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Scientific Editors

Aquatic Ecology of the Mondego River Basin
Global Importance of Local Experience

Coimbra • Imprensa da Universidade

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ON THE STRUCTURE OF THE BENTHO-PELAGIC FAUNA FROM THE MONDEGO ESTUARY SOUTHERN ARM

Abstract

This work presents the investigations made on the bentho-pelagic zooplankton of the Mondego estuary southern arm. These communities were sampled from June 1996 to July 1997 using macrozooplankton and suprabenthic nets, with 335 µm and 500 µm mesh size respectively. The diversity of the samples and the distribution of the species along the main estuarine gradients were assessed. Diversity was highest in the marine zone where density and biomass were lowest. Diversity decreased upstream and was lowest in the brackish part where density and biomass reached maximal values. Communities were identified using a divisive classification multivariate statistical technique. Communities could be distinguished and their position along the unidirectional salinity-turbidity spatial gradient was described. The spatial patterns dominated over the temporal patterns. The species composition, density and biomass of the dominant species of each community were compared among communities. A general seasonal cycle was documented with a more abundant and diverse assemblage during the spring and autumn than summer and winter.

Introduction

In recent years, knowledge on the suprabenthic communities of the NE Atlantic has increased (Kaartvedt 1985, 1986, Macquart-Moulin 1985, Fossa and Brattegard 1990, Elizalde et al. 1991, Zouhiri and Dauvin 1996, Cunha et al. 1997 a, b) and several infralittoral and circalittoral areas have been studied (Sorbe 1982, 1984, 1989; Cornet et al. 1983, Wang and Dauvin 1984, Buhl-Jensen and Fossa 1991, Hamerlynck and Mees 1991, Dauvin et al. 1994, Zouhiri and Dauvin 1996, Azeiteiro and Marques 1999, Cunha 2000).

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Few systematic works have been carried out on the continental shelf off Portugal. Monteiro Marques (1979) and Sousa Reis et al. (1982) conducted biocoenotic studies off the southern and southwestern coast. Marques and Bellan-Santini (1985, 1991, 1993) studied the biodiversity and distributional ecology of amphipod crustaceans based on several benthic surveys carried out systematically along the coast. Recently the Southern Iberian margin suprabenthos was studied by Cunha et al. (1997 a, b) and estuarine suprabenthic communities are being studied by Azeiteiro and Marques (1999) in the Mondego estuary and by Cunha (2000) in Ria de Aveiro.

The suprabenthos (Beyer 1958, Brunel et al. 1978), tychoplankton (Kennish 1990) or tychopelagic compartment (Attlas and Bartha 1993), demersal zooplankton (Kennish 1990), benthopelagic zooplankton (Azeiteiro et al. submitted) and nectobenthic communities (Viitasalo and Rautio 1998) are known to be an important source of food for demersal fishes (Mauchline 1982, Sorbe 1981, 1984, Astthorsson 1985). These communities play an important role in the estuarine trophodynamics (Hamerlynck et al. 1990, Mees and Hamerlynck 1992, Sorbe 1981, 1984). A clear understanding of the energy and material fluxes in estuaries should always take into consideration the well established importance of these communities in those ecosystems (Boysen 1975, Wooldridge 1989, Buhl-Jensen and Fossa 1991, Hamerlynck and Mees 1991, Azeiteiro and Marques 1999, Cunha 2000).

Peracarid crustaceans of the suprabenthos, demersal zooplankton, benthopelagic zooplankton, nectobenthos and tychoplankton, or associated with floating macroalgae contribute to the pelagic community (Locke and Corey 1989). Their contribution to the plankton community is most important during night-time hours due to the migration patterns and then having a very important role in the trophodynamics of coastal and estuarine areas (Buhl-Jensen and Fossa 1991, Grabe 1996). Amphipods and cumaceans usually emerge from the sediment but do not commonly swim high up into the water column (Kaartvedt 1986, 1989). However some amphipods species are frequently collected in pelagic or hyponeustonic catches (Macquart-Moulin 1984). In contrast to amphipods and cumaceans mysids migrate upwards during the night and some of them are collected near the surface in high densities (Kaartvedt 1985). The migration of mysids constitutes an important mechanism for vertical and horizontal transfers of organic matter along coastal ecossystems (Macquart-Moulin and Maycas 1995). These transfers enable diel changes between the bottom and the surface. Mysids and some other benthopelagic crustaceans (especially the isopod *Eurydice* and decapod larvae), are the only vectors able to achieve diel transport of benthic matter directly up to the surface (Macquart-Moulin and Maycas 1995). Holopelagic animals can only ensure this upward transfer of benthic matter indirectly after predation of nectobenthic organisms (Macquart-Moulin and Maycas 1995).

Swimming activity and diel changes in the vertical distributions of suprabenthic species have been studied and described by several authors (Macquart-Moulin and Patriti 1993, Macquart-Moulin and Ribera Maycas 1995, Dauvin and Zouhiri 1996). On the whole these studies also documented that the swimming activity increases during the night. These diel activity patterns of the peracaridean crustaceans have been reported by several authors (e.g. Macquart-Moulin 1984, Sorbe 1984, Kaartvedt 1985, 1986, Wang and Dauvin 1994, Zouhiri and Dauvin 1996).

Our objectives for the present work were: (1) to investigate the density, biomass and diversity distribution of the faunal assemblage living in the vicinity of the bottom on the Mondego estuary southern arm and (2) to investigate the density, biomass and diversity distribution of the crepuscular peracarid macroplankton on the Mondego estuary southern arm.

