



Assessing progress towards an ecologically coherent network of MPAs in Secretary of State Waters in 2014

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Executive summary

In autumn 2014, Defra asked JNCC to review progress towards the Marine Protected Area network assuming a second tranche of MCZs are designated in 2015 to inform a decision on whether any further MPAs might be required beyond 2015 to meet national and international policy commitments.

JNCC reviewed the currently available information for MPAs in autumn 2014. All assessments of progress towards MPA network commitments were undertaken against the biogeographic regions defined by the Charting Progress 2 project (CP2). Following our review in 2014, JNCC note that designating all the sites and features selected for consultation in 2015 as a second tranche of MCZs would make notable progress towards meeting policy commitments for a network of MPAs in Secretary of State waters. Many of the 'big gaps' identified in JNCC's 2013 assessment would be filled and the network would be well connected in UK waters. However, JNCC identified some remaining shortfalls in the CP2 regions:

- In the Northern North Sea CP2 region there remains a shortfall in the protection of low energy circalittoral rock, which currently is not protected at all within the existing MPA network. There is also a shortfall in the proportion of subtidal sand and subtidal mud protected in the region, with both of these habitats being represented at less than the minimum recommended 10% of known extent.
- In the Southern North Sea CP2 region, there appear to be no shortfalls for broadscale habitats meeting the criteria of representativity, replication and adequacy. However, only a very small proportion of the subtidal coarse sediment, subtidal sand, subtidal mud and subtidal mixed sediments present on the deeper shelf area of the region protected in the existing network.
- In the Eastern Channel CP2 region there remains a shortfall in the protection of low energy circalittoral rock, which is not currently protected at any site within the existing MPA network. There is therefore also a shortfall in the proportion of low energy circalittoral rock protected in the region as well as shortfalls in the proportions of subtidal sand, subtidal mud and subtidal mixed sediments protected in the region with all of these habitats being represented at less than the minimum recommended 10% of known extent.
- In the Western Channel and Celtic Sea CP2 region there remains a shortfall in the protection of sufficient replicates of deep-sea bed habitat within the existing MPA network. There is also a shortfall in the proportion of low energy circalittoral rock and subtidal sand protected in the region with both of these habitats being represented at less than the minimum recommended 10% of known extent.
- In the Irish Sea CP2 region there remains a shortfall in the proportion of moderate energy circalittoral rock protected in the network with less than the minimum 10% of known extent being protected.
- Many Features of Conservation Interest remain under represented and/or insufficiently replicated within all of the CP2 regions. However, there are existing site options available and/or records in the wider CP2 region that could address these shortfalls.

Although there appear to be relatively few shortfalls when the MPA network in the CP2 regions is assessed against the high level criteria used in this assessment, JNCC completed

a further more detailed analysis to consider the likely representation of the more detailed biotopes known to occur within each region. Our results showed that at the time of the assessment it is very unlikely that the broadscale habitats within the MPA network will sufficiently reflect the range of marine flora and fauna in Secretary of State waters, with the subtidal habitats on the deeper shelf areas most under-represented. JNCC recommend that Defra not only focus on addressing the remaining shortfalls highlighted by the high level criteria but also consider whether a range of finer scale habitats should be included in the network to better reflect the full range of habitats within Secretary of State waters. JNCC suggest that any selection process for site options to address shortfalls also considers which options can best contribute to capturing the full range of finer scale biotopes known to occur within Secretary of State waters.

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1 Background

In 2012 Defra and the Devolved Administrations published a statement on the expected UK contribution to an ecologically coherent MPA network in the north-east Atlantic¹. The statement noted that:

“UK Governments have committed to providing a contribution to an ecologically coherent MPA network in the North East Atlantic, in accordance with the OSPAR Convention which is an evolving scientific concept. The OSPAR Commission guidance outlines five main elements to assist in interpreting the concept of an ecologically coherent MPA network. The principles which underpin an ecologically coherent network are widely accepted and supported by the scientific community and by the administrations.”

The five main OSPAR principles guiding the process are:

Features: *Sites should represent the range of species, habitats and ecological processes in the area. The proportion of features included in the MPA network should be determined on a feature-by-feature basis, considering whether features that are in decline, at risk or particularly sensitive are of a higher priority and would benefit from a higher proportion being protected by MPAs.*

Representativity: *To support the sustainable use, protection and conservation of marine biological diversity and ecosystems, areas which best represent the range of species, habitats and ecological processes.*

Connectivity: *This may be approximated by ensuring the MPA network is well distributed in space and takes into account the linkages between marine ecosystems.*

Resilience: *Adequate replication of habitats, species and ecological processes in separate MPAs in each biogeographic area is desirable where possible. The size of the site should be sufficient to maintain the integrity of the feature for which it is being selected.*

Management: *MPAs should be managed to ensure the protection of the features for which they were selected and to support the functioning of an ecologically coherent network. In autumn 2013, Defra asked JNCC to identify any ‘big gaps’ in the existing network to inform Defra’s decisions on a second tranche of Marine Conservation Zones (MCZs) for consultation and then potential designation in 2015. JNCC used information that had been compiled in summer 2013 as part of a UK MPA Stock-take to complete an assessment of ‘big gaps’². All conclusions and subsequent advice only related to English territorial waters and UK offshore waters around England, Wales and Northern Ireland – the Secretary of State waters. However, the assessment did use information from Welsh, Northern Irish and Scottish waters when assessing progress towards the MPA network commitments.*

¹ Joint Administrations Statement. 2012. UK Contribution to Ecologically Coherent MPA Network in the North East Atlantic. Available online at: <http://www.scotland.gov.uk/Resource/0041/00411304.pdf>

² Identifying the remaining MCZ site options that would fill big gaps in the existing MPA network around England and offshore waters of Wales & Northern Ireland. Available at: <http://jncc.defra.gov.uk/page-6658>

Defra reviewed the information available, including the advice on 'big gaps', to select a 'long-list' of recommended MCZs to go forward into the second Tranche. JNCC and Natural England provided scientific advice on these sites in July 2014. Using the available scientific and socio-economic information, Defra decided on a final list of sites and associated features for the second tranche of MCZs that will go forward into a public consultation and possible designation in 2015.

In autumn 2014, Defra asked JNCC to review progress towards the MPA network assuming the second tranche of sites are designated with a view to deciding on whether any further MPAs might be required beyond 2015 to meet national and international policy commitments. The current report summarises the outcome of JNCC's assessment of progress and provides advice on possible options to fill any remaining shortfalls.

2 Identifying the remaining gaps in the network

In 2013, JNCC developed the approach to identify potential "big gaps" in the network based on criteria that took into account both the OSPAR MPA network principles - where appropriate information was available, together with wider guidance published by the OSPAR Commission. The criteria were considered the minimum necessary to identify potential "big gaps" within the existing MPA network in Secretary of State (SoS) waters; intertidal areas were excluded from the process since appropriate information was not available. JNCC reviewed these criteria for this 2014 assessment that resulted in some slight modifications. The revised criteria are still based on the OSPAR principles of 'Features', 'Representativity', 'Resilience' and 'Connectivity' in line with the joint Administration statement. JNCC provided detailed advice to Defra ahead of gaining their agreement on the criteria set out below. Further detailed information is also provided in [Annex 1](#).

2.1 Assessing features

For the purposes of the 2014 assessment, a gap exists in the network if any of the following criteria are *not* met:

- **Two examples of each subtidal broadscale habitat feature (EUNIS Level 3) are protected within each Charting Progress 2 region:**
 - Ensures that all broadscale habitats (equivalent to the current EUNIS Level 3 habitats) are represented within the network in each biogeographic region. This is relevant to the OSPAR principle of representativity; and
 - Ensures a degree of replication of broadscale habitats within the network. This is relevant to the OSPAR principle of resilience.

- **Three examples of each Feature of Conservation Importance (FOCI) are afforded protection in each Charting Progress 2 region:**
 - Ensures that rare and threatened species and habitats are afforded specific protection within the network, which is relevant to the OSPAR features principle; and,
 - Helps ensure replication of rare and threatened species and habitats within the network, which is relevant to the OSPAR resilience principle.

There is an important exception to this criterion when a FOCI comes from the OSPAR list of Threatened and Declining (T & D) species or habitat. The OSPAR Commission recognises that some of these listed features may not be threatened or

declining in each OSPAR area. In any cases where a FOCl is not considered threatened and/or declining in a CP2 region, there will be no requirement for enhanced replication and only two replicates will be required for that region.

- **10% by area of each subtidal broadscale habitat occurring in each Charting Progress 2 region is included within the network:**
 - The proportion of each broad scale habitat afforded protection within the network is relevant to the OSPAR features principle.
- **Sites affording protection to the same habitat at EUNIS Level 2 are not further than 80km apart from each other:**
 - Applying a basic distance separation criterion increases the likelihood that sites with similar features are ecologically connected to each other, which is relevant to the OSPAR connectivity principle.

Meeting these criteria alone will not necessarily ensure the MPAs in that area make an appropriate 'full' contribution to the creation of an ecologically coherent network of MPAs. It should also be noted that the questions above do not address all aspects of the OSPAR MPA network principles, for example, the current analysis has not assessed whether the MPAs "best represent" the range of habitats and species as required by the OSPAR principle of representativity. Broad-scale habitats (EUNIS level 3) have been used as a proxy to try to represent the full range of features within our seas. JNCC have provided more detailed advice on whether we felt that the examples of broad-scale habitats protected within existing sites adequately afford protection collectively to the range of more detailed biotopes under each broad-scale habitat in the EUNIS habitat classification hierarchy known to occur in each CP2 region. Taking this extra level of detail in account enabled JNCC to assess the likelihood of the existing sites representing the range of marine flora and fauna known to occur within SoS waters.

OSPAR guidance on developing an ecologically coherent network of MPAs suggests that '*Contracting Parties may wish to include 20% of the total extent of each EUNIS level 3 habitat or species population (where considered appropriate) with at least 10% included within the network*'. JNCC has also provided more detailed advice on the progress towards the broad-scale habitat features meeting the 20% (by area) recommendation by the OSPAR Commission.

2.2 Assessing site options

JNCC reviewed each site option³ against the following six questions:

- Does the site fill a current gap within the CP2 region for a broadscale habitat feature (i.e. there are currently **no** examples of that feature protected in the region)?
- Does the site provide a replicate within the CP2 region for a broadscale habitat feature (i.e. there is currently **only one** existing example of that feature protected in the region)?

³ Site options are described in Section 3.3 but are only designated MCZs or remaining recommended MCZs

- Does the site fill a current gap within the CP2 region for a FOCI feature (i.e. there are currently **no** examples of that feature protected in the region)?
- Does the site provide a replicate within the CP2 region for a FOCI feature (i.e. there is currently **only one** existing example of that feature protected within the region)?
- Does the site help contribute to at least 10% (by area) of the broadscale habitat feature within the CP2 region being afforded protection within MPAs?
- Does the site fill a spatial gap in the network?

The answers to these six questions were combined to determine whether the site could contribute to filling a remaining gap in the network. A commentary was drafted to explain the reasoning behind the response to the simple question “Does this site fill a gap in the network?”. Generally speaking, the justifications behind the answers are:

- **Yes:**
 - The site is the only option in the CP2 region to fill a gap for a feature, or one of only two options where both are required (i.e. there are no sites currently designated in the region for that feature).
 - The site offers a combination of features that would fill several gaps within the CP2 region.
 - The site is one of the three most important in the CP2 region for its contribution to the total quantity of a feature being afforded protection.
 - The site is the only option to fill a spatial gap in the network.
- **Maybe:**
 - The site would provide an adequate contribution to fill a gap in the CP2 region but there are other options available.
- **No:**
 - The site doesn't fill any gaps.
 - The site fills small gaps but doesn't provide a major contribution (for example, the site would help towards increasing the percentage of habitats afforded protection within the network but not by a large amount).
 - The site fills gaps but there are many other sites available that could fill the same gap, and would be better options (i.e. help to fill more gaps).

In certain circumstances, a degree of expert judgement was applied to the general principles outlined above. Any such case was explained within the site commentary.

3 Information included within the assessment

The UK MPA stock-take will not be completed until later in 2015 and therefore appropriate data were only available for some of the existing MPA designations – namely the SACs, MCZs and the NCMPAs in Scotland. Only these three designation types were considered in the current assessment. Consequently it was not been possible to assess the full set of features and to take account of all of the existing sites present within the UK MPA network. Importantly, there were limited data available for MPAs that protect substantial areas of the intertidal zone (such as Sites of Special Scientific Interest). JNCC decided that an assessment of big intertidal gaps would provide an unrealistic picture of the current levels of protection within the network. Consequently, the assessment focussed on identifying big gaps for subtidal features within the network as outlined below.

3.1 Features

JNCC assessed:

- Subtidal EUNIS Level 3 habitats (A3 Infralittoral rock and other hard substrata, A4 Circalittoral rock and other hard substrata, A5 Sublittoral sediment, A6 Deep-sea bed); and
- Features of Conservation Importance (FOCI).

EUNIS Level 3 habitats were originally selected as MCZ broad scale habitat features as a proxy to ensure that the range of biodiversity within SoS waters would most likely be represented within the MPA network. However, some Level 3 habitats occur across a range of physical conditions resulting in many detailed biotopes present at EUNIS Level 4 and beyond. If there are only a limited number of MPAs for a EUNIS Level 3 habitat, there is a reasonable likelihood that the range of more detailed biotopes known to occur within that Level 3 class would not be encompassed within a few sites. To better represent the full range of biodiversity within the network, the current assessment considered the presence of EUNIS Level 3 habitats within sites across the biological zones from EUSeaMap⁴. These zones divide the subtidal region into the shallow and the deeper areas of the continental shelf.

As the assessment was based on the MCZ features, the listed features within the Special Areas of Conservation and the Scottish Nature Conservation MPAs were translated to their equivalent 'MCZ feature'. The information used for the 2014 work on feature presence within these existing MPAs comprised the information from the UK MPA stock-take in autumn 2013, where the data for Welsh inshore SACs and offshore SACs in relevant CP2 regions were reviewed and updated in 2014.

3.2 Regions

OSPAR guidance suggested the network should take biogeographic variation into account when considering features. In line with the approach taken for the 2013 'Big Gaps' assessment, the current work used the Charting Progress 2 (CP2) reporting regions that overlap with Secretary of State waters as the biogeographic regions for MPA network assessment (see Figure 1). These regions are:

- Northern North Sea;
- Southern North Sea;
- Eastern Channel;
- Western Channel and Celtic Sea;
- Irish Sea.

