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Distribution and Reproductive Biology of Two Deep-water Squalid Sharks, *Centroscymnus coelolepis* (Portuguese Dogfish) and *Centrophorus squamosus* (Leafscale Gulper Shark), in the Rockall Trough Area of the Northeast Atlantic

by

P. Crozier

Scottish Association for Marine Science, Dunstaffnage Marine Laboratory,
Oban, Argyll, Scotland, PA34 4AD. E-mail: pcroz@dml.ac.uk

Abstract

The distribution and reproductive biology of two deep-water squalid sharks, *Centroscymnus coelolepis* (Portuguese dogfish) and *Centrophorus squamosus* (leafscale gulper shark) have been studied using pre-fishery and recently collected survey data from the continental slope to the west of the British Isles. The results show that the commercial deep-water fishery appears to have had more of an effect on the leafscale gulper shark than on the Portuguese dogfish, with a reduction in the abundance of larger mature individuals of leafscale gulper shark. Small individuals of both species (<60 cm) were absent from all data analysed. Immature fish were generally found at greater depths than the adults. Numbers of sharks landed from a market sampling program showed a greater similarity in the ratio of males and females caught for the leafscale gulper shark than the Portuguese dogfish. The lack of pregnant female (D to F stage) leafscale gulper sharks in both pre- and post fishery surveys might suggest that the fishery would have less of an impact on this species than on the Portuguese dogfish where pregnant females are landed. It is possible that the distribution (both vertically and geographically) of the Portuguese dogfish exceeds that of the commercial fishery resulting in less exploitation of the whole stock.

Introduction

A deep-water fishery targeting blue ling (*Molva dypterygia*) and roundnose grenadier (*Coryphaenoides rupestris*) developed to the west of the British Isles in the early 1990s. The bycatch from this fishery includes two species of deep-water squalid sharks, *Centroscymnus coelolepis* (Portuguese dogfish) and *Centrophorus squamosus* (leafscale gulper shark). Although the information on the reproduction of deep-water squaloid sharks below 500 m depth is limited it is known that they have reproductive strategies that make them vulnerable to commercial fishing. They have low fecundity, a high age at first maturity and generally have slow growth. Monitoring the landings from the fishery and investigating their reproductive biology will provide information that will be of value in formulating advice on how to conserve the stocks from over-exploitation. In this study it has been possible to have access to pre-fishery data from a variety of research surveys carried out in the Northeast Atlantic in the 1970's and 1980's. These data are being compared with recently collected data to determine whether the commercial fishery is having an impact on the stocks.

Materials and Methods

Data were collected from four recent research cruises between April 1999 and September 2000 to the west of the British Isles, and from archived data from the same area in the 1970s and 1980s. The available information included the location and depth of capture, total length and the reproductive biology of each shark. Sexual maturity was

determined following a scale described for all elasmobranch species by Stehmann (1987). For males the size and form of the claspers and information on the seminal vesicle, and testes were used to determine maturity. For females the number of eggs/embryos were counted and the widths of the uterus and nidamental gland were measured. Monthly data were also recorded on number, sex and total length for the Portuguese dogfish and leafscale gulper shark from a deep-water fish market between January 1999 and December 2001.

Results

Data on total length showed that there has been no reduction in length for the Portuguese dogfish since the start of the fishery. However there has been a reduction in the number of large specimens of the leafscale gulper shark (Figure 1). An analysis of the data on sexual maturity for both species showed that immature specimens of both sexes (A, B stages) were found at greater depths than more mature individuals (C, D stages). Pregnant (D-F stages) females of the leafscale gulper shark were absent. Small individuals (<60 cm) of both species were also not found. There were no differences in the proportions of the different sexual maturity stages of female Portuguese dogfish between pre-fishery and recent data (Figure 2). However, there was a greater abundance of immature leafscale gulper sharks throughout the depth range in the recent sampling (Figure 3). Data on the proportion of males and females in the monthly market samples from landings of the French trawlers at the Scottish port of Lochinver were also analysed. The results showed that the sex ratio in landings of the leafscale gulper shark was quite similar from month to month (Figure 4). The monthly landings of the Portuguese dogfish tended to be dominated by either males or females (Figure 5).