Materials and Methods

Sampling

Five sampling stations were located along the southern arm of the estuary in order to represent the whole subsystem (Fig. 1). Station 1 is the closest one to the mouth of the estuary. The depth was 2 to 4m, the bottom consists of coarse to medium sand, low organic matter and carbonate content (Azeiteiro 1999, Azeiteiro and Marques 1999), and the influence of both the north arm and neritic waters is stronger. Station 2 is located in approximately the middle of the south arm, the depth ranges from 1 to 2m, and the bottom consists of fine sand (Azeiteiro 1999, Azeiteiro and Marques 1999). Station 3 is located in the inner area of the southern arm, close to the connection with the northern arm, whose key characteristics are very shallow waters and sandy mud bottoms, rich in organic matter and carbonate contents (Azeiteiro 1999, Azeiteiro and Marques 1999). Finally, stations 4 and 5 are located in the Pranto river, noted mainly for its very shallow waters and fine sediments, with large fractions of fine sand to clay, and the highest organic matter and carbonate contents (Azeiteiro 1999, Azeiteiro and Marques 1999).

Suprabenthic samples (samples collected with a suprabenthic sledge which consists of a heavy metal frame equipped with a net 500 µm mesh size; all the samples were quantitative) were collected monthly from the five stations (Fig. 1), which were visited in Spring tides, always following the same sequence. On 14 different occasions, between June 96 and July 97, a total of 70 daytime samples, during low tide, were collected (Azeiteiro and Marques 1999).

Monthly sunset plankton collections were made at the same five stations. Subsuperficial tows were made with a 0.5 m diameter 0.500 mm mesh plankton net. Each station was visited monthly for 12 months from July 1996 to June 1997, and on each visit various measurements were made and samples collected for analysis. All five stations were visited in spring tide waters in the same sequence and sampled in high tide. The volume of water filtered by the nets was measured with a HydroBios flowmeter mounted in the mouth of the nets. The zooplankton samples were preserved in 4 % neutralized formalin after collection.

Measurements of salinity, temperature, oxygen, pH and Secchi transparency were determined in situ each time faunal samples were collected. Water samples were collected for chlorophyll a biomass and phaeophytin (Azeiteiro and Marques 1999).

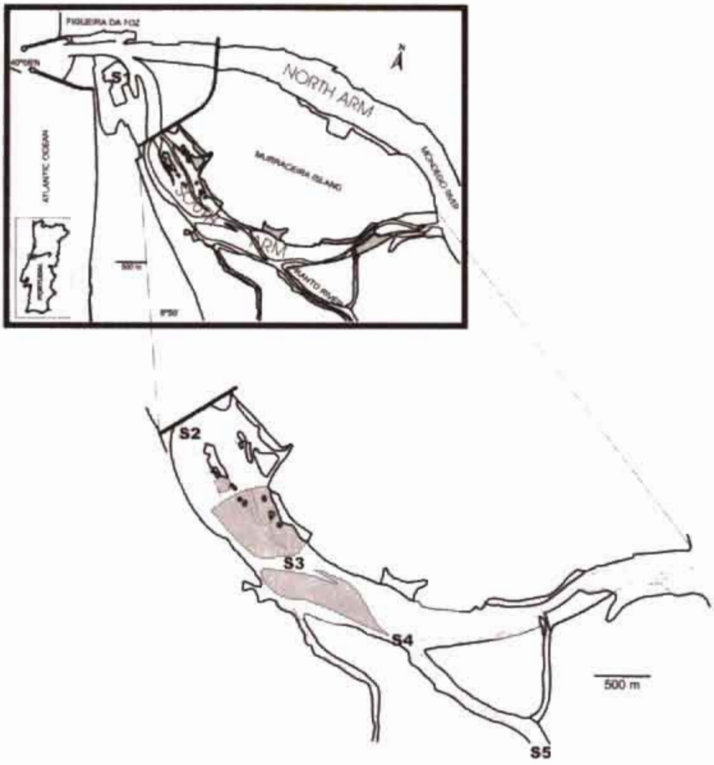

Fig. 1 Map of Mondego river estuary showing the locations of the five sampling stations in the southern arm.

Physico-chemical data analysis

Principal Component Analysis (PCA) was used to identify the major sources of variation in the physico-chemical data (Legendre and Legendre 1979). Data were organised into a matrix of 9 physico-chemical variables x 70 samples and standardised (Legendre and Legendre 1979). Correlation matrixes were calculated using the Pearson's coefficient. Data analysis was performed using the NTSYS-PC (Numerical Taxonomy and Multivariate Analysis) version 1.80 software package (Rohlf 1990).

Studies of the descriptive physico-chemical data and a description of the clorophyll a biomass related to this study have been published elsewhere (Azeiteiro and Marques 1999).

Laboratory procedures

In the laboratory all animals were identified, if possible to species level, and counted and weighed; all density and biomass data are presented as numbers of individuals (N) and mgrams ash-free dry weight (mgAFDW) per m^3 (Azeiteiro and Marques 1999).

Communities data analysis

The sampling sites were classified into clusters according to species composition using the classification program TWINSPAN (Hill 1979), which is a dichotomous divisive technique. TWINSPAN yields indicator species characterising the various groups (Azeiteiro and Marques 1999).

Diversity of the communities (Magurran 1988) was calculated with the H the Shannon-Wiener diversity index (Azeiteiro and Marques 1999).

