

## Ranking English offshore MPAs for bottom trawl ban byelaws

In the UK's offshore waters, we have 76 MPAs, 63 (83%) of which are designated to protect over 23 million ha of ecologically important seabed habitat. However, though they are designated on paper, the majority of these sites offer very little in the way of actual protection. Damaging human activities such as bottom trawling and dredging that have been ubiquitous around our shores for centuries continue unabated. This not only prevents the recovery of ecosystems lost to years of exploitation, but could also be compromising the seabed's capacity to store carbon and buffer the effects of the climate crisis.

Between 1<sup>st</sup> February and 28<sup>th</sup> March 2021, the Marine Management Organisation (MMO) ran a consultation to collect opinions on proposed byelaws to ban bottom trawling in four English offshore MPAs<sup>1</sup> with the promise in time to extend this process to all 40 English offshore sites. On 13<sup>th</sup> April 2022, these byelaws were confirmed and are due to come into force on 13<sup>th</sup> June 2022<sup>2</sup>. In the time between the consultation opening and this decision being announced, England's offshore MPA network experienced over 67,000 hours of bottom trawling and dredging<sup>3</sup>.

Using information on fishing activity, blue carbon storage, habitat sensitivity and conservation objectives, we have compiled an assessment of all English offshore MPAs designated for seabed features. From this assessment, we present two tranches of MPAs in need of byelaws enforcing a site-wide ban on bottom-towed gear.

### Method

We overlaid the boundaries of offshore benthic MPAs with fishing activity data from the Global Fishing Watch Marine Manager Portal and blue carbon distribution data from Smeaton et al (2021)<sup>4</sup> to find out mean annual fishing rate (hours/km<sup>2</sup>/year) and total organic carbon content of each MPA (tonnes) (Appendix A.1)

As in Dunkley and Solandt (2021)<sup>5</sup>, we used Global Fishing Watch fishing activity data to determine total bottom trawling, seining and dredging hours (and rate) within each site (data resolution 0.01x0.01dd). We averaged fishing data where bottom-contacting mobile gear was used (henceforth referred to as 'fishing') from between 2015 and 2020 to define annual mean fishing hours for each site.

In addition to this, we used data from the Marine Life Information Network (MarLIN) to define habitat sensitivity to trawling. Within the MarLIN dataset<sup>6</sup>, habitats are assigned a high/medium/low sensitivity rating for a range of pressures including seabed abrasion (i.e. trawling). However, many of the habitats are classified to EUNIS level 5 or 6. As we intended to cross-reference this data with the EUSeaMap in which habitats are classified only to EUNIS level 4, we averaged the sensitivity scores of the EUNIS level 5/6 habitats nested within the corresponding level 4 habitats (see Appendix A.2). To reflect the range in sensitivity scores within each EUNIS level 4 habitat, we used a finer magnitude scale to categorise sensitivity levels (not sensitive (0), not sensitive-low (0.5), low (1), low-medium (1.5), medium (2), medium-high (2.5) and high (3)) (Appendix B). After assigning each sensitivity level a numerical score, we cross-referenced the EUSeaMap GIS data with the scores to create a spatial dataset of sensitivity scores. Finally, we assigned the MPAs where all conservation objectives were to 'maintain' features a score of 1, and MPAs where there was at least one objective to 'recover' or 'restore' a feature (even in addition to a maintain objective) a score of 2 (Appendix E)<sup>7</sup>.

For fishing effort and blue carbon we assigned scores depending on their magnitude on a scale of low (1), medium (2), high (3) and very high (4) (Appendix C and D), again assigning each record in the GIS data an appropriate score to

<sup>1</sup> Dogger Bank SAC, Inner Dowsing, Race Bank and North Ridge SAC, The Canyons MCZ and South Dorset MCZ

<sup>2</sup> Decision documents for: [Dogger Bank SAC](#), [The Canyons MCZ](#), [Inner Dowsing, Race Bank and North Ridge SAC](#), and [South Dorset MCZ](#) (UK Gov, 2022)

<sup>3</sup> Global Fishing Watch <https://globalfishingwatch.org/map/fishing-activity/> (Accessed 13<sup>th</sup> May 2022).

<sup>4</sup> Lability of carbon was not assessed due to a lack of available data.

<sup>5</sup> <https://media.mcsuk.org/documents/marine-unprotected-areas.pdf>

<sup>6</sup> <https://www.marlin.ac.uk/data-extract>

<sup>7</sup> Conservation objectives were sought from MCZ factsheets and JNCC data and are subject to change as additional environmental condition surveys are completed.

create spatial dataset of scores. We then undertook an overlay analysis to assess the relationship between the carbon, fishing and sensitivity score layers using the raster calculator tool (ArcGIS). For this, we used the fishing score to weight both the carbon and sensitivity scores, then found the mean of the two weighted scores creating a fourth raster layer of these new ‘risk’ scores. Then using the Zonal Statistics tool (ArcGIS), we totalled the scores within each MPA boundary to find the overall risk score for each site and corrected these scores to account for the conservation objective by doubling the score for MPAs where there was at least one objective to ‘recover’ or ‘restore’ a feature (Appendix A.3). This final overall score was then used to rank the MPAs for prioritisation for management. We then placed the sites into two tranches according to the median score (median = 3548): 1 – critically important (overall score  $\geq 3548$ ) and 2 – important (overall score  $< 3548$ ) placing the four sites for which byelaws are currently under consultation in a third ‘in progress’ group.

