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SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL AND
TECHNOLOGICAL ADVICE
Eighteenth meeting
Montreal, 23-28 June 2014
Item 4.1 of the provisional agenda*

UPDATE ON THE PROCESS TO DESCRIBE AREAS IN THE NORTH-EAST ATLANTIC MEETING THE CBD EBSA CRITERIA

Note by the Executive Secretary

1. The Executive Secretary is circulating herewith, for the information of participants in the eighteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, the letter and two attachments sent by the Secretariats of the Commission for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Commission) and North-East Atlantic Fisheries Commission (NEAFC), dated 4 June 2014, regarding the ongoing scientific and technical process of applying the scientific criteria for ecologically or biologically significant marine areas (EBSAs) in the North-East Atlantic, as noted by the Conference of the Parties to the Convention at its eleventh meeting (decision XI/17, paragraph 10).

2. The information is presented in the form and languages in which it was received by the Secretariat, including: (i) a letter sent to the Executive Secretary of the Convention on Biological Diversity, dated 4 June 2014; (ii) ICES (June 2013) OSPAR/NEAFC special request on review of the results of the Joint OSPAR/NEAFC/CBD Workshop on Ecologically and Biologically Significant Areas (EBSAs); (iii) ICES (September 2013, (Version 2 19/12/13)) OSPAR/NEAFC special request on review and reformulation of four EBSA Proformas.

* UNEP/CBD/SBSTTA/18/1.

Dr Braulio Ferreira de Souza Dias
Executive Secretary
Convention on Biological Diversity
413, Saint Jacques Street, suite 800
Montreal QC H2Y 1N9
Canada

4 June 2014

For information: Update on the process to describe areas in the North-East Atlantic meeting the CBD EBSA criteria

Dear Dr Dias

I am writing to inform you of progress by the OSPAR Commission and North East Atlantic Fisheries Commission (NEAFC) relating to the description of areas meeting the CBD EBSA criteria in the North East Atlantic.

As you will recall the joint scientific workshop was convened in response CBD Decision X/29 by OSPAR and NEAFC, as competent regional organisations, in collaboration with the CBD Secretariat and held in Hyères, France, September 2011 (as noted in CBD decision UNEP/CBD/COP/DEC/XI/12)[1]. The workshop described ten areas that were considered as meeting one or more of the EBSA criteria in the North East Atlantic, beyond 200nm. Further revision of the identified areas was carried out through an independent scientific review of the evidence by the International Council for the Exploration of the Sea (ICES) in 2013. The resultant interim advice (enclosure 1 to this letter) was considered by OSPAR in June 2013, OSPAR and NEAFC requested ICES to conclude their advice and prepare updated the proforma for four areas (merged original areas 1, 3 and part of area 2; area 4 and area 10).

As a result ICES produced the revised advice (enclosure 2 to this letter) - updated proforma presenting evidence for four areas that were considered as meeting the CBD EBSA scientific criteria in the North-East Atlantic:

1. Mid-Atlantic Ridge North of the Azores and South of Iceland;
2. Charlie-Gibbs Fracture Zone;
3. The Hatton and Rockall Banks and the Hatton-Rockall Basin;
4. The Arctic Ice habitat – multiyear ice, seasonal ice – marginal ice zone.

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[1] *Takes note* that there is an ongoing scientific and technical process, with respect to the areas in the North-East Atlantic, which is described in UNEP/CBD/COP/11/INF/38, supported by; UNEP/CBD/SBSTTA/16/INF/5 and UNEP/CBD/SBSTTA/16/INF/5/Add.1, and *requests* the Executive Secretary to include these documents in the EBSA information-sharing mechanism;

Contracting Parties of both NEAFC and OSPAR are currently continuing their consultations concerning the possible submission to CBD of scientific and technical information and experience related to the application of the EBSA-criteria, including details of areas that meet the EBSA criteria in the North-East Atlantic.

This information is hereby provided for information to SBSTTA 18 without prejudice to the on-going process within the North East Atlantic.

Yours sincerely

Darius Campbell
Executive Secretary
OSPAR Commission

Stefán Ásmundsson
Secretary
NEAFC

Cc Ms Jihyun Lee

Encl:

1. ICES (June 2013) OSPAR/NEAFC special request on review of the results of the Joint OSPAR/NEAFC/CBD Workshop on Ecologically and Biologically Significant Areas (EBSAs) http://bit.ly/1o9TCm5

2. ICES (September 2013, (Version 2 19/12/13))OSPAR/NEAFC special request on review and reformulation of four EBSA Proformas http://bit.ly/1pR7kcS

ECOREGION General advice
SUBJECT OSPAR/NEAFC special request on review of the results of the Joint OSPAR/NEAFC/CBD Workshop on Ecologically and Biologically Significant Areas (EBSAs)

Advice summary

ICES reviewed the ecological evidence supporting the ten proposed ecologically and biologically significant areas (EBSAs) from the OSPAR/NEAFC/CBD Workshop of September 2011, as presented in the annexes to that report. The review applied standard ICES practices and used primarily the references cited in the relevant annexes, but augmented those references with other publications and data sources. In nine of the ten proposed EBSAs, ICES came to different conclusions than were contained in the OSPAR/NEAFC/CBD Workshop report, with regard to the rankings of the Convention on Biological Diversity (CBD) EBSA criteria.

Of the ten proposed EBSAs, ICES supports the conclusion of the OSPAR/NEAFC/CBD workshop that the Arctic Ice area (Area 10) meets one or more EBSA criteria and this area could go forward at this time, possibly with minor suggested changes to the rationale.

