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Assessment of Cod Stock on the Flemish Cap From
Data of Trawl Survey in 1996

by

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Abstract

This paper presents estimates of cod stock on the Flemish Cap calculated from data of trawl survey conducted from April 30 to May 12, 1997 compare to similar results of 1990-1995.

Data on size and age composition, distribution of cod average catches (by abundance and biomass) by strata are given for 1990-1996.

Abundance and biomass of cod in 1996 were estimated to be the lowest since such surveys have been conducted using stratified method and constituted 1.1×10^6 cod and 0.73×10^3 tonnes, respectively.

Introduction

Results given in this paper were acquired in research cruises annually carried out by the Polar Institute in the Northwest Atlantic.

The aim of the paper is to analyze the obtained estimates of cod abundance and biomass on the Flemish Cap compare to analogous data for 1990-1995.

Materials and Methods

Trawl survey was carried out using stratified-random method (Doubleday, 1981; Bulatova, Chumakov, 1986, Bishop, 1994) by bottom trawl with a small-mesh insertion (12-mm mesh size) in the codend with 30 min towing at 3.5 knots. Tows were made throughout 24 hours.

To characterize interannual variations in the stock status, results from 1996 survey were compared to data of trawl surveys of previous years (Kuzmin, 1991, 1992; Kiseleva, Vaskov, 1994; Kiseleva, 1996). Dates of surveys are given in Table 1. In 1994 no trawl survey was conducted on the Flemish Cap.

Results

Area of cod on the Flemish Cap is restricted by a shallow and a part of bank slopes with depth down to 400 m. However, in some years cod in catches occurred in deeper layers too. Data of trawl survey conducted in May 1996 showed single cods occurring throughout the bank area down to 700 m. Area of 11961 sq. miles was surveyed but cod were distributed only over 9297 sq. miles area (Table 2). No dense concentrations of cod were found. The largest catch was taken in the deepwater strata (517) and constituted 21 kg per 30-min towing. Cod from 21 to 100 cm in length occurred in catches (Table 3). Catches were dominated by cod 33-51 cm long at age 3-5 from 1993-1991 yearclasses, respectively (Table 4).

Tables 5 and 6 give the results from calculations of total abundance and biomass of cod in each stratum and in the whole area. Analysis of cod abundance and biomass estimates by strata

showed that the main part of the stock for 1990-1996 were distributed in strata with 127-366 m depth range. Because area of strata have an effect on stock assessment, to compare distribution of cod by years over the whole bank area, average values of abundance and biomass for each stratum per one tow were taken (Table 7, 8). Analysis of those data showed that in some years cod formed dense concentrations in different strata. So, in April-May 1991, 1992 and 1995 dense concentrations of cod were observed in strata 505, 506, 507 and 509, in June-July 1990 and 1993 in strata 503, 504, 507, 508, that is in April-May cod concentrated in the western area of the bank but in June-July in its eastern part. Such distribution of cod is probably related to seasonal distribution and concentration of zooplankton (Konstantinov et al., 1985). In May 1996 such distribution pattern was not observed. Cod did not form dense concentrations and kept far between throughout the total bank area probably because of low abundance.

Estimates of cod abundance and biomass obtained in 1996 are the lowest ones not only for the study period but from the beginning of investigations using stratified-random method and constitute 1.1×10^6 cod and 0.73×10^3 tonnes, respectively (Table 5, 6).

Prolonged reduction of cod stock on the Flemish Cap having started in the beginning of 80s could not help affecting the stock structure. Analysis of size and age composition of cod in catches showed a decrease in both length and age of fish caught. If in 1960-1975 commercial catches were dominated by cod at age 5-8 and in 1982-1985 by cod at age 3-5 (Vazgues, 1986), then according to our data (Table 3,4) since 1992 cod at age 2-3 and 24-38 cm long have dominated the catches. There were scarcely any cod older than age 8. Abundant yearclasses of 1991 and 1993 were intensively exploited by fishery from age 2 and the recruitment of the stock with 1992 and 1994 yearclasses appeared poor. At the same time, this is not the first year when early maturation of cod is observed at age 3 and 36 cm in length for males and age 4 and 43 cm length for females which probably means the protective response of the population to reduction of its stock.

Conclusions

The stock of the Flemish Cap cod was estimated to be at a low level and constituted 1.1×10^6 cod in abundance and 0.73×10^3 tonnes in biomass.

Cod catches were dominated by 1993-1991 yearclasses, 1993 yearclass was the most abundant.

