

ZOOPLANKTON TEMPORAL PATTERN IN THE WESTERN MEDITERRANEAN: A DECADE STUDY OF TWO TIME SERIES: 1995-2004

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Abstract

For a 10 year period two Western Mediterranean zooplankton time series (Mallorca Channel and Gulf of Naples) have been analyzed and compared. The environmental seasonal patterns in relation to their main zooplankton groups have been described. No trends were found for temperature, but a salinity increasing trend was observed in the Balearic Sea. Zooplankton was dominated by copepods which, together with cladocerans and appendicularians contributed more than 84% to total. Copepods and cladocerans were more important in Naples, while siphonophores and ostracods were only found in the Balearic Sea. Other minor groups occurred in both areas but during different seasons. Although the period considered may be too short to investigate climate effects, the synchronies observed in the zooplankton suggested common responses to basin-scale signals.

Keywords: *Zooplankton*, *Copepoda*, *Balear Sea*, *Tyrrhenian Se*, *Western Mediterranean*

Introduction

The Mediterranean plays a critical role in the global climate system and is one of the most sensitive areas on earth in a global warming context, particularly due to its location at the boundary of two different climate cells and regimes of the temperate and sub-tropical zones (1). On a large scale the Mediterranean could be considered to be a uniform basin representative of the warm temperate region, however it is far from being biogeographically homogeneous, due to its complex morphology with many orographic features and a complex sea floor. The Western Mediterranean (WM), in connexion with the Atlantic through the Straits of Gibraltar, forms a small semi-enclosed basin in which processes are similar to those in the neighbouring ocean, where to study climate or warming effects (2).

Sampling sites and methodology

The sampling sites (St. PA, in the SW of Mallorca island and St. MC in the inner Gulf of Naples) are located at similar latitudes (39°28'59 and 2°25'63; 40°48.5 and 14°15, Balears and Naples respectively), depths (~75m) and coastal proximity (2 nm). However, st. PA is exposed to more offshore waters, located in a boundary area between northern and southern WM waters, st. MC has more coastal character, being heavily influenced by land run-off and a densely populated region at the border between the coastal and offshore waters. Comparable methods were used for sampling and analytical methods (3, 4).

Results and Discussion

Seasonal cycle-Temperature pattern was very similar at both sites and, with the exception of the summer period, was slightly lower in the Balearics (17.07 °C) than in Naples (17.24 °C). Salinity, even at the surface, was lower in the Balears (37.6-37.8) than in Naples (37.9-38.1), excepting the surface during spring.

The pattern of total zooplankton showed that the main difference between the two sites was due to copepods (59% in Balears and 68% in Naples) but also to cladocerans, (8 and 11%). Appendicularians followed them (17% and 11%) as may correspond at both different ecosystems (3,4). In lower abundances doliolids and chaetognaths, were present during the first part of the year in Balears, although mainly present in autumn in Naples. Siphonophores and ostracods were abundant only in the Balearic site as correspond to more oceanic area (3). The most important copepods were *Clausocalanus* and *Oithona* group, but *Acartia clausi*, *Centropages typicus*, *Paracalanus parvus* and *Temora stylifera* were abundant with peaks in different periods of the year. Their relative contributions of these copepods showed interesting differences at the two sampling sites, in relation to differences in the local environmental conditions.

Interannual variability- Temperature showed marked variability with no significant trends. Warmer conditions were observed during 1997 and 1998 in the Balearics and after year 2000 in Naples. Salinity increased in the Balearics during the whole period but no in Naples. The interannual variability of total zooplankton and copepod abundances showed an increasing trend in Naples, that was interrupted after the year 2000. No trend was observed in Balears. Cladocerans showed marked interannual variability and excepting years 2000 and 2001, lower values in Balears. Appendicularians did not show clear differences throughout the study period at either both sites. Doliolids and chaetognaths, decreased in Balears and increased slightly in Naples.

Opposite trends were observed for the siphonophores and the ostracods. The most abundant copepods *Clausocalanus* spp., *A. clausi* and *C. typicus* exhibited marked interannual variability at both sites with no clear trend. *Oithona* spp., *T. stylifera* and *P. parvus* increased in Naples.

The differences recorded in the community composition at groups and species level indicated a strong adaptation to local conditions, nevertheless they had a clear oligotrophic character at the Balearic site and a marked coastal influence at the Naples site.

Although the period considered may be too short to investigate zooplankton pattern in relation to climate forcing, the synchronies in the zooplankton patterns recorded at both sites points suggested responses of zooplankton to signals at the basin scale. Longer time-series and further analysis have to be encouraged in the Mediterranean as a potential tool to long term evolution of planktonic communities and their responses to climate change.

References

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