

PROJECT Nº 96/025: MODELLING THE RELATIONSHIP BETWEEN FISHING EFFORT AND EFFECTIVE FISHING MORTALITY IN WESTERN MEDITERRANEAN TRAWL FLEETS: THE CASE OF HAKE AND STRIPED RED MULLET FISHERIES IN BALEARIC ISLANDS

KEY WORDS

Fishing effort, fishing mortality, CPUE, modelling, métier, Mediterranean, trawl fleet, hake, striped red mullet, Balaeric Islands.

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OBJECTIVES

The general aim of this study was to develop an approach that could enable the analysis of the relationship between effective effort exerted over two of the main target species and the corresponding fishing mortalities in a typical Mediterranean trawl fishery, as is the case off Mallorca Island.

To achieve this, a set of secondary objectives was defined. These objectives were split into two groups. The first group was related to the quantification of the parameters that define the relationship, i.e. annual fishing mortality, F , and effective annual effort, f , by 'métier'. These objectives were:

- To divide the Palma trawl fleet into homogenous subfleets or 'métiers'.
- To estimate the annual effective effort (f) on hake and on striped red mullet, by subfleet, or 'métier', considering several effort units.
- To calculate the annual fishing mortalities (F), split by 'métier', for both species.
- Finally, from the previous parameters, to calculate the values of the catchability index (q), by species and 'métier', and to analyse their temporal evolution along the period considered.

The second group of objectives was directed to obtain complementary information useful for a better interpretation of the results of the previous analysis:

- To assess the evolution of the fleet capacity during the period studied.
- To know the evolution of some relevant elements of the trawl fisheries in the study area: global landings and catch per unit effort (CPUE) of trawlers, catch composition, global effort and economic value of landings, for the whole fleet and by 'métier'.
- To estimate the evolution of total landings and CPUE for the main demersal species captured by trawlers, throughout the study period and within the annual cycle.
- To determine the period, amplitude and trends of the fluctuations observed in the volume of catches of the main target species of the trawl fishery: red shrimp, hake and red mullets.

APPROACH AND METHODOLOGY

Fleet capacity. The number and main characteristics of the trawlers in the different ports of Mallorca Island were initially determined from two kinds of official fleet censuses for the years 1991 and 1994. Two censuses came from the General Secretary of Marine Fisheries of the Agriculture, Fisheries and Food Ministry and the other two were provided by the local government of the Balearic Islands. Most of the missing data were obtained from the Palma harbour fishermen association.

Fleet activity. The sources of data were the receipts of daily sales, by boat, from the Palma port central auction wharf. It was possible to compile all information for the period 1983-1991. Due to the enormous amount of data, a database was built using the Microsoft Access program. With this in place, a number of the objectives could be tackled.

Historical data of landings of red shrimp, hake and red mullets were then analysed using time series analysis techniques. Then estimates of fishing mortalities were calculated using Virtual Population Analysis (VPA).

Finally, with the fishing mortality estimates and the effective fishing effort, estimated from the relational database, statistical techniques were used to attempt relating the two.

MAIN FINDINGS AND CONCLUSIONS

From the analysis of the activity of the trawl fleet based on Palma harbour from 1983 to 1991, the following more relevant conclusions were established:

1. Despite the legal measures for limiting the fleet capacity, the modernisation of the fleet and its technological improvement as well, have lead to an increase of the global fishing effort.
2. Parallel to this raising of fishing effort, a transfer of it from the shelf to slope fishing grounds was produced.
3. Taking into account both physical characteristics of the vessels and their landings by species, the trawl fleet could be split into three well defined subfleets, or 'métiers'. Each 'métier' affects in a different way the several target species.
4. The global nominal effort was not correlated with the hake and striped mullet landings. However, these correlations were significant when appropriate effective fishing effort measures were considered.
5. The evolution of the hake and striped red mullet landings depended not only on the state of the respective stocks, but of the effective fishing effort exerted on them as well.
6. Highly significant correlations between annual fishing mortality and effective fishing effort were obtained. In the case of hake, effective fishing effort was found to be best represented by the number of fishing days with catches >10 kg multiplied by the gross registered tonnage (GRT) of the corresponding vessels. For striped red mullet, effective effort was measured best by simply using the number of days in which the species was captured.
7. This meant that management options could be set more precisely when considering the typology of the fleet and its activity pattern. In this sense, the availability of a relational database, including at least disaggregated data on daily catches by species and vessel, and the parallel studies on population dynamics, are the key elements to develop a general approach leading to an improvement of Mediterranean trawl fleet management.