Discussion

Results collected from pre-fishery and recent data indicate that the commercial deep-water fishery may have had a greater impact on the leafscale gulper shark than on the Portuguese dogfish. The reduction in the abundance of large mature individuals of leafscale gulper shark suggests that these fish may have been removed by the commercial fishery. Sexual segregation by depth in the water column with an absence of small juveniles for both species have been observed in previous studies. Girard and Du Buit (1999) and Clarke (2000) recorded similar results in the Northeast Atlantic. Both authors suggest that females migrate into deeper waters to give birth and then return to shallower depths to feed. Clarke also speculates that the juveniles of these species may spend the first few years in the water column and therefore will avoid capture by the bottom trawls of the commercial fishery. Girard and Du Buit suggest that juveniles may inhabit areas that are not targeted by the bottom trawl fishery, such as the Mid-Atlantic Ridge. The absence of pregnant females (D-F stages) of leafscale gulper shark was also recorded in their studies. However, the lack of capture of mature females does not appear to have protected the stocks of the leafscale gulper sharks. By contrast the fishery on the Portuguese dogfish, where pregnant females are caught and landed, appears to have had little effect on the length distribution. It is possible that the distribution (both vertically and geographically) of the Portuguese dogfish exceeds that of the commercial fishery resulting in less exploitation of the whole stock.

References

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- STEHMANN, M. 1987. Quick and dirty tabulation of the stomach contents and maturity stages for skates (Rajidae), squaloid and other ovoviviparous and viviparous species of sharks. American Elasmobranch Society Newsletter, no. 3, 5-9.

