

HISTORICAL OCEANOGRAPHIC MULTIDISCIPLINARY DATASETS IN THE MEDITERRANEAN BASIN FOR MODELLING PAST AND FUTURE ECOSYSTEM CHANGES

Gabriel Gorsky¹ * and Vangelis Papathanassiou²

¹ Laboratoire d'Océanographie de Villefranche (LOV), B.P. 28, 06234 Villefranche-sur-Mer Cedex, France - gorsky@obs-vlfr.fr

² Hellenic Centre for Marine Research, P.O. BOX 712, Anavissos 19013, Greece

Abstract

Collection of historical multidisciplinary time series and spatial datasets is actually undertaken in the SESAME (Southern European Seas: Assessing and Modelling Ecosystem changes) EU program. Data are collected from existing national and international sampling sites and from different cruises in the Mediterranean and Black seas. The aim is to analyse the changes in the ecosystems and forcing variables. Emphasis is given on the data collection on pelagic biodiversity and biomass of bacterio-, phyto- and zooplankton and nekton. Geochemical data related to sequestration of carbon and to the temporal evolution of the Mediterranean basin's river systems will be collected as well. Typical marine habitats will be defined and mapped. The data will be used for trend analyses and for model validation.

Keywords : *Hydrology, Food Webs, Time Series, Geochemistry, Models.*

Introduction

The scientific objectives of SESAME are to assess and predict changes in the Mediterranean and Black Sea ecosystems (SES) and in their ability to provide goods and services. Both seas will be approached as a coupled climatic/ecosystem entity, with links and feedbacks to the world ocean. The assessment of ecosystem changes will be based on the identification of the major regime shifts that occurred during the last 50 years. Mathematical models validated and upgraded using existing and new observations will be used to predict ecosystem responses to changes in climate and anthropogenic forcings during the next five decades. SESAME will provide an integrated, ecosystem based approach, with a coupled climatic/ecosystem modelling.

Scientific objectives

- 1- Identify the major changes and/or regime shifts and the natural and anthropogenic forcings responsible for these changes for the last 50 years.
- 2- Assess the current ecosystem status that represents an important landmark from which future evolution of the SES ecosystems can be estimated.
- 3- Collect historical and current multidisciplinary datasets, including new observations, in order to analyse the signals of environmental changes in the past and validate the models.
- 4- Collect new information through multidisciplinary, multiship oceanographic cruises in the SES.

Assessment of past changes in the Mediterranean and Black seas

The resilience of ecosystems depends on the levels of functional diversity. For a given ecosystem, functionally diverse communities are more likely to adapt to climate change and climate variability than impoverished ones. The conservation of biodiversity and functional types, along with the reduction of habitat loss, fragmentation and degradation, may promote the long-term persistence of ecosystems. Therefore, in order to assess impact of the climate change and anthropogenic activities we will collect historical multidisciplinary and time-series data from: published databases, grey literature, reports and observations, cruise data, unpublished existing datasets as well as from re-treatment of historical samples, where necessary. Comprehensive datasets will be organised and introduced into SESAME databases. Data on phytoplankton biomass and biodiversity will be collected from various areas reflecting the diversity in the photosynthetic production. Zooplankton species associations will be used as indicators to evaluate long-term changes in the marine environment, related to the climate change and to increased anthropogenic pressure. An effort will be devoted to construct a zooplankton research and monitoring network (i.e. MedZoo built in the framework of the CIESM Zooplankton Indicators program) that will include the Black Sea and Mediterranean countries. Existing long time zooplankton and environmental data series (figure 1) collected at several sites of the SES, will provide a unique database for assessing trends and shifts in pelagic ecosystems [1,2,3]. MedZoo is a CIESM initiative that will act within the project and may become a legacy of SESAME to the SES community.

Data concerning fish stock biomass parameters, species diversity and composition will be collected and occurrence and abundance of invasive species will be investigated. Information on the habitat types will be ranked according to features regarding resistance, resilience and vulnerability. Quantitative and qualitative information on water column characteristics related to the carbon cycling including remotely determined sea

temperature, colour and sea level fluctuations will be provided. Seafloor biogeochemical processes related to the marine carbon fixation will be monitored and changes in the quantity of organic matter and analysis of time dependent changes in macrofauna composition will be carried out. Information will be given on the effects of the variability of river discharges on the evolution of plankton communities in the estuaries impacted by anthropogenic activities. The controlling factors influencing variability in river discharge at decadal and centennial scales will be assessed.

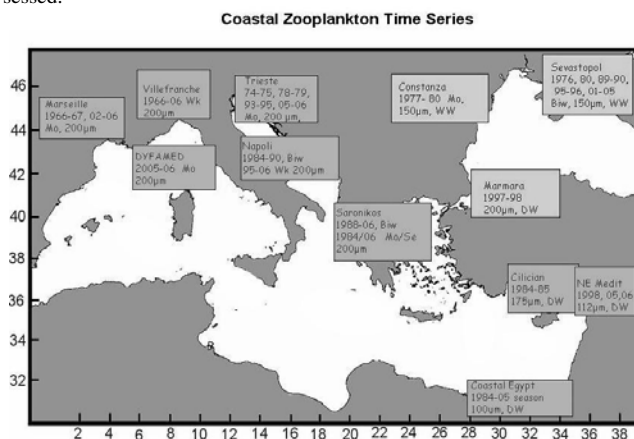


Fig. 1. Coastal zooplankton long term series. The gap in the data from southern Mediterranean is to be completed through the activities of the MedZoo CIESM group (axes: longitude and latitude).

Data collected in the different fields will be used first for the simulation of major changes in ecosystems functioning in the last 50 years in response to natural and anthropogenic forcings. In the second phase, future scenarios as outcomes of predictive models will be validated against the past observations.

References

- 1 - Licandro P., F. Ibanez & M. Etienne . 2006. Long-term fluctuations (1974-1999) of the salps *Thalia democratica* and *Salpa fusiformis* in the northwestern Mediterranean Sea : Relationships with hydroclimatic variability. *Limnol. Oceanogr.*, 51 : 1832-1848.
- 2 - Molinero J.C., F. Ibanez, S. Souissi, M. Chifflet & P. Nival. 2005. Phenological changes in the Northwestern Mediterranean copepods *Centropages typicus* and *Temora stylifera* linked to climate forcing. *Oecologia* 145: 640-649.
- 3 - Molinero J-C., F. Ibanez, P. Nival, I. Buecher & S. Souissi. 2005. North Atlantic climate and northwestern Mediterranean plankton variability. *Limnol. Oceanogr.* 50 (4): 1213-1220.