

Spatial and temporal distribution patterns of the effort of cuttlefish (*Sepia officinalis*) fishery at the Marine Reserve of Fishing Interest Ría de Cedeira (Galicia, NW Spain).

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SUMMARY

Cephalopods are a high profile fishery resource. The capture of cuttlefish in Galicia is one of the most traditional fisheries, with major socioeconomic importance, and basically made artisanal fleet. Thus, within the MRFI of Ría de Cedeira, the sepia is the most important revenue and catches for this fleet. Since it is a reserve of fishing interest, is of great importance to know if there is the expected positive effect of protection on the evolution of catches and habitat use of this species and can thus develop a sustainable model. This study aims at characterizing the cuttlefish fishery within the MRFI, and proposes sustainable management, on the basis of CPUE, fishing areas, spatial behavior of fishing vessels, etc. To do this, we conducted a monitoring of fishing days of the artisanal fleet dedicated to the cuttlefish fishery that operates in the MRFI from October 2008 to May 2011. The results show an increase in catches in recent years within the MRFI. The monthly evolution of catches shows a time of increased catchability from mid-winter to late spring. There was a change in the behavior of the vessels after the implementation of the reservation, eliminating fishing pressure on the area of special protection.

INTRODUCTION

The Marine Protected Areas (MPAs) of Galicia are called Marine Reserves of Fishing Interest (MRFIs). These MRFIs represent a specific management tool aimed at achieving a sustainable exploitation of the resources of fishing interest by establishing specific protective measures in demarcated areas of traditional fishing-grounds.

This study aims at characterizing the cuttlefish fishery within the MRFI of Ría de Cedeira (NW Galicia, Spain) on the basis of catch data per unit of effort, fishing areas, spatial behaviour of fishing vessels, changes in body size, etc. in order to detect a response to the protection after implementing the MRFI. In the Marine Reserve (MR), a series of measures more restrictive than those existing in official regulations are applied with regard to sea-fishing activities. In the study area, which is located in the MR, fishing is carried out with gears. Small-scale fishing methods such as gillnetting are allowed in this area.

Cuttlefish (*S. officinalis*) are fast growing cephalopod molluscs living mainly in areas of soft, sandy and muddy bottoms. Their life cycle lasts approximately two years showing early sexual maturity, extended seasonal breeding, intermittent terminal spawning and complex recruitment. This species with high commercial value is caught throughout the year, despite showing high seasonal peaks due to their migrations, biological cycle, environmental conditions and fishery dynamics of small-scale fleets. In the MRFI Ría de Cedeira, the cuttlefish season develops from October to May. Cuttlefish is caught with trammel nets. There is no catch limit, but a minimum mantle length of 80 mm (ML).

MATERIALS AND METHODS

In order to collect data, fishing working days of small-scale fleets catching cuttlefish at the MRFI were monitored from October 2008 to May 2011.

Data of every fishing working day were recorded by means of monitoring record lists. Monitoring record lists are simple surveys, where the name of the vessel, the fishing gear used, number of pieces, date of shootings and haulings and the volume of kilograms and/or number of caught specimens are recorded. Fishermen were provided with a map of the fishing area to locate geographically every shooting of a fishing working day in the cases in which no GPS is available.

GPSs were programmed to record every minute the position of the vessel with the aim of obtaining constant geographical information of the fishing activity, thus characterizing the spatial and temporal distribution patterns of the effort. The routes of the monitored vessels recorded by the GPSs were entered in a geographical information system (GIS) to analyze the distribution of the route points in order to obtain general information about the fishing areas and the spatial behaviour of vessels.

RESULTS AND DISCUSSION

Official sale data of cuttlefish at the fish market in Galicia show a stabilization of the catches and average price since 2005. The results obtained on the basis of sales data at the fish market, monitored catches and unreported catches, show a slight increase in the volume of cuttlefish catches within the MRFI. This increase in cuttlefish catches by the small-scale fleet fishing at the MRFI may be due to the ban on fishing with gillnets within the NA, natural inflow area of this species towards the interior part of the ría, when the creation decree of the MRFI entered into force.

The average price of cuttlefish throughout the monitoring period is higher at the beginning of the fishing season and stabilizes in the first months of the year until the end of the season. Slight variations in average price during the rest of the season are due to an inverse proportion with regard to the volume of catches. Thus, the higher the catches rate is, the lower the average price and viceversa.

The monthly evolution of catches shows a higher catchability period from the middle of the winter season until the end of spring. Catches per unit of effort (CPUE), in Kg/1000m, are similar among fishing seasons, reaching the highest values between January and April, which coincides with the highest peak of adult cuttlefish migration towards shallow areas to mate and spawn.

Within the MRFI, a behaviour change of vessels was observed after implementing the reserve, which eliminated the fishing pressure on the NA and focused on the central area, mainly on shallow areas by the coast. A greater effort was also observed in the area close to the SA in the fishing border on gill nets of continental waters. In the future, we hope to study the cuttlefish fishery performance per vessel with the data from the monitoring of fishing routes.

Cuttlefish fishery within MRFI Ría de Cedeira seems to have been stable throughout the last 7 years. So far, no reserve effect has been observed possibly due to the fact that this fishery focuses on adult specimens and does not overexploit the resource. Slight differences observed among fishing seasons may be due to changes in environmental conditions.