## Results

Of the 40 English offshore Marine Protected Areas (MPAs) there are 35 designated for **benthic features** (Figure 1) (the remaining five sites are designated for harbour porpoise (*Phocoena phocoena*) or birds). Aside from the 4 sites for which byelaws have now been announced, we found 16 of these MPAs fell into the highest priority category (‘**critically important**’) so were placed into the first tranche, and 15 MPAs were categorised as ‘**important**’ so placed into the second tranche (Table 1). Of the sites deemed critically important, the *South-West Deeps (East)* Marine Conservation Zone (MCZ) (‘A’ in Figure 1) received the highest score of all sites. The MPA was designated in 2019 to restore subtidal and deep-sea sediment and maintain sandbank habitats off the south-west coast of Cornwall<sup>8</sup>. Whilst the habitats present within the site only have a medium sensitivity rating to abrasion, on average the area experiences over 5,000 hours of bottom trawling each year and stores up to 1.7 million tonnes of organic carbon.

When we scored and included the four sites for which byelaws have been announced, Dogger Bank SAC and The Canyons MCZ are deemed ‘critically important’, whilst South Dorset MCZ and Inner Dowsing, Race Bank and North Ridge SAC are ‘important’ (Table 1).

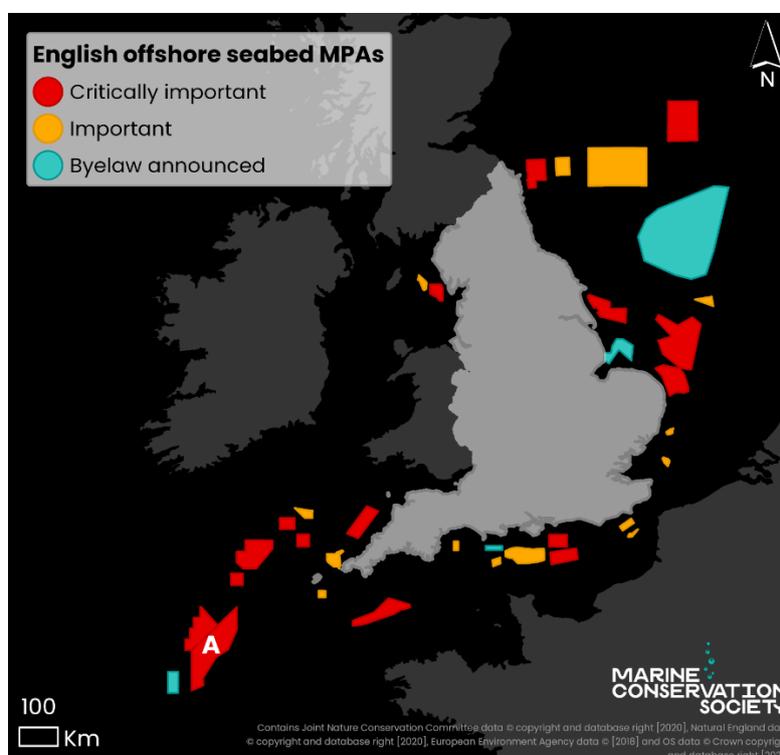


Figure 1 Priority ranking of English offshore benthic Marine Protected Areas. MPAs ranked as **important** are indicated in orange, and MPAs ranked as **critically important** are indicated in red. Blue MPAs indicate where byelaws have been announced. Contains Joint Nature Conservation Committee data © copyright and database right [2020], Natural England data © copyright and database right [2020], European Environment Agency data © [2018], and OS data © Crown copyright and database right [2021].

<sup>8</sup> [Defra \(2019\) South West Deeps \(East\) Marine Conservation Zone \[online\]](#)

Table 1 English offshore benthic Marine Protected Areas ranking.

