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Marine habitat mapping: estimation of wave exposure in Cabrera Archipelago National Park for identification of essential fish habitats

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Wave exposure in coastal areas may drive the presence and dynamics of benthic communities. In addition it can affect the survival rates of the species recruiting in the first meters of the water column, conditioning the spatial distribution of their juvenile stages. Therefore, the inclusion of wave exposure in habitat studies of littoral species may improve habitat identification and classification, resulting in better habitat models and species predictions of occurrence or abundance.

The project EPIMHAR focuses on the identification of essential habitat for the dusky grouper (*Epinephelus marginatus*) in the Cabrera Archipelago National Park (Balearic Islands, Western Mediterranean sea).

To evaluate the relevance of mapping coastal exposition for prediction purposes of dusky grouper spatial distribution, we have computed the average wave exposure for the coast line of the Cabrera Archipelago. Exposition values have been calculated following the EXA methodology that allows the elaboration of maps of mean wave exposure with high spatial definition. This method is based on frequencies of wind direction and mean velocities for a period of time for the whole study area and wind fetch values at each analysis position. For the calculation of wave exposure two integration periods have been chosen during the dusky grouper recruitment seasons (mid summer and autumn). Wind data (direction and intensity) from 2008, registered at the Cabrera mooring located north of Cabrera Archipelago, were provided by IMEDEA (CSIC-UIB, TMMOS <http://www.imedea.uib-csic.es/tmoos/boyas/>). Final cartography was generated with a spatial definition of 50 m.

Results show important spatial and seasonal differences, which are driven by the local wind regimes, the location of the Cabrera National Park and the position of the islets within the Archipelago. North winds were predominant during summer but North-East winds showed highest intensity. On the other hand, North-East winds prevailed in autumn being South-West winds the most intense. These regimes create areas of higher exposition values on the eastern side of the archipelago during summer and on the western side during autumn.

In spite of this there are clear differences according to the degree of openness for areas with the same orientation. Islets located at the north of the archipelago show high values of exposition for all the periods analysed, while bays located north of the main island are the most sheltered all year round.

Applying the EXA method during proper integration periods allows including a physical variable in habitat models to characterize the spatial distribution of species recruiting or distributed in shallow areas, as for *E.marginatus*, thus improving management tools at marine protected areas.