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ICNAF Res.Doc. 75/87ANNUAL MEETING - JUNE 1975On the age-length structure of the West Greenland
cod stock in 1958-1974

by

I.N. Simachyova
PINRO
Murmansk, USSR

Abstract

The age-length composition of the West Greenland stock of cod in 1958-1974 is analysed in this paper. Problems of the dynamics of the stocks and rate of cod growth are considered. Proposals of the possible reasons of decrease in the cod stocks off the West Greenland coast are made.

Introduction

USSR conducts an insignificant fishery off the West Greenland coast, i.e. in the ICNAF Subarea 1. Maximal catch of cod, amounting to 5 000 tons, was taken in 1963; in other years it was equal to some tens or hundreds of tons. Nevertheless, taking into account the promise of the area for the fishery, USSR scouting and research vessels conduct annually, beginning since 1958, ichthyoplankton and hydrological observations in the area. Most observations are usually conducted in the first half of the year; particularly, quantitative and qualitative composition of fishing concentrations of cod in the Lille-Hellefiske, Banan and Fyllas Banke areas is investigated. A considerable proportion of the West Greenland stock of cod usually spend winter and mature in the winter-spring period there. Biological samples, collected in January-

May in the areas mentioned, can be fully representative for characteristics of the West Greenland stock of cod as a whole. All the more, we obtained data on the age-length composition of cod, as a rule, from fishing concentrations where catches taken by the bottom trawl with the conventional mesh amounted to 2-8 tons per trawling.

Measurements of the fish length were fully converted into the age by the age-length keys, that made it possible to analyse rather a numerous biological material.

Data on the age and length composition, presented in Table 1 and Fig. 1, primarily refer to the "northern" stock of cod, i.e. to the truly West Greenland stock.

Results

The material available (mass measurements of cod - 550 000 specimens, age data - 50 000 otoliths; all age determinations were made by the author) makes it possible to draw the following conclusions :

1. In 1958-1974 cod aged from 1 to 23 years were met with in commercial catches taken by the bottom trawl with the conventional mesh on the central West Greenland shelf in the first half of the year. Cod at the age of 1-2 years were rather scarce. Due to a small length and other areas of distribution (northern and coastal regions of West Greenland), cod of these year groups are not practically found in commercial catches.

2. Having rather a high rate of growth, the West Greenland cod even at the age of 3 years sometimes come to 10-12% (by the number of specimens) in commercial catches. On the average the proportion of 3 year old specimens (mean length 41-42 cm) was approximately equal to 4%.

3. On reaching the age of 4 years (mean length 46-53 cm), the West Greenland cod actively enter the fishing stock. According to our observations in 1961, 1964, 1965, 1972 cod at the age of 4 years took the first place by the number of specimens

(30-55%), practically forming the basis for the fishery. Cod aged 4 made up on the average 22% (by the number of specimens) in commercial catches for all years of observations.

4. Leading age groups, on which the cod fishery in the central areas of the West Greenland coast is based, are 5 and 6. In many cases they take the first place by the number of specimens constituting on the average 29-30% for five year old specimens and 21-22% for six year old fishes.

5. The proportion of the next age groups (7-9 year olds) in commercial catches depends much on the year class strength. Usually, specimens of the abundant year class retain their abundance at a rather high level until they are 7-8 years old. Maximal values (by the number of specimens) of 7-8 year olds in our catches were registered at a level of 20-27%; on the average during 16 years fishes aged 7 years made up 11-12%, 8 year olds - 5 to 6% and 9 year olds - 2 to 3%.

6. Importance of specimens at the age of 10 years and older is rather insignificant in commercial catches in the central areas - from several tenths to 1.0-1.5% (for each age group). It should be noted that beginning approximately since the middle of 60's the number of specimens older than 10 years decreased.

Average age of cod in catches off the West Greenland coast during 16 years (1958-1974) hasn't undergone considerable changes, remaining at a level of 5-6.5 years; only in 1965-1966 the average age was somewhat lower than 5 years (4.6-4.9) at the cost of young abundant year classes entering the fishery.

Certain regularity between the average age and yield of cod is noted: the higher total annual catch off the West Greenland coast, the smaller average age of fishes in the stock.

8. For the observation period one can single out several most abundant year classes, specimens of which made up the bulk or a considerable part in commercial catches over 5-6 years, a certain periodicity in appearance of such year classes in

4 years is being traced (Fig.1). The 1953,1957,1961 and somewhat .. less abundant 1965,1968 year classes of cod refer to them.

