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Assessment of *Sebastes Marinus* Stock in Division 3M by Russian Research Trawl Surveys in 1987-1996.

by

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ABSTRACT

This paper presents results from surveys for Sebastes marinus on the Flemish Cap carried out in 1987-1996. In previous years the assessment included only a so-called fraction of beaked redfishes S.mentella and S.fasciatus with S.marinus not being included. However, in some years S.marinus accounted for 14.0% (29.7 mill.fish) of the total abundance of redfishes of the Seabastes genus and 23.5% (14.4 thou.t) by biomass.

From 1987 to 1996 the abundance of S.marinus varied between 0.6 and 29.7 mill.fish and biomass from 0.1 to 14.4 thou.t. In 1996 the abundance of S.marinus was 9.6 mill.fish and biomass 5.9 thou.t.

INTRODUCTION

Results presented here are based on the evidence provided by scientific research surveys conducted by the Polar Research Institute on the Flemish Cap. The main objective of those surveys was to collect data for assessment of stocks of major commercially valuable species with S.marinus being one of them.

MATERIAL AND METHODS

Trawl surveys used a stratified-random method (Doubleday, 1981; Bulatova, Chumakov, 1986).

Hauls were performed on a 24-hour basis. A fine-meshed insertion with the mesh size of 10-12 mm was used in a codend of the research trawl, drawing 1625. Duration of each haul was 30 min.

Table 1 presents information relating to Russian trawl surveys conducted on the Flemish Cap from 1987 to 1996.

Before 1995 hauls were performed to as deep down as 731 m. In 1996 for the first time hauls in strata 520, 524, 528, 533 in the depth range from 732 to 914 were carried out. In 1992 the survey did not cover strata 504, 509, 513, 517. In 1994 no research trawl survey was carried out on the Flemish Cap.

In research surveys redfishes of the Sebastes genus were split into two groups: S.mentella + S.fasciatus and S.marinus. It was done because of identification and separation of redfishes S.mentella and S.fasciatus being very diffucult.

RESULTS

Tables 2 and 3 present estimates of abundance and biomass of S.marinus stratum-by-stratum and for the whole Div.3M for 1987 to 1996. The analysis of those shows that in the period from 1987

to 1991 S.marinus major concentrations were found in the depth range from 147 to 367 m. In 1992-1996 the redfish were found to change their distribution pattern towards deeper waters over the Flemish Cap. In the 1996 survey only single S.marinus occurred in catches from above 800 m in deeper strata with the depth range of 732-914 m.

Major fraction of the stock estimated on the basis of data from bottom surveys was distributed in the survey period mainly in the western shallow part of the bank (strata 505, 510 and adjacent).

Since strata over the Flemish Cap differ in area and this affects the stock assessment, Tables 4-5 give average estimates of abundance and biomass per one haul. The greatest catch (in number) of redfish per haul (258.4 fish) was taken in stratum 502 in 1988. This was due to the fact that small immature redfish dominated catches from depth 147-183 m in this stratum. By biomass the greatest catch of 152.0 kg was taken in stratum 505 in 1988. In general, average catch of S.marinus during the period under consideration varied from 1 to 30 fish or 0.5 to 5 kg.

Table 6 presents estimates of abundance (mill.fish) and biomass (thou.t) for 1987-1996.

The highest estimate of the stock size of 29.7 mill.fish or 14.4 thou.t was obtained for 1988, which corresponded to 14.0% and 23.5%, respectively, of the total stock of redfishes of Sebastes genus (Vaskov, MS 1997/?). A lower stock estimate for 1992 can be explained by an incomplete coverage of the redfish distribution area and a short duration of survey. A 1991 estimate can be assumed as the minimum stock size estimate. The abundance of Sebastes marinus in that year was 1.9 mill.fish or 0.1 thou.t, which corresponded to 0.1% and 0.2%, respectively, of the total abundance and biomass of redfishes. In 1996 the abundance of S.marinus on the Flemish Cap was estimated at 9.6 mill.fish or 5.9 thou.t.

Despite estimates of S.marinus biomass provided by Spanish trawl surveys (Vazguez, 1996) being higher than those provided by Russian surveys their variation trend in 1988-1993 is similar (Fig.1).

