MS11:

Implementation of pilot restoration actions in shallow hard bottoms and mesophotic habitats

Marine Ecosystem Restoration in Changing European Seas MERCES

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Means of verification

Brief description

The implementation of pilot actions was intended to start in M18. However bearing in mind the final starting date of the project these actions should have started in December 2017. Since the weather conditions are not appropriate for field work required to implement the pilot actions we decided to advance about 6 months the activities of this task. We planned a total of 4 pilot actions, two for macroalgal habitats and two for coralligenous. The four pilot actions have been implemented according to the plan.

1-Pilot coralligenous Portofino MPA area (Italy, Mediterranean Sea). UNIVPM and GAIA have carried out an analysis to define the areas and habitats subject to different levels of stress in the two locations chosen for the implementation of pilot restoration actions (Portofino MPA and Gallinara Island, Italy). Selection has been based not only on data collected *in situ* but also on interviews with fishermen and diving professionals.

This pilot action for the restoration of shallow coralligenous habitats (25-30 m) started in May 2017. Two sets of horizontal and vertical quadrats have been created on the opposites sides of the Lighthouse dive site (Portofino MPA), and populated with transplanted sponges and gorgonians (*Spongia officinalis* and *Eunicella cavolini* on vertical quadrats, *Petrosia ficiformis* and *Eunicella singularis* on horizontal ones). Local dive centers have been involved in the operations and are being prompted to support during the monitoring phase.
This pilot action serves three main aims: a) raise awareness of marine restoration in the diving system, engaging dive operators and divers in the set up and following operations; b) test protocols and observe the effects of transplanted organisms on the hosting communities; c) test whether divers may hamper restoration (to this aim, only one of the two sets of quadrats is located in a moderately visited area, while the other is located in an area that is very rarely visited).

Figure 1. General view of the transplants of the white gorgonian *Eunicella singularis* in the Gallinara Island.

2- Pilot coralligenous Medes MPA area (Spain, Mediterranean Sea). CSIC and UB have launched a pilot action for the restoration of shallow coralligenous habitats 10-15 m in the Medes Islands at the Parc Natural del Montgrí, Illes Medes i Baix Ter in May 2017 with the participation of local diving centers. In particular, in collaboration with the managers of the Medes Islands MPA and local diving centers CSIC and UB conducted transplants of fragments

of red gorgonians *Paramuricea clavata* in an area affected by mass mortality. In the preparation of the pilot actions several coordination meetings and public presentations on the MERCES project and goals of the pilot restoration action were held with the participants. At the end more than 400 colonies were transplanted in just one dive thanks to the collaboration between scientists (CSIC and UB) and 12 diving instructors. During summer, CSIC and UB have surveyed the pilot action. Unfortunatelly, this summer the Catalan coast suffered a severe bloom of filamentouse algae (*Acinetospora crinita*) that covered the substratum and adult gorgonians. This event did not allow monitoring the transplants. In October 2017, filamentous algae cover decreased allowing CSIC and UB monitored the results from the pilot action. The survival and health status of gorgonians transplanted were recorded after 5 months of the beginning of the pilot action.
This video display the implementation of the pilot action Link to video https://www.youtube.com/watch?v=Kgar7860Lic&feature=youtu.be.

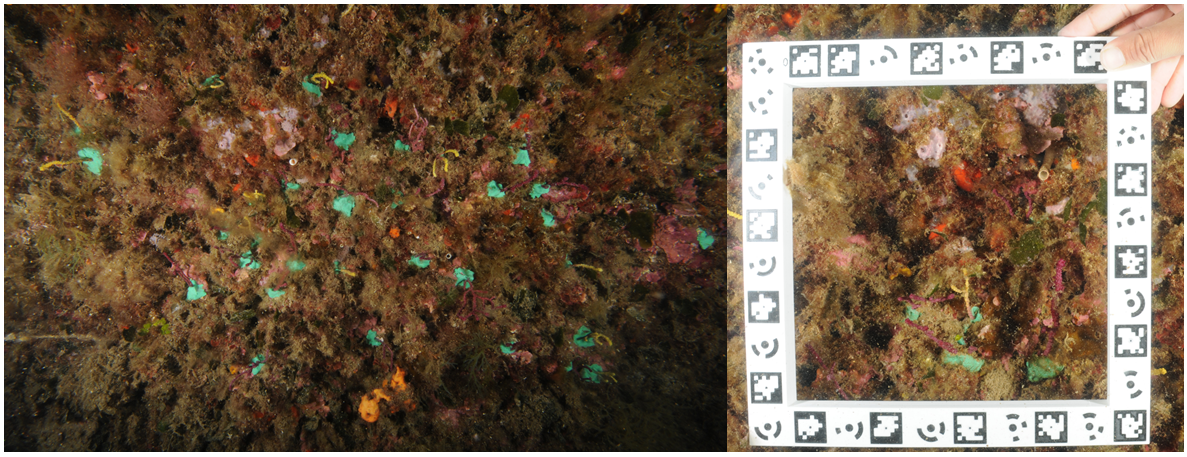

Figure 2. Transplants of the red gorgonian *Paramuricea clavata* within the Parc Natural del Montgrí, Illes Medes i Baix Ter MPA.