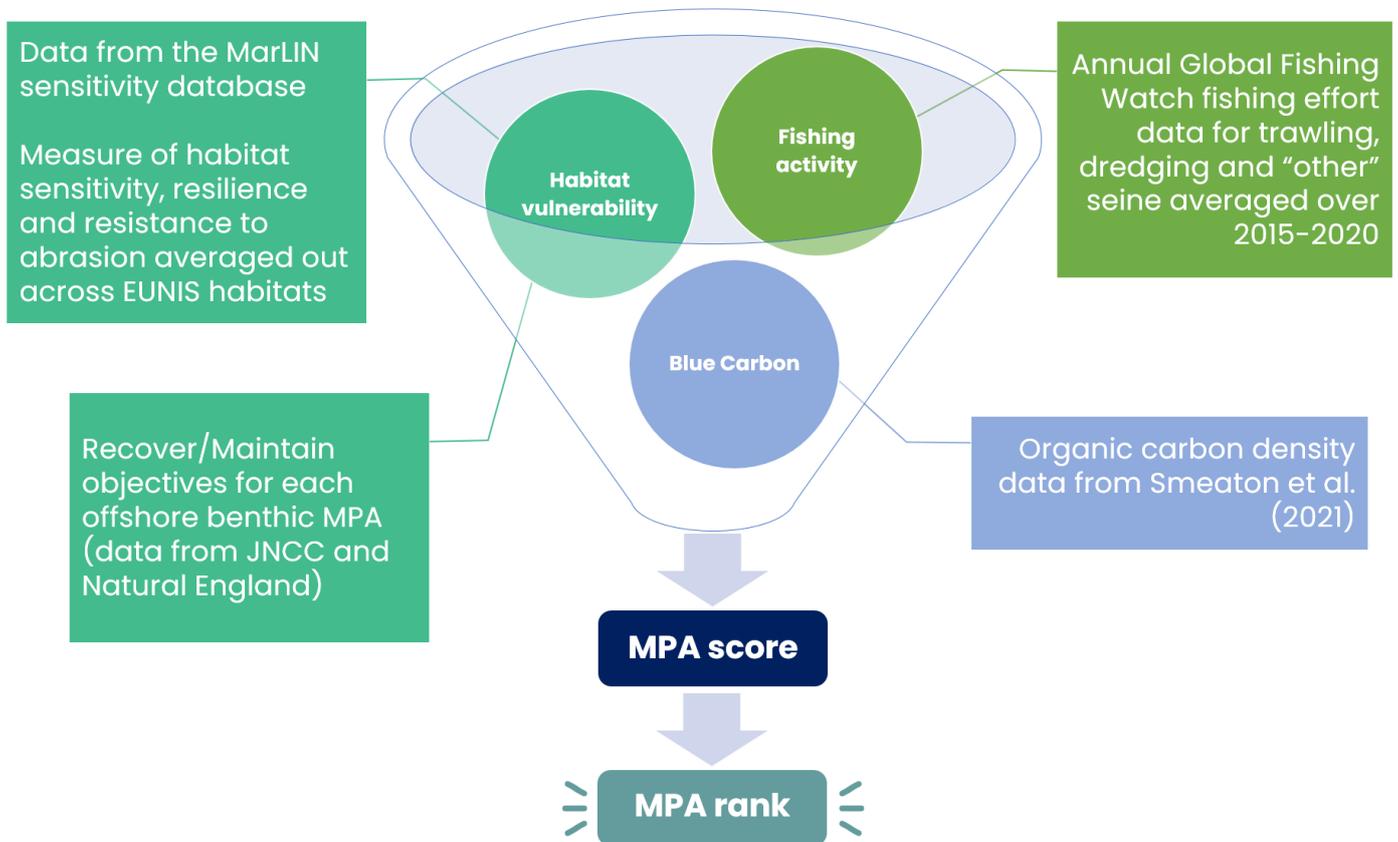
	Site code	MPA name	Conservation obj.	Fishing rate	Blue carbon	Sensitivity	% Disturbed area (approx.)	Trawling ban in place?	Priority
TRANCHE 1	UKMCZ0089	South-West Deeps (East)	▲	●	●	●	73%	✗	Critically important
	UK0030358	North Norfolk Sandbanks and Saturn Reef	▲	●	●	●	79%	✗	Critically important
	UKMCZ0047	Greater Haig Fras	▲	●	●	●	91%	✗	Critically important
	UKMCZ0050	Western Channel	▲	●	●	●	100%	✗	Critically important
	UKMCZ0083	South West Approaches to the Bristol Channel	▲	●	●	●	99%	✗	Critically important
	UKMCZ0025	South-West Deeps (West)	▲	●	●	●	80%	✗	Critically important
	UKMCZ0049	Offshore Brighton	▲	●	●	●	100%	✗	Critically important
	UK0030369	Haisborough, Hammond and Winterton	▲	●	●	●	51%	✗	Critically important
	UKMCZ0078	Holderness Offshore	▲	●	●	●	61%	✗	Critically important
	UKMCZ0046	Fulmar	★	●	●	●	36%	✗	Critically important
	UKMCZ0085	North-East of Haig Fras	▲	●	●	●	100%	✗	Critically important
	UKMCZ0048	North-West of Jones Bank	▲	●	●	●	100%	✗	Critically important
	UKMCZ0023	East of Haig Fras	▲	●	●	●	100%	✗	Critically important
	UKMCZ0043	Farnes East	▲	●	●	●	56%	✗	Critically important
	UKMCZ0044	Offshore Overfalls	▲	●	●	●	99%	✗	Critically important
UKMCZ0045	West of Walney	▲	●	●	●	60%	✗	Critically important	
TRANCHE 2	UKMCZ0087	South of Celtic Deep	▲	●	●	●	99%	✗	Important
	UKMCZ0079	Inner Bank	▲	●	●	●	100%	✗	Important
	UKMCZ0076	Cape Bank	▲	●	●	●	75%	✗	Important
	UKMCZ0077	East of Start Point	▲	●	●	●	100%	✗	Important
	UK0030380	Wight-Barfleur Reef	▲	●	●	●	37%	✗	Important
	UK0030353	Haig Fras	▲	●	●	●	68%	✗	Important
	UKMCZ0084	Markham's Triangle	▲	●	●	●	96%	✗	Important
	UKMCZ0080	Kentish Knock East	▲	●	●	●	100%	✗	Important
	UKMCZ0091	West of Wight-Barfleur	▲	●	●	●	97%	✗	Important
	UKMCZ0090	West of Copeland	▲	●	●	●	93%	✗	Important
	UKMCZ0082	South of the Isles of Scilly	▲	●	●	●	100%	✗	Important
	UK0030368	Bassurelle Sandbank	▲	●	●	●	100%	✗	Important
	UKMCZ0026	Swallow Sand	★	●	●	●	3%	✗	Important
	UKMCZ0081	Orford Inshore	▲	●	●	●	97%	✗	Important
	UKMCZ0024	North East of Farnes Deep	★	●	●	●	38%	✗	Important
CONSULTATION	UK0030352	Dogger Bank	▲	●	●	●	50%	✓	Byelaw announced (Critically important)
	UKMCZ0027	The Canyons	▲	●	●	●	51%	✓	Byelaw announced (Critically important)
	UK0030370	Inner Dowsing, Race Bank and North Ridge	▲	●	●	●	37%	✓	Byelaw announced (Important)
	UKMCZ0022	South Dorset	▲	●	●	●	62%	✓	Byelaw announced (Important)