The Northern North Sea includes both Scottish and English waters, the Western Channel and Celtic Sea includes both English and Welsh waters and the Irish Sea includes English, Welsh, Northern Irish and Scottish waters. Consequently, there are MPAs outside of Secretary of State waters whose data have been included within the assessment.

⁴ EUSeaMap. Available online at: <http://jncc.defra.gov.uk/page-5020>

3.3 MPAs used for the assessment

The MPAs included within the current assessment were:

- Special Areas of Conservation (SACs);
- Marine Conservation Zones (MCZs);
- Nature Conservation MPAs (NCMPAs).

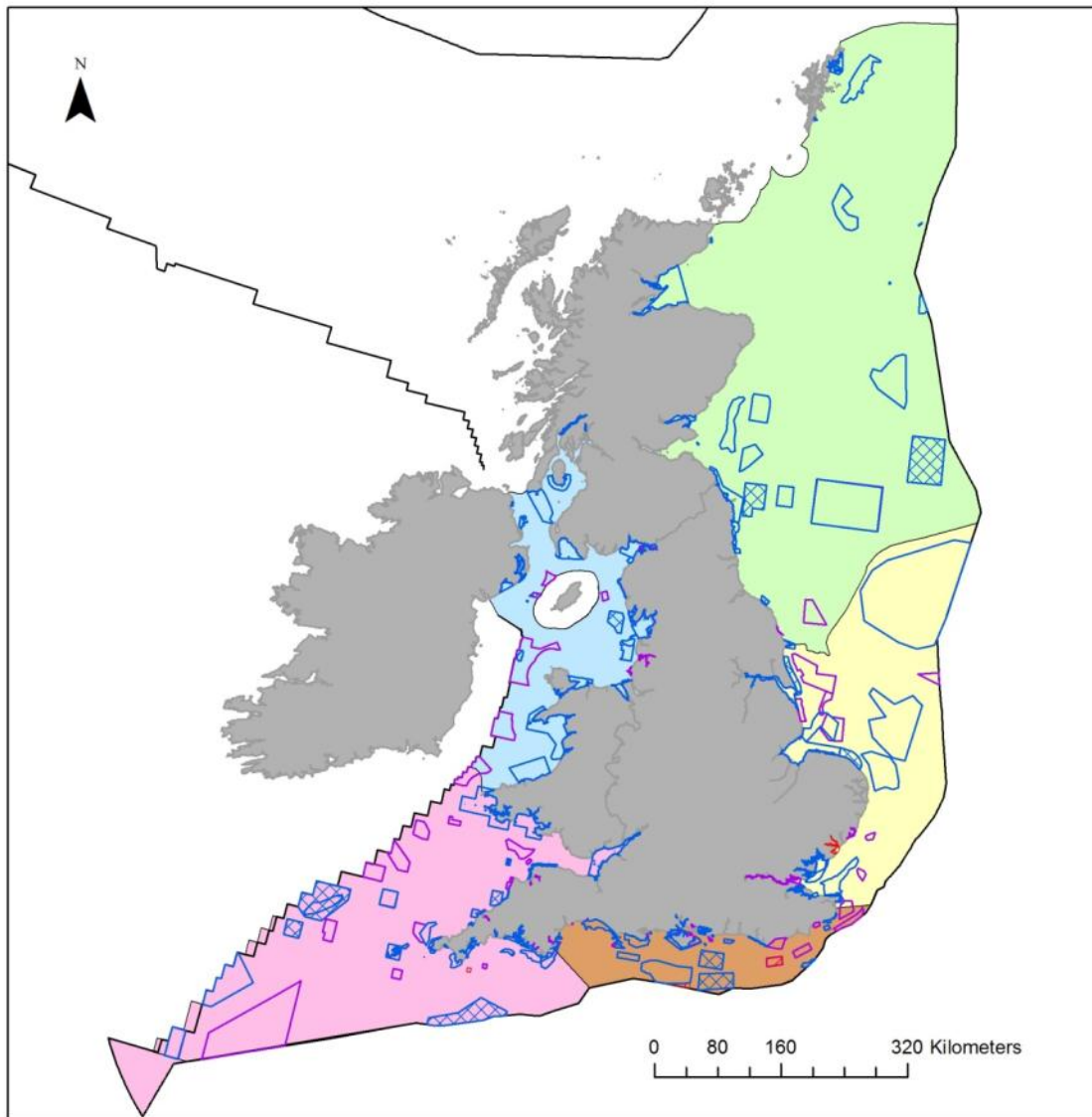
These sites are shown in Figure 1. Data are not yet available for other types of MPA, which was the same situation as the 2013 'Big Gaps' assessment.

For the purposes of this 2014 assessment, ***all sites and features being considered for designation in tranche 2 were treated as designated***. If any of these sites or features are not designated later in 2015 there may be implications for the results of this current analysis and, in some cases, the criteria may no longer be met.

The following MPAs were not included within the current assessment:

- Special Protection Areas (SPAs) – there has not yet been a site-by-site assessment undertaken to identify any non-avian marine features that might be afforded protection within each SPA;
- Sites of Special Scientific Interest/Areas of Special Scientific Interest –there is not yet an agreed UK list of *SSSIs/ASSIs with marine components* nor a site-by-site assessment to identify those marine habitat and/or species features that may be afforded protection within each SSSI/ASSI;
- Ramsar Sites –there is not yet an agreed UK list of *Ramsar Sites with marine components* nor a site-by-site assessment to identify those marine features that might be afforded protection within each Ramsar Site.

As these three types of designation afford protection to substantial areas of the intertidal zone, JNCC decided that an assessment of intertidal areas in advance of the incorporation of existing intertidal sites would provide an unrealistic picture of the current levels of protection within the network. Consequently, the 2014 assessment focussed on identifying big gaps for subtidal broadscale habitats and FOCl within the network. It should also be noted that some SPAs and Ramsar sites may offer some protection to subtidal features. However, the focus of any management in a SPA will be the avian features and may not fully protect any habitat or other species features.



- Existing Sites (SAC's, MCZ's, NCMPAS)
- MCZ (T2)
- Recommended Marine Conservation Zones
- MCZs not included in the assessment
- UK & Ireland
- UK Continental Shelf Designated Area

CP2 Reporting Regions

- Eastern Channel
- Irish Sea
- Northern North Sea
- Southern North Sea
- Western Channel & Celtic Sea



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Figure 1. Map outlining the regions and MPAs included within the analysis. Note there are further MPAs in northern and western waters of the UK, and in waters around the Isle of Man that were not included in the present analysis.

3.4 Options considered to address gaps

Defra asked JNCC to consider options that could potentially address any shortfalls identified within the existing network. The MCZ site options included within the assessment were:

- Features present within but not currently protected in existing MCZs (designated in 2013);
- Features present in recommended MCZs (rMCZ) that were not designated in November 2013 nor included in the second tranche of MCZs currently being considered potential designation in 2015; and,
- Features present within but not currently proposed for designation in the rMCZs in the second tranche.

The location of these sites is shown in Figure 1.

The additional features that these sites could contribute to the network have come from information provided by both Natural England and JNCC, either based on recommendations from the regional MCZ projects or from more recent survey work. For the purposes of this present analysis, we have assumed that those features would be of a suitable quality and provide a viable replicate within the MPA network if designated. Additional work to assess feature viability or quality at the site level to determine whether the feature is actually fit for designation within the MCZ has not been undertaken.

Those rMCZs that Defra have previously indicated will definitely not progress to designation were excluded from the current 2014 assessment. These sites are East Meridian, Hilbre Island Group, South of Falmouth, Stour and Orwell and Wight-Barfleur Extension.

3.5 Limitations of the information included within the assessment

JNCC identified the following limitations with the information currently available to inform the assessment:

- The analysis did not incorporate intertidal broadscale habitats into the analysis, and therefore could not identify any site options for potential gaps in intertidal broadscale habitats.
- For any FOCl that may be present in the intertidal or the subtidal zone, the 2014 analysis may be identifying gaps where those features are already afforded adequate protection within the region's intertidal areas by SSSIs/ASSIs, SPAs or Ramsar sites.
- The analysis did not consistently review habitat patch size or species population size to determine whether all sites flagged as potential replicates for a feature would actually be viable replicates. Therefore, the results could erroneously indicate that features are adequately represented in the network when some examples may not be viable due being only small patches of habitats or small numbers of individuals being present. Further work on feature viability is required to check any site selected offers a viable contribution to the network.
- The current assessment used a collation of the work undertaken by each of the administrations for their own network reporting in December 2012⁵. Work is ongoing

⁵ JNCC and Natural England. 2012. Marine Conservation Zone Project: JNCC and Natural England's advice to Defra on recommended Marine Conservation Zones. Peterborough and Sheffield. Available online from:

to ensure the UK MPA 'stock-take' data are fully comparable between administrations to create a UK-wide dataset based on a common approach, particularly with regards to compiling a standardised UK-wide dataset on which MCZ broadscale habitats and MCZ FOCI features are afforded protection within other MPAs.

- The site options incorporated into the assessment relied on the list of features recommended by the regional MCZ projects and any new features identified through survey. If the information available on the features present within the sites changes following further survey, so too will any information on what gaps in the network those sites are appropriate to fill.

4 Method for assessing site options

JNCC reviewed each site option against six questions. The following section outlines the methodology followed for these questions.

The first two questions considered the protection of broadscale habitats within the network:

- Question 1: Does this site fill a current gap within the CP2 region for a broadscale habitat feature (i.e. there are currently no examples of that feature protected in the CP2 region)?
- Question 2: Does this site provide a replicate within the CP2 region for a broadscale habitat feature (i.e. there is currently only one example of that feature protected in the CP2 region)?

A representativity table was created for each subtidal broadscale habitat feature⁶ containing all the existing sites and site options divided by CP2 region. Each feature was considered individually within each CP2 region to establish any remaining shortfalls in occurrence of the feature within the sites.

In the cases where a site straddles the boundary between two CP2 regions, the mapped location of broadscale habitat features within the site was taken into account to determine for which region(s) the site should count as a replicate/site option for each feature. Any overlap in the boundaries of sites has also been considered when determining the total number of replicates and options available for a feature within a region.

If there were currently no sites within the region affording protection to a broadscale habitat feature then a shortfall was identified and any site options that could fill that gap were flagged (Question 1). In these circumstances, if sufficient site options were available, two sites would need to be designated to meet the minimum network criteria of two examples per region.

<http://www.ccg.gov.uk/landscape--wildlife/managing-land-and-sea/marine-policies/planning--management/marine-protected-areas.aspx>

Scottish Natural Heritage and the Joint Nature Conservation Committee. 2012. Advice to the Scottish Government on the selection of Nature Conservation Marine Protected Areas (MPAs) for the development of the Scottish MPA network. Scottish Natural Heritage Commissioned Report No. 457. Available online from: <http://jncc.defra.gov.uk/page-5510>
Countryside Council for Wales (CCW), 2012. Welsh Marine Protected Areas: Contribution to the UK Network; CCW Report to Welsh Government to Support Government's Marine Protected Area reporting duty under section 124 of the Marine and Coastal Access Act (2009).

⁶ Map data are stored as EUNIS Level 3 habitats and thus the results for the broadscale habitats were presented as their equivalent EUNIS habitat: A3.1, A3.2, A3.3, A4.1, A4.2, A4.3, A5.1, A5.2, A5.3, A5.4, A5.5, A5.6 and A6.

If there was currently one site within the region affording protection to a broadscale habitat feature, a replicate was required to meet the minimum network criteria of having two examples per region. Site options that could provide that replicate were flagged (Question 2).

JNCC also considered the likelihood of whether the range of more detailed biotopes (EUNIS level 4 & beyond) within a broadscale habitat are likely to be protected in the existing MPA network. Two aspects were considered for each CP2 region: firstly reviewing whether the replicates of the features occurred in different EUSeaMap biological zones (Shallow, Shelf, Bathyal)⁷; and secondly, reviewing sample biotope assignments in the Marine Recorder database and the modelled distribution EUNIS level 4 habitats by the EUSeaMap project.

Limitations:

- It was not always possible to consider whether a feature that occurs in an area of a SAC overlapping with an MCZ should be treated as one or two separate replicates. As such there could be some double counting within the results. Such instances for broadscale habitats were checked and did not have any significant implications for whether or not replication targets were met. However it was not possible to check such double counting for FOCI.

The next two questions considered the protection of habitat and species FOCI:

- Question 3: Does this site fill a current gap within the CP2 region for a FOCI feature (i.e. there are currently no examples of that feature protected in the region)?
- Question 4: Does this site provide a replicate within the CP2 region for a FOCI feature (i.e. there is currently only one example of that feature protected within the region)?

To answer these questions, information on the FOCI protected within existing sites and remaining site options were considered for each CP2 region. The MCZ Project Ecological Network Guidance⁸ recommended three to five replicates of FOCI within the network. Enhanced replication of FOCI (for example, those listed as an OSPAR Threatened and/or Declining habitats and species or features in the NERC Act 2006), within each CP2 region will reflect their conservation status and increase resilience across the network. Work progressed through OSPAR⁹ has also recommended a minimum of three replicates for threatened and declining habitats and species within a given biogeographic region. This recommendation of three replicates was applied to all FOCI apart from in those cases where an OSPAR T&D species or habitat was not listed as T&D within an OSPAR regional sea (I, II, III, IV and V) which overlaps wholly or partially with a CP2 region in Secretary of State waters. In such cases only two replicates would be needed to meet network criteria (see [Annex 2](#)).

Where a FOCI was not protected by any sites within the existing MPA network in the region, a shortfall was identified and the remaining site options that could fill the gap were flagged

⁷ EUSeaMap. Available online: <http://www.emodnet-seabedhabitats.eu/default.aspx?page=2024>

⁸ Available at: http://jncc.defra.gov.uk/PDF/100705_ENG_v10.pdf

⁹ OSPAR. (2008). A matrix approach to assessing the ecological coherence of the MPA network. Available at: http://jncc.defra.gov.uk/pdf/0506_UK_OSPARMPAsEcoCoherenceAssessmt.pdf

(Question 3). In such circumstances, if sufficient options were available, two or three sites would need to be designated to meet the minimum network criteria.

If a FOCI was currently protected by only one or two sites within the region then it was identified that a replicate(s) was required to meet the minimum network criteria of two or three examples per region. Possible site options that could provide that replicate were flagged (Question 4).

