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Grenadiers in the Spanish Fishery of Greenland Halibut,  
NAFO Divisions 3LM and 3N, 1991-1993

by

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**ABSTRACT**

In the Spanish Greenland halibut Fishery, grenadier are an important component in the by-catch. Their catch, catch-rate and size distribution were analyzed during the period 1991 to 1993.

The importance of these species in relation to the targetted species increased in the period studied and the proportion between the two in by-catch was approximately 50%. Yields were greater during the first half year period, and increased with depth. Sizes of roundnose were smaller to the south (3N) whereas roughhead sizes were larger in this same division.

**INTRODUCTION**

Substantial concentrations of roundnose grenadiers (*Coryphaenoides rupestris*) and roughhead grenadier (*Macrourus berglax*) inhabit slope areas in depths greater than about 500 m, in the northwest Atlantic. The population dynamics and biology of these species has proved difficult to study due to their deep distribution, together with their relative unimportance as a commercial species in the northwest Atlantic.

Russian scientists have provided data on survey research and grenadier fisheries. These reports include discussions on the biology and distribution of these species, (e.g. Chumakov and Savvatimsky 1990, 1993). Parsons (1976), Atkinson and Power (1987) describe their distribution and relative abundance off the east coast of Canada based on the results of Canadian research surveys.

Since 1991, a new, deeper Spanish fishery was developed on the boundary of Divisions 3L and 3M, extended to the North of Division 3N (Figure 1). Bottom trawlers fish from depths of 800 m providing the opportunity to study the abundance and distribution of commercial grenadiers at unusual depths.

In this paper, we present the first description of the presence of grenadier in the catches of the Spanish NAFO fishery. We consider two Spanish fleets: small freezer vessels traditionally catching flatfish although mainly fishing for Greenland halibut, from the second half of 1992, and large freezer vessels fishing for Greenland halibut in deep water of Divisions 3LM, since 1991.

Thirteen small freezer vessels were fishing in the NAFO area during 1992, and twelve in 1993. The majority moved to deep waters to fish Greenland halibut in the same area described for large freezer vessels. (Junquera et al., 1992).

During the second half of 1992 all vessels were fishing for Greenland halibut and each small freezer vessel had an observer on board. In 1993, one in every three vessels had an observer on board sampling the catch. In the large bottom trawler freezer vessels targeting Greenland halibut, one in every three vessels also had an observer on board. These observers collected catch data per haul during the 2nd half of 1991 and throughout the year in the period 1992-1993. In 1993, 25725 individuals were measured in the large vessels (149 samplings) and 31364 individuals in the small vessels (171 sampling).

## RESULTS

Figure 2 shows the composition of catch by grenadier species. Catches of Roundnose grenadier were greater than roughhead catches in the large vessel fleet: in 1991, this was approximately 6 times greater, although this year, it is likely that there are errors in the identification of grenadier species. In 1992 and 1993, the proportion is 1.5 times greater.

In the small vessel fleet, the most important species in the catches was roughhead grenadier, both in 1992 and 1993, with approximately 80% of roughhead. This may be due to the fact that, relative to the other fleet, this fleet made a greater fishing effort in Division 3N where the yields for this species are greater (Figure 3).

Considering the two fleets combined, the proportion between the two species is of around 50% in both years (Figure 2), despite the fact that in previous studies, roundnose was more abundant than roughhead in the area (Atkinson, op. cit.).

Examining the proportion between catches of grenadier and target species (Greenland halibut), a progressive increase of importance was observed during the study period in both fleets and in all the divisions. The only exception to this was in the roundnose catches of the large vessels which shows no clearly defined tendency (Fig. 3).

**Catch rate by Division and semester.** (Fig.4) The catch rate of roughhead was clearly higher than for roundnose in all Divisions except Div. 3M, during the first six months for the both fleets, although it must be pointed out that these high yields in 3M are due to only 2 vessels. In Division 3N, the catch rate for roughhead was highest for the two fleets (Fig. 4).

The catch rate of roughhead grenadier was higher in the first six months than in the second for the two fleets. These differences in catch rate suggest that fish moved up and down the slope at different times of the year. Thus Podrazhanskaya (1971) concluded that roundnose grenadier move up the slopes to shallower waters during the second half of the year. Roughhead grenadier seems to present a similar seasonal movement pattern, according to our data.

