

CHANGES IN BENTHIC MACROINVERTEBRATE COMMUNITY IN THE VENETIAN LAGOON (ITALY) 2002-2007

D. Tagliapietra^{1*}, E. Keppel¹, G. Pessa², A. Rismondo² and M. Sigovini¹

¹ Consiglio Nazionale delle Ricerche, Istituto di Scienze Marine (CNR-ISMAR) - davide.tagliapietra@ve.ismar.cnr.it
² SELC

Abstract

Remarkable changes in the benthic communities of Venice lagoon were observed between 2002-2007. The temporal evolution was characterized by a general increase of species richness, numerical abundance, biomass and diversity. There was a rapid change between 2002 and 2003, with an increase of abundance and biomass in the seaward zones of the lagoon. After such a change, these zones stabilized, while for the inner zones the recovery continued in 2007. The communities of the internal areas shifted from an organic-adapted community towards a more marine community. Spatial patterns and typical transitional gradients were evidenced each year. The role of main hydrogeological drivers is also briefly discussed. The study underlines the importance of considering physiographic zones in describing benthic dynamic.

Keywords: Lagoons, Monitoring, Biodiversity, Sediments

We demonstrate changes in the benthic macroinvertebrate community of the Venetian Lagoon between 2002-2007. Sixty stations distributed all over the lagoon were sampled in May-June of 2002, 2003 and 2007 ("MELa Project" Magistrato alle acque di Venezia / Consorzio Venezia Nuova). A zonal approach was adopted, by which changes in benthic communities structure are referred to the different physiographic zones composing the lagoon ecosystem (Rochford, 1951, Roy et al., 2001, Tagliapietra *et al.*, in press). Five physiographic zones were identified: the Marine Tidal Deltas, close to the three sea inlets, the Central Basin and the Sheltered Lagoon, located on the middle ranges of the lagoon and two landward zones; the Fringe zone and the Bayhead Estuary. The temporal evolution was characterized by a general increase of species richness, numerical abundance, biomass and diversity. Both the total number of species and the average number of species per station increased, this trend being more pronounced in the Fringe zone and Bayhead Estuary. The highest species richness was found in 2007 (255 species). The first two years were characterized by a higher number of organic-tolerant species, whereas 2007 presented more sensitive ones. There was an increase of individuals from 2002 to 2003 in all zones, especially in the Sheltered Lagoon. Such an increase was also observed in 2007, but only for the Marine Tidal Delta and the Fringe Zone. Numerical abundances were dominated by polychaetes and amphipods, being typically higher in the inner zones because of the occurrence of opportunistic species. Also the biomass increased considerably from 2002 to 2003 in the Marine Tidal Delta and the Central basin. In 2007, the increase involved in the inner areas such as the Fringe Zone and the Bayhead Estuary. Minima were recorded in the Sheltered Lagoon. Biomass was dominated by bivalves. Exception to this trend was observed in the Central Basin with a reduction of both abundance and biomass in 2007 compared to 2002-2003. Temporal changes in dominant taxa were reflected in the trophic composition that shifted towards filter feeders. The diversity followed the species number and therefore decreased along the transitional gradient from sea to land. The biomass diversity showed a progressive increase mainly in the inner typologies, as the Fringe zone and the Bayhead Estuary. In every year, species richness correlated mainly to residence times and salinity, then to turbidity and sediment texture. Similarly diversity indexes correlated to species number although with lower coefficients. The environmental variables had a relatively low correlation with similarity matrices of both abundance and biomass. The role of turbidity and sediment organic matter in structuring the lagoon benthic assemblages was also important; as an example in the areas with high turbidity the community is less rich than that expected and characterized by organic-tolerant species. In the multivariate analysis performed on the abundance, the 2007 samples resulted quite different from those of 2002 and 2003 which largely overlapped. The community structure of the internal areas showed a progressive shift towards the Marine Tidal Delta structure. The shift towards a Marine Tidal Delta community structure was more evident for the Fringe Zone samples, especially for those of the Lido Basin. In this context the Bayhead Estuary stations kept their individuality. Biomass showed a temporal evolution similar to that of abundance. In conclusion, we found a rapid change between 2002 and 2003 with an increase of the vigour (abundance and biomass) in the seaward zones of the lagoon. The Marine Tidal Delta areas, after a rapid change, stabilized, while for the inner zones the recovery continued in 2007 with the exception of the Sheltered Lagoon. In 2007 the general overview pointed at an increase of diversity all over the lagoon. This increase was not followed by an increase of vigour in the Central

Basin where a sensible reduction of both abundances and biomass was recorded. Our study underlines the importance of considering physiographic zones in describing benthic dynamic.

References

- 1 - Roy P. S., Williams R. J., Jones A. R., Yassini I., Gibbs P. J., Coates B., West R.J., Scanes P.R., Hudson J.P. and Nichol P., 2001. Structure and function of south-east Australian estuaries. *Estuarine, Coastal and Shelf Science* 53: 351-384.
- 2 - Rochford, D. J., 1959. Classification of Australian Estuarine Systems. *Archives of Oceanography and Limnology* . 11:171-177.
- 3 - Tagliapietra D., Sigovini M., Volpi Ghirardini A., 2009. A review of terms and definitions to categorize estuaries, lagoons and associated environments, Marine and Freshwater Research, *Marine and Freshwater Research* 60 (6): 497-509.
- 4 - Tagliapietra, D., Zanon, V., Frangipane, G., Umgiesser, G., Sigovini, M., (in press). Physiographic zoning of the Venetian Lagoon. CORILA Research program 2004-2007 Results.