

INCREASING ABUNDANCE OF THE ROUND SARDINELLA, *SARDINELLA AURITA*, RELATED TO THE WARMING TREND IN THE NW MEDITERRANEAN

P. Martín * and A. Sabatés

ICM-CSIC, Barcelona, Spain - * paloma@icm.csic.es

Abstract

In the last decade a marked increase in the abundance of the warm water pelagic species *Sardinella aurita* has been observed, following the warming of the NW Mediterranean waters. From the distribution of commercial landings along a latitudinal gradient, the possible replacement of *Sardina pilchardus* by *Sardinella aurita* is brought up.

Key words: *Sardinella aurita*, stock fluctuations, temperature, NW Mediterranean

Introduction

In the NW Mediterranean, an increase in the annual mean sea temperature has been recorded. This increase has been, during the last 25 years, of 0,7 °C at surface, and of 0,4 °C at 80 m depth (1); and, between 1959 and 1989, of 0,12°C at >400 m depth (2). Furthermore, the distribution range of fishes and benthic organisms characteristic of warm waters has expanded (e.g. 3), and their presence is more and more frequent in the northern part of the sea. Conversely, the abundance of boreal species has dramatically decreased since the 1980's (4), suggesting a process of tropicalization of NW Mediterranean. At a large scale, variations in the geographic limits of the distribution are the most immediate effect of the global warming on the ichthyofauna, resulting to both local extinctions and invasions by allochthonous species from warmer or tropical environments. This effect is likely to be observed on those populations located at the boundaries of the species geographical distribution. Round sardinella, *Sardinella aurita*, is a thermophilous small pelagic species, having a tropical to subtropical distribution in the Mediterranean and Eastern Atlantic coasts, particularly sensitive to temperature changes (5). *S. aurita* was known to complete its full biological cycle off the Catalan coast at least since the early 1980's (6).

Results

Sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*), are the main target species for the purse seine fleet, accounting for the highest catches off the Catalan coast. However, *S. aurita* landings have increased in the last decade, implying that the species is more abundant in the area (Fig. 1). It is worth mentioning that in coincidence with the *S. aurita* abundance increase, a decreasing trend in the landings of *S. pilchardus* and *E. encrasicolus* has been observed, especially for sardine. In the case of anchovy, the most intensively exploited small pelagic species off the Catalan coast, this trend ended by 1999, probably explained by varying fishing pressure.

S. aurita is particularly abundant in the southern Mediterranean, its abundance gradually decreasing northwards. The differences in species abundance are linked to the latitudinal pattern of the sea surface temperature (7). Along a latitudinal gradient in the Spanish Mediterranean coast, the proportion of this species in the 2001 purse seining landings was much higher in the southern ports, where sardine presence was lower, decreasing northwards (Fig. 2). Altogether seems to indicate that a replacement of sardine by round sardinella would be taking place in the NW Mediterranean. At present, there is no evidence for competition between these two species in the study area.

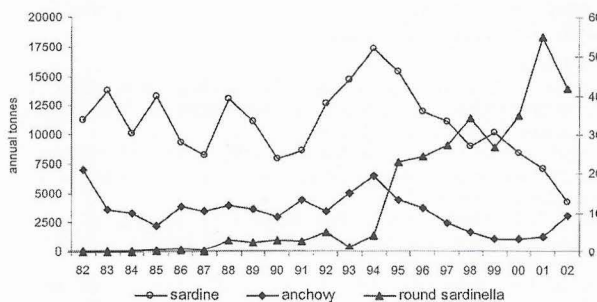


Fig. 1. Annual landings from five fishing ports along the Catalan coast (data from the fishermen's associations and the autonomous government statistics; sardine and anchovy left axis, round sardinella right axis).

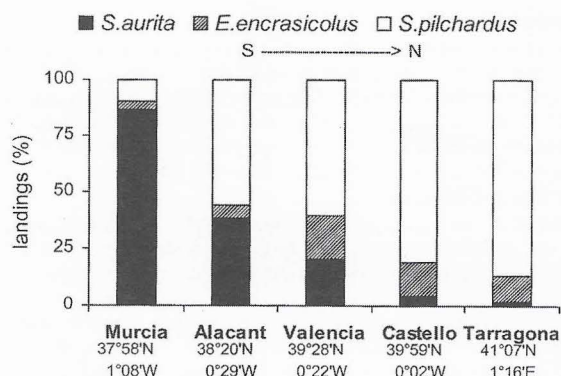


Fig. 2. Small pelagics landings along the Spanish Mediterranean coast (in percentage of the 2001 landings; data from different autonomous government's statistics).

Our results show that *S. aurita* gradually spreads northwards. The observed changes in the geographical distribution and abundance of *S. aurita* in the last years suggest a trend in the long term, consequence of global warming, and would not be only a response to interannual variability.

References

- 1 - Salat J., and Pascual, J., 2002. The oceanographic and meteorological station at l'Estartit (NW Mediterranean). Tracking long-term hydrological change in the Mediterranean Sea. *CIESM Workshop. Series*, 16: 29-32.
- 2 - Bethoux J.P., Gentili B, Raunet J., and Tailliez D., 1990. Warming trend in the western Mediterranean deep water. *Nature*, 347:660-662.
- 3 - Francour P., Boudouresque C.F., Harmelin J.G., Harmelin-Vivien M., and Quignard J.P., 1994. Are the Mediterranean waters becoming warmer? Information from biological indicators. *Mar. Poll. Bull.*, 28: 523-626.
- 4 - Quignard J.P., Raibaut A., 1993. Ichthyofaune de la côte languedocienne (Golfe du Lion). Modifications faunistiques et démographiques. *Vie et Milieu*, 43:191-195.
- 5 - Guidetti P., Boero F., and Dulcic J., 2002. Mass mortality of gilt sardine, *Sardinella aurita* (Clupeidae), in the Adriatic and Ionian Seas. *Cybius*, 26: 317-319.
- 6 - Palomera I., and Sabatés A., 1990. Co-occurrence of *Engraulis encrasicolus* and *Sardinella aurita* eggs and larvae in the Northwestern Mediterranean. *Sci. Mar.*, 54: 63-69.
- 7 - Climatological Atlas of the Mediterranean Sea. Scientific Report of the MAST-MOBD initiative for ocean data and information management. Contract number MAS2.0093.0075.BE (<http://modb.oce.ulg.ac.be/atlas/atlas.html>).