High variability of S.marinus abundance and biomass estimates was likely to be associated with its redistribution as a result of migrations both in Div.3M and mid-water. A trawl survey allows to assess only a bottom component of the stock while a pelagic one is not covered.

Fig.2 shows S.marinus length frequencies for 1987-1996. Its length in catches taken by a research bottom trawl varied from 5 to 57 cm. In 1984-1985 strong year-classes were observed to appear which in 1987 were represented by fish of 6 to 10 cm in length. In 1991 catches were dominated by 7-12 cm redfish from strong 1988-1989 year-classes. Fish from those year-classes prevailed in catches in 1996 and were from 22 to 28 cm. The appearance of strong year-classes with S.marinus is of the same type as the appearance of strong year-classes with S.mentella and S.fasciatus. The strength of a year-class is dependent on reasons common for redfishes of this genus and most probably related to hydrographic conditions.

CONCLUSIONS

Results from Russian trawl surveys showed that in 1987-1996 S.marinus on the Flemish Cap were distributed mainly in the depth range from 147 to 367 m. Major concentrations were found in the western shallow part of the bank in strata 505 and 510. In 1996 the redfish were observed to be redistributed to deeper waters over the bank.

Estimates of the stock size for 1987-1996 varied considerably, with abundance changing from 0.6 to 29.7 mill.fish and biomass

from 0.1 to 14.4 thou.t. In 1996 the abundance of S.marinus was estimated at 9.6 mill.fish and biomass at 5.9 thou.t.

In 1984-1985 and 1988-1989 strong year-classes of S.marinus were observed to appear.

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Table 1. An inventory of Russian trawl surveys.

Year	Vessel		Valid tows	Dates
1987	MB-1202	PERSEY-III	131	21.06-07.07
1988	MB-1202	PERSEY-III	124	04.06-16.06
1989	MB-1202	PERSEY-III	129	24.06-08.07
1990	MB-1202	PERSEY-III	119	21.06-03.07
1991	MG-1362	VILNIUS	100	27.04-08.05
1992	MG-1366	K.SHAYANOV	53	15.04-20.04
1993	MG-1352	VILNIUS	69	27.06-07.07
1995	MI-0708	OLENITSA	58	20.05-29.05
1996	MI-8339	OLAINE	76	30.04-12.05

Table 2 . Biomass of S.marinus (tons) by strata based on data from trawl surveys, 1987-1996*.

Stratum	Depth, m	1987	1988	1989	1990	1991	1992	1993	1995	1996
501	128-146	15.6	8.7	361.4	1.9	13.6	0.1	7.7	4.8	1.1
502	147-183	89.3	4284.2	23.8	9.7	34.3	0.0	77.3	28.5	3.6
503	185-256	101.0	20.2	511.0	10.1	3.8	32.4	76.2	16.0	3.6
504	-"-	12.4	14.3	10.0	4.8	6.1	-	7.1	1.0	34.2
505	-"-	573.6	7917.2	355.2	934.6	12.0	24.2	20.1	269.8	5363.7
506	-"-	141.0	43.5	229.1	7.6	22.7	22.2	47.2	22.3	1.9
507	258-366	867.0	238.9	451.2	22.2	0.0	31.3	46.7	60.2	25.4
508	-"-	9.0	16.9	78.7	6.4	0.0	0.0	2203.6	14.0	21.5
509	-"-	117.9	27.6	60.6	0.0	0.0	-	9.7	22.3	15.8
510	-"-	1459.9	887.9	4112.7	1923.0	5.2	99.2	214.3	67.0	57.8
511	-"-	875.8	966.5	614.8	90.4	0.0	18.9	35.7	117.2	50.7
512	367-549	0.0	0.0	0.0	0.0	0.0	8.5	0.0	77.6	22.2
513	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	4.7
514	-"-	0.0	0.0	0.0	13.0	0.0	69.1	0.0	0.0	86.5
515	-"-	0.0	0.0	8.8	0.0	0.0	7.6	0.0	69.8	144.5
516	550-731	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.5	0.0
517	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0
518	-"-	0.0	10.6	0.0	0.0	0.0	0.0	0.0	0.0	5.9
519	-"-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.1	3.4
520	732-914	-	-	-	-	-	-	-	-	0.0
524	-"-	-	-	-	-	-	-	-	-	7.2
528	-"-	-	-	-	-	-	-	-	-	0.0
533	-"-	-	-	-	-	-	-	-	-	0.0

* No investigations were carried out in 1994 .

