

# BEHAVIOUR OF THE EXPLOITED DEMERSAL RESOURCES OF THE LIGURIAN SEA THROUGH TWELVE YEAR SERIES OF BIOMASS INDICES.

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## Abstract:

Two short time series of independent biomass indices were used to describe behaviour of the main demersal resources of the Ligurian Sea (NW Mediterranean Sea). Data were obtained from seasonal stratified trawl surveys and the monitoring of landings of the commercial trawlers. Although there were differences between the two sets of data, the overall trends seem to be quite coherent. *Eledone cirrhosa* has shown a clear increase from 1987 onward, while *Aristeus antennatus* has been decreasing since 1988. Other species, such as *Merluccius merluccius* and *Mullus barbatus* show evident seasonal variation in both indexes, with no signs of an overall trend. *Nephrops norvegicus* fluctuates with lowest levels of abundance between 1989 and 1993; at the present it is in an increasing phase. *Micromesistius poutassou* shows no evident regularities in biomass fluctuation.

**Key-words:** demersal, trawl surveys, time series, Ligurian Sea.

## Introduction

The variation of abundance of the exploited resources is one of the most exciting subjects in stock assessment. Although most of the models used assume the steady state, it is evident that only few species behave according to the equilibrium hypothesis. The aim of this study is to describe the abundance dynamics of the main demersal resources of the Ligurian Sea (NW Mediterranean Sea) by means of two short time series of independent biomass indices obtained from seasonal trawl surveys and the monitoring of commercial landings. Although there are often discrepancies in results given by the two different methods, the comparison of abundance trends indicated by surveys and observations of landings is considered one of the most promising approaches in stock assessment (1).

## Materials and methods

The indices of abundance have been assessed during programmes on the evaluation of demersal stocks, promoted by Italian Government and the European Union from the middle of the 80s onward.

Data concern the main demersal target species in the Ligurian area and in most of the seas surrounding Italy: *Mullus barbatus* Linneus, 1758, *Merluccius merluccius* (Linneus, 1758), *Micromesistius poutassou* (Risso, 1826), *Eledone cirrhosa* (Lamark, 1798), *Aristeus antennatus* (Risso, 1816) and *Nephrops norvegicus* (Linneus, 1758).

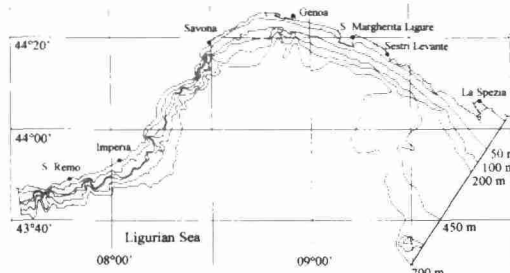


Fig. 1 - Ligurian bottoms sampled during the trawl survey programmes. The isobaths delimiting the bathymetric strata are shown. The main trawling sites of the Ligurian coast are also indicated.

The first set of data consists of standardized catch indices obtained during trawl surveys from 1985 to 1995, carried out in spring and in late summer/early autumn (2, 3). Hauls were effected during day light on bottoms at depths between 10 and 700 m off the Ligurian coast (Fig.1). Catches per hour of trawling were used to estimate two different average indexes of biomass in the sea for each survey. Since data do not present a normal distribution, the traditional arithmetic mean is given together with the median.

The second set of data derives from the monitoring of commercial landings made by trawlers from Santa Margherita Ligure (eastern Ligurian coast), which is the most representative fishing site on the Ligurian coast in terms of numbers of trawlers and variety of trawling types (4).

The fishing grounds trawled by the S.Margherita Ligure fleet are in the central/eastern part of the area explored by the trawl surveys from the canyons off Genoa eastward (Fig.1). Landings were monitored from July 1987 onward twice a month. Mean monthly landings per boat per day of fishing (CPUE) were calculated keeping trawlers fishing on bathyal bottoms separated from those operating on neritic grounds. Data shown were smoothed by means a three - point running average.

## Results

The evolution of the biomass indices of the main resources shows different patterns. Hake seemingly fluctuates without a clear trend (Fig.2). However, it is possible to find regular signs of the late spring/early sum-

mer hake recruitment, which is the most important of two occurring every year in the Ligurian Sea (5, 6), observing the high biomass indexes in summer/autumn trawl surveys. These maxima, due mainly to recruits of 0+ groups, seem to become peaks in landings during the late winter and spring of the following year, when fish belong to 1+ group. Unfortunately data are insufficient to test the lag between the two index maxima statistically.

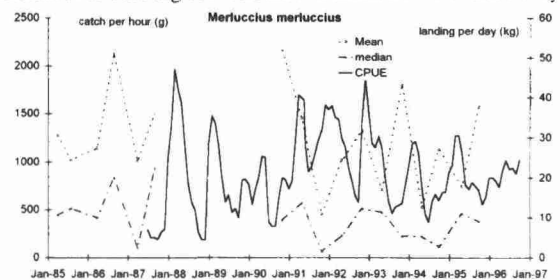


Fig. 2 - Evolution of abundance of hake as shown by trawl surveys and the monitoring of commercial trawler yields. Trawl survey biomass indices are given as mean and median of catches per hour of trawling; landings as average per trawler per fishing day (CPUE).

Differently, white horned octopus show a clear overall increase from 1987 onward, both on the basis of landings and trawl surveys (Fig.3).

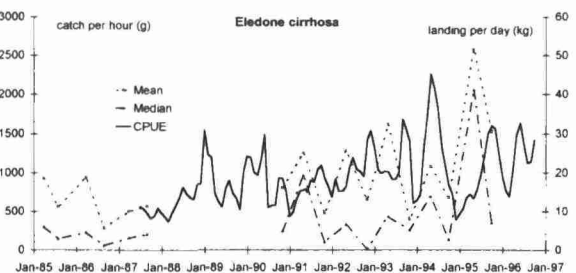


Fig.3 - Evolution of abundance of white lesser octopus as shown by trawl surveys and the monitoring of commercial trawler yields. Trawl survey biomass indices are given as mean and median of catches per hour of trawling; landings as average per trawler per fishing day (CPUE).

Red mullet show a regular seasonal variation in both biomass indices with maxima during the autumn (Fig.4). These high catches are due both to the growth of young fish recruited in August in infralittoral bottoms (7) and to autumn migration on deeper levels, which increase their vulnerability to trawling.

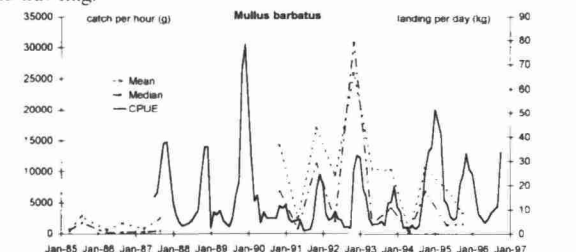


Fig.4 - Evolution of abundance of red mullet as shown by trawl surveys and the monitoring of commercial trawler yields. Trawl survey biomass indices are given as mean and median of catches per hour of trawling; landings as average per trawler per fishing day (CPUE).