Roundnose grenadier shows no clear seasonal pattern.

**Catch rate by deep strata.** The catch rates of both species were analyzed by deep strata, division, semester and fleet.

In the case of Roughhead caught by the large vessels, during the 1st semester, catch rate increases with depth in all Divisions. Maxima were recorded in the 1001-1200 m strata in Div. 3L. During the 2nd semester, at a depth of up to 1400 m, catch rates were of the same order, decreasing with depth.

In the case of Roundnose, yields increased with depth in both semesters. Maxima were in Div. 3M at 1200-1400 m during the 1st semester, and at 1400-1600 during the 2nd, being higher during the 1st semester (Fig. 5).

An increase in yield with depth was observed in both species during the 1st semester, and also in the 2nd for Roundnose.

In the small vessels, yields were very low, except in the case of roughhead during the 1st semester. In this case, an increase in yield with depths was noted up to 1200 m.

**Length distribution.** In the distribution of sizes of samplings in the roughhead catch (Fig. 8), individuals are larger in 3N than in the other two divisions located further north, and were smaller in 3L. This increase in sizes towards the South coincides with reports by Savvatimsky (1983) and Atkinson (1987). In the case of roundnose, smaller sizes appear in 3N and larger in 3M (Fig. 7). This presence of smaller individuals in the south confirms the results by Podrazhanskaya (1971), later questioned by Atkinson (1987).

Examination of size distribution by fleet (Fig. 7) shows that the small vessels catch more small sized roundnose individuals than the large vessels. This is probably due to their greater activity in Div. 3N where, as already stated, individuals are smaller.

In the case of roughhead, it is the large vessels which catch more smaller individuals, probably due to the same reason.

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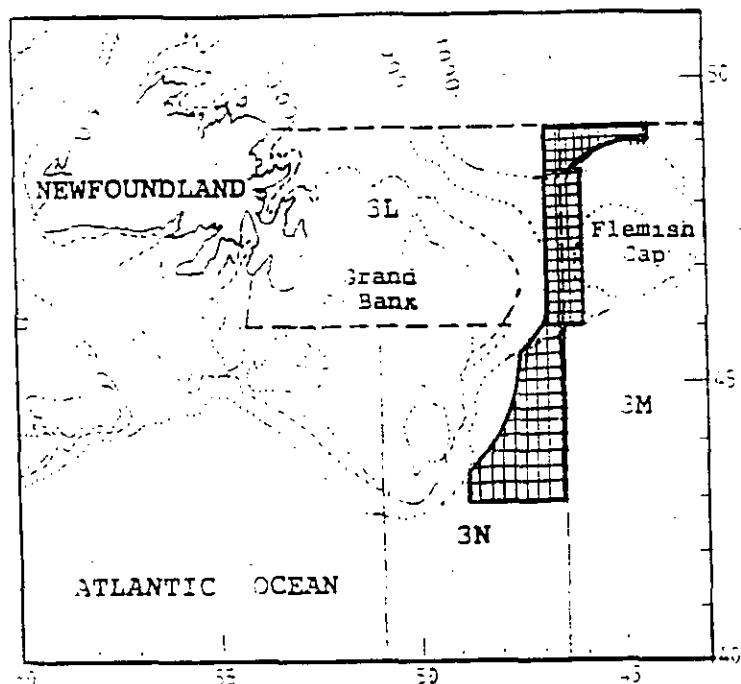


Fig. 1.- Fishing area of Spanish fleet target to Greenland halibut in NAFO area.

