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Assigning the EUNIS classifications to UK's Offshore Regional Seas

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JNCC EQA statement:

This report is compliant with the JNCC Evidence Quality Assurance Policy http://jncc.Defra.gov.uk/default.aspx?page=6675.

Please note:

The following report was edited in 2019-2020 following peer-review by Ellen Last (JNCC), Suz Henderson (SNH), James Highfield (NE), Kirsten Ramsey (NRW) and Marion Harrald (MSS), with changes made to improve clarity. The associated contract output spreadsheets have also been updated following review by JNCC.

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Contents

Executive Summary

JNCC are looking to update evidence on the sensitivity of Marine Protected Area (MPA) features to marine activities and associated pressures, based on the recently updated MarLIN Marine Evidence based Sensitivity Assessments (MarESA)[1]. As there are no geographical/regional considerations within the biotope classifications (EUNIS Habitat Classification and The Marine Habitat Classification for Britain and Ireland), a sensitivity assessment for an MPA feature (inclusive of broadscale habitats) may be based on biotopes that do not occur in a particular biogeographical area (taken here as the Charting Progress 2 Regional Sea Boundaries). To reduce uncertainty and exclude irrelevant biotopes from these sensitivity assessments, JNCC commissioned this project to identify which seabed biotopes (based on the EUNIS classification) are present or absent in each of the Charting Progress 2 Regional Seas 1-7. To further reduce uncertainty, the project sought to identify whether there were distinct subregions in each of the Regional Seas.

This work follows on from a similar project commissioned by Natural England (NE) to assign biotopes to the English inshore regional seas (Hiscock 2016), which has been applied to NE's advice on operations within their Designated Sites System. However, the JNCC project focussed on the biotopes that are relevant to the offshore areas (outside the 12nm limit) of the Regional Seas UK-wide. Those biotopes that are either restricted to coastal/inshore areas, occur in the deep sea, or that characterise the water column were not assessed as part of this work. The key evidence used to assign biotopes to the Regional Seas was; benthic sample data held in the Marine Recorder database, environmental information from European Marine Observation and Data Network (EMODnet), biotope information from JNCC (2015), National Biodiversity Network (NBN) species records, as well as further survey reports and other relevant literature.

There were, however, significant difficulties in obtaining relevant data. The offshore regions of the UK largely consist of sediment plains that are less well-studied than inshore areas and there was limited information on the distribution of many biotopes. Biotopes and their component species may occur in either a wide range of conditions and/or the factors that determine their distribution and temporal and spatial variability are poorly understood. For many biotopes it was therefore challenging to assess whether they were likely to be present or absent with a high level of confidence. Many biotopes were therefore assessed as possibly present based on expert judgement rather than definitely present or absent.

On the basis of environmental variables, subregions were identified in four of the seven Regional Seas. These subregions either contained fewer biotopes than the main Regional Sea or contained distinct types of biotopes. In all regions and subregions, the list of potential biotopes to be considered in sensitivity assessments was refined. The project described here will enable MarLIN's MarESA sensitivity assessments to be applied to Regional Seas and habitat features of offshore MPAs without creating unnecessarily precautionary advice.

The project outputs include this technical report, the Excel biotope database, which provides an audit trail of the evidence and decisions made and an Excel spreadsheet showing biotope presence/absence. Associated GIS data layers were also produced which show the subregions identified as part of the project.

[1] https://www.marlin.ac.uk/sensitivity/sensitivity_rationale

Glossary

Biotope	The physical 'habitat' with its biological 'community'; a term which refers to the combination of physical environment (habitat) and its distinctive assemblage of conspicuous species.
Parent biotope	A higher-level biotope in the classification, for example, the L5 biotope associated with a L6 biotope would be the ‘parent’ biotope.
Child (sub-) biotope	A lower level biotope in the classification, for example, for a L5 biotope, the associated L6 biotope would be a ‘child’ or ‘sub-biotope’.
Circalittoral	The subzone of the rocky sublittoral dominated by animal communities, which is below the infralittoral (dominated by algae). No lower limit is defined, but species composition changes below about 40m to 80m depth, depending on depth of the seasonal thermocline.
Charting progress 2	Charting Progress 2 presents an updated and improved assessment of the status of the UK marine environment.
Habitat	Habitat can be defined as either the place where a plant or animal lives or synonymously with biotope to mean both the physical and environmental conditions that support a particular biological community together with community itself (EMODNET, n.d.).
Infralittoral	A subzone of the sublittoral in which the upward-facing rocks are dominated by erect algae, typically kelps; it can be further subdivided into the upper and lower infralittoral (based on Hiscock 1985).
Offshore	The UK offshore marine area consists of: (a) any area of sea within the limits of the exclusive economic zone, but excluding the area of sea within the seaward limits of the territorial sea adjacent to the United Kingdom; and (b) the area of sea within the limits of the UK sector of the continental shelf, so far as not falling within the area mentioned in (a). (JNCC 2016).
Marine Protected Area	Marine Protected Areas (MPAs) are a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural value (JNCC 2015a).

Abbreviations

CP 2	Charting Progress 2
EMODnet	European Marine Observation and Data Network
EUNIS	European Nature Information System
JNCC	Joint Nature Conservation Committee
MarESA	Marine Evidence based Sensitivity Assessment
MarLIN	Marine Life Information Network
MBA	Marine Biological Association
MESH	Mapping European Seabed Habitats
MPA	Marine Protected Area
NBN	National Biodiversity Network
nm	Nautical mile
SNCB	Statutory Nature Conservation Body

1 Introduction

JNCC are looking to update evidence on the sensitivity of Marine Protected Area (MPA) features to marine activities and associated pressures, based on the recently updated MarLIN Marine Evidence based Sensitivity Assessments (MarESA)[2]. Previously, sensitivity assessments of seabed habitats, such as those developed by Project MB0102 (Tillin *et al*. 2010), were largely focused on broad-scale habitats (EUNIS Level 3) or designated features (e.g. FOCI). These tend to result in sensitivity score 'ranges' (e.g. 'low to high') due to the range of communities that could make up these habitats. Furthermore, it is often unclear which communities are driving the higher or lower ends of the sensitivity score ranges in the assessments. At such broad scales, confidence in the habitat sensitivity is therefore lower, making their application less meaningful, for example in their use in understanding the impacts of activities on habitats.

JNCC wish to use these up-to-date sensitivity assessments for a range of purposes:

- To further improve updated Advice on Operations for MPA Conservation Advice[3], including for broad-scale habitats, such as Annex I habitats.
- To allow inclusion of Annex I habitat sensitivity assessments and updates to Priority Marine Feature assessments in the Scottish Feature Activity Sensitivity Tool (FeAST)[4].
- To develop habitat sensitivity maps for vulnerability assessments, such as the Marine Strategy Framework Directive (MSFD) common indicator 'BH3: Extent of Physical Damage to Predominant and Special Habitats'.
- To improve understanding of the effects of pressures on MPA features to implement appropriate monitoring methods for offshore MPAs.

As there are no geographical/regional considerations within the biotope classifications (EUNIS Habitat Classification and The Habitat Classification for Britain and Ireland), a sensitivity assessment for a broad-scale habitat may be based on biotopes that do not occur in a particular biogeographical area (taken here as the Charting Progress 2 Regional Sea boundaries). This may result in unnecessarily precautionary assessments if any highly sensitive biotopes have been included in the broad-scale habitat assessment, despite not occurring in a particular biogeographical region. Furthermore, since JNCC's responsibilities are for the areas beyond the 12 nautical mile limit of territorial waters (i.e. offshore), intertidal and shallow water biotopes are not relevant to the offshore region. It is, therefore, desirable when providing advice, to exclude irrelevant biotopes from sensitivity assessments, so that the process of identifying whether there are sensitive biotopes in a location is streamlined and the risk of a false assessment reduced.

To reduce uncertainty in sensitivity assessments, JNCC commissioned this project to identify which seabed biotopes (based on the EUNIS classification) are present or absent in each of the Charting Progress 2 Regional Seas 1-7. To further reduce uncertainty, the project also sought to identify whether there were distinct subregions in each of the Regional Seas. This work follows on from a similar project commissioned by Natural England (NE) to assign biotopes to the English inshore regional seas (Hiscock 2016), which has been applied to NE's advice on operations within their Designated Sites System. However, the JNCC project focused on the biotopes that are relevant to the offshore areas (outside the 12nm limit) of the Regional Seas. Those biotopes that are either restricted to coastal/inshore areas, occur in the deep sea, or that characterize the water column were not assessed.

[2] https://www.marlin.ac.uk/sensitivity/sensitivity_rationale
[3] http://jncc.defra.gov.uk/default.aspx?page=6849
[4] https://www.marine.scotland.gov.uk/feast/

The approach to assigning biotopes to the Regional Sea areas and identifying subregions is outlined in section 2 (Methods). The key evidence used was the benthic sample data held in the Marine Recorder database, environmental information from the European Marine Observation and Data Network (EMODnet), species records held by the National Biodiversity Network (NBN) and further survey reports and other relevant information as detailed in Section 3, which briefly describes the results.

Survey coverage of offshore areas is limited, as described in the section on information and evidence gaps (Section 3.2). For many biotopes it was therefore challenging to assess whether they were likely to be present or absent with a high level of confidence, and many biotopes were assessed as 'possibly present' based on expert judgement rather than definitely present or absent, as outlined in Section 3.3 (Limitations and exceptions).

Advice on using the spreadsheets is provided (Section 3.4) and the project conclusions are presented in Section 4.

1.1 Aims

The aim of the project was to clearly determine which EUNIS habitats and biotopes do occur, or are likely to occur, within each of the relevant Charting Progress 2 Regional Seas (1-7) and where applicable, to identify subregions with distinctive character.