In four proposed EBSAs (Reykjanes Ridge south of Iceland EEZ (Area 1); Charlie-Gibbs Fracture Zone and Subpolar Frontal Zone of the Mid-Atlantic Ridge (Area 2); Mid-Atlantic Ridge north of the Azores (Area 3); the Hatton and Rockall banks and Hatton–Rockall Basin (Area 4)), ICES considers that much of the area within the proposed EBSAs do not meet any of the EBSA criteria and for this reason the boundaries of these proposals need to be revised. More restricted parts of the proposed EBSAs meet several of the EBSA criteria and could go forward after boundary revision. ICES notes great similarities in the pro forma describing Areas 1 and 3 and part of Area 2 (OSPAR/NEAFC/CBD, 2011). A boundary revision to encompass the relevant parts of these areas as a single extended Mid-Atlantic Ridge proposed EBSA could be considered a step forwards. ICES recommends changes also to the pro forma rankings for all of these proposed EBSAs.

Only a small part of the proposed EBSA for the Arctic Front – Greenland/Norwegian seas (Area 9) possibly meets some of the EBSA criteria. However, another part of the general area might meet some of the EBSA criteria. ICES recommends that further data analyses followed by an evaluation of the new results against the EBSA criteria be undertaken before any further decision is taken.

The rationales for four proposed EBSAs (around the Pedro Nunes and Hugo de Lacerda seamounts (Area 5); Northeast Azores–Biscay Rise (Area 6); Evlanov Seamount region (Area 7); and Northwest of Azores EEZ (Area 8)) are not well supported by the information presented in the relevant annexes. There is a need for further data and analyses in these areas, particularly in relation to seabirds, and another evaluation of the areas against the EBSA criteria.

ICES found no clear evidence of additional EBSAs in areas beyond national jurisdiction (ABNJ) of the Northeast Atlantic meeting the CBD scientific criteria.

Request

a) Review the description of areas meeting one or more of the CBD EBSA scientific criteria developed as an outcome of the Joint OSPAR/NEAFC/CBD Scientific Workshop, in particular:

> *1. Review each of the ten area delineations and descriptions in line with the CBD EBSA Scientific criteria and the most up-to-date scientific data and information, specifying any additional scientific data and information that is available;*
>
> *2. Provide, if appropriate, revised EBSA proposals in the format of proformas adopted by the CBD*

b) If there is clear evidence for additional areas in ABNJ of the North-East Atlantic meeting the CBD EBSA scientific criteria, present a description with supporting scientific data and information for such areas, including CBD EBSA proformas for each.

ICES advice

ICES made the following conclusions and proposals.

Area 1. Reykjanes Ridge south of Iceland EEZ: Much of the area in the proposed EBSA does not meet any of the EBSA criteria. A more restricted area down the spine of the Mid-Atlantic Ridge and defined by depth ranges of deep-water coral and sponge concentrations does meet several EBSA criteria and the boundary delineation, ranking, and full rationale could be developed based on this new boundary.

Area 2. Charlie-Gibbs Fracture Zone and Subpolar Frontal Zone of the Mid-Atlantic Ridge: Some areas in the proposed EBSA do not meet any of the EBSA criteria. A complex combination of the area down the spine of the Mid-Atlantic Ridge, the benthic area aligned with and close to the main fractures, and the water column in which the Subpolar Front is found throughout the year, does meet several EBSA criteria and the boundary delineation, ranking and full rationale could be developed at based on this new boundary.

Area 3. Mid-Atlantic Ridge north of the Azores: Much of the area in the proposed EBSA does not meet any of the EBSA criteria. A more restricted area down the spine of the Mid-Atlantic Ridge and defined by depth ranges of deep-water coral and sponge concentrations does meet several EBSA criteria and the boundary delineation, ranking, and full rationale could be developed based on this new boundary.

Area 4. The Hatton and Rockall banks and Hatton–Rockall Basin: Much of the area in the proposed EBSA does not meet any of the EBSA criteria. A more restricted area down to approximately 1500–1800 m depth, but excluding the abyssal plain does meet several EBSA criteria and the boundary delineation, ranking, and full rationale could be developed based on this new boundary.

Area 5. Around the Pedro Nunes and Hugo de Lacerda seamounts: The proposed EBSA is not supported well by the information presented in the pro forma. There is a need for further analyses of those data already considered, as well as any additional relevant data on seabird foraging and other information. When these analyses are done, including for the additional data, another evaluation of the area against the CBD EBSA criteria would make it possible to advise which areas, if any, meet EBSA criteria.

Area 6. Northeast Azores–Biscay Rise: The proposed EBSA is not supported well by the information presented in the pro forma. There is a need for further analyses of those data already considered as well as any additional relevant data on seabird foraging and other information. When these analyses are done, including for the additional data, another evaluation of the area against the CBD EBSA criteria would make it possible to advise which areas, if any, meet EBSA criteria.

Area 7. Evlanov Seamount region: The proposed EBSA is not supported well by the information presented in the pro forma. There is a need for further analyses of those data already considered as well as any additional relevant data on seabird foraging and other information. When these analyses are done, including for the additional data, another evaluation of the area against the CBD EBSA criteria would make it possible to advise which areas, if any, meet EBSA criteria.

Area 8. Northwest of Azores EEZ: The proposed EBSA is not supported well by the information presented in the pro forma. There is a need for further analyses of those data already considered as well as any additional relevant data on seabird foraging and other information. When these analyses are done, including for the additional data, another evaluation of the area against the CBD EBSA criteria would make it possible to advise which areas, if any, meet EBSA criteria.

