Assessing Environmental Quality In Benthic Ecosystems: the Role of Community Structure Models

E. Fresi[*], M. Scardi and M. Penna

Dept. of Biology, University of Rome "Tor Vergata", via della Ricerca Scientifica – 00133 Rome, Italy
[*]E-mail: fresi@uniroma2.it

Monitoring and assessing environmental quality is becoming a common task in marine biology and benthic communities are certainly among the most sensitive indicators. Their role has been clearly pointed out in many papers, as well as in the Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive).

In spite of the emphasis on the role that communities play, however, no widely accepted methods are available as far as marine ecosystems are concerned, whereas several procedures (e.g. indices of biotic integrity) are available for freshwater ecosystems. In this framework, we will discuss the role of different approaches, ranging from very simple indicators to more complex procedures (e.g. models of community structure or comparisons with respect to reference sites).

In particular, we will focus on an application involving a community-based procedure that relies upon a very simple unsupervised modelling procedure. Our approach is aimed at identifying recurrent structures in benthic marine communities, as a preliminary step towards the assessment of the overall environmental quality of coastal ecosystems.

The large database which supported our work was collected by retrieving data from recent and mostly homogeneous sources consisting of lists of macrozoobenthic species and their abundances. We have been able to find such data for about 2200 sampling sites so far, but only in 673 sites the information about grain size and other sedimentological parameters was also available. This environmental information played a key role in determining the expected community structure, which was then compared to the observed one to obtain an estimate of the environmental quality.

In this framework we briefly discussed the role that methods based on Machine Learning techniques can play. Finally, the importance of the selection of a proper metrics for measuring the distance between observed and reference (or modelled) community structures were pointed out.