Results

In the PCA analysis (Fig. 2), the first axis correlates strongly with the main estuarine gradients: salinity and Secchi disc depth. The largest vector, which, per definition, explains most of the variance, nearly parallels the firts axis and represents the salinity gradient. It is strongly and negatively correlated with the 1/Secchi vector. The first axis (with its correlated salinity-turbidity gradient) thus reflects the spatial longitudinal variation, whereas the second axis rather reflects the seasonal component. All marine samples are located on the positive side of the firts axis.

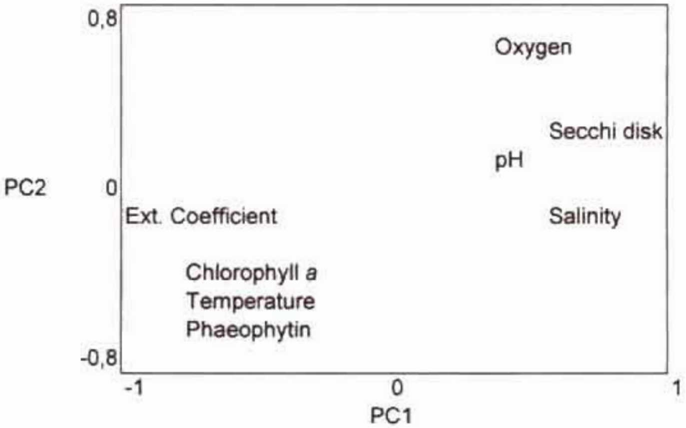

Fig. 2 Projection of the physicochemical and biological parameters and sites in the space defined by PC1 and PC2.

A total of 74 species were identified. The faunal assemblage living in the immediate vicinity of the bottom was dominated by crustaceans, especially mysids. Other important groups were amphipods, isopods, caridean shrimps, larval stages of brachyuran crabs and postlarval fish.

Seasonal variation of density (indm^{-3}) and biomass (mgm^{-3}) (AFDW) showed a clear bimodal variation pattern with highest values in October and May (Fig. 3). January with a lower density value than the other months showed the highest biomass values what is understood by the occurrence of Pisces post-larvae *(Anguilla anguilla)* (Fig. 4).

The highest diversity values where obtained in May and July to August (Fig. 5).

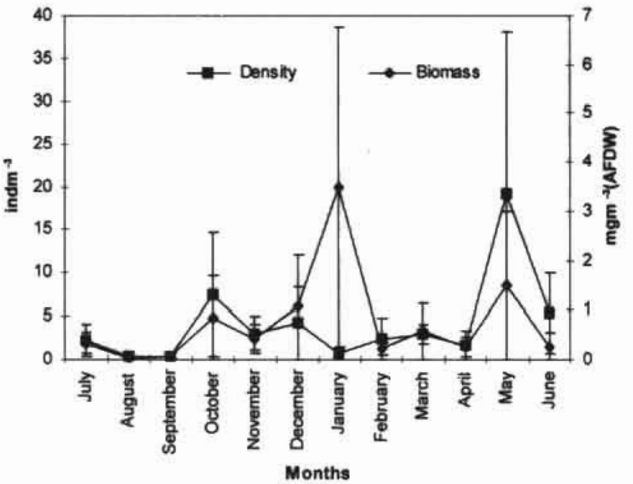

Fig. 3 Seasonal changes in total suprabenthic density (indm^{-3}) and biomass (AFDW) (mgm^{-3}), July 1996 – June 1997.

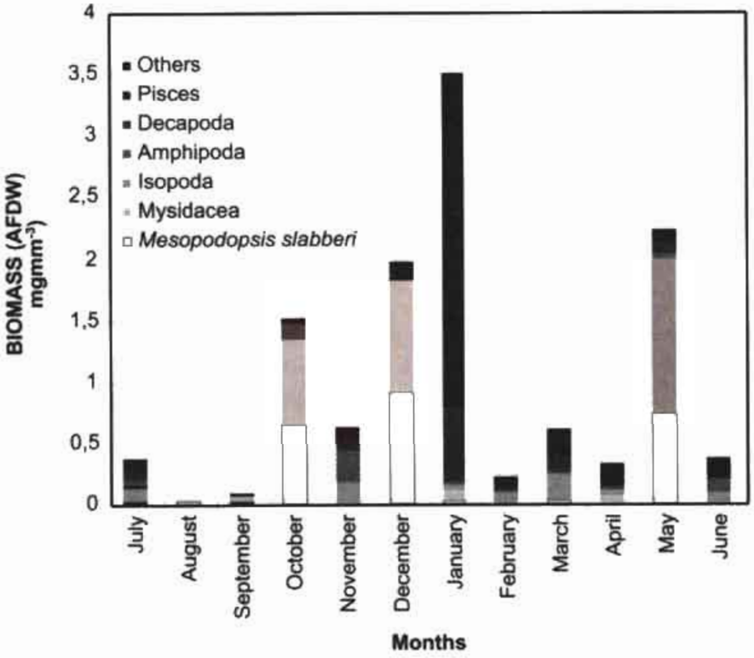

Fig. 4 Biomasses (AFDW) of the suprabenthonic groups and M. slabberi (mgm^{-3}), July 1996- June 1997.

