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On the Murmansk Cod Fishery

by

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The first publication about fishes and their coastal fishery off Murman belongs to N.Ya.Danilevsky (1862). Thereupon a volumenous material was collected by "Expedition for scientific and fishery investigations off the Murman coasts" that was organized by N.M.Knipovich (Breitfus and Gebel,1903,1906,1908, 1912 and 1915; Knipovich,1902-1904).Later on Murmansk Biological Station,Floating Marine Institute,Research Institute of Fishery, Institute for Investigations of the North,State Oceanographic Institute,All-Union and Polar Research Institutes of Marine Fisheries and Oceanography (VNIRO and PINRO) were engaged in research of the raw material for the coastal fishery off the Murman coast.

Yu.Yu.Marti (1939) and T.I.Glebov (1963) generalized data on the Murman coast cod.

Several populations of cod inhabit the waters off the Kola Peninsula coast : coastal White Sea cod,winter White Sea cod or cod of the open part of the sea,fjord cod of the Murman coast,or

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x) PINRO,Murmansk,USSR

turyanka, and Murmansk coastal cod (Svetovidov,1948).

Turyanka apparently do not make long migrations into the open sea. They differ markedly by the form and colour from the more abundant Murmansk coastal cod. The cod of the Murman coast little differ in appearance from the sea or oceanic cod (Esipov, 1931;Glebov,1941,1963).

Three types of otoliths are distinguished in the cod living in the Barents Sea. On the basis of differences in the structure of otoliths taken from 122658 fishes caught in 1961-1973,the ratio between Murmansk and Atlantic cod in catches taken in the southern Barents Sea was determined.

Distinct boundaries between zones of intensive and delayed growth are typical of the otoliths of the first type. Additional zones are not formed. Cod with such easily distinguished otoliths distribute from the Murman coast to the extreme south-eastern Barents Sea.

The cod reproduce in inlets,bays and in the open parts of the western and eastern coasts of Murman and in the Motovsky Bay. The fish received the name Murmansk cod. They spawn from late February to early July at depths from 15 to 385 m mainly at the temperature of the near bottom layer from 1°5° to 2°. Salinity on the spawning grounds of cod off the Murman coast varies from 32°64 to 35 ‰ . The peak of the spawning is observed from mid-March to late April (Skvortsov,1927;Suvorov,1932; Tanasiichuk,1932;Tarasov,1932;Tanasiichuk and Chueva,1933;

Rass,1934,1949;Pertseva,1939;Ponomarenko,Khokhlina,Sorokina, 1970).

Murmansk cod grow faster,have smaller number of gill rakers, earlier attains sexual maturity and live for a shorter time compared with the migrating cod (Dementyeva and Tanasiichuk, 1935;Mesyatseva,1936;Kamennitskaya,1939;Glebov,1941,1963; Mankevich,1960,1964). Murmansk cod are similar to the Norwegian coastal cod by many indices mentioned (Rollefsen,1962). Both Murmansk and Norwegian coastal cod make migrations into the open sea (Hylen,1964).

Spawning of cod off the Murman coast goes more effectively and it lasts for 4–5 months in the hydrologically warm years (1937, 1938,1949,1950,1951,1954,1955,1959,1960,1970,1973). In the cold years (1940,1941,1945,1946,1947,1948,1953,1956,1957,1958,1961, 1963,1965,1966,1967,1968) mature cod approach the spawning grounds off the Murman coast in smaller quantities and therefore the spawning period reduces to three months. In such years the main mass of cod migrate to the north-western coast of Norway. The quantity of mature and immature migrants depends on the strength of year classes.

