

Ecological drivers and seasonal change in commercial species distributions of the Northwestern Mediterranean Sea

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Despite multiple studies that focus on marine Mediterranean resources and ecosystems, there is a lack of information considering the importance of seasonality on these ecosystems. This knowledge is key to predict and understand how ecosystems can react to climate change effects and how to improve fishing management. Here, we examined the spatial distribution of eight commercial marine species; including fish, crustaceans and cephalopods, in a highly exploited area of the Northwestern Mediterranean Sea during two different seasons (winter and summer). We hypothesised that the seasonal differences in the water column (with a marked thermocline in summer and absence of it in winter), as well as the spatial heterogeneity of oceanographic conditions, can result on a seasonal variation of species distributions, which may impact ecosystem spatial and functional traits. We employed a Bayesian hierarchical species distribution model with data from two experimental oceanographic surveys conducted during winter and summer of 2013. Our model included seven explanatory variables; depth, type of bottom substrate, water temperature (surface and bottom), sea surface salinity, primary production, and fishing effort as the drivers of species distributions during both seasons. We identified significant drivers in each season and we analysed if they were specific or common to all the studied species. Then, we investigated whether the functional relationships between the predicted and explanatory variables varied from winter to summer. Our results provide solid knowledge about ecosystem response to environmental and anthropogenic drivers, as well as the first systematic quantification of seasonal changes in commercial species distributions in the western Mediterranean Sea. These results could have important management applications and help project regional ecosystem responses to existing or new stressors in the future.