Twinspan analysis of the 60 trawls shows a strong dominance of spatial structure, i.e. the similarities between the clusters grouping the samples of different months are high (Fig. 6). A first split divides the year in a cluster with the marine stations (mouth of

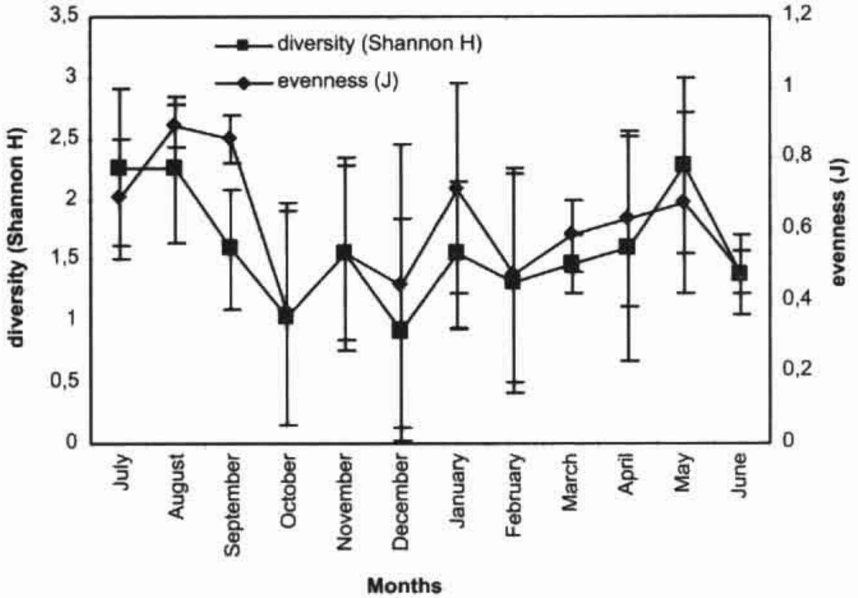

Fig. 5 Monthly changes in the species richness (Shannon H), July 1996- June 1997.

the estuary: sampling stations S1 and S2) and a cluster with the mid and inner stations (sampling stations S3, S4 and S5). Indicator species for the most seaward part are *Schistomysis spiritus*, *Gastrosaccus spinifer* and *Paramysis c.f. bacescoi* and for the inner estuary *Mesopodopsis slabberi* and *Paragnathia formica*. In the next division, in the mouth cluster Autumn and Spring with indicator species Mesopodopsis slabberi are separated from late Summer and Winter. The next split, in the second cluster, distinguishes Autumn from Spring with indicator species Engraulis encrasicolus, and, in the first cluster, distinguishes late Summer from Winter with indicator species *Anguilla anguilla*. The next split in the other main cluster of the mid and inner group divides the samples in Winter, late Summer and Autumn group with indicator species, *Gastrosaccus spinifer*, *Paragnathia formica* and *Melita palmata* from Summer and Spring with indicator species *Praunus flexuosos*. The next split, in the first cluster, isolates Winter from late Summer and Autumn, and, in the second cluster, Summer from Spring.

Figure 6 also shows the density values of the most important species in each cluster. The composition of species assemblages in the eight clusters differed substantially but mysids were dominant except for cluster 4 (Spring and early Summer inner and mid estuary) where temporary suprabenthos (merosuprabenthos) (Hamerlynck and Mees 1991, Azeiteiro and Marques 1999) dominated and cluster 5 (Winter mouth of the estuary) where temporary suprabenthos also dominated. The bottom fauna reaches higher numbers in the inner estuary (in all months). The brackish community is dominated by *Mesopodopsis slabberi* (Table 1).

Table I. Biomass (%) spatial variation of the main taxonomic groups and *M. slabberi* within the Mondego southern arm sampling stations.

	S1	S2	S3	S4	S5
M. slabberi	0,74	7,76	8,05	18.27	40,60
Mysidacea	61,39	24,15	13,59	21.38	41,04
Isopoda	0,77	4,50	1,07	1.28	1,17
Amphipoda	3,99	8,39	0,56	0,37	0,05
Decapoda	23,91	12,01	13,49	6.88	5,70
Pisces	8,84	41,83	63,23	51.82	11,43
Others	0,37	1,37	0	0	0

