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Assessment of Greenland Halibut (*Reinhardtius hippoglossoides*) Stock on the Flemish Cap (Division 3M) by Data of the Russian Trawl Survey of 2001

by

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Abstract

Assessment of abundance and biomass of Greenland halibut, as well as fish distribution by depth range are presented by results of the trawl survey carried out in May/June, 2001. Investigations were performed over the area of 16 thou. mile^2 to the depth of 1 280 m and in accordance with the stratification accepted in the NAFO. Indices of G. halibut stock on the Flemish Cap bank constituted in 2001 as follows: by abundance - 14.2 mill. spec. and biomass – 12.7 thou. t. Due to the Russian surveys data of 1995, 1996 and 2001, dynamics of abundance and biomass of Greenland halibut indicate to the increase of the stock indices in Div. 3M in 2001. Data on fish length-age composition and distribution are presented. Individuals 13-90 cm long at the age of 1-17, were occurred in catches. The basis of catches (46.7%) consisted of small immature individuals 43-48 cm long. Fish of 1994, 1995 and 1996 year-classes predominated in abundance, their portion in catches constituted 78.8%. The obtained results were compared with results of trawl surveys of Russia, Canada and the European Union performed in 1987-2001. By results of analyses, the expert values of biomass underestimated earlier were derived.

Introduction

In 1987-1992 the annual catch of Greenland halibut in Div. 3LMNO outside the 200- mile fishing zone of Canada increased from 2 to 50 thou. t (STATLANT 21A). In 1990-94, the annual catch in this area reached 22-50 thou. t. Since 1995, G. halibut has become a shared out object, therefore the fishery for this species has decreased. Due to the preliminary fisheries statistics in 1995-2000, the catch in the open part of Div. 3LMNO constituted 13-22 thou. t.

The Russian fishery in the NAFO Convention Area became active again in 1998. In order to study the status of resources, the Russian Federation renewed the scientific research (Table 1). Results are presented in the paper. The aim of the work is to estimate the status of biomass and abundance of G. halibut on the Flemish Cap by results of the trawl assessment survey.

Materials and Methods

Results presented in the paper were obtained during trawl sampling survey of demersal fish species in May/June, 2001, on the Flemish Cap on board of the trawler MG – 1360 "Mozdok". The survey was carried out by the stratified random method (Doubleday, 1981; Bishop, 1994; Bulatova and Chumakov, 1986). Investigations were carried out over the area of 16 thou. miles^2 within the depth range 127-1 280 m. Trawlings were being performed day and night. In the standard assessment demersal trawl, drawing 1625 A, a small mesh size insertion in the codend (a = 10-12 mm) was used. 90 trawlings of half an hour's duration were performed (Fig. 1, Table 2). Sampling and

processing of the primary biological material were done by methods accepted in PINRO and NAFO. Age of fish was predominantly determined by scales and partly by otoliths.

Results and Discussion

During the survey, Greenland halibut were found in catches over the whole surveyed area of the Flemish Cap, excluding the most shallow strata 501 and 502 in the depth range of 127-146 m (Table 2). In strata at depths from 187 to 731 m, average catches of G. halibut per one assessment trawling did not exceed 11.2 kg. The main number of halibut was distributed over strata area with depth range 732-1 280 m. The densest concentrations were registered in strata 534, 533 and 524 in which the average catch per one trawling constituted 108.0, 42.9 and 34.4 kg, correspondingly.

The results of Russian surveys carried out on the Flemish Cap in 1995 and 1996 were published earlier (Savvatimsky and Vaskov, 1997) and are in Tables 1, 3 and 4. In 1995, the investigations were carried out in the area of 10 thou. miles^2 in the depth range from 127 to 731 m. In 1996, the area of 12 thou. miles^2 was surveyed within depth range from 127 to 914 m. Indices of stock in 1995 and 1996 constituted 2.5 and 2.8 mill. spec. by abundance and 1.1 and 1.2 thou. t by biomass, correspondingly. Due to data of the trawl survey of 2001, the indices of abundance and biomass were calculated and constituted 14.2 mill. spec. and 12.7 thou. t, correspondingly. The results obtained in 2001 exceeded the previous Russian values of 1995 and 1996 as follows: 18-19 times – the abundance and 8-9 times – the biomass.

