A	t, S, O_2, P
"Topseda"	July	4	8-A, I4-A, I3-A	t, S, O_2, P
"Sevastopol"	August	-	-	t, S, O_2, P
"Sevastopol"	December	2	II-A, IO-A	t, S, O_2, P

In May-June I965, cold Arctic air penetrated Subarea I from the Canadian coast, thus negative anomalies of air temperature reached I-2°. In other months an active cyclonic activity was typical for Subarea I; warm air masses were driven in from the South of Atlantic. This process was especially intensive in January, February and March, when a positive anomaly of air temperature was 8-II° (in December up to 6°).

In intensive influx of warm Atlantic waters started in November I965 and water temperature in layers from 0

to 50, 0 to 200 and 200 to 500 meters became I-I.5° higher than in previous years. Heat advection and intensive solar radiation gave rise to an early warming of the surface layer of the sea in the first half of I965. In May water temperature in the layer 0-50 m in the area between Lille and Store Hellefiske Banks was 0.3° - 0.5° higher than in May I960 and I964, but it was 0.7° lower than in a very warm year I96I. For the years mentioned, similar differences, even more distinct, were observed in the layer of 0 - 200 m.

In May I965, the water temperature in the layer of 200-500 m was the same as in May I960, but it was 0.2 - 0.8° higher than in May I96I and I964. In June I965, the water temperature of an Atlantic component of the West-Greenland Current in the layer of 200-500 m was 4.3 - 4.8°, i.e. 0.3 - 0.9° higher as compared with I96I-I962.

In July I965, a very intensive warming of water layer of 0-50 m was observed to the north of Lille Hellefiske Bank; the temperature of water became I.5-2.0° higher than in June.

In some areas, the surface water temperature rose up to 5.5°. The water temperature below I° was no more observed within the shallow area of the Bank.

In the second half of the year, a very rapid decrease in temperature was observed within the surface water layers. In December I965, the water temperature in the layer of 0-50 m along the section to the north of Lille Hellefiske Bank was 0.8° below than in December I964, and 0.3° higher, than in the cold year, I963. But, in December I965 the water temperature in the layer of 200-500 m remained 0.2° higher than in December I964 and 0.5 higher than in December I963.

II. Biological studies

Cod. In January and early in February fishing and fish-finding operations were carried out on Banan and Fyllas

Banks, where cod occured throughout a large area at depths from I00 to 280 m.

The most dense concentrations were found on the western and south-western slopes of Banan Bank. Cod of 55-65 cm in length prevailed.

Cod 40-55 cm long was usually observed in great numbers at lesser depths (I00-I50 m).

Individual catches of the Soviet large stern trawler made 8-I0 tons, but ordinary hauls usually gave 2-5 tons. Continuous local displacements of cod were observed within that area and fish did not stay on a fishing ground more than two or three days. Vertical migrations of cod (of diurnal nature too) were very pronounced. The catches with bottom trawl were most efficient from 5 p.m. to I0 a.m. The finding devices recorded cod concentrations within the layer from 20 to 25 m off the bottom with the thickness of schools being about 50 m. Sand launce was a basic food component for cod.

In August dense concentrations of cod were not discovered. Catches taken with trawl from the "Sevastopol" on the northern and southern banks gave not more than 300-500 kg mainly (45-65 cm long).

In December scarce concentrations of cod, mainly 48-58 cm long, were discovered by "Sevastopol" near Cape Farewell; the catches made 500 kg per haul. Somewhat northward, on Banan Bank, the catches amounted to one ton per haul. Cod occured through a large area and formed the most dense concentrations along the slopes of Bank, at depths of I80-280 m.

As a whole, 4- and- 5-year-olds were dominant in the catches obtained in I965, i.e. it was cod of I96I and I960 year-classes. In the beginning of I965, the bulk of catches consisted of five year old fish 55,5 cm in length, and in the second half of the year there were mostly 4 years old, 56-6I cm long.

It should be noted, that in the end I965 the 4-year-old cod on Lille Hellefiske and Banan Banks was larger in size (58-6I cm) than cod of the same age on Danas Bank (56 cm). It gives the reason to believe that in summer I965 the feeding conditions in the northern areas were more favourable.

Tagging. In I965, 29 specimens of cod tagged by Soviet ichthyologists in I962-I964 were captured by fishermen of Iceland, England, Danemark, Norway, Federal Republic of Germany and France. Polyethylene hydrostatic tags of ampoule type were applied. It is interesting to note that 7 specimens of tagged cod were recaptured near the shore of Iceland. All these fishes were over 80 cm in length and obviously approached the Icelandic coasts for spawning. I9 specimens were caught on different banks off West Greenland; the positions of recapture of one specimen remains unknown. The route of migration of other two specimen are of great interest.

Tagged				Tag code number	Recaptured		
Date	Latitude N	longitude W	length (cm) of cod		Date	Area	length (cm) of cod
I7 December I963	63°30'	52°20'	48	37072	July I965	Grand Newfoundland Bank	63
I0 July I963	62°36'	5I°50'	75	27II5	February I965	Labrador	78

The positions of recapture of these two specimens are not quite precise; and the quoted length of the latter specimen is obviously less than its real length at the moment of recapture (perhaps it is a length up to the candal fork, whereas the Soviet ichthyologists registre the total maximum length). But, it cannot detract the possibility that some cod specimens could make migrations from Greenland to the North American Continent.

Subareas 2 and 3

A. Status of Fisheries

A total of 210.993 tons of fish (mainly cod) were taken in Subareas 2 and 3. The main fishing areas were 2 J in January-May, 3 L in July - August, 3 M in June and November - December, and 2H in December.

