

Co-occurrence of marine predators in the northern Iberian Peninsula inferred from spatial modelling

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In the last few decades, there has been a remarkable development of niche models to help understand the ecological response of species to current rapid environmental changes. In the present study, we applied niche modelling to the predator community of the northern and northwestern shelf waters of the Iberian Peninsula to analyse the coexistence of different species considering their habitat preferences. The PELACUS multidisciplinary surveys are annually conducted in the study region for the assessment of pelagic fish stocks and mapping of oceanographic conditions, in addition to collecting marine mammal and seabird sightings since 2007. Using data collected concurrently from these surveys, we developed niche models for 14 marine predator species (3 cetaceans, 10 birds and 1 fish species) incorporating multi-trophic ecological descriptors (e.g., phytoplankton, zooplankton and small pelagic fish) alongside the more usual oceanographic variables (e.g., sea surface temperature, chlorophyll *a*). This approach provided a test of the common assertion that oceanographic variables are useful to characterise predator habitats because they act as a proxy for prey distribution. Niche models were developed pooling observations for the 2007-2013 period. Overall results highlighted that niche models were mainly driven by bathymetry (28.5% ± 20), sea surface temperature (11.0% ± 18) and variability in fish biomass (9.9% ± 9.3), followed by the spatial gradient of chlorophyll *a* (7.9% ± 9.7), zooplankton biomass (7.0% ± 9.6) and variability in phytoplankton biomass (6.2% ± 9.4). Thus, direct environmental variables (collected concurrently during the oceanographic surveys such as zooplankton and small pelagic fish biomass) were among the main contributing variables explaining the distribution of the species. Based on the variable contribution (%) for each predator species, we found niche segregation among four groups of predators. This made it possible to identify consistent community-level hotspot areas. The highest number of species was found in the western sector of the study area (Galicia), covering the whole continental shelf and shelf-break, along with small diversity spots scattered throughout the Cantabrian coastal area.

Keywords: biodiversity hotspots, marine predators, species distribution models,, Northern Iberian Shelf