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EFFECTS OF GORGONIAN FORESTS ON THE RECRUITMENT OF EPIBENTHIC SPECIES

EFFETTO DELLE FORESTE DI GORGONIE SUL RECLUTAMENTO DELLE SPECIE EPIBENTONICHE

Abstract - The aim of the present study was to investigate the possible effects of the gorgonian forests on the short-term recruitment of epibenthic species in the coralligenous assemblages. Apical branches of *Eunicella cavolinii* and *Paramuricea clavata* were transplanted on recruitment plastic panels deployed in two experimental sites (Tavolara and Portofino). Four months after the deployment, epibenthic assemblages colonising the panels largely differed between sites and in relation to the gorgonian species revealing both site and species-specific gorgonian forests effects. Overall, both gorgonian species reduced the growth rate of non-calcareous algae and the recruitment of some serpulid polychaetes.

Key-words: benthos, interaction, species diversity, *Eunicella cavolinii*, *Paramuricea clavata*.

Introduction - Mediterranean gorgonian forests are threatened by several human activities (*i.e.* recreational fishing and trawling, anchorage, diving, pollution) and are deeply affected by climatic anomalies related to the global changes (Ballesteros, 2009). These anomalies can promote the development of mucilaginous aggregates, which can overgrow and kill the colonies (Giuliani *et al.*, 2005), as well as the sinking of the summer thermocline, which increase the susceptibility to pathogens and epibionts. In the last decade, these phenomena led to several gorgonian mass mortality events in the northwestern Mediterranean Sea (Cerrano *et al.*, 2000; Vezzulli *et al.*, 2010). Although these phenomena have been largely investigated, little is known on the possible impact of gorgonian loss on coralligenous assemblages. The aim of the present study was to investigate the possible short-term effects of the gorgonian forests on the recruitment of epibenthic sessile species.

Materials and methods - The possible effects of the presence of *Eunicella cavolinii* (Koch, 1887) and *Paramuricea clavata* (Risso, 1826) (Anthozoa: Plexauridae) on the recruitment of epibenthic organisms were investigated by two parallel manipulative field experiments carried out from June to October 2010. Gorgonian forests were simulated by transplanting three apical branches of about 20 cm on plastic panels (10.5×15.0 cm). Forest density and biomass were comparable to the natural Mediterranean high-density populations of *E. cavolinii* and *P. clavata*, respectively (Weinbauer and Velimirov, 1996; Linares *et al.*, 2008). Sets of four panels with and without gorgonians were arranged in plots (Fig. 1). For each gorgonian species, four forested and four non-forested plots were deployed, interspersed, in two randomly selected sites (Tavolara Island, Sardinia, and Portofino promontory, Liguria) at 24 and 40 m in depth for *E. cavolinii* and *P. clavata* respectively. After 4 months all the panels were collected. Panels were taken to the surface in individual plastic zip-bags and then preserved in a buffered solution of formaldehyde (4%). Sessile species were identified to the lowest possible taxonomic level and their percent covers were estimated by superimposing a grid of 400 equal sized squares. Differences

in assemblage structures were analysed using principal coordinate analysis (PCO; Gower, 1966) based on Bray-Curtis dissimilarities of square root-transformed data. Differences in community structures, species abundances and species diversity indices between treatment (Fo: fixed factor with 2 levels: presence/absence of gorgonian forest), sites (Si: random factor with 2 levels: Tavolara/Portofino), and plots (Pl: random factor nested in FoSi with 4 levels) were assessed by permutational non-parametric multivariate analysis of variance (PERMANOVA; Anderson and ter Braak, 2003).

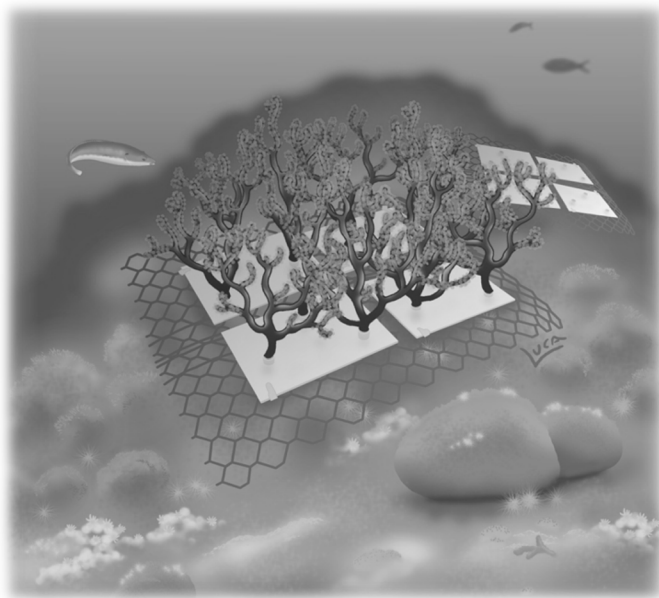


Fig. 1 - Graphical representation of experimental panels and plots.