References

- Bishop, C.A. 1994. Revision and additions to stratification schemes used during research vessel surveys in NAFO Subareas 2 and 3. NAFO SCR Doc. 94/43, Serial No. N2413, 23 p.
- Bulatova, A.Yu. and A.K.Chumakov. 1986. USSR trawl surveys in NAFO Subarea 0,2,3. NAFO SCR Doc.86/66, Serial No. N1183, 13 p.
- Doubleday, W.G. Editor. 1981. Manual on groundfish survey in the Northwest Atlantic. NAFO Scientific Council Studies. No 2., Dartmouth, Canada, 55 p.
- Kiseleva, V.M. and A.A. Vaskov. 1994. Status of cod stock in NAFO Subarea 3 from 1993 trawl-acoustic survey data. NAFO SCR Doc.94/12, Serial No. N2375, 9 p.
- Kiseleva, V.M. 1996. Estimation of cod stock in Div.3M by data of 1995 trawl survey. NAFO SCR Doc.96/7, Serial No. N2673, 7 p.
- Konstantinov, K.G., T.N. Turuk, and N.V. Plechanova. 1985. Food links of some fish and invertebrates on Flemish Cap. NAFO Sci. Coun. Studies, N.8, 39-48 pp.
- Kusmin, S.A. 1991. Assessment of cod stock in NAFO Subarea 3 by the data from 1990 trawl-acoustic survey. NAFO SCR Doc. 91/5, Serial No. N1877. 19 p.
- Kuzmin, S.A. 1992. Assessment of cod stock in NAFO Subarea 3 by the data from 1991 trawl-acoustic survey. NAFO SCR Doc. No. 92/13, Serial No. N2055, 11 p.

Vazquez, A., A. Avila de Melo, E. de Cardenas and R. Alpoim.
 1995. An assessment of the cod stock in NAFO Division 3M.
 NAFO SCR Doc.95/73, Serial No. N2590, 8 p.

Table 1. List of Russian trawl surveys.

Year	Vessel	Valid tows	Dates
1990	MB-1202 "Persey"	119	21.06 - 03.07
1991	MG-1362 "Vilnius"	100	27.04 - 08.05
1992	MG-1366 "K. Shaitanov"	53	15.04 - 20.04
1993	MG-1362 "Vilnius"	69	27.06 - 07.07
1995	MI-0708 "Olenitsa"	58	20.05 - 29.05
1996	MI-8339 "Olaïne"	76	30.04 - 12.05

Table 2. Results from the trawl survey for cod
 in Div 3M, 1996.

Stratum	Depth, m	Area, mile sq.	Nos of tows	Mean catch/ <u>1 valid tow</u> fish	Mean catch/ kg	Abundance, '000	Biomass, tons
501	127-146	342	3	6.7	4.3	168.9	108.3
502	147-183	838	4	2.5	1.2	155.2	73.1
503	184-256	628	3	2.0	0.8	93.0	36.6
504	"-	348	3	2.7	1.1	69.7	29.2
505	"-	703	3	1.3	2.9	69.4	151.4
506	"-	496	3	0.3	0.1	12.2	4.8
507	258-366	822	3	0.3	0.0	20.3	2.4
508	"-	646	3	2.0	1.2	95.7	56.1
509	"-	314	3	3.7	2.3	85.3	53.9
510	"-	951	3	0.7	0.5	46.9	32.2
511	"-	806	3	0.7	0.3	39.8	16.7
512	367-546	670	3	0.7	0.2	33.1	12.0
513	"-	249	3	1.0	0.6	18.4	11.5
514	"-	602	3	0.3	0.1	14.9	4.6
515	"-	666	3	0.3	0.3	16.4	16.9
516	550-731	634	3	0.0	0.0	0.0	0.0
517	"-	216	4	9.8	7.6	156.0	121.0
518	"-	210	5	0.0	0.0	0.0	0.0
519	"-	414	3	0.0	0.0	0.0	0.0
520	732-914	525	4	0.0	0.0	0.0	0.0
524	"-	253	5	0.0	0.0	0.0	0.0
528	"-	530	3	0.0	0.0	0.0	0.0
533	"-	98	3	0.0	0.0	0.0	0.0
Total		11961	76			1094.4	730.6

Table 3. Length composition of cod in Div. 3M
by the data from the 1990 -1996 trawl surveys, %.

