

**Adão, M. H., 2004 – Dynamics of meiofauna communities in association with *Zostera noltii* seagrass beds in the Mira estuary (SW Portugal). PhD dissertation University of Évora, Portugal, 328p.**

## **SUMMARY**

Most estuarine primary consumers are found on the bottom of the estuary, where a rich benthic community is usually very abundant, and they are directly involved in most physical and chemical processes that occur in estuaries, such as interaction with sediments, the nutrient cycle and energy flux. The meiobenthos is an important benthic component in marine and estuarine sediments, and is composed of animals of small body size, with a range between 31-1000 µm. In estuarine sediments, meiofauna: (i) facilitate biomineralization of organic material and enhance nutrient regeneration, (ii) serve as food for a variety of higher trophic levels, and (iii) exhibit high sensitivity to environmental modification. The spatial, temporal and vertical distribution, abundance, species composition and fluctuations of the meiobenthic communities are deeply influenced by several biotic and abiotic factors: food resources, oxygen, salinity, temperature, turbidity, hydrodynamic regime, sediment grain size characteristics and topography, trophic relationships, biogenic structures, bioturbation, disturbance effects. In sediments, the most abundant taxon of meiofauna is usually nematodes, and copepods are typically second.

In shallow estuaries there are often dense communities of monocotyledonous flowering plants, seagrass beds, which extend mainly by under-sediment rhizome systems. In temperate regions, the seagrass beds of *Zostera* are the most common of these plants, occurring in mud and sandy soft sediments. In recent years, there has been a surge of interest in the faunal composition and ecology of the invertebrates inhabiting seagrass beds. The impetus for such research effort has largely been based upon a recognition of the role seagrass beds play in the energy flux of estuaries, either through their release of dissolved organic carbon directly into the water column, or, after defoliation and the fragmentation of leaves, by contributing to the detritus pool.

There are several studies that have focused on the meiobenthic communities associated with seagrass beds; however, only two studies were identified concerning meiofauna associated with seagrass beds of *Zostera noltii*, which were studied in terms of density, biomass and seasonality based on major taxa.

The meiobenthos studies in Portugal are documented by only three studies: Austen *et al.* (1989) studied the community structure of the macrobenthos and meiobenthos in the Ria Formosa; Rosado (1996) studied the meiofauna from different sediments of the Sado estuary and Franco (1999) studied the vertical distribution of meiofauna in the Tejo estuary.

The current study essentially centres on the study of the meiofauna of the sediments associated with seagrass beds of *Zostera noltii* in the Mira estuary, through the study of the temporal variation of the meiofauna communities, focusing on the ecology of the free-living marine nematodes. Its aim is to relate the temporal and vertical variation patterns of meiobenthic composition communities to variations in the environmental factors, and to discuss how strong is the influence of the temporal changing environment on the structural characteristics of the meiofauna taxa, and the trophic and age composition of the nematodes.

The study was carried out at two sampling sites to compare meiofauna composition, Nematoda assemblages and density temporal and vertical variation patterns, and to discuss structuring factors of meiofauna and Nematoda assemblages at both sampling sites.

The higher abundances and composition of meiofauna and Nematoda assemblages observed throughout the study agree with the results of previous observations carried out in the vegetated intertidal muddy sediments of several estuaries, namely in *Zostera noltii* seagrass beds.

A total of 17 meiofauna taxa were registered, with Nematoda the dominant taxon (>87%). The higher relative densities of Nematoda taxon structured the temporal variations, and consequently the seasonality of meiofauna assemblages. The study of the temporal variation of the dominant genera, age and trophic composition and the several relationships with environmental factors allowed an explanation of the structuring factors of the temporal dynamics of meiofauna communities.

The temporal variations of the important factors structuring meiofauna and Nematoda communities, such as temperature, salinity, pH, amount of dissolved oxygen (DO) and concentrations of nutrients in the water and in sediment proportions of silt and clay, were similar between stations. However, there were clear differences between both sampling sites concerning the temporal variations of some environmental factors, such as organic matter content of the sediment, which determined differences in ammonia sediment concentration and phosphate sediment concentration. There are also differences in the temporal variation of the biomass of *Zostera noltii* and in clay proportions.

The analysis of the temporal variations of meiofauna and Nematoda assemblages, at both sampling stations, indicated an evident seasonality. However, the seasonal patterns were different at both stations. The seasonality for Nematoda at both stations contradicted the seasonality generally observed in other studies, which usually peaks in the warmest months. In this study the densities of the dominant genera *Paracomesoma*, *Terchellingia*, *Odontophora*, *Linhomoeus*, *Paramonoshystera*, *Daptonema*, *Chromodora*, *Ptycholaimellus* and *Camacolaimus* rose in autumn and/or in winter-spring.

The temporal patterns of the vertical variations of meiofauna densities and Nematoda assemblages showed clear seasonality at both sampling sites. The density patterns of the uppermost sediment layer structured the seasonality of the sediment layer between 0-10 cm depth, due to the majority of the meiofauna and nematodes being concentrated in the uppermost 3 cm.

The temporal variation of environmental factors considered determinant of the seasonality in temperate regions, such as temperature, salinity, pH, amount of dissolved oxygen (DO) and granulometry were not of fundamental importance for structuring the seasonality and composition of meiofauna and Nematoda assemblages. The range of environmental factors at both sampling sites did not allow any specific factor to be identified. However, it was possible recognize that the combined effect of a given set of factors creates the habitat conditions which are able to explain the seasonal variations.

The temporal variation patterns in trophic structure and the life history of the Nematoda genus assemblages are the most important biotic factors for structuring the seasonality obtained and the differences between sampling sites. The temporal variation patterns of the juveniles were closely associated with the temporal variation patterns of the populations. The juveniles were present throughout the sampling period, and the highest densities were coupled with peak densities of the populations and consequently an increase in reproduction activity. In contrast, the lowest densities of the populations corresponded to a decline in reproduction activity. The other important biological factor that could explain the seasonality obtained at each sampling station was trophic dynamic fluctuations. Indeed, an evident changing of the trophic group dominance was observed, suggesting changes in food availability.