1.2 Project outputs

The project's outputs are this technical report, a spreadsheet recording the presence or absence of relevant biotopes (subtidal biotopes) that occur in the UK and an Excel spreadsheet (entitled 'biotope database') recording key habitat variables for each biotope and information governing distribution. The biotope database provides an audit trail of decisions made regarding inclusion and exclusion within the CP2 regional seas and sub-regions. The associated GIS data layers used or developed by this project (Marine Recorder data points, offshore MPAs, Regional seas and subregions) were delivered to JNCC as an ESRI shapefile format using the WGS84 datum. The shapefiles show the overlap between MPAs, regions and subregions and Marine Recorder data points.

2 Methods

2.1 Study area

This work focused on the offshore regional seas based on the areas defined by Charting Progress 2 (UKMMAS 2010). The Charting Progress 2 assessment subdivided the entire UK sea area into eight regions (see Figure 1) based on the biogeographic regions identified as part of the Review of Marine Nature Conservation (RMNC Working Group 2004), principally using physical and biological features such as tidal fronts and seabed flora and fauna. The regional seas therefore have some biogeographic basis relevant to biotope distribution. Only regions 1-7 were included in this project. Region 8 was excluded as it covered the deep-sea region of the continental shelf where knowledge of the biotopes present is more limited and will be reliant on deep-sea expertise.

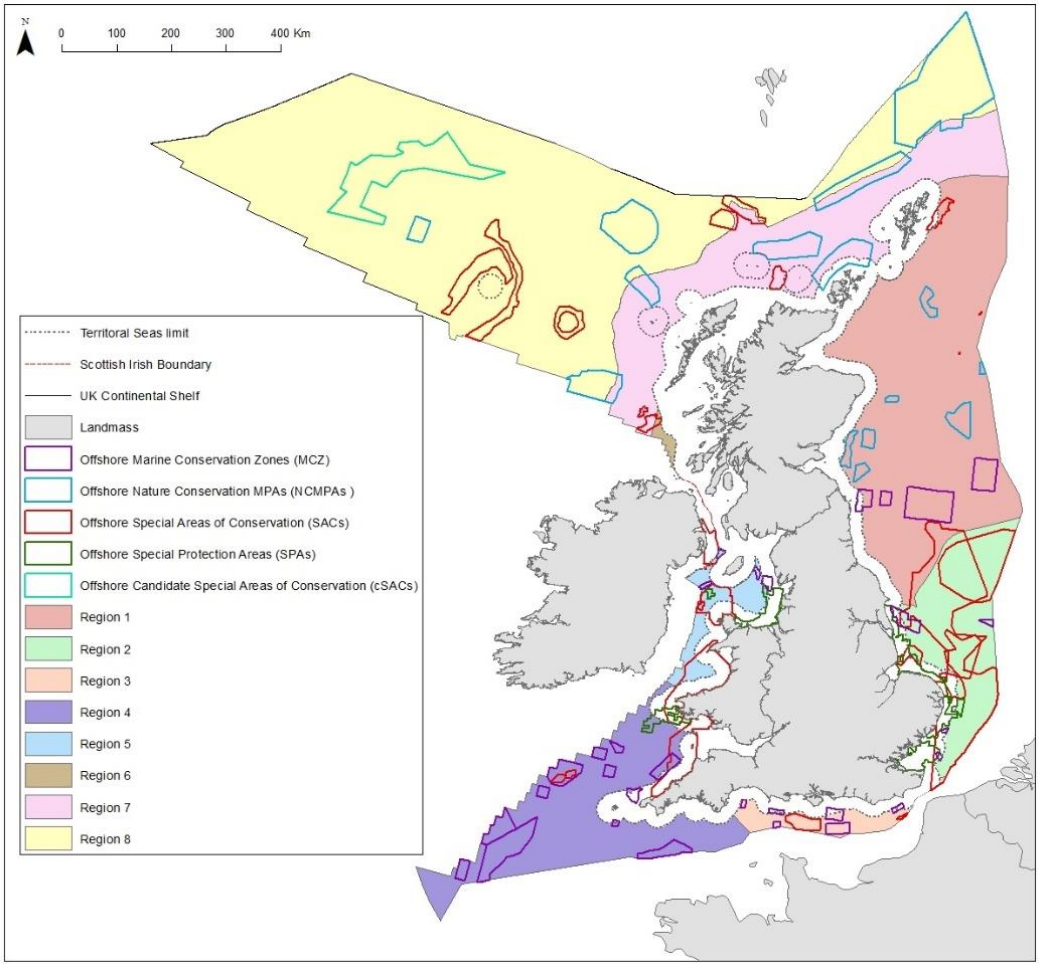

Figure 1. Offshore UK MPAs (version c20190905) displayed by CP2 Regional Seas (offshore only). Please note that some of the MPAs are joint inshore/offshore sites.

2.2 Biotope classification

The key reference and the starting-point for the presence/absence biotope spreadsheet was the Microsoft® Excel spreadsheet that shows the correlation between EUNIS biotope codes and the Marine Habitat Classification for Britain and Ireland (v15.03) (hosted on the JNCC website: via http://jncc.defra.gov.uk/page-6767).

2.3 GIS data analysis

GIS data layers were analysed using ArcGIS 10.3. The principal datasets used in the regional and subregion biotope assessments were:

1) Marine Recorder data points supplied by JNCC (see Section 2.4 below)
2) Seabed substratum (EMODnet geology)
3) Kinetic energy due to waves and currents (EMODnet)
4) Bathymetry (depth) (EMODnet and JNCC bathymetry layer (online))
5) EU SeaMap - light- used to define boundary of infralittoral and circalittoral
6) EU SeaMap biological zones

2.4 Marine Recorder data

JNCC supplied Marine Recorder data (as biotope data points) to this project as a series of GIS shapefiles. These were processed to identify the number of data points for each biotope in each offshore Regional Sea (see Figure 2 below). The Marine Recorder data for the UK was clipped to areas past 12nm (offshore) using the shapefiles supplied by JNCC. The number of Marine Recorder data points representing each biotope were exported by CP2 Regional Sea (Regions 1 to 7) and by certainty (Certain/Uncertain) to the Excel biotope database (GIS Data-Export tab) (see Section 2.6).

It was noted that biotopes identified as unlikely to occur offshore could still be present in the exported list. Marine Recorder records for anomalous inshore biotopes were added to the main Excel presence/absence spreadsheet but were not considered in the biotope database. They are shown in a separate tab in the biotope database called 'inshore biotopes'.

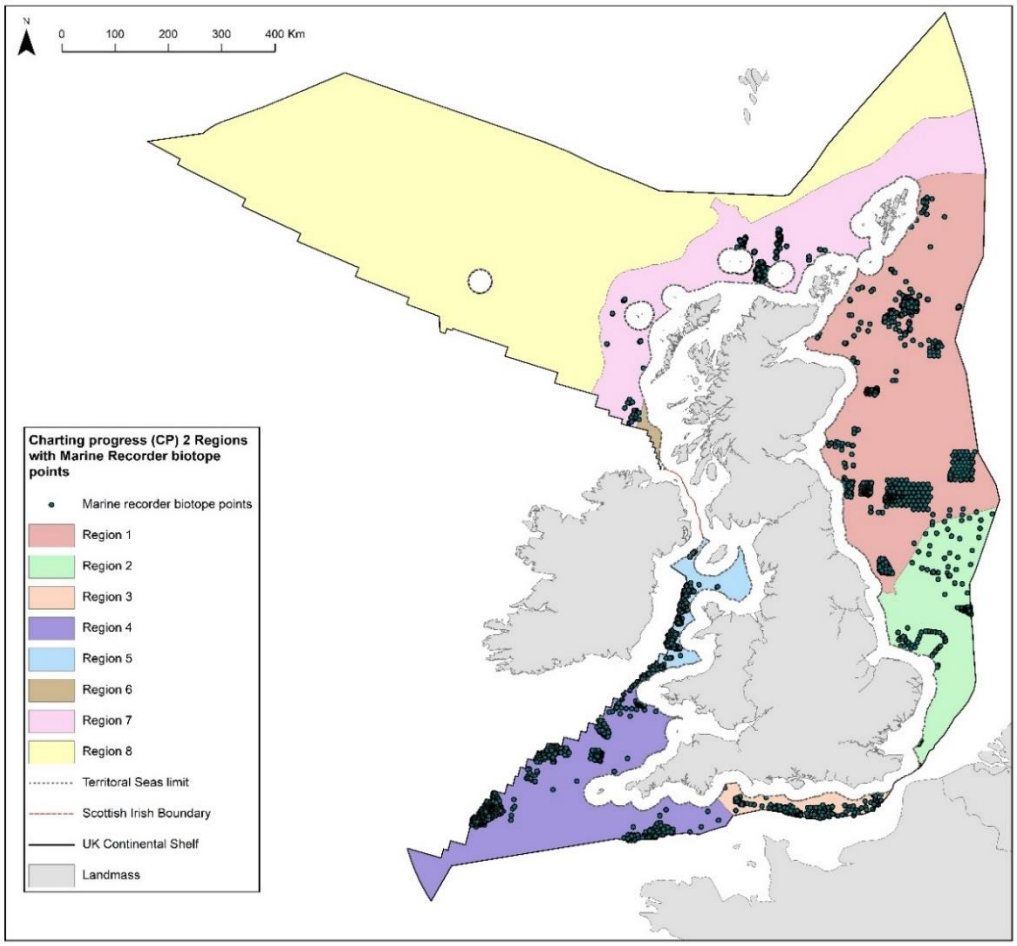

Figure 2. Marine Recorder offshore biotope data points by CP2 Regional Seas (1-8). Marine Recorder data was taken from the C20190208 public snapshot (v51)[5].