B. Research work

I. Environmental studies

Oceanography. In winter 1964-1965, the water temperature near Labrador and Newfoundland remained below the average level recorded for many years. In January 1965 the off-bottom waters with negative temperature penetrated together with the Coastal Branch of the Labrador Current to the south, up to 45° N, whereas, in January of a very cold 1963 this penetration reached 45°30' N.

In January 1965, cold waters penetrated with the Main branch of the Labrador Current to the south-east, up to 48° W, while in January 1963 - up to 49° W only.

However in summer and autumn 1965 a Polar Canadian and Labrador Currents became weaker.

The mentioned process as well as an intense sun heating led to considerable warming of water masses in Subareas 2 and 3. Thus, for example, at a series of stations along the section 7A the water temperature in a layer of 0-75 m in September, 1965 was higher than in September 1964. In deeper waters, in the layer of 150 m, the temperature in 1965 remained below than in 1964.

(see Table)

Depth (m)	47°00' N 49°30' W		47°20' N 48°55' W		47°36' N 48°30' W	
	I964	I965	I964	I965	I964	I965
0	9.38	II.84	7.I4	8.65	7.58	8.3I
I0	9.2I	-	7.02	-	7.03	-
20	9.I3	II.65	6.46	8.56	6.48	2.62
30	8.98	II.76	5.40	8.02	2.33	I.50
50	0.43	2.06	-I.28	5.45	-0.92	-0.30
75	-0.I4	0.50	-I.0I	0.73	-I.00	-0.84
I00	-	-	-0.86	-0.I8	-0.34	-0.89
I50	-	-	0.02	-0.I0	0.38	-0.I0

However, in December I965 - January I966 the water temperature in deeper layers was higher than in previous years. Thus, for instance, on I2th January I966 a series of I3 stations was taken in the Division 3K (between points 50°40'N, 55°00' W and 52°00' N, 50°I5' W. In the layer of 200-500 m, an average water temperature appeared to be 0.78° higher than in January, I962.

In winter I965-I966 on the south-western and southern slopes, of the Grand Bank the water temperature of all layers was I°-2° higher than in moderate winter I96I-I962.

It could be suggested that the North-Atlantic Current usually moving to south of the Grand Bank, in I965 was not so strong. As a result Corioli force which caused the deviation of the current to the right has become weaker; warm waters moved in more left direction and reached the slopes of the Grand Bank.

Further, the inflow of warm waters to the north of Europe has decreased, particularly, to the Barents Sea (where winter was extremely severe), and consequently there was observed some decrease in compensatory driven away of Arctic waters with East-Greenland and Canadian - Polar Currents. This fact caused, in its turn, higher water temperatures near Labrador, and some shifting of the ice

fringe further to the north, as well as to some changes in the pattern of distribution of fishes.

Plankton. Plankton samplings were taken almost everywhere in Subareas 2 and 3, but they are not yet completely treated. Nevertheless one can come to some conclusions regarding plankton distributed off the Flemish Cap Bank. There it was possible to observe the second generation of Copepoda. In the middle of July a great number of eggs and nauplii were found in plankton samples. In the beginning of August, the specimens at third to fith stages of development predominated in the population of Copepoda and, earlier stages were not practically found.

Since the end of February, the abundance of larvae of Ophiopluteus ramosus was characteristic of the plankton of Flemish Cap Bank. The observations conducted showed that their mass settling took place in the second half of July.

Assessment of young cod. During the last five years the assessment of young cod is carried out in winter time. Trawlings of one hour duration were performed by conventional bottom trawl with a fine meshed screen inserted into the cod end. Data obtained in winter 1965-66 together with evidence collected earlier are set out in Table 2. One can conclude, that there was no possibility to make the assessment of young cod every winter in Subarea 2 (sometimes heavy ice condition hampered this process).

The last cruise, from December 1965 through February 1966, was made in extremely favourable ice conditions, and assessment of young cod was completed for all Divisions of Subareas 2 and 3. The estimation of young cod stocks of Labrador population is of particular interest.

The catches of 2-3 year old cod in Division 3K were always rather big (egg and larvae are brought in with the Labrador Current from the spawning grounds located in Subarea 2).

Table 2 showed a feeble fluctuation in the average catch of the young per hour of trawling in Division 3K by separate years. The highest catch was obtained only in winter I965/66, because for the first time it was possible to investigate a coastal area of Division 3K which was previously covered with ice during the winter period. In winter I965-66 the average catch will consist of 43 specimens (provided that only the young caught outside the coastal area are taken into account).

Table 2

Average catch of young cod (up to 35 cm long) per hour of trawling in Subareas 2 and 3.

Years \ Divisions	2A	2H	2J	3K	3L	3M	3N	3O	3P
I96I/62	-	-	60	38	26	I5	I3	2	I5
I962/63	7	29	I08	3I	25	49	7	I2	85
I963/64	-	-	-	34	44	7	I3	4	I7
I964/65	-	-	-	4I	6I	25	68	29	56
I965/66	20	96	I68	65	72	I5	I73	I5	46

It can be suggested that the recruitment of the Labrador population is going on at a permanent level every year.

This conclusion is also confirmed by data set forth in Table 3, where the number of young cod of different ages is shown. for four years.

