

SCALES OF TEMPORAL VARIABILITY OF GROUND FISH LANDINGS IN NORTH-WESTERN MEDITERRANEAN

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Abstract

The paper deals with the question of interrelationships between the abundance of fishery resources and their exploitation. Three different types of variations could be identified from the analysis of groundfish landings in the Gulf of Lions and in the Catalan Sea. Various examples were used to illustrate the daily, seasonal and inter-annual variations of demersal resources and of fishing intensity.

Key-words : fisheries, Western Mediterranean

Introduction

Speaking of reciprocal relationships between the abundance of fishery resources and exploitation is quite a truism. The biology and ecological behaviour of fish constitute one of the main types of factors that can determine variations in the dynamics of fishing effort and in the strategies of fishing fleets (1). The influence of resources on fishing intensity is widely taken into account by fishery biologists, while the major question of marketing is often poorly considered.

The aim of the present paper is to introduce reflection on this theme and the results might be considered as preliminary. In order to furnish elements on this topic for further discussion, several actual cases of temporal variations in landings of demersal resources were analysed. These variations can be intra-annual (daily or seasonal) or inter-annual. They suggest various questions, the response to which is related to the different components of the exploitation. Some examples issued from data collected in the Catalan Sea and in the Gulf of Lions illustrate these three different types of variations. The possible causes and impact on fishing intensity and on dynamics of fishing fleets will be considered.

Material and methods

Data used for the estimation of daily variations were obtained from the daily catch statistics of the Barcelona auction market for January, March, August and November 1992. Monthly catch statistics of ten ports of the Catalan coast, from 1987 to 1993, have been used to illustrate the seasonal variations of *Sepia officinalis*. Concerning the Gulf of Lions, landing data were taken from the Sete auction market. This market was computerised in 1970. Therefore, a time series of 25 years landings is now available, this being mainly from the trawler fleet fishery.

Monospecific time series analyses (2) were based on monthly data available for the period. They allowed highlighting general trends, seasonal cycles and even pluriannual cycles in some case (3). Several procedures from the Statgraphics-Plus package were used. viz.

* The Seasonal Decomposition procedure performing a classic decomposition of a time series ; the multiplicative ratio-to-moving-average method was used, the computed seasonal index for each month being based on average ratios to the moving average.

* The Autocorrelation Function procedure, allowing to show pluriannual cycles in addition to seasonal patterns.

Results and discussion

Daily variations

The daily variations observed in landings may be due to various causes. The direct impact of meteorological conditions on the fishing fleet's dynamics and on their catches is well known : possible reduced accessibility of the fishing grounds (4) as well as modification in the behaviour of fish (including bottom fish). Market demand must also be of consequence on fishing activity. The example of daily landings of the red shrimp *Aristeus antennatus* (Fig. 1) shows a weekly periodicity with higher catches on Mondays and Fridays and lower catches during the middle days of the week (Wednesday-Thursday). This pattern occurs throughout the year, as can be observed in the four analysed months, representing the four seasons of the year.

Seasonal variations

Seasonal patterns can be observed in landings for many species. Different cases may be encountered corresponding to different biological behaviours :

Case 1. Recruitment to fishing grounds

The red mullet (*Mullus barbatus* and *M. surmuletus*) landings from trawl fleet on the Catalan coast and in the Gulf of Lions (Fig. 2) show a high autumnal peak, with a maximum in September and October respectively. This peak corresponds both to the arrival and to the concen-

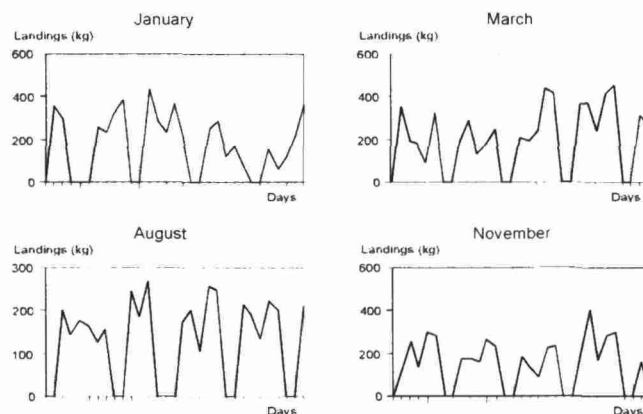


Fig. 1. Red shrimp *Aristeus antennatus* : daily landings of the Barcelona trawler fleet in 1992. (On X axis Sundays points are shown with continued broken vertical lines).

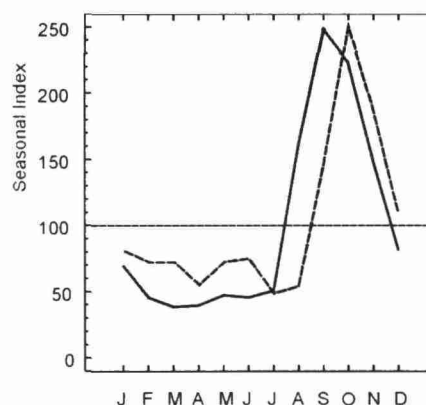


Fig. 2. Mean seasonal variations in landings of *Mullus* spp from trawler fleet. — = Catalan coast (1987-93). - - - = Gulf of Lions (Sete, 1971-95).

tration of new recruits (mainly *M. barbatus*) belonging to the 0 group in the coastal fishing grounds. Consequently, the fishing fleets move towards these fishing grounds looking for these recruits (5).

Case 2. Seasonal trophic or spawning migrations

In the Gulf of Lions, the sea bass (*Dicentrarchus labrax*) moves during the period spring to autumn into lagoons to feed and in winter into the sea where reproduction takes place (6). Mean annual landings of the species at the Sete auction market reflect these migrations and show the seasonal availability of resources for the trawl fleet : the level of catches is seen to be higher from September to April (Fig. 3).

Case 3. Sequential fisheries

Various patterns of exploitation can be observed according to the concerned species. For cuttlefish *Sepia officinalis*, in the Catalan Sea, different seasonal peaks can be observed according to the different types of gear and depth in which they fished (Fig. 4). Cuttlefish is a shallow water species and trawlers can catch only a part of the population i.e., mainly small and medium sized immature individuals. The small-scale fishery fleets take advantage of the spawning migrations to catch the large specimens in shallower waters (less than 25 m depth) when the mature animals move towards the coast (7).