Area 9. The Arctic Front – Greenland/Norwegian seas: Only a small part of the area proposed by the OSPAR/NEAFC/CBD Workshop as an EBSA was considered to possibly meet some of the criteria. However, another part of the general area might meet some EBSA criteria. There is a need for more analyses of productivity and diversity data for the more southerly part of the main area, and then a re-evaluation of the new results against the EBSA criteria, before any areas might be considered as possibly meeting EBSA criteria.

Area 10. The Arctic Ice: The rationale for concluding that this area meets one or more EBSA criteria can be improved, but the review by ICES generally supports the conclusions of the OSPAR/NEAFC/CBD workshop. A suggested revised proforma is attached as Annex 1.5.6.5.1 to this advice.

With regard to new proposed areas that meet EBSA criteria, ICES has no additional information. However, ICES suggests a potential alternative configuration to the areas in proposed EBSAs 1, 2, and 3 that would comprise two areas meeting EBSA criteria, one covering the specified depths of the entire Mid-Atlantic Ridge, and one for the Charlie-Gibbs Fracture Zone and pelagic area of the Subpolar Front. Each of the two areas would have coherent, but different ecological rationales.

ICES has provided its rankings for the revised proposed EBSAs and the rationale for those rankings. ICES has not revised the narrative or the references in the existing pro forma of proposed EBSAs other than for Arctic Ice habitat (Annex 1.5.6.5.1). Once OSPAR and NEAFC have made a decision on the configuration of the Mid-Atlantic Ridge proposed EBSAs, ICES could revise the pro forma for these EBSAs by the end of September 2013.

Background

Method

ICES conducted its review informed by the content of the CBD Decisions IX/20 and X/29 on Marine and Coastal Biodiversity (CBD, 2008, 2010), the reports from the 'Azores Workshop' (CBD, 2007) and the 'Ottawa Workshop' (CBD, 2009), and the UNGA Resolution 58/240 (United Nations, 2004). ICES considers that the application of the criteria was intended to be a *comparative* or *relative* process, such that areas should be evaluated against other generally comparable areas (e.g. of comparable depth and latitude). In addition, even though the application of EBSA criteria is not guided directly by management considerations, potential benefits of spatial management measures are a relevant consideration in the evaluation. However, the appropriate baseline is not the absence of all management, but the presence of measures sufficient to ensure human uses are sustainable in areas typical of the zone of evaluation.

ICES is responding to a request about EBSAs, and ICES stresses that this advice does not imply that any areas reviewed should or should not be considered as VMEs (but ICES notes that there is an overlap with advice provided recently on vulnerable marine ecosystems (VMEs; ICES, 2013a)). ICES notes that all areas found to meet criteria for VMEs would be expected to meet one or more criteria for EBSAs as well. However, the reverse is not necessarily true and EBSAs do not necessarily contain VMEs. There is neither a policy nor an ecological rationale for automatically excluding bottom fishing (or any other activity) from areas proposed as EBSAs. The expected initial response of regulatory authorities is to conduct risk or threat assessments of the activities they regulate relative to the properties considered ecologically or biologically significant, and to subsequently undertake management appropriate to the outcome of these assessments.

ICES advice is based on applying several standards during its review, including:

- Assigned rankings on a criterion should apply to at least most of the area included in a proposed EBSA, and not just to a small subset of the total area.
- Higher assigned rankings required the proposed area to differ from adjacent areas and other areas of similar depth and latitude on the property represented by the criterion.
- Some evidence must be available to justify awarding a higher ranking, noting that comprehensive data for the high seas cannot be expected.
- Rankings should not be based on the presence or history of threats to the features represented by the criteria, but on the biological, ecological, and geomorphological features of the area.
- Although EBSAs are not defined by or linked to any particular management actions by any authorities, it is appropriate to consider whether or not spatial management tools might benefit the conservation or sustainable use of the relevant features.

For each of the ten areas in the OSPAR/NEAFC/CBD report proposed to meet EBSA criteria, ICES assigned one of three categories:

- Proceed with boundaries proposed by the OSPAR/NEAFC/CBD Workshop, with a rationale revised by ICES.
- Proceed with developing a proposed EBSA with different boundaries than those proposed by the OSPAR/NEAFC/CBD Workshop, and with a rationale provided by ICES.
- Do not proceed with proposing an EBSA at this time, but rather undertake further collation and analysis of information and reconsider when the additional work is completed.

Although ICES review included an evaluation and commentary on all pro forma contents of the OSPAR/NEAFC/CBD 2011 Workshop report, this advice presents only ICES conclusions as to whether the areas meet the EBSA criteria. This advice takes the form of biological properties that ICES concludes would define the boundaries, rankings, and rationales of those areas against the EBSA criteria.

Proposed EBSAs that need minor revisions to the rationale

Area 10. The Arctic Ice

A suggested revised pro forma is attached to this advice as Annex 1.5.6.5.1.

Proposed EBSAs that should have redefined boundaries before proceeding

Area 1. Reykjanes Ridge south of Iceland EEZ

ICES advises that an area along the Reykjanes Ridge can be justified as meeting one or more EBSA criteria. This would be a much smaller area than the one proposed in the OSPAR/NEAFC/CBD Workshop report. Appropriate boundaries for such a proposed area that meets EBSA criteria would be a depth contour that runs in the deeper of two properties:

1. Including a large portion (arbitrarily, perhaps 90%) of all hard volcanic substrates; habitats are reported to host the larger known coral formations and their associated communities
2. Including a large portion (arbitrarily, 90%) of the records of large sponge communities in the overall northern Mid-Atlantic Ridge.