The increase of indices of assessment can be explained as follows. On the one side, it is a consequence of the fact that in 2001 the survey was performed at large area and depths. A part of biomass in the depth range 915-1280 m constituted 66.7% (Fig. 4). The main part of Greenland halibut biomass on the Flemish Cap was distributed within those deepwater strata, which were not surveyed before. On the other side, the comparison of stock indices obtained for depth range 185-731 m by the Russian surveys shows the increase of abundance and biomass in 2001. Index of abundance increased in 2001 up to 2.9 thou. t that is 13% higher than that of 1995 (2.5 thou. t) and 86% higher than that of 1996 (1.5 thou. t). Correspondingly, index of biomass in 2001 was 48% higher than that of 1995 (1.1 thou. t) and 435% higher than that of 1996 (0.3 thou. t).

Individuals 13-90 cm long and at the age of 1-17 occurred in catches. The basis of catches (46.7%) consisted of small immature fish 43-48 cm long. Length of G. halibut increased with the increase of the trawling depth. The number of specimens less than 30 cm constituted 9.4% in average. Fish of 1994, 1995 and 1996 year classes predominated in abundance (78.8%), their portion in catches was presented as 17.7, 36.8 and 24.3%, correspondingly (Fig. 2 and 3).

The analysis of results of assessment surveys of Canada in 1996-2000 (Bowering, 2001), the European Union in 1988-2000 (Saborido and Vazquez, 2001) and Russia in 1995, 1996 and 2001 shows that in nearly all the surveys not all the depths were observed where G. halibut were distributed. The most profound investigations were carried out in the Canadian survey of 1996 when depths from 128 to 1 463 m were observed. Later on, in 1997-2000, only strata in the range from 732 to 1 763 m were investigated during the surveys of Canada. Surveys of the European Union were carried out at less depths from 127 to 731 m. Consequently during the whole period of observations, G. halibut stock was estimated not in the whole. It is possible to calculate the value of these incomplete estimations. In this case, the survey of Canada of 1996 can be taken as a standard. Then, basing on data on distribution of biomass in different depth ranges of this survey, it is necessary to interpolate the derived data on the results of other surveys. The comparative analysis of the mentioned surveys performed in this way allows to estimate, approximately the underestimated biomass of Greenland halibut on the Flemish Cap as follows:

- in the Russian survey of 1995 – 80-90%;
- in the Russian survey of 1996 – 60-70%;
- in the Russian survey of 2001 – 5-10%;
- in the Canadian surveys of 1997-2000 – 10-30%;
- in the EU surveys of 1988-2000 – 50-70%.

The analysis of underestimated biomass shows that assessments of the stock were often registered lower than should be. Data of surveys of Canada, the European Union and Russian indicate that values of G. halibut stock in Div. 3M

fluctuate greatly from year to year. In general, considering results of Russian surveys of 1995, 1996 and 2001, there is a tendency of Greenland halibut stock to increase in strata with similar depth ranges.

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Table 1. A list of Russian trawl surveys in 1995, 1996, 2001.

Year	Vessel	Valid tows	Area, sq.miles	Dates
1995	MI – 0708 "Olenica"	58	10555	20.05 - 29.05
1996	MI – 8339 "Olaine"	76	11961	30.04 - 12.05
2001	MG-1360 "Mozdok"	90	15760	10.05 - 04.06

Note: No investigations were carried out in 1997-2000.

Table 2. Results from the trawl survey for Greenland halibut in Div. 3M, 2001.

