Corso di Dottorato di Ricerca in Scienze della Vita e dell'Ambiente – XXXVIII Ciclo
Biologia ed Ecologia Marina
Dipartimento di Scienze della Vita e dell'Ambiente (DiSVA)


Gongolaria barbata

Development of new experimental approaches for the study of the responses of marine organisms to multiple anthropogenic impacts

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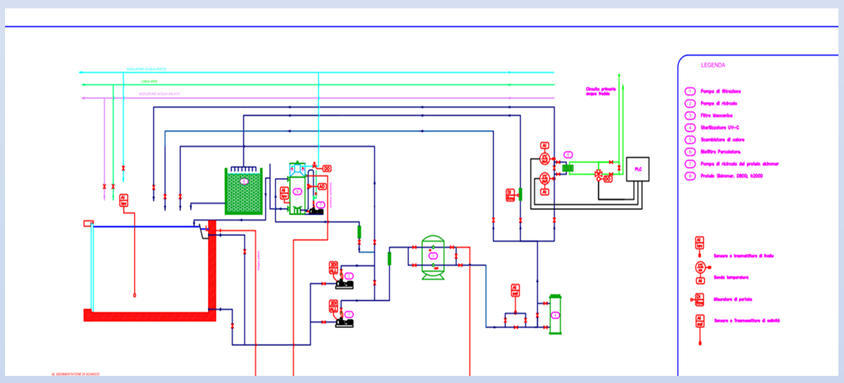
- Importance of the experimental approach in marine ecological research and how integrated research, through the use of aquaria and mesocosms in the field, can answer questions related to multi-stress and multi-impact conditions and what are the future needs. Environmental conditions are also changing in deep sea, which requires technological development allowing the maintenance of organisms of deep and extreme environments.
- Evaluate multiple anthropogenic impacts, including cumulative and synergistic impacts due to changes in T and pH, as well as identify new model organisms to evaluate responses to impacts. Through the development of mesocosms, the effect of contaminants on food webs (*Cystoseira* sp., filter feeders, crustaceans) in different areas of the Central Adriatic will be evaluated.
- Development of technological experimental systems for the maintenance of new models for scientific research with particular reference to ascidians.
- Experimental systems for the upscaling of restoration interventions (macroalgae and seagrass) and date mussel.
- Development of experimental systems and technologies for the maintenance and manipulation of species in deep and extreme environments.


Cymodocea nodosa



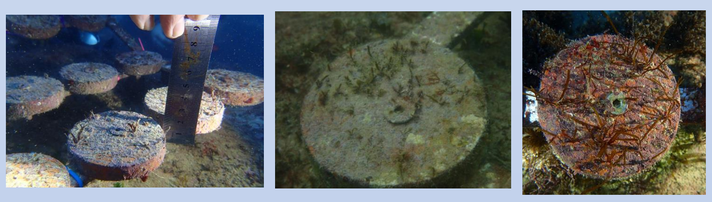
Typical example of P&I of a *Life Support System*

All experiments are carried out in the experimental aquaria.

To guarantee the highest standards in the maintenance of marine organisms in a controlled environment, we used LSS (*Life Support System*).


Aquarium systems used for the experiments

1 Can water depth play a pivotal role to counteract the storm effects in the long-term restoration of *Gongolaria barbata* in Adriatic Sea ?


SV1 SV2 SV3

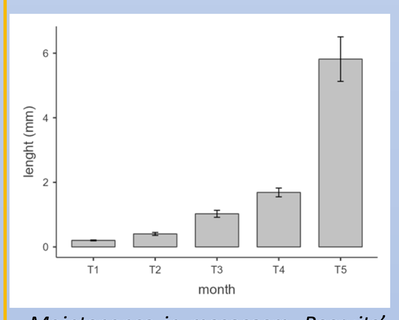
Objective: to test different outplanting depths to evaluate which one promote an effective and longterm recovery of *Gongolaria barbata* in a exposed site along the Conero Riviera (Adriatic Sea).