9. Rate of growth of the West Greenland cod is rather high: they attain 40.2 cm by the end of 3d year,49.1 cm by the end of 4 year,57.8 cm by the end of 5 year,66.1 cm by the end of 6 year,71.6 cm by the end of 7 year,77.6 cm by the end of 8 year,82.0 cm by the end of 9 year,86.3 cm by the end of 10 year,the sizes of fishes of the same age groups being extremely variable from year to year (See Table 1). Variation ranges amount to 10 cm and more even in the young age groups. Average length of cod in catches throughout 16 years,along with the average age,does not vary markedly,making up 56.1-66.1 cm.

10. Rather a stable age-length composition of cod in catches throughout many years doesn't give any grounds to consider the high intensity of the fishery,that was the case during last ten years,to be the main reason for the decrease in cod stocks off the West Greenland coast.

As it is known,in 1970-1974 more cold water species (American plaice,Greenland halibut,capelin),compared with cod,were widely distributed in the Davis Strait area. Cooling of waters in the Davis Strait,especially north of 64°N,was unfavourable not only for the survival of eggs and larvae of cod off the West Greenland coast but,apparently,was responsible for a considerable migration of adult cod into warmer areas - south-eastern Greenland and Iceland.

Judging by the results of fishery and cod tagging, similar phenomena existed in the history of the formation of the West Greenland stock of cod. The present period,due to water cooling,is likely to be unfavourable,to some extent, for boreal species of fishes,such as redfish and cod,while it is favourable for the Arcto-boreal fauna.

Table 1

Age composition of the West Greenland cod, in %, and average length, in cm, in 1958-1974

Age	1958		1959		1960		1961		1962		1963	
	%	cm	%	cm								
I	-	-	-	-	-	-	-	-	1,9	20,2	-	-
2	-	-	-	-	-	-	-	-	0,1	32,1	2,1	30,9
3	3,6	37,9	4,4	41,2	3,8	40,6	1,7	39,8	1,8	42,3	11,9	42,6
4	16,4	46,1	8,5	51,4	25,2	47,3	55,4	51,0	20,6	51,2	10,2	52,4
5	48,4	52,5	20,5	61,3	13,8	56,6	14,6	61,5	28,0	59,7	20,0	59,9
6	12,7	63,1	33,0	65,6	15,1	65,8	12,1	67,2	13,4	71,4	41,6	67,6
7	6,1	68,4	10,0	71,5	27,8	70,6	6,5	72,6	7,6	75,5	8,0	75,5
8	7,0	72,6	6,7	75,6	5,2	74,4	8,0	77,2	4,9	79,0	1,7	81,6
9	1,1	75,7	5,1	77,2	2,6	77,9	0,9	80,2	14,8	81,1	0,8	84,6
10	2,6	74,3	2,9	79,4	3,0	79,7	0,3	82,7	1,6	84,0	2,2	85,9
11	1,6	78,5	3,9	80,2	0,6	79,5	0,1	85,4	1,4	83,6	0,2	89,9
12	-	-	2,6	79,1	1,4	81,8	0,1	83,2	1,6	87,6	0,3	92,9
13	-	-	0,9	83,1	0,9	84,4	0,1	97,2	0,3	87,9	0,4	89,3
14	0,5	86,5	0,8	79,5	0,3	85,6	0,1	88,0	0,8	89,4	0,1	89,3
15	-	-	0,2	85,0	0,2	83,9	0,1	94,7	1,2	89,6	0,2	91,9
16	-	-	0,3	88,8	0,1	83,1	0,1	85,0	+	112,9	0,3	92,5
17	-	-	-	-	-	-	-	-	+	109,0	+	91,0
18	-	-	0,1	89,9	-	-	-	-	0,1	87,6	+	93,7
19	-	-	0,1	90,5	-	-	-	-	+	91,0	-	-
20	-	-	-	-	-	-	-	-	-	-	+	91,0
21	-	-	-	-	-	-	-	-	-	-	+	94,0
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
Average age	5,5		6,6		6,1		5,0		6,2		5,5	
Average length, cm	56,1		66,1		62,1		58,5		65,7		62,6	
Specimens measured	18.250		29.410		34.370		13.090		16.003		176363	
Specimens aged	1055		4410		2962		900		1291		10.319	

Table 1

(Continued)

