



Conference Abstract

Seasonal variations in diversity and abundance of macroalgal assemblages over a 13-year period in the eLTER site “Mar Piccolo of Taranto”

Giuseppe Denti[‡], Antonella Petrocelli^{‡,§}, Ester Cecere[‡], Pasquale Ricci[‡]

[‡] Institute for Water Research (IRSA)-CNR, Taranto, Italy

[§] National Biodiversity Future Center, Palermo, Italy

[|] University of Bari, DBBA, Bari, Italy

Corresponding author: Antonella Petrocelli (antonella.petrocelli@cnr.it)

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Abstract

Macroalgae are an important biological component of transitional water systems (TWS) since they are involved in the main ecosystem processes and represent an exploitable resource. In TWS, their diversity and abundance are strongly influenced by species interactions, the variability of environmental factors, and anthropogenic activities. Long-term monitoring can help to understand the causal link between natural or anthropogenic-induced change in the phytobenthic communities. However, this kind of study is still very scarce. The Mar Piccolo of Taranto (southern Italy, Mediterranean Sea) is a TWS, where phytobenthic studies have a historical tradition. The first ones date back to the 20's, followed by fragmented studies from the end of the 80's until 2011, when seasonal and continuous observations were initiated, within the framework of the Italian LTER network, and, recently included in the NRRP Projects ITINERIS and NBFC. Here, we report the results of 13-year observations on the macroalgae populations, focusing on the variation of diversity and abundance of both native and non-indigenous species (NIS), which represent a consistent component of the phytobenthic community, to date. This analysis aimed to assess the differences in species distribution and growth among different zones of the basin, to better understand the basin community structure and lay the basis for future predictions.

The Mar Piccolo of Taranto is a lagoon-like environment, elliptical and divided, in its center, into two sub-basins named the First Inlet and the Second Inlet. Two stations, A in the First Inlet and B in the Second Inlet, were investigated using multivariate methods on diversity indices (species richness or Margalef index d , and species diversity or Shannon-Wiener index H') and total abundance of species (N), along the time series 2011-2023. Median values of d , H' , and N were calculated for each station and season, and differences were tested using the non-parametric Kruskal-Wallis (χ^2) test and *post-hoc* multiple comparisons with Mann-Whitney test (U).

Multivariate analysis based on Bray-Curtis similarity calculated on fourth-root transformed abundance data of a stations-species (102x53) matrix was visualized through a Principal Coordinate analysis (PCoA).

A clear separation of replicates by stations was observed on the x-axis (40.7% of explained variation). On the y-axis (11.3%), while replicates of station A appeared packed, replicates of station B were dispersed with a variation in abundance and species composition according to seasonal changes. The main species correlated to station A were the native *Amphiroa beauvoisii*, *Ellisolandia elongata*, and *Dictyota dichotoma* var. *dichotoma*, without seasonal changes in the assemblages. At station B, the native *Chaetomorpha linum*, *Chondracanthus acicularis*, *Gracilaria bursa-pastoris*, and the NIS *Osmundea oederi* were mainly correlated to the winter period, while the NIS *Hypnea corona*, and the native *Spyridia filamentosa* were associated to the summer one.

At station A, seasonal changes of d index showed the highest significant median values in winter (1.25) and spring (1.18) and the lowest in summer (0.79) and autumn (0.50) (KW test $\chi^2=15.57$; $p<0.01$). For the H' index, a significant difference was observed between the median values of spring (1.31) and summer (0.76, $U=31$; $p<0.05$). Total abundance did not show significant changes among the seasons.

At station B, the d index showed small significant differences between summer (0.47) and winter (1.11; $U=33$; $p<0.05$). H' index was significantly lower in summer (0.31) than in other seasons ($p<0.05$). Total abundance showed significant changes among the seasons, with a median value of autumn (1790) significantly lower than those of summer (6213) and spring (5384) (KW test $\chi^2=16.6$; $p<0.01$).

The different values recorded for each index and total abundance, at the two studied stations, are strictly linked not only to their different edaphic and environmental features but also to the composition in species. Station A results more homogeneous, with higher total abundance compared to station B, where the lowest values of both d and H' , especially in spring and summer, are linked to the seasonal dominance of *Hypnea corona*, the only NIS showing an invasive behavior in the basin. Its thalli are absent in winter, and progressively increase during late spring, peaking in summer in a large area of the Second Inlet, with the highest abundance at station B.

Climate change is ongoing, and heat waves and storms are increasingly frequent, likely causing notable changes in species distribution. Therefore, the analysis of long-term

biological data is preparatory to the correlation with the main environmental parameters, which are going to be continuously monitored through the new measurement equipment. This will support some predictions on the macroalgal biodiversity fate, also with a view to a possible their sustainable exploitation.

Keywords

Biodiversity, Mar Piccolo, Mediterranean Sea, seaweeds

Presenting author

Giuseppe Denti

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Conflicts of interest

The authors have declared that no competing interests exist.