BIODIVERSITY PATTERNS OF DEEP-SEA BENTHIC MEGAFAUNA ON WESTERN AND CENTRAL MEDITERRANEAN BASINS

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Abstract
Abundance, biomass and diversity patterns of bathyal and abyssal Mediterranean megafauna were analysed. Sampling was conducted with a bottom otter-trawl at depths ranging from 600 to 4000 m in the western Balearic Sea, the western Ionian Sea, and the eastern Ionian Sea. A general decline in diversity with depth along the three zones was found, while influence of geographic area was less marked.
Keywords: Biodiversity, Deep Sea Ecology, Western Mediterranean, Ionian Sea

The Mediterranean deep-sea environment is an optimal natural laboratory to study ecological processes. Commercial trawling reaches depths of 900 m maximum, allowing for studies of non-impacted environments below this depth. Knowledge of benthic megafaunal diversity and its patterns of variation between basins is at present very scarce.

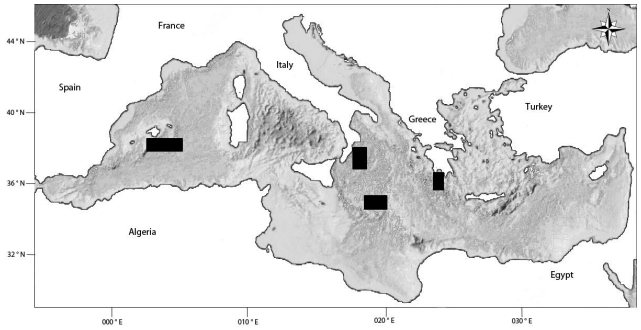

Fig. 1. Map of Mediterranean Sea, with sampled areas indicated

Megafaunal samples were collected in 26 OTMS trawls between 600 and 4000 m during a trans-Mediterranean cruise (June 2001, Fig. 1). The western Balearic basin, the western Ionian sea and the eastern Ionian sea were investigated. The megafauna was identified to species level, counted and wet weighted (± 1 g). A faunal list was compiled, indicating occurrence of each species in each zone. Species richness, Shannon-Wiener H', Margalef's diversity and Pielou's evenness indexes were calculated for each sample. Similarity of community structure amongst samples from all geographic areas and depths was visualised with a non-metric multidimensional scaling (MDS). Two-way similarity percentages (SIMPER) statistical routine was conducted, using "depth" and "basin" as crossed factors and Bray-Curtis measure as similarity [2].

The most speciose groups were Actinopterygii (45% of species), crustaceans (32.4% of species) and Chondrichthyes (7.8% of species). Across the whole dataset, Margalef species richness index shows a significant decrease with depth and negative linear correlations between species richness and depth were found for each of the three zones considered separately. Pielou's index increased with depth in the western Balearic basin, with an abrupt decrease at 1230 m caused by the abundance peak of the fish *Alepocephalus rostratus* in the western Balearic. A similar pattern was present in the western Ionian, with a decrease of the index at 1500 and 1700 m caused by the spiderfish *Bathypterois dubius*. The biology of this species is more adapted to the scarce trophic resources, although the exact reasons for this dominance of *B. dubius* are, at present, not described. Species evenness at the two abyssal depths was low compared to the rest of the western Ionian basin. In the eastern Ionian Sea, the evenness index showed an inverted V-shape pattern. Shannon-Wiener index, along with standardized biomass, are shown in Fig. 2.

According to SIMPER analysis, dissimilarity in community composition between the western Balearic basin, the western Ionian and the eastern Ionian, across all depth ranges, is mainly caused by the fishes *A. rostratus* and *C. mediterraneus*, the shark *C. coelolepis* and the decapods *A. antennatus*, *P. typhlops*, and *G. longipes*. The MDS showed a clear depth zonation. The trawls at 600-800 m grouped together, confirming the *middle slope* subdivision [3]. The depth range 1000-1700 m showed the higher dispersion between trawls, as previously reported for fishes and crustacean assemblages in the Mediterranean. The deepest assemblages at 1700-3000 m, along with the two trawls conducted at 3300 m and 4000 m in the central Ionian abyssal plain, grouped together, suggesting that below 1500 m there are no major changes in assemblages structure with depth. The three zones exhibited a comparable species richness down to 1500 m depth, but after this limit only the western Balearic basin maintained a Margalef index of above 2.0, while in the Ionian basins (both western and eastern) values decreased rapidly. We suggest that higher surface productivity and coastal input of the western Balearic basin supply the necessary energy to sustain a diverse community at lower depths in this zone. In the more oligotrophic Ionian Sea, organic matter arrival to the lower slope and deep basin is reduced, forcing a decrease in diversity earlier in the depth range.

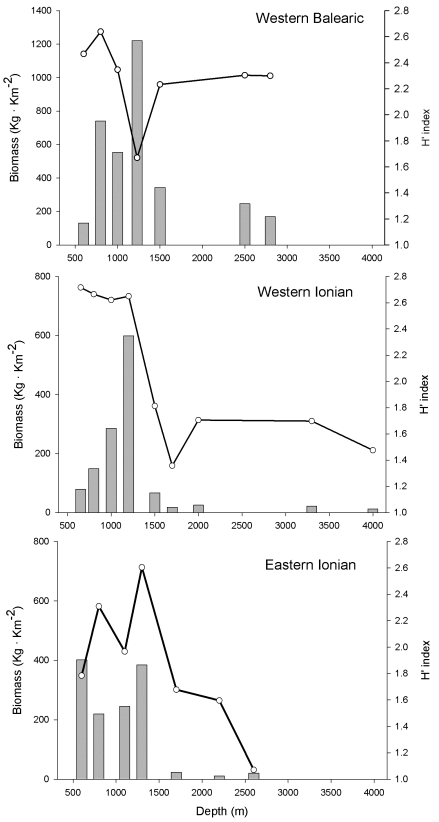

Fig. 2. Standardized biomass (gray bars) and values of Shannon diversity index (lines) for the three studied areas

References
1 - Sardà, F., et al., eds., 2004. Mediterranean deep-sea biology. *Sci. Mar*. 68(3). 204 pp.
2 - Clarke, K.R. and R.M. Warwick, *Change in marine communities: an approach to statistical analysis and interpretation*. 2001: PRIMER-E Ltd., Plymouth, UK.
3 - Pérès, J.M., *History of the Mediterranean biota and colonization of the depths*, in *Western Mediterranean*, R. Margalef, Editor. 1985, Pergamon Press, Oxford. p. 198-232.