RECOVERY AFTER ANTHROPOGENIC DISTURBANCE: EARLY EFFECT OF PROTECTION ON RECOVERY PATTERNS OF HARD SUBTIDAL SESSILE ASSEMBLAGES

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Abstract

A manipulative experiment was conducted to explore the effect of protection on recovery dynamics of hard subtidal sessile benthic assemblages affected by date mussel (*Lithophaga lithophaga*) fishery. Preliminary results showed that the recovery of disturbed assemblages was faster in the protected location than in controls. However, the study underlines the need for long-term monitoring experiments in any attempt to assess the potential role of marine protected areas in mitigating the negative effects of human disturbance on coastal biota.

Key words: date mussel fishery, subtidal habitat, multi-layer assemblages, recovery dynamics, MPA

Introduction and methods

Date mussel (*Lithophaga lithophaga*) fishery (DMF) is one of the most harmful anthropogenic activities affecting hard subtidal benthic assemblages in the Mediterranean Sea (1, 2). Despite of this, little is known on recovery dynamics of assemblages in patches disturbed by DMF. On April 2003, we started a manipulative experiment simulating DMF damage at three locations at Punta Campanella (Campania, SW Italy). One of these was located inside a no-take, no-access marine protected area, the other two random-chosen locations served as controls. At each location, six plots were randomly individuated on subvertical rocky walls at 4-6 m depth, three of these were treated and three served as unmanipulated controls. Few days later, a photographic sampling was carried out providing n=5 replicates for each plot. Samples were examined by visual estimates evaluating cover percentage and number of taxa (3).

Results

DMF caused, on average, a decrease of 75% of the average values of total cover recorded in controls and 1/6 of the total number of taxa completely disappeared in manipulated plots. The nMDS ordination of the Bray-Curtis dissimilarity values (Fig. 1a) well separated treatments but also portrayed differences among locations within treatments. Multivariate analyses also revealed that erect algae, massive sponges, vermetids, hydroids and colonial ascidians mostly contributed to separate disturbed and undisturbed assemblages, thus indicating a strong impact of DMF on these taxa. Encrusting and cryptic organisms were apparently less affected by DMF as indicated by their low contribution to the values of dissimilarity between disturbed and undisturbed assemblages. The nMDS ordination of data from the second time of sampling (July 2003) showed that manipulated plots in the protected location aggregated with their respective unmanipulated plots, whilst in control locations manipulated and unmanipulated plots were still clearly separated (Fig. 1b).

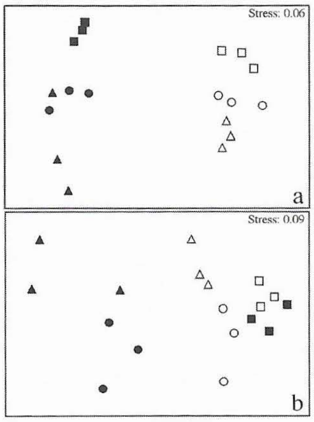

Figure 1a,b. Non-metric multidimensional scaling ordinations based on Bray-Curtis dissimilarity values of plots' centroids (untransformed data). (a) 1°Time; (b) 2°Time. Squares = protected location, Circles = Control location 1, Triangles = Control location 2; manipulated plots = filled symbols, unmanipulated plots = empty symbols.

Discussion and conclusion

Local factors could be considered of greater importance in driving recovery dynamics, especially when DMF allows the survival of small colonies and create relative small embedded patches as in our case. In such a situation, vegetative propagation from neighbours and residual pool of taxa escaped to complete destruction may exert an important role in recovery of disturbed assemblages (4). Thus, the importance of differences in growth rates and interspecific relations among the involved taxa could rise against external factors (e.g. larval supply) that, instead, could have a central role when larger areas of substrate are heavily affected by DMF (5). The ecological mechanisms driving an apparently faster recolonization in protected locations are still unknown. Our results suggest that protection has a critical effect on recovery dynamics. This effect tends to accelerate the recovery without changing the structure of pre-existing assemblages. Paradoxically, erect algae, that experienced the greatest DMF impact, were those that recovered faster and mostly contributed to similarity between disturbed and undisturbed assemblages in the second time of sampling but, under the canopy, the other layers of assemblages are far from pristine conditions. It is unlikely that in the protected location assemblages as a whole had recovered completely, due to differences in life cycles, growth rates and distribution of organisms across layers in multi-stratified systems (6). Turf regains space very quickly after disturbance (7) but encrusting and cryptic organisms could be much slower in recovering. Thus, DMF disturbance could act differently across layers, and the recovery of the whole assemblage could occur over a longer period than what needed by the turf layer. Moreover, seasonality and the time of disturbance's occurrence could have significant outcomes on recovery. This study is, therefore, still in progress to monitor the temporal trend of recovery over a longer-time period. Since the integrity of benthic communities is crucial for coastal ecosystems, a deeper understanding of recovery dynamics in areas damaged by DFM with the use of long-term experimental monitoring is needed to integrate the preventive action of authorities with an effective policy of mitigation of human impact on coastal zone.

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