RICHNESS AND DISTRIBUTION OF EPIBENTHIC MOLLUSCS ON A SANDSTONE REEF IN THE NORTHEAST OF BRAZIL

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INTRODUCTION

The majority studies about molluscan distribution on reef systems were developed on true coral reefs, which exhibit great diversity and coral covery (McClanaham, 1990; Augustin *et al.*, 999; Zuschin *et al.*, 000; Zuschin *et al.*, 001). In these systems, the molluscs present a wide range of taxa assemblages closely linked to coral substrata (Zuschin *et al.*, 000).

However, most Brazilian reef systems aren't true coral reefs, in other words, they are thin coralline formations and their main reef builders are encrusting calcareous algae and vermetid molluscs (Maida & Ferreira, 1997). In spite of the low richness of corals (19 species for Brazil), the reefs concentrate a great number of other species, including taxons with economical and ecological importance, such as molluscs.

Molluscs are good environmental indicators, because they frequently inhabit a variety of ecological niches in tropical - subtropical reef - associated hard substrata environments (Zuschin *et al.*, 001). Information on spatial variability and distribution of species on reef systems is important to evaluate the anthropogenic disturbance of marine environments (Richmond, 1993; Dayton, 1994).

Little is known about molluscan communities and distribution on reef systems in the Northeast because there are few studies done on this subset. Some notable studies are Matthews (1967), Matthews & Rios (1969, 1974), Furtado - Ogawa (1970), Matthews & Kempf (1970), Oliveira (1971) e Haimovici *et al.*, (1994).

The present study aims to record the spatial distribution of epibenthic molluscs in the sandstone reef system of Maracajaú and associate it with different substrata type.

OBJECTIVES

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MATERIAL AND METHODS

Data Collections

The collection of qualitative data was done in Maracajaú reef system during August/06 to February/07, and the quantitative during Aug and quantitative during March/07, using snorkelling and scuba diving. The species of molluscs was registered and classified into 6 groups of feed niche: carnivorous, coralivorous, filter feeders, deposit feeders and scrap feeders.classified in agreement to your feed niche.

There were twenty three sites established in different habitats: 11 in the reef habitat (patch reefs), 3 in the sandy bottom and 9 in the seagrass bed. Three band transects of 10x1m were sampled at each site and the data was obtained for each m ^{2} of the transect (Adjeround, 2000). In each quadrant (1m ^{2}) the number of species was counted, and substratum rugosity and recovery (coral, zoanthids, sand, mud, rock, seagrass and the macroalgae functional groups classified by Littler & Littler (1983)) were given values from 0 - 3 units.

Data processing

Firstly the molluscan data was submitted to CLUSTER and MSD analysis, with the Bray - Curtis índex, in order to find the spatial distribution of the species. Then, the substratum data were normalized and submitted to PCA analysis, with Euclidian distance, to verify the variation of substrata on different sites.

A similarity matrix of the substratum data was obtained to process the BIO - ENV analysis (Clarke & Warwiick, 1994). Starting from the similarity matrix of molluscan and substratum data, the BIO - ENV analysis was carried out, in order to find possible distribution patterns that could be associated to the substratum variables.

RESULTS AND DISCUSSION

A number of 46 species were registered, divided into 3 classes: Gastropoda (37 spp), Bivalvia (9 spp) and Cephalopoda (1 sp). The species registered are commom to reef systems of the Northeast of Brazil, and also included some Carribean species. The richnest habitat for the epibenthic mollusks should were registered in the reefs (39 species), meanwhile 20 species in the seagrass, and only 3 in the sandy bottom. During the quantitative sampling, 184 individuals were recorded in 17 species, with the most individuals (165) and species (8) occurring in the reef habitat. The increased rugosity in the reef environment provides major structural complexity, which foments an increase on richness and density of many species (Konh & Leviten, 1976).

The carnivorous group was the most abundant and richest in the reef habitat, both at qualitative (27 species) and quantitative (8 species and 143 individuals) sampling, while the remaining species occurred in low densities in the other groups. Only 3 individuals of the coralivorous Coralliophila caribaea were observed, probably due to the low occurrence of the coral Favia gravida, which was the coral that this gastropod preys on, according to Rios (1994).

The results found in the analysis of molluscan data showed a low similarity (<40%) among all the sites, but into the reef habitat, a more homogeneous distribution was found. The analysis of substrata data exhibited 4 groups (2 in the seagrass and 2 in the reef habitat). The BIO - ENV analysis showed that the variation on covery of seagrass, sand, fleshy algae and rugosity were the main components that influenced species and density variation in the reef system. In general, molluscs present a horizontal zonation in shallow waters linked to environmental and substrata differences (Sheppard, 1984; Augustin *et al.*, 999), as was evidenced in these result.

The variation between sand and mud in the seagrass bed presented an important feature for the distribution of the species in this habitat, which was already described by Zuschin & Honegger (1998). It was observed that the gastropods Voluta ebraea and Oliva scripta preferred the sandy substrata, a common habitat for these two species according to Rios (1994). The occurenece of the deposit feeders Cerithium spp. and the scrap feeder Nassarius vibex in the muddy substrata could be due to the greater availabity of food, as a result of the high rate of organic matter deposition in this substrata (Teixeira *et al.*, 001).

In the reef habitat, the rugosity and the main recovery of fleshy macroalgae and zoanthids proved to be the components that most facilitate the species density, but not an increase in richness. Although a positive relationship exists between the molluscs and the rugosity, the richness was lower than other Brazilian reefs, as for example Abrolhos, which have a register of 293 molluscan species (Dutra *et al.*, 005). This reef have the largest coral richness in Brazil, with 19 species, and great recovery (Castro e Pires, 2001), which probably allows an increase in molluscan richness, according to Zuschin *et al.*, (2000). Therefore the low richness in molluscs registered in the Maracajaú reef should be due to the low coral cover and low coral richness, with only 4 species registered (Arantes, 2004).

The great recovery of fleshy macroalgae could indirectly contribute to the low richness as well, because this group of algae with large coverage can prevent the recruitment of coral species reducing coral coverage (McCook, 1999), and then cause a decrease of molluscan species. Other feature that could contribute to the low richness of molluscs is the great recovery of zoanthids, mainly *Palythoa caribeaorum*, because, according to Pèrez's results (Pérez *et al.*, 005), there are few species of molluscs associated with this zoanthid.

The most abundant species (*Trachypollia nodulosa, Engina turbinella, Leucozonia nassa*) occured in a wide distribution in the reef, possible due to the fact that are generalists carnivore, according to Rios (1994). The feed niche of the most abundant species could explain the result of mollusc density being associated with the substrata characteristics registered in the reef. This means that these generalist species can occur in any kind of recovering substrata because they are capable of feeding on many other species.

Therefore, the lower richness of epibenthic molluscs in this reef should be associated with the low coral cover, and great coverage of zoanthids and fleshy macralgae, which characterize a reef system not dominated by corals, with the occurrence more generalist individuals than specialist. Even so, the occurrence of generalist molluscs with these substrata features could be a negative indicator for the reef health.

CONCLUSION

The distribution of the epibenthic molluscs in the Maracajaú reef system should be associated with the susbtratum type and food availability. The great abundance of generalist species in the reefs characterize the epibenthic molluscs of a sandstone reef, however the association of these species with the substrata covering registered in this study (low coral coverage and great recovering of fleshy algae and zoanthids) could indicate a state of damaged reef.

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