Operationalising Ecologically or Biologically Significant Marine Areas Criteria for Ecosystem-Based Conservation and Management

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BACKGROUND

Criteria by the Convention on Biological Diversity (CBD) for **identifying Ecologically or Biologically Significant Marine Areas (EBSAs)** provide a foundation for **ecosystem-level analysis**, shifting focus from individual species to broader ecological processes. But vast sizes and a lack of detail on the spatial distribution of specific ecosystem elements **complicate integration** of currently recognised EBSAs into **local conservation** and **marine spatial planning (MSP).**

OBJECTIVES

We developed and applied **practical guidelines** for implementing EBSA criteria in conservation planning and MSP in the Bay of Biscay.
Our **main objectives** were:

1. To delineate EBSAs at **scales relevant** to **regional and national decision-making**
2. To identify **areas of high ecological significance** for pelagic (incl. seabirds) and benthic-demersal ecosystem components to inform **realm-specific management and conservation strategies**

OPERATIONALISATION PROCESS IN THE BAY OF BISCAY

EBSA criteria	Conservation features
Uniqueness or rarity	Unique and rare habitats (coral reefs, sponge aggregations, seamounts, etc)
Special importance for life-history stages of species	Spawning / breeding / nursery areas (fish, seabirds, cetaceans); Habitats known to serve as spawning, nursery or feeding areas (estuaries, kelp forests, seamounts, etc)
Importance for threatened, endangered or declining species and/or habitats	Species and habitats included in protection lists (European Red List, EU Habitats or Birds Directives, Vulnerable Marine Ecosystems (VMEs), OSPAR List)
Vulnerability, fragility, sensitivity, or slow recovery	VMEs; Sensitive or slow recovering species (seabirds, cetaceans, elasmobranchs, seagrasses, etc); Habitats known to host vulnerable species (seamounts, reefs, etc)
Biological productivity	Chl-a based estimates of primary productivity; Habitats associated with high productivity (estuaries, reefs, canyons, etc)
Biological diversity	Species and habitats richness; Habitats known to support higher biodiversity (reefs, kelp forests, estuaries, canyons, etc)
Naturalness	Assessments of the biodiversity condition and cumulative anthropogenic pressures

1. DATASET: Our review of CBD guidelines and past EBSA efforts provided a synthesized guidance on **identifying target features**. We integrated diverse sources and datasets to collect **145 geospatial data layers.**

2. DATA EVALUATION: We developed a two-step approach for a **spatially explicit data quality and coverage evaluation**:

1. **Fitness for Use Score (FUS)** quantifies **data quality and suitability** for the assessment requirements.
2. **Data Coverage Index** aggregates FUS values across all layers to map out both **data completeness and quality.** It showed that the continental shelf and slope were better covered than offshore deep-sea areas (Fig 1).

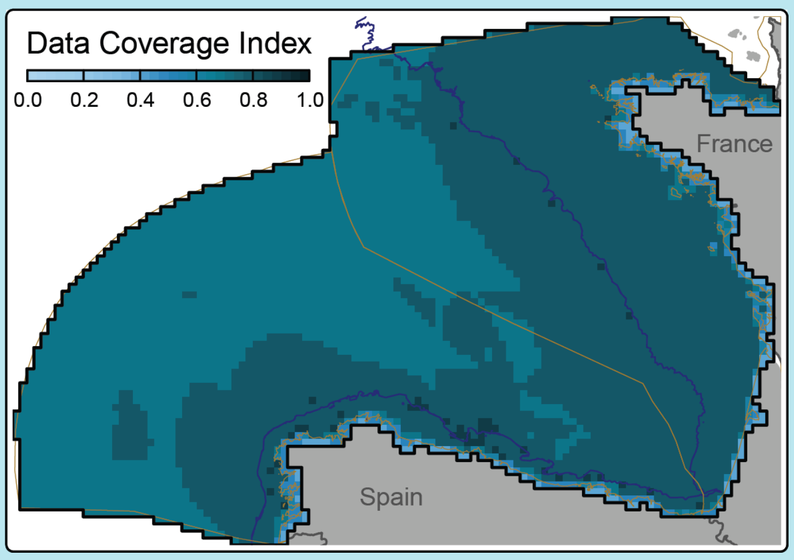

Fig 1. Map displaying the Data Coverage Index in the Bay of Biscay.

3. DELINEATING EBSAs: The key areas per EBSA criteria were identified by **overlaying the geospatial layers of conservation features meeting each of the criteria** (some features met several) and selecting **the top 10% scoring grid cells** (Fig 2 A-G) . The resulting **high-scoring areas** were integrated into a **summary map** quantifying **criteria overlap**, consistent with the CBD approach (Fig 2 H).