As seen from the Table, the number of counted fingerlings did not rise over I for the four year period; the number of specimens at the age of I+ varied from 2 to 5 , at the age of 3+ - from I0 to 47. It can be stated for comparison that the fluctuations in the number of the young cod in the southern part of the Barents Sea during the same period are more considerable, (so they are: at 0 + from 3 to 74; at I+ from 3 to I0; at 2+ from 2 to I8; at 3+ from I to I9. Thus, fluctuations of the

Labrador cod are not so noticeable than that in the case of Barents Sea cod.

The following regularity is easily traced in Divisions 2G, 2H, 2J, 3K: larger specimens of the young cod are found in the northern part of the area and smaller ones in the southern area (Table 4).

This fact can be explained by a gradual movement of the young cod to the north, following its growth rate and development.

Table 4 shows also that the larger specimens of young cod inhabit deeper layers.

In the southern part of Subarea 3 (Divisions 3N, 3O, 3P), the number of young cod of different year-classes fluctuated very pronouncedly.

Table 3

The average catch of young cod of different year-classes per hour of trawling in Division 3K

Age	Year-classes						
	I958	I959	I960	I96I	I962	I963	I964
0 +				I	I	I	I
I +			5	3	5	2	
2 +		2I	II	2I	3I		
3 +	I0	I5	I5	47			

Thus, in winter I964/65 the specimens at the age of 0+ (I964 year-class) dominated in Division 3N, and almost none of individuals at the age of I+ were found; after the year elapsed, the individuals at the age of 0+ were not practically observed in winter I965/66, and the bulk of the catch was constituted by individuals at the of age I+.

Tagging. In I965, 865I specimens of bottom fish mostly cod were tagged in Subareas 2 and 3. The greatest number of fishes (5302 specimens) were tagged in Division 2J, close

Table 4 The catch of young cod per hour of trawling and an average length of fish at different depths

Depth (m)	Division 2G		Division 2H		Division 2J		Division 3K	
	catch per hour of trawling	length (cm)	catch per hour of trawling	length (cm)	catch per hour of trawling	length (cm)	catch per hour of trawling	length (cm)
101-150	-	-	4	23,4	-	-	-	-
151-200	-	-	-	-	188	28.5	280	25.7
201-250	3	28.3	144	30.4	290	29.5	102	27.5
251-300	28	31.1	276	31.2	81	29.1	68	27.6
301-350	73	33.0	-	-	81	29.1	40	28.6
351-400	-	-	-	-	18	31.5	15	28.3
At all depths	20	31.6	96	31.0	168	29.4	65	27.4

to the oceanic slope, where the concentrations of cod at pre-spawning, spawning and after-spawning stages were fished.

The particulars of recaptures of fish tagged and released in I96I-I965, are tabulated below.

Year of tagging	Recaptured in I965										
	USSR	Canada	England	Spain	German Democrat. Republ.	Federal Republ. of Germany	Portugal	Norway	Poland	France	Total
I96I	2	I	-	-	-	-	-	-	-	-	3
I962	-	2	-	-	-	-	-	-	-	-	2
I963	3	9	2	4	3	2	I	-	-	-	24
I964	7	50	8	7	I2	6	2	3	I	I	97
I965	I3	69	8	5	-	I	I	-	I	-	98
Total	25	I3I	I8	I6	I5	9	4	3	2	I	224

Cod bearing the Soviet tags was caught as a rule by Canadian fishermen, fishing in summer period off Newfoundland and Labrador.

It is interesting to analyze the route covered by one tagged cod, which was released at coordinates of 58°3I'IN and 59°39'9W on April 5, and caught in the point of 54°I3'N and 54°25'W on May 25. The fish covered about 300 miles in the course of 50 days journey mainly within the stream of course.

In I965, 559 specimens of cod were tagged in Division 3M. Data on movements of some specimens are shown in the Table below.

Marked				Caught		
Date	Latitude N	longitude W	length of fish (cm)	Date	Latitude N	longitude W
February 27	46°38'8	46°06'8	53	May 5	46°50'	45°45'
28	46°34'3	45°47'4	72	June I0	46'4I'	45°33'
28	46°34'3	45°47'4	75	August 5	46'30'	45°I5'
28	46°34'3	45°47'4	56	June 2	46°50'	45°45'
27	46°39'8	46°I3'9	60	May 30	47°58'	45°05'
28	46°34'3	45°47'4	55	June I	46°50'	46°I5'

These data as well as the results of tagging of previous years confirm the fact of isolation of cod population on Flemish Cap Bank.

Cod never cross the way of icebergs, from Flemish Cap Bank to the Grand Bank and backward.

In I965 in Subareas 2 and 3, the Soviet fishing vessels caught I2 cod specimens bearing Canadian tags and 4 specimens with Danish tags.

Haddock. Throughout the year, no dense concentrations of haddock were found in Divisions 3N and 30.

The individuals of I96I and I962 year-classes were dominant in catches of research vessels. I963 and I964 year-classes according to assessment data were very poor.

The otolith structure and vertebrae count and some other factors provide the ground to believe that haddock of the Saint-Pierre Bank population prevailed in Divisions 30 and 3N.

Thus, haddock can migrate in great number from the Saint-Pierre Bank further to the east, up to the boundaries of the south-eastern slope of the Grand Bank, crossing on their way the Coastal Branch of the Labrador Current.

Subarea 4

A. Status of Fisheries

Silver hake.

In I965 a further decrease in USSR catches of silver hake was observed in Subarea 4. The catches dropped from I23.0 thousand tons in I963 and 8I.I thousand tons in I964 to 50 thousand tons in I965.

The reduction in silver hake catches can be explained by decline in the availability and, partially, by unfavourable hydrological conditions which hampered the formation of sustained commercial concentrations.

From the beginning of I965 to May silver hake concentrations were of no commercial importance.