Table 3 . Abundance of S.marinus (thou.spec.) by strata based on data from trawl surveys, 1987-1996*.

Stratum	Depth, m	1987	1988	1989	1990	1991	1992	1993	1995	1996
501	128-146	589.0	50.7	1731.1	12.7	785.3	8.4	92.9	42.2	8.4
502	147-183	782.1	16042.7	151.7	108.6	337.0	0.0	589.7	227.6	15.5
503	185-256	990.2	179.4	1508.5	81.4	83.7	83.7	628.0	77.5	15.5
504	-"-	45.1	45.1	25.8	25.8	146.1	-	85.9	8.6	171.9
505	-"-	2326.0	9130.3	1272.9	2273.9	78.1	52.1	78.1	486.0	7464.0
506	-"-	1224.7	342.9	906.3	134.7	455.6	36.7	575.6	122.5	12.3
507	258-366	1948.4	514.2	1502.0	69.6	0.0	73.1	45.7	40.6	101.5
508	-"-	35.9	47.9	95.7	53.2	0.0	0.0	5491.0	47.9	111.7
509	-"-	157.0	93.0	167.5	0.0	0.0	-	23.3	93.0	85.3
510	-"-	2518.4	1599.7	6333.0	3498.7	10.1	140.9	328.7	211.3	375.7
511	-"-	1910.5	1598.7	1410.5	172.5	0.0	47.8	119.4	641.8	199.0
512	367-549	0.0	0.0	0.0	0.0	0.0	16.5	0.0	330.9	99.3
513	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	30.7
514	-"-	0.0	0.0	0.0	5.6	0.0	89.2	0.0	0.0	356.7
515	-"-	0.0	0.0	11.0	0.0	0.0	9.9	0.0	98.7	509.8
516	550-731	0.0	0.0	0.0	0.0	0.0	0.0	0.0	172.2	0.0
517	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0
518	-"-	0.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	9.3
519	-"-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.1	10.2
520	732-914	-	-	-	-	-	-	-	-	0.0
524	-"-	-	-	-	-	-	-	-	-	15.0
528	-"-	-	-	-	-	-	-	-	-	0.0
533	-"-	-	-	-	-	-	-	-	-	0.0

* No investigations were carried out in 1994 .

Table 4 . Data on average catches (spec.) per one valid tow from the Russian trawl surveys for S.marinus in Div. 3M by stratum in 1987-1996* .

Stratum	Depth, m	1987	1988	1989	1990	1991	1992	1993	1995	1996
501	128-146	23.3	2.0	68.3	0.5	31.0	0.3	3.7	1.7	0.3
502	147-183	12.6	258.4	2.4	1.8	5.4	0.0	9.5	3.7	0.3
503	185-256	21.3	3.9	32.4	1.8	1.8	1.8	13.5	1.7	0.3
504	-"-	1.8	1.8	1.0	1.0	5.7	-	3.3	0.3	6.7
505	-"-	44.7	175.3	24.4	43.7	1.5	1.0	1.5	9.3	143.3
506	-"-	33.3	9.3	24.7	3.7	12.4	1.0	15.7	3.3	0.3
507	258-366	32.0	8.4	24.7	1.3	0.0	1.2	0.8	0.7	1.7
508	-"-	0.8	1.0	2.0	1.0	0.0	0.0	114.8	1.0	2.3
509	-"-	6.8	4.0	7.2	0.0	0.0	-	1.0	4.0	3.7
510	-"-	35.8	22.7	89.9	49.7	0.1	2.0	4.7	3.0	5.3
511	-"-	32.0	26.8	23.6	2.9	0.0	0.8	2.0	10.8	3.3
512	367-549	0.0	0.0	0.0	0.0	0.0	0.3	0.0	6.7	2.0
513	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	1.7
514	-"-	0.0	0.0	0.0	0.1	0.0	2.0	0.0	0.0	8.0
515	-"-	0.0	0.0	0.2	0.0	0.0	0.2	0.0	2.0	10.3
516	550-731	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0
517	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0
518	-"-	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.6
519	-"-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.3
520	732-914	-	-	-	-	-	-	-	-	0.0
524	-"-	-	-	-	-	-	-	-	-	0.8
528	-"-	-	-	-	-	-	-	-	-	0.0
533	-"-	-	-	-	-	-	-	-	-	0.0

* No investigations were carried out in 1994 .

