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Abundance of Young Cod in the
waters off Newfoundland

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Introduction

In investigations into changes in the state of the stocks of commercial fishes ichthyologists use, along with other methods, the numbers of young fish. Data on relative abundance of young cod during their first three years of life can serve as a basis for forecasting future catches.

Material and methods

For 9 years since December 1961 Soviet ichthyologists have determined the abundance of young cod in Subarea 3. Data were collected by the big side trawlers of 2,800 tons displacement. A bottom trawl with a 31.4m headline was used. An 8-mm mesh (knot-to-knot) capron net of 8 m in length was inserted into the codend.

A series of trawlings was carried out at stations located regularly over the whole observed area and at different depths. All the trawl-caught young up to 35 cm in length were counted but, since 1968 when observations were taken late in the season, young up to 40 cm in length were counted. The average catch of specimens per 1 hour trawling was taken as an index of year-class abundance.

Results of investigations carried out in April-July 1969 are presented in this paper.

Distribution of young cod, April-July 1969

The North Newfoundland Bank (3K)

In June-July 1969 the young distributed scarcely not forming stable concentrations. As in the previous years they occupied depths of 150-350 m, and occurred mainly in the waters with the temperature near the bottom from 1 to 3°C. Catches taken off the coast were somewhat greater compared to those taken in the offshore part of the bank. (Fig.1, Table 1). Maximum number of specimens taken per 1 hour-trawling was not higher than 200; the average catch amounting to 58 specimens.

The Great Newfoundland Bank (Divs. 3L, 3N, 3O)

Evidently in April the young start migrating from the slopes to the shallows of the Great Newfoundland Bank and their distribution corresponds to spreading of the near-bottom waters with different temperature gradients (Fig. 1).

In the northeastern part of the Great Newfoundland Bank, small cod up to 40 cm in length were dispersed over a large area at depths from 100 to 250 m with the temperatures from 0 to 1.5°C.

The waters of the Great Newfoundland Bank less than 100 m deep and north of 45°00'N had near bottom temperatures of 0.2-0.4°C. Here, catches of young were not more than 25 specimens per trawling.

To the south the number of young in the catches gradually increased reaching a maximum in the western part of the southwest slope, where at a water temperature of 2°C at 85 m in depth, specimens were caught per 1 trawl hour. This concentration was found in waters with high temperature gradients. Perhaps, the influx of warm water favoured the displacement of young from the southwest slope into the shallows; the number of specimens remaining on the continental slope was insignificant.

Also in May, young from the southeastern part of the bank remained on the slope. In a stream of cold water at a depth of 100-200 m and a temperature of 0.2-0.8°C. This stream was observed along the slope up to "tail" of the Great Newfoundland Bank and was bounded on both sides by warm waters with temperatures up to 3°C. Maximum catches in the frontal zones reached 500 specimens per 1 hour-trawling.

The Saint Pierre Bank (3P)

On Saint Pierre Bank, young were caught in smallest numbers off the coast. Their number in catches increased towards the continental slope, where 723 specimens were taken at depths of 100-150 m (at the temperature of 5.7°C) and 809 specimens (at the temperature of 0.5°C). The temperature of the near-bottom waters in this area fluctuated from -0.1°C to +5.8°C at a distance of 3 miles.

Thus, the greatest concentrations of young and adult cod were observed in the frontal zones.

In spite of the fact that in spring and at the beginning of summer, the young migrate to the shallows, they probably do not migrate extensively to the coast and back, similar to adult cod, and during their first three years remain near the place where they began living on the bottom.

Assessment on abundance of year classes of young cod

The North Newfoundland Bank

The catches of young cod on the north Newfoundland Bank can be considered an indicator of the abundance of the Labrador cod stock. Competence in this judgement is based on studies of the ecology of the Labrador cod stock, (Fleming, 1958; Templeman, 1962; Serebryakov, 1967; Postolaky, 1963, 1968; Konstantinov & Noskov, 1967; Elizarov, 1963).

Generally in catches which were taken on the bank area and which were available for observation fish aged 3-4 were prevalent (Bulatova, 1968). The number of young (1-2 years) is small, being somewhat greater in coastal areas compared to offshore bank areas. On this basis it could be that the main mass of cod larvae from the Labrador spawning grounds is carried downstream to the coast of the South Labrador and Newfoundland, where they go to bottom. Young adults aged 2-3 migrate from the shore and move northward. Canadian researchers from the Biological Station in St. John's, Nfld., have the same views on this subject.

In the summer of 1969 on the north Newfoundland Bank, 3- and 4-year olds of the 1966 and 1965 year-classes were prevalent in catches of young cod (Table 2, Fig. 2).