In addition, the proposed area will include the only known hydrothermal vent in the area (Olafsson *et al.*, 1991; German *et al*., 1994; German and Parsons, 1998; Mironov and Gebruk, 2007), whatever depth contour is used. Information on water masses should also be consulted, allowing proper identification of benthic and fish fauna to be included in a revised narrative to a pro forma for this area.

In the time available ICES did not have the geological data to delineate the depth contour that would meet the first criterion, but such information should be readily available in marine geology databases. Nor did ICES have access to all of the records of where the large sponge deposits were taken. However, references to sources for those data are in the OSPAR/NEAFC/CBD Workshop pro forma and should be tracked back to find the appropriate depth contour for the second criterion in the tables below.

Evaluation of the revised area against the EBSA criteria

CBD EBSA Criterion	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Uniqueness or rarity	The area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations), or endemic species, populations, or communities, and/or (ii) unique, rare, or distinct habitats or ecosystems, and/or (iii) unique or unusual geomorphological or oceanographic features.			**X**	**(X)**

<table>
<tr><td rowspan="2">CBD EBSA Criterion</td><td rowspan="2">Description</td><td colspan="4">Ranking of criterion relevance
(please mark one column with an X)</td></tr>
<tr><td>Don’t Know</td><td>Low</td><td>Some</td><td>High</td></tr>
<tr><td colspan="6">Explanation for ranking

The bracketed “High” ranking is for a very restricted area covering the only known hydrothermal vent on the Reykjanes Ridge. Though this is a unique feature it occupies only a small part of the area proposed here as meeting this EBSA criterion (Olafsson et al., 1991; German et al., 1994; German and Parsons, 1998; Mironov and Gebruk, 2006).

The MarEco sampling of corals and sponges reported a few species new to science and these may be restricted to the proposed area, although a firm conclusion on this cannot be drawn until more extensive sampling is undertaken.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

Although many populations undoubtedly complete their life cycles within the large area proposed in the OSPAR/NEAFC/CBD Workshop Report as an EBSA, this would be true of any marine area of comparable size. There is no evidence that the life history of any species is strongly dependent on any specific features of the area proposed as an EBSA.

There is evidence from other areas of the Northeast Atlantic that areas of high coral density may be important as egg-case and nursery areas of deep-water sharks and rays. The area proposed here is targeted on the depths and substrates associated with higher coral and sponge densities, and if sharks and rays also concentrate spawning and early development in these habitats, then the score would be “Some” or “High” on this criterion as well.</td></tr>
<tr><td>Importance for threatened, endangered, or declining species and/or habitats</td><td>Areas containing habitats for the survival and recovery of endangered, threatened, or declining species, or areas with significant assemblages of such species.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

Large formations of corals and sponges are found in the area proposed by ICES as meeting this criterion. Habitats containing these species are listed by OSPAR and also feature as VME indicator species; the majority of these would be included in the proposed EBSA. Additional explanation regarding corals and sponges is included in the rationale for the criterion on Vulnerability.

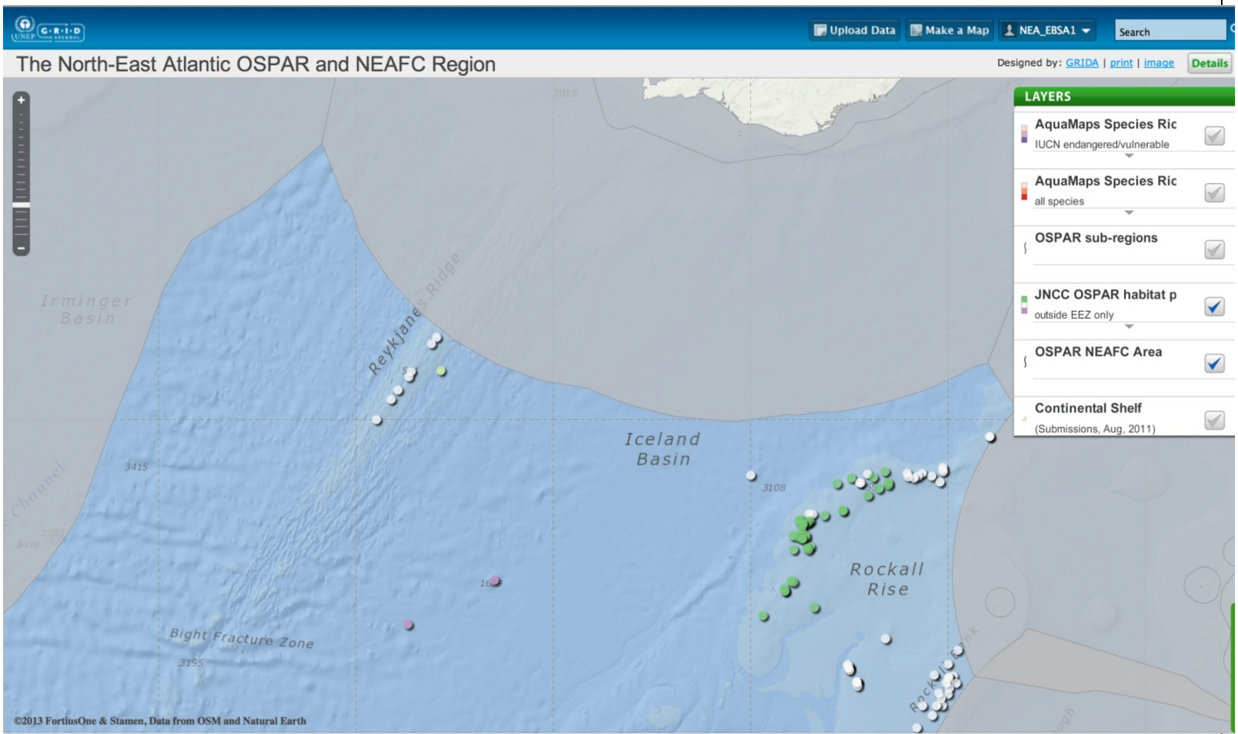
The possible role of the area proposed by ICES in the life histories of sharks and rays is discussed in the criterion on Vulnerability and Sensitivity.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td></td><td>X</td></tr>
</table>