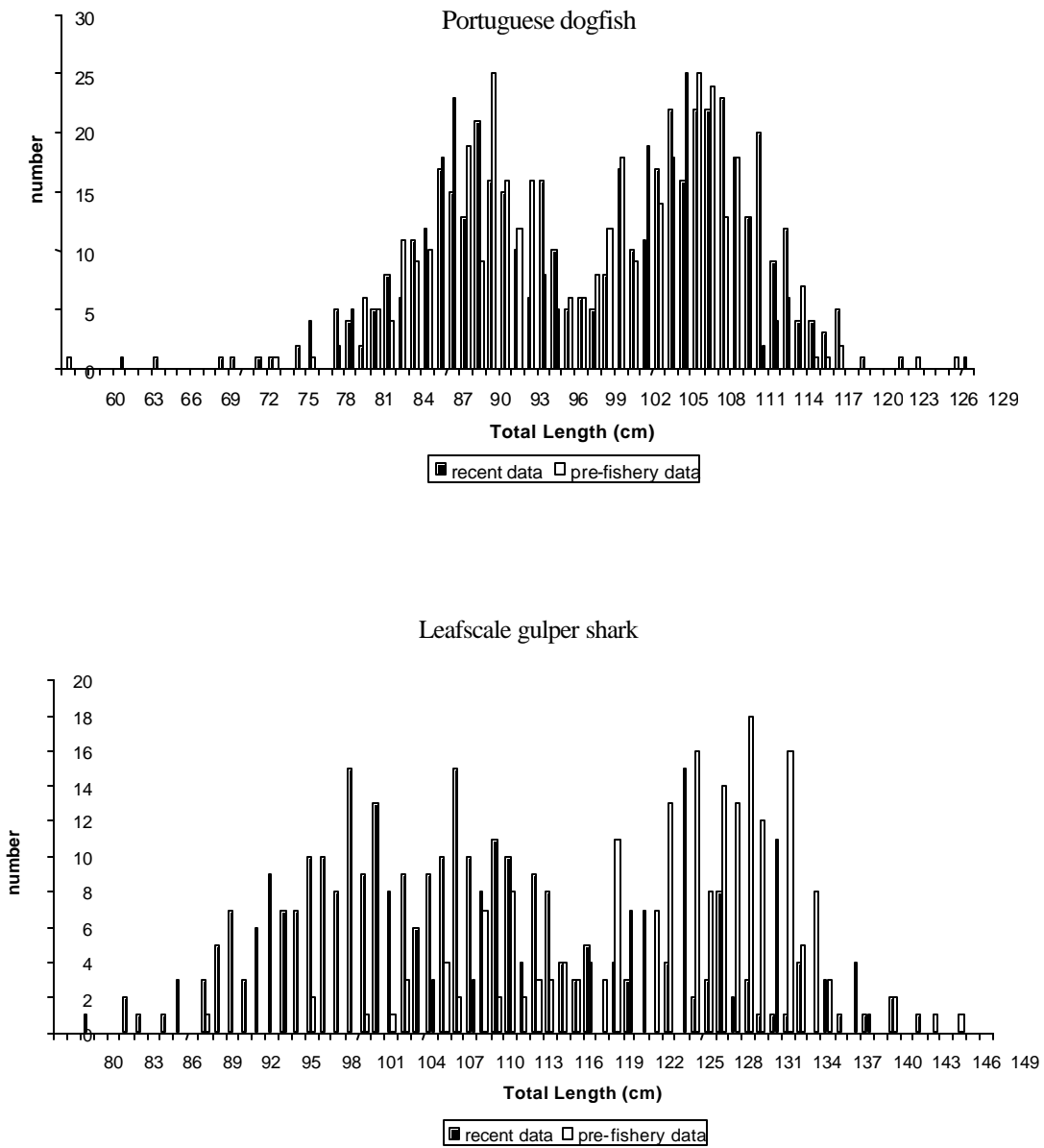


Fig. 1. Length frequency distributions of the Portuguese dogfish and leafscale gulper shark comparing pre-fishery and recently collected data.