Average catch of 3-year olds of the 1966 year-class was greater than the catches of 3-year olds of the two previous year-classes. Apparently, the strength of the 1966 year-class will be greater than average (Fig. 3).

The same may be said about the 1967 year-class which as 2-year olds were more numerous in catches than the 2-year olds of the previous year classes (Table 2).

Comparison of the strengths of the 1960 to 1966 year-classes of cod on the north Newfoundland Bank and in the Barents Sea (Baranenkova, 1968; Nizovtsev & Trambachev, 1969), then shows that they fluctuate in an opposite direction (Fig. 4). Unfortunately, one set of observations is insufficient to provide proof of this relationship.

The Great Newfoundland Bank

The northeast slope of the Great Newfoundland Bank may serve as a mixing place for the Labrador and south Newfoundland cod stocks.

Evidently, in April 1969 a number of 4-year olds of the 1965 year-class (Fig.2) which were prevalent in the young catches on the southeast slope (Table 2) had penetrated onto the northeast slope.

The same mixing apparently takes place on the southwest slope of the Great Newfoundland Bank between the south Newfoundland cod and the Saint Pierre cod. Trawlings on the boundary of the southwest slope (Div.30) with the southeast slope (Div.3N) took a greater quantity of larger young of the 1965 and 1966 year-classes; nearer Saint Pierre, mainly young of the 1968 year-class, 10-16 cm in length, were caught.

Abundance of the 1966 year-class of cod on the Great Newfoundland Bank was a little higher than that of previous year-classes except the 1964 year-class. The 1967 year-class was poor both in the first and second year of life.

The 1968 year-class will probably be of great importance to the fishery (Fig. 2, Table 2).

The Saint Pierre Bank

The 1968 year-class was especially numerous on Saint Pierre Bank. Evidently, favourable conditions observed in 1968 made for a rich year-class on Saint Pierre Bank and the southwest slope of the Great Newfoundland Bank.

Average catch of young cod of the 1967 year-class at the second year of life increased to 20 specimens, but it is hardly probable that this year-class will be better than average (Table 2).

As on the Great Newfoundland Bank the 1966 year-class was a little better than the long-term mean level.

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Table 1 Distribution of young by depths in different ICNAF divisions.

Depth, m	3 M		3 K		3 L		3 N		3 O		3 P	
	q	n	q	n	q	n	q	n	q	n	q	n
I-50							I	0	-	-	2	I5
5I-100	-	-	-	-	II	55	2I	23	26	96	I5	49
10I-150	I	58	-	-	I2	I40	8	222	7	20	I2	2I9
15I-200	2	34	5	57	2I	I05	7	23I	7	II	I3	I30
20I-250	7	65	I4	96	I9	I02	5	83	I	0	5	I5
25I-300	4	I5	I3	50	7	48	4	I72	I	6	I	0
30I-350	2	4	9	55	3	28	-	-	-	-	I	I
35I-400	-	-	4	I6	-	-	I	0	-	-	-	-
40I-450	-	-	4	2	-	-	-	-	-	-	-	-

Note: q - number of trawlings;
 n - average number of specimens per 1 hour-
 trawling.

Table 2: Average catches (number of specimens) of young cod per 1 hour-trawling of different year-classes on the Newfoundland Banks.

Year	1 year	2 years	3 years	4 years										
classes: K	3 L	3 N	3 P	3 K	3 L	3 N	3 O	3 P						
I958	-	-	-	-	-	-	-	-	10	10	1	0	2	
I959	-	-	-	-	-	2I	2I	8	1	4	15	10	1	1
I960	-	-	5	2	3	0	3	8	2	5	11	8	1	0
I961	I	I	3	4	4	3	6	20	5	6	24	11	4	1
I962	I	I	7	42	2	5	8	15	2	12	24	13	6	2
I963	I	2	I	3	I	8	5	36	31	30	17	33	7	3
I964	I	I	4I	24	3I	3	15	137	13	22	8	48	73	42
I965	I	I	I	5	I	I	12	21	15	23	20	25	22	37
I966	0	0,1	2	5	7	3	8	27	17	32	27	43	37	34
I967	0,2	0,5	0,2	2	0,3	8	11	3	4	20	-	-	-	-
I968	0,5	I	6	18	40	-	-	-	-	-	-	-	-	-

