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Trends in productivity and biomass yields in the Mediterranean Sea Large Marine Ecosystem during climate change

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ABSTRACT

In this essay we briefly describe climate change in the Mediterranean Sea Large Marine Ecosystem (LME) using different indices. We further describe the evolution of yearly catches and species composition of the catches in the West (W), Central (C), and East (E) Mediterranean LME during 1970–2010 and the exploitation status of the fisheries resources and review various signals of climate on Mediterranean fisheries. In addition, we explore the mean temperature of the catch in the W, C and E Mediterranean under a scenario considering the catches of species migrating through the Suez Canal. We further review the existing habitat modeling studies at the Mediterranean scale of various species and discuss their response to climate change. Finally, we present the development of a 3-D full life cycle population model and the respective model forecasts of European anchovy (*Engraulis encrasicolus*) biomass at the Mediterranean Sea LME scale.

1. Introduction – general characteristics

The Mediterranean Sea Large Marine Ecosystem (LME) has an area of about 2.5 million km^2, representing about 0.82% of world's oceans (Coll et al., 2010). Yet, it accounts for about 30% of the international seaborne trade volume and 20% of the oil traffic (Galil, 2006) and 6.27% of marine species in terms of numbers (Coll et al., 2010). It is highly heterogeneous in terms of hydrography, bathymetry and productivity (Zenetos et al., 2002). It connects through the Strait of Gibraltar to the Atlantic Ocean, through the Strait of Bosporus to the Sea of Marmara and the Black Sea, while in the southeast part the Suez Canal links the Mediterranean to the Red Sea (Zenetos et al., 2002). It is a high salinity, concentration basin, where surface Atlantic water enters the Mediterranean and deep Mediterranean water flows out into the Atlantic Ocean (Zenetos et al., 2002). It is generally considered oligotrophic, especially its S-SE part, compared to the Atlantic and the Black Sea and locally eutrophic, especially in its W and N parts (Krom et al., 1991; Zenetos et al.,

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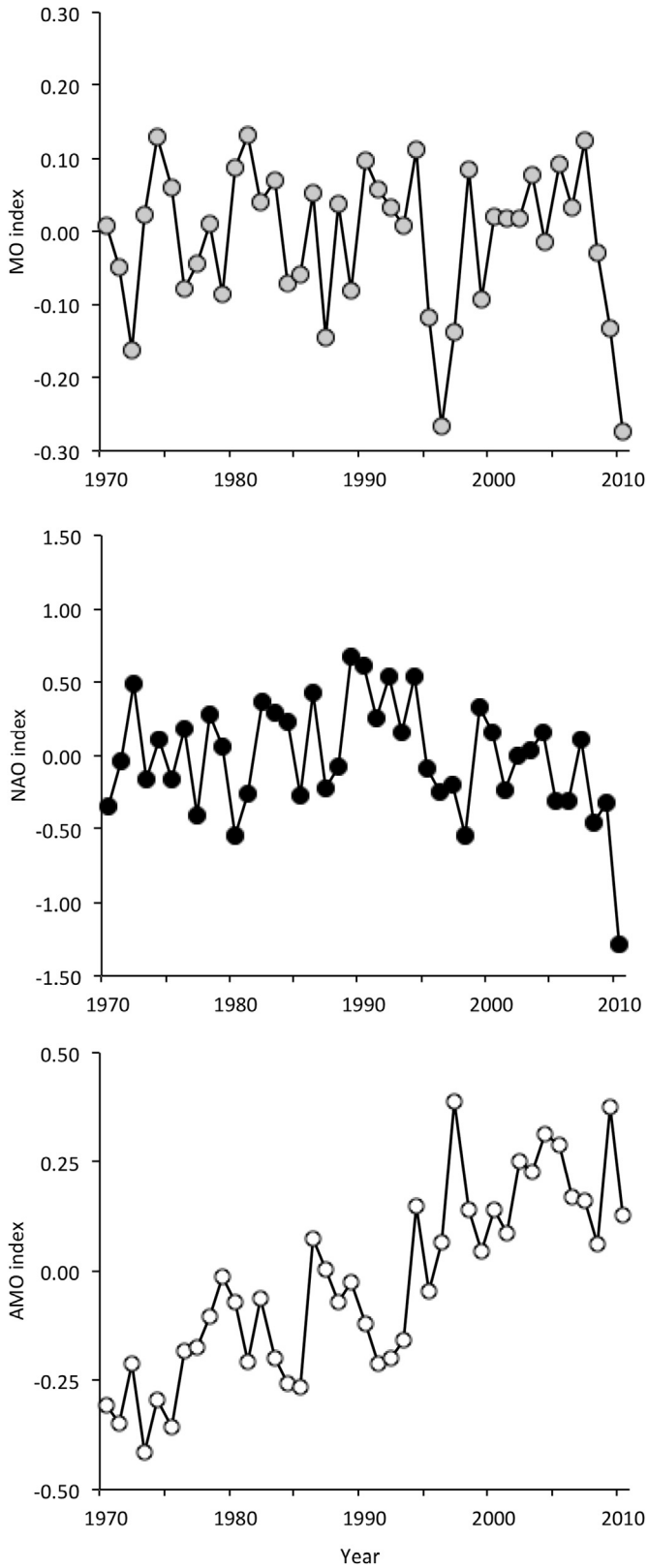

Fig. 1. Time series of Mediterranean Oscillation index (grey dots), North Atlantic Oscillation index (black dots) and Atlantic Multidecadal Oscillation index (white dots), during 1970–2010. Data from the global mapping routine of the National Oceanographic and Atmospheric Administration (NOAA, US Department of Commerce, www.noaa.gov).