Stratum	Depth, m	Area, mile^2	No of tows	Mean catch on valid tow		Index	
				fish	kg	abundance '000	Biomass, tons
501	127-146	342	3	0.0	0.0	0.0	0.0
502	147-183	838	3	0.0	0.0	0.0	0.0
503	185-256	628	3	0.3	0.0	15.5	1.8
504	185-256	348	3	3.7	0.7	94.5	18.1
505	185-256	703	3	8.0	0.2	416.6	10.1
506	185-256	496	3	0.3	0.0	12.2	0.5
507	258-366	822	3	5.3	1.0	324.7	58.1
508	258-366	646	3	4.0	1.8	191.4	86.5
509	258-366	314	3	0.3	0.1	7.8	3.0
510	258-366	951	3	2.7	2.7	187.9	187.9
511	258-366	806	3	1.7	0.2	99.5	10.3
512	367-549	670	3	5.7	4.3	281.2	211.1
513	367-549	249	3	7.3	5.5	135.3	101.8
514	367-549	602	3	2.7	2.7	118.9	118.9
515	367-549	666	3	1.0	0.3	49.3	16.9
516	550-731	634	3	14.0	11.2	657.5	526.5
517	550-731	216	2	5.0	4.0	80.0	63.3
518	550-731	210	3	4.3	3.5	67.4	54.4
519	550-731	414	4	4.5	3.1	138.0	93.9
520	732-914	525	3	18.7	15.5	725.9	604.4
524	732-914	253	3	35.0	34.4	655.9	644.9
528	732-914	530	3	34.3	27.7	1347.9	1085.8
533	732-914	98	2	48.5	42.9	352.1	311.2
521	915-1097	517	3	13.3	14.6	510.6	558.1
525	915-1097	226	2	13.0	20.4	217.6	340.9
529	915-1097	488	3	29.7	25.0	1072.4	903.8
532	915-1097	238	3	14.7	12.0	258.6	211.7
534	915-1097	486	3	108.0	108.0	3888.0	3888.0
522	1098-1280	533	3	18.3	22.3	723.8	882.1
526	1098-1280	177	2	8.0	10.7	104.9	140.6
530	1098-1280	1134	3	18.0	18.1	1512.0	1522.3
Total		**15760**	**90**			**14247.5**	**12657.0**

Table 3. Data on average catches per one valid tow from the Russian trawl survey for Greenland halibut in Div. 3M by strata in 1995, 1996, 2001.

Stratum	Depth, m	Mean catch on valid tow					
		No			Kg		
		1995	1996	2001	1995	1996	2001
501	127-146	0.0	0.0	0.0	0.0	0.0	0.0
502	147-183	0.0	0.0	0.0	0.0	0.0	0.0
503	185-256	2.3	1.3	0.3	0.1	0.2	0.0
504	185-256	0.0	0.7	3.7	0.0	0.0	0.7
505	185-256	1.3	1.0	8.0	0.4	0.1	0.2
506	185-256	0.7	1.0	0.3	0.0	0.1	0.0
507	258-366	4.3	9.0	5.3	0.5	1.3	1.0
508	258-366	0.3	3.7	4.0	0.0	0.4	1.8
509	258-366	0.3	0.3	0.3	0.0	0.0	0.1
510	258-366	2.3	3.3	2.7	0.2	0.4	2.7
511	258-366	4.0	0.3	1.7	0.5	0.0	0.2
512	367-549	2.0	1.7	5.7	0.6	0.3	4.3
513	367-549	0.0	0.7	7.3	0.0	0.0	5.5
514	367-549	0.3	0.0	2.7	0.0	0.0	2.7
515	367-549	0.7	0.7	1.0	0.3	0.1	0.3
516	550-731	19.0	4.0	14.0	12.8	2.0	11.2
517	550-731	5.0	0.5	5.0	5.6	0.2	4.0
518	550-731	6.0	0.0	4.3	4.9	0.0	3.5
519	550-731	14.3	2.0	4.5	5.0	0.8	3.1
520	732-914		1.8	18.7		1.3	15.5
524	732-914		2.4	35.0		1.8	34.4
528	732-914		27.7	34.3		19.9	27.7
533	732-914		4.3	48.5		2.3	42.9
521	915-1097			13.3			14.6
525	915-1097			13.0			20.4
529	915-1097			29.7			25.0
532	915-1097			14.7			12.0
534	915-1097			108.0			108.0
522	1098-1280			18.3			22.3
526	1098-1280			8.0			10.7
530	1098-1280			18.0			18.1

Table 4. Abundance and biomass from the Russian trawl survey for Greenland halibut in Div. 3M by strata in 1995, 1996, 2001.