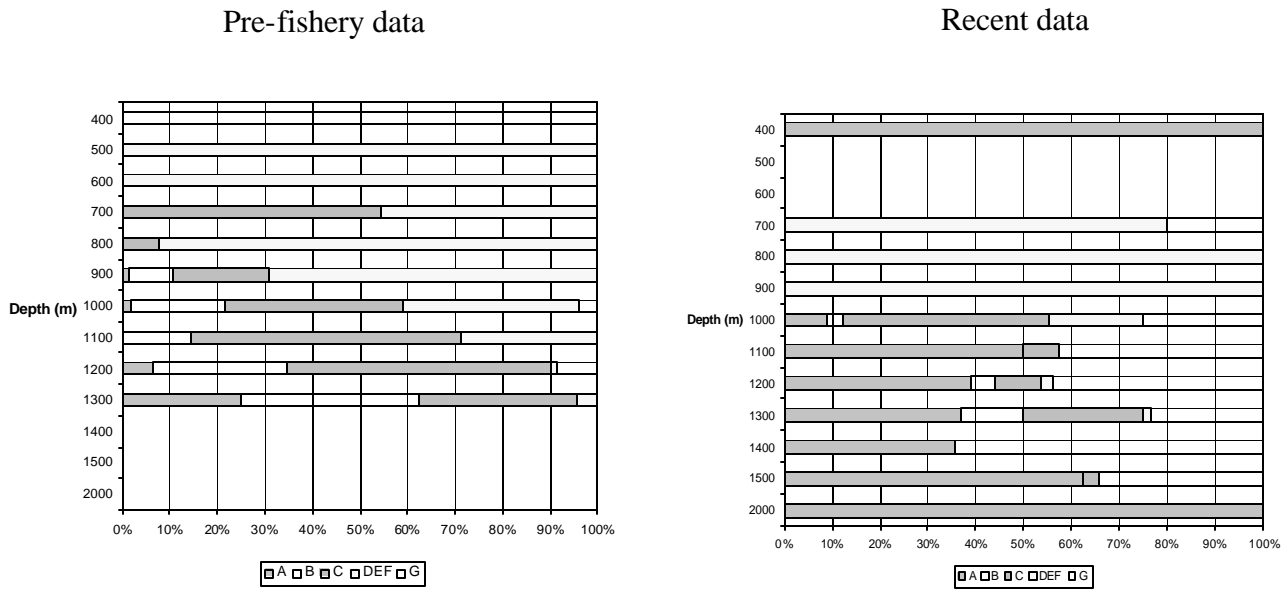


Fig. 2. The percentage of different sexual maturity stages by depth for female Portuguese dogfish.

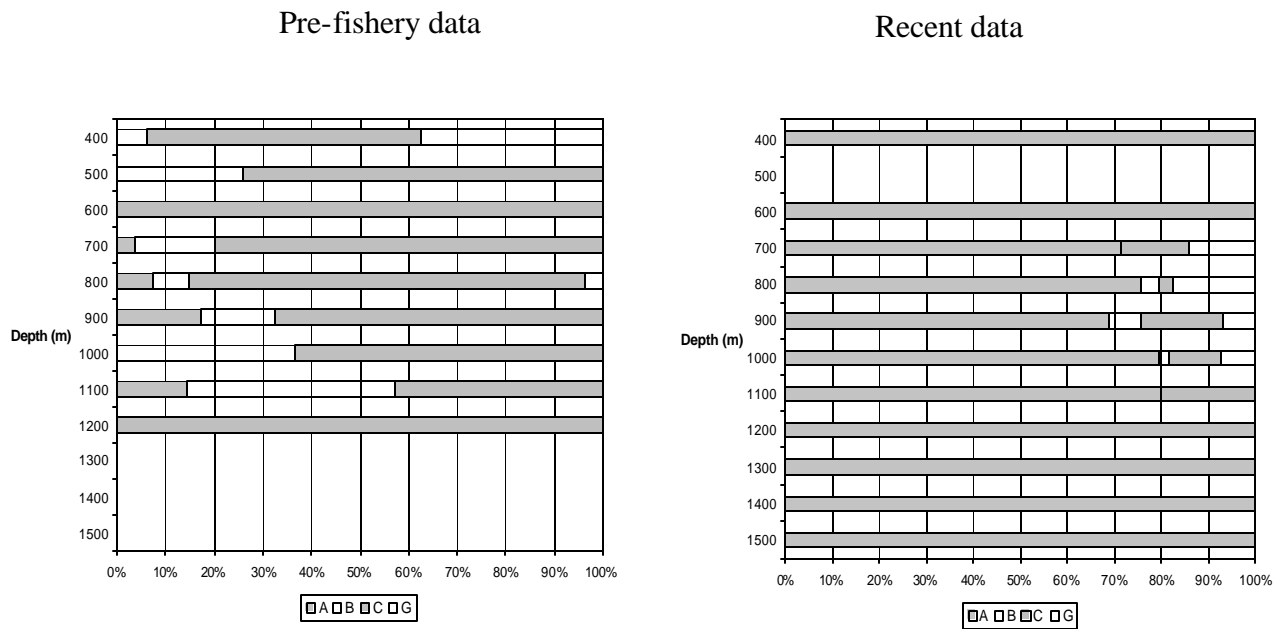


Fig. 3. The percentage of different sexual maturity stages by depth for female leafscale gulper shark.