Additionally, if none of the remaining site options could address any gaps identified then the available data were checked for records of the feature occurring within the wider CP2 region out with of current existing or recommended sites. For the northern North Sea and Irish Sea CP2 regions, these data covered the whole region including Scottish and Northern Irish waters, recognising that Defra could only take forward any new sites for records of the features within Secretary of State waters.

Limitations:

- It was not always possible to consider the distribution of FOCI within sites that straddle two CP2 regions to identify where the feature occurs and whether this is within just one CP2 region or both. In such cases, the site was considered to contribute to replication in both CP2 regions.
- For FOCI that could also occur in the intertidal zone, the analysis may be identifying gaps where those features are already afforded adequate protection within the region by SSSIs/ASSIs, SPAs or Ramsar sites.

The next question considered the degree to which the existing sites protect a proportion of the known distribution of each feature within each CP2 region:

- Question 5: Does this site help contribute to ensuring that at least 10% of the EUNIS Level 3 feature within the CP2 region is afforded protection within MPAs?¹⁰

JNCC calculated the area of each subtidal broadscale habitat¹¹ present within each CP2 region, the area of that habitat that was already afforded protection within existing MPAs and the area of that habitat that would be added to the network by each site option¹². The main source of habitat data was a draft version (dated 1st October 2014) of the *EUNIS level 3 seabed habitat map integrating data originating from maps from field surveys and the EUSeaMap model* (henceforth called the 'Combined Map'). The Combined Map was used to calculate habitat cover within MPAs (SACs, NCMPAs, MCZs and rMCZ/MCZ site options) and to habitat cover outside of MPAs at the regional scale. The 'stock-take' data on the EUNIS Level 3 habitats afforded protection by each site was used to ensure that features were excluded if they occurred in MPAs but were not formally protected. The areas of EUNIS Level 3 habitats afforded protection in overlapping MPAs were included only once.

To determine any shortfalls in adequacy for each CP2 region, habitat features were assessed against two criteria:

¹⁰ A more technical description of the methodology used to undertake the area assessment is provided within Annex 1 for anyone wishing to repeat the analyses.

¹¹ Represented as the equivalent EUNIS Level 3 habitats in the data

¹² Area estimates were calculated in Albers Equal Area Conic Projection.

- less than 10%¹³ of the mapped subtidal broadscale habitat feature in the CP2 region is currently protected in existing SACs, NCMPAs and MCZs.
- less than 20% of the mapped subtidal broadscale habitat feature in the CP2 region is currently protected in existing SACs, NCMPAs and MCZs.

In some cases these criteria may not have been met but a shortfall was not flagged. Such examples were either because it is very likely (based on available evidence) that remaining, viable and unprotected patches only occur outside of Secretary of State waters, or the area of the habitat found within the region is minute (for example only a patch of 0.01 km² recorded).

Some limitations were identified with the approach described above:

- The Combined Map includes large areas where the habitat distribution is derived from a habitat model or interpolating widely spaced data, and where there may be limited groundtruthing and/or acoustic data.
- Some broadscale habitats recommended for designation in the site options were not shown within the site in the Combined Map since their data have yet to be added to the source data sets of the map; these features' adequacy could not be assessed. Consequently, the absence of these 'missing' habitats will have resulted in an under estimation of their extent, and hence a corresponding over estimation of the habitat(s) that were shown in the maps.
- The Combined Map is a broad-scale map with a coarse spatial resolution. Habitats typically occurring at a fine scale (e.g. A5.5 Sublittoral macrophyte-dominated sediment) are likely to be under-represented in these maps and their extent would therefore be underestimated in the analysis. For this reason the following were features were not assessed in terms of adequacy:
A3.7 Features of infralittoral rock; A4.7 Features of circalittoral rock; A5.5 Sublittoral macrophyte-dominated sediment; A5.6 Sublittoral biogenic reefs; A5.7 Features of sublittoral sediments; A6.6 Deep-sea bioherms; A6.7 Raised features of the deep-sea bed; A6.8 Deep-sea trenches and canyons, channels, slope failures and slumps on the continental slope; and, A6.9 Vents, seeps, hypoxic and anoxic habitats of the deep sea
- The analysis assumed that where a broadscale habitat was flagged as being afforded protection within an SAC, that the entirety of that habitat was protected within the site boundary. In reality, the broadscale feature will only be afforded protection within the site boundary wherever the Annex I habitat with which it is associated is present. This means that, particularly for larger sites which might have several Annex I habitats, the current assessment may have over-estimated the amount of broadscale habitats (both the number of habitats and the area of habitats) afforded protection within sites.
- The Combined Map does not contain habitat data for the south-western extremity of Secretary of State waters, where the UK continental shelf (UKCS) was extended in March 2014. An area of approximately 2,400 km² (2.5% of the Western Channel and Celtic Sea region) lacks data, which includes either bathyal or abyssal habitats (EUNIS A6).

¹³ The 10% level was identified by the OSPAR Commission (2006) as guideline minimum for representation of EUNIS level 3 habitats in the OSPAR MPA network. OSPAR Commission (2006). Guidance on developing an ecologically coherent network of OSPAR marine protected areas. No. 2006-03.

The final question considered the degree to which sites with the same broad habitat feature are connected. Technical details of work undertaken to complete area calculations for this question are provided in [Annex 3](#).

- Question 6: Does this site fill a spatial gap in the network?

To answer this question, JNCC created six data layers in ArcGIS to show:

1. Existing sites affording protection to A3 (Infralittoral rock and other hard substrata);
2. MCZ site options that could afford protection to A3 (Infralittoral rock and other hard substrata);
3. Existing sites affording protection to A4 (Circalittoral rock and other hard substrata);
4. MCZ site options that could afford protection to A4 (Circalittoral rock and other hard substrata);
5. Existing sites affording protection to A5 (Sublittoral sediment); and,
6. MCZ site options that could afford protection to A5 (Sublittoral sediment).

Buffers of 40km¹⁴ from the site boundary were calculated for each of the existing MPAs affording protection to either A3, A4 or A5 and expert judgement used to identify by eye any spatial gaps of more than 80km between EUNIS Level 2 habitats in existing sites. Sites were deemed not connected when the buffers between two adjacent existing sites holding the same habitat did not meet. If there was a potential site option available that would allow those buffers to meet and therefore improve connectivity, that site was flagged as an option to fill a spatial gap.

The JNCC Evidence Quality Assurance policy and guidance was applied throughout different stages of this assessment, with quality control checks made to data used in the assessment and quality assurance checks of the results presented in the final products.

¹⁴ The 80km spacing was identified by Roberts et al (2010) as a guideline for the greatest distance between sites supporting similar habitats to ensure sufficient ecological connectivity. Roberts, C.M., Hawkins, J.P., Fletcher, J., Hands, S., Raab, K. and Ward, S. 2010. Guidance on the size and spacing of Marine Protected Areas in England. NECR037, Sheffield: Natural England, 2010. Available at: <http://publications.naturalengland.org.uk/publication/46009>

5 Overview results of the feature protection within each CP2 region

The following table presents an overview of the shortfalls in feature protection against the minimum criteria described in section 2.1 above. The table also indicates where a site option is not currently available to increase the level of protection to meet the criteria. In such cases, it will be necessary to review the data available on the distribution of the features elsewhere in each CP2 region to determine whether a new site option could be developed to provide the degree of protection required¹⁵. For some broadscale habitats the replication criteria have been met and so no shortfall is shown in this table, however JNCC’s assessment looking at the likely finer scale habitats within these replicates may have identified a potential lack of representation of the wider range of biotopes available within this broadscale habitat. Any such cases are described in the text following Table 1. Note that any FOCI which also occur in the intertidal zone may have a shortfall but could be afforded adequate protection within the region by SSSIs/ASSIs, SPAs or Ramsar sites.

Table 1: A summary of the shortfalls identified in feature protection within the MPA network in each CP2 region. This table incorporates the results from Questions 1-5. Broadscale habitats and FOCI have been split into two groups depending on whether gaps can be addressed by remaining site options or a gap cannot be filled by any remaining MCZ site options in the CP2 region but the feature is present within the region in Secretary of State waters. Note where a shortfall has been flagged in a CP2 region, the site options identified to address the shortfall are only drawn from Secretary of State waters.

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
Northern North Sea	<p>Broadscale habitats¹⁶ with site options:</p> <p>Low energy circalittoral rock (currently 0 examples protected by the existing network. There is one site option for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region).</p>	<p>Broadscale habitats with site options:</p> <p>Low energy circalittoral rock (currently 0% protected by the existing network. There is one site option for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider</p>

¹⁵ As SSSI’s and SPA’s were not considered in the assessment it is also worth bearing in mind that there may be replicates already afforded protection by these types of designation.

¹⁶ The full list of EUNIS Level 3 habitats for which MCZs have been recommended can be found within the MCZ Project Ecological Network Guidance. Available at: http://jncc.defra.gov.uk/pdf/100705_ENG_v10.pdf

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>Broadscale habitats without site options:</p> <p>None.</p> <p>FOCI habitats and species¹⁷ with site options:</p> <ul style="list-style-type: none"> • Intertidal under boulder communities (currently only 2 examples protected when 3 are required); • Peat and clay exposures (currently only 1 example protected when 3 are required. There is 1 site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region); 	<p>CP2 region);</p> <p>Subtidal sand (currently 7.3% protected by the existing network. There are 2 site options for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region);</p> <p>Subtidal mud (currently 4.4% protected by the existing network. There are two site options for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region).</p> <p>Broadscale habitats without site options:</p> <p>None.</p>

¹⁷ The full list of FOCI habitats and species for which MCZs have been recommended can be found within the MCZ Project Ecological Network Guidance. Available at: http://jncc.defra.gov.uk/pdf/100705_ENG_v10.pdf

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<ul style="list-style-type: none"> • Ross worm reef (<i>Sabellaria spinulosa</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other potential records of the feature¹⁸ within the wider CP2 region); • Sea pens and burrowing megafauna (currently only 1 example protected when 3 are required); • Sheltered muddy gravels (currently only 1 example protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Tide swept Channels (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely). <p>FOCI habitats and species without site options: The following FOCI are those for which a gap has been identified in relation to the criteria of representation and/or replication and there are no remaining site options but there are records for the feature in the CP2 region:</p> <ul style="list-style-type: none"> • Amphipod shrimp (<i>Gitanopsis bispinosa</i>) (currently 0 examples 	

¹⁸ There are records of the species only and further analysis would be required to determine whether the records meet the criteria for biogenic reef

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>protected when 3 are required).</p> <ul style="list-style-type: none"> • Burgundy maerl paint weed (<i>Cruoria cruoriaeformis</i>) (currently 0 examples protected when 3 are required); • Cold-water coral reefs (currently 0 examples protected when 3 are required); • Common maerl (<i>Phymatolithon calcareum</i>) (currently 0 examples protected when 3 are required); • Estuarine rocky habitats (currently 2 examples protected when 3 are required); • Lagoon sea slug (<i>Tenellia adspersa</i>) (currently 0 examples protected when 3 are required); • Maerl beds (currently 1 example protected when 3 are required); • Native oyster (<i>Ostrea edulis</i>) (currently 0 examples protected when 3 are required); • Spiny lobster (<i>Palinurus elephas</i>) (currently 0 examples protected when 3 are required); • Stalked jellyfish (<i>Lucernariopsis campanulata</i>) (currently 0 examples protected when 3 are required); • Stalked jellyfish (<i>Haliclystus auricula</i>) (currently 0 examples protected when 3 are required); • Subtidal chalk (currently 1 example protected when 3 are required). 	
<p>Southern North Sea</p>	<p>Broadscale habitats with site options:</p> <p>None</p> <p>FOCI habitats and species with site options:</p>	<p>Broadscale habitats with site options:</p> <p>None.</p>

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<ul style="list-style-type: none"> • Fragile sponge and anthozoan communities (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Horse mussel beds (<i>Modiolus modiolus</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Mud habitats in deep water (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Ocean quahog (<i>Arctica islandica</i>) (currently only 1 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Smelt (<i>Osmerus eperlanus</i>) (currently 1 examples protected when 3 are required); • Stalked jellyfish (<i>Lucernariopsis campanulata</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Stalked jellyfish (<i>Haliclystus auricula</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no 	

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>other records for the feature within the wider CP2 region which address this gap completely);</p> <ul style="list-style-type: none"> • Tentacled lagoon worm (<i>Alkmaria romijni</i>) (currently only 2 examples protected when 3 are required); • Tide swept Channels (currently 0 examples protected when 3 are required. There is one site options for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely). <p>FOCI habitats and species without site options: The following FOCI are those for which a gap has been identified in relation to the criteria of representation and/or replication and for which there are no remaining site options but there are records for the feature in the CP2 region:</p> <ul style="list-style-type: none"> • Amphipod shrimp (<i>Gitanopsis bispinosa</i>) (currently 0 examples protected when 3 are required); • Giant Goby (<i>Gobius cobitis</i>) (currently 0 examples protected when 3 are required); • Lagoon sand shrimp (<i>Gammarus insensibilis</i>) (currently 2 examples protected when 3 are required); • Lagoon sea slug (<i>Tenellia adspersa</i>) (currently 0 examples protected when 3 are required); • Native oyster (<i>Ostrea edulis</i>) (currently 2 examples protected when 3 are required); • Sea-fan anemone (<i>Amphianthus dohrnii</i>) (currently 0 examples protected when 3 are required); • Short snouted seahorse (<i>Hippocampus hippocampus</i>) (currently 0 examples protected when 3 are required); • Starlet sea anemone (<i>Nematostella vectensis</i>) (currently 0 examples 	

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>protected when 3 are required);</p> <ul style="list-style-type: none"> Undulate ray (<i>Raja undulata</i>) (currently 0 examples protected when 3 are required). 	
<p>Eastern English Channel</p>	<p>Broadscale habitats with site options:</p> <p>Low energy circalittoral rock (currently 0 examples protected by the existing network. There is one site option for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region).</p> <p>Broadscale habitats without site options:</p> <p>None.</p>	<p>Broadscale habitats with site options:</p> <p>Low energy circalittoral rock (currently 0% protected by the existing network. There is one site option for this feature in the CP2 region which can contribute to filling this gap).</p> <p>Subtidal sand (currently 3.6% protected by the existing network. There are 13 site options for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region);</p> <p>Subtidal mud (currently 1.5% protected by the existing network. There are 5 site options for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region);</p> <p>Subtidal mixed sediments (currently 0.9% protected by the existing network. There are 15 site options for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region)*.</p> <p>Broadscale habitats without site options:</p>