A fishable concentration of silver hake was discovered only in May, on the slopes of the shelf, to the south-west of Sable Island, where an inflow of warm waters (having off-bottom temperature of about 8.5°) was observed. Catches of BMRT per hour of trawling gave rather good results for this period (3.3 tons at an average).

Towards the end of May the intensity of inflow of warm waters fell and hake concentrations dispersed.

In June the concentrations of silver hake again were not found. In July individual catches of silver hake from BMRT made up to 2-2.5 tons per hour of trawling in the shallow waters of Sable Island at depths of 25 to 60 m.However, silver hake was taken as by-catch in fishing for haddock, cod and flounder.

The catches by BMRT (in tons) per hour of trawling for the period from May through August, I963,I964 and I965 are tabulated ~~XX~~ below.

Months / Years	V	VI	VII	VIII
I963	3.4I	4.I8	3.72	3.42
I964	3.38	2.74	3.70	3.75
I965	3.29	2.I8	2.00	2.00

These data show that in I965, the catches by BMRT per hour of trawling decreased which is an evidence of decline in silver hake stocks off Nova Scotia. But the general abundance of silver hake decreased much more than catches per hour of trawling, because judging from distribution of fishing fleets one can see that area of silver hake concentrations became several times less. Apparently, further decline in stocks and catches of silver hake may be expected in the near future.

Haddock. The USSR catches of haddock in Subarea 4 rose from 5.5 thousand tons in I964 to 45.5 thousand tons in I965. The increase in haddock catches in I965 can be attributed to considerable growing of density and magnitude of haddock stocks on one hand and decline in silver hake stocks on the other hand. So, vessels switched over to haddock fishery, which was carried out in the second half of the year, when silver hake was no longer fished on Georges Bank.

The catches of haddock were taken mainly in the shallow waters of Sable Island at depths from 30 to 60 m. Cod and flounder were taken together with haddock.

An incidental fishery of argentine, silver hake, pollock and redfish was conducted throughout the whole slope of the shelf, especially on the southern slopes of Browns and Lakhov have Banks.

B. Special Research Studies

Hydrography. In I965 hydrological investigations were continued in the area of the Nova Scotian shelf and Georges Bank. Six research and exploratory vessels took part in oceanographic work ; they made observations along the standard sections once during a season. The locations of stations on standard sections in Division 5Z, 4X and 4W are shown on Fig. I.

The results of observations of the water temperature in Divisions 4X and 4W showed that cooling which began in I963 still continued even in I965.

Slow rise in temperature was observed from the beginning of I965 till spring and a drop in temperature (almost up to the level of I964) was observed in summer and autumn.

The volume of warm water became somewhat greater in the course of I965, although it was less than in I962 and I963.

Like in previous I964 the minimum temperature of the intermediate cold layer was 0.5°. Temperature conditions of the Nova Scotian Shelf (Fig. 2-4) are represented by three sections.

In August the temperature fluctuated from I4° in the surface layer up to 6° in the off-bottom layer on a section between Georges and Browns Banks (Fig.2).

Along the Halifax section in January, the temperature observed was 2.3° in the surface layer and 6° in the off-bottom layer, in May the temperature varied from 3° on the surface to 5° on the sea bed and in August - from I7° to 5.8° respectively (Fig. 3).

In May along the section 60°I5'W the water temperature was 2° on the surface and 0.I° - 0.2° in the off-bottom layer, and in August it was I5° on the surface and 2° - in the off-bottom layer (Fig. 4)

B. Ichthyological investigations

Silver hake. In I965 observations on the length and age compositions of commercial and experimental silver hake catches were continued in Division 4W. A further increase in the average length of silver hake from 30.4 cm in I963, 3I.3 cm in I964 to 32.2 cm in I965 was observed in catches taken in I965. Simultaneously, the percentage of four-year-old individuals increased in catches from 3I.I% in I963 to 57.7% in I965, and the percentage of three-year-old specimens dropped from 56.4% in I963 to 26.3% in I965.

Such fluctuations in size and age composition of silver hake as well as decrease in catches per effort, and decline in fishing intensity points to a considerable decrease in recruitment of silver hake stocks by year-classes appeared after I960. At the same time, the value of recruitment appear to be gradually reduced by years.

Subarea 5

A. Status of Fisheries

Silver hake. The catches of silver hake in the area of Georges Bank increased from I07.4 thousand tons in I963 and I67.3 thousand tons in I964 to 28I thousand tons in I965.

The increase in catches was due to the growth of commercial efforts. The silver hake fishery was conducted like in I964, mainly on the south-western and southern slopes of Georges Bank as well as further to the south-western part of the Georges Bank outside the ICNAF Area in the vicinity of the Hudson Canyon. In I965, I5.6 thousand tons of silver hake were caught outside the ICNAF Area. The intensive silver hake fishery started in the second half of March, when stable concentrations of that fish were discovered in the area of the Hudson Canyon.

Silver hake concentrations were observed in the area of warm waters inflow with off- bottom temperature ranging from 6.0 to 9.5° at depths of I50-280 m. In April silver hake concentrations began to move gradually towards the south and south-western slopes of Georges Bank.

In June silver hake cnncntrations were of lesser density and unstable as compared with the period covering the end of March, April and May.

In July silver hake concentrations decreased with the termination of spawning which resulted in significant decline in catches. In further period, silver hake fishery in the area of Georges Bank was not regular.

