BENTHIC COMMUNITY SETTLED ON AN ARTIFICIAL REEF IN THE WESTERN ADRIATIC SEA (ITALY)

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Abstract

Quantitative benthic samples were collected for two years from the horizontal and vertical walls of the concrete modules of Senigallia artificial reef (northern Adriatic sea) to investigate the community settled after about ten years from reef deployment. The artificial structures resulted colonised by a typical eutrophic water community dominated by filter-feeders and showed a different structure on vertical and horizontal surfaces, due to some environmental factors such as siltation, wave motion and currents.

Key-words: Adriatic Sea, artificial reef, benthic community

Introduction

A general assumption of artificial reef research is that the deployment of man-made structures on soft bottoms favours the increase of original benthic communities complexity (1) due to the development of hard-substrate species which could not find available settlement surfaces before.

This statement was confirmed in the central Adriatic Sea, where some studies carried out on the first artificial reef built on a soft-bottom area evidenced that the submersion of man-made substrates favoured the natural settlement of large banks of mussels (*Mytilus galloprovincialis*) and oysters (*Ostrea edulis*, *Crassostrea gigas*) which otherwise might be lost for the lack of suitable surfaces (2).

In order to obtain a more deep knowledge about the benthic communities which colonize these artificial structures in respect to the different depth levels and orientation, Senigallia artificial reef was investigated after ten years from its deployment.

Material and Methods

Senigallia artificial reef is an open-sea area exposed to winds and currents and affected by the Cesano river inflow. It was deployed in 1987 at 1.5 nm offshore, on a sand-muddy bottom (12-13 m deep), far from natural and artificial hard substrates and consists of 29 pyramids, each made of five, 2m-side concrete blocks (4 at the basis and 1 at the top; 3).

The benthic community settled both on basis and top blocks of the pyramids was seasonally investigated, from April 1997 to March 1999. Standard areas (40x40 cm) were sampled with a suction-sampler (horizontal surfaces) and scraping technique (vertical walls). Two replicates for each surface were taken at each survey. Mean abundance (N/dm^2), mean species richness (S_m) and Shannon-Weaver diversity index (H') were computed to quantify the role of the different group species within the community. Similarity among communities having different spatial settlement was evaluated using Cluster analysis based on species abundance and biomass.

Results

In the overall, 56,855 individuals belonging to 179 taxa were identified, 160 of which having a known link with a specific substrate type. Epifauna settled on the artificial modules was dominated by filter-feeders. Crustaceans (amphipods), polychaetes and molluscs represented the most abundant groups everywhere (Table 1). Crustaceans (i.e. *Corophium acherusicum*) were more numerous on the top of pyramids, while polychaetes (*Polydora ciliata*) dominated on the basis blocks. These groups were also the most important in terms of S_m without relevant differences between the two depth levels.

Table 1. Biotic parameters describing the benthic community.

Groups	BOTTOM			TOP		
	N/dm^2	S_m	H'	N/dm^2	S_m	H'
Cnidaria	84.7	4.0		102.2	5.0	
sd	28.6	0.0		23.3	0.0	
Crustaceans	876.4	36.5		1174.1	36.0	
sd	118.5	2.1		159.1	1.4	
Echinoderms	3.7	4.0		6.2	4.5	
sd	1.0	0.0		1.8	0.7	
Molluscs	145.3	34.5		176.2	35.0	
sd	9.0	7.8		14.8	7.1	
Polychaetes	711.7	32.0		242.5	31.5	
sd	75.6	5.7		21.7	2.1	
Others	16.2	10.0		16.1	10.5	
sd	2.1	0.0		1.8	0.7	
Total	**1838.0**	**121.0**	**0.85**	**1717.3**	**122.5**	**0.78**
sd	**23.5**	**0.9**	**0.02**	**10.1**	**0.5**	**0.01**

Very similar H' values were observed concerning the overall communities settled at the two depth levels (Table 1).

Regardless of the block level, S_m was higher on the horizontal surfaces (130.0±11.3) than on the vertical ones (113.5±4.9) mainly colonised by hard-substrate species, above all filter-feeders like bivalves (*M. galloprovincialis*, *O. edulis*, *C. gigas*), hydroids (*Obelia dichotoma*, *Bougainvillia ramosa*) and barnacles (i.e. *Balanus trigonus*, *Balanus perforatus*), which represented 57% of the species having a known link with a specific substrate. In addition to them, deposit and suspension-feeders were found on the horizontal surfaces, always covered by a thin layer of sand-muddy sediment. These were typical soft-bottom organisms, e.g. gastropods and bivalves, representing 51% of the species linked to a specific substrate. These results were confirmed by Cluster analysis that grouped the surfaces according to their orientation (Fig. 1).

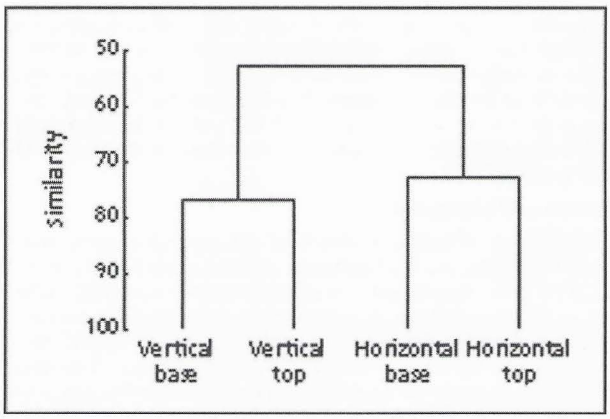

Fig. 1. Cluster analysis based on abundance and biomass of the species.

Conclusions

About ten years from the deployment, the concrete blocks of Senigallia artificial reef resulted colonised by a typical eutrophic water community showing a different structure on vertical and horizontal surfaces, due to the environmental conditions. On the horizontal walls, where siltation caused by Cesano river inflow and bottom sediment resuspension due to wave motion are more intense, the community was more heterogeneous and included a higher number of species than the vertical ones, without consistent differences among the depth levels.

Differently, the strong hydrodynamism plays a basic role in the vertical surface community composition inducing a continuous turn-over of suspended material. On the basis blocks such hydrodynamism was less intense, favouring a higher settlement of sand species (i.e. *Sabellaria spinulosa*) limiting the occurrence of hard-substrate filter-feeders in respect to the top of the pyramids.

References

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