Length, cm	Year					
	1990	1991	1992	1993	1995	1996
9- 11	-	-	-	-	-	-
12- 14	1	3	3	-	-	-
15- 17	4	30	42	-	-	-
18- 20	1	17	10	1	-	-
21- 23	12	8	88	4	13	9
24- 26	43	29	221	62	116	43
27- 29	61	23	248	223	234	52
30- 32	36	19	191	277	127	52
33- 35	56	115	75	148	34	121
36- 38	74	291	24	73	41	189
39- 41	99	170	19	58	48	137
42- 44	135	63	18	67	86	103
45- 47	101	30	8	45	100	52
48- 50	109	37	22	20	76	69
51- 53	99	45	14	6	47	86
54- 56	46	40	4	5	33	60
57- 59	59	32	4	1	15	-
60- 62	28	18	3	1	10	-
63- 65	15	11	1	2	11	-
66- 68	12	8	-	1	3	9
69- 71	1	3	-	1	1	-
72- 74	-	5	1	1	-	-
75- 77	-	1	1	1	1	-
78- 80	-	1	1	1	1	-
81- 83	3	-	-	+	-	-
84- 86	-	-	-	-	-	-
87- 89	3	-	-	-	1	9
90- 92	-	-	-	-	-	-
93- 95	-	-	-	-	-	-
96- 98	1	-	-	-	-	-
99-101	-	-	-	-	-	9
102-104	-	-	-	-	1	-
105-107	-	-	-	-	-	-
108-110	-	-	-	-	-	-
No. of fish, %	999	999	1000	998	999	1000
No. of fish, spec.	676	1500	718	2088	788	117
Mean length, cm	43,95	39,87	29,48	33,84	37,48	41,18

Table 4. Age composition of cod in Div.3M by the data from the 1990-1996* trawl-surveys, %.

Age	Year					
	1990	1991	1992	1993	1995	1996
1	6	32	48	-	-	-
2	19	53	427	437	267	121
3	186	369	422	334	297	457
4	707	358	63	153	304	171
5	68	139	28	57	115	224
6	7	46	8	12	10	9
7	-	4	3	4	3	-
8	4	-	1	3	1	9
9	1	-	-	-	1	-
10	-	-	-	-	-	9
11	-	-	-	-	1	-
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	-	-	-
15	-	-	-	-	-	-
Fish number, %	998	1001	1000	1000	999	1000
No. of fish age sample, spec.	238	299	179	193	301	116
Mean age	3,87	3,67	2,64	2,89	3,33	3,63

*No investigations were carried out in 1994

Table 5. Abundance of cod (thou. spec.) by stratum based on data trawl surveys in Div .3M, 1990 - 1996*

Stratum	Depth, m	Area, mile sq.	Year					
			1990	1991	1992	1993	1995	1996
501	127-146	342	82.3	278.7	50.7	135.1	84.4	168.9
502	147-183	838	201.7	461.1	82.8	325.9	1200.1	155.2
503	184-256	628	552.4	130.2	986.2	12420.4	1767.7	93.0
504	"	348	708.9	352.2	-	5980.4	43.0	68.7
505	"	703	147.5	260.4	989.4	1445.1	12063.8	69.4
506	"	496	183.7	147.0	2406.5	857.3	1041.0	12.2
507	258-366	822	869.8	203.0	2118.9	60.9	0.0	20.3
508	"	646	1297.3	231.3	406.7	837.4	47.8	95.7
509	"	314	81.4	3151.6	-	201.6	1442.1	85.3
510	"	951	86.1	191.2	479.0	47.0	23.5	46.9
511	"	806	26.5	2706.5	943.3	59.7	59.7	39.8
512	367-546	670	56.7	19.8	231.6	0.0	16.5	33.1
513	"	249	13.8	27.7	-	6.1	49.2	18.4
514	"	602	0.0	2295.4	0.0	0.0	0.0	14.9
515	"	666	0.0	63.4	39.5	0.0	0.0	16.4
516	550-731	634	0.0	0.0	0.0	0.0	0.0	0.0
517	"	216	0.0	0.0	0.0	0.0	26.7	156.0
518	"	210	0.0	0.0	0.0	0.0	0.0	0.0
519	"	414	0.0	0.0	0.0	0.0	0.0	0.0
Total			4308.1	10509.5	8734.6	22376.9	17865.5	1094.2

* No investigations were carried out in 1994

Table 6. Biomass of cod (tons) by stratum based on data trawl surveys in Div .3M, 1990 - 1996*

