

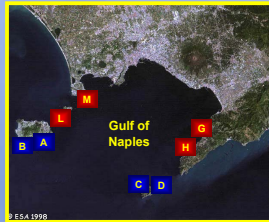
Biodiversity of macroalgal assemblages in the Gulf of Naples



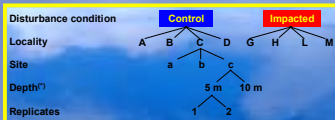
Ivan Guala, Annunziata Esposito, Maria Cristina Buia

Stazione Zoologica 'A. Dohrn' - Laboratory of Benthic Ecology - Punta San Pietro 80077 Ischia (Napoli)

In the framework of ALIENS project, focused on the introduction of macroalgal species along European shores and their impact on native seaweed communities, a hierarchical survey was carried out during summer 2002, with the aim to describe the community composition on rocky substrate, and to valuate its variability in relation to anthropogenic disturbance, in the Gulf of Naples.



The percent cover of each conspicuous species, at both 5 and 10 m depths, was assessed *in situ* on 2,500 cm² surfaces haphazardly selected; only for shallower stands, the identification of all species collected in 100 cm² sub-samples was also performed.



(*) Identification by light microscope was performed only for samples collected at 5 m depth.

Analysis of variance (ANOVA) was performed on the total number of species for both 2,500 and 100 cm² quadrats.

Multivariate patterns of macroalgal assemblages were displayed by non-metric multidimensional scaling (nMDS); similarity matrices were built with Bray-Curtis index for percent cover data, and with Sorenson coefficient for presence/absence data.

Differences among distinct factors were tested by analysis of similarities (ANOSIM); important taxa in characterizing each condition were assessed by similarity percentages (SIMPER).

A total of 46 conspicuous taxa were identified. ANOVA on species richness did not show any significant differences among different factors.

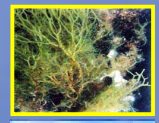
The nMDS plot on percent cover of conspicuous species (considering locality centroids, n = 6) and the ANOSIM test showed some separation attributable to disturbance but not to different depths.



Sphacelariales



Jania rubens



Dictyotales

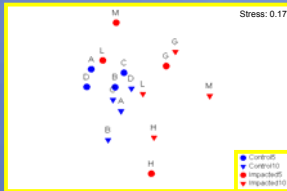
Among the main taxa, Sphacelariales characterized the impacted localities, while *Padina pavonica* and *Caulerpa racemosa* the control ones; *Jania rubens* and Dictyotales were common in both conditions.



Padina pavonica



Caulerpa racemosa



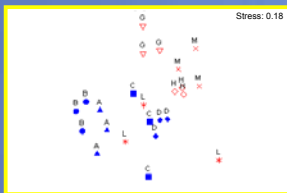
	Global R	p
Disturbance	0.151	*
Locality	0.435	**
Depth	0.089	ns

189 taxa were identified for 5 m depth. Significant lower values were found in impacted localities (F = 44.15; p < 0.001).

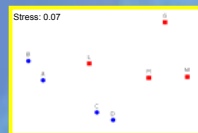
The nMDS plot on presence of all species in 100 cm² sub-samples (considering site centroids, n = 2) and the ANOSIM test showed a clearer separation between disturbance conditions and localities.

The nMDS plot considering locality centroids (n = 6) revealed a spatial trend according to the distance from the inner part of the Gulf.

The microscopic analysis permitted the identification of another two non-native species: *Acrothamnion preissii*, and *Womersleyella setacea*. For both species this was the first record along the coasts of Campania.



	Global R	p
Disturbance	0.449	**
Locality	0.799	**



Acrothamnion preissii



Womersleyella setacea

The results of visual assessment indicate an overall heterogeneity of macroalgal composition of rocky subtidal beds, mainly for impacted localities. Moreover this method highlights that *C. racemosa* is the only introduced species with an invasive behaviour.

The analysis on 100 cm² samples strengthens the separation related to disturbance conditions. In addition it shows that impacted localities are characterized by a lower species richness. Moreover this different scale of analysis permits the detection of new introduced species before they could become invasive as reported in other areas of the Western Mediterranean (Rindi *et al.*, 1999; Piazzzi and Cinelli, 2003).

The finding of the three non-native species, mostly in fishing and boating resorts, is in agreement with Ceccherelli and Piazzzi, 2001 and Ribera Siguan, 2002, who consider anchorages and fishing nets as the main causes of their spreading at local scale.

References

- ✓ Ceccherelli G., Piazzzi L., 2001 - Dispersal of *Caulerpa racemosa* fragments in the Mediterranean: lack of detachment time effect on establishment. *Bot. Mar.* 44: 209-213.
- ✓ Piazzzi L., Cinelli F., 2003 - Evaluation of benthic macroalgal invasion in a harbour area of the western Mediterranean Sea. *Eur. J. Phycol.* 38 (3): 223-231.
- ✓ Rindi F., Guiry M.D., Cinelli F., 1999 - Morphology and reproduction of the adventive Mediterranean rhodophyte *Polysiphonia setacea*. *Hydrobiol.* 398/399: 91-100.
- ✓ Ribera Siguan M.A. (2002) - Review of non-native marine plants in the Mediterranean Sea. *In: E. Leppäkoski et al. (eds), Invasive Aquatic Species of Europe*, 1-6. © Kluwer Academic Publishers, Netherlands.

We are grateful to Maria Monia Flagella, Mariamichela Cigliano, Raffaella Raniello, Nikos Andreakis, Bruno Iacono, Maurizio Lorenti, Gabriele Proaccini, Wiebe Kooistra, Marco Dappiano, Francesco Paolo Patti, Vincenzo Rando and Vincenzo Di Martino for their assistance during sampling activities. A special thanks to Professor Marc Verlaque for helping us to identify uncertain species. We are sincerely thankful to Eleanor Fiore and Rosanna Messina for correcting the English. This research is part of the 'ALIENS Project' funded by the European Community.