Red hake. (Urophycis chuss)

Up to I964 red hake was not the object of special fishery. Since December I964, the Soviet vessels of BMRT type began to fish on the concentrations of red hake along the south-western slopes of Georges Bank. Concentrations of red hake were observed even in May along the south-western slopes of the Bank, at depths of I40 to 300 m where off-bottom temperature was 7.0 - 8.6°. The concentrations were dense and usually found in the off-bottom layer.

In January-April, the BMRT catches per hour of trawling made up 4-6 tons, and RT catches per hour of trawling were I.0-I.2 ton. In summer, red hake migrated to the south-eastern slopes of Georges Bank. In that period its concentrations were less dense.

Haddock. In I965 on Georges Bank haddock catches increased up to 8I.8 thousand tons. Haddock fishery was mainly carried out in the second half of the year. Haddock schools occured throughout almost the whole area of the Bank, but they were more stable on the south-eastern and northern slopes.

Herring. In I965 the USSR herring catches sharply dropped from I30.I thousand tons in I964 to 42.3 thousand tons in I965. Decrease in herring catches was due to reduction of that fishery because of decline in consumer demand for Georges Bank herring.

The stock of herring is in a good state and allow to take much larger catches. Throughout the year some vessels took herring as by-catch. Catches by large refrigerated trawlers (BMRT) per hour of trawling varied in different periods from 2 to I0 tons.

Herring catches by vessels of BMRT type per hour of trawling and day of fishing in June, September and October I965

Months	Number of days of fishing	Number of trawling hours	Catch (in tons)	Catch per day of fishing	Catch per hour of trawling
June	34	482	977.4	28.8	2,0
September	3I	I73	I803.I	58.2	I0.4
October	3I	382	949.6	30.6	2.5

B. Research work

Environmental studies

Hydrology. Observations of hydrological regime in Division 5Z are partially represented in Fig. 4 and 5.

Anomalies on Georges Bank were observed only on its northern slopes in contrast to the Nova Scotian Shelf, where they were traced everywhere in the course of I965.

A constant influence on temperature conditions on southern slopes was exerted by inflows of warm oceanic waters.

In summer I965, cold water of Labrador current origin penetrated up to the bottom in the areas adjacent to the north-western slopes of Georges Bank; the volume of that water was greater but the temperature was 0.5° to - I°C in comparison with the summer period of I964. In August the temperature in the north, along 67°W was I7° in the surface layer and 6.3° near the bottom and in the south it ranged from 2I° in the surface layer to 8° in the off-bottom layer (Fig. 5)

Zooplankton. In I965, seven plankton surveys were completed from April through November.

Three of them were performed at 55 stations and four - only in the areas of ichthyoplankton sampling on the southern

and northern slopes of the Bank. At present samples are being treated in laboratory conditions.

Ichthyoplankton. In I965 collection of ichthyoplankton with net having a mouth of 80 cm in diameter was carried out on the hake spawning grounds. Six surveys were completed from June to October. Silver hake eggs were found in large numbers only on the southern and south-western slopes. Solitary eggs and larvae of silver hake were observed on the northern slopes of the Bank. Samples collected in the areas of herring spawning are not yet treated.

Ichthyological investigations.

Silver hake. In I965 the observations of size and age composition of silver hake catches were continued. Investigations into age composition showed that in catches taken in I965 two-year-old fish made at an average 6.9%, three-year old specimens - 52.I%, four-year olds - 33.4% and five-year-olds - 5.9%.

Thus, the catches as in previous years were mainly composed of three and four-year old fishes. But in I962-I963 the four-year old specimens were more abundant than the three-year olds, whereas in I964-I965 the number of three-year-olds grew.

The mean length of silver hake diminished from 3I.7 cm in I962, 30.4 cm in I963 and 30.5 cm in I964 to 28.3 cm in I965 due to an increase of the number of three-year-olds in catches. Probably the decrease in average length and the growth of the percentage of three-year old fishes were due to a considerable rise in catches of silver hake during the recent years.

Herring. The analysis of age samples has shown that in I965 the I960 year-class constituted the bulk of catches (57.0% in May and 49.5% in September); the I959 year-class ranked second in its significance (23.0% in May and I5.3% in September); the I96I year-class made 20.0% and II.4% respectively.

In I966 the bulk of herring catches on Georges Bank was also composed ~~by~~ of the I960 year-class, i.e. six-year-olds. It should be taken into consideration that the numerical strength of that year-class would considerably lessen due to natural mortality. Since the I96I and I962 year-classes have proved to be comparatively poor, the herring stocks in I966 will decrease as compared to I963 and I964. This fact however will not affect the magnitude of catches, because the state of herring stocks allow to take considerably higher catches than had been obtained so far. Such a conclusion is confirmed by the assessment data relating to the abundance of spawning population which had been obtained on the basis of eggs count on the spawning grounds.

Investigations carried out on herring spawning grounds have shown that the mass spawning in I965 took place in two areas within the northern part of the Bank: one of them was about two square miles where spawning lasted from II to I3 September; the second one was six square miles where spawning took place from 20 to 25 September. In I965 herring eggs were deposited in layer of 5-7 cm thick. The water temperature was about 5-6° at a spawning time, and 8-I0° - in the period of eggs development.

Red Hake. In I965 the observations of age and size compositions were conducted.

In comparative haulings red hake was represented by individuals from 25 to 50 cm in length, the bulk of catches was composed by fishes of 27-39 cm long and I50-250 grams by weight.

On the basis of age determination by otoliths, one can say that red hake is, like silver hake, a fish with a short life circle. The bulk of red hake catches in March consisted of fishes at the age from 2 to 4 years. Thus, the two-year-old specimens made 24.6%, the three-

-year olds 35.0%, the four-year olds - 32.0%, the five-year olds - 5.9% and the six-years olds - 2.5%. A similar composition was observed in the samples taken from catches in other months too.

