Enric Massutí, Sebastià Monserrat, Pere Oliver, Joan Moranta, José Luis López-Jurado, Marta Marcos, Manuel Hidalgo, Beatriz Guijarro, Aina Carbonell and Pilar Pereda, (2007). The influence of oceanographic scenarios on the population dynamics of demersal resources in the western Mediterranean: Hypothesis for hake and red shrimp off Balearic Islands
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Abstract: The aim of the present paper is to study the relationships between some climatic indices and parental stock, recruitment and accessibility to trawl fishery of hake (Merluccius merluccius) and red shrimp (Aristeus antennatus) off Balearic Islands (western Mediterranean). Available annual catch per unit effort, recruitment and spawning stock biomass have been used as biological data. As environmental data, the meso-scale IDEA index and the large-scale North Atlantic Oscillation (NAO) and Mediterranean Oscillation (MO) indices have been used. To analyze possible links between these indices with the population dynamics of demersal resources, two non-linear approaches have been applied: (i) stock–recruitment relationships from Ricker and Beverton–Holt models, by sequentially incorporating environment factors; (ii) generalized additive modelling, both classical general and threshold non-additive models were considered. The latter simulate an abrupt change in explicative variables across different phases (time periods or climatic index values). The results have shown that two oceanographic scenarios around the Balearic Islands, associated with macro and meso-scale climate regimes, can influence the population dynamics of hake and red shrimp. This is especially true for recruitment, which seems to be enhanced during low NAO and IDEA indices periods. During these periods, colder-than-normal winters generate high amounts of cold Western Mediterranean Intermediate Waters (WIW) in the Gulf of Lions, which flow southwards and reach the Balearic Islands channels in spring, increasing the productivity in the area. This oceanographic scenario could also be favourable to the distribution of hake on the fishing grounds where the trawl fleet targets this species, increasing its accessibility to the fishery. Both spawning stock and abundance of red shrimp seems to be also enhanced by high MO index periods, which could reflect the increased presence of the saline and warm Levantine Intermediate Waters (LIW) in the study area, extending over the fishing grounds of this species. The proposed interactions can be useful to assess and manage these important demersal resources.

Keywords: Recruitment; Catchability; Trawl fishery; Hake; Red shrimp; Environmental factors; Climate indices; Western Mediterranean; Balearic Islands