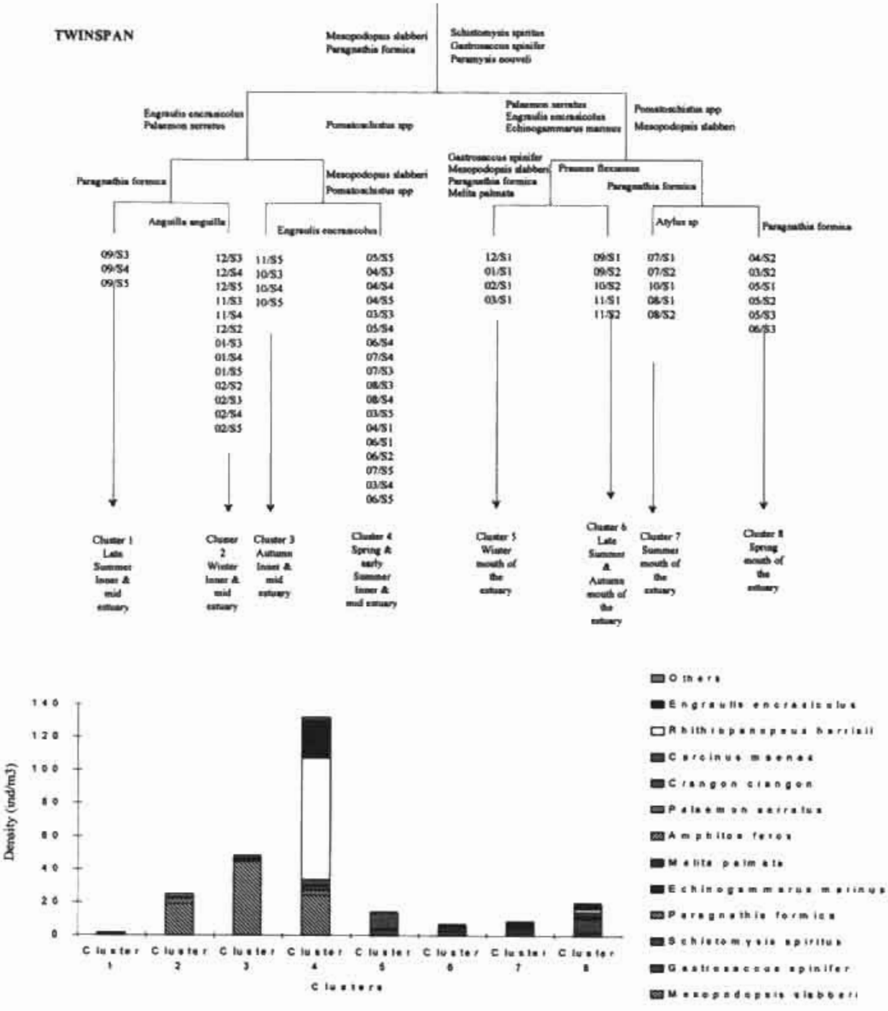

Fig. 6 The TWINSPAN analysis of the samples based on the density data with the indicator species for each division indicated and faunal composition for the identified clusters.

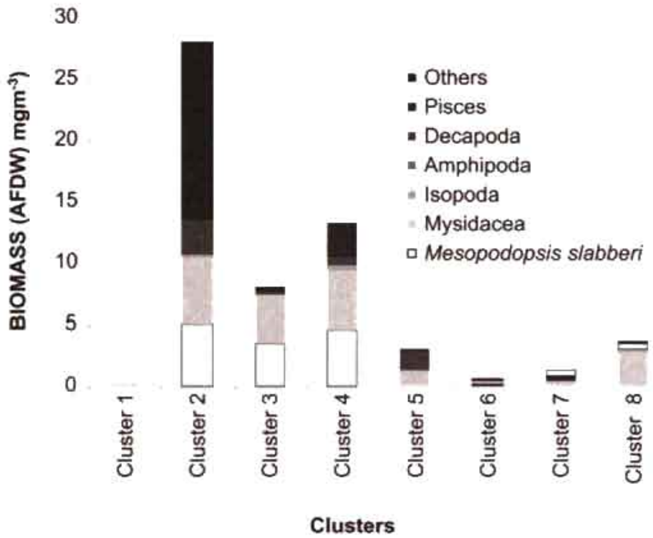

Fig. 7 Faunal composition, for the biomass values, of the communities identified by TWINSPAN of all density data.

The clusters also differed in biomass (Fig. 6). Figures 6 and 7 also illustrates the seaward decline of total density and biomass of the faunal assemblage living in the immediate vicinity of the bottom as well the distribution of the most important species and groups.

Mysids dominated the suprabenthos in all stations. *Neomysis integer* and *Paramysis bacescoi* appear always in mid estuary. *Praunus flexuosos* is also restricted to the mid zone. *Mesopodopsis slabberi* is a euryhaline species which occurs in higher numbers in the mid and inner estuary. *Schistomysis spiritus*, *Gastrosaccus spinifer* and *Siriella clausi* are the dominant mysids in the marine part of the estuary. *Schistomysis spiritus* is a typical marine species which enters the estuary in Winter, is still present in very low numbers in Spring but is completely absent in Summer.

Diversity Twinspan analysis showed the temporal structure (i.e. samples of a single month resemble one other more closely than samples from the same station in any other month) (Fig. 8) but also the spatial structure. The cluster analyses formed 4 clusters. Winter and late Summer are the poorest seasons. The most downstream stations have the highest diversities, where a high number of species are present and the individuals are distributed more evenly among them.

