10. Macrophytobenthic colonization of artificial reefs in the Ligurian Sea (*Loano-Savona*)

Research unit

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Objectives

The present study is part of a wider research directed to the macrophytobenthos qualitative-quantitative analysis on artificial reefs placed in different areas. The main purpose is to characterize the macroalgal flora and the community structure of the Loano artificial modules.

Particularly, the algal colonization of Loano artificial reefs, already investigated both qualitatively and quantitatively in previous researches (Falace *et al*., 1998; Falace & Bressan, 1999; Falace & Bressan, 2002; Falace *et al.*, 2002), has been analysed after 10 years with a similar methodology, in order to study the long time biodiversity variations and to verify the processes affecting the colonization of artificial reefs.

This indications, together with the study of artificial reefs that present a similar architecture but placed in different areas, may result useful for a better planning of these structures.

In this paper are reported the preliminary observations concerning the two samplings carried out till now, since the algal biodiversity needs to be examined in different seasons.

Materials and methods

The study has been conducted on the horizontal surfaces of 5 modules of one pyramid of the Loano artificial reef, submerged at 18m. For the description of this reef see Relini *et al*., 1995.

On each of these 5 horizontal surfaces (respectively on the top cube and on the 4 lower ones), according to previous surveys, 3 representative areas of 20x20cm were scraped.
Samplings have been carried out in May and July '06 and the following ones are planned for October '06 and March '07. Furthermore, in order to obtain a representative picture of the species presence and distribution, algae have been collected by means of herborization also on the vertical surfaces.
The collected samples were fixed in a 4% of formaldehyde-seawater solution and stored at the Algological Laboratory of the University of Trieste, for further floristic, phenological and quantitative analyses.
Moreover, a plastic box (having the same characteristics of the ones used in the Gulf of Trieste for *C. barbata* transplantation - see chapter 4) with 6 "plastic algae" was placed in July on the horizontal surface of the top cube. These artificial algae, miming the 3-dimensional structural complexity of habitat forming species (see chapter 4), have been employed to enhance the primary and the secondary production, by favouring the colonization of epiphytes and increasing the habitat complexity. Similar artificial algae have also been placed at the end of September '06 in the Gulf of Trieste (on the pyramids of the Ridge of S. Croce and Filtri di Aurisina, and on the seabed at Miramare Natural Reserve and at Santa Croce) in order to lead comparative analyses.

Preliminary observations
From a physiognomic point of view the algal population is characterised by the dominance of turfed species being disappeared the upper layer ones. The Loano's artificial reef was, in fact, characterised by the dominance of Phaeophyceae and in particular by *Sargassum vulgare* C. Agardh in the upper layer of the community, and by *Stypocaulon scoparium* (L.) Kützing in the middle layer. The community structure resulted then even more complex for the presence of numerous epiphytes located mainly on the fronds of the erect thallus species.
The disappearance of *Sargassum* and the absence of upper layer algae, led to the dominance of a turf characterised by species which reach their *optimum* at moderate or high sedimentation rates. In particular, the horizontal surfaces were covered (average coverage 80%) by opportunist small sized species. These species, able to trap the sediment, are morphologically characterised by cartilaginous or filamentous thalli densely branched and with a rhizoidal holdfast.
Although the causes of the observed changes have not been completely clarified, it is possible to suggest that the increased sedimentation rate, related to the anthropogenic activity, could have negatively influenced the macroalgae

development. As a matter of fact on rocky shores, sediments causing smothering, scouring and replacement of stable substrata, can affect species recruitment and slow-developing algae survival (e.g. Fucales).
During the last years the Loano's coastline has been subject to significant alterations (enlargements of the tourist harbour, continuous beach replenishment...) that could have modified the hydrodynamic and structural characteristics of the sea bottom.
However, despite the analyses are not yet completed and these results must be considered as preliminary, the quantitative regression described is not associated with a significant reduction of the species richness.
According to previous researches, in July it was possible to observe a greater development of the vegetation, both quantitatively and qualitatively. Particularly the horizontal surfaces were characterised by the growth of species such as *Dictyota dichotoma* (Hudson) J.V. Lamouroux, *Padina pavonica* (Linnaeus) Thivy and *Dictyopteris polypodioides* (A.P. de Candolle) J.V. Lamouroux.
It is important to emphasize the importance of the long term algal investigations carried out on artificial reefs. The macroalgae, being sessile and able to integrate the abiotic inputs with the biotic ones, enable to characterize a specific area and to supply useful information on the quality of the marine environment.