In the years of current cooling of Arctic (1956–1972) the cod reproduced mainly off the coast of Norway. For example,in 1967 (one of the coldest years) the percentage of the mature Murmansk cod was less than in 1962–1966 (Table 1) and it made up 6.4%. In the summer of 1967,when temperature of the near bottom waters in the southern Barents Sea tended to become normal,immature

and spawned out cod moved again in great quantities from the north-western coast of Norway to the coastal, central and eastern Barents Sea. According to data by T.S.Rass (1949) and T.I.Glebov (1963) in the 30's spawning grounds of cod off the Murman coast occupied the third place after spawning grounds off Lofoten Islands and off the middle Norway coast.

Otoliths of the second type have wide relief zones of intensive and delayed (year) growth. Additional merks are formed extremely rarely and they can be easily distinguished from year ones. Cod with otoliths of the second type distribute all over the Bear Island - Spitsbergen shelf : off West Spitsbergen as far as its extreme northern fjords, in the South Cape Deep, Hope Island area, Perseus Ellevation, off King Karl Island (78°50'N), on the Central Ellevation (76°N), round Bear Island, in the Kopytov Bank area.

They reproduce mainly on the bank slopes off Bear Island at depths from 100 to 300 m and deeper when temperature in the near bottom layer is from 0° to 3° and higher. The fish received the name Bear Island cod. A portion of the Bear Island cod migrate annually for reproduction to the north-western coast of Norway. Immature fishes follow the mature ones.

A small quantity of the Bear Island cod attain sexual maturity when they are 56-65 cm long, usually they are 62-65 cm in length at the age of 5 complete year. The average age of the mature Bear Island cod varies from 6·7 to 8·8 years.

The third type of otoliths is characterized by a complicated

zone structure,formed by a series of additional marks. The cod with such complicated structure of otoliths are distributed all over the Barents Sea and outside its boundaries,and it received the name Atlantic cod.

Their main spawning grounds are found in the Vestfjord,off the Lofoten Islands and off north-western coast of Norway where they reproduce at a depth of 15 to 250 m,more rarely up to 400 m. Optimal conditions for reproduction are created at a temperature of 4-6° (7°).

The spawning period of the Atlantic cod off the north-western coast of Norway lasts from January to June,mass spawning taking place from mid-March to mid (late) April.

In the years when temperature conditions in the period of reproduction (January-June) on the spawning grounds off Bear Island or in the waters of the Murman coast are close to the temperature conditions of waters of the north-western coast of Norway,the spawning of the Atlantic cod can take place in any of the above areas.

Atlantic and Murmansk cod differ not only in the otolith structure but in some meristic (counting) features. Average indices of the number of vertebrae,fin rays,gill rakers are higher for the Atlantic cod compared with the Murmansk and Bear Island ones.

Data on the ratio between the Atlantic and Murmansk cod in the southern Barents Sea for 1961-1973 are shown in Table 1.

In 1967-1971 an increase in the abundance of the Atlantic cod, with the maximum in 1970 (81.5%),was observed again. Strong year classes (1962,1963,1964) predominated in the fishing stock

of cod in those years. In 1971,1972 the above year classes were recruited with the poor 1965,1966,1967 and 1968 year classes, and proportion of the Atlantic cod dropped to 62·7-56·3%.

On the average for 1961-1973 the proportion of the Murmansk cod makes up 32·3% and that of the Atlantic cod 67·7%. When using these data one can find the importance of the groups in cod catches.

Table 1

Importance of the Murmansk and Atlantic cod in the fishing stock in the southern Barents Sea in 1961-1973 (in %)

Years	: Atlantic cod	: Murmansk cod	: Number of specimens
1961	55.5	44.5	6081
1962	70.0	30.0	8058
1963	69.8	30.2	5420
1964	68.2	31.8	9147
1965	69.5	30.5	8303
1966	59.7	40.3	15560
1967	65.7	34.3	15457
1968	75.4	24.6	11682
1969	78.0	22.0	1940
1970	81.5	18.5	10001
1971	77.9	22.1	8844
1972	62.7	37.3	8592
1973	56.3	43.7	13573
Long-term mean	67.7	32.3	122658

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