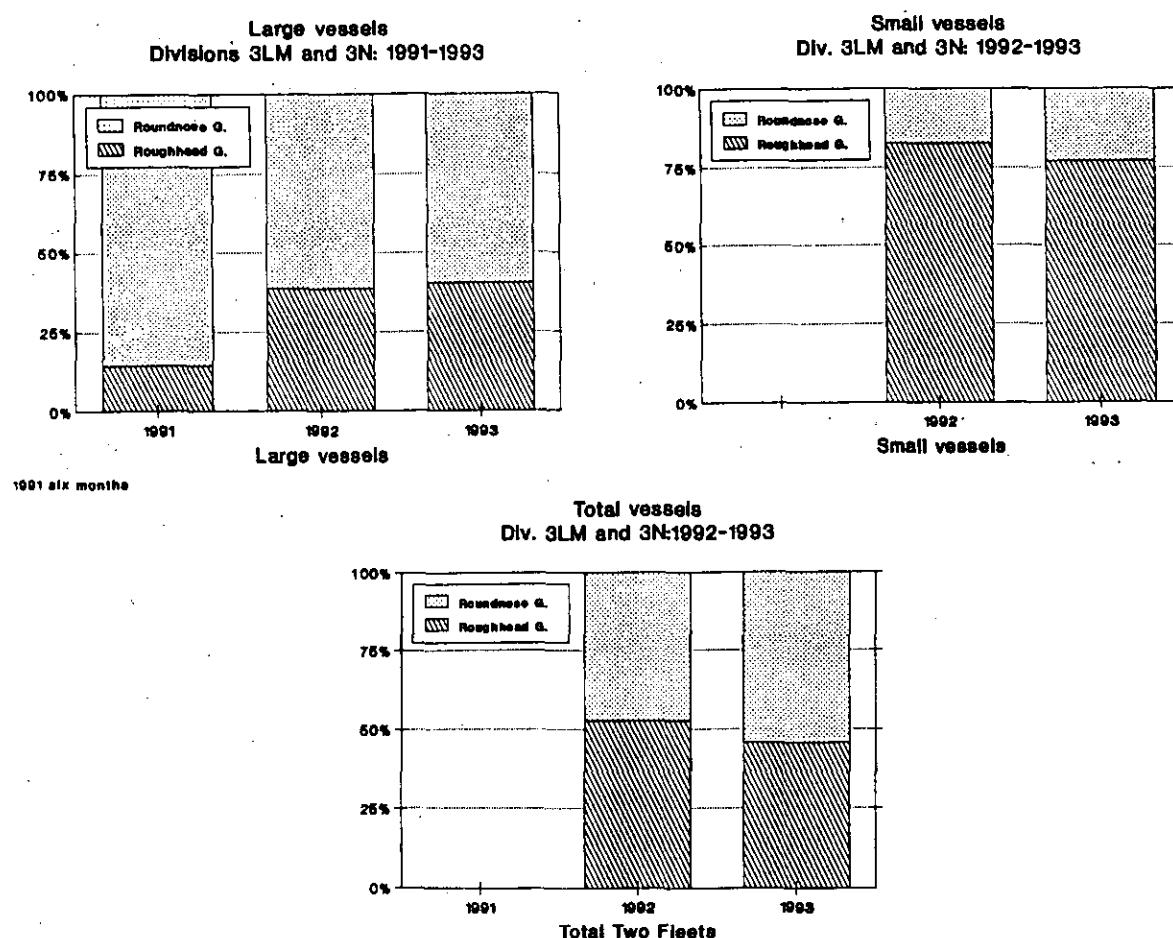
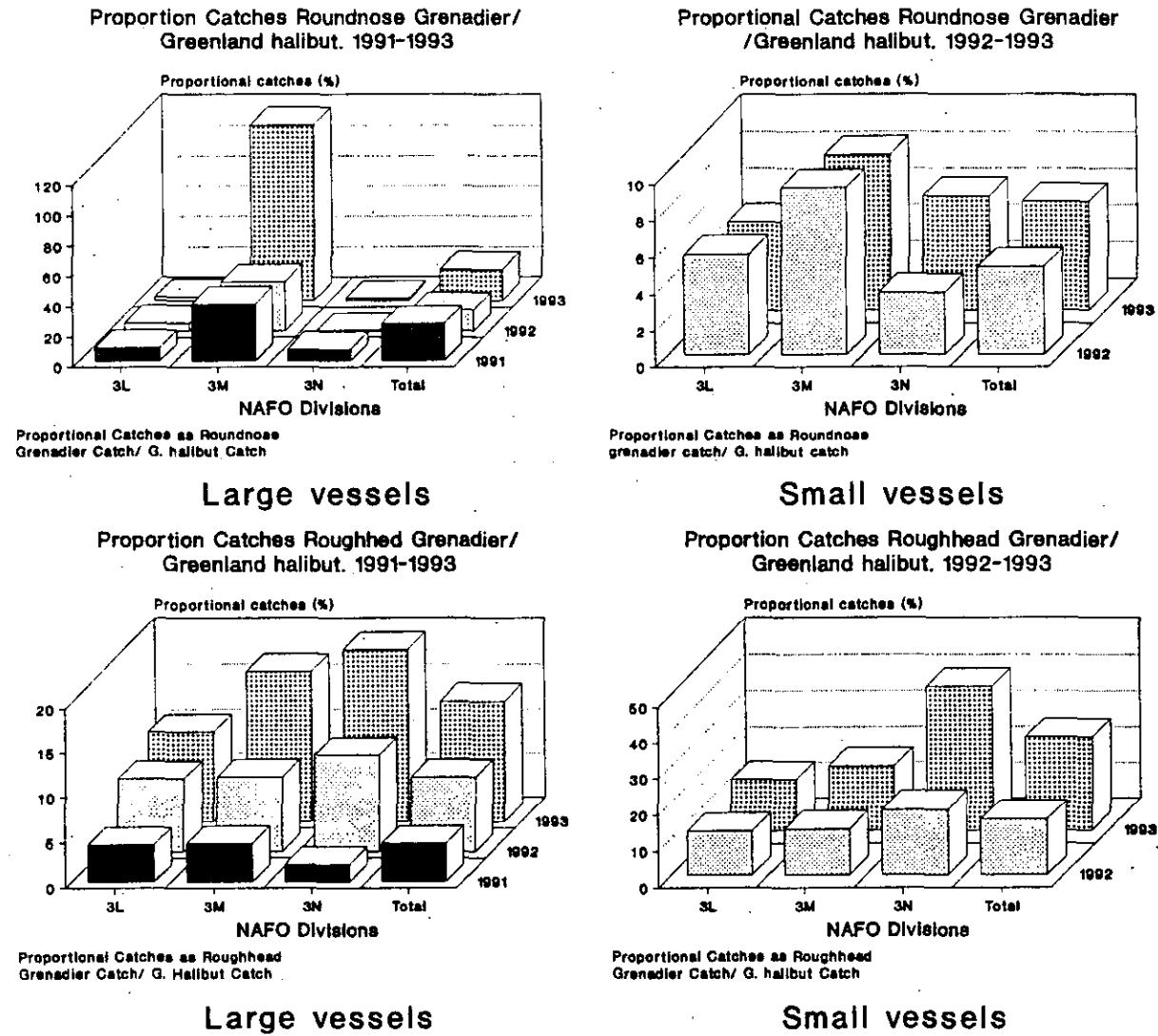
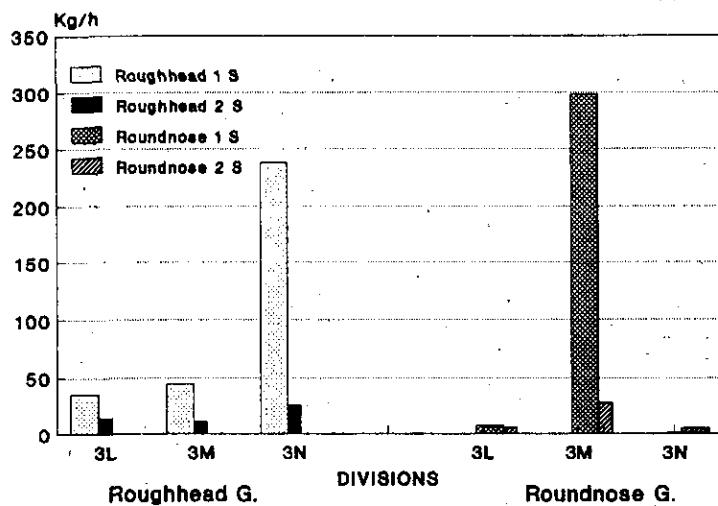