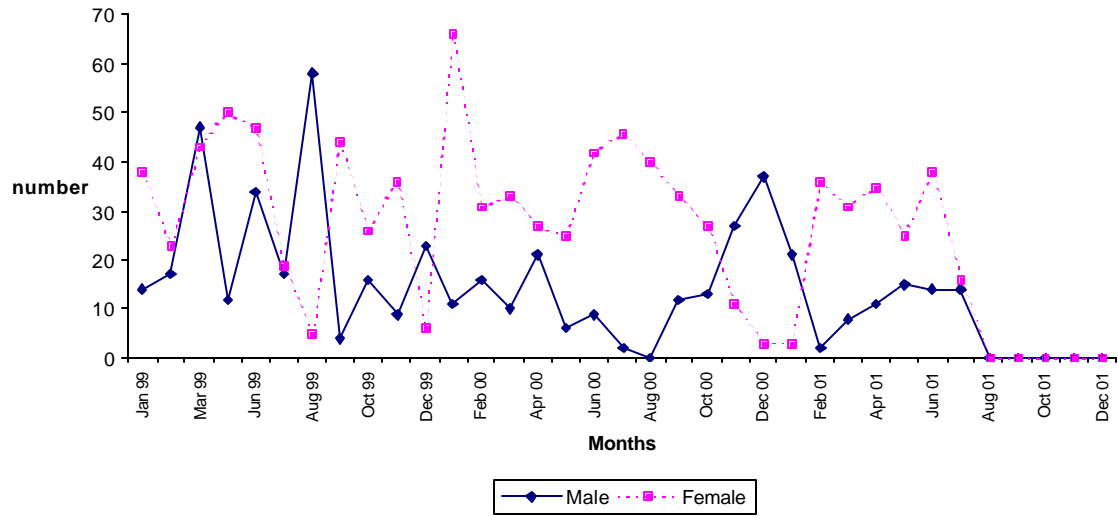


Fig. 4. Monthly landings of male and female Portuguese dogfish sampled at the port of Lochinver, Scotland.

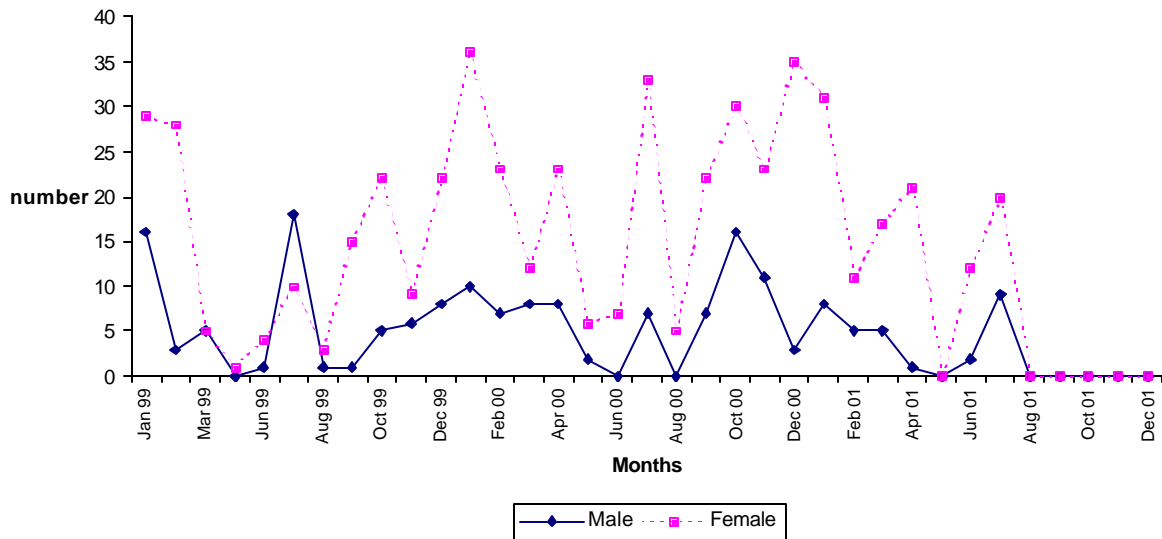


Fig. 5. Monthly landings of male and female leafscale gulper shark sampled at the port of Lochinver, Scotland.