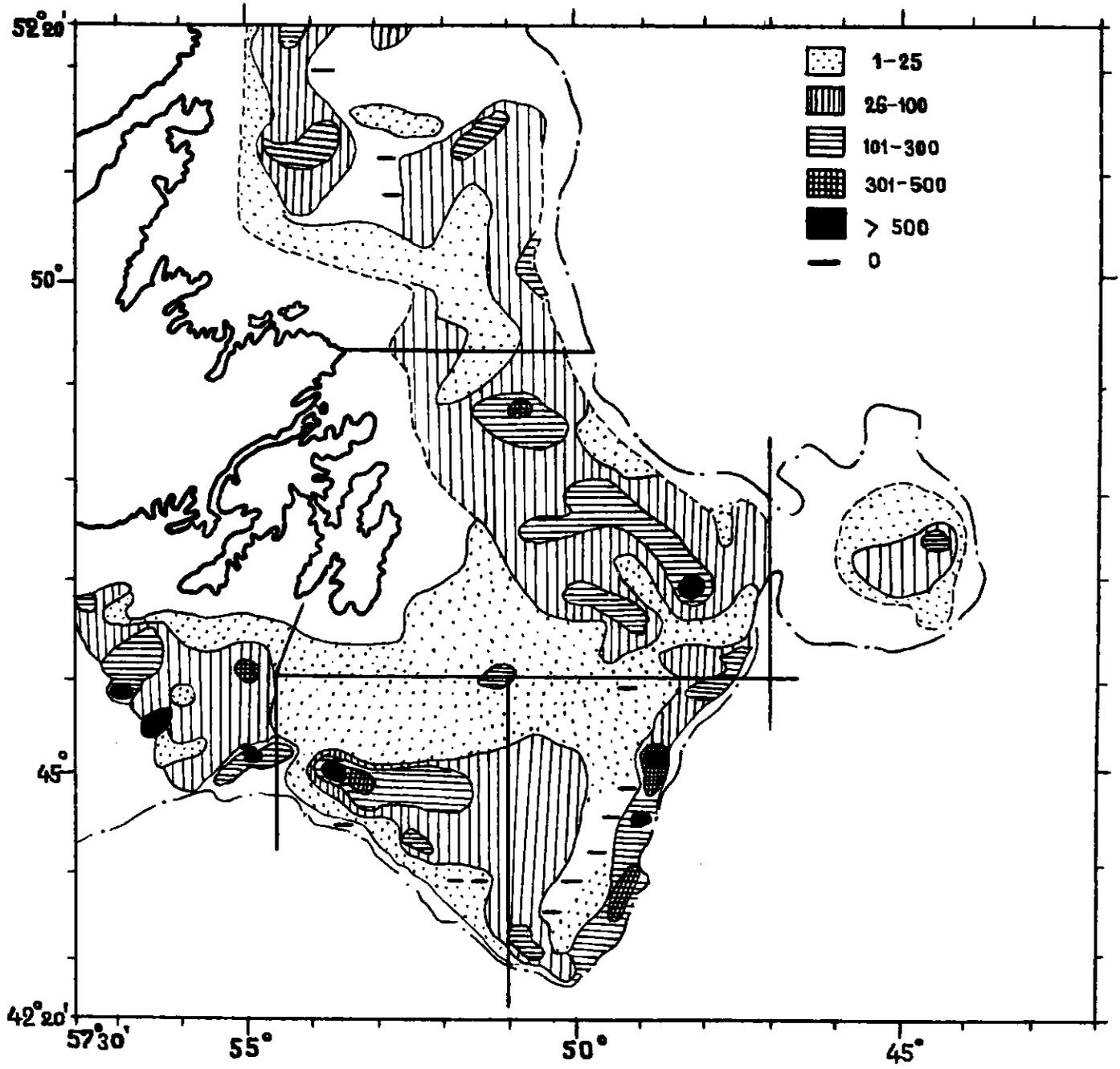


Fig. 1. Young cod distribution (catches in numbers of specimens) in Subarea 3.