3- Pilot macroalgal Medes MPA area (Spain, Mediterranean Sea). UB carried out the removal of two species of sea urchins *Paracentrotus lividus* and *Arbacia lixula* from barren areas to promote the restoration of *Cystoseira elegans* macroalgal forests. Two barren areas between 5-10 m depth with high densities of sea-urchins (20-25ind/m^2) and null cover of macroalgal species were selected as experimental areas and all sea urchins found within the pilot sites (> 100 m2) were removed. After removal *Cystoseira elegans in situ* recruitment enhancement techniques were setup in view to promote the recruitment of *C. elegans* to restore macroalgal forest in baren areas. Furthermore, the two barren areas are located under two management schemes within Parc Natural del Montgrí, Illes Medes i Baix Ter allowing testing for the potential differential success under different fishing pressure. During the pilot action, the recruitment of *C. elegans* is being estimated. The removal of sea-urchins will be repeated during spring in 2018 and the survival of recruits installed in 2017 will be assessed one year later.
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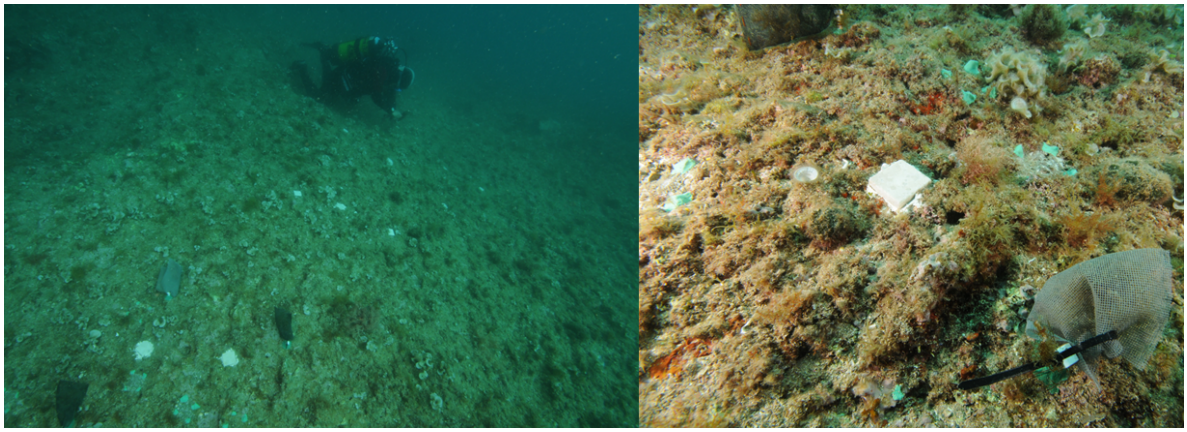

Figure 2. Recruitment enhancement protocols setup in a barren area within the Parc Natural del Montgrí, Illes Medes i Baix Ter MPA.

4- Pilot macroalgal Vega area (Norway, North Atlantic Sea). NIVA conducted the first part of the field activities for the WP3 pilot study in May 2017. Transplant techniques for kelp was tested. The fieldwork took place in Vega, an archipelago in mid-Norway. A suitable study site for kelp transplantation, with moderate densities of sea urchins (*Strongylocentrotus droebachiensis*), were established and kelp (*Laminaria hyperborea* and *Saccharina latissima*) were harvested from donor-populations at three different locations (donor sites) and deployed/transplanted at the study site (transplant site). A sub-set of plants was processed and transplanted by identical procedures to the donor sites to serve as procedural controls.
The second part of the pilot study were conducted September 2017. During the September field campaign, the mortality of the transplanted kelp were determined. Kelp fronds and floats were carefully rinsed to facilitate further survival (restoration success) of the transplanted kelp. Sea urchins (n=500) were harvested at the restoration site to reduce the grazing pressure on the transplanted kelp.

Figure 3. The fronds of the transplanted kelp were clean and healthy in May 2017 (left picture). In September 2017 the fronds were heavily fouled by epibionts and the condition of the kelp was reduced (right picture).