Marine biological value along the Portuguese continental shelf; insights into current conservation and management tools

Inês Gomes[1,2], Sergi Pérez-Jorge[3], Laura Peteiro[4], Joana Andrade[5], Juan Bueno-Pardo[1], Victor Quintino[1], Ana Maria Rodrigues[1], Manuela Azevedo[6], Ann Vanreusel[2], Henrique Queiroga[1], Klaas Deneudt[7]

1 — Department of Biology & CESAM, University of Aveiro
2 —Marine Biology Research Group, Ghent University, Belgium
3 — MARE – Marine and Environmental Sciences Centre and Institute of Marine Research (IMAR), Azores University
4 —Departamento de Ecoloxía e Bioloxía Animal, Facultade de Ciencias do Mar, Vigo University, Spain
5 — Sociedade Portuguesa para o Estudo das Aves (SPEA) Lisboa
6 — Instituto Português do Mar e da Atmosfera (IPMA) Lisboa
7 — Flanders Marine Institute (VLIZ) InnovOcean site, Ostend, Belgium

Background

The valuation ("attributing importance/weight") of nature is an inbuilt component of environmental management decisions, based on ecological, economic and/or ethical values. In this study, marine biodiversity was valued using an ecological approach based on the intrinsic value incorporated in biodiversity per se, regardless of any human association.

Methods

The marine biological valuation protocol (MBV, Derous et al., 2007) was drawn upon the methodology of the terrestrial valuation maps, to fulfill the emergent need on solid spatial information to support European environmental status assessment and marine spatial planning approaches.

The method was applied on the Portuguese continental shelf, a large area with great topographic and oceanographic variability, representing 13% of the Portuguese economic exclusive zone. We compiled data on the distribution and abundance for a wide taxonomic range of ecosystem components (seabirds, demersal fish, cephalopods and crustaceans, macrobenthos, marine mammals and sea turtles) and evaluated according to a set of assessment questions related to species abundance, rareness and ecological significance on a grid of 9 x 9 km subzones.

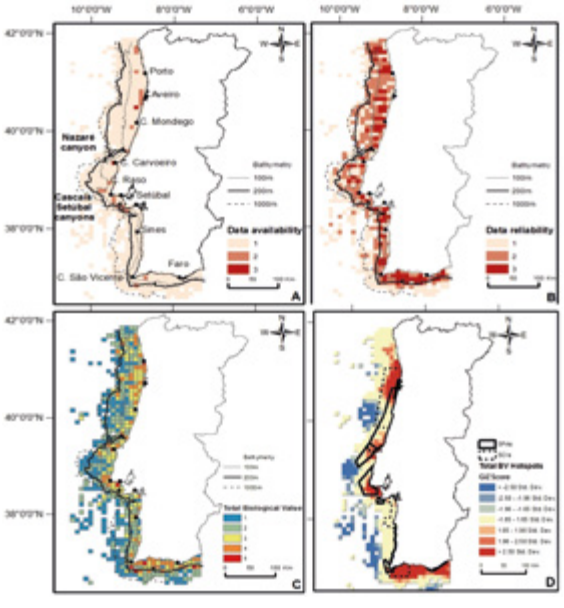

FIGURE 1
A, B: Total data availability and reliability scores (1 = Low, 2 = Medium, 3 = High);

C: Total biological value (1 = Very Low, 2 = Low, 3 = Medium, 4 = High, 5 = Very High);

D: Hotspot classification showing z-scores using 95% confidence levels to determine the areas of spatial significance ("hotspots" in red) and spatial overlap with Natura 2000 Special Protection Areas (SPAs) and recently proposed marine Sites of Community Importance (SCIs).

Results

The application of the MBV to the Portuguese continental shelf waters resulted in the recognition of four major biologically valuable regions "hotspots" (Myers et al 2000), despite temporal and spatial data limitation; off Aveiro and expanding to the north, off Cabo Carvoeiro, the region off Cabo Raso and Setúbal bay, and covering the majority of the south region (Figure 1). These areas matched topographic and physical oceanographic attributes known to influence biodiversity, such as coastline orientation, prominent capes, submarine canyons, large estuaries, habitat type and wind-induced upwelling areas.

The hotspots confirmed previously identified areas for protection (particularly Natura 2000 marine conservation areas in the northern and central regions), and drew attention to currently unprotected sites, mainly in the southern region.

Discussion and Conclusions

The rise of the blue growth economy is rushing countries to make smaller scale decisions on the spatial allocation of maritime human activities. This is particularly true in the Portuguese case, having one of the largest continental shelf areas in the European Union. MBV maps can provide a useful multi-metric indicator, suitable to assist appropriate-scale management decisions in the context of the increased maritime exploitation.