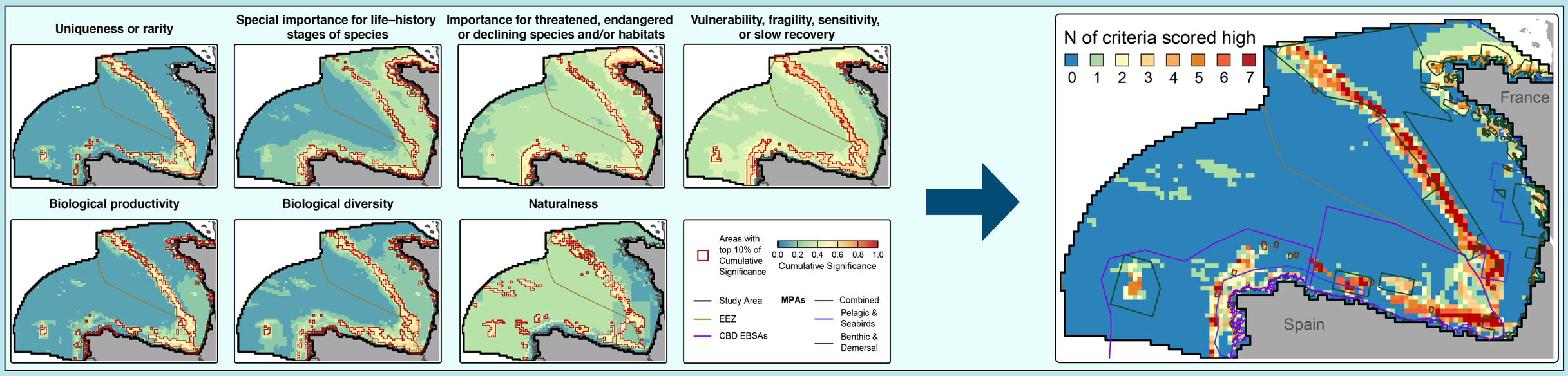

Fig 2. Maps displaying (A-G) the Cumulative Significance of various areas in the Bay of Biscay for each of the EBSA criteria and (H) the number of EBSA criteria scoring high per grid cell

4. IDENTIFYING AREAS OF HIGH ECOLOGICAL SIGNIFICANCE: We used spatial conservation prioritisation with zones, integrating **pelagic (incl. seabirds)** and **benthic-demersal realms**, to analyse the dataset and outline the regions of **high ecological significance across the depths** (Fig 3).

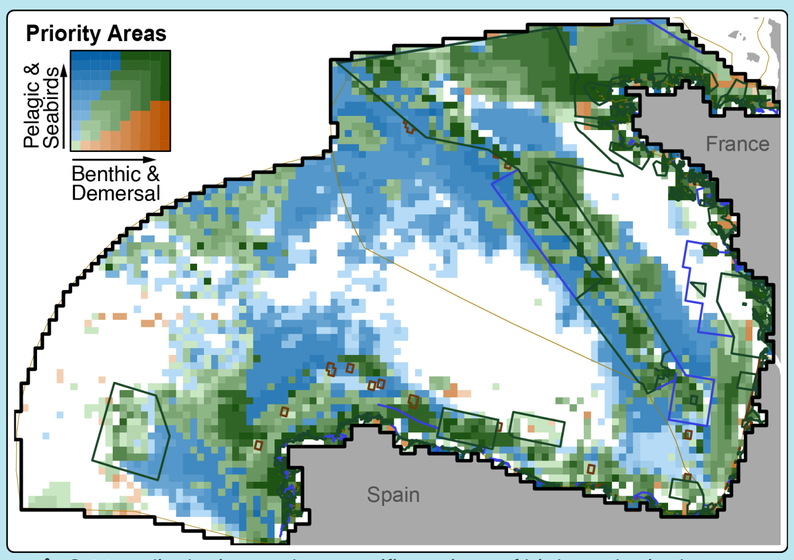

Fig 3. Map displaying realm-specific regions of high ecological significance in the Bay of Biscay.

CONCLUSIONS

1. By identifying **ecological hotspots** at a **finer resolution** than typical CBD EBSAs, this study **bridges the gap** between the **global-scale** CBD approach and the **detailed planning** needed for **MPA/MSP**.
2. In the Bay of Biscay, our application of EBSA criteria revealed **distinct areas of ecological significance** (Fig 2) and highlighted **key areas** for both **pelagic (incl. seabirds)** and **benthic-demersal ecosystems** (Fig 3), underscoring the **gaps in current MPA coverage** and **informing realm-specific management and conservation strategies**, e.g., gear-specific fisheries regulations.
3. A **side-by-side comparison** of spatial analysis results (Fig 2-3) and the data coverage assessment (Fig 1) enables a straightforward **evaluation of results against data uncertainty**, allowing the estimation of the relative confidence and aiding decision-making.

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