2.5 Biotope subregions

For the CP2 regions, 1, 4, 5 and 7, subregions were identified that were considered to have a distinctive character. The boundaries of the subregions were identified based on EMODnet data layers, expert judgement and supplemented by a short literature review of readily accessible evidence for the region or subregion. The basis for identifying each subregion is described in Section 3.

2.6 Biotope database

The evidence and assessments made for each biotope for each region and subregion are recorded in the Excel spreadsheet entitled the 'Biotope Database' that accompanies this report. All coastal, intertidal and inshore biotopes that do not also occur in offshore regions were excluded. For the relevant biotopes, information was taken from the JNCC online biotope descriptions on the habitats they occur in, i.e. substratum type, physical disturbance (wave and currents) and depth. The biotope description was also used to identify any key characterising species and any other relevant information such as recorded distribution and links to other biotopes or classification schemes.

The biotope database cells were populated at Levels 3, 4 and 5 for each subregion based on the evidence for biotope occurrence (Marine Recorder data points and EU SeaMap

[5] Marine Recorder snapshot available at https://hub.jncc.gov.uk/assets/4df6ab95-8d06-44cf-b4f8-e1c3db68174a

predicted habitats). Additional survey records held by EMODnet, identified from EU SeaMap were also queried as necessary. Other evidence, such as key reviews and survey reports, were also used to populate the database (the references for these are supplied in this report, see section 5). The National Biodiversity Network (NBN) Gateway (www.data.nbn.org.uk) was searched for a number of key species that characterise biotopes (see Appendix 2).

Where no information was available, judgements were made as to whether the habitat was suitable for particular biotopes to occur within regions and subregions. Many of the possible assessments were based on the project team's expert judgement that habitats in the region were suitable for the biotope (based on the JNCC descriptions (JNCC 2015b) and EMODnet information on environmental variables).

The basis of the decision for excluding or including each biotope in a regional sea or sub-region was recorded. Biotope presence was assessed as 'yes', 'possible', 'unlikely' or 'no'.

2.6.1 Assessing biotope presence and absence

A few simple rules were followed when completing the biotope database and presence/absence spreadsheet:

A biotope was assessed as present in a region or subregion (cell = yes) when any of the following criteria were met:

- there were >1 Marine Recorder data points;
- the biotope was recorded by survey reports or other literature;
- if a Level 5 biotope or Level 6 sub-biotope was present (child biotope) then the higher Level 4 biotope complex (parent biotope) was considered present by default (note, other biotopes/sub-biotopes in the complex were not recorded as present by default on this basis);
- there were no Marine Recorder data points, but EU SeaMap predicted the biotope to be present; or
- expert judgement/experience indicated that the biotope was present in that region.

A biotope was assessed as possibly present (cell=possible) when any of the following criteria were met:

- there was a single Marine Recorder data point but no further information;
- habitats within the region were considered likely to be suitable for a biotope to occur and characterising species were recorded within the region;
- another very similar biotope within the biotope complex was present; or
- the Level 4 biotope complex (parent biotope) was assessed as present based on data and there were no factors to rule out the presence of the Level 5 or 6 biotope/sub-biotope (child biotopes).

A biotope was assessed as unlikely (cell=unlikely in the biotope database and possible in the biotope presence/absence sheet) where there was no evidence to support presence and confidence in presence was low, but its presence could not be entirely discounted.

A biotope was assessed as not present (cell=no) when either:

- the habitat was known to be unsuitable for a biotope to occur, based on the JNCC (2015) description, for example very shallow biotopes would not be present in regions that are very deep;

- when the region or subregion was outside the species distribution range (based on literature or NBN records); or
- when the region was outside the recorded biotope distribution based on the JNCC (2015) description (this was interpreted cautiously as some biotopes may be under recorded).

2.7 Outputs

The information on presence and absence of EUNIS Level 4 and 5 biotopes was summarized within the Excel biotope database, and a standalone Excel spreadsheet showing presence/absence (Yes/No/Possible) was supplied as a final output. The 'possible' category included biotopes that were assessed as 'unlikely' to be present. The associated GIS data shapefiles were delivered to JNCC as an ESRI shapefile format using the WGS84 datum. The shapefiles show the overlap between the offshore MPAs considered by this project, the Charting Progress 2 Regional Seas, the subregions and Marine Recorder data points.

The presence/absence excel spreadsheet aligns with the correlation tables developed for the inshore study commissioned by Natural England (Hiscock 2016). The spreadsheet includes biotopes that were not considered relevant to this project and not specifically assessed, these were marked as 'Inshore only', 'Water column' or Ice associated' as appropriate in the field cells. Biotopes that did not occur in the UK were left as blank and the cells filled in grey.

The spreadsheet includes a column to indicate relevance to this project. These categories differed from the earlier Natural England (NE) inshore work and a tab was added to track these changes (NE Revised sheet codes). The relevance column identified UK biotopes as 'Yes' (includes all UK biotopes including those that occur only inshore and were not assessed by this project), 'NA' (not assessed) non-UK biotopes or those outside the scope of the project e.g. terrestrial biotopes, 'Not UK' seabed biotopes that occur outside of the UK, and 'Unknown if UK'. If evidence was found for a biotope that was 'Not UK' or 'Unknown if UK' this information was added to the biotope database and/or the Excel spreadsheet.

2.8 Quality assurance

After the regions and subregions were identified, the Marine Recorder data points and EU SeaMap biotope polygons were double checked against the region/subregion records in the biotope database before this information was transported to the biotope presence/absence spreadsheet. These double checks prevented misattribution due to clipping errors or transcription errors. The parent/child biotope relationships were also checked for consistency.

3 Results

3.1 Regional Seas

The sections below briefly describe the rationale for proposing the subregions within each Charting Progress 2 region. Appendix 1 presents a map of each region showing the proposed subregions. Figure 3 (below) shows the CP2 regions, proposed subregions and offshore MPAs.

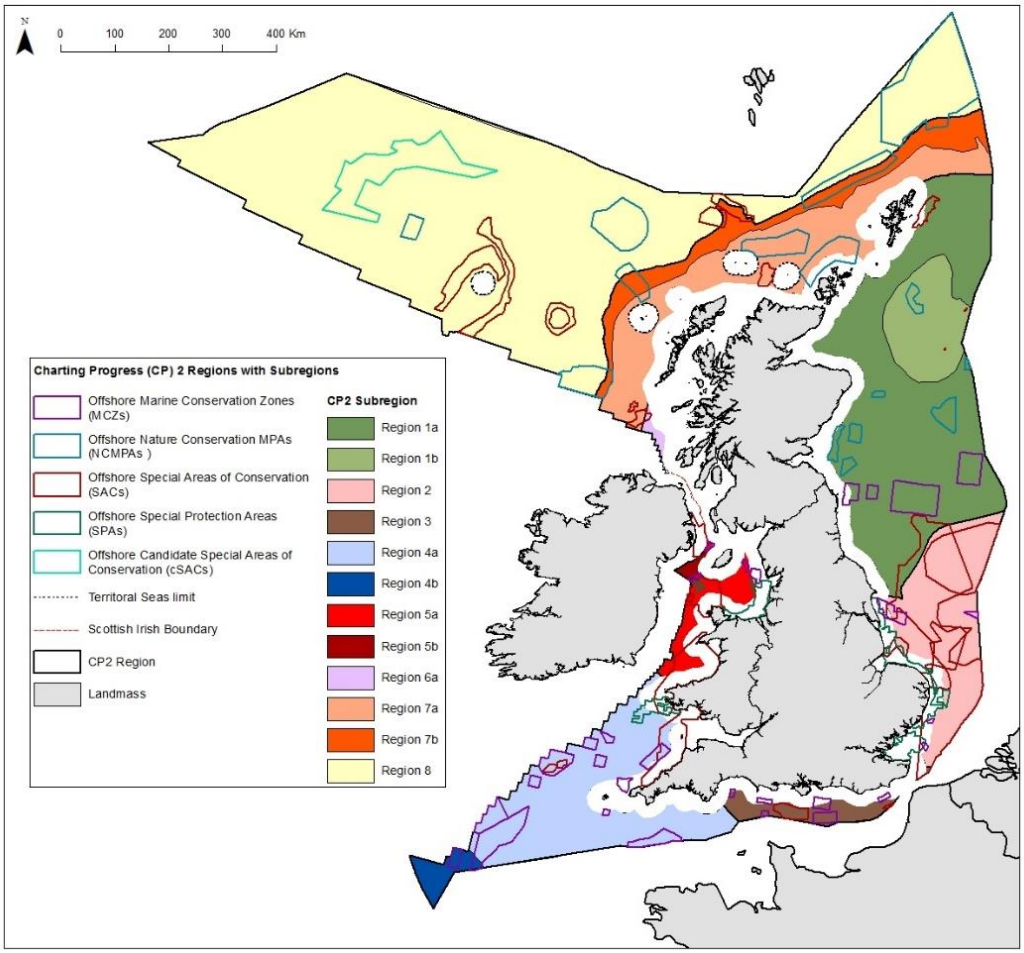

Figure 3. CP2 regions, and the subregions proposed by this project, shown together with the existing offshore MPAs (version c20190905). Please note that although Region 7a, Region 8 and the deep-sea MPAs occurring within those regions are shown on the map, these were outside the scope of the contract. Please note that some of the MPAs are joint inshore/offshore sites.

3.1.1 Region 1 (Northern North Sea)

The Northern North Sea region largely consists of sediment plains with a notable distinct area of deeper muds (the Fladen Grounds). The region is identified as part of the Boreal province (Hiscock 1991). The Marine Recorder data points for this region are concentrated on the northern, southern and the inshore/offshore boundary line (see Figure 2).

The Marine Recorder data indicates the presence of rock in some parts of this region but largely the seabed within this region consists of coarse sands, fine sands, muddy sands and mixed sediments. The extent of circalittoral rock was predicted by Downie *et al.* (2016). Rock present is considered likely to be covered with a thin layer of sediment (Downie *et al.* 2016) and the region was considered too deep and too scoured to support infralittoral rock and algal communities.

Two subregions were identified for this area (see Figure 3 and also Figure A1, Appendix 1).

Subregion 1a (the main area of the region outside of subregion 1b) is largely predicted by EU SeaMap to contain deep circalittoral sand (A5.27) with patches of deep circalittoral coarse sediment (A5.15). Most Marine Recorder data for this region relates to this area (see Figure 2).

Subregion 1b the Fladen Grounds, are a large area of deeper mostly mud sediments in the northern North Sea. The subregion polygon was drawn around the EU SeaMap polygon for biotope A5.37 (Deep circalittoral mud). This area is predicted to contain small patches of deep circalittoral sand (A5.27) and small patches of the biotope *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment (A5.445). This area is also known to contain areas of burrowed mud with seapens and *Nephrops norvegicus* (based on Tillin et al., 2006).

The offshore MPAs designated for benthic habitats that fully or partially occur in the region are:

Subregion 1b:
- Braemar Pockmarks (SAC);
- Central Fladen (NCMPA); and
- Scanner Pockmark (SAC).

Subregion 1a:
- Farnes East (MCZ);
- Firth of Forth Banks Complex (NCMPA);
- Fulmar (MCZ);
- East of Gannet and Montrose Fields (NCMPA);
- North East of Farnes Deep (MCZ);
- Norwegian Boundary Sediment Plain (NCMPA);
- Pobie Bank Reef (SAC);
- Swallow Sand (MCZ); and
- Turbot Bank (NCMPA).

3.1.2 Region 2 (Southern North Sea)

The Southern North Sea region was not subdivided into subregions (see Appendix 1 Figure 2). Although the presence of a possible distinct area was considered, based on the Dogger Bank, which is a shallower region of sand sediments, it was considered that subdivision was not useful due to the number of biotopes that occurred both inside and outside the proposed subregion.

Additional survey data to identify biotopes was sourced from Parry *et al.* (2015a) and Diesing *et al*. (2009), and offshore records for *Caryophyllia smithii* were provided by Coolen *et al*. (2015). The seabed within this region consists mostly of sediments but there are a few records for circalittoral rock (based on 12 Marine Recorder data points). Marine Recorder data points or other survey data identified 30 Level 4, 5 and 6 biotopes within this region including moderate energy circalittoral rock, infralittoral coarse sediments, circalittoral coarse sediments, fine sands and muddy sands and mixed sediments in deeper areas. Biogenic reefs formed by *Sabellaria spinulosa* are also considered to be present. Approximately 40 biotopes were considered to be possibly present.

Biotopes that were considered to be absent included all deep-sea biotopes (depth >200m), infralittoral rock biotopes, soft rock biotopes and most infralittoral mud and mixed sediment biotopes.

Areas within the Dogger Bank and outside may contain peat outcrops from submerged land surfaces that can be of considerable archaeological interest (Russell & Stevens 2014) but no data on species present in these deposits was found from a brief literature search.

The offshore MPAs designated for benthic habitats that fully or partially occur in the region are:

- Dogger Bank (SAC);
- Haisborough, Hammond & Winterton (SAC);
- Inner Dowsing, Race Bank & North Ridge (SAC);
- Markham's Triangle (MCZ);
- Holderness Offshore (MCZ); and
- North Norfolk Sandbanks and Saturn Reef (SAC).

3.1.3 Region 3 (Eastern Channel)

The eastern part of the English Channel (see Figure 3 and also Figure A3, Appendix 1) is considered to be a transition area between the Atlantic Ocean and the North Sea (James *et al.* 2007). This region corresponds with the eastern limit of Boreal-Lusitanian water masses and the eastern limit of *Caryophyllia smithii* into the channel (based on Cabioch *et al*. 1977). The region is primarily composed of circalittoral coarse sediments (Dauvin 2015). There are no records of infralittoral rock biotopes but there are records of circalittoral rock biotopes, including deep sponges (A4.12) and mixed faunal communities (A4.13) within the Wight-Barfleur Reef SCI. Sublittoral mixed sediments become more prevalent in the south and west. Subtidal chalk also occurs in this region (Downie & Curtis 2014).

Additional information on biotopes and species present was provided by survey reports (Coggan *et al.* 2009; Coggan & Diesing 2011; Downie & Curtis 2014; James *et al.* 2007). Approximately 30 biotopes were assessed as present based on the Marine Recorder data points and sampling records, these were all circalittoral rock (high and moderate energy) and sublittoral coarse sediments, sands and mixed sediments. There were no records for mud or muddy sediments (other than mixed). A further 55 biotopes were assessed as possibly present. A further 169 biotopes, including all infralittoral rock, shallow muddy biotopes and maerl beds were assessed as absent.

The offshore MPAs designated for benthic habitats that fully or partially occur in the region are:

- Bassurelle Sandbanks (SAC);
- Offshore Brighton (MCZ);
- Offshore Overfalls (MCZ);
- West of Wight-Barfleur (MCZ);
- East of Start Point (MCZ);
- South Dorset (MCZ);
- Inner Bank (MCZ); and
- Wight-Barfleur Reef (SAC).

3.1.4 Region 4 (Western Channel & Celtic Sea)

The water masses in Region 4 are defined as Boreal-Lusitanian and contain some warm water species reaching the northern extent of their distribution. Species typical of the open water seabed habitats penetrate into the western part of the English Channel (Glemaréc 1973). The open seabed and channel habitats typically contain sediment and rock biotopes (although the rock may be covered with sediment in some areas, Diesing *et al*. 2015). The only subregion subdivision proposed for this region was to separate the deeper area in the most south-western part of the region - subregion 4b (see Figure 3 and Appendix 1 Figure A4).

The deep-sea region contained only a limited number of biotopes and all infralittoral and most circalittoral biotopes were assessed as absent.

The offshore MPAs designated for benthic habitats that fully or partially occur in the region are:

Subregion 4a:

- East of Haig Fras (MCZ);
- Greater Haig Fras (MCZ);
- Haig Fras (SAC);
- North-West of Jones Bank (MCZ);
- South West Deeps (West) (MCZ);
- North-east of Haig Fras (MCZ);
- South of Celtic Deep (MCZ);
- South of the Isles of Scilly (MCZ);
- Cape Bank (MCZ);
- South West Approaches to the Bristol Channel (MCZ);
- South West Deeps (East) (MCZ); and
- Western Channel (MCZ).

Subregion 4b:

- The Canyons (MCZ); and
- South West Deeps (East) (MCZ).

3.1.5 Region 5 (Irish Sea)

The Irish Sea region is a region defined as Boreal, it is bound by the Boreal-Lusitanian species of Region 4 to the south and Region 6 to the North (Hiscock 1991). Within the Irish Sea region, a single subregion was identified to the west of the Isle of Man (subregion 5b, See Figure A5, Appendix 1).

The main Irish Sea region (subregion 5a) consists of a range of seabed habitats, including gravelly sediments, sand wave fields, sand banks and mud filled depressions (Wilding *et al*. 2005). A notable topographical feature in this region is the Celtic trough, a deep-water channel which is up to 70km wide and more than 60m deep (Wilding *et al*. 2005) and runs north-south through the region. Wilding *et al*. (2005) note that the Irish Sea can be considered a single body of water and that splitting the area into biogeographical regions would be a relatively arbitrary process. However, we propose that the deeper area of mud between the Irish Sea offshore boundary and the Isle of Man could be considered distinct. Although deep muds do occur in the main subregion (Mackie 1990) the deeper area contains fewer biotopes, which would reduce the sensitivity range for this area.

Subregion 5a within the Irish Sea area is defined as the region outside of the deeper subregion 5b (see below). This subregion consists of a range of sediment types occurring in patches.

Subregion 5b, known as Western Basin, is the largest area of deep muds in the Irish Sea (Mackie 1990) and is a deep area with low current speeds (Mackie 1990).
The offshore MPAs designated for benthic habitats that fully or partially occur in the region are:

Subregion 5a:
- Croker Carbonate Slabs (SAC);
- Queenie Corner (MCZ);
- West of Walney (MCZ);
- West of Copeland (MCZ); and
- South Rigg (MCZ).

Subregion 5b
- Pisces Reef Complex (SAC); and
- Queenie Corner (MCZ).

3.1.6 Region 6 (Minches and Western Scotland)

Most of this region is inshore (>12nm) and was not assessed as part of this project (see Figures 1 and 2). EU SeaMap predicts that the predominant habitat within the region is deep circalittoral sands (A5.27). Region 6 was separated into one subregion, 6a (see Figure 3 and Appendix 1 Figure A6) by the offshore boundary, rather than any key environmental/biogeographic differences.

Subregion 6a contains a number of biotopes with a patchy distribution and is notable for the presence of the tall seapen *Funiculina quadrangularis.*

The only offshore MPA that occurs in this region is a section of the Stanton Banks SAC (subregion 6a).

3.1.7 Region 7 (Scottish Continental Shelf)

Based on EU SeaMap predicted habitat data, this region was subdivided into two subregions 7a and 7b (see Figure 3 and Appendix A1, Figure A7). Region 7 encompasses Boreal-Lusitanian species and Boreal species (Hiscock 1991). However, water mixing and other habitat factors mean that species distributions do not necessarily match that predicted by the water masses (Eletheriou 2003) and the region was not further subdivided on this basis.

Subregion 7a occurs closer to the Scottish mainland and Islands and is shallower than subregion 7b. Marine Recorder data points for this subregion are concentrated to the south west of the Outer Hebrides (The Barra Fan and Hebrides Terrace Seamount - sublittoral sediment) and on the Northern Coast of Scotland (Solan Bank Reef – moderate energy circalittoral rock and sublittoral coarse sediment). The majority of records are moderate energy circalittoral rock biotopes (A4.2), with a large number of sublittoral coarse sediments.

Most littoral biotopes that were clipped to offshore areas occurred in this region. This is likely due to how the 12nm offshore status is defined when considering the Scottish Isles, and the anomalies consist primarily of littoral biotopes.

Subregion 7b, based on EU SeaMap, consists of deep Atlantic mid-bathyal habitats including deep-sea sand (A6.3) in the west and east of this region, deep-sea mixed substrata (A6.2), deep-sea muddy sand (A6.4) and deep-sea mud (A6.5). There were no Marine Recorder data points for this region[6]. This subregion supports deep sea sponge aggregations and offshore deep-sea muds with *Nephrops norvegicus* and reefs of *Lophelia pertusa*.

The offshore MPAs designated for benthic habitats that fully or partially occur in this region all occur within subregion 7a:

- Solan Bank Reef (SAC);
- North-west Orkney (NCMPA);
- Stanton Banks (SAC); and
- West Shetland Shelf (NCMPA).

It should also be noted that a number of deep-sea MPAs overlap with subegion 7a, 7b and region 8 (not assessed), however these were not considered by this project.

3.2 Information and evidence gaps

Wherever possible, survey data has been used to identify the presence or apparent absence of biotopes. However, for most of the regions there were gaps in available Marine Recorder data. The key information gaps for the regions were:

- Region 1: Marine Recorder data points for this region are concentrated on the northern, southern and along the inshore boundary line (see Figure 2). Marine recorder holds few data points for the central region and offshore boundary line.
- Region 2: Marine Recorder holds no data for the mid and southern regions.
- Region 4: No Marine Recorder data for the portion of this region extending south from the Isles of Scilly.
- Region 7: Very restricted survey coverage[7] (see Figure 1 with one survey clustered in the mid-region and another area of survey in the east). The suggested sub-region division into inner and outer regions is based on predicted habitats from EMODnet (EU SeaMap, supported by information on bathymetry).

The project team are aware that there is additional survey data available for at least some of the regions. Some of the data is commercial and in-confidence such as oil field surveys and is therefore not available. There may also be a delay in survey analysis and processing and the input of this to databases such as Marine Recorder. The time and expense of adding data also limits availability.

Other obstacles prevent some data being added to publicly accessible databases. For example, the Norman Holme towed sledge data from the English Channel has DECCA co-ordinates that are difficult to georeference and the associated film is difficult to view.

For some characterising species such as *Echinus esculentus*, *Modiolus modiolus* and *Ostrea edulis* that may be at risk of commercial exploitation, biodiversity records are only available at low resolution on the NBN gateway and other sources and are thus difficult to assign with confidence.

[6] Please note that there have been a number of deep-sea surveys undertaken in Region 7, however these were not in Marine Recorder when this work was undertaken.
[7] Please note that there have been a number of deep-sea surveys undertaken in Region 7, however these were not in Marine Recorder when this work was undertaken.

This study found that although many authors referred to biogeographic subdivisions, with many reports referring to Boreal, Arctic and Lusitanian distributions (Hiscock 1991; Dinter 2001, among others), to the authors' knowledge there are no definitive lists of species centred on these regions/provinces. This is a key knowledge gap that could be addressed with a targeted study.

3.3 Limitations and exceptions

In addition to the information and evidence gaps noted above there are also limitations in sampling, mapping and predicting biotope distributions.

- Grab sampling may not capture more deeply buried organisms such as *Echinocardium cordatum*. Large species, including those that characterise some biotopes may be patchily distributed and again not adequately sampled by grabs.

- Video surveys provide greater spatial coverage and can quantify epifaunal abundance but do not identify small or cryptic fauna. Although some infauna can be identified from protruding parts or burrows, many infauna species will not be recorded.

- Laboratories that analyse benthic samples adhere to quality guidelines and practices that aim to minimise human error and inconsistency in species identification, but it is likely that experience and skill of analysts may vary and that there may be some inconsistencies in classification. Similarly, the basis that is used to assign biotopes may vary between laboratories. We noted in some reports that samples were not assigned to a biotope if the sample matched a described biotope assemblage, but the sampled area differed from the JNCC description in terms of depth or another character. In some other cases it is possible that people may treat the biotope classification more flexibly. To take account of this we have highlighted in the biotope database where characterising species or similar assemblages were found but the habitat did not exactly match the biotope categories.

- There are some inconsistencies between biotope descriptions in the JNCC (2015) online descriptions. In some instances, the habitat conditions described for the Level 4 biotope complexes may sometimes differ from the constituent Level 5 biotopes and Level 6 sub-biotopes.

- The EUNIS biotope classification is a useful tool to categorise habitats and biotopes and has largely proved applicable to UK sea areas, however, some areas may contain habitats that do not conform to the biotope classification.

- Information on some biotopes and habitats are limited. Some biotopes in particular are recognised as requiring further definition, e.g. A5.421, SS.SSa.IMuSa.EcorEns, or more information on the habitats in which they occur e.g. A5.244, SS.SSa.IMuSa.SsubNhom (JNCC 2015b).

- Human activities, particularly widespread bottom disturbance from fishing, may have altered, or continue to alter, biotopes within an area.

- Biotopes and species may not be present in areas predicted to be suitable because they are vulnerable (sensitive and exposed) to human activities, or species may be absent for other reasons such as low rates of larval dispersal, e.g. for the pink sea fan *Eunicella verrucosa* where most larvae settle close to adults or where currents fail to transport planktonic larvae to new areas.

- The distribution of species and biotopes may change over time and biotopes may grade into one another without distinct boundaries spatially and over time. This means that sample information may be out of date and not reflect current distribution, although, on broader scales, habitats are unlikely to undergo significant changes in physical and chemical variables and are likely to support similar types of habitats and species over time.

3.4 Advice on using the spreadsheets and databases

In the absence of an official UK 12nm border, some issues were encountered in defining 'offshore' areas, in particular for the Irish Sea (Region 5 and 6) and the Scottish Isles (Region 7). This included the presence of littoral biotopes in offshore regions (presumably from small isles and islands not recognised as being 'land' for the purposes of the 12nm exclusion).

Whether or not a biotope can be confidently assigned to a region or sub-region relies greatly on whether or not survey data is available. The offshore areas of the UK are less well studied than inshore areas and therefore predictive habitat maps from EMODnet have been used with caution and supplemented with additional information where possible from published survey data (see references) and information on distribution, supplemented with expert knowledge.

4 Conclusions

For each CP2 region we have assessed whether there is any evidence to support division into subregions and have identified the biotopes that are present (based on survey data), those that may possibly be present and those biotopes that are most likely absent. Unfortunately, only a small proportion of the biotopes that were considered were associated with survey data to support an assessment and this was identified as a key limitation. Many biotopes were assessed as 'Possible' in the biotope database and presence/absence spreadsheet as there was not enough evidence to state confidently that they were present or absent in a region or subregion.

Many of the assessments where it was determined that a biotope could 'possibly' occur were based on expert judgement and on the JNCC descriptions (JNCC 2015b). Decisions on whether habitats were suitable for particular biotopes to occur were based largely on data held by EMODnet, which may be predicted or extrapolated from survey data points rather than ground-truthed data. The biotope presence or absence spreadsheets and the biotope database therefore reflect our current understanding of seabed habitats and this may change in the future.

As Level 4 biotopes are based on species and habitat information it is possible that sampling may show changes in biotope extent over time if species composition changes. For Level 5 and 6 biotopes this is especially true as these may be classified based on small differences in species composition such as the presence of a single characterising species. We may be more confident in assigning biotopes as absent where these are based on habitat factors such as depth and the presence of suitable substratum as these are unlikely to change. Absences predicted on the basis of species or recorded distributions of habitats have, in general, a lower confidence as these could change as our knowledge of the marine environment increases through greater sampling effort or as species range changes in response to warming seas.

Through the identification of sub-regions and refining the list of potential biotopes in each region and sub-region, this will reduce uncertainty in sensitivity assessments for broad scale habitats. The project described here will, therefore, enable MarLIN's MarESA sensitivity assessments to be applied to Regional Seas and habitat features of offshore MPAs without creating unnecessarily precautionary advice.

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Appendix 1: Charting Progress 2 Regional Seas and subregions

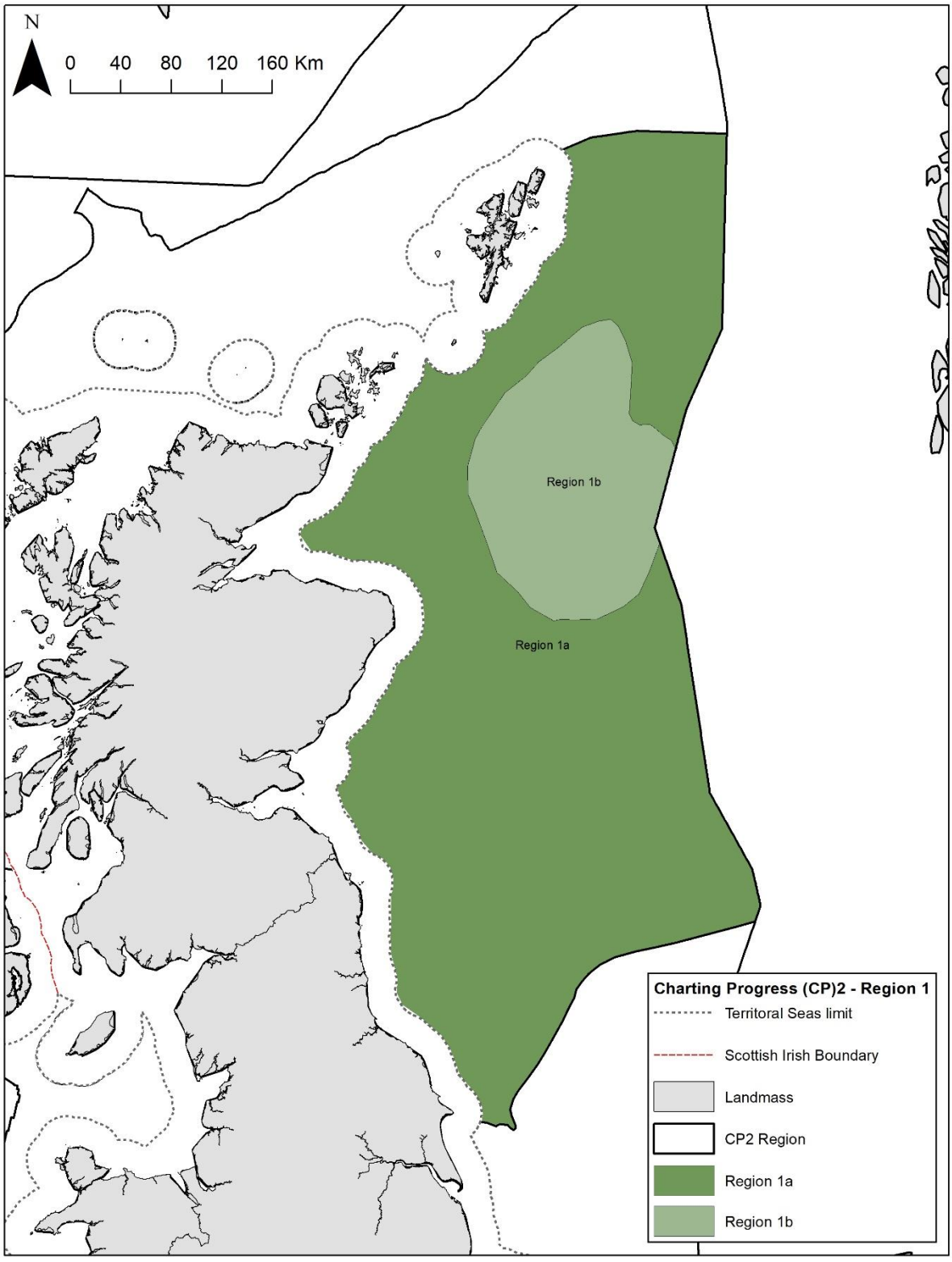

Figure A1.1. Map showing the Northern North Sea Region and 12nm limit (territorial seas limit). Two subregions are shown, the main area (subregion 1a) and the Fladen Ground (subregion 1b).

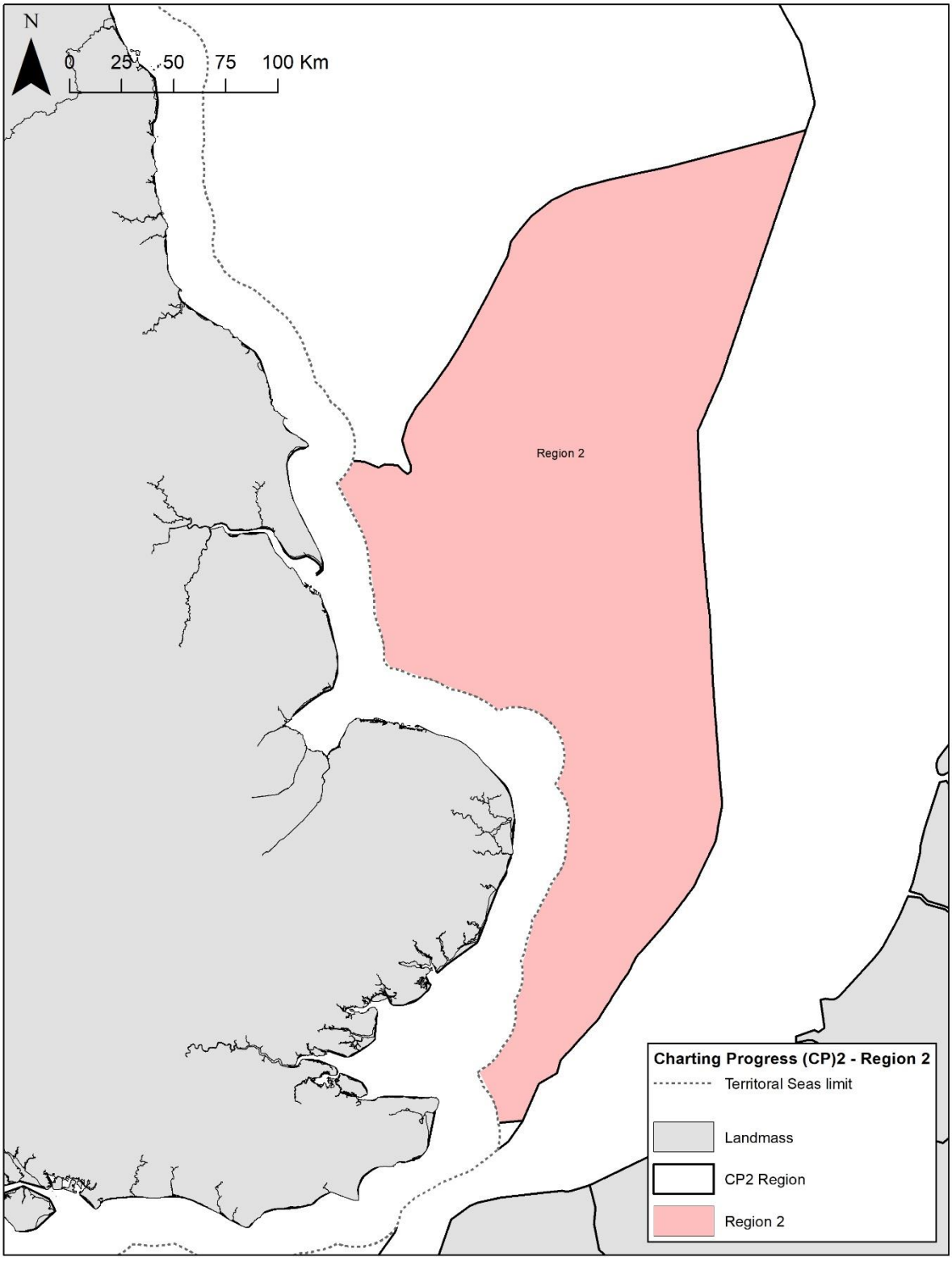

Figure A1.2. Map showing the Southern North Sea Region (Region 2) and 12nm limit (territorial seas limit).

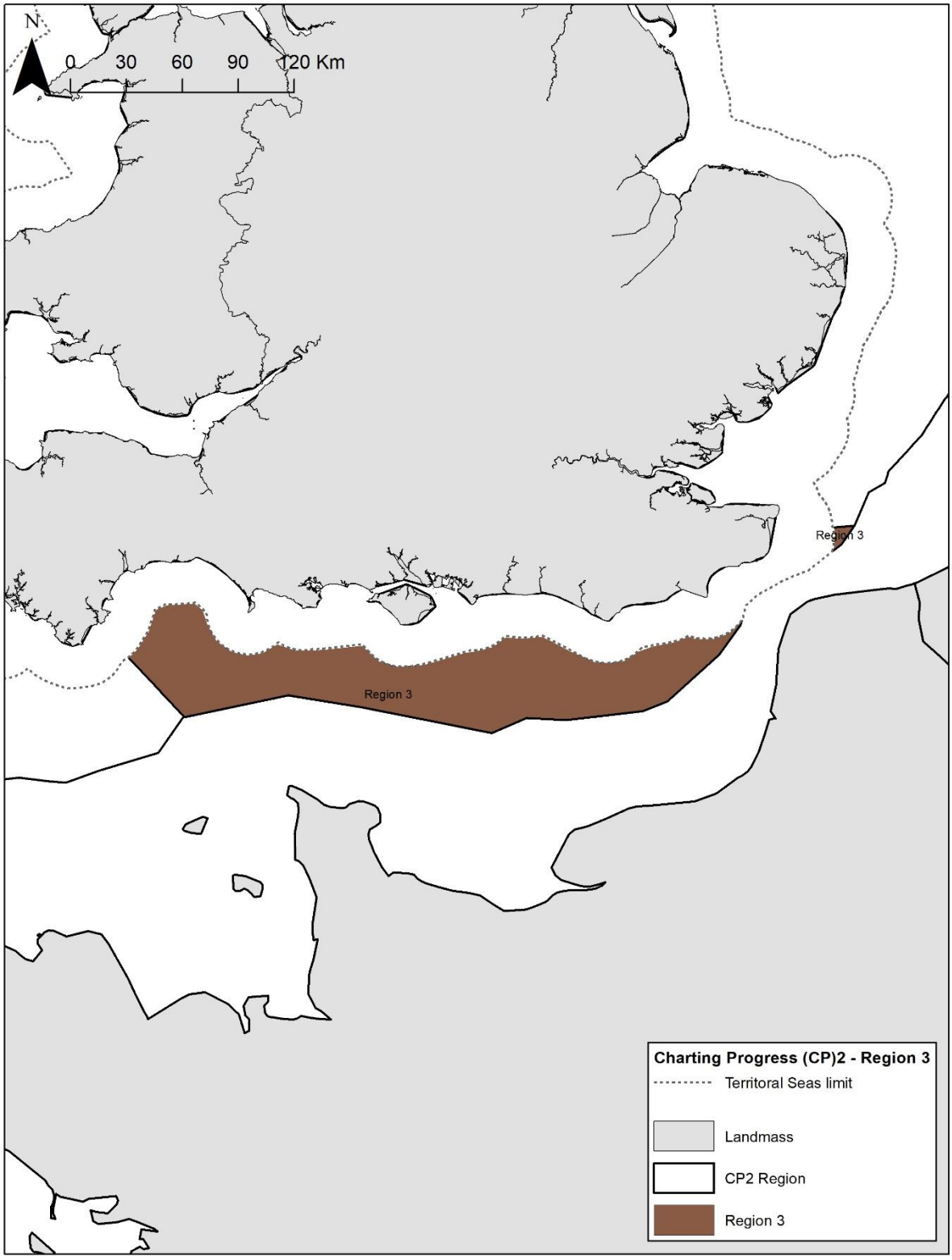

Figure A1.3. Map showing the Eastern Channel Region (Region 3) and 12nm limit (territorial seas limit).

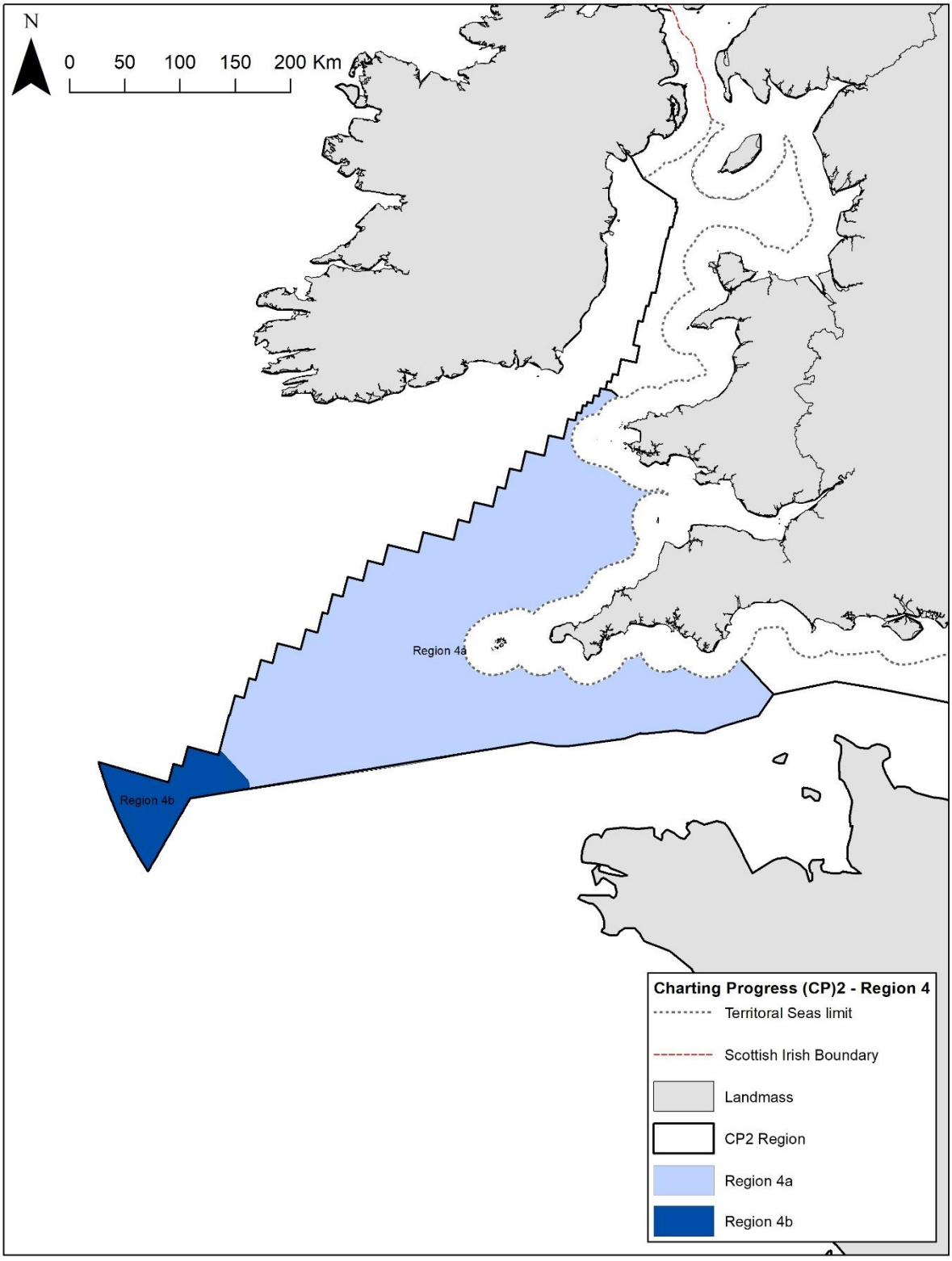

Figure A1.4. Map showing the Western Channel Region and 12nm limit (territorial seas limit). Two subregions are shown 4a (the main subregion) and 4b (an area of deeper water).

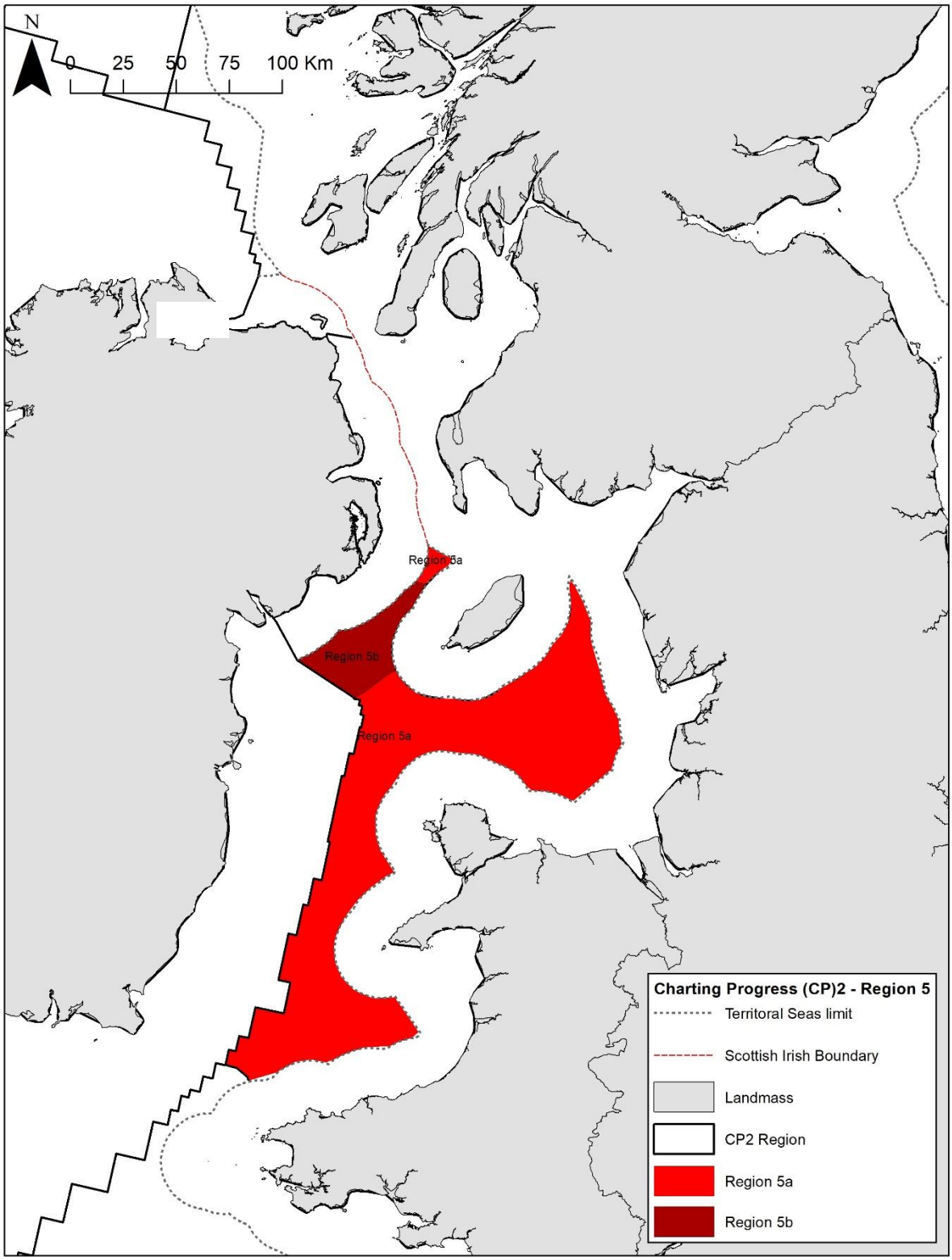

Figure A1.5. Map showing the Irish Sea Region and 12nm limit (territorial seas limit). Two subregions are shown, an area of offshore deep mud (subregion 5b) and the main part of the region outside of this (subregion 5a).

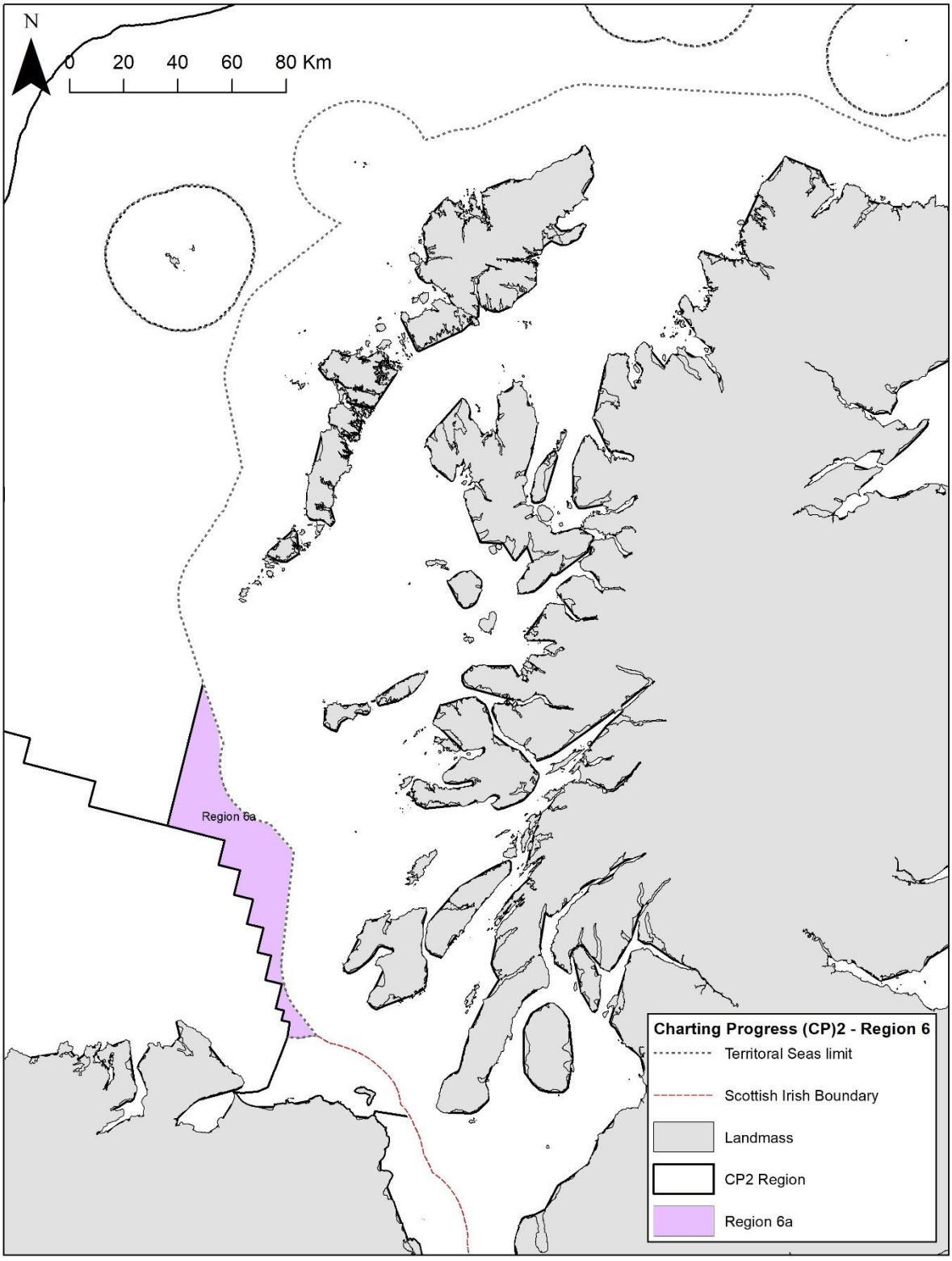

Figure A1.6. Map showing the Minches and Western Scotland Region and 12nm limit (territorial seas limit). The subregion 6a is shown which has been separated by the offshore boundary.

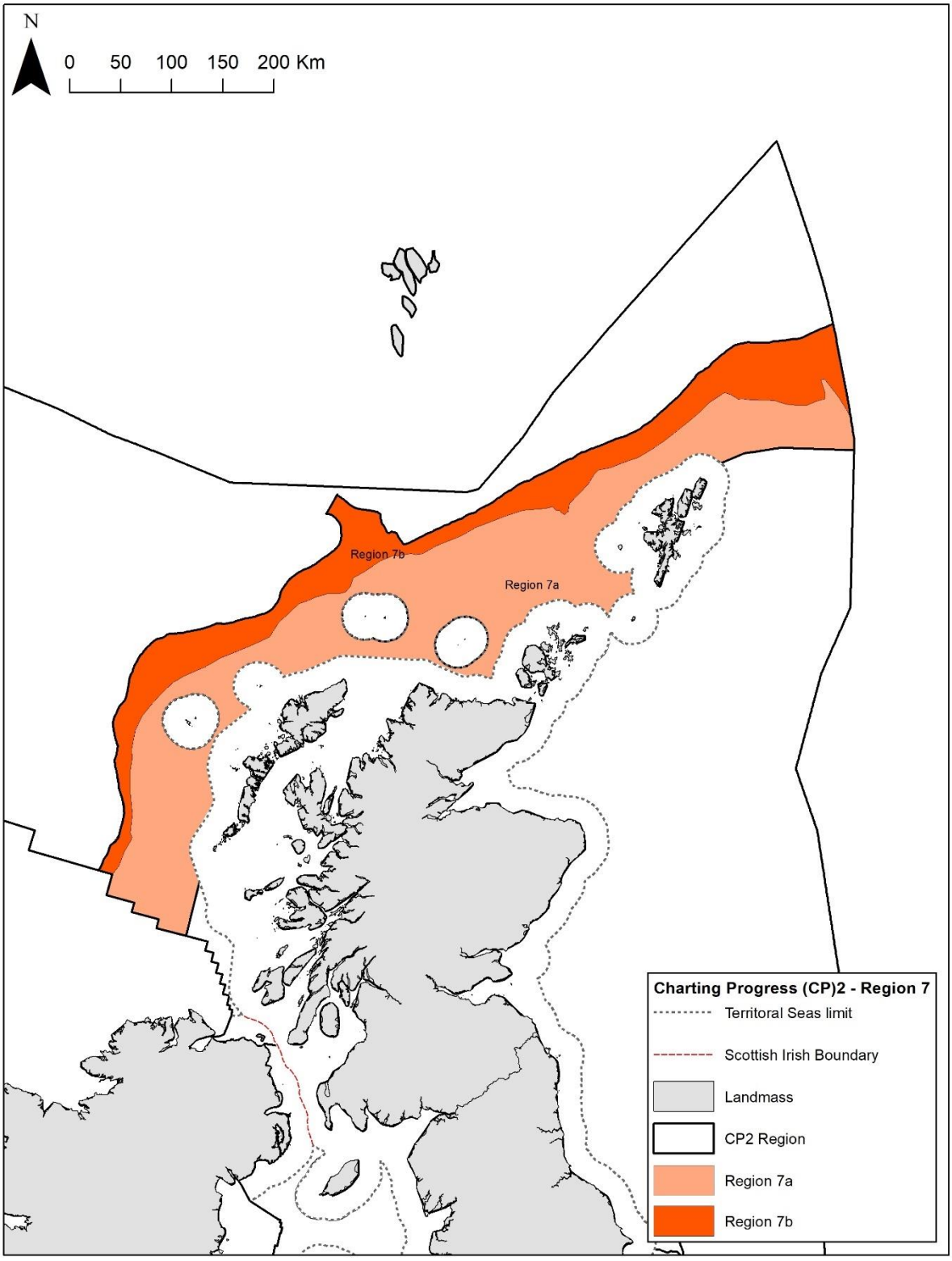

Figure A1.7. Map showing the Scotland Continental Shelf Region and 12nm limit (territorial seas limit). Two subregions are shown, subregion 7a and the outer subregion 7b.

Appendix 2: Key Characterising Species

Table A2.1. Key characterising species records checked on NBN and associated EUNIS biotopes.

Species	EUNIS Biotopes
Abra alba, Nucula nitidosa	A5.261
Abra prismatica and *Bathyporeia elegans*	A5.25
Amphiura brachiata	A5.262
Amythasides macroglossus	A5.151
Arenicola marina	A5.243
Branchiostoma lanceolatum	A5.145
Brissopsis lyrifera	A5.363
Caryophyllia smithii	A4.2146
Cerianthus lloydii	A5.441 & A5.4411
Crepidula fornicata	A5.431
Echinorcardium and *Ensis*	A5.241
Echinocyamus pusillus	A5.251
Eunicella verrucosa	A4.1311
Halcampa chrysanthellum and *Edwardsia timida*	A5.132
Lagis koreni	A5.355
Laminaria ochroleuca	A3.1153
Lanice conchilega	A5.137
Lithothamnion glaciale	A5.51
Lithophyllum fasciculatum	A5.51
Lophelia pertusa	A5.631
Maldane sarsi, Eudorellopsis deformis	A5.271
Musculus discors	A4.242
Myrtea spinifera	A5.377
Nemertesia spp	A5.4411
Neocrania anomala	A4.31 biotope complex
Neopentadactyla mixta	A5.144
Ocnus planci	A5.344
Ophiothrix fragilis *Ophiocomina nigra*	A5.445 and A4.212
Ostrea edulis	A5.435
Paracentrotus lividus	A3.114
Pentapora spp. and *Pentapora foliacea*, *Porella compressa.*	A4.212
Pecten maximus, *Aequipecten opercularis*	A5.146
Phymatolithon calcareum	A5.51
Protodorvillea kefersteini	A5.143
Sabella pavonina	A5.432
Spisula subtruncata	A5.244
Swiftia pallida	A4.133
Virgularia mirabilis, Pennatula phosphorea, Funiculina quadrangularis	A5.354 A5.36 and sub-biotopes
Venerupis senegalensis (as *Venerupis corrugata*)	A5.433