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Approaches to defining quantitative targets for habitat types in a Marine Protected Area network

An application to the UK



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Biodiversity targets

- Should be as quantitative as possible
 - Provide a clear purpose for conservation decisions
 - Allow measurement of success
- Targeted biodiversity features can include:
 - species
 - habitat types
 - communities
 - ecosystems and ecosystem services
 - ...

Objective of the study

- Assess approaches that can be used to formulate percentage targets for the coverage of EUNIS level 3 marine habitat types and UK 'habitats of conservation importance' (HCI) within an MPA network
- Use **best available data**

Setting targets for habitat types

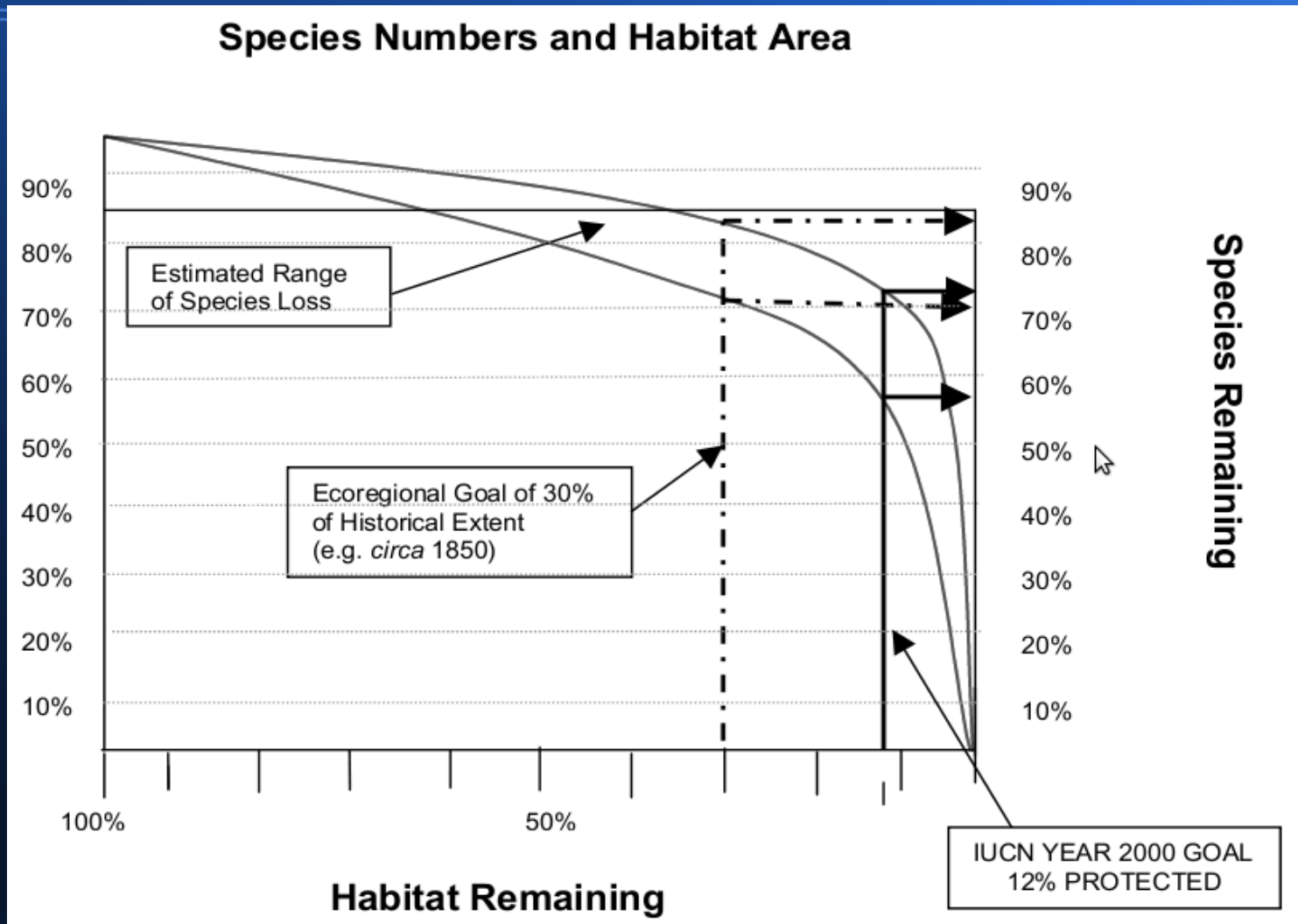
- Five methodologies:
 1. fixed percentage targets across all habitats
 2. trade-off target size with area or cost
 3. protect the habitat of selected focal species
 4. **variable targets for habitats based on a species-area curve**
 5. **heuristic methods applied to a variety of specific targets**