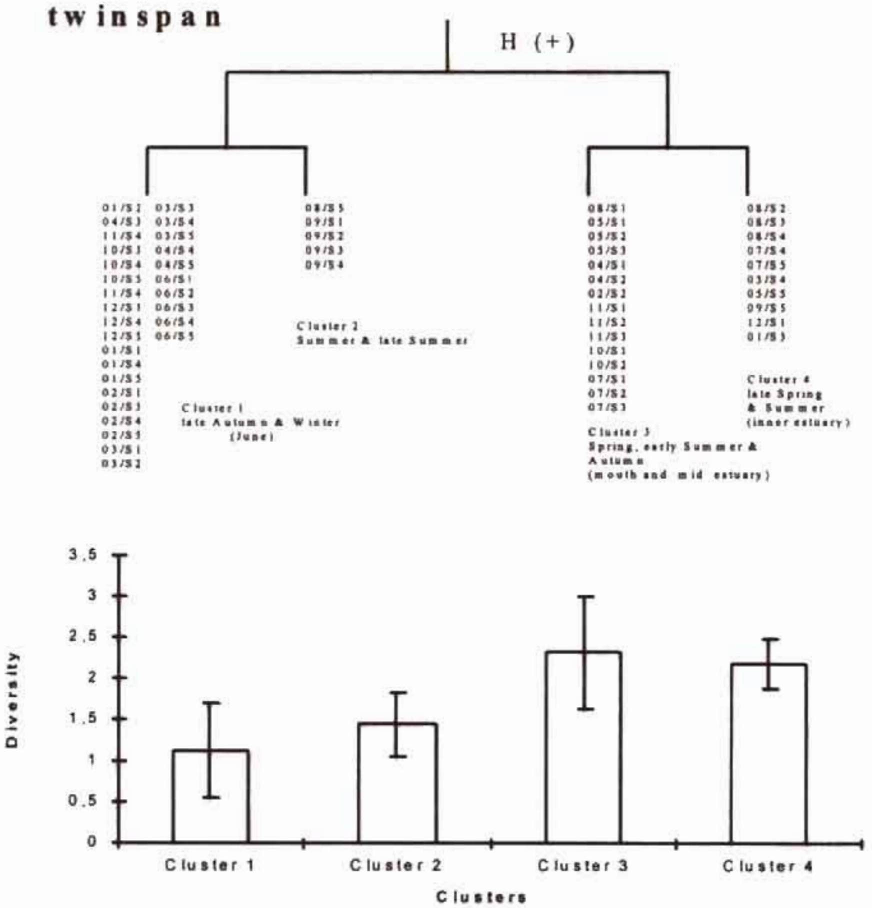

Fig. 8 The TWINSPAN analysis of the samples based on the diversity and formed clusters with the average diversity values.

In the crepuscular subsuperficial collections fifty species of peracarids were identified: isopods (14 species), mysids (14 species) and amphipods (18 species) were the most diverse taxocenes. Densities (ind100m^{-3}) and biomass (mg100m^{-3}) (AFDW) (Fig. 9) followed a similar pattern, with autumn-early winter and spring-early summer maxima.

Species richness (Margalef diversity index) (Magurran 1988) (Fig. 11) showed a pattern with a late summer-early autumn and spring maxima. April, with a low number of species and low number of individuals (the high diversity value only reflects the high equitability), doesn´t follow the regular pattern described in the last period.

The majority of the peracarids caught in the study area were estuarine species: mysids: *Mesopodopsis slabberi*, *Neomysis integer* (Leach), *Praunus flexuosos* (Muller), *Schistomysis spiritus* (Norman), and *Paramysis bacescoi*, *nouveli* and *helleri* (Labat), *Siriella* sp., *isopods: Idotea chelipes* (Pallas), *Lekanesphaera hookeri* (Leach), and *Paragnathia*

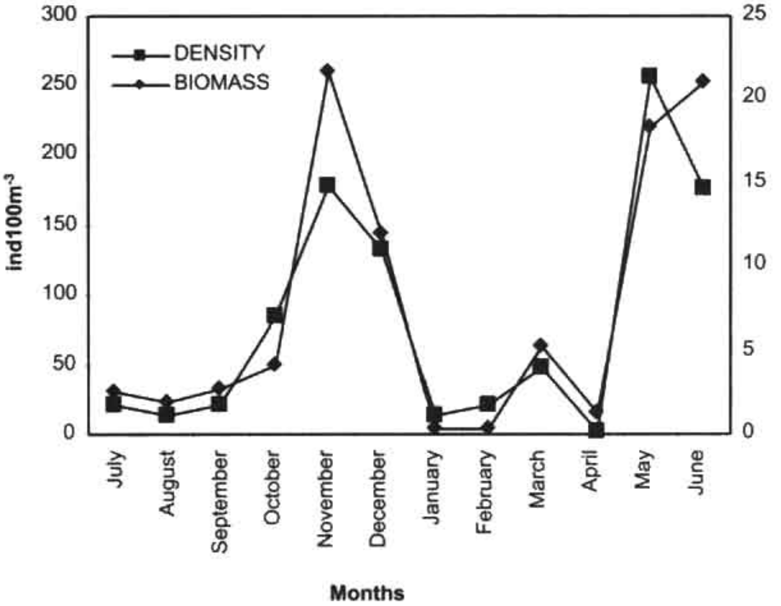

Fig. 9 Monthly changes in the total densitiy (ind100m^{-3}) and biomass (mg100m^{-3}) (AFDW) of peracarid zooplankton in crepuscular-time collections in the southern arm of the Mondego estuary, July 1996-June 1997.

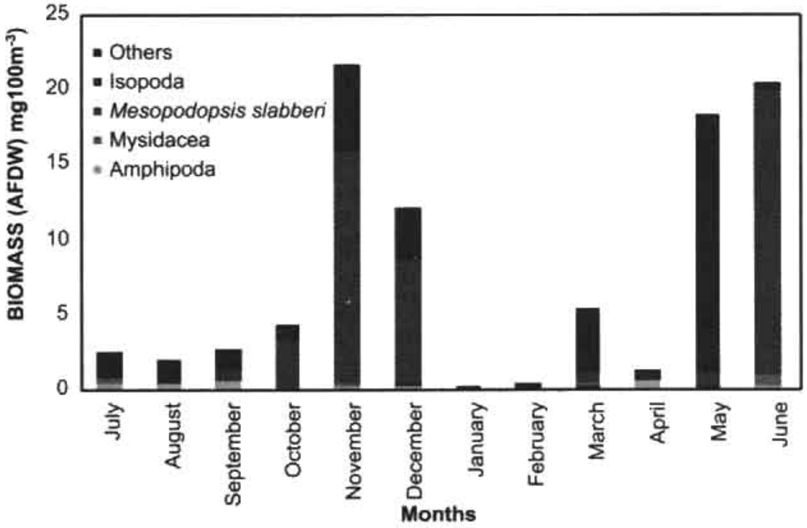

Fig. 10 Biomasses (AFDW) of peracarids (mgm^{-3}) in crepuscular-time collections in the southern arm of the Mondego estuary, July 1996- June 1997.

