IMPLEMENTING A MULTIDISCIPLINARY MONITORING SYSTEM IN THE SPANISH MEDITERRANEAN

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Abstract

Climate change, resources management or environmental protection are some of the questions that scientists have to deal with in the current century. The management of the marine environment requires multidisciplinary and multitask observing systems which have to consider oceanographic structures, coastal/open sea interactions and those between different basins. This can only be achieved through the international cooperation of national monitoring programs. Here we describe the monitoring system RADMED, implemented in the Spanish Mediterranean by the Instituto Español de Oceanografía. We provide examples of results obtained in the frame of RAMED in such different fields as climate change, distribution of biochemical variables or resources management.

Keywords: Monitoring, Western Mediterranean, Time Series, Hydrology, Plankton

The Instituto Español de Oceanografía carries out four cruises per year covering a large set of oceanographic stations (fig. 1). These stations cover the Spanish Mediterranean and are distributed along transects normal to the coast. The basic strategy is to cover the different areas where differences in the large scale oceanographic conditions could be expected.

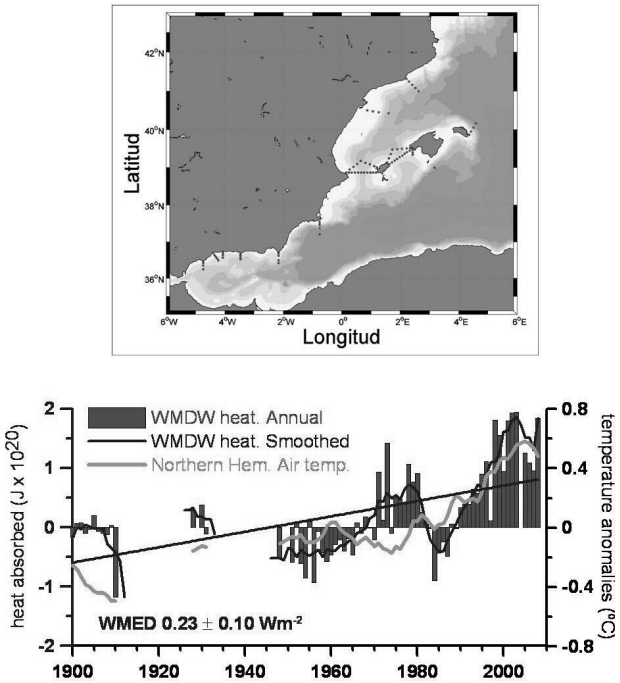

Fig. 1. RADMED and DESMMON stations (upper panel) and time evolution of the WMED heat content along the twentieth century

This monitoring includes productive areas such as the Alboran Sea, oligotrophic waters as those to the north of Cape Palos and around the Balearic Islands, or areas of special interest as those surrounding the Ebro river. Coastal, shelf and deep stations are included. Deep stations provide a description of the water column along the time. The sampling during the four seasons of the year allow us to filter out the seasonal cycle for the purpose of long term climate change studies. At the same time permits the study of some seasonal phenomena such as the intermediate water formation. We can accomplish the description of coastal/open sea and latitudinal gradients in the biochemical distributions of the waters surrounding the Spanish coast. We calculate climatological values for different variables along the Spanish waters, including surface and deep ones. Deviations or anomalies along time can be followed. In all the stations the following sampling is included: Temperature, salinity, dissolved oxygen, chlorophyll-a, inorganic nutrients, phyto and zooplankton abundance and taxonomic composition. At present, other variables of key importance for the analysis of the sea health state are being included. These variables are: pH, Total Inorganic Carbon, nitrous oxide and methane, thanks to the collaboration with IFM-GEOMAR and IMEDEA under the umbrella of DESMMON project.

The objective of this monitoring program is to make an along shore and cross-shore description of the variables mentioned above, defining ranges of variability and mean values. This is possible thanks to the length of time series available, such as temperature (fig.1). Long term changes in temperature, salinity and heat absorbed have been evaluated showing the present warming and salinification of Mediterranean waters in the frame of climate change [1]. The evolution of these time series has many purposes. As an example, it has been shown that monitoring programs can be used in the management of short life cycle species such as *O. vulgaris* (fig. 2) which, in the case of the Alboran Sea, seems to be highly influenced by temperature variability [2]. In the near future we expect to extend the basic description of the health state of the Spanish Mediterranean to gases of greenhouse effect such as carbon dioxide, methane and nitrous oxide.

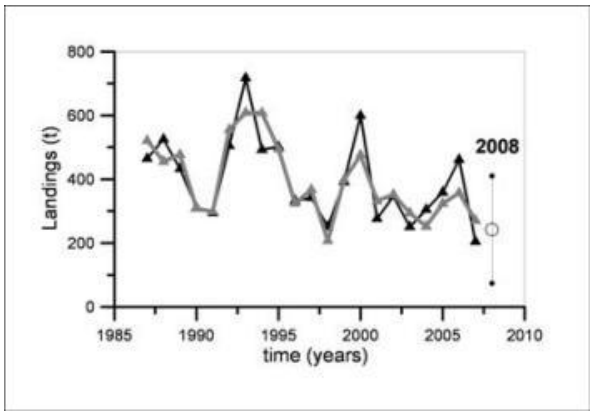

Fig. 2. Octopus landings in the Alboran sea (black line) and landings predicted by a model based on temperature time series

References

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