Age	1964		1965		1966		1967		1968		1969	
	%	cm	%	cm	%	cm	%	cm	%	cm	%	cm
I	-	-	-	-	-	-	-	-	-	-	-	-
2	0,1	22,3	0,4	29,8	0,1	27,6	-	-	-	-	-	-
3	10,5	41,3	2,3	39,4	9,4	41,7	1,1	43,8	5,7	38,2	0,4	37,0
4	47,6	48,0	54,1	53,4	24,0	49,2	16,4	48,7	6,9	46,4	10,0	48,2
5	10,5	58,9	32,9	60,6	44,5	58,2	28,3	56,5	37,5	56,5	20,5	52,9
6	9,9	66,6	3,3	70,5	14,5	67,4	38,8	66,6	29,1	63,8	20,1	62,7
7	15,2	73,1	2,1	75,6	1,9	75,9	11,7	74,3	14,2	69,7	17,0	70,7
8	2,7	80,1	3,9	80,1	2,0	82,0	1,2	81,8	5,1	72,8	20,4	75,8
9	1,0	84,5	0,5	90,6	3,1	83,9	1,0	83,6	0,9	74,8	8,7	81,3
10	0,5	83,6	0,1	86,8	0,2	91,6	1,1	89,7	0,3	79,8	1,0	85,0
11	1,5	87,6	0,1	95,9	0,2	87,5	0,1	91,9	0,2	85,6	0,4	85,9
12	0,1	87,6	0,2	107,0	+	99,2	0,1	93,4	0,1	92,9	1,2	91,1
13	0,1	95,6	0,1	94,0	0,1	91,1	0,1	100,1	-	-	-	-
14	0,2	91,5	-	-	+	97,0	0,1	94,5	-	-	0,1	97,0
15	-	-	-	-	+	100,0	+	106,0	-	-	-	-
16	+	96,5	-	-	+	106,8	+	106,0	-	-	-	-
17	0,1	93,1	-	-	-	-	+	100,0	-	-	-	-
18	+	112,6	-	-	-	102,3	-	-	-	-	-	-
19	+	91,0	-	-	-	103,0	-	-	-	-	0,2	88,0
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	+	128,5	-	-	-	-	-	-
23	-	-	-	-	+	106,0	-	-	-	-	-	-
Average age	5,0		4,6		4,9		5,6		5,6		6,5	
Average length	56,4		57,9		57,7		62,2		59,9		65,5	
Spec. measured	57697		18202		50897		25107		33931		2598	
Specimens aged	3979		1534		11961		3916		2000		600	

Table 1 (Continued)

Age	1970		1972		1973		1974	
	%	cm	%	cm	%	cm	%	cm
1	-	-	-	-	-	-	-	-
2	-	-	0,1	37,0	-	-	-	-
3	0,1	46,0	2,0	42,5	-	-	0,4	38,5
4	19,9	45,5	30,0	49,3	3,5	47,3	5,2	50,5
5	23,6	56,2	17,9	59,8	66,9	56,2	39,7	58,8
6	20,9	57,1	26,2	68,0	15,3	66,2	37,8	67,4
7	27,6	65,1	11,6	76,5	5,6	76,9	10,9	74,9
8	5,1	68,9	4,0	76,7	5,7	81,5	4,8	81,1
9	2,1	80,3	3,7	79,9	0,8	82,4	0,8	93,6
10	0,4	86,7	1,1	89,2	2,2	97,2	0,4	99,1
11	0,2	88,5	2,1	89,3	-	-	-	-
12	-	-	0,9	93,0	-	-	-	-
13	0,1	91,0	0,2	98,5	-	-	-	-
14	-	-	0,1	102,1	-	-	-	-
15	-	-	0,1	109,8	-	-	-	-
16	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-
Average age	5,8		5,7		5,5		5,7	
Average length	58,1		63,3		61,1		64,7	
Spec. measured	30853		32486		3803		1646	
Specimens aged	1300		2204		348		300	

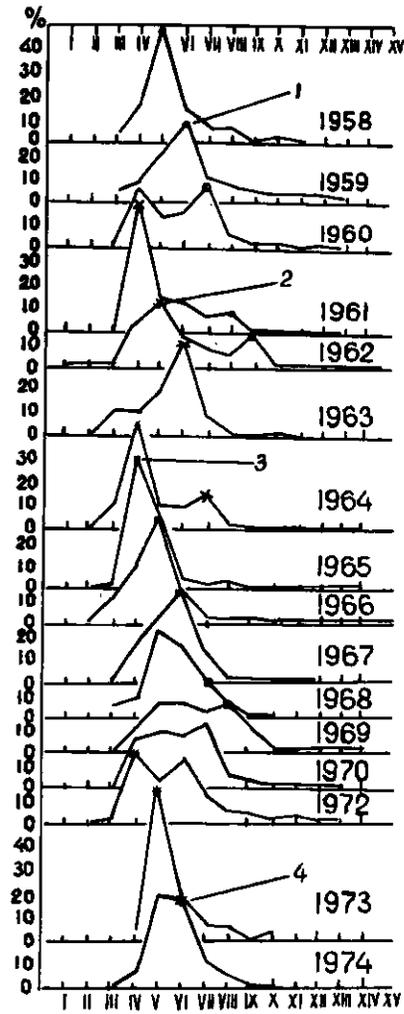


Fig. 1. Age composition of the West Greenland cod in 1958-1974 (in %).

- 1 - 1953 year-class
- 2 - 1957 year-class
- 3 - 1961 year-class
- 4 - 1968 year-class