Figure 2 .- Grenadier Catches Composition by species in Spanish Fishery target to G. halibut: 1991-1993



**Figure 3.- Proportion catches Grenadiers/G. halibut. Spanish  
fleets 1991-1993. NAFO Divs. 3LM and 3N**

Grenadiers Catch rate (Kg/h)  
Large vessels



Grenadiers Catch rate (Kg/h),  
Small vessels

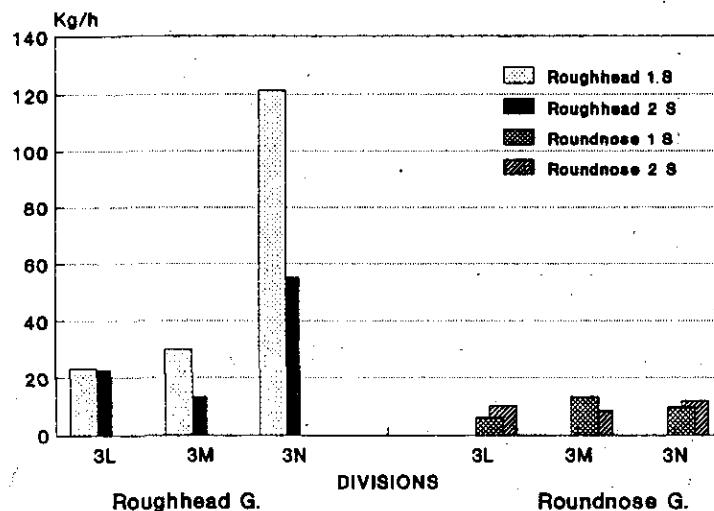
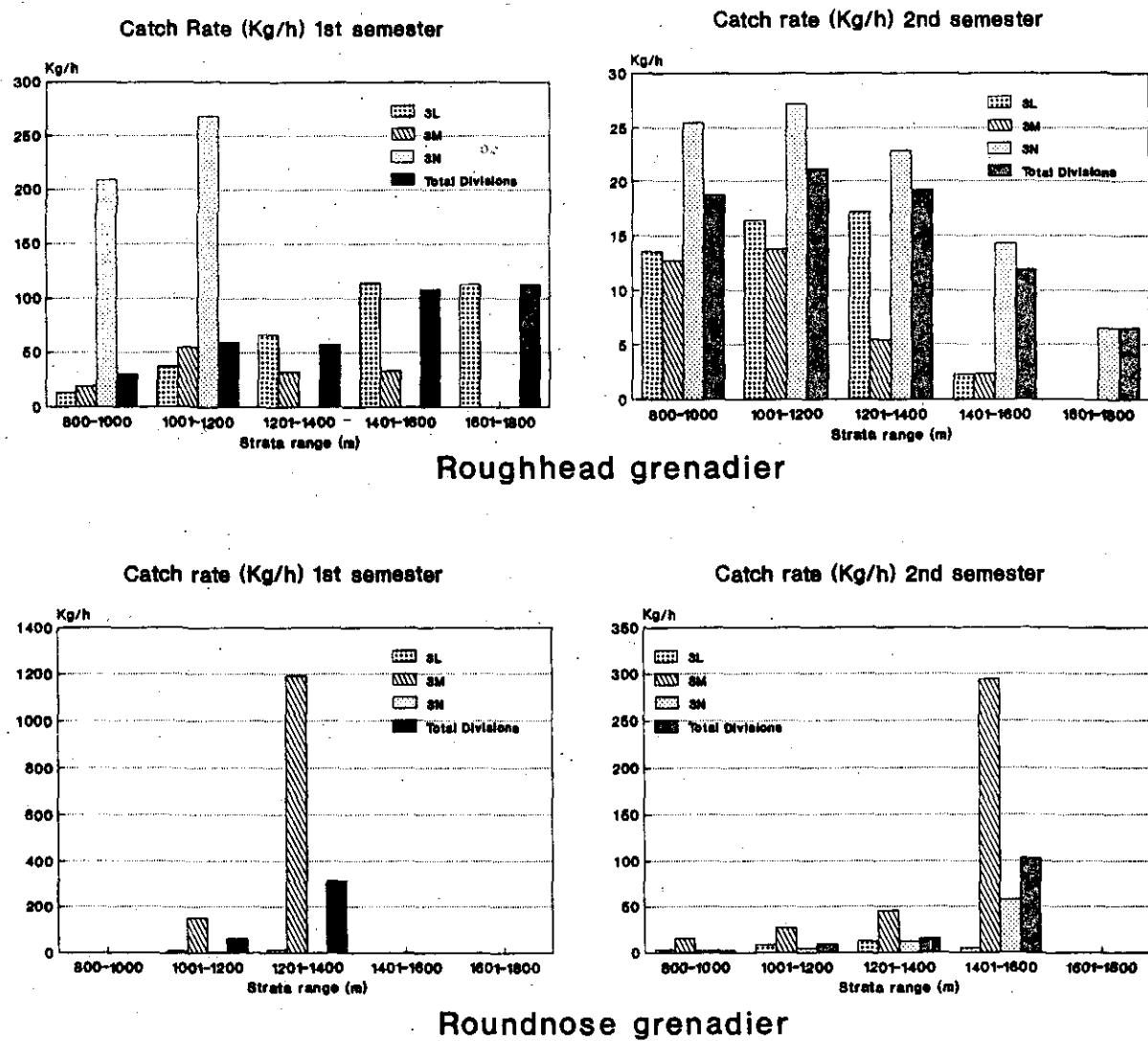
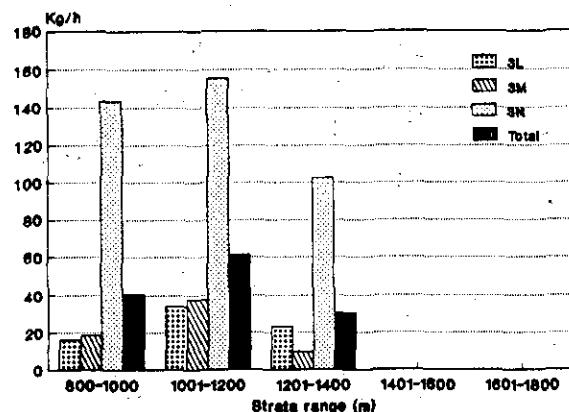