Stratum	Depth, m	Area, (mile sq.)	Year						
			1990	1991	1992	1993	1995	1996	
501	127-146	342	36.7	38.0	20.3	60.6	14.8	108.3	
502	147-183	838	96.7	100.2	41.4	162.4	618.3	73.1	
503	184-256	628	453.6	91.2	180.5	4611.3	1315.7	36.6	
504	"	348	665.7	100.5	-	1550.8	49.5	29.2	
505	"	703	85.9	31.2	156.2	553.5	4242.3	151.4	
506	"	496	138.4	24.2	392.2	713.1	366.3	4.8	
507	258-366	822	1023.8	149.2	786.7	127.7	0.0	2.4	
508	"	646	949.1	119.6	172.3	707.9	31.2	56.1	
509	"	314	104.1	2058.4	-	153.3	1369.7	53.9	
510	"	951	190.2	143.9	194.4	149.6	96.8	32.2	
511	"	806	47.8	1343.3	294.9	189.1	54.5	16.7	
512	367-546	670	116.3	32.8	175.4	0.0	9.2	12.0	
513	"	249	13.4	38.3	-	7.6	66.4	11.5	
514	"	602	0.0	2415.2	0.0	0.0	0.0	4.6	
515	"	666	0.0	52.9	73.0	0.0	0.0	18.3	
516	550-731	624	0.0	0.0	0.0	0.0	0.0	0.0	
517	"	216	0.0	0.0	0.0	0.0	27.5	120.1	
518	"	210	0.0	0.0	0.0	0.0	0.0	0.0	
519	"	414	0.0	0.0	0.0	0.0	0.0	0.0	
Total			3921.7	6738.9	2487.3	8996.9	8262.2	729.7	

* No investigations were carried out in 1994

Table 7. Data on average catches (kg) per one valid tow from the Russian trawl surveys for cod in Div 3M by stratum in 1990 - 1996*

Stratum	Depth, m	Area, (mile sq.)	Year						
			1990	1991	1992	1993	1995	1996	
501	127-146	342	1.4	1.5	0.8	2.4	0.6	4.3	
502	147-183	838	1.6	1.6	0.2	2.6	10.0	1.2	
503	184-256	628	9.8	2.0	3.8	99.1	28.3	0.8	
504	"	348	25.8	3.9	-	60.2	1.9	1.1	
505	"	703	1.7	0.6	3.0	10.6	81.5	2.9	
506	"	496	3.8	0.7	10.7	19.4	10.0	0.1	
507	258-366	822	16.8	2.5	12.9	2.1	0.0	0.0	
508	"	646	19.8	2.5	3.6	14.8	0.7	1.2	
509	"	314	4.5	88.5	-	6.6	58.9	2.3	
510	"	951	2.7	2.0	2.6	2.1	1.4	0.5	
511	"	806	0.8	22.5	4.9	3.2	0.9	0.3	
512	367-546	670	2.3	0.7	3.3	0.0	0.2	0.2	
513	"	249	0.7	2.1	-	0.4	3.6	0.6	
514	"	602	0.0	54.2	0.0	0.0	0.0	0.1	
515	"	666	0.0	1.1	1.5	0.0	0.0	0.3	
516	550-731	634	0.0	0.0	0.0	0.0	0.0	0.0	
517	"	216	0.0	0.0	0.0	0.0	1.7	7.6	
518	"	210	0.0	0.0	0.0	0.0	0.0	0.0	
519	"	414	0.0	0.0	0.0	0.0	0.0	0.0	

* No investigations were carried out in 1994

Table 8. Data on average catches (spec.) per one valid tow from the Russian traw surveys for in Div .3M by stratum in 1990 - 1996*

Stratum	Depth, m	Area, mile sq.	Year					
			1990	1991	1992	1993	1995	1996
501	127-146	342	3.3	11.0	2.0	5.3	3.3	6.7
502	147-193	838	3.3	7.4	1.3	5.3	19.3	2.5
503	194-256	628	11.9	2.8	21.2	267.0	38.0	2.0
504	"-	348	27.5	13.7	-	232.0	1.7	2.7
505	"-	703	2.8	5.0	19.0	27.8	231.7	1.3
506	"-	496	5.0	4.0	65.5	23.3	28.3	0.3
507	258-366	822	14.3	3.3	34.8	1.0	0.0	0.3
508	"-	646	27.1	4.8	8.5	17.5	1.0	2.0
509	"-	314	3.5	135.5	-	8.7	62.0	3.7
510	"-	951	1.2	2.7	6.8	0.7	0.3	0.7
511	"-	806	0.4	45.3	15.8	1.0	1.0	0.7
512	367-546	670	1.1	0.4	4.7	0.0	0.3	0.7
513	"-	249	0.8	1.5	-	0.3	2.7	1.0
514	"-	602	0.0	51.3	0.0	0.0	0.0	0.3
515	"-	666	0.0	1.3	0.8	0.0	0.0	0.3
516	550-731	634	0.0	0.0	0.0	0.0	0.0	0.0
517	"-	216	0.0	0.0	0.0	0.0	1.7	9.8
518	"-	210	0.0	0.0	0.0	0.0	0.0	0.0
519	"-	414	0.0	0.0	0.0	0.0	0.0	0.0

* No investigations were carried out in 1994