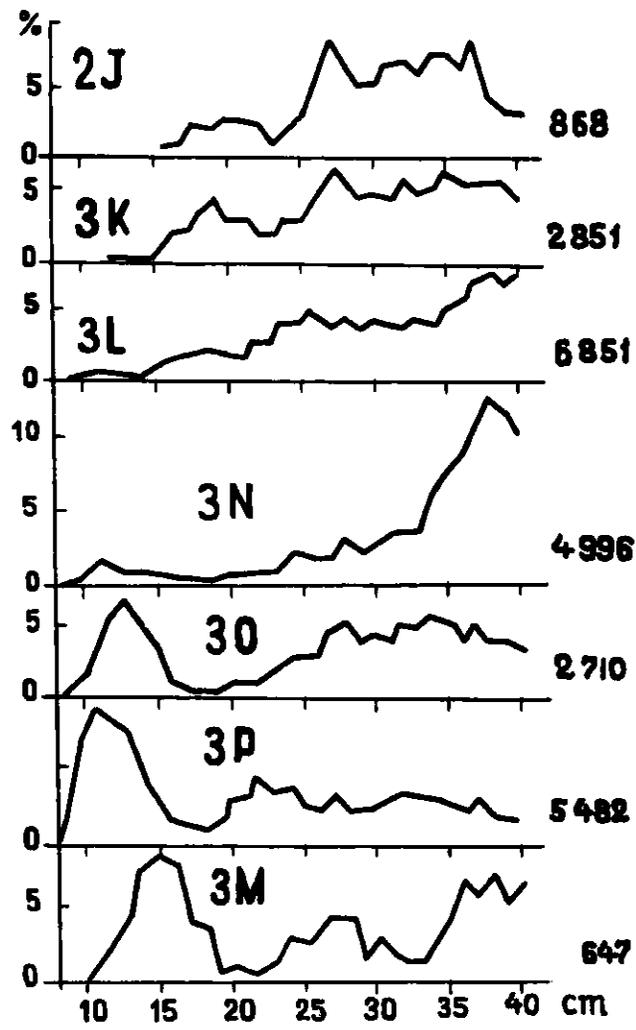


Fig. 2. Length composition of young cod in different divisions.

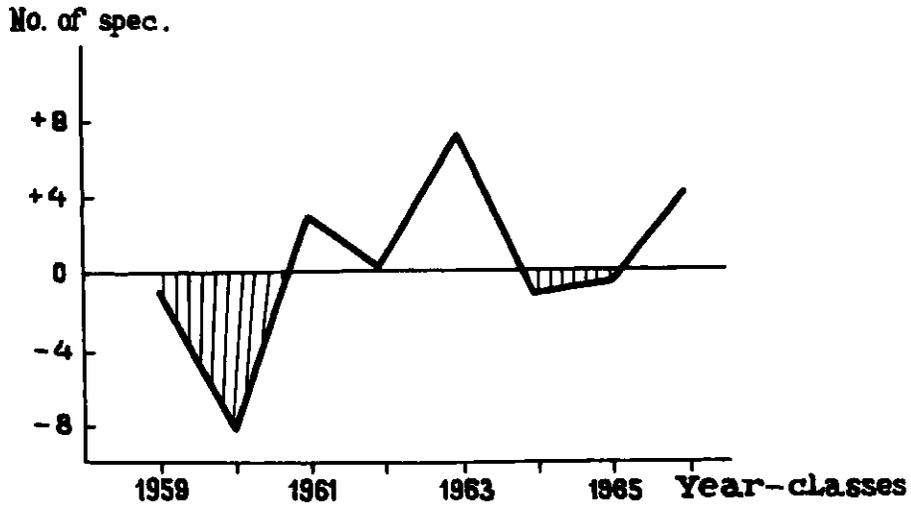


Fig. 3. Total abundance of young cod aged 3 and 4 on the north Newfoundland Bank as deviations from the long-term level.

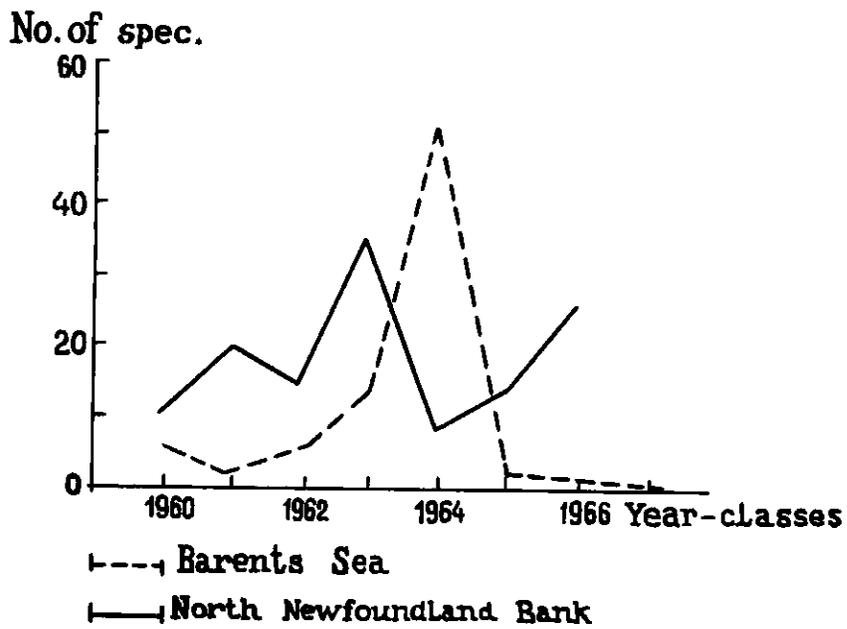


Fig. 4. Fluctuations in abundance of 3-year cod of different year-classes on the north Newfoundland Bank and abundance of the young aged 2 and 3 in the Barents Sea (Area 1).