Stratum	Depth, m	Index					
		abundance '000			biomass, tons		
		1995	1996	2001	1995	1996	2001
501	127-146	0.0	0.0	0.0	0.0	0.0	0.0
502	147-183	0.0	0.0	0.0	0.0	0.0	0.0
503	185-256	108.4	61.9	15.5	3.5	8.1	1.8
504	185-256	0.0	17.3	94.5	0.0	0.3	18.1
505	185-256	70.0	52.1	416.6	19.2	5.2	10.1
506	185-256	24.6	36.7	12.2	0.9	3.7	0.5
507	258-366	263.6	548.0	324.7	31.8	79.3	58.1
508	258-366	15.8	175.5	191.4	0.6	18.2	86.5
509	258-366	7.8	7.7	7.8	1.9	0.2	3.0
510	258-366	164.1	234.6	187.9	11.3	28.4	187.9
511	258-366	238.8	19.7	99.5	30.6	2.3	10.3
512	367-549	99.3	82.9	281.2	27.2	15.9	211.1
513	367-549	0.0	12.4	135.3	0.0	0.8	101.8
514	367-549	14.7	0.0	118.9	0.4	0.0	118.9
515	367-549	32.6	33.1	49.3	12.3	4.8	16.9
516	550-731	892.3	187.9	657.5	600.5	95.9	526.5
517	550-731	80.0	8.0	80.0	90.0	3.3	63.3
518	550-731	93.3	0.0	67.4	76.4	0.0	54.4
519	550-731	439.5	61.3	138.0	152.1	25.5	93.9
520	732-914		68.1	725.9		52.4	604.4
524	732-914		45.0	655.9		34.6	644.9
528	732-914		1086.3	1347.9		781.8	1085.8
533	732-914		31.4	352.1		17.0	311.2
521	915-1097			510.6			558.1
525	915-1097			217.6			340.9
529	915-1097			1072.4			903.8
532	915-1097			258.6			211.7
534	915-1097			3888.0			3888.0
522	1098-1280			723.8			882.1
526	1098-1280			104.9			140.6
530	1098-1280			1512.0			1522.3
Total		**2543.9**	**2769.9**	**14247.5**	**1058.3**	**1177.7**	**12657.0**