In the ***aquaria***, some small nets were put on the surface with the fertile apices inside and on the bottom were put clay tiles on which the zygotes will fall resulting in new recruits. The temperature (about 20°C), photoperiod (15L:9D) and light intensity (125 µmol photons m^{-2} s^{-1}) were set to reflect the environmental conditions at sea during the reproductive period of the species.

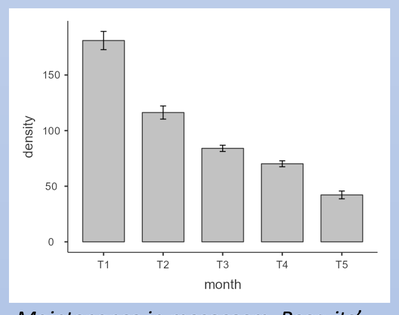
In the ***field***, in July, the tiles were outplanted to the restoration site (La Vela). The tiles were screwed to three 65-cm-long steel structures and fixed to the sea bottom.

The three structures were anchored at three different depths: 1 m (SV1), 1.5 m (SV2) and 2.5 m (SV3).

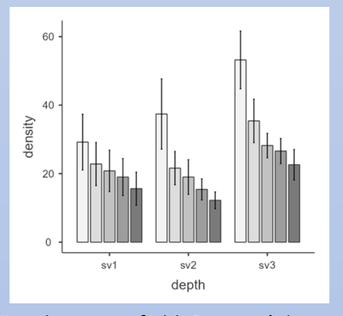
Inverse relationship: density decreases, height increases.



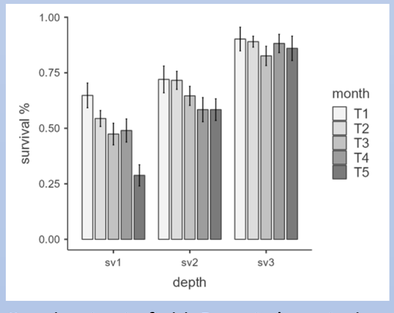
Maintenance in mesocosm. Recruits' length from the first (T1) to the fifth month (t5).



Maintenance in mesocosm. Recruits' density from the first (T1) to the fifth month (t5).



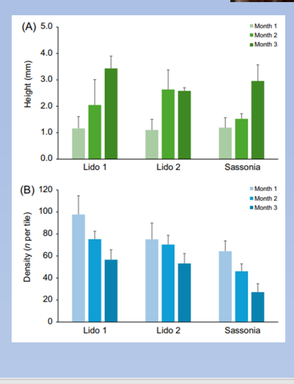
Outplanting in field. Recruits' density from the first (T1) to the fifth month (t5).



Outplanting in field. Recruits' survival from the first (T1) to the fifth month (t5).

3 Stranded seaweeds (*Gongolaria barbata*): an opportunity for macroalgal forest restoration

Is it possible to use beached fragments of *Gongolaria barbata* to create new recruits?



Mean heights (A) and density (B) of Gongolaria barbata recruits on tiles placed below the fertile adults, across the 3 months in mesocosms. Data are reported as mean ± SE.

Stranded individuals of *Gongolaria barbata* offer an opportunity to promote habitat restoration.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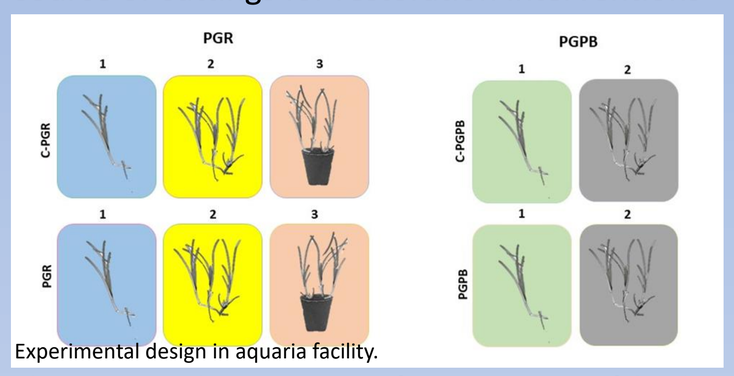
PRACTICE AND TECHNICAL ARTICLE