Haddock. The analysis of haddock composition based on experimental catches taken by herring trawl (with mesh-size in cod end of 40 mm) was made on research and exploratory vessels in 1965.

It was found out that the bulk of catches had been composed of fishes from 30 to 42 cm in length.

The domination of fishes of the mentioned sizes in the catches confirms the results of the USA investigations pointing to the appearance of a rich 1963 year-class. The collected samples of otoliths will allow (after the appropriate treatment) to evaluate the importance of individual year-classes in the experimental catches of 1965.

Tagging. In August 1965, 1706 specimens of silver hake and 2047 specimens of herring were tagged with hydrostatic tags on the western, northern and eastern slopes of Georges Bank.

Serological investigations. The collection of samples of blood serum in different parts of the Nova Scotian Shelf and Georges Bank was performed on board BMRT "Atlant" in order to study the location of silver hake stocks and genetic relationship of different local groups in autumn and winter time. The total number of samples collected was 256.

At present, the treatment of serum samples is partially done by the method of electrophoresis. Further investigations of silver hake blood serum is supposed to be performed with application of immunity - electrophoresis method.

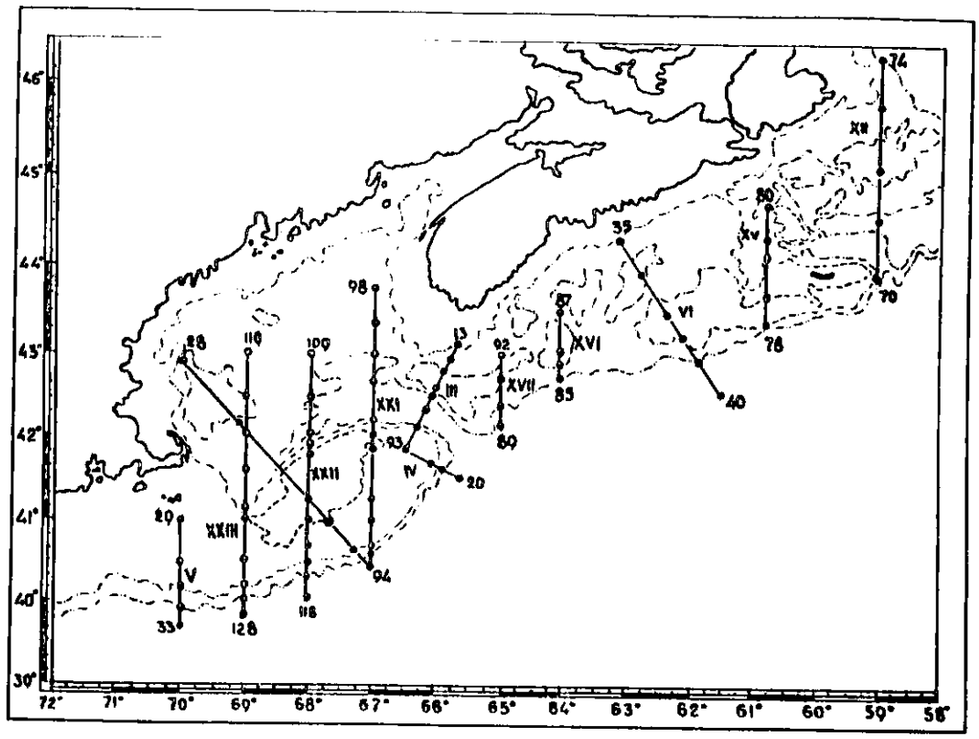

Fig. 1. Location of standard hydrological sections in Divisions 4W, 4X, 5Z.

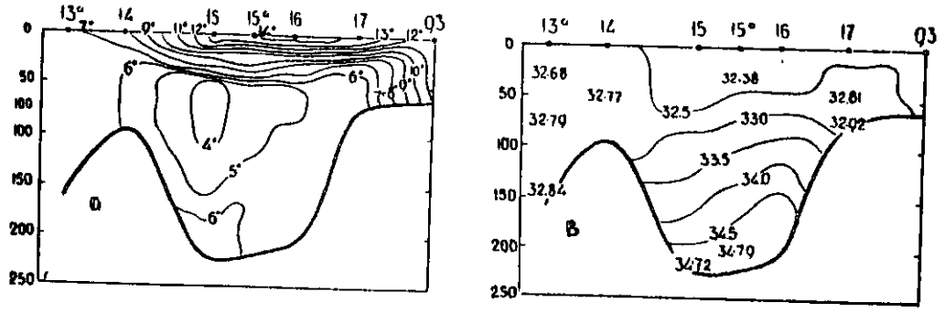

Fig. 2. Water temperature (°C) and salinity (‰) along Section III on 3 August 1965.