CBD EBSA Criterion	Description	Ranking of criterion relevance (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**

Explanation for ranking

With regard to corals and sponges, Mortensen *et al*. (2008) found cold-water corals "*at every sample station … observed at depths between 800 and 2400 m, however were commonly found shallower than 1400 m …, with species richness being very high. … no major reef structures were recorded, with the maximum colony size approximately 0.5 m in diameter. The number of coral taxa was strongly correlated with the percentage cover of hard bottom substrate ….*" The area proposed here is targeted at the seamount peaks and slopes where hard substrates dominate. For sponges, no actual large expanses of sponge reef were reported in the OSPAR/NEAFC/CBD Workshop report. However, the pro forma in that report (OSPAR/NEAFC/CBD, 2011) notes that overall sampling of the area is patchy and cites three studies that found local patches with high densities of sponges, although in no cases were the sizes of the patches documented.

These observations of widespread occurrences of corals and sponges are supported by the records in the GRID–Arendal data, which show both taxa to be presented in nearly every appropriate sample taken along the cruise tracks in the database.



CBD EBSA Criterion	Description	Don't Know	Low	Some	High
Biological productivity	Areas containing species, populations, or communities with comparatively higher natural biological productivity.		**X**		

Explanation for ranking

Although benthic productivity of the proposed smaller EBSA may be higher than benthic productivity on the abyssal plain, productivity integrated over the entire water column and seafloor seems typical of systems of comparable depth and latitude globally.

CBD EBSA Criterion	Description	Don't Know	Low	Some	High
Biological diversity	Areas containing a comparatively higher diversity of ecosystems, habitats, communities, or species, or with higher genetic diversity.			**X**	

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<tr><td colspan="6">Explanation for ranking

The possible, but incompletely documented presence of large coral and sponge stands, and the documented high diversity of benthic and associated fish when corals or sponges are present in moderate or high density imply that some areas may have high diversity. Aside from these benthic communities of somewhat restricted distribution, the biodiversity otherwise appears typical of biotic communities at similar depths and latitude.</td></tr>
</table>

Area 2. Charlie-Gibbs Fracture Zone and Subpolar Frontal Zone of the Mid-Atlantic Ridge

ICES advises that an area with the following boundaries, capturing three distinct features, would meet one or more EBSA criteria. The area would include the following features:

i. *Subpolar Frontal Zone* (coinciding with the Charlie-Gibbs Fracture Zone): The northern and southern boundaries for this feature should be set according to the known northernmost and southernmost meandering of the frontal system at 53°N and 48°N, respectively (Søiland *et al*., 2008). The eastern and western boundaries for this feature should be set according to the eastern and westernmost extension of the Charlie-Gibbs Fracture Zone (topography; approx. at 27°W and 42°W, respectively).

ii. *Charlie-Gibbs Fracture Zone*: The eastern and western boundaries for this feature should be set according to the east–west extension of the Fracture Zone (approx. at 27°W and 42°W, respectively). The northern and southern boundaries for this feature should be set with a view to encompass the characteristic bathymetry, topography, and substrates of the Fracture Zone.

iii. *Sections of the Mid-Atlantic Ridge*: The northernmost and southernmost boundaries would coincide respectively with the southern boundary of proposed Area 1 (Reykjanes Ridge south of Iceland EEZ) and the northern boundary of proposed Area 3 (Mid-Atlantic Ridge north of the Azores). Boundaries to the east and to the west would be a depth contour running in the deeper of two properties:

- including a large portion (arbitrarily, perhaps 90%) of all hard volcanic substrates; habitats reported to host the larger known coral deposits and their associated communities;
- including a large portion (arbitrarily, 90%) of the larger known deep-sea sponge aggregations.

Where the Charlie-Gibbs Fracture Zone crosses the Mid-Atlantic Ridge, the benthic boundaries of the Fracture Zone in feature ii) may extend to the east and west beyond the area defined by feature iii) for the Mid-Atlantic Ridge. In those cases the benthic area of the Fracture Zone is proposed for inclusion in the EBSA proposed here. However, any part of the seafloor and associated benthos that lies *below* the pelagic feature i) (the total area occupied by the Subpolar Front during its annual movement) but does *not* meet either feature ii) or feature iii) is *not* included in the area proposed as meeting EBSA criteria. Only those parts of the water column where the Subpolar Front is prominent at some time during the year are proposed as meeting one or more of the EBSA criteria. Moreover, in the entire *pelagic* area described by i), at any given time only those parts of the total area where the Subpolar Front is located would be expected to meet some of the criteria. Although maps will show the full pelagic area is proposed as part of this complex EBSA, any conservation measures for ecological properties of the water column would need to take into account the position of the Subpolar Front to be fully effective. For each of the above-mentioned features a set of geographic coordinates delineating their respective boundaries needs to be determined.