Stranded seaweeds (*Gongolaria barbata*): an opportunity for macroalgal forest restoration

Giuliana Marletta[1,2], Domenico Sacco[1], Roberto Danovaro[1,2], Silvia Bianchelli[1,2,3]

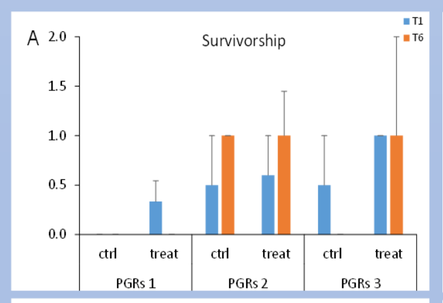
2 Effectiveness of growth promoters for the seagrass *Cymodocea nodosa* restoration

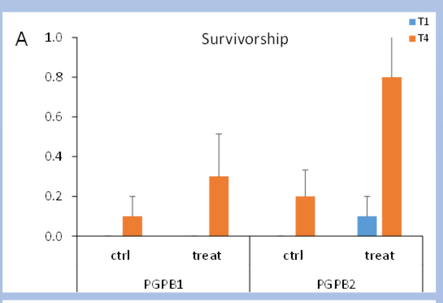
Objective: to test the effects of PGRs and PGPB on the survival and growth of different types of fragments of *C. nodosa*, namely stranded or fragmented and maintained in aquaria, to explore their potential to produce new shoots and roots and thus representing a potential source of cuttings for restoration interventions

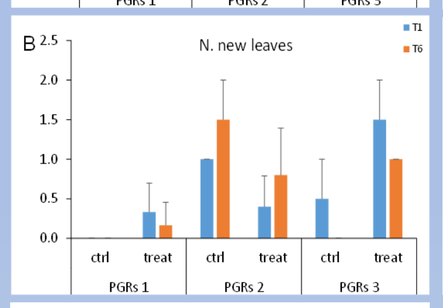


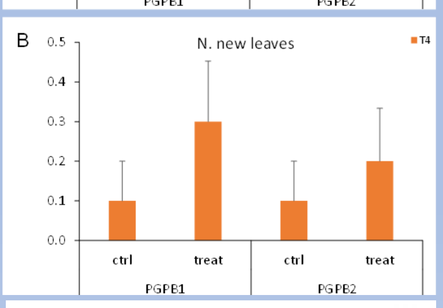
Experimental design in aquaria facility.

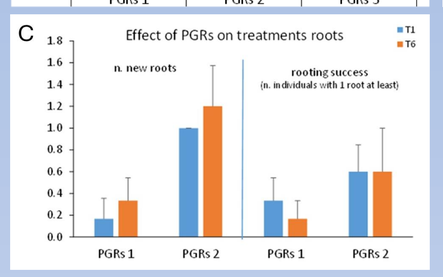
These growth-promoters (PGPB or PGRs) had positive effects on the survivorship of fragments and significantly contributed to the formation of new leaves and roots in the fragments of *C. nodosa*.

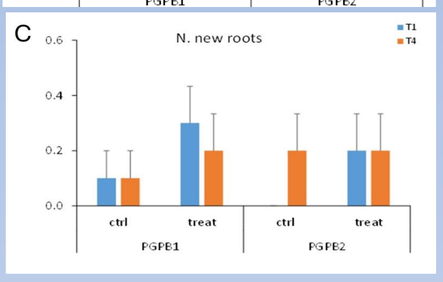












Effect of PGRs treatment on A) survivorship, B) number of new leaves, and C) number of new roots and rooting success of C. nodosa fragments.

Effect of PGPB treatment on A) survivorship, B) number of new leaves, and C) number of new roots and rooting success of C. nodosa fragments.