Conservation objective	Fishing/Blue carbon/Sensitivity level	Trawl ban in place?
Restore' or  Restore and Maintain'  Maintain only	Very high*  High  Medium  Low  None**	Yes  Unconfirmed  No

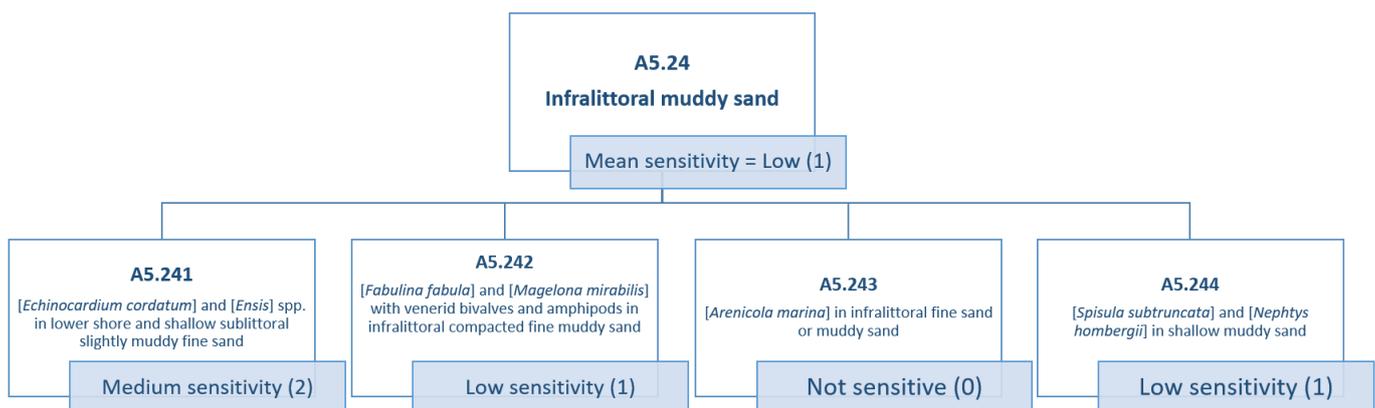
\* not applicable to sensitivity score \*\* or 'Not sensitive'