Species-area curve

$$S = A^z$$

- S = proportion of species expected to be found
- A = proportion of area protected
- z describes the rate at which species are encountered in the area
 - habitat-specific

Species-area curve



From McNeely et al. 2001

Species-area curve

- Can be calibrated with existing habitat-specific biodiversity data
- Aims at the representation of species in a network of protected areas
- Does not ensure persistence of species, which requires the conservation of processes through specific design of the MPA

Heuristic methods

- Rules of thumb derived from scientific knowledge
- Can accommodate biodiversity data of variable quality and quantity





EUNIS habitats

0 200 400 600 km



Legend

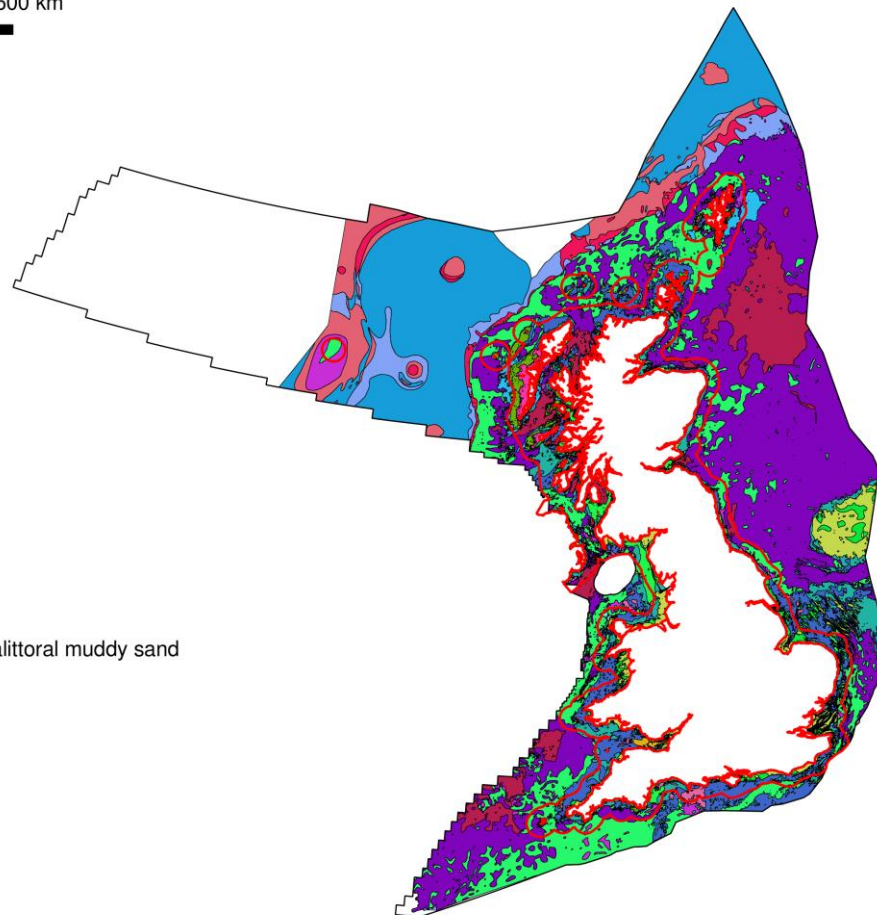
EUNIS level 3

-  Circalittoral coarse sediment
-  Circalittoral fine sand or circalittoral muddy sand
-  Circalittoral mixed sediments
-  ...