Figure 4.- Grenadiers catch rate by division, semester and fleet. 1993

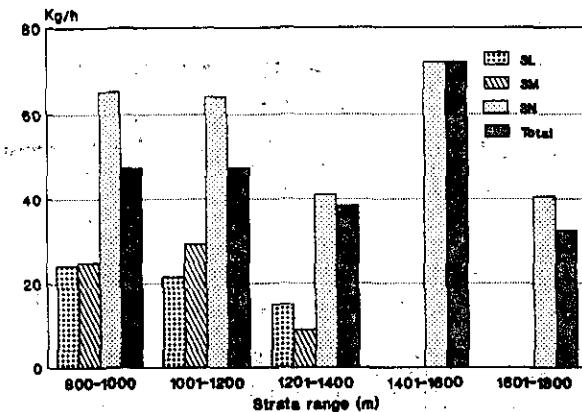


**Figure 5.- Grenadiers catch rate by Division and deep strata for large vessels. 1993**

Catch Rate (Kg/h) 1st semester

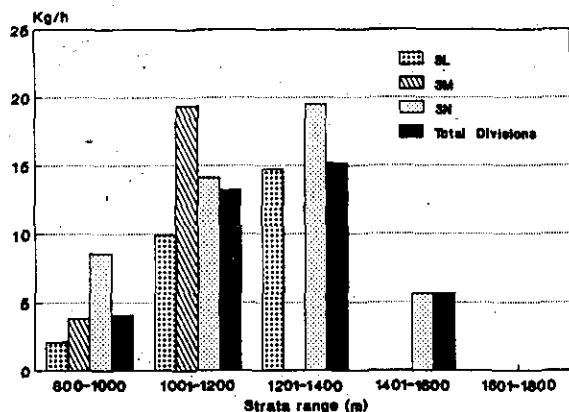


Catch Rate (Kg/h) 2nd semester

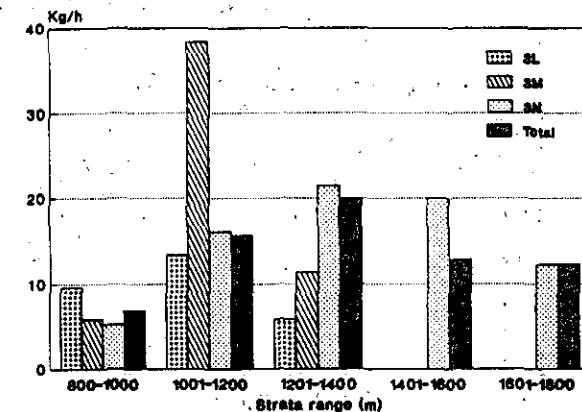


### Roughhead grenadier

Catch Rate (Kg/h) 1st semester



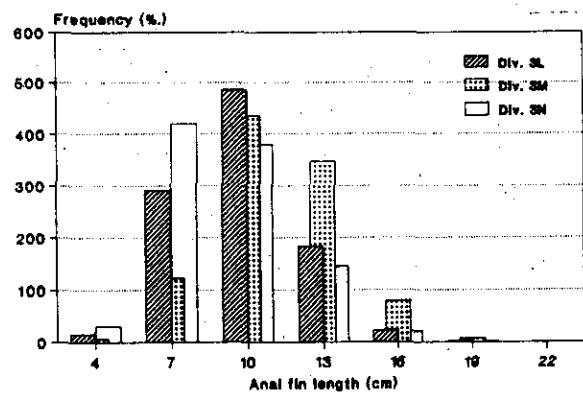
Catch Rate (Kg/h) 2nd semester



### Roundnose grenadier

Figure 6.- Grenadier catch rate by Division and deep strata for small vessels. 1993