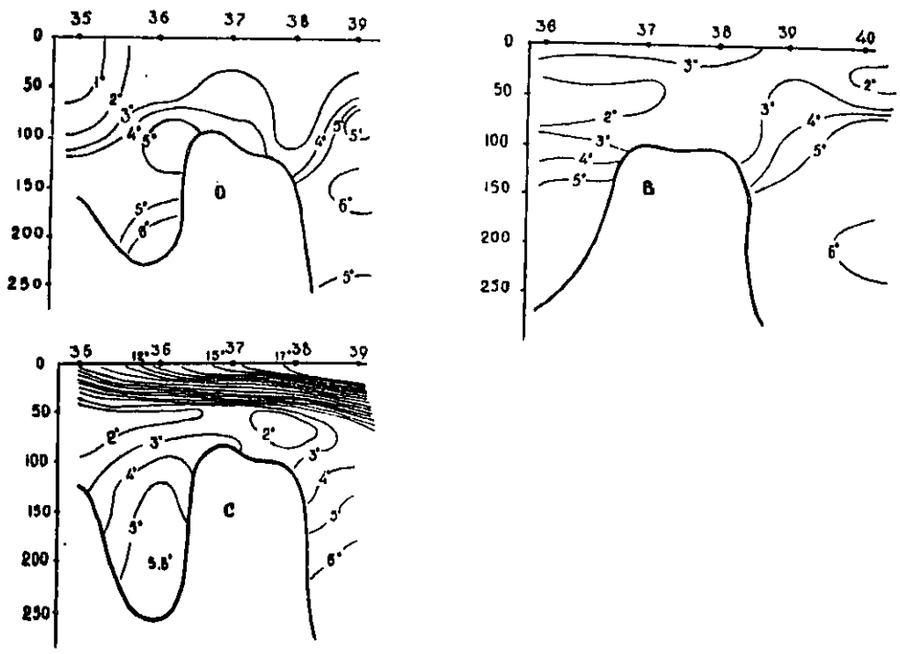

Fig. 3. Water temperature (°C) on Section VI.
a. 20 January 1965
b. 7 May 1965
c. 25 August 1965

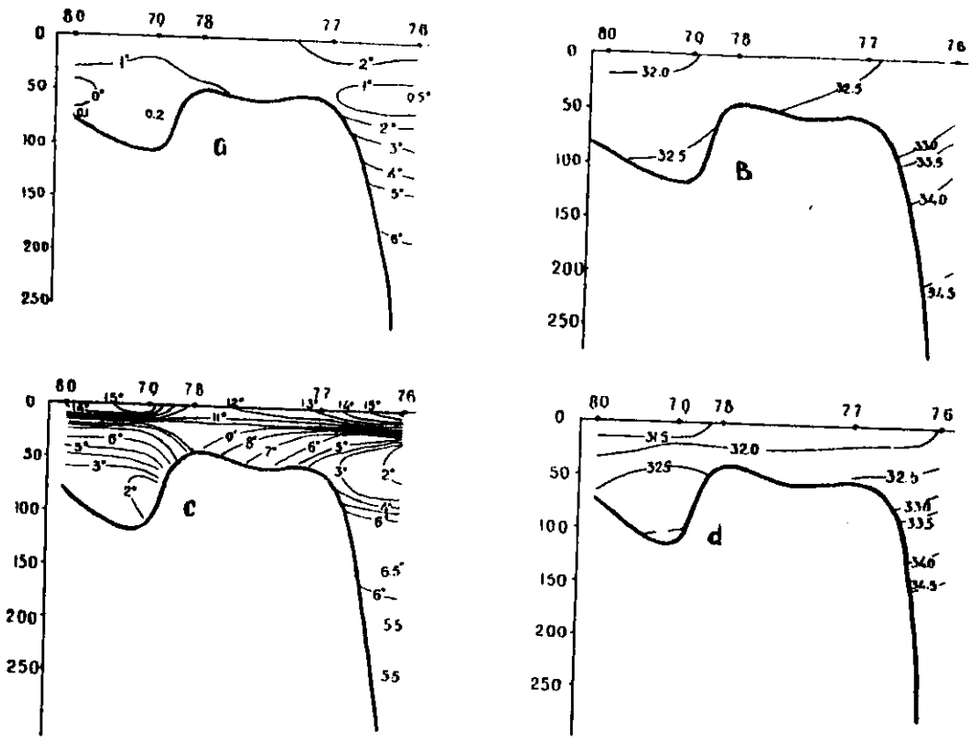

Fig. 4. Water temperature (°C) and salinity (‰) along Section XV
a. temperature, 5 May 1965
b. salinity, 5 May 1965
c. temperature, 3 August 1965
d. salinity, 3 August 1965