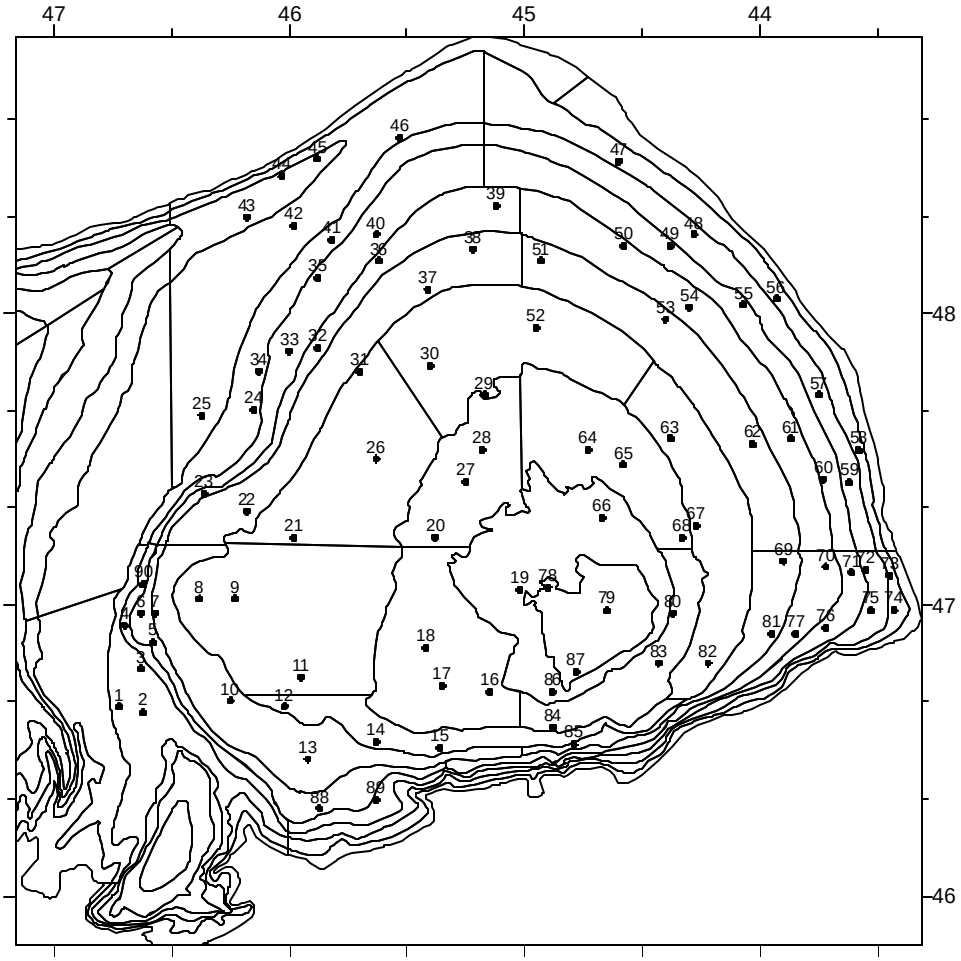

Fig. 1. Position of trawl stations in Div. 3M in 2001.

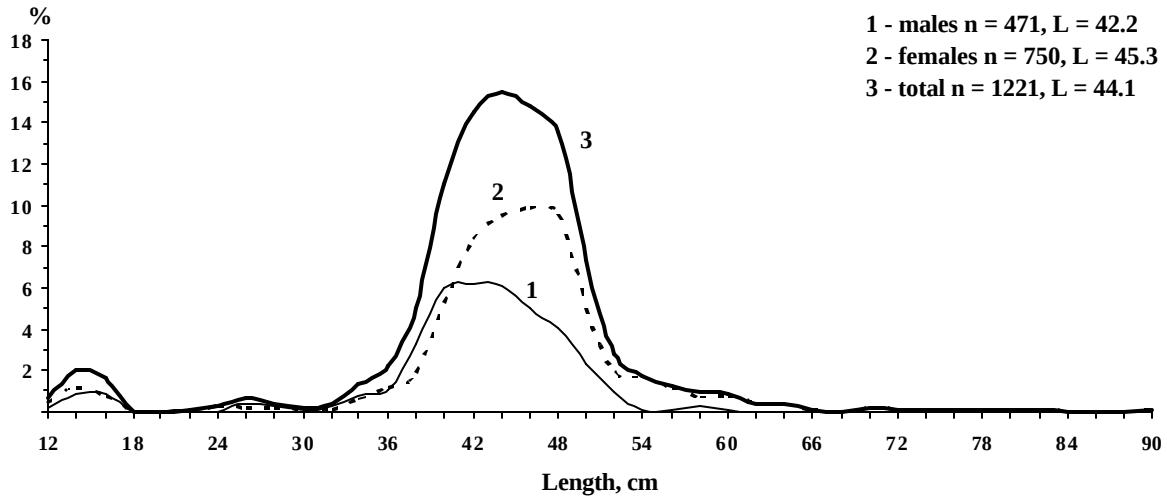

Fig. 2. Length composition of Greenland halibut in Div. 3M in 2001.