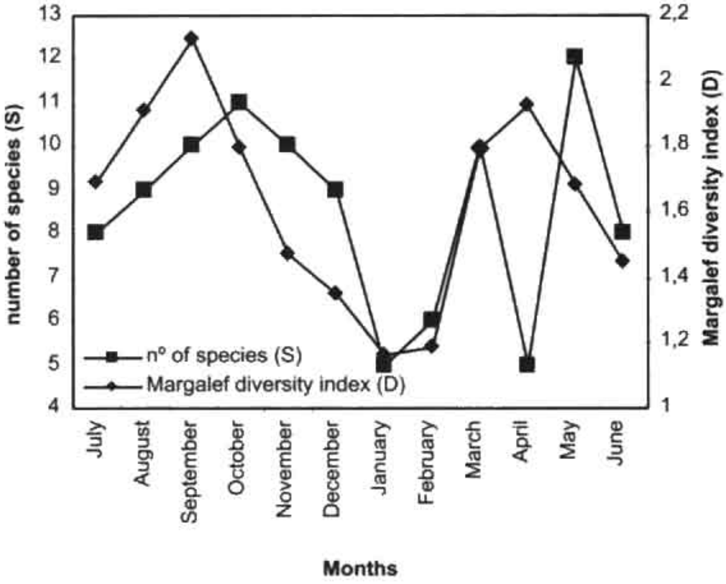

Fig. 11 Monthly changes in the species richness (Margalef diversity index) and number of species of peracarid zooplankton in crepuscular-time collections in the southern arm of the Mondego estuary, July 1996- June 1997.

formica and the amphipods: *Corophium multisetosum* (Stock), *Melita palmata* (Montagu), *Amphitoe* spp. and *Echinogammarus marinus* (Leach). The numerically dominant groups were the mysids and the isopods. In the autumn and late spring *Mesopodopsis slabberi* was the most abundant species and in the late winter and spring *Paragnathia formica* was the dominant species. The biomass dominant groups (Fig. 10) were also the mysids and the isopods. In the autumn *Mesopodopsis slabberi* was the biomass dominant species. Along the studied period, the mysid *Mesopodopsis slabberi* (van Beneden) and the isopod *Paragnathia formica* (Hesse) comprised about 93 % of the total density and biomass of the assemblage in the crepuscular peracarid macroplankton fauna.

Discussion

The suprabenthic communities have been studied for the last decade in several NE Atlantic areas (Bay of Biscay: Sorbe 1982, 1984, 1989, Cornet et al. 1983, English Channel: Dauvin et al. 1994, Wang and Dauvin 1994, Zouhiri and Dauvin 1996, North Sea: Fossa and Brattegard 1990, Hamerlynck and Mees 1991, Brattegard and Fossa 1991, Buhl-Jensen and Fossa 1991, West Portugal: Cunha 2000, Cunha et al. 1997 a, b).

Mysids dominated the suprabenthos. Mysids and decapods are well represented in coastal communities (Webb and Wooldridge 1990, Buhl-Jensen and Fossa 1991, Hamerlynck and Mees 1991, Dauvin et al. 1994, Brandt 1995, Azeiteiro and Marques

1999, Cunha 2000). The recorded densities are subject to several possible sources of bias. Net efficiency was assumed to be 100%. However, mysids are good swimmers which are known to actively avoid nets (Mauchline 1980). Thus, the reported densities may be a gross underestimate of the actual number of mysids present in the area. The species *Gastrosaccus spinifer* spends most of the daytime buried in the sand (Tattersall and Tattersall 1951 *in* Mees and Hamerlynck 1992) and was most certainly underestimated. The species *Praunus flexuosos* (Tattersall and Tattersall 1951 *in* Mees and Hamerlynck 1992) which are known to prefer shallow intertidal parts of estuaries, may be also underestimated due to problematic bed conditions and shipping. Another possible source of bias may be the vertical distribution and diel changes. Swimming activity and diel changes in the vertical distribution of suprabenthic species have been studied and described by several authors (Macquart-Moulin 1965, 1984, 1991, 1992, Macquart-Moulin and Patriti 1993, Macquart-Moulin and Maycas 1995, Dauvin and Zouhiri 1996). Species-specific behavioural patterns together with other factors such as light, currents or food availability determine the swimming activity of suprabenthic animals (Fossa 1985, 1986, Elizalde et al. 1991, Vallet et al. 1995).

Absence of a species from the samples does not necessarily mean it is not present in the estuary. This is certainly true for the rare species and for animals not efficiently caught with the sledge e.g. *Rhithropanopeus harrisi* (Wolff and Sandee 1971 and Van Damme et al. 1992 all *in* Mees et al. 1995), which are abundant in the estuary (Gonçalves 1991, Azeiteiro 1999).

The mysid fauna resembles that of other European estuaries (Sorbe 1981, Mees et al. 1993 a, 1995). The following within-estuary patterns were consistently found: diversity was highest in the marine zone, where density and biomass were lowest. Diversity decreased in an upstream direction, where density and biomass reached maximum values.

Multivariate analysis is a useful descriptive tool for an exploratory analysis of data. Multivariate analysis neatly summarises the structure in complex data sets and can help us to formulate hypothesis. The multivariate analysis showed that in the suprabenthic community spatial structure dominated over the seasonal patterns, i.e. the similarities between the clusters grouping the samples of different months are high. The main reason for this is the fact that the spatial gradient in species composition in estuaries is very steep: the communities of the marine and brackish parts are composed mostly of different species. Furthermore, most temporary and migratory suprabenthic species are not able to penetrate far into the estuary resulting in a species-poor community upstream, which is always dominated by the same few species. Despite the fact that strong temporal variations in abundances are observed for the main brackish water populations, community structure as a whole thus remains stable throughout the year (Mees et al. 1993 a, b, Azeiteiro and Marques 1999).