UK continental shelf

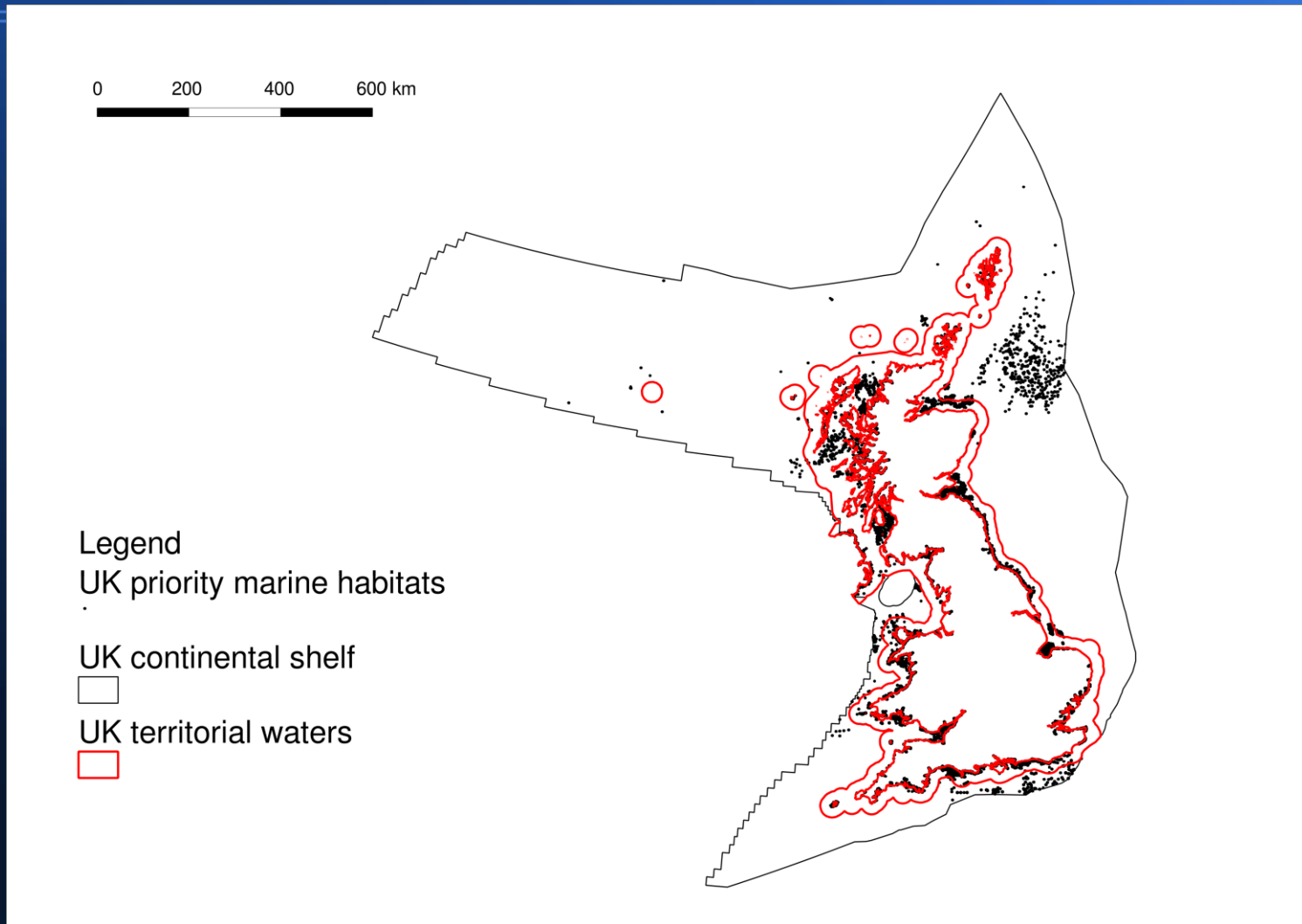


UK territorial waters



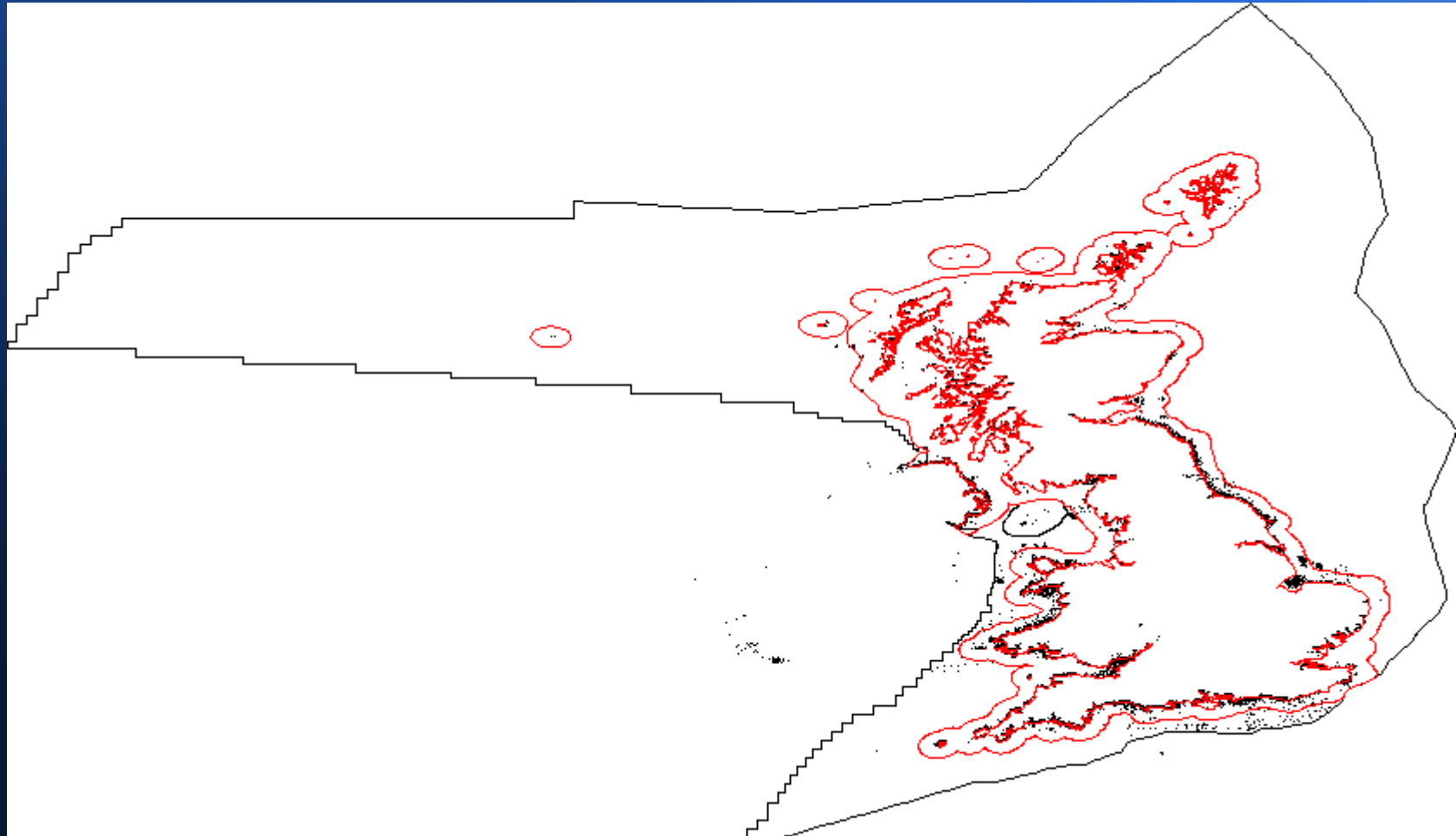
Predicted level 3 EUNIS habitat types

HCI (from BAP)



HCl sampled by the UK Biodiversity Action Plan

Marine Recorder database



Sampled locations stored in the Marine Recorder database

Use a composite target

- Baseline percentage target based on species-area curves
- Add percentage target for level of threat based on heuristic
- Add target for minimum size/maximum distance of protected sites

Target for species representation in EUNIS level 3 habitats

- Formulate baseline percentage targets as follows:
 - inside UK territorial waters
 - use the species data in the Marine Recorder database to estimate habitat-specific z values (rate of species accumulation)
 - outside UK territorial waters
 - as above, or use surrogate variables, or develop heuristic rule based on expert opinion on approximate rate of species accumulation

Target for species representation in HCI

- Undersampled and highly threatened
- As they are represented as points, species-area curves cannot be used
- For the rarest HCIs (5th-10th percentile of the distribution frequency) include all occurrences in the MPA network
- For more common HCIs decrease the target proportionally (to 30-40% for those with larger number of known occurrences)

Target for level of threat (both EUNIS level 3 and HCI)

- Estimate qualitatively the level of threat to each habitat type
- Increase the baseline percentage targets according to a heuristic rule based on the level of threat

Design criteria for conservation of ecological processes

- Min. size / max distance of protected sites:
 - identify the target ecological processes to be conserved by the network. Each of these processes will take place at a spatial scale that can be identified at least approximately and should guide the decisions on the minimum size and maximum distance
- Number of replicates:
 - Constrained by the intersection of the overall proportion of each habitat type to be conserved and the minimum size of protected sites

Final recommendations

Monitor biodiversity in MPA network

Revise targets periodically with newly available data

Adapt MPA network to new targets and future changes

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