Evaluation of the revised area against the EBSA criteria

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<tr><td colspan="6">Explanation for ranking

The portion of the proposed area encompassing both the Charlie-Gibbs Fracture Zone and Subpolar Front Zone are unique. Both represent unique or unusual geomorphological or oceanographic features in the Northeast Atlantic. Other portions of the proposed EBSA are part of the Mid-Atlantic Ridge and, as discussed for Area 1 (Reykjanes Ridge south of Iceland EEZ), may host some unique benthic species based on Mar-Eco sampling.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

There is no evidence available suggesting a significant importance of the area for life-history stages of widespread species in comparison to other marine areas of similar size and depth range.</td></tr>
<tr><td>Importance for threatened, endangered, or declining species and/or habitats</td><td>Areas containing habitats for the survival and recovery of endangered, threatened, or declining species, or areas with significant assemblages of such species.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking

There is good evidence that the area contains a significant assemblage of species and habitats that are assessed to be threatened, endangered, or declining, including the following: orange roughy (Hoplostethus atlanticus), leafscale gulper shark (Centrophorus squamosus), gulper shark (Centrophorus granulosus), Portuguese dogfish (Centroscymnus coelepis), Sei whale (Balaenoptera borealis), sperm whale (Physeter macrocephalus), leatherback turtle (Dermochelys coriacea), Lophelia pertusa reefs, and deep-sea sponge aggregations. Depending on the species, the special features of the Fracture Zone, the Subpolar Frontal Zone, or in a few cases the Mid-Atlantic Ridge, all provide important biological functions to the species which aggregate along each one.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td>X</td><td></td></tr>
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<tr><td colspan="6">Explanation for ranking

The Charlie-Gibbs Fracture Zone and sections of the Mid-Atlantic Ridge through its associated substrate, current, and feeding conditions, provide habitats to a number of sensitive/vulnerable species and communities both on soft and hard substrate and in the water column. In particular biogenic habitats such as those formed by cold-water corals and sponges are considered vulnerable, often fragile, and slow (if at all) to recover from damage. Some fish species associated with the Fracture Zone and Mid-Atlantic Ridge also show slow growth, late maturity, irregular reproduction, and long generation time, as well as community characteristics of high diversity at low biomass. However, there is no evidence available suggesting that the area contains a significantly higher proportion of species that are functionally fragile or with slow recovery than other areas of comparable structure and depth range along the Mid-Atlantic Ridge.</td></tr>
<tr><td>Biological productivity</td><td>Areas containing species, populations, or communities with comparatively higher natural biological productivity.</td><td></td><td>X</td><td></td><td>(X)</td></tr>
<tr><td colspan="6">Explanation for ranking

There is good evidence that, due to the Subpolar Front, the pelagic area where the front is located at any particular time is characterized by an elevated abundance and diversity of many taxa, including an elevated standing stock of phytoplankton. This justifies a ranking of “High” for the pelagic area around the Subpolar Front, as it moves seasonally. However, there is no evidence of relatively elevated productivity in the benthic communities of the Fracture Zone and Mid-Atlantic Ridge.</td></tr>
<tr><td>Biological diversity</td><td>Areas containing a comparatively higher diversity of ecosystems, habitats, communities, or species, or with higher genetic diversity.</td><td></td><td></td><td>X</td><td>(X)</td></tr>
<tr><td colspan="6">Explanation for ranking

The area of the Fracture Zone is characterized by a very high structural complexity, offering a diverse range of habitats. The area of the Subpolar Front is a feature where species are documented to assemble seasonally, and the sections of the Mid-Atlantic Ridge north and south of the Fracture Zone represent different biogeographic settings and their respective characteristic communities. Consequently, each of the three features characterizing this area contribute to a relatively higher diversity of ecosystems, habitats, communities, and species in comparison to other areas of similar size along the Mid-Atlantic Ridge.</td></tr>
</table>

Area 3. Mid-Atlantic Ridge north of the Azores

ICES considers that one or more EBSA criteria would be met by an area with boundaries including all the following properties:

- Including a large portion (arbitrarily, perhaps 90%) of all hard volcanic substrates on the Mid-Atlantic Ridge south of the summer location of the Subpolar Front.
- Including the Moytirra Hydrothermal Vent Field.
- Incluings the area in the Mid-Atlantic Ridge included in the 50% density Kernel for foraging Cory’s shearwater.

Evaluation of the proposed area against the EBSA criteria

<table>
<tr><th rowspan="2">CBD EBSA Criterion</th><th rowspan="2">Description</th><th colspan="4">Ranking of criterion relevance
(please mark one column with an X)</th></tr>
<tr><th>Don’t Know</th><th>Low</th><th>Some</th><th>High</th></tr>
<tr><td>Uniqueness or rarity</td><td>The area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations), or endemic species, populations, or communities, and/or (ii) unique, rare, or distinct habitats or ecosystems, and/or (iii) unique or unusual geomorphological or oceanographic features.</td><td></td><td>X</td><td></td><td>(X)</td></tr>
<tr><td colspan="6">Explanation for ranking

There is support for qualification under this criterion only from the hydrothermal vent field in the area which is considered to be rare, and its associated communities which may be unique. This habitat is known from a single discrete location (thus the brackets) and so it cannot be considered to offer justification for the entire extent of the proposed area. ICES does not consider that any of the other evidence presented here supports qualification under this criterion.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

There is some support for qualification under this criterion from the occurrence of an important long-range foraging area for Cory’s shearwaters during their breeding season. However, the core area encompassing 50% of locations at sea is relatively small and does not justify the entire extent of the proposed area.