Table 5 . Data on average catches (kg) per one valid tow from the Russian trawl surveys for S.marinus in Div. 3M by stratum in 1987-1996*.

Stratum	Depth, m	1987	1988	1989	1990	1991	1992	1993	1995	1996
501	128-146	0.6	0.3	14.3	0.1	0.5	0.01	0.3	0.2	0.04
502	147-183	1.4	69.0	0.4	0.2	0.6	0.0	1.2	0.5	0.1
503	185-256	2.2	0.4	11.0	0.2	0.1	0.7	1.6	0.3	0.1
504	-"-	0.5	0.6	0.4	0.2	0.2	-	0.3	0.04	1.3
505	-"-	11.0	152.0	6.8	18.0	0.2	0.5	0.4	5.2	103.0
506	-"-	3.8	1.2	6.2	0.2	0.6	0.6	1.3	0.6	0.1
507	258-366	14.2	3.9	7.4	0.5	0.0	0.5	0.8	1.0	0.4
508	-"-	0.2	0.4	1.6	0.1	0.0	0.0	46.0	0.3	0.4
509	-"-	5.1	1.2	2.6	0.0	0.0	-	0.4	1.0	0.7
510	-"-	20.7	12.6	58.4	27.3	0.1	1.4	3.0	1.0	0.8
511	-"-	14.7	16.2	10.3	1.5	0.0	0.3	0.6	2.0	0.8
512	367-549	0.0	0.0	0.0	0.0	0.0	0.2	0.0	1.6	0.4
513	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.3
514	-"-	0.0	0.0	0.0	0.3	0.0	1.5	0.0	0.0	1.9
515	-"-	0.0	0.0	0.2	0.0	0.0	0.2	0.0	1.4	2.9
516	550-731	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0
517	-"-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0
518	-"-	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.4
519	-"-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.1
520	732-914	-	-	-	-	-	-	-	-	0.0
524	-"-	-	-	-	-	-	-	-	-	0.4
528	-"-	-	-	-	-	-	-	-	-	0.0
533	-"-	-	-	-	-	-	-	-	-	0.0

* No investigations were carried out in 1994 .

Table 6 . Abundance and biomass of S. marinus in Div. 3M by the data from the 1987-1996* trawl surveys

Year	Area, sq.mile	Number of hauls	Abundance, fish 10^6	Biomass, thou.t
1987	10555	131	12.5	4.3
1988	10555	124	29.7	14.4
1989	10555	129	15.1	6.8
1990	10555	119	6.4	3.0
1991	10555	100	1.9	0.1
1992	9428	53	0.6	0.3
1993	10555	69	8.1	2.8
1995	10555	58	2.7	0.9
1996	11961	76	9.6	5.9

* No investigations were carried out in 1994

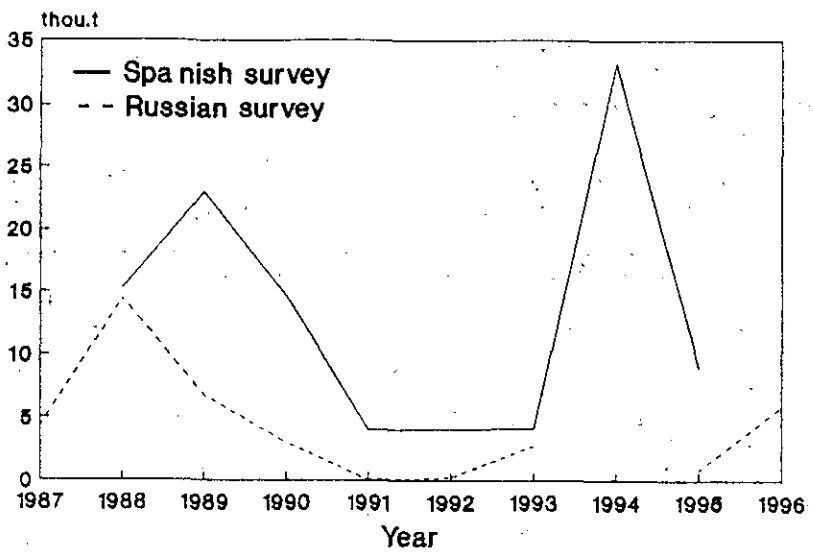

Fig. I . Results of biomass estimation of S.marinus in Div. 3M based on data from Russian and Spanish surveys.