The sequential appearance, high abundance and disappearance of the different species of the temporary suprabenthos affects the community structure and the cluster analysis. Diversity values showed that temporal patterns remain important, but spatial patterns emerge in any case. In Winter, lower diversity values may also be due to the combined effect of tides and freshwater discharge, causing strong daily variations in physico-chemical factors. From Winter to Summer, the decrease in freshwater discharge, and consequently easier tidal penetration, seems to favour the incursion of suprabenthic marine species inside the estuary. Despite their sparse populations, the intrusion of these species may explain the observed increase in diversity (Azeiteiro and Marques 1999). Marques et al. (1993 a, b) observed the same pattern with epifaunal species. The hydraulic circulation in the southern arm depends essentially on tides and on the freshwater discharge of the Pranto river (Marques et al. 1993, 1994). Marques et al. (1993) claim, using the definition of McLusky (1989), that the southern arm presents favourable environmental conditions for true estuarine organisms. However, species diversity could be higher in Spring, Summer and Autumn seasons if there was not an increase of biological activity and the enhancement of estuarine populations, namely of *Mesopodopsis slabberi*, that decreased species evenness; thus the species diversity values may be underestimated in those seasons but not corresponding to a reduction in species richness. Marques et al. (1993) observed the same pattern with epifaunal species. Besides the behavioural and environmental factors, the life cycle features of suprabenthic species may determine density fluctuations that induce temporal changes in the community structure (Boysen 1975, Buhl-Jensen and Fossa 1991, Hamerlynck and Mees 1991, Dauvin et al. 1994, Azeiteiro et al. 1999). In summary, the estuary contained distinct communities along the unidirectional salinity-Secchi disc transparency gradient (Azeiteiro and Marques 1999).

In the Mondego estuary a first survey of peracarid crustaceans was done in the intertidal communities only on isopods and amphipods (Marques et al. 1988). In that study, using benthonic sampling methodologies on the intertidal, Marques et al. (1988) have made an inventory of 14 isopod species and 21 amphipod species.

The majority of the peracarids caught in the study area were estuarine species and most of the species are benthopelagic: all the mysids, isopods and same of the amphipods, e.g., *Atylus* and *Ampelisca*, (Macquart-Moulin and Maycas 1995) and *Dexamine* (Macquart-Moulin and Patriti 1981); the Oedicerotidae species (two species were caught: *Pontocrates arenarius* Bate and *Perioculodes longimanus* Bate and Westwood) are referred to (Macquart-Moulin and Patriti 1981) as pelagic species. The identified amphipods taken in the plankton nets were generally immature individuals, – a situation described by other authors (Macquart-Moulin and Patriti 1981). Cumaceans are not truly planktonic, but despite being sand-burrowers they do swim quite effectively. Males are especially prevalent in plankton samples taken at night (Todd and Laverack 1991). The euphausid *(Nyctiphanes couchi)* caught in the study area is a pelagic species, already refered for the Portuguese coast (Cunha et al. 1997 a, b) and the three cumaceans *(Pseudocuma longicornis* Bate, *Eocuma dollfusi* Calman and *Diastylis* sp.) are bentho-pelagic species (Macquart-Moulin and Patriti 1981). Water mixing and sediment resuspension mechanisms may also explain the presence of the two cumaceans caught in that study. Butman (1987 in Grabe 1996) claimed that that kind of mechanism may affect the biological communities associated with sediments. Sediments may be reworked and resuspended up from the bed and may disturb the infauna. Such a mechanism may contribute to the dispersal of infaunal and epifaunal peracarids.

The most abundant species were the euryhaline mysid *Mesopodopsis slabberi* found in almost all estuaries (Makings 1977, Wooldridge 1983 *in* Webb et al. 1987, Azeiteiro et al. 1999) and the isopod *Paragnathia formica* which is a very important species in the estuary (Gonçalves 1991, Azeiteiro 1999); *P. formica* adults are usually benthic but pranizas are often ectoparasitic on fish and often taken in plankton nets (Naylor 1972). Other species may originate from inshore and estuarine environments. Examples includes the mysids: *Siriella* and *Schistomysis* species and *Gastrosaccus spinifer* (Makings 1977); the isopods Ligia oceanica and *Idotea baltica* (Naylor 1972); and Oedicerotidae amphipods and certainly the euphausids.

The fact that the downstream stations present saline stratification (Gonçalves 1991) and the collections were made with sub-surficial tows probably led to a subapreciation of the results since the haloclin may determine the animals upward migration. The low abundances of amphipods and cumaceans, mostly mud and sand-dwelling and sand-burrowing animals, can be explained in light of their sensitivity to surrounding disturbance e.g., eutrophication (Pardal 1998) and pollution (Macquart-Moulin and Patriti 1981). On the contrary the mobile species of the diverse substrata can survive more easily. This is the case for the mysid *Mesopodopsis slabberi* and the isopod *Paragnathia formica*, which add their euryhaline character (Macquart-Moulin and Patriti 1981, Azeiteiro et al. 1999).

Mysids also dominated the crepuscular peracarid fauna. Mysids and decapods are well represented in coastal communities (Buhl-Jensen and Fossa 1991, Hamerlynck and Mees 1991, Dauvin et al. 1994, Azeiteiro and Marques 1999, Cunha 2000) and together with amphipods are usually the most abundant groups in coastal communities (Buhl-Jensen and Fossa 1991, Hamerlynck and Mees 1991, Azeiteiro and Marques 1999, Cunha 2000). That study brings a new importance to the isopod populations namely the contribution of immatures to the pelagic community.

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