

SEAGRASS MONITORING BY REMOTE SENSING IN THE CONTEXT OF BIODIVERSITY CONSERVATION

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Abstract

Remote sensing is a powerful tool in monitoring seagrasses, especially for managing the ecosystem. Along the coast, seagrass meadows are often subject to increased turbidity and may exhibit negative physiological responses to stress, or can tolerate it through photo-adaptation. Physiological changes are also evident in the genetic structure of meadows. This research aims at implementing a methodology for suitably monitoring mediterranean coastal ecosystem and, in particular, seagrasses, using an integrated and synergic approach. This consists of a more advanced remote sensing techniques and GIS technologies coupled with innovative methods for *in situ* measurements devoted to calibration of aero-spatial remotely sensed data. We investigated two sites: Central Tyrrhenian Sea (Italy) and the Aegean Sea (Greece).

Keywords: *Posidonia, Remote Sensing, Physiology, Monitoring, Biogeography*

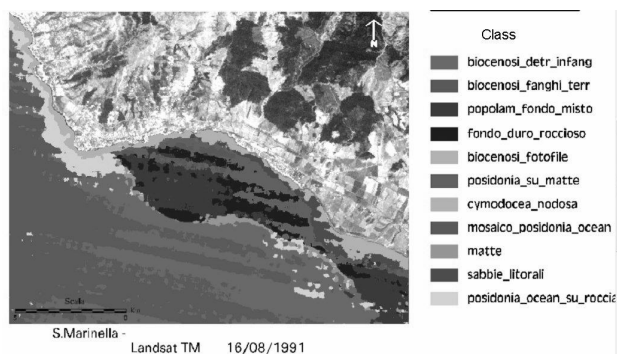


Fig. 1. Map of seagrasses distribution at S. Marinella site derived from Landsat-TM data of 1991.

INTRODUCTION

SIMS (*Seagrasses Integrated Monitoring System*) project is aimed at monitoring and mapping seagrass distribution and estimating the related biophysical parameters in two European areas. The goal of our project is to support different activities concerning customers' duties in terms of shallow water ecosystem management by means of Earth Observation data processing. Instead of using only laborious field collection methodology in a sometimes difficult environment, the project intends to provide customers with improved information, in line with other new technologies (i.e. GIS).

In this research we used satellite imagery as a tool for monitoring *Posidonia oceanica* meadows comparing two sites in the Mediterranean: the central Tyrrhenian Sea (Italy) and the Aegean Sea (Greece).

Tyrrhenian Sea.

The Tyrrhenian site is located off the central coast of Lazio region, close to the S. Marinella site. In this site some years ago research activities were started to monitor bio-physical parameters of *P. oceanica* meadows. Rhizomes from the near zone of Civitavecchia were transplanted *in situ* to remediate seagrass lost.

Results of these multi-yearly ENEA's activities include the monitoring of meadows evolution in terms of phenological parameters and genetic trends [1, 2].

Maps of main seagrass beds at this test site were first developed by diving activity. Geo-referencing was done with careful measurements taken by means of cartography and bathymetry. This meadow presents a patchy distribution of *P. oceanica* plants in the entire coastal area, which extends for several

kilometres. As can be seen in figure 1, the preliminary map obtained from Landsat-TM data of 1991 (even with some artefacts arising from the sensor low radiometric resolution) shows the distribution of the seagrasses in the area.

Aegean Sea

The second site is situated in the Aegean Sea, in East Greece, in the area around Arkoï island. Monitoring the Aegean sea by satellite images (IKONOS, LANDSAT, MERIS) allowed to track large areas of *P. oceanica* and seagrass beds in this part of the Mediterranean.

The framework of this project is satellite imagery used in combination with visual census data. This will lead to the development of a tool to quantify the size and the density of the seagrass meadows. Simultaneously seagrass biodiversity, both in Tyrrhenian and Aegean populations, will be evaluated by the RAPD molecular marker technique [1, 2].

The expected results are:

-to assess the role of environmental processes in shaping genetic diversity of seagrasses to identify molecular populations-specific RAPD patterns, from the combined studies of genetic variability and bio-chemical tests;

-to relate such patterns to environmental conditions and morphological and physiological features of the aquatic plants and to detect early process genetic erosion in stress conditions;

-to specify Remote Sensing and GIS procedures and bio-physical parameters/indicators thematic maps, designed to support sustainable management policies of Mediterranean ecosystems.

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References

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