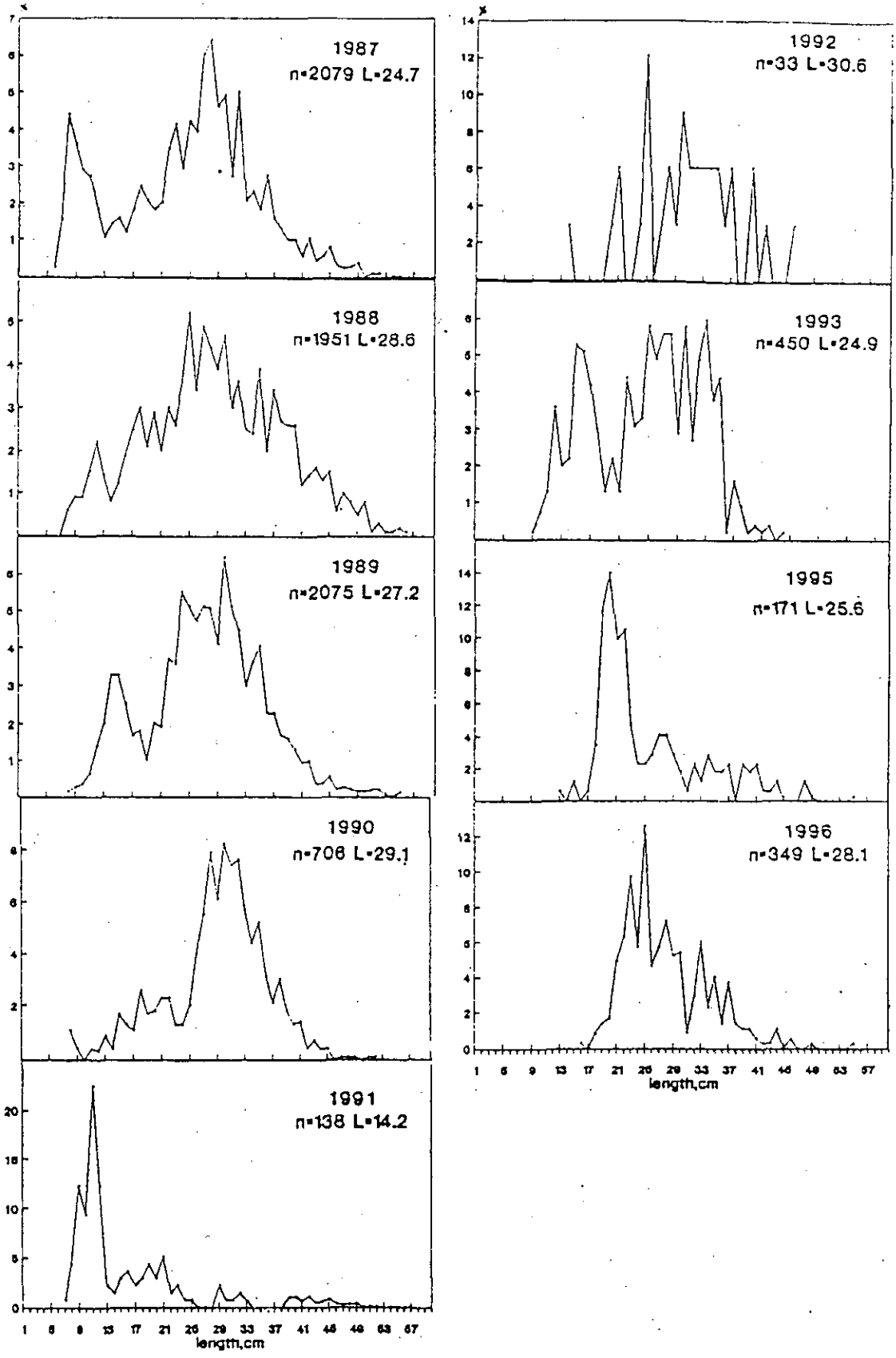

Fig. 2 . Length frequencies of S.marinus on Flemish Cap by results of sampling surveys in 1987-1996.