

# PROJECT FINAL REPORT

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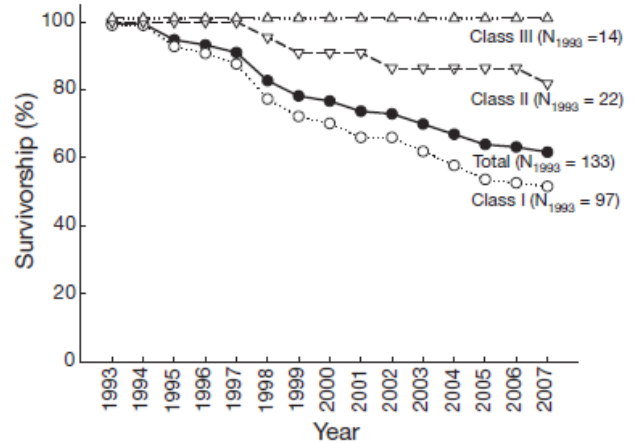
## **1. FINAL PUBLISHABLE SUMMARY REPORT** *(This section normally should not exceed 2 pages)*

### **Structure and dynamics of marine rocky benthic communities: Reactions and perspectives facing the global change**

Anthropogenic activities modify ecosystems worldwide, changing biological cycles, transforming the environment, and enhancing the mobility of biota. Coastal marine habitats are a main focus of attention because they harbour a high biological diversity, are among the most productive systems of the world and are affected by several anthropogenic impacts. The Mediterranean sublittoral coralligenous rocky benthic communities are highly sensitive to climate change and the spread of invasive species, among other disturbances. Currently, there is an increasing concern about the unexpected consequences on direct and potential combined effects of these disturbances. This scenario offers a wide horizon of research opportunities to understand and ameliorate ongoing threats to marine ecosystems.

Europe's marine biodiversity constitutes a vast but fragile resource of great cultural and economic importance to its people. Many marine species of the Mediterranean Sea are presently endangered and some are probably prone to extinction. The degradation of marine Mediterranean ecosystems began centuries ago, but there is no global summary of the magnitude of this change. This project aimed to analyse long-term trends on the high-diverse coralligenous communities. The highly-diverse coralligenous communities support social and economic development in several European regions. Therefore, their protection is an imperative socioeconomic and environmental need. Long-term trajectories of communities provide a powerful tool to explain global patterns and causes of ecosystem collapse, as well as to predict future ecosystem states, allowing managers to anticipate ecosystem decline through an understanding of the sequences of species and habitat loss.

The project focused on the reactions of species and communities facing strong disturbances associated to global change. To do so, an approach including ecological field surveys (baseline data on community and population structure and dynamics), environmental data (temperature), and statistic analysis was developed (See Figure 1).



**Figure 1. Left:** Underwater survey of photographic samples to obtain data on dynamics and structure of coralligenous communities in the NW Mediterranean Sea. **Right:** High survivorship patterns over more than a decade of a temperate sponge dwelling on the sublittoral rocky habitats of the NW Mediterranean Sea.

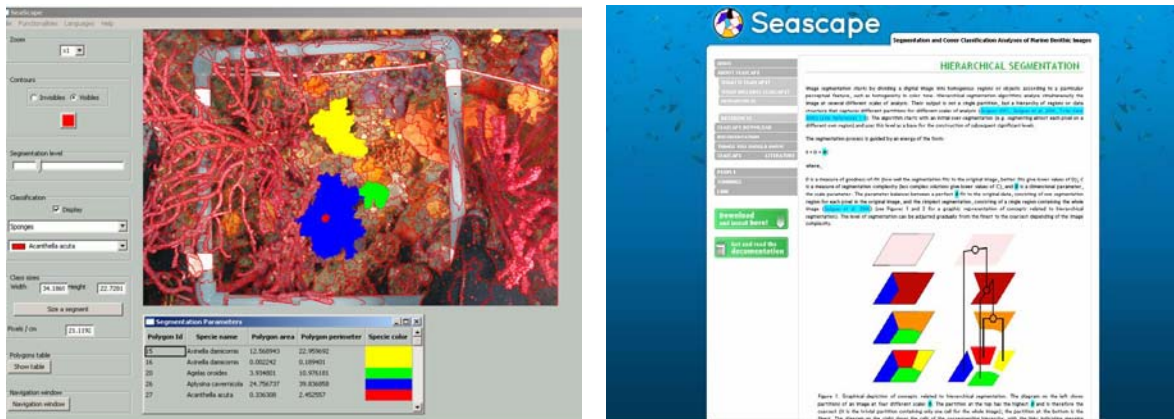
#### **Brief summary of the main activities carried out during the ERG:**

- **Field surveys during the ERG:** Several littoral scientific expeditions in the NW Mediterranean Sea, covering more than 2000 Km, were carried out to obtain ecological data.
- **Stays at International Research Centers:** Cary Institute of Ecosystem Studies (NY, USA). Topic: Course on Likelihood Methods in Ecology, year: 2009. Delaware State University & North Carolina State University, Topic: Scientific Discussion with Researchers, year: 2009. University of Bologna (Italy), Topic: Course on Detecting Biological and Environmental Changes, year: 2008.
- **Transfer of Knowledge:** (in course) Co-Direction of PhD Thesis (Barcelona University) with the title “Biodiversity and conservation of coralligenous communities in the NW Mediterranean Sea”. Master Student of Marine Sciences (Barcelona University). Title: Population dynamics of the soft coral *Alcyonium acaule* in the NW Mediterranean Sea, a 5-year study (2009-2010).

- Development of software to analyse images:** Through an ongoing fruitful collaboration with engineers, we developed new software to improve the analyses of underwater images. The development of this semi-automatic outline and classification tool constitutes an important step forward in the analysis and time- processing and represent a powerful technological platform to analyze underwater benthic images at any scale (e.g. coral reefs, rocky and soft benthic communities in temperate and polar seas). We remark the importance of bringing image technology to the field of marine benthic ecology. The software named Seascape is an open-source platform and the compiled software, source code, developer guide, and user manual are available online (<http://www.seascapesoft.com>) (Figure 2). Financial support is acknowledged. The site web will be opened once the scientific article will be accepted.

Reference:

**Teixidó N**, Albajes-Eizagirre A, Bolbo D, Colleu E, Demestre M, Garrabou J, Guigues L, Gili JM, Piera J, Prelot T, Soria-Frisch A (in revision) Hierarchical Segmentation based software for Cover Classification Analyses of Sea Benthic Images (Seascape). Marine Ecology Progress Series



**Figure 2. Left:** An example of the segmentation process applied to one underwater image from a benthic community in the Mediterranean Sea. **Right:** First version of the site web of Seascape ([www.seascapesoft.com](http://www.seascapesoft.com)). The site web will be available when the companion article will be published