Mapping of the hydrographical characteristics relevant to fisheries in the vicinity of the Maltese Islands

Aldo Drago[*]

Abstract

An ecosystem-based approach to the management of fish resources calls for a more profound understanding of the ecosystem component interactions and functioning, including an improved capacity to predict, with sufficient reliability, the response to forcings, in particular by the physical environment. The persistent oceanic systems driving the transfer of heat and momentum, cause water masses to mix, carrying biotic material and shaping phytoplanktonic biomass distributions which have an important bearing on biological processes, in particular on the transit paths and locations of pelagic fishes. Movements of fish are strongly connected to the physical characteristics and dynamics of the water body in which they reside, and are strongly correlated with temperature fronts, borders of flow, and zones of divergence and convergence.

A deeper insight into and concrete quantification of such relationships can furnish essential indicators for the conservation and sustainable use of marine living resources, as well as provide a better understanding of threats to stocks and biodiversity. The highly active mesoscale variability in the Strait of Sicily and the particular position of the Maltese Islands with respect to the swift Atlantic Ionian Stream make this sea area ideal for such studies.

The main aims of the proposed work are to: (1) assess and improve knowledge of the relationships between bioproductivity and physico-chemical conditions of the marine environment; and (2) develop a local capability to acquire, analyse and predict ocean mesoscale features as a basis and potential for fishery forecasts. The proposed methodology consists of three mutually supportive and complementary modules making use of remotely sensed information, numerical modelling, and in situ observations. In more detail, the proposed modules consist of:

- Analysis of near-real-time multi-spectral data (thermal and optical satellite images) for the routine mapping of relevant physical processes in the oceanic ecosystem, and establishment of their correlation with pelagic fish abundance; the focus would be on the integration of fishery data for a joint analysis using remote sensing, meteo and model data to develop algorithms for the tracking of fish stocks, through the elaboration of sea-surface temperature and chlorophyll distributions, position and displacement of frontal zones and mesoscale structures (eddies, jets, upwellings, etc.); the use of the method as an operational fishery-management tool would be investigated.

- Development of numerical techniques for nowcast/forecast of the mesoscale variability in the sea area surrounding the Maltese Islands, with the aim of producing short-term forecast maps of relevant oceanic features; in combination with remote sensing and in situ observations, the application of numerical models would be

[*] Physical Oceanography Unit, IOI-Malta Operational Centre, University of Malta, c/o 36, Old Mint Street, Valletta VLT12, Malta; Tel.: 00356 21232493; Fax: 00356 21232493; e-mail: aldo.drago@um.edu.mt

pursued to: (1) assess the seasonal occurrence and variability of fish abundance and type in the region, and (2) investigate the potential for operational forecasts of fish distributions and movements.

- Acquisition of physical oceanographic data by dedicated surveys and continuous observations to provide baseline information for numerical models, and improve the knowledge of the phenomenology of physical processes in the region (especially in the southern approaches to the Maltese Islands); measurements would be made from fixed points and CTD stations, and would include meteo and sea-level observations from coastal installations.