## Appendix A – methodology schematics

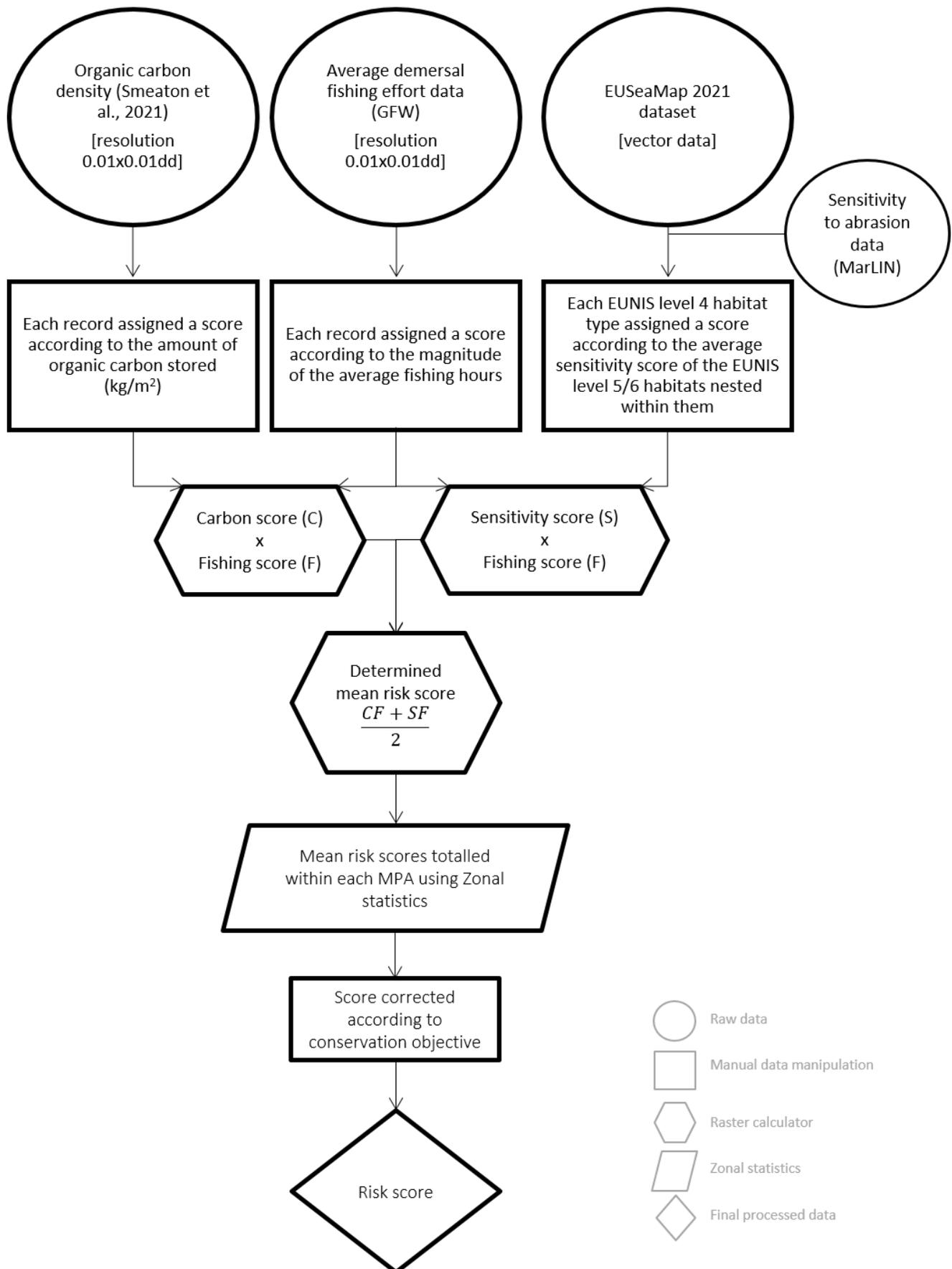
### A.1 Overlay analysis summary



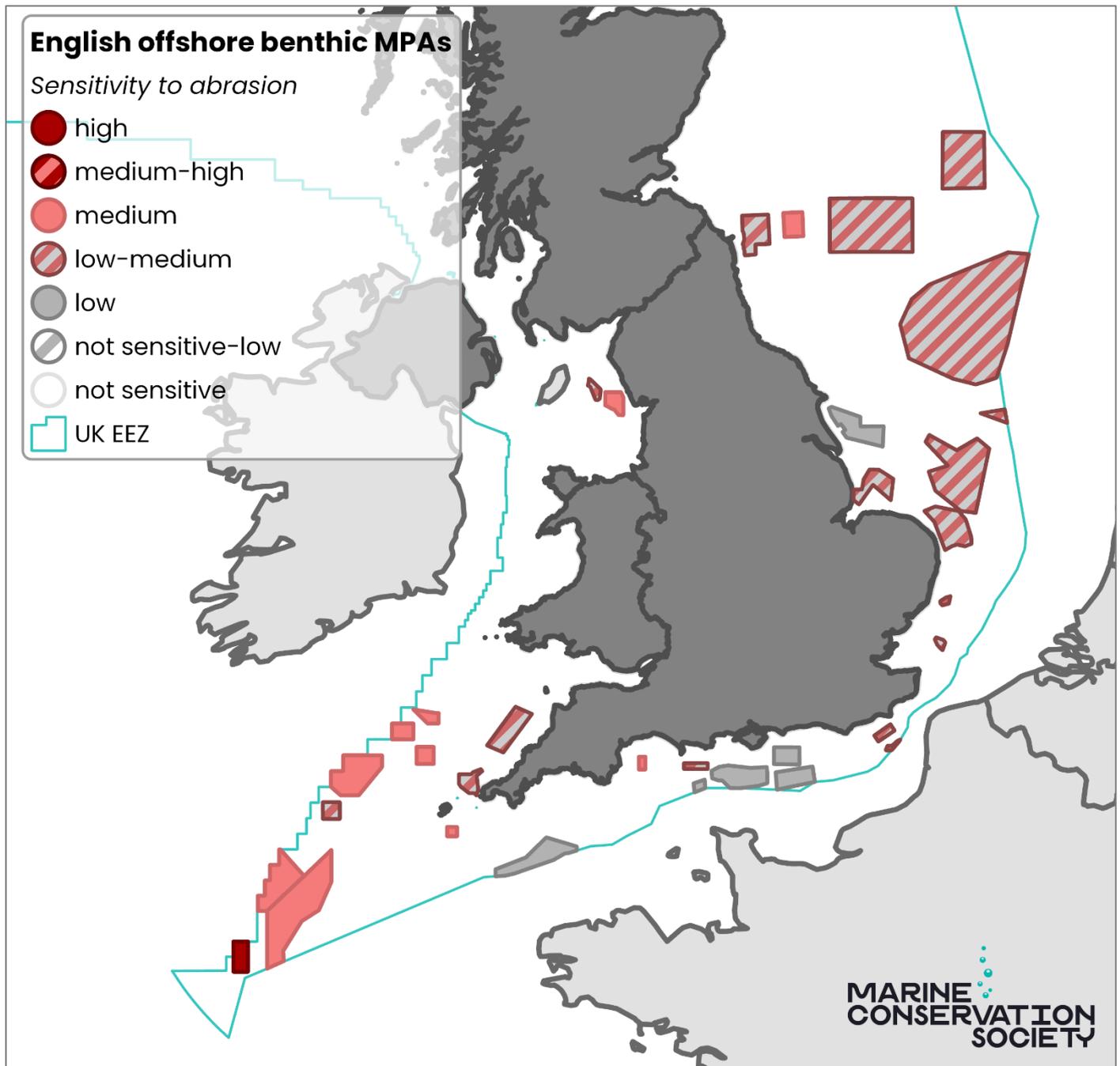
### A.2 Sensitivity data processing:



A.3 Detailed overlay analysis



## Appendix B – Sensitivity map and data sources



Contains sensitivity data provided by the MarLIN programme ([www.marlin.ac.uk](http://www.marlin.ac.uk)), the Marine Biological Association of the United Kingdom © copyright and database right [2020], MPA polygon data from Joint Nature Conservation Committee data © copyright and database right [2020], Natural England data © copyright and database right [2020], and country data from European Environment Agency data © [2018], and OS data © Crown copyright and database right [2021].

### Definitions of 'Sensitivity' (MarLIN)<sup>9</sup>

The intolerance of a species or habitat to damage from an external factor and the time taken for its subsequent recovery (Laffoley et al. (2000); Tyler-Walters & Hiscock (2005)).

The likelihood of change when a pressure is applied to a feature (receptor) and is a function of the ability of the feature to tolerate or resist change (resistance) and its ability to recover from impact (resilience) (Tillin et al. (2010), Tillin & Tyler-Walters (2014)).

#### References:

*Laffoley, D.A., Connor, D.W., Tasker, M.L. & Bines, T., 2000. Nationally important seascapes, habitats and species. A recommended approach to their identification, conservation and protection, pp. 17. Peterborough: English Nature.*

*Tillin, H.M., Hull, S.C. & Tyler-Walters, H., 2010. Development of a sensitivity matrix (pressures-MCZ/MPA features). Report to the Department of the Environment, Food and Rural Affairs from ABPmer, Southampton and the Marine Life Information Network (MarLIN) Plymouth: Marine Biological Association of the UK., Defra Contract no. MB0102 Task 3A, Report no. 22., London, 145 pp.*

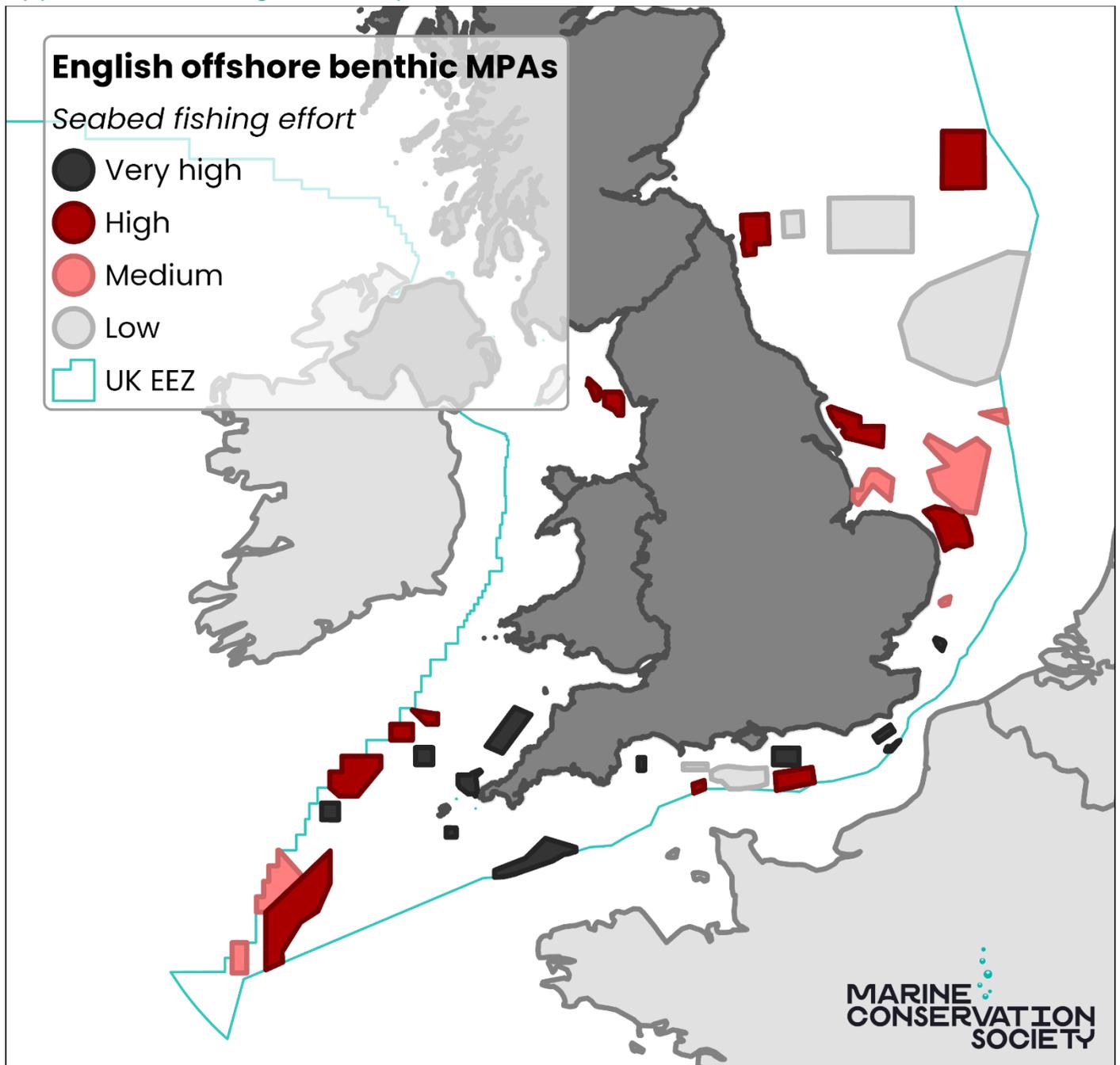
*Tillin, H. & Tyler-Walters, H., 2014. Assessing the sensitivity of subtidal sedimentary habitats to pressures associated with marine activities. Phase 2 Report – Literature review and sensitivity assessments for ecological groups for circalittoral and offshore Level 5 biotopes. JNCC Report No. 512B, 260 pp.*

