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Age Structure of Roughhead Grenadier (*Macrourus berglax*) on Flemish Cap, 1994

by

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Abstract

The population dynamics and biology of Roughhead grenadier has proved difficult to study due to their distribution in depths greater than about 500 m, together with their relative unimportance as a commercial species in the Northwest Atlantic.

Age-length keys and biomass swept area method estimates for Roughhead grenadier (*Macrourus berglax*) are presented in this paper. Samples were collected in a bottom trawl survey in NAFO Div. 3M in 1994. Ageing was done on otoliths by sex. Age structure of catches showed clear differences between the two sexes at age older than 8 years. The materials confirmed the relatively slow growth and multiaged structure of *M. berglax* in the sample area.

Introduction

Grenadiers are an important component in the by-catch in the Spanish Greenland halibut Fishery. The importance of these species in the Spanish catch in relation to target species increased in the period 1991-1993 (Paz, J. and S.Iglesias 1994). Total catches of Roughhead grenadier in Div. 3LM averaged about 5100 t from 1991-1993 (Atkinson, D.B. et al., 1994). The impact of this fishing pressure is unknown at present.

Although the Roughhead depth range is 200-1400 m (Snelgrove and Haedrich 1985), data on age structure and length composition of *Macrourus berglax* on Flemish Cap (NAFO Div. 3M) presented in this paper arrives from depths less than 720 m.

Materials and Methods

Total biomass of *Macrourus berglax* on Flemish Cap estimated by the swept area method were calculated in the random-stratified bottom trawl surveys carried out by the European Union in June-July 1989-1994 on the area. Length composition of this specie was also estimated for the years 1993 and 1994.

Macrourus berglax were measured from tip of snout to base of first anal-fin ray, in 0.5 cm intervals, as adopted by NAFO in June 1980 (Savvatimsky, 1986) as a standard measurement for roundnose and roughhead.

Ages were determined from otoliths collected in 1994. The otoliths were broken through the nucleus, partially embedded in black plasticine and illuminated by light directed against the concave surface and transmitted up through the broken surface.

Results

The Roughhead grenadier total biomass estimated by the swept area method in 1989-1994 surveys are presented in the Table 1. Figure 1 shows the anal-fin length compositions of Roughhead grenadier in 1993 and 1994 .

The biomass increase from 1991 to 1993 (Table 1) coincides with the dominance of relatively abundant 1986 and 1987 year-classes. These annual classes are identified in figure 1 with anal-fin length of 16 and 18 cm in 1993 (6 and 7 years old respectively). These annual classes are present in 1994 as 7 and 8 years old fish, with 18 and 19.5 cm modal length. The decline of biomass from 1993 to 1994, as these results indicate, is so high that it is unlike be a consequence of a fishery, although the increase of fishing pressure in the last years (Atkinson, op. cit.) took place.

The complex multy-mode length structure corresponds to a slow growth of this specie and to a multiaged structure with growth differences between males and females.

Many difficulties in reading Macrouridae age from otoliths and scales have been reported previously (Savvatimsky, 1984). In general, it is not difficult to count rings on otoliths in small fish. However, age reading in larger fish (>10 years old) is more complicated since many rings are presented and they lie close to each other.

The anal fin length-age key is given by sex in Table 2 and the mean anal-fin length at age and sex is presented in Fig. 2. Mean length at age was similar for males and females up to 6 years old. Larger females appear to grow somewhat quicker than males, but the material from only one survey is too limited for this to be ascertained conclusively. A similar growth differences by sex was described Savvatimsky (1994) using scales for ageing fish. Some of the irregularities in mean anal-fin length values, are the result of insufficient sampling.

Table 3 shows the age composition by sex in 1994. It confirms the importance of the 1986 years-class (7 years old) in the fishery.

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Table 1.- Biomass swept area method estimates in Flemish Cap Div. 3M 1989-1994.

Years	Biomass (tons)
1989	1024
1990	1014
1991	1587
1992	1878
1993	3757
1994	2350

Table 2.- Anal fin length -age key by sex of *Macrourus berglax* from Div. 3M, 1994.

Females

Length	Age class															Total
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Nº
6	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2
7	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	3
8	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	6
9	-	-	1	4	-	-	-	-	-	-	-	-	-	-	-	5
10	-	-	-	9	1	-	-	-	-	-	-	-	-	-	-	10
11	-	-	-	2	1	1	-	-	-	-	-	-	-	-	-	4
12	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	4
13	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	4
14	-	-	-	-	5	1	-	-	-	-	-	-	-	-	-	6
15	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	3
16	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	3
17	-	-	-	-	-	3	6	2	-	-	-	-	-	-	-	11
18	-	-	-	-	-	-	5	3	-	-	-	-	-	-	-	8
19	-	-	-	-	-	-	1	6	5	-	-	-	-	-	-	12
20	-	-	-	-	-	-	-	2	3	2	-	-	-	-	-	7
21	-	-	-	-	-	-	-	1	4	2	-	-	-	-	-	7
22	-	-	-	-	-	-	-	-	1	3	1	-	-	-	-	5
23	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	2
24	-	-	-	-	-	-	-	-	1	1	3	-	-	-	-	5
25	-	-	-	-	-	-	-	-	-	1	3	-	-	-	1	5
26	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	2
27	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
28	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
29	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	2
30	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	2
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Total	-	2	7	18	14	12	12	14	15	10	9	3	3	-	2	121

