A MARINE ENVIRONMENT INTERDISCIPLINARY OBSERVATORY IN THE EASTERN LIGURIAN SEA

M. Abbate [1], A. Bordone [1], G. Cerrati [1], S. Cocito [1], F. Conte [1], R. Cupido [1], R. Delfanti [1]*, V. Difesca [1], A. Lisca [1], C. Lombardi [1], A. Negri [1], A. Peirano [1], P. Picco [1] and S. Sgorbini [1]

[1] ENEA, Marine Environment Research Centre, La Spezia, Italy - roberta.delfanti@enea.it

Abstract

Since the 90' ENEA CRAM is involved in the environmental monitoring of the Eastern Ligurian coastal marine ecosystem. The observatory includes meteo-marine observations from fixed platforms (meteorological station, buoys and moorings), at sea campaigns with in situ sampling and underwater surveying of benthic and pelagic communities. The aim is to control the evolution of environmental conditions for climatic studies as well as for the management of the coastal area. The long-term observations allowed to detect the "intrusion" of alien and harmful invasive species favored by the warmer surface water temperatures, and to approach a comprehensive study of the mortality events which affected benthic species in this area.

Keywords: Monitoring, Time Series, Coastal Systems, Ligurian Sea

Since the 90' ENEA CRAM is involved in the environmental monitoring of the Eastern Ligurian coastal marine ecosystem within ELIOS (Eastern Ligurian Interdisciplinary Observing System). In addition to the scientific need to monitor coastal ecosystem changes and predict future trends, there is an increasing request to provide data for a science-based management of a coastal zone subject to increasing anthropogenic pressures. This observation network offers an ideal platform to study specific processes characterized by seasonal and higher temporal resolution time scale.

Within ELIOS, the monitoring activities are carried out multidisciplinary. The meteo-marine conditions are provided by integrating different systems of measurements, to ensure the necessary spatial and temporal resolution including: a coastal meteorological station [1] measuring wind speed and direction, solar radiation, air temperature, relative humidity and atmospheric pressure, precipitation; a shelf sea meteo oceanographic buoy located at a sea depth of 28 m providing meteorological measurements, sea temperature, salinity, fluorescence, oxygen and ph profiles in the upper 25 m of the water column; an oceanographic mooring deployed at 30 m depth providing currents, temperature and salinity measurements at 15 m and 25 m depth. Some autonomous temperature sensors have also been fixed to the rocks. Repeated (weekly during summer) synoptic surveys in the Gulf of La Spezia include temperature, salinity, fluorescence, profiles; nutrients and turbidity (Secchi-disk) in the water column and sampling of phytoplankton. Open-sea meteo oceanographic observations (atmospheric parameters, sea temperature and salinity, ADCP currents profiles in the thermocline) are available from the meteo-oceanographic buoy ODAS ITALIA 1 located in the Central Ligurian Sea and form the oceanic mooring deployed nearby. Benthic communities (coralligenous and *Posidonia* meadows) and the presence of invasive and harmful species (*Ostreopsis ovata*) are regularly investigated through underwater surveys and sampling at fixed locations.

Data collected by the two buoys allowed to investigate thermal anomalies below the sea surface, how these affected at different degree the coastal and the open sea area and to follow the evolution and the response of the ocean-atmosphere system to that particular event. In particular, the persistence of calm weather conditions caused a sea temperature anomaly of about 4 degree down to 25 m. Twelve-year monitoring of gorgonian population trends allowed to analyse population size structure, colony and recruitment density of a damaged *Paramuricea clavata* population after 1999 and 2003 mortality events and to identify changes in biological, ecological and demographic features [2]. This population supplies a paradigmatic example of the response of a population living from 16 to 25 m depth, thus near the edge of the summer thermocline, to the mortality associated to anomalous temperature increase. The high colony recovery and recruitment rates found (4 fold increase) suggest a good resilience for this population due to the reproductive output of the smaller-younger colonies [3]. Nevertheless, its geographical isolation, together with an increased frequency of mortality events, could challenge its persistence.

The long-term observations allowed to detect the "intrusion" of alien and harmful invasive species favored by the warmer surface water temperatures. In the Gulf of La Spezia the first *Ostreopsis ovata* bloom took place during the hot summer of 1998. When meteo-marine conditions favourable to *O. ovata* development, mainly high temperature and flat sea, persisted for weeks blooms took place with the production of millions of cells causing hypoxia and sometime damage to human health. On the contrary, rough sea and waves caused a sharp reduction of *O. ovata* density.

This observing system, providing a continuous environmental and meteo-marine monitoring, allows a better understanding of the sensitivity of marine organisms and communities to the rapid changes of the environmental conditions, particularly in time of climate change. In addition, the real time surveillance could support local administrators in the management of navigation and environmental emergencies.

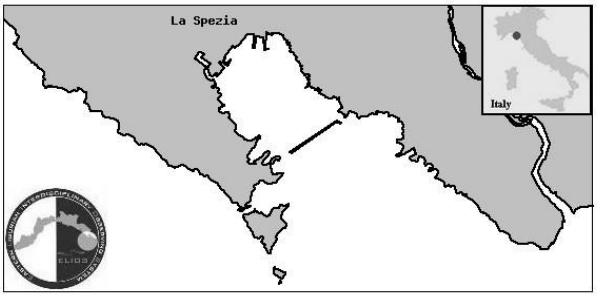

Fig. 1. Location of the observing system in the Eastern Ligurian Sea

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