Roundnose grenadier length frequency  
by Divison. 1993



Roundnose grenadier length frequency  
by Fleet. 1993

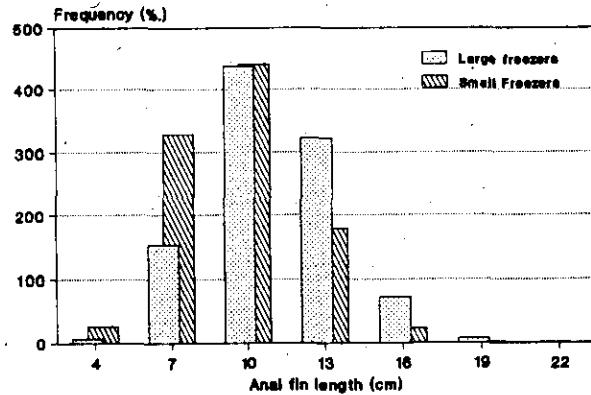
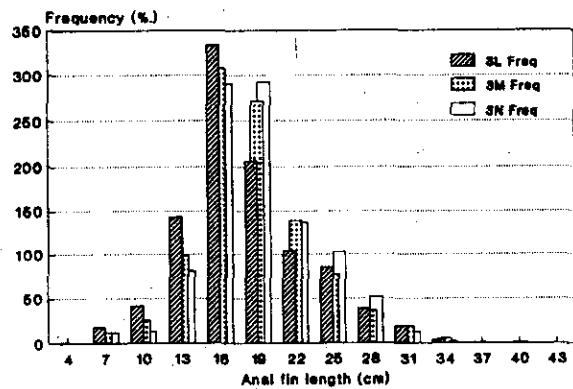


Figure 7.- Length frequency of roundnose grenadier as  
collected Spanish observers

Roughhead grenadier length frequency  
by division. 1993



Roughhead grenadier length frequency  
by Fleet 1993

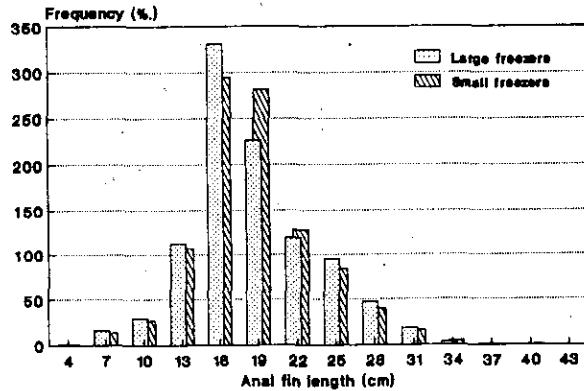


Figure 8.- Length frequencies of roughhead grenadier as  
collected Spanish observers