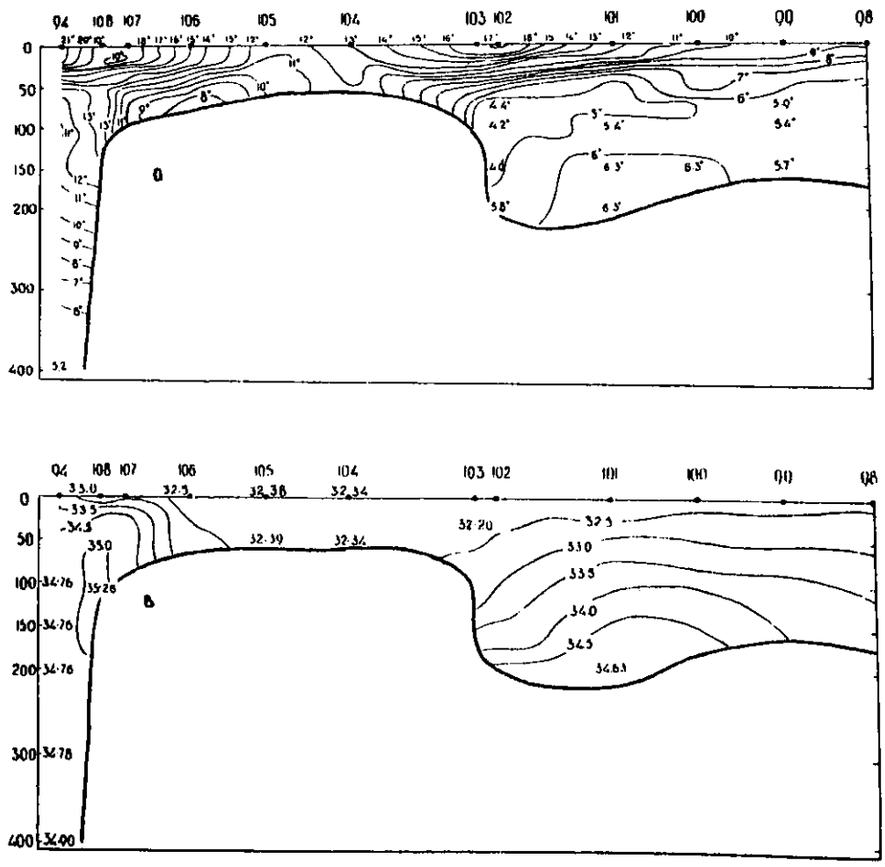

Fig. 5. Water temperature (°C) and salinity (‰) on Section XXI, 5 August 1965.
a. temperature
b. salinity

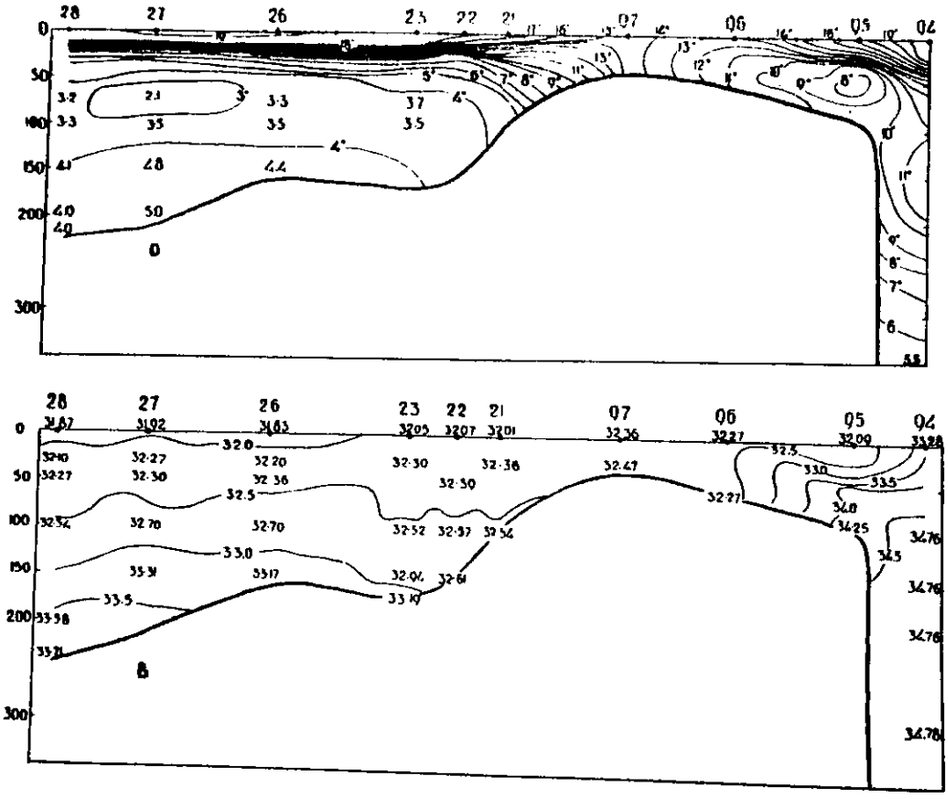

Fig. 7. Water temperature (°C) and salinity (‰) on Section XXIV (sta. 28-94)
a. ?
b. ?

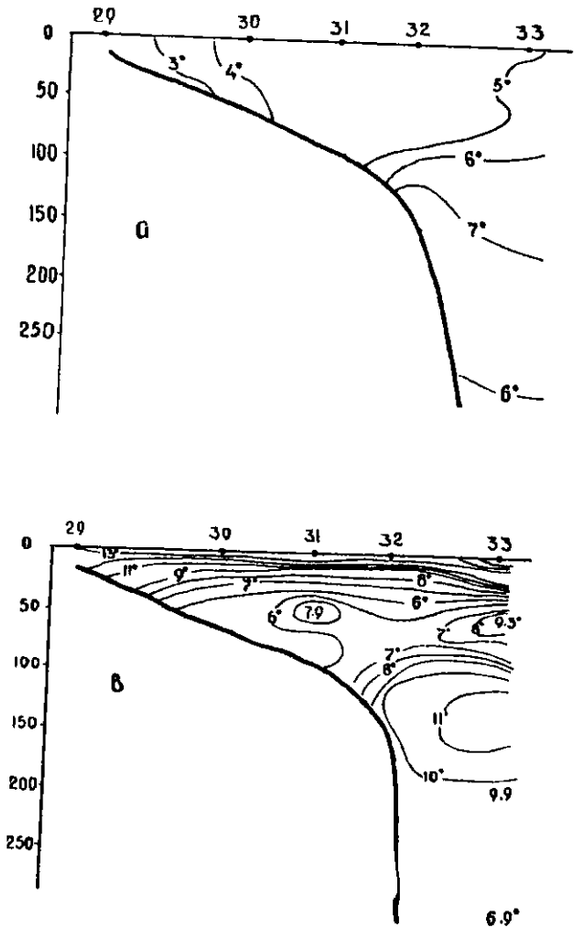

Fig. 6. Water temperature (°C) on Section V.
a. January
b. 26 June 1965