*Tyler-Walters, H. & Hiscock, K., 2005. Impact of human activities on benthic biotopes and species. Report to Department for Environment, Food and Rural Affairs from the Marine Life Information Network (MarLIN), contract no. CDEP 84/5/244. Marine Biological Association of the UK, Plymouth.*

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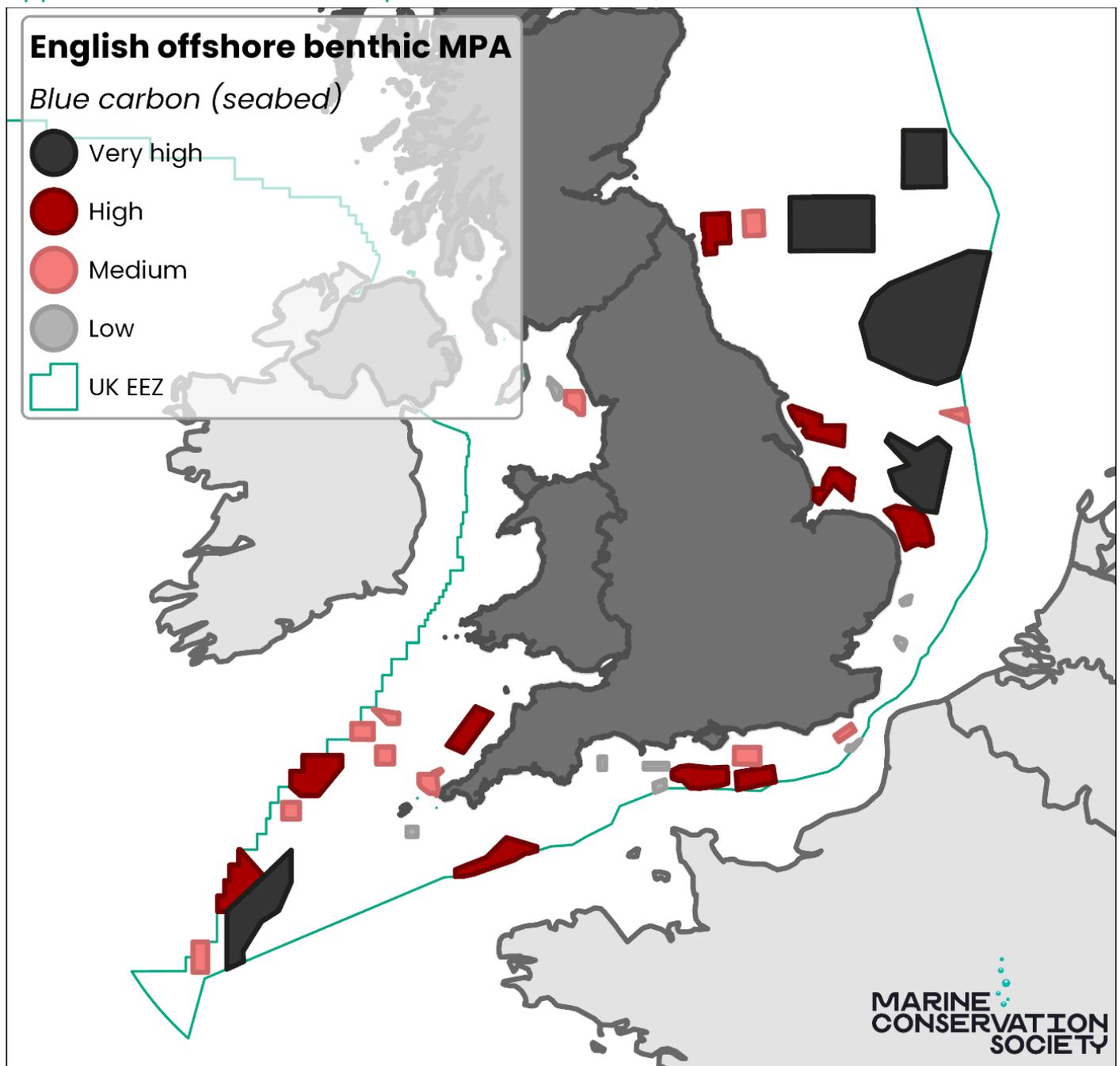
<sup>9</sup> [https://www.marlin.ac.uk/sensitivity/sensitivity\\_rationale](https://www.marlin.ac.uk/sensitivity/sensitivity_rationale)