Rappresentazione grafica dei pannelli e delle aree sperimentali.

Results - After 4 months, epibenthic assemblages colonising the panels differed among plots and between sites both in *Eunicella cavolinii* (Fig. 2) and in *Paramuricea clavata* (Fig. 3) experiments. Recruitment differences between sites could be related to the local larval supply, water quality, sedimentation and hydrodynamic conditions that largely varied between Tavolara and Portofino. The presence of *E. cavolinii* did not significantly affect the epibenthic assemblage structure, even if some site-specific effects were detectable. For example, *E. cavolinii* enhanced percent cover of coralline algae ($P < 0.05$) and reduced density of the serpulid polychaete *Hydroides stoichadon* Zibrowius, 1971 ($P < 0.05$) at one site.

Paramuricea clavata significantly affected the assemblage structure (Si x Fo: $P < 0.01$), the abundance of single taxa and of ecological groups, although some effects were detected only at one site. For example, *P. clavata* reduced the density of the serpulid polychaete *Janua (Dexiospira) pagenstecheri* (de Quatrefages, 1865) ($P < 0.05$), which was present only at Tavolara. Overall, presence of gorgonians reduced the percent cover of non-calcareous algae and the recruitment of serpulid polychaetes. Moreover, they reduced species diversity and evenness of the assemblages on the experimental panels.

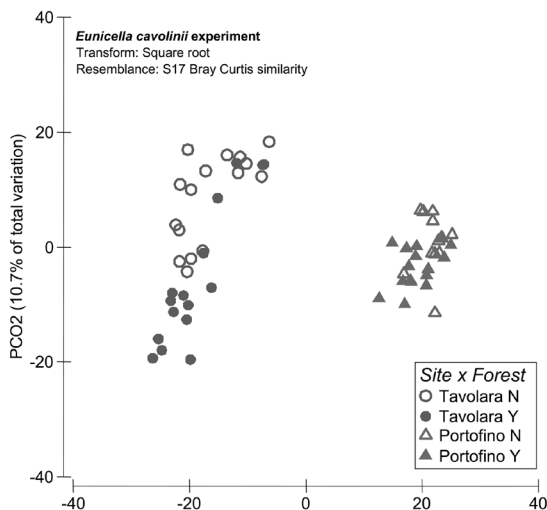


Fig. 2 - PCO ordination plot showing similarities among assemblages found in each recruitment panel at Tavolara and Portofino in presence (Y) and absence (N) of *Eunicella cavolinii* forests.

Grafico d'ordinamento PCO che mostra le similarità tra i popolamenti rinvenuti su ciascun pannello a Tavolara e Portofino in presenza (Y) e assenza (N) delle foreste di *Eunicella cavolinii*.

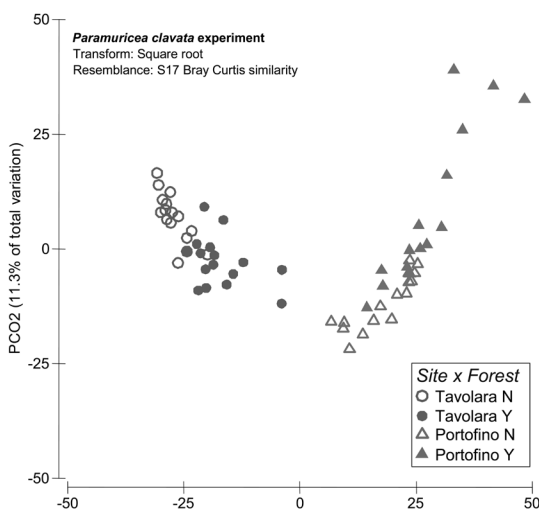


Fig. 3 - PCO ordination plot showing similarities among assemblages found in each recruitment panel at Tavolara and Portofino in presence (Y) and absence (N) of *Paramuricea clavata* forests.

Grafico d'ordinamento PCO che mostra le similarità tra i popolamenti rinvenuti su ciascun pannello a Tavolara e Portofino in presenza (Y) e assenza (N) delle foreste di *Paramuricea clavata*.

Conclusions - Analyses of the recruitment revealed site and species-specific effects of the gorgonian forests. Gorgonians could affect the recruitment of the assemblages by modifying microscale hydrodynamism and sediment deposition, intercepting

the larvae before their settlement, creating shading that reduces photosynthesis, competing for food with the filter-feeders and/or producing allelochemicals. These biological and physical interactions deserve further studies.

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