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>FOCI habitats and species with site options:</p> <ul style="list-style-type: none"> • Common maerl (<i>Phymatolithon calcareum</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Estuarine rocky habitats (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Honeycomb worm reefs (<i>Sabellaria alveolata</i>) (currently only 1 example protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Long snouted seahorse (<i>Hippocampus guttulatus</i>) (currently only 1 examples protected when 3 are required); • Maerl beds (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Mud habitats in deep water (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for 	<p>None.</p>

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely);</p> <ul style="list-style-type: none"> • Native oyster beds (<i>Ostrea edulis</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Peacock’s tail (<i>Padina pavonica</i>) (currently 1 examples protected when 3 are required); • Peat and clay exposures (currently only 2 example protected when 3 are required); • Seapen and burrowing megafauna (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Short snouted seahorse (<i>Hippocampus hippocampus</i>) (currently only 2 examples protected when 3 are required); • Spiny lobster (<i>Palinurus elephas</i>) (currently only 1 example protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Stalked jellyfish (<i>Lucernariopsis campanulata</i>) (currently 1 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); • Stalked jellyfish (<i>Haliclystus auricula</i>) (currently 0 examples 	

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely);</p> <ul style="list-style-type: none"> • Tentacled lagoon worm (<i>Alkmaria romijni</i>) (currently only 2 examples protected when 3 are required); • Tide swept channels (currently only 1 example protected when 3 are required). <p>FOCI habitats and species without site options: The following FOCI are those for which a gap has been identified in relation to the criteria of representation and/or replication and for which there are no remaining site options but there are records for the feature in the CP2 region:</p> <ul style="list-style-type: none"> • Couch's goby (<i>Gobius couchi</i>) (currently 1 example protected when 3 are required); • Defolin's lagoon snail (<i>Caecum armoricum</i>) (currently 2 examples protected when 3 are required); • Lagoon Sandworm (<i>Armandia cirrhosa</i>) (currently 2 examples protected when 3 are required); • Lagoon sea slug (<i>Tenellia adspersa</i>) (currently 1 example protected when 3 are required); • Ocean quahog (<i>Arctica islandica</i>) (currently 0 examples protected when 3 are required); • Sea snail (<i>Paludinella littorina</i>)** (currently 1 example protected when 3 are required); • Smelt (<i>Osmerus eperlanus</i>) (currently 0 examples protected when 3 are required); • Starlet sea anemone (<i>Nematostella vectensis</i>) (currently 2 examples 	

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>protected when 3 are required);</p> <ul style="list-style-type: none"> Undulate ray (<i>Raja undulata</i>) (currently 0 examples protected when 3 are required). 	
<p>Western Channel and Celtic Seas</p>	<p>Broadscale habitats with site options:</p> <p>Deep-sea bed (currently 1 example protected by the existing network. There is one site option for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region).</p> <p>Broadscale habitats without site options:</p> <p>None.</p> <p>FOCI habitats and species with site options:</p> <ul style="list-style-type: none"> Burgundy maerl paint weed (<i>Cruoria cruoriaeformis</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap but no other records for the feature within the wider CP2 region which address this gap completely); Common maerl (<i>Phymatolithon calcareum</i>) (currently 1 examples protected when 3 are required); Giant goby (<i>Gobius cobitis</i>) (currently only 2 examples protected when 3 are required). 	<p>Broadscale habitats with site options:</p> <p>Subtidal sand (currently 9.6% protected by the existing network. There are 13 site options for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region).</p> <p>Broadscale habitats without site options:</p> <p>Low energy circalittoral rock (currently 0.2% protected by the existing network and the feature is present within the wider CP2 region);</p>

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<ul style="list-style-type: none"> • Long snouted seahorse (<i>Hippocampus guttulatus</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Peat and clay exposures (currently only 1 example protected when 3 are required); • Ross worm reefs (<i>Sabellaria spinulosa</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other potential records for the feature¹⁸ within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Short snouted seahorse (<i>Hippocampus hippocampus</i>) (currently 0 examples protected when 3 are required. There is one site option for this feature in the region which can contribute to filling this gap and there are other records for the feature within the wider CP2 region which could potentially provide a replicate towards addressing this gap, either partially or completely); • Stalked jellyfish (<i>Lucernariopsis campanulata</i>) (currently only 2 example protected when 3 are required); • Stalked jellyfish (<i>Lucernariopsis cruxmelitensis</i>) (currently 0 examples protected when 3 are required); • Tentacled lagoon worm (<i>Alkmaria romijni</i>) (currently 0 examples protected when 3 are required); • Tide swept channels (currently only 2 examples protected when 3 are required). <p>FOCI habitats and species without site options: The following FOCI are those for which a gap has been identified in</p>	

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>relation to the criteria of representation and/or replication and for which there are no remaining site options but there are records for the feature in the CP2 region:</p> <ul style="list-style-type: none"> • Amphipod shrimp (<i>Gitanopsis bispinosa</i>) (currently 0 examples protected when 3 are required); • Cold-water coral reefs (currently 1 example protected when 3 are required); • Coral maerl (<i>Lithothamnion corallioides</i>) (currently 1 example protected when 3 are required); • Couch's goby (<i>Gobius couchi</i>) (currently 0 examples protected when 3 are required); • Gooseneck barnacle (<i>Pollicipes pollicipes</i>) (currently 0 examples protected when 3 are required); • Littoral chalk communities (currently 1 examples protected when 3 are required); • Peacock's tail (<i>Padina pavonica</i>) (currently 0 examples protected when 3 are required); • Sea snail (<i>Paludinella littorina</i>)** (currently 0 examples protected when 3 are required); • Undulate ray (<i>Raja undulata</i>) (currently 0 examples protected when 3 are required). 	
Irish Sea	<p>Broadscale habitats with site options:</p> <p>None.</p> <p>Broadscale habitats without site options:</p> <p>None.</p>	<p>Broadscale habitats with site options:</p> <p>Moderate energy circalittoral rock (currently 8.6% protected by the existing network. There are 3 site options for this feature in the CP2 region which can contribute to filling this gap and the feature is present within the wider CP2 region);</p>

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<p>FOCI habitats and species with site options:</p> <ul style="list-style-type: none"> • Smelt (<i>Osmerus eperlanus</i>) (currently 0 examples protected when 3 are required). <p>FOCI habitats and species without site options: The following FOCI are those for which a gap has been identified in relation to the criteria of representation and/or replication and for which there are no remaining site options but there are records for the feature in the CP2 region:</p> <ul style="list-style-type: none"> • Burgundy maerl paint weed (<i>Cruoria cruoriaeformis</i>) (currently 0 examples protected when 3 are required); • Common maerl (<i>Phymatolithon calcareum</i>) (currently 0 examples protected when 3 are required); • Coral maerl (<i>Lithothamnion corallioides</i>) (currently 0 examples protected when 3 are required); • Fan mussel (<i>Atrina pectinata</i>) (currently 0 examples protected when 3 are required); • File shell beds (currently 0 examples protected when 3 are required); • Littoral chalk communities (currently 1 example protected when 3 are required); • Pink sea-fan (<i>Eunicella verrucosa</i>) (currently 0 examples protected when 3 are required); • Ross worm reefs (<i>Sabellaria spinulosa</i>) (currently 1 example protected when 3 are required); • Spiny lobster (<i>Palinurus elephas</i>) (currently 0 examples protected when 3 are required); • Stalked jellyfish (<i>Lucernariopsis campanulata</i>) (currently 0 examples protected when 3 are required); 	<p>Broadscale habitats without site options: None.</p>

CP2 Region	Features that are not currently meeting the replication criteria	Habitats with less than 10% (by area of the total area of habitat present within the region) within existing MPAs
	<ul style="list-style-type: none"> • Stalked jellyfish (<i>Haliclystus auricula</i>) (currently 0 examples protected when 3 are required); • Undulate ray (<i>Raja undulata</i>) (currently 0 examples protected when 3 are required). 	

*The combination of sites in the Eastern Channel CP2 region for which we are missing data could potentially fill the remaining gap for A5.4 in the region (which only equates to just over 14km²).

** This species no longer exists as a separate entity as it has been reclassified as belonging to the species *Melarhappe neritoides* (which is much more common) and it was formally accepted as being removed from the MCZ FOCI list by Defra back in 2012.

When a shortfall was identified for a FOCI but there were no site options to fill this gap, JNCC analysed the available data to ascertain whether there were records for that FOCI within the CP2 region outside of the remaining rMCZ site options. Further information is provided within Table 1 above. It was not possible to systematically review the data for all these records or carry out any form of confidence assessment and so there may be cases where records for features may be flagged that are historic or that confidence in feature presence is low. In particular, some records indicating the presence of ross worm (*Sabellaria spinulosa*) and Horse Mussel (*Modiolus modiolus*) may not meet the criteria that define biogenic reef habitats created by individuals of these species. A more detailed analysis of the underlying data would be required to ascertain if these records of the species actually represent biogenic reef.

JNCC's assessment of whether examples of each broadscale habitat are being protected in the existing MPA network across its depth range (using EUSeaMap biological zones of 'shallow', 'shelf' and 'bathyl'¹⁹) showed instances where although the replication target for a broadscale habitat had been met, these were often located in the 'shallow' biological zone²⁰. Where examples were protected in the 'shelf' biological zone²¹ they tend to more often than not be within inshore waters rather than in the offshore zone. For example, out of all of the subtidal mud protected in the Irish Sea a very small proportion is actually protected in the 'shelf' biological zone with the areas of habitat protected being small areas of deeper water within lochs or inshore areas. Therefore it is unlikely that the full range of biotopes within deep circalittoral mud habitats are being afforded protection within the existing MPA network. In these cases JNCC consider it likely that the range of habitats present in the CP2 region are not being adequately represented in the existing MPA network. JNCC suggest that Defra consider designating further MPAs to provide a wider representation of habitats within the MPA network. In the case of subtidal sedimentary habitats, a higher proportion of these habitats in each CP2 region tend to occur in the deeper 'shelf' biological zone, although the majority of the habitats protected lie within sites in the 'shallow' biological zone. Fauna present in the deeper variants of the sediment habitats are less likely to be represented within the network, with the risk that the policy commitment to protect the '*range of marine features present in the UK marine area*'.

To further illustrate this likely shortfall in the protection of more detailed biotopes, a coarse level assessment of the biotopes recorded within sample data held within Marine Recorder together with the EUNIS level 4 habitats predicted to occur by the EUSeaMap habitat model provided a clearer indication of the range of finer level biotopes present within each CP2 region. This assessment was undertaken on site boundaries and so assumed that everything within a site boundary is protected and so may underestimate some gaps that do exist in reality in the CP2 region. In addition, because the dataset for biotopes from Marine Recorder for each CP2 region do not span the whole of the CP2 region spatially, with the majority of data tending to have been collected from inside or near to MPAs, these figures are also likely to be underestimated. Further information has been summarised in [Annex 4](#).

¹⁹ For further information on the EUSeaMap biological zones see the EUSeaMap methodology report. Available online here: Available online: <http://www.emodnet-seabedhabitats.eu/default.aspx?page=2024>

²⁰ Predominantly found in the inshore area within 12nm

²¹ Predominantly found in the offshore area beyond of 12nm)

5.1 Spatial distribution of MPAs

JNCC undertook a spatial analysis of the location of sites in relation to seabed bathymetry and their proximity to the boundary between CP2 regions. The assessment against bathymetry considered whether there are MPAs designated within each depth band within each CP2 region (see Table 2). Such an approach was one of the spatial tests used in a recent assessment of the ecological coherence of the OSPAR MPA network²². The study considered the distribution of MPAs across the bathymetric zones: 0-10m (coastal zone); 10-75m (shelf seas); 75-200m (deeper shelf seas); and 200-2000m (slope/upper bathyal)²³. Intertidal sites were not included in our 2014 assessment so they are not represented in the figures below.

Table 2: The proportion of each CP2 region within different bathymetric depth zones and the proportion of that within MPAs..

	CP2 region									
	Northern North Sea		Southern North Sea		Eastern Channel		Western Channel & Celtic Sea		Irish Sea	
Depth m	% of each depth band in the CP2 region	% of each depth in MPAs in the CP2 region	% of each depth band in the CP2 region	% of each depth in MPAs in the CP2 region	% of each depth band in the CP2 region	% of each depth in MPAs in the CP2 region	% of each depth band in the CP2 region	% of each depth in MPAs in the CP2 region	% of each depth band in the CP2 region	% of each depth in MPAs in the CP2 region
0-10	0.9	39.4	8.2	51.8	6.2	21.9	2.0	67.4	11.3	46.5
10-75	5.7	23.9	85.9	35.2	62.4	19.8	9.3	20.5	48.6	19.9
75-200	93.3	8.4	5.9	1.0	31.4	19.7	88.4	8.7	39.9	6.3
200-2000	<0.1	47.1	N/A	N/A	N/A	N/A	0.2	60.2	0.3	0

Table 2 shows there tends to be (with the exception of the Northern North Sea) more MPAs in the 0 – 75m depth bands than in the deeper 75m+ areas. When looking at the proportion of the seabed of each CP2 region within each depth band compared to the seabed within MPAs in each depth band, a similar situation is apparent in the Northern North Sea, Western Channel and Celtic Sea and Irish Sea regions. Even though proportionately there is more seabed within the 75m+ depth bands there is proportionately less of this area protected in the existing network (see Table 2). . In the Northern North Sea CP2 region over 90% of the seabed is within the 75 – 200m depth band but only 8.4% is currently protected within the existing MPA network. In the Western Channel and Celtic Sea CP2 region over 85% of the seabed is within the 75 – 200m depth band but only 8.7% is currently protected within the

²² OSPAR (2013) An assessment of the ecological coherence of the OSPAR network of Marine Protected Areas. Available at: http://www.ospar.org/documents/dbase/publications/p00619/p00619_ecological_coherence_report.pdf

²³ The depth >2000m (lower bathyal/abyssal) was not considered in this assessment because areas of seabed at this depth do not occur in Secretary of State waters.

existing MPA network. In the Irish Sea CP2 region almost 40% of the seabed is within 75 – 200m depth band but only 6.3% is currently protected in the existing network. In the Southern North Sea CP2 region, although only 5% of the seabed is within the 75 – 200m depth band only 1% of this area is currently being protected within the existing MPA network. The proportion of seabed protected in each depth band within MPAs in the Eastern Channel CP2 regions is proportionate to the total area of seabed within each depth band.