Appendix C – Fishing effort map and data sources



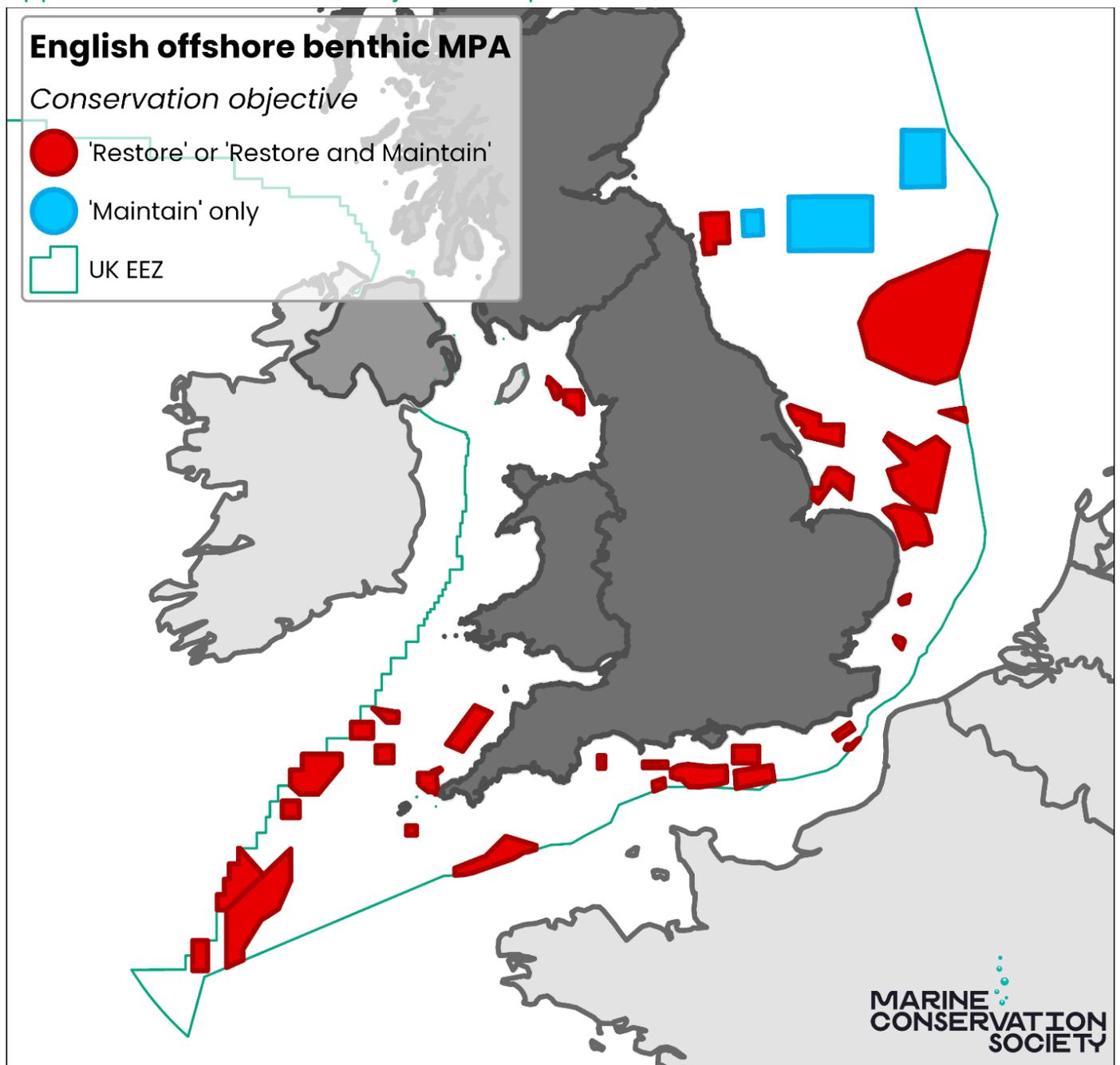
Contains fishing data from Global Fishing Watch (2021), MPA polygon data from Joint Nature Conservation Committee data © copyright and database right [2020], Natural England data © copyright and database right [2020], and country data from European Environment Agency data © [2018], and OS data © Crown copyright and database right [2021].

Appendix D – Blue carbon map and data sources



Contains blue carbon data from Smeaton et al. (2021), MPA polygon data from Joint Nature Conservation Committee data © copyright and database right [2020], Natural England data © copyright and database right [2020], and country data from European Environment Agency data © [2018], and OS data © Crown copyright and database right [2021].

Appendix E – Conservation Objective map and data sources



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