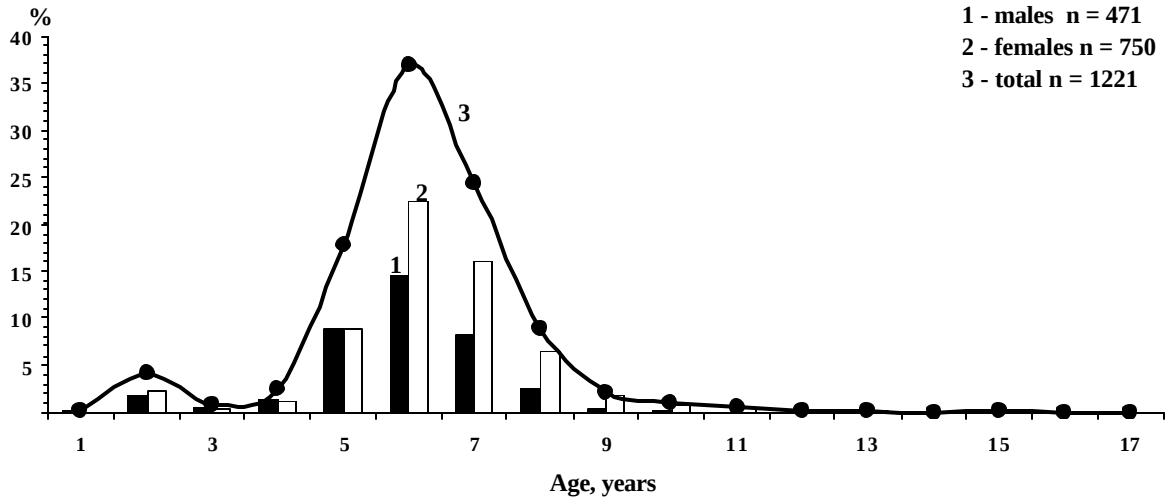

Fig. 3. Age composition of Greenland halibut in Div. 3M in 2001.

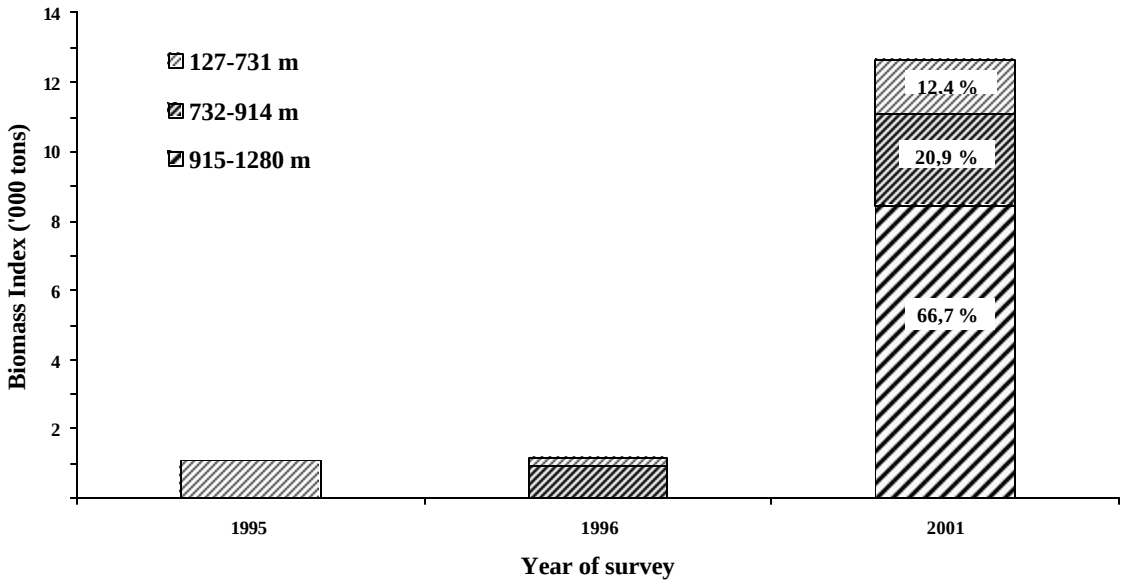

Fig. 4. Biomass Indexes of Greenland halibut, at different depths. Russian surveys in Div. 3M in