Males

Length	Age class															Total
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Nº
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
8	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
9	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
10	-	-	-	8	1	-	-	-	-	-	-	-	-	-	-	9
11	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	6
12	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2
13	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	3
14	-	-	-	-	3	4	-	-	-	-	-	-	-	-	-	7
15	-	-	-	-	2	3	1	-	-	-	-	-	-	-	-	6
16	-	-	-	-	-	5	5	1	-	-	-	-	-	-	-	11
17	-	-	-	-	-	5	11	1	-	-	-	-	-	-	-	17
18	-	-	-	-	-	-	6	11	1	-	-	-	-	-	-	18
19	-	-	-	-	-	-	1	5	4	1	-	-	-	-	-	11
20	-	-	-	-	-	-	-	-	4	3	-	1	-	-	-	8
21	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	5
22	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	1	13	12	19	24	18	14	4	-	2	-	-	-	107

Table 3.- Age composition by sex of *Macrourus berglax* in Div. 3M, 1994.

Age class	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
males	-	-	135	1134	854	1410	1614	1203	961	331	-	217	-	-	121	7980
females	-	61	252	868	1041	763	760	1016	1256	1069	945	442	376	-	196	9045
Total	-	388	1205	3890	4117	4731	4778	4614	4054	1936	1215	803	438	-	333	32502

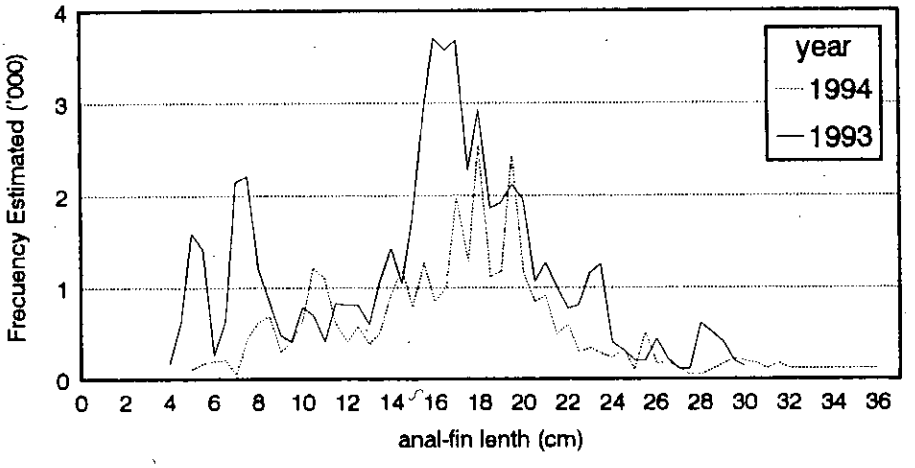

Fig 1. Anal-fin length distributions of Roughhead grenadier in Div. 3M, 1993-94.

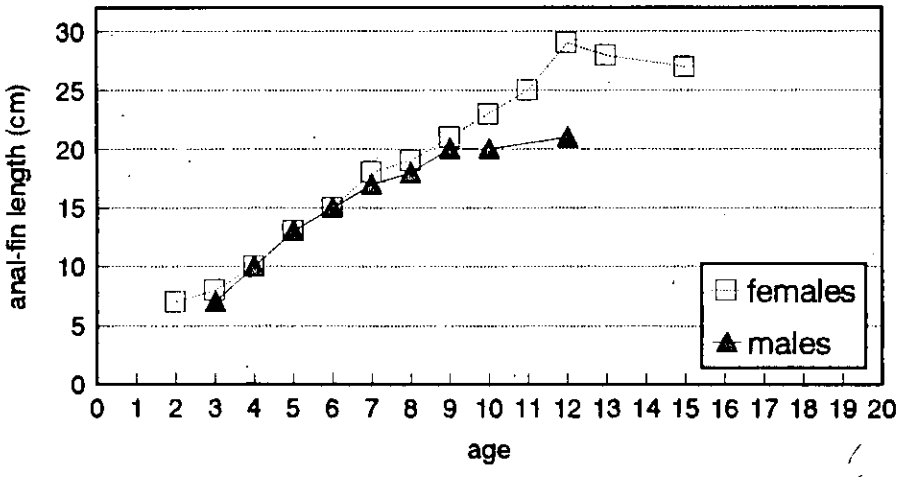

Fig. 2.- Mean anal-fin length (cm) at age of Roughhead grenadier in Div. 3M, 1994.