If research finds that deep-sea sharks and rays use the denser coral deposits as important spawning and nursery grounds, as has been reported in the Hatton–Rockall Bank area proposed by ICES, then there would be additional justification for a score of “Some” on this criterion.</td></tr>
<tr><td>Importance for threatened, endangered, or declining species and/or habitats</td><td>Areas containing habitats for the survival and recovery of endangered, threatened, or declining species, or areas with significant assemblages of such species.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

The only recognised threatened and/or declining species identified in the report as occurring in the area are the deep-water sharks Centrophorus squamosus and Centroscymnus coelolepis, both of which are included on the OSPAR list of threatened and/or declining species and habitats. Since this area is not considered to have special importance for their survival (compared with other areas of similar depth and latitude elsewhere) they would not qualify under this criterion.

However, in addition to the threatened and declining species mentioned in the proposal, the OSPAR listed habitats ‘seamount communities’ and ‘coral gardens’ are likely to exist in this area. If these were taken into account together with the sharks, this might be regarded as a significant assemblage of threatened and declining species and habitats and the ranking would be “Some”.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td>X</td><td></td></tr>
</table>

CBD EBSA Criterion	Description	Ranking of criterion relevance (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Explanation for ranking The proposed area focuses on areas with high abundance of seamounts, stony corals, and coral gardens. Recently a new hydrothermal vent was discovered on the ridge at 45ºN. Seamounts, ocean ridges with hydrothermal vents, coral reefs, and coral gardens are all considered priority habitats in need of protection by the OSPAR convention for the protection and conservation of the Northeast Atlantic. There is good support for qualification under this criterion from the occurrence of vulnerable marine ecosystems, including seamounts, stony corals, coral gardens, and hydrothermal vents.					
Biological productivity	Areas containing species, populations, or communities with comparatively higher natural biological productivity.		**X**		
Explanation for ranking There is no evidence that the productivity in the revised area is any different from the expected productivity of marine systems of similar depth and latitude.					
Biological diversity	Areas containing a comparatively higher diversity of ecosystems, habitats, communities, or species, or with higher genetic diversity.			**X**	
Explanation for ranking The presence of a hydrothermal vent field does not in itself indicate high diversity, but it does provide some evidence of habitat heterogeneity from which species diversity may be inferred. In addition, there is a mingling of benthic faunas characteristic of both warmer southern and cooler northern ocean environments, giving the area as a whole somewhat higher net biological diversity, although the diversity in any individual site is not markedly enhanced.					

Area 4. The Hatton and Rockall banks and the Hatton–Rockall Basin

The Hatton and Rockall banks, and associated slopes, represent unique offshore bathyal habitats (200 to 3000 m) and constitute a prominent feature of the Northeast Atlantic continental margin south of the Greenland to Scotland ridges. The banks and slopes have high habitat heterogeneity and support a wide range of benthic and pelagic faunas. They are also subject to significant fishing impact, including bottom trawling, longlining, and midwater fisheries. The banks encompass a large depth range and consequently the seabed communities encounter strong environmental gradients (e.g. temperature, pressure, and food availability). These factors cause large-scale changes in species composition with depth and give rise to a high diversity of species and habitats. The area is influenced by a number of different water masses and there is considerable interaction between the topography and physical oceanographic processes, in some areas focusing internal wave and tidal energy which results in strong currents and greater mixing and resuspension.

ICES recommend that additional work is needed primarily to refine the boundaries set out for this proposed EBSA. In particular the evidence base to use the 3000 m contour as the southern and western limits of this proposed EBSA is questionable since no evidence was provided that ecosystems meeting EBSA criteria are present at these depths. The features contributing to the uniqueness and rarity, threatened and declining species, vulnerability/fragility/sensitivity, and importance for life-history criteria stages all occur exclusively at relatively shallow depths (< 1500 m) with most being < 1200 m, and the only additional benefit gained by extending the boundary to 3000 m is an increase in the overall depth range covered and hence additional biological diversity. It is unclear whether the additional diversity conferred by the inclusion of the 1500 to 3000 m depth zone is any different from that present in any other area at comparable depth and latitude.

ICES therefore recommends that proposed EBSA should go forward with a revised boundary approximating to the 1500 m depth contour. If further work can establish significant additional value in the inclusion of greater depths, the boundary could be adjusted accordingly in the future.

Evaluation of the proposed area against the EBSA criteria

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<tr><td>Uniqueness or rarity</td><td>The area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations), or endemic species, populations, or communities, and/or (ii) unique, rare, or distinct habitats or ecosystems, and/or (iii) unique or unusual geomorphological or oceanographic features.</td><td></td><td></td><td>X</td><td>(X)</td></tr>
<tr><td colspan="6">Explanation for ranking

The area has considerable environmental heterogeneity, and therefore biological diversity, as a result of its large depth range and strong environmental gradients. Habitat-forming sessile benthic communities, such as those of giant protozoans and sponges, are common. Although distinctive these features are not rare per se.

Large areas of cold-water corals and sponges have been reported in the area. Some of these have been impacted by bottom trawl and longline fishing and past periods of bottom gillnet fishing, but some areas of large coral frameworks still exist, including areas such as the Logachev coral carbonate mound province which spans both national EEZ (Ireland) and international waters. Many of these coral frameworks are now protected as VMEs.