This spatial assessment also considered whether there are sites designated in the area of the transition zones between CP2 regions. One of the conclusions from a JNCC commissioned independent review of the use of biogeography and different biogeographic scales in MPA network design was that careful consideration should be given to assessing the contribution of habitats and species in the transition zones between biogeographic regions as these areas can themselves be unique environments²⁴. The existing MPA network has a number of sites that cross these transition zones between biogeographical regions but there are some additional remaining site options that could make a contribution to ensuring these areas of importance are included within the network (see Table 3).

Table 3: MPAs in Secretary of State waters located in the transition zones between biogeographic regions. Sites in *italics* are rMCZ site options and MCZs that have features which are not yet designated.

Site name	Designation type	CP2 regions
Flamborough Head	SAC	Northern North Sea/Southern North Sea
<i>Goodwin Sands</i>	rMCZ	Southern North Sea/Eastern Channel
Lyme Bay and Torbay	SAC	English Channel/Western Channel & Celtic Seas
<i>Skerries Bank and Surrounds</i>	MCZ	English Channel/Western Channel & Celtic Seas
<i>North of Celtic Deep</i>	rMCZ	Western Channel & Celtic Seas/Irish Seas
Pembrokeshire Marine/Sir Benfro Forol	SAC	Western Channel & Celtic Seas/Irish Seas

JNCC recommend that Defra consider the importance of these sites in relation to their location on the transition areas between biogeographic regions when making any decisions on future site designations.

5.2 Connectivity of the MPA network in Secretary of State Waters

The assessment of the distance between MPAs showed that sites with similar broadscale habitat types in the network are relatively well connected, with only a few remaining areas where the distance between sites is greater than recommended. The results are displayed in the series of maps below (Figure 2). There is a spatial gap in the network between MPAs containing A3 Infralittoral rock in the Eastern Channel CP2 region and there are remaining site options that could address this spatial gap. There is also a spatial gap in the network between MPAs containing A4 Circalittoral rock in the Southern North Sea CP2 region and the Irish Sea CP2 region and in both cases there are remaining site options that could address these spatial gaps. There are also parts of the network in the offshore in the Eastern Channel and Western Channel and Celtic Sea CP2 regions where the degree of connectivity could be improved, with site options available in the offshore area. In the case of A5 Subtidal

²⁴ Gubbay, S. (2014), *A review of the use of biogeography and different biogeographic scales in MPA network assessment*, JNCC Report 496, ISSN 0963 8901. Available at: <http://jncc.defra.gov.uk/page-6750>

sediments, the existing MPA network is connected when assessed against the criteria, however the connectivity between sites in the offshore of the Western Channel and Celtic Seas region could be improved, with site options available. It should be noted however that the maximum distance criteria for this high level proximity analysis was set in the context of a general lack of more detailed information on the dispersal of marine organisms in UK waters. Further work may be required to gain an understanding of the principle of connectivity and its contribution to an overall assessment of whether a network is ecologically coherent.

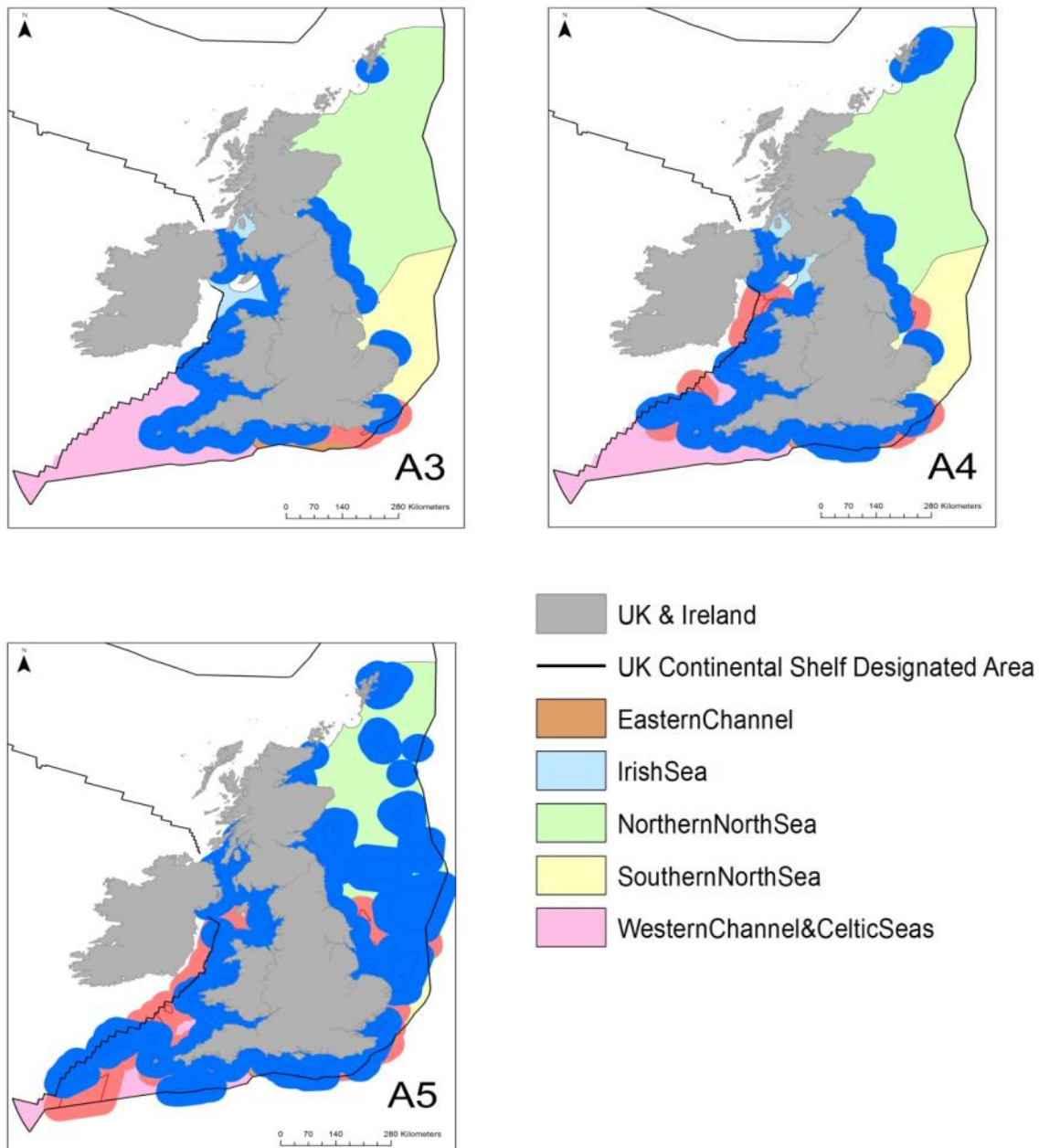


Figure 2. Maps indicating potential connectivity between sites with habitats aggregated to EUNIS Level 2. The blue areas on the map outline 40km buffers around the existing MPAs, the red areas on the map outline the 40km buffers around the MCZ site options that could be

added to the network to improve connectivity. A3 = Infralittoral rock and other hard substrata; A4 = Circalittoral rock and other hard substrata; A5 = Sublittoral sediment.

5.3 MPAs in adjacent international waters

Defra requested additional information on the potential interaction between MPAs in adjacent international waters and the MPA network in Secretary of State waters.

Comprehensive data are not available for all MPAs in adjacent waters, however information from the European Environment Agency²⁵ on marine SACs and SPAs, along with data from the OSPAR MPA database 2013²⁶ on OSPAR MPAs was collated (see Figure 3 and Table 3). It is important to note that these data do not include information on any other national designation types in these adjacent waters.

Currently most sites in adjacent international waters are located within territorial waters and therefore well separated from Secretary of State waters. There are six SACs within adjacent international waters in the Southern North Sea and Eastern Channel CP2 regions, which are numbered on Figure 3 and listed in Table 4. In addition, there are a number of 'Grande Secteurs'²⁷ in adjacent French offshore waters (see Figure 3) with some of these adjacent to the Western Channel and Celtic Sea CP2 region. These 'areas of search' are zones of interest being considered for potential Natura 2000 sites that make up recent recommendations for the extension of the French Natura 2000 network offshore. At the present time these are only recommendations and do not represent formal site boundaries and so these areas may change in future.

Table 4: SACs within international waters adjacent to the offshore part of Secretary of State waters.

Number on map	Site	Designated Feature(s)
1	Doggerbank SAC (Germany)	Sandbanks which are slightly covered by sea water all the time, Harbour porpoise (<i>Phocoena phocoena</i>)
2	Doggersbank SAC (Netherlands)	Sandbanks which are slightly covered by sea water all the time, Harbour porpoise (<i>Phocoena phocoena</i>)
3	Klaverbank SAC (Netherlands)	Reefs
4	Vlaamse Banken SAC (Belgium)	Reefs, Sandbanks which are slightly covered by sea water all the time
5	Bancs Des Flandres SAC (France)	Sandbanks which are slightly covered by sea water all the time
6	Récifs Gris-Nez Blanc-Nez SAC and Ridens et dunes hydrauliques du détroit du Pas-de-Calais (France)	Reefs, Sandbanks which are slightly covered by sea water all the time

²⁵ European Environment Agency – Natura 2000 datasets. Available online at: <http://www.eea.europa.eu/data-and-maps/data/natura-4>

²⁶ OSPAR MPA database. Available online at: http://www.ospar.org/content/content.asp?menu=01511400000000_000000_000000 Please note this is from 2013 and will not include any MPA submitted to OSPAR in 2014.

²⁷ More information available online at: http://spn.mnhn.fr/spn_rapports/archivage_rapports/2014/SPN%202014%20-%202037%20-%20Rapport_GS_ATL_Vf.pdf and http://spn.mnhn.fr/spn_rapports/archivage_rapports/2014/SPN%202014%20-%202039%20-%20Resume_rapport_GS_recifs_ATL_Vf2.pdf and http://spn.mnhn.fr/spn_rapports/archivage_rapports/2014/SPN%202014%20-%202030%20-%20Rapport_GS_OM-MM_Vf.pdf

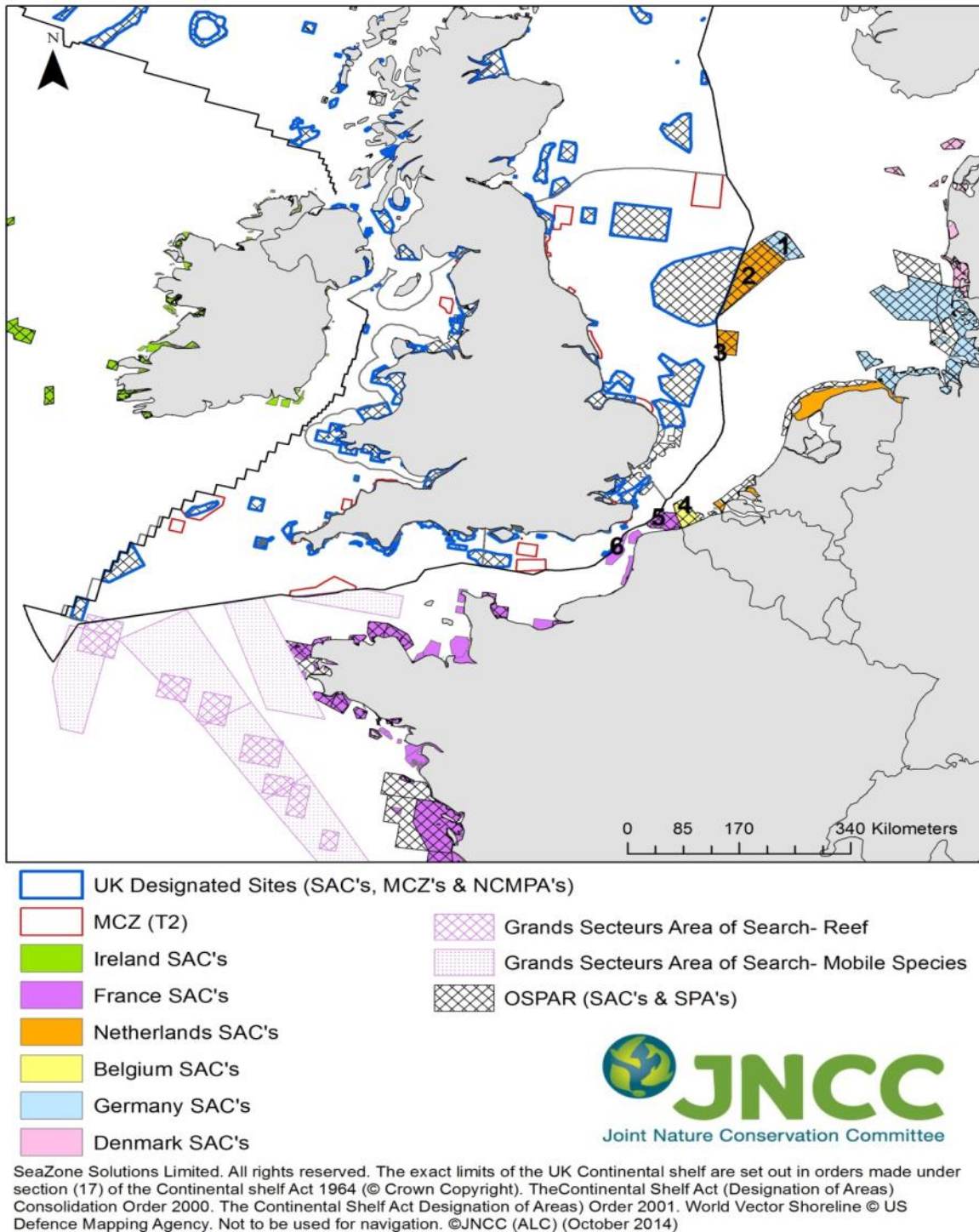


Figure 3: Map outlining UK MPAs and MPAs in international waters adjacent to Secretary of State waters. Note this map only shows SACs and OSPAR MPAs – there are some

additional international MPAs²⁸, however these tend to be coastal and so are less relevant to areas adjacent to UK waters.

Using the results of the connectivity assessment in section 5.2 and the data for these SACs in adjacent international waters, JNCC used expert judgement to identify by eye whether these international sites could contribute to filling any spatial gaps identified between EUNIS Level 2 habitats in the existing MPA network in Secretary of State waters. It is important to note that all of the international sites in adjacent international waters will contribute to the connectivity of the wider international MPA network and help fill spatial gaps between different nation's waters. The French SAC known as the Ridens et dunes hydrauliques du détroit du Pas-de-Calais could potentially improve connectivity of MPAs containing Subtidal sediments in the offshore area of the Eastern Channel CP2 region because of its close proximity to existing UK MPAs. At present there is still a substantial gap between UK and French waters in the Western Channel and Celtic Sea regions, however if some of the potential Grand Secteurs progress this may help fill this spatial gap. In particular, if France progressed Grande Secteur A that borders the UKCS in the far south west approaches it could potentially improve connectivity for A4 Circalittoral rock in that area, and between the Canyons MCZ and potentially South West Deeps East (if this was designated).

6 Summary

Designating all the sites and features that have been selected for consultation in 2015 in tranche 2 would make notable progress in further developing the existing network of MPAs in Secretary of State waters. Many of the 'big gaps' identified in the 2013 assessment would be filled. However a number of shortfalls remain to be addressed.

In the Northern North Sea CP2 region there remains a shortfall in the protection of low energy circalittoral rock, which currently is not protected at all within the existing MPA network. There is also a shortfall in the proportion of subtidal sand and subtidal mud protected in the network, with both of these habitats being under represented at less than the minimum 10% of known extent. Furthermore, although 10% of the known extent of moderate energy circalittoral rock and subtidal coarse sediment in this CP2 region is being protected within existing MPA network, this area remains below the recommended 20% of known area that advised by the OSPAR Convention. The analysis showed that only a very small proportion of both subtidal sand and subtidal mud occurring on the deeper shelf area of the region are protected in the existing network. More detailed analysis of the biotope records within Marine Recorder together with the EUNIS level 4 habitats predicted to occur by the EUSeaMap habitat model showed that at least 1 EUNIS level 4 subtidal habitat and 18 subtidal biotopes within the broadscale habitats present are currently not protected in the CP2 region by the existing MPA network. The gaps highlighted through this analysis for subtidal broadscale habitats and biotopes are likely to be a result of the fact that although over 90% of the seabed in the CP2 region is within the 75 – 200m depth band, only approximately 8% of seabed at these depths lies within the existing MPAs.

In the Southern North Sea CP2 region, there appears to be no shortfalls for broadscale habitats meeting the criteria of representativity, replication and adequacy. Nevertheless, only a very small proportion of subtidal coarse sediment, subtidal sand, subtidal mud and subtidal mixed sediments occurring on the deeper shelf area of the region are protected in the

²⁸ Information on these other international MPAs is collated in the MAIA database. Available online at: <http://www.maia-network.org/homepage>

existing network. More detailed analysis of the biotope records within Marine Recorder together with the EUNIS level 4 habitats predicted to occur by the EUSeaMap habitat model showed that at least 2 EUNIS level 4 subtidal habitats and 2 subtidal biotopes within the broadscale habitats present are currently not protected in the CP2 region by the existing MPA network. The gaps highlighted through this analysis for subtidal broadscale habitats and biotopes are likely to be a result of the fact that although only 5% of the seabed in the CP2 region is within the 75 – 200m depth band only 1% of seabed at these depths lies within the existing MPAs.

In the Eastern Channel CP2 region there remains a shortfall in the protection of low energy circalittoral rock, which is not currently protected at any site within the existing MPA network. There are also shortfalls in the proportions of low energy circalittoral rock, subtidal sand, subtidal mud and subtidal mixed sediments protected in the network with all of these habitats being under represented at less than the minimum 10% of known extent. Furthermore, although 10% of the known extent of high energy infralittoral rock, moderate energy circalittoral rock and subtidal coarse sediment habitats are being protected within existing MPA network in this CP2 region, this proportion remains below the recommended 20% of known area advised by the OSPAR Commission. The analysis also flagged that only a very small proportion of moderate energy circalittoral rock occurring on the deeper shelf area of the region is included in the existing network. More detailed analysis of the biotope records within sample data held within Marine Recorder together with the EUNIS level 4 habitats predicted to occur by the EUSeaMap habitat model showed that at least 4 EUNIS level 4 subtidal habitats and 15 subtidal biotopes within the broadscale habitats present are currently not protected in the CP2 region by the existing MPA network.

In the Western Channel and Celtic Sea CP2 region there remains a shortfall in the protection of sufficient replicates of deep-sea bed within the existing MPA network. There is also a shortfall in the proportion of low energy circalittoral rock and subtidal sand protected in the network with both of these habitats being represented at less than the minimum 10% of known extent. Furthermore, although 10% of the known extent of moderate energy circalittoral rock, subtidal coarse sediment, subtidal mud and deep-seabed in this CP2 region is being protected within existing MPA network, this proportion remains below the recommended 20% by area advised by the OSPAR Commission. Although the high level analysis only identified a few gaps in relation to the representation of broadscale habitats, the analysis identified that moderate energy circalittoral rock and low energy circalittoral rock have either only a very small proportion or none of the area occurring on the deeper shelf area of the region protected in the existing network. In addition, a more detailed analysis of the biotope records within Marine Recorder together with the EUNIS level 4 habitats predicted to occur by the EUSeaMap habitat model showed that at least 1 EUNIS level 4 subtidal habitat and 10 subtidal biotopes within the broadscale habitats present are currently not protected in the CP2 region by the existing MPA network. The gaps highlighted through this analysis for subtidal broadscale habitats and biotopes are likely to be a result of the fact that although over 85% of the seabed in the CP2 region is within the 75 – 200m depth band, only approximately 9% of seabed at these depths lies within the existing MPAs.

In the Irish Sea CP2 region there remains a shortfall in the proportion of moderate energy circalittoral rock protected in the network with less than the minimum 10% of known extent being protected. JNCC note that, whilst 10% of the known extent of high energy circalittoral rock, subtidal coarse sediment, subtidal sand, subtidal mud and subtidal mixed sediments is being protected within existing MPA network in this CP2 region, this area remains below the recommended 20% advised by the OSPAR Commission. Although the high level analysis didn't identify any gaps in relation to the representation of broadscale habitats, the analysis identified that moderate energy circalittoral rock, subtidal coarse sediment, subtidal sand, subtidal mud and subtidal mixed sediment have only a very small proportion of these

habitats present on the deeper shelf area of the region protected in the existing network. In addition, a more detailed analysis of the biotope records within Marine Recorder together with the EUNIS level 4 habitats predicted to occur by the EUSeaMap habitat model showed that at least 11 EUNIS level 4 subtidal habitats and 6 subtidal biotopes within the broadscale habitats present are currently not protected in the CP2 region by the existing MPA network. The gaps highlighted through this analysis for subtidal broadscale habitats and biotopes are likely to be a result of the fact that although almost 40% of the seabed in the CP2 region is within the 75 – 200m depth band, only approximately 6% of seabed at these depths lies within the existing MPAs.

There are still many Features of Conservation Interest (FOCI) that have not achieved representation and/or replication targets within all of the CP2 regions. However, there are existing site options available and/or records in the wider CP2 region that could address these shortfalls. The present results should be considered together with the additional advice provided by JNCC and Natural England on the review of FOCI recommended for protection by MCZs in the Ecological Network Guidance.

Overall the existing MPA network is relatively well connected in Secretary of State Waters with sites generally well distributed across the range of depths that occur. The amount of seabed at different depths within the existing MPA network is however disproportionate to the total area of seabed within each depth range, with relatively less deeper offshore areas within the existing MPAs. The network is relatively well connected with adjacent international waters especially in the Northern North Sea and Eastern Channel regional seas. As the Natura network in French offshore waters progresses, it is possible that UK offshore sites will connect with sites in French offshore waters to increase connectivity for subtidal rock habitats in the Western Channel and Celtic sea region. However, there are still MCZ site options in these areas that would also improve the connectivity of the network in Secretary of State Waters.

JNCC recommends that Defra focuses both on addressing the remaining shortfalls highlighted by the high level network criteria and considers whether a range of finer scale habitats can be included in the network to better reflect the full range of habitats within Secretary of State waters. JNCC recommends that the selection process for any additional site options to fulfil the higher level criteria also considers which options can best contribute to capturing the full range of finer scale biotopes known to occur within Secretary of State waters.

JNCC's 2014 assessment assumed that all sites and features that have been selected for consultation in 2015 will be designated. If any of these features or sites do not progress to designation, there is a chance that the network criteria will no longer be met and the MPA network will not meet the policy commitments. JNCC note that 'management' is a key OSPAR network principle defining an *ecologically coherent network of well-managed MPAs*. JNCC has not included any criteria in the 2013 or 2014 assessments to consider whether the existing MPAs are 'well managed'. It will be necessary to consider whether appropriate management is in place to control anthropogenic pressures that are creating adverse impacts on seabed features, particularly in offshore areas. It would seem likely that the network of MPAs in Secretary of State water will not be judged *ecologically coherent* until such management is established.

Annex 1: Criteria for assessing progress towards an ecologically coherent MPA network in Secretary of State Waters in 2014

Background

In 2013 JNCC undertook an assessment to identify any big gaps in the existing network to inform Defra's decisions on possible MCZs for consultation and then designation in 2015²⁹. In 2014, JNCC developed an approach to identify potential "big gaps" in the network based on criteria that took into account both the OSPAR MPA network principles where appropriate information was available, and wider guidance published by the OSPAR Commission. The criteria JNCC proposed were the minimum necessary to identify potential "big gaps" within the existing MPA network in Secretary of State waters, excluding intertidal areas. The criteria for the current 2014 assessment are based on the OSPAR principles of 'Features', 'Representativity', 'Resilience' and 'Connectivity' in line with the statement made by Defra and the Devolved Administrations on the expected UK contribution to an ecologically coherent MPA network in the north-east Atlantic in 2012³⁰. The five OSPAR principles guiding the process are:

Features: *Sites should represent the range of species, habitats and ecological processes in the area. The proportion of features included in the MPA network should be determined on a feature-by-feature basis, considering whether features that are in decline, at risk or particularly sensitive are of a higher priority and would benefit from a higher proportion being protected by MPAs.*

Representativity: *To support the sustainable use, protection and conservation of marine biological diversity and ecosystems, areas which best represent the range of species, habitats and ecological processes.*

Connectivity: *This may be approximated by ensuring the MPA network is well distributed in space and takes into account the linkages between marine ecosystems.*

Resilience: *Adequate replication of habitats, species and ecological processes in separate MPAs in each biogeographic area is desirable where possible. The size of the site should be sufficient to maintain the integrity of the feature for which it is being selected.*

Management: *MPAs should be managed to ensure the protection of the features for which they were selected and to support the functioning of an ecologically coherent network.*

Proposed criteria for 2014 assessment

For the purposes of the 2014 assessment, JNCC assumed a shortfall exists in the network if any of the following criteria are **not** met:

²⁹ Identifying the remaining MCZ site options that would fill big gaps in the existing MPA network around England and offshore waters of Wales & Northern Ireland. Available at: <http://jncc.defra.gov.uk/page-6658>

³⁰ Joint Administrations Statement. 2012. UK Contribution to Ecologically Coherent MPA Network in the North East Atlantic. Available online at: <http://www.scotland.gov.uk/Resource/0041/00411304.pdf>

- Two examples of each broadscale habitat feature (EUNIS Level 3) are protected within each Charting Progress 2 region:
- Ensures that all broadscale habitats (equivalent to the current EUNIS Level 3 habitats) are represented within the network in each biogeographic region. This is relevant to the OSPAR principle of representativity; and
- Ensures a degree of replication of broadscale habitats within the network. This is relevant to the OSPAR principle of resilience.

Justification

Representation of broadscale habitats was one of the criteria set out in the MCZ Project Ecological Network Guidance (ENG)³¹ and used for the 2013 'Big Gaps' assessment by JNCC. Representing examples of the range of broadscale habitats in UK waters in the network aims to deliver the duty of the Marine and Coastal Access Act for '*the network represent the range of features present in the UK marine area*', whilst also contributing to the resilience of the network. JNCC note the Act does not further define the meaning of '*the range of features*' but guidance from OSPAR³² suggests the MPA network should consider representing the habitats at EUNIS Level 3 (essentially the MCZ broadscale habitats) as a proxy for the likely range of biodiversity within a geographic area. Nevertheless, the OSPAR guidance notes that "Ensuring that natural variation in features is covered within the network is particularly relevant to protected areas for habitat features where representation has been determined using a classification at a fairly coarse scale (e.g. EUNIS level 3). It also supports the conservation of genetic variation within species by selecting different populations; this is likely to be particularly important for species which are declining in numbers." Each EUNIS Level 3 habitat contains a range of more detailed habitats at increasing degrees of differentiation down the hierarchy through levels 4, 5 and 6 (see Table 1 below). Whilst ensuring the MPA network hosts two examples of a broadscale habitat would meet the minimum requirement, it is very likely that those two examples would not represent the range of more detailed habitats present within that area. A level 3 habitat like *Sublittoral sand* is known occur across a wide range of physical conditions from shallow near-shore areas through to deep areas on the continental shelf, where the corresponding biological communities vary considerably in their taxonomic composition.

As part of the 2014 assessment, JNCC considered whether the range of biotopes likely to be present within the broadscale habitats within each CP2 region are likely to be represented in the network, providing further advice on potential solutions where appropriate. To date, data limitations dictated the use of the broadscale habitats as a proxy to represent the likely range of habitats and species within our seas. However, it would seem timely for JNCC to advise Defra whether the use of the broad-scale habitats will adequately represent the likely range of more detailed biotopes known to occur in UK waters. Research has shown that it is likely that in addition to biogeographic variation in species composition, each habitat will vary in its detailed composition with depth³³.

³¹ Available at: http://jncc.defra.gov.uk/PDF/100705_ENG_v10.pdf

³² OSPAR Commission (2006). Guidance on developing an ecologically coherent network of OSPAR marine protected areas. No. 2006-03. Paragraph 23. Available at: <http://www.ospar.org/welcome.asp?menu=0>

³³ Foster NL, Foggo A, Howell KL (2013) Using Species-Area Relationships to Inform Baseline Conservation Targets for the Deep North East Atlantic. PLoS ONE 8(3): e58941. doi:10.1371/journal.pone.0058941. Available at: <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0058941>; Gladstone W (2007) Requirements for marine protected areas to conserve the biodiversity of rocky reef fishes. Aquat Conserv-Mar Freshw Ecosyst 17: 71–87. doi: 10.1002/aqc.759. Available at:

Table A1-1: An example showing the range of more detailed habitats within the EUNIS Level 3 habitat *Sublittoral Sand*; the number of more detailed habitats is for habitats likely to occur in the UK only.

EUNIS Level	Habitat type	Number of habitats at Level 5	Number of habitats at Level 6
3	Sublittoral sand		
4	<i>Sublittoral sand in low or reduced salinity</i>	1	
4	<i>Sublittoral sand in variable salinity (estuaries)</i>	3	
4	<i>Infralittoral fine sand</i>	5	11
4	<i>Infralittoral muddy sand</i>	8	
4	<i>Circalittoral fine sand</i>	3	
4	<i>Circalittoral muddy sand</i>	5	
4	<i>Deep circalittoral sand</i>	2	

JNCC used depth as an indicator for the biological variation within EUNIS Level 3 broadscale habitat to look at whether each broadscale habitat is represented in the MPA network across the range of depths in which it occurs within the CP2 region. In addition, JNCC reviewed the biotopes actually recorded within sample data held within Marine Recorder together with the EUNIS level 4 habitats predicted to occur by the EUSeaMap habitat model. These two data sets provided a clearer indication of the range of more detailed biotopes present within each CP2 region. Considering these extra levels of detail will enabled us to assess the extent to which the existing sites are likely to represent the full range of marine flora and fauna in Secretary of State waters. Including examples of features in additional MPAs in the network would increase the likelihood that the range 'marine flora and fauna' are fully represented within the MPA network, and would satisfy the OSPAR features principle. It should be noted that any additional examples of broadscale habitats to meet the OSPAR representativity and features principles will increase the number of replicates any given broadscale habitat beyond the minimum required to meet the replication principle alone, but would also contribute to meeting other criteria such as adequacy and connectivity. Following our analysis, JNCC report on the EUNIS level 3 broadscale habitats against the network criteria and only provide this extra level detail on finer scale habitats in our summary advice.

A similar approach was adopted for subtidal sediment habitats in Scottish Nature Conservation MPAs (NCMPAs)³⁴ where it was felt that within a given depth range the underlying substrate characteristics are likely to be a strong determinant of the types of species present in the sand and gravel communities³⁵ within these sites. Consequently, JNCC recommended that examples of these sediment habitats were protected in shallow, shelf and off shelf areas.

We also undertook a separate spatial analysis of the location of sites, specially looking at whether there is an MPA designated within each depth band (where these depths occur) within each CP2 region. Such an approach was one of the tests used in recent assessment

<http://onlinelibrary.wiley.com/doi/10.1002/aqc.759/abstract;jsessionid=05863A272AEA3574442ADEE1DE4ACBE B.f02t03>

³⁴ See the Detailed Assessments Against the Selection Guidelines documents for Firth of Forth Banks Complex & West Shetland Shelf Nature Conservation MPAs.

³⁵ Eleftheriou, A. and Basford, D.J. (1989). *The macrobenthic infauna of the offshore northern North Sea*. Journal of the Marine Biological Association of the United Kingdom. 69: 123-143.

of the ecological coherence of the OSPAR MPA network³⁶ which considered distribution of MPAs across bathymetric zones (0-10m (coastal zone); 10-75m (shelf seas); 75-200m (deeper shelf seas); 200-2 000m (slope/upper bathyal) and >2000m (lower bathyal/abyssal)). Considering such geographic distribution is another way to make sure a range of biological communities are protected within the network and representing likely changes in biological community composition.

- Three examples of each Feature of Conservation Importance (FOCI)³⁷ are afforded protection in each Charting Progress 2 region, except for where an OSPAR feature is not listed as Threatened and Declining species or habitat in the region. In these cases there will be no enhanced replication and only two replicates will be required³⁸:
- Ensures that rare and threatened species and habitats are afforded specific protection within the network, which is relevant to the OSPAR features principle; and,
- Helps ensure replication of rare and threatened species and habitats within the network, which is relevant to the OSPAR resilience principle.

Justification

The MCZ Project ENG³⁹ recommended three to five replicates of FOCI within the network. Enhanced replication of FOCI (for example, those listed as an OSPAR Threatened and/or Declining habitats and species or features in the NERC Act 2006), within each CP2 region will reflect their conservation status as rare, threatened or declining features and increase resilience across the network. Work progressed through OSPAR⁴⁰ has also recommended a minimum of three replicates for threatened and declining habitats and species within a given biogeographic region.

JNCC and Natural England provided advice to Defra in 2014 (MPA Network Board Paper) noting:

'The OSPAR List of Threatened and/or Declining Species and Habitats separates out habitats and species by OSPAR region to highlight in which OSPAR region the features are threatened and/or declining. The OSPAR Contracting Parties recently reviewed the status of the habitats and species. It is therefore appropriate for JNCC and Natural England to reconsider the advice provided in the Ecological Network Guidance. Specifically, we could review the FOCI derived from the OSPAR List of Threatened and/or Declining Species and Habitats to determine whether each feature is still listed as threatened and/or declining in both OSPAR regions II and III that cover Secretary of State waters. Should any feature no longer be considered rare or threatened in an OSPAR region, the enhanced replication targets could be removed from any of the biogeographic regions that overlap with that OSPAR region.'

³⁶ OSPAR (2013) An assessment of the ecological coherence of the OSPAR network of Marine Protected Areas. Available at: http://www.ospar.org/documents/dbase/publications/p00619/p00619_ecological_coherence_report.pdf

³⁷ The Features of Conservation Importance are those as listed within Section 4.2 of the MCZ Project Ecological Network Guidance. Available at: http://jncc.defra.gov.uk/pdf/100705_ENG_v10.pdf

³⁸ Two replicates will still be required to reflect the features rare and threatened conservation status in adjoining Charting Progress 2 regions and UK seas.

³⁹ Available at: http://jncc.defra.gov.uk/PDF/100705_ENG_v10.pdf

⁴⁰ OSPAR. (2008). A matrix approach to assessing the ecological coherence of the MPA network. Available at: http://jncc.defra.gov.uk/pdf/0506_UK_OSPARMPAsEcoCoherenceAssessmt.pdf

Any OSPAR features not considered as threatened and/or declining in any region will not receive enhanced replication within that region (see [Annex 2](#)).

- 10% by area of each broad scale habitat occurring in each Charting Progress 2 region is included within the network:
- The proportion of each broad scale habitat afforded protection within the network is relevant to the OSPAR features principle.

Justification

The 10% level was identified by the OSPAR Commission as a minimum guideline for representation of EUNIS level 3 habitats in the OSPAR MPA network⁴¹.

JNCC considered whether this minimum proportion would sufficiently include the likely range of more detailed biotopes within the equivalent EUNIS level 3 habitat and provided further advice where appropriate. A justification for such an approach is provided earlier in the notes on representation and replication.

JNCC also provided advice on the proportion of broad scale habitat features in relation to meeting the 20% (by area) recommended by OSPAR guidance¹¹. OSPAR guidance on developing an ecologically coherent network of MPAs suggests that '*Contracting Parties may wish to include 20% of the total extent of each EUNIS level 3 habitat or species population (where considered appropriate) with at least 10% included within the network*'. Research has shown that protecting 10% by area of habitats would not necessarily be sufficient to conserve the 'majority' of species⁴² and so it is likely that a higher conservation target for % by area would be more appropriate. Research commissioned by JNCC during the the MCZ Project⁴³ determined the proportion of the known extent of each broad scale habitat that would most likely protect different proportions of the total number of species previously recorded within each habitat type. JNCC and Natural England recommended that the network aimed to protect the majority of different species known to occur in each EUNIS Level 3 habitat (where we defined 'majority' as 70-80%). The lower threshold values for the habitat area that would most likely protect 70% of species within each broadscale habitat would broadly deliver the OSPAR guideline of 20% of the total extent'. These values will vary for each of the EUNIS broadscale habitats as set out in the ENG (see Table 1). For this reason we recommended that a minimum of 10% of each EUNIS level 3 broadscale habitat should be protected within the network, with an upper range defined by 70% of the species occurring within the habitat.

⁴¹ OSPAR Commission (2006). Guidance on developing an ecologically coherent network of OSPAR marine protected areas. No. 2006-03. Available at: <http://www.ospar.org/welcome.asp?menu=0>

⁴² Rondinini, C, (2011), A review of methodologies that could be used to formulate ecologically meaningful targets for marine habitat coverage within the UK MPA network, JNCC Report 438, ISSN 0963-8091. Available at: <http://jncc.defra.gov.uk/page-5813>. Rondinini, C, (2011), Meeting the MPA network design principles of representivity and adequacy: Developing species-area curves for habitats, JNCC Report 439, ISSN 0963-8091. Available at: <http://jncc.defra.gov.uk/page-5816>. Desmet, P. & Cowling, R. 2004. Using the species-area relationship to set baseline targets for conservation. *Ecology and Society*, 9, 11.

⁴³ Rondinini, C, (2011), Meeting the MPA network design principles of representivity and adequacy: Developing species-area curves for habitats, JNCC Report 439, ISSN 0963-8091. Available at: <http://jncc.defra.gov.uk/page-5816>

Table A1-2: Percentage ranges of EUNIS Level 3 subtidal habitat area necessary to represent increasing percentages of the known species occurring within each EUNIS Level 3 habitat type (after Rondinini 2010).

Code	Name	Proportion of each EUNIS Level 3 habitat type for each percentage of species at				
		50%	60%	70%	80%	90%
A3.1	High energy infralittoral rock	2.5	6.6	15.0	30.5	57.1
A3.2	Moderate energy infralittoral rock	3.0	7.5	16.5	32.4	58.7
A3.3	Low energy infralittoral rock	2.8	7.1	15.9	31.6	58.0
A4.1	High energy circalittoral rock	1.4	4.3	11.2	25.4	52.3
A4.2	Moderate energy circalittoral rock	1.9	5.4	13.0	27.9	54.7
A4.3	Low energy circalittoral rock	2.7	7.1	15.7	31.5	57.9
A5.1	Subtidal coarse sediment	3.0	7.6	16.5	32.4	58.7
A5.2	Subtidal sand	2.3	6.3	14.5	29.9	56.6
A5.3	Subtidal mud	2.3	6.2	14.5	29.8	56.5
A5.4	Subtidal mixed sediments	2.8	7.3	16.1	31.9	58.3

It was not possible to develop species-area curves for the habitats: deep-sea bed; subtidal macrophyte-dominated sediment and subtidal biogenic reefs due to the limitations of available data. Within the ENG JNCC and Natural England advised that a 'sufficient' proportion of each of these habitats would be protected by meeting the other guidelines. In 2013 research was published which focused on using species-area relationships across two depth bands to inform baseline conservation targets for the deep-sea bed of the North-East Atlantic. The study's results suggest an MPA network incorporating 10% of the deep-sea area would capture approximately 49-58% (for the depth bands 1100–1800m and 200–1100m, respectively) of sessile benthic species. In order to capture 75% of all species, an MPA network would need to incorporate between 30% and 40% of the area (depending on depth)⁴⁴.

We noted earlier that additional examples beyond the minimum number of replicates may be required if sufficient examples are included to cover the likely range of 'marine flora and fauna' within the network. It is possible that the proportion of each broadscale habitat within the network may also exceed the 10% minimum threshold if the network aims to cover the full range of biodiversity in UK waters.

⁴⁴ Foster NL, Foggo A, Howell KL (2013) Using Species-Area Relationships to Inform Baseline Conservation Targets for the Deep North East Atlantic. PLoS ONE 8(3): e58941. doi:10.1371/journal.pone.0058941. Available at: <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0058941>

- Sites affording protection to the same habitat at EUNIS Level 2 are not further than 80km apart from each other:
- Applying a basic distance separation criterion increases the likelihood that sites with similar features are connected to each other, which is relevant to the OSPAR connectivity principle.

Justification

The 80km spacing was identified by Roberts *et al.* (2010)⁴⁵ as a guideline for the distance between sites supporting similar habitats to ensure sufficient ecological connectivity. This guideline was used within the MCZ project Ecological Network Guidance and within the 2013 Big Gaps assessment. Within the 2014 analysis JNCC also considered whether there are sites designated in the area of the transition zones between CP2 regions. One of the conclusions from the JNCC commissioned independent review of the use of biogeography and different biogeographic scales in MPA network design was that careful consideration should be given to assessing the contribution of habitats and species in the transition zones between biogeographic regions as these areas can themselves be unique environments⁴⁶. Such an approach will also contribute to ensuring that a range of habitats are protected in the network.

In addition to considering each of the remaining MCZ site options (rMCZ or proposed new feature within designated MCZ) to evaluate whether they could contribute towards filling any of the remaining gaps, JNCC also noted any existing records of features outside of the remaining MCZ site options if none of these options could fill any shortfall in the network.

⁴⁵ Roberts, C.M., Hawkins, J.P., Fletcher, J., Hands, S., Raab, K. and Ward, S. 2010. Guidance on the size and spacing of Marine Protected Areas in England. NECR037, Sheffield: Natural England, 2010. Available at: <http://publications.naturalengland.org.uk/publication/46009>

⁴⁶ Susan Gubbay, (2014), A review of the use of biogeography and different biogeographic scales in MPA network assessment, JNCC Report 496, ISSN 0963 8901. Available at: <http://jncc.defra.gov.uk/page-6750>

Annex 2 - MCZ Project ENG features that are listed as OSPAR Threatened and/or Declining in the OSPAR regional seas overlapping each of the CP2 regions of the Secretary of State waters

The following table shows those OSPAR Threatened and/or Declining (T&D) habitats and species within the OSPAR regional seas (I, II, III, IV and V) that overlap wholly or partially with each CP2 region in Secretary of State waters.

CP2 Region (relevant OSPAR Regional Sea)	ENG feature
Northern North Sea (OSPAR Region II)	Blue Mussel beds (including Intertidal <i>Mytilus edulis</i> beds on mixed and sandy sediments)
	Cold-water coral reefs
	Coral gardens
	European eel (<i>Anguilla anguilla</i>)
	Horse mussel (<i>Modiolus modiolus</i>) beds
	Long snouted seahorse (<i>Hippocampus guttulatus</i>)
	Maerl beds
	Native oyster (<i>Ostrea edulis</i>)
	Native oyster (<i>Ostrea edulis</i>) beds
	Ocean quahog (<i>Arctica islandica</i>)
	Ross worm (<i>Sabellaria spinulosa</i>) reefs
	Seagrass beds
	Sea-pen and burrowing megafauna communities
	Short snouted seahorse (<i>Hippocampus hippocampus</i>)
Southern North Sea (OSPAR Region II)	Blue Mussel beds (including Intertidal <i>Mytilus edulis</i> beds on mixed and sandy sediments)
	Cold-water coral reefs
	Coral gardens
	European eel (<i>Anguilla anguilla</i>)
	Horse mussel (<i>Modiolus modiolus</i>) beds
	Long snouted seahorse (<i>Hippocampus guttulatus</i>)
	Maerl beds
	Native oyster (<i>Ostrea edulis</i>)
	Native oyster (<i>Ostrea edulis</i>) beds
	Ocean quahog (<i>Arctica islandica</i>)
	Ross worm (<i>Sabellaria spinulosa</i>) reefs
	Seagrass beds
	Sea-pen and burrowing megafauna communities
	Short snouted seahorse (<i>Hippocampus hippocampus</i>)

CP2 Region (relevant OSPAR Regional Sea)	ENG feature
Eastern Channel (OSPAR Region II)	Blue Mussel beds (including Intertidal <i>Mytilus edulis</i> beds on mixed and sandy sediments)
	Cold-water coral reefs
	Coral gardens
	European eel (<i>Anguilla anguilla</i>)
	Horse mussel (<i>Modiolus modiolus</i>) beds
	Long snouted seahorse (<i>Hippocampus guttulatus</i>)
	Maerl beds
	Native oyster (<i>Ostrea edulis</i>)
	Native oyster (<i>Ostrea edulis</i>) beds
	Ocean quahog (<i>Arctica islandica</i>)
	Ross worm (<i>Sabellaria spinulosa</i>) reefs
	Seagrass beds
	Sea-pen and burrowing megafauna communities
	Short snouted seahorse (<i>Hippocampus hippocampus</i>)
Western Channel & Celtic Seas (OSPAR Regions II, III, IV, V)	Blue Mussel beds (including Intertidal <i>Mytilus edulis</i> beds on mixed and sandy sediments)
	Cold-water coral reefs
	Coral gardens
	Deep-sea sponge aggregations
	European eel (<i>Anguilla anguilla</i>)
	Horse mussel (<i>Modiolus modiolus</i>) beds
	Littoral chalk communities
	Long snouted seahorse (<i>Hippocampus guttulatus</i>)
	Maerl beds
	Native oyster (<i>Ostrea edulis</i>)
	Native oyster (<i>Ostrea edulis</i>) beds
	Ocean quahog (<i>Arctica islandica</i>)
	Ross worm (<i>Sabellaria spinulosa</i>) reefs
	Seagrass beds
Sea-pen and burrowing megafauna communities	
Short snouted seahorse (<i>Hippocampus hippocampus</i>)	
Irish Seas (OSPAR Region III)	Blue Mussel beds (including Intertidal <i>Mytilus edulis</i> beds on mixed and sandy sediments)
	Cold-water coral reefs
	Coral gardens
	Deep-sea sponge aggregations
	European eel (<i>Anguilla anguilla</i>)
	Horse mussel (<i>Modiolus modiolus</i>) beds

CP2 Region (relevant OSPAR Regional Sea)	ENG feature
	Littoral chalk communities
	Long snouted seahorse (<i>Hippocampus guttulatus</i>)
	Maerl beds
	Native oyster (<i>Ostrea edulis</i>) beds
	Ross worm (<i>Sabellaria spinulosa</i>) reefs
	Seagrass beds
	Sea-pen and burrowing megafauna communities
	Short snouted seahorse (<i>Hippocampus hippocampus</i>)

Annex 3: Technical details of work undertaken to complete area calculations for Question 5⁴⁷

Calculating the percentage cover of features within each region, the percentage cover of protection provided by the existing MPA network, and the percentage cover of habitat eligible for further protection in each site required the following information:

- Total area of each subtidal EUNIS Level 3 habitat per Charting Progress 2 reporting region;
- Total area of each subtidal EUNIS Level 3 habitat within existing MPAs per Charting Progress 2 reporting region;
- Total area of each subtidal EUNIS Level 3 habitat within each site option per Charting Progress 2 reporting region
- Total area of each Charting Progress 2 reporting region

The source of habitat data was the draft version (dated 1st October 2014) of the *EUNIS level 3 seabed habitat map integrating data originating from maps from field surveys and the EUSeaMap model* (henceforth called the 'Combined Map'). The Combined Map has greater detail than the EUSeaMap model of seabed habitats⁴⁸ and was used to calculate habitat cover within MPAs (SACs, NCMPAs, MCZs and MCZ/rMCZ site options), and habitat cover outside of MPAs at the regional scale. However, the biozone attribute of the EUSeaMap model (2012 version) giving broad depths (shallow, shelf/offshore, bathyal and abyssal) was merged into the Combined Map to further refine the EUNIS Level 3 habitats by depth.

JNCC processed the Combined Map, a CP2 reporting regions layer (modified to the latest UK continental shelf) and SAC, NCMPA, MCZ and rMCZ site boundary layers in ArcGIS v.10.1 to calculate the area of all polygons in each site and region. Habitat polygons from the Combined Map were subdivided using the boundaries of intersecting CP2 regions to create an integrated map, with each habitat polygon attributed with a CP2 region name and the area of the polygon (as km²). This map covered the full extent of each of the five CP2 regions within the MCZ project area.

In a separate layer the habitat polygons from the Combined Map were also subdivided and clipped to MPA site boundaries to create an integrated map with data from all input layers (i.e. final habitat polygons were the smallest common denominator of the overlaid layers). Each habitat polygon was attributed with CP2 region name, MPA site name, MPA designation status and the area of the polygon. MPAs that overlap with each other and currently or potentially⁴⁹ protect the same features were integrated together so that the area of overlap was only represented once in the map (not duplicated by each of the sites). Area estimates were calculated with the integrated map projected in Albers Equal Area Conic Projection.

Attribute data from the two integrated maps were imported to a SQL-Server database. Data for all polygons of each habitat type were aggregated to estimate the total area of each EUNIS Level 3 habitat per site option, per region, or protected in the MPA network per

⁴⁷ Please note that any major limitations associated with these methodologies are described above within the main body of the report.

⁴⁸ EU SeaMap is a broad-scale modelled habitat map that covers over 2 million square kilometres of European seabed. It is available to download from: <http://jncc.defra.gov.uk/page-5040>

⁴⁹ Potentially protected refers to the features proposed for designation in recommended site options.

region, using SQL database queries of the CP2 region, MPA name attribute and MPA designation status data. To estimate the total area of protected habitats within existing MPAs, area data were joined with a secondary 'stock-take' dataset listing the EUNIS Level 3 habitat features protected in existing SACs, NCMPAs and MCZs. This join ensured that features were excluded if they occurred in MPAs but were not formally protected, or if they were intertidal. The area totals of habitat polygons and CP2 regions were used to calculate the percentage cover of each EUNIS Level 3 habitat per region, the percentage of each habitat protected by MPAs relative to its total extent per region, and the percentage of each habitat available for further protection in a recommended site option.

Annex 4: A summary of the shortfalls identified in broadscale habitat protection

These results apply to the MPA network in Secretary of State waters in each CP2 region in relation to Questions 1 – 2 and further detailed analysis.

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotopes recorded within Marine Recorder not protected?
Northern North Sea							
High energy infralittoral rock	YES	YES	NO – But not a gap	NO – But not a gap	N/A	N/A	N/A
Moderate energy infralittoral rock	YES	YES	YES	YES	YES	0	0
Low energy infralittoral rock	YES	YES	NO – But not a gap	NO – But not a gap	N/A	N/A	N/A
High energy circalittoral rock	YES	YES	YES	YES	YES	1	0
Moderate energy circalittoral rock	YES	YES	YES	NO	YES	0	1
Low energy circalittoral rock	NO	NO	NO	NO	NO	0	0
Subtidal coarse sediment	YES	YES	YES	NO	YES	0	1
Subtidal sand	YES	YES	NO	NO	YES	0	2
Subtidal mud	YES	YES	NO	NO	YES	0	10
Subtidal mixed sediments	YES	YES	YES	YES	YES	0	1

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotopes recorded within Marine Recorder not protected?
A5.5 Subtidal macrophyte-dominated sediment	YES	YES	N/A	N/A	YES	0	3
A5.6 Subtidal biogenic reefs	YES	YES	N/A	N/A	YES	0	0
A6 Deep-sea bed	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Southern North Sea							
A3.1 High energy infralittoral rock	YES	YES	YES	YES	YES	0	0
A3.2 Moderate energy infralittoral rock	YES	YES	YES	YES	YES	0	0
A3.3 Low energy infralittoral rock	NO – But not a gap	NO – But not a gap	NO – But not a gap	NO – But not a gap	N/A	N/A	N/A
A4.1 High energy circalittoral rock	YES	YES	YES	YES	YES	0	0
A4.2 Moderate energy circalittoral rock	YES	YES	YES	YES	YES	1	0
A4.3 Low energy circalittoral rock	NO – But not a gap	NO – But not a gap	NO – But not a gap	NO – But not a gap	N/A	N/A	N/A

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotopes recorded within Marine Recorder not protected?
A5.1 Subtidal coarse sediment	YES	YES	YES	YES	YES – But only a very small proportion on the shelf.	0	0
A5.2 Subtidal sand	YES	YES	YES	YES	YES – But only a very small proportion on the shelf.	1	1
A5.3 Subtidal mud	YES	YES	YES	YES	YES – But only a very small proportion on the shelf.	0	0
A5.4 Subtidal mixed sediments	YES	YES	YES	YES	YES – But only a very small proportion on the shelf.	0	1
A5.5 Subtidal macrophyte-dominated sediment	YES	YES	N/A	N/A	YES	0	0
A5.6 Subtidal biogenic reefs	YES	YES	N/A	N/A	YES	0	0
A6 Deep-sea bed	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Eastern Channel							
A3.1 High energy	YES	YES	YES	NO	YES	0	0

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotope recorded within Marine Recorder not protected?
infralittoral rock							
A3.2 Moderate energy infralittoral rock	YES	YES	YES	YES	YES	0	0
A3.3 Low energy infralittoral rock	YES	YES	YES	YES	YES	0	2
A4.1 High energy circalittoral rock	YES	YES	YES	YES	YES	1	1
A4.2 Moderate energy circalittoral rock	YES	YES	YES	NO	YES – But only a very small proportion on the shelf.	0	1
A4.3 Low energy circalittoral rock	NO	NO	NO	NO	YES	1	0
A5.1 Subtidal coarse sediment	YES	YES	YES	NO	YES	0	0
A5.2 Subtidal sand	YES	YES	NO	NO	YES	1	2
A5.3 Subtidal mud	YES	YES	NO	NO	YES	1	5
A5.4 Subtidal mixed sediments	YES	YES	NO	NO	YES	0	2
A5.5 Subtidal macrophyte-	YES	YES	N/A	N/A	YES	0	1

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotores recorded within Marine Recorder not protected?
dominated sediment							
A5.6 Subtidal biogenic reefs	YES	YES	N/A	N/A	YES	0	1
A6 Deep-sea bed	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Western Channel & Celtic Sea							
A3.1 High energy infralittoral rock	YES	YES	YES	YES	YES	0	0
A3.2 Moderate energy infralittoral rock	YES	YES	YES	YES	YES	0	0
A3.3 Low energy infralittoral rock	YES	YES	YES	YES	YES	0	2
A4.1 High energy circalittoral rock	YES	YES	YES	YES	YES	0	0
A4.2 Moderate energy circalittoral rock	YES	YES	YES	NO	YES – But only a very small proportion on the shelf.	0	0
A4.3 Low energy circalittoral rock	YES	YES	NO	NO	NO	0	0
A5.1 Subtidal	YES	YES	YES	NO	YES	0	0

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotopes recorded within Marine Recorder not protected?
coarse sediment							
A5.2 Subtidal sand	YES	YES	NO	NO	YES	0	1
A5.3 Subtidal mud	YES	YES	YES	NO	YES	1	4
A5.4 Subtidal mixed sediments	YES	YES	YES	YES	YES	0	1
A5.5 Subtidal macrophyte-dominated sediment	YES	YES	N/A	N/A	NO	0	1
A5.6 Subtidal biogenic reefs	YES	YES	N/A	N/A	YES	0	1
A6 Deep-sea bed	YES	NO	YES	MAYBE	N/A	0	0
Irish Sea							
A3.1 High energy infralittoral rock	YES	YES	YES	YES	YES	0	0
A3.2 Moderate energy infralittoral rock	YES	YES	YES	YES	YES	0	0
A3.3 Low energy infralittoral rock	YES	NO – But not a gap	NO – But not a gap	NO – But not a gap	YES	N/A	N/A
A4.1 High	YES	YES	YES	NO	YES	2	0

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotopes recorded within Marine Recorder not protected?
energy circalittoral rock							
A4.2 Moderate energy circalittoral rock	YES	YES	NO	NO	YES – But only a very small proportion on the shelf.	2	0
A4.3 Low energy circalittoral rock	YES	YES	NO – But not a gap	NO – But not a gap	YES	N/A	N/A
A5.1 Subtidal coarse sediment	YES	YES	YES	NO	YES – But only a very small proportion on the shelf.	2	1
A5.2 Subtidal sand	YES	YES	YES	NO	YES – But only a very small proportion on the shelf.	1	1
A5.3 Subtidal mud	YES	YES	YES	NO	YES – But only a very small proportion on the shelf.	1	2
A5.4 Subtidal mixed sediments	YES	YES	YES	NO	YES – But only a very small proportion on the shelf.	3	0
A5.5 Subtidal macrophyte-dominated	YES	YES	N/A	N/A	YES	0	2

	Represented?	Replicated?	10% protected?	20% protected?	Examples on both shallow and shelf biological zones (if habitat occurs in both zones)?	EUNIS level 4 habitats predicted to occur by the EUSeaMap not protected?	Biotopes recorded within Marine Recorder not protected?
sediment							
A5.6 Subtidal biogenic reefs	YES	YES	N/A	N/A	YES	0	0
A6 Deep-sea bed	N/A	N/A	N/A	N/A	N/A	N/A	N/A