An area of polygonal faults may be a unique seabed feature. It is currently poorly investigated but may host important biological communities (e.g. cold-seeps).

The polygonal faults do not themselves appear to support unique biological communities or species but may be indicative of possible presence of active hydrocarbon seeps. One such active seep has recently been discovered in this area, supporting a rare chemosynthetic community that hosts species that have not been recorded elsewhere (hence the bracketed "High" score).

There is support for qualification under this criterion from the occurrence of polygonal faults and an active cold hydrocarbon seep. These features exist within a very restricted area of the site and, as described, the uniqueness and rarity criterion would only apply where these habitats occur. If further information is provided on the occurrence of large areas of cold-water coral reef, this may provide further support for this criterion over a wider geographical area.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

Cold-water corals and areas of natural coral rubble provide highly diverse habitats. Recent observations show that Lophelia pertusa reefs provide nursery grounds for deep-water sharks, and egg cases of deep-water rays were recorded with small patches of Solenosmilia variabilis framework on the Hebrides Terrace Seamount during the RRS James Cook 073 Changing Oceans Expedition in June 2012. New evidence from RRS James Cook cruises 073 and 060 shows that small patch reefs of L. pertusa on Rockall Bank are used as refuge by gravid Sebastes viviparous.

Parts of the Hatton–Rockall area are important as spawning areas for blue whiting, and the area is used as a corridor for a range of migrating species, including turtles.

Blue whiting has a widespread spawning area from the Faroe–Shetland Channel in the north to the Porcupine Bank in the south. Three areas of blue ling spawning aggregations are known on the shallow parts of Hatton and Lousy banks. These are significant since they represent three of the six known or suspected spawning locations for the southern stock of blue ling.</td></tr>
</table>

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<tr><td colspan="6">Explanation for ranking

The OSPAR threatened and declining habitats and species "carbonate mounds" and Lophelia pertusa are confirmed to be present in the area, and indicator species for "deep-sea sponge aggregations" and "coral gardens" have been recorded. The presence of these habitats has been confirmed in some areas that are now protected as VMEs.

The cold-water corals and natural rubble contain very large numbers of invertebrate species, including giant protozoans (xenophyophores), vase-shaped white sponges, actiniarians, antipatharian corals, hydroids, bryozoans, asteroids, ophiuroids, echinoids, holothurians, and crustaceans.

The distribution of cold-water coral has been severely reduced in the area over the last 30 years.

The deep-water sharks C. coelolepis and C. squamosus are also listed in the OSPAR list. Both occur in the area, but there is no information to indicate that this area is important for either species in the sense of having a significant proportion of the population or higher density than other areas of similar depth in the region.

Both Zino's petrel (endangered) and Fea's petrel (near threatened) are listed on the IUCN Red List. A further five species of seabirds listed in Annex I of the European Union Bird's Directive are found within the area. However, tracking for the two petrel species (data in Figure 2 of the proposal; OSPAR/NEAFC/CBD, 2011) appears to show that the area is of relatively low importance (5 to 10% of tracked birds) during a very short period (one month).

Knowledge of cetaceans in the area is poor, but the critically endangered northern right whale (Eubalaena glacialis) has been observed in this area. However, this single observation is insufficient to demonstrate importance for this species.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td></td><td>X</td></tr>
</table>

CBD EBSA Criterion	Description	Ranking of criterion relevance (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**

Explanation for ranking

It is uncertain how "a relatively high proportion" is defined in this context, but there is good evidence for vulnerable habitats and benthic species in the area (records of cold-water coral reefs and carbonate mounds, and indicator species for coral gardens, deep-water sponge aggregations). Distribution is not uniform across the area and many of the areas where they occur are now protected as VMEs.

There is a high diversity of corals, including bamboo coral (Isididae), black coral (Antipatharia), as well as the reef-forming stony corals (Scleractinia), though some of these may now be reduced in distribution and occurring in patches. Cold-water coral habitats are easily impacted and recover very slowly. Some species of cold-water corals can live for more than 4000 years.

Many of the demersal fish have life histories of deep-water fish fauna with very slow recovery times as a result of their slow reproductive rate compared to pelagic fish. These fish may be more exposed to fishing pressure because trawlable habitat is more common in this area than is typical at these depths. Stocks have already been diminished in some areas.

There is good support for qualification under this criterion from the occurrence of vulnerable marine ecosystems, including stony corals, carbonate mounds, possible coral gardens and deep-sea sponge aggregations, and an active cold seep. Although comparative studies have not been done, it is probable that occurrence of corals in the Rockall–Hatton area is higher than in other areas of comparable depth and latitude. This would therefore constitute a "relatively high proportion".

The species or habitats discussed in this rationale are generally found in depths above 1500 m and thus this proposed EBSA should be limited to this depth contour.

Biological productivity	Areas containing species, populations, or communities with comparatively higher natural biological productivity.		**X**		

Explanation for ranking

It is likely that pelagic production may be enhanced relative to surrounding areas due to upwelling, but benthic secondary production in deep-water environments is generally considered to be low compared to other environments.

Biological diversity	Areas containing a comparatively higher diversity of ecosystems, habitats, communities, or species, or with higher genetic diversity.				**X**

Explanation for ranking

The area comprises a patchwork of habitats with species changing consistently with both habitat type and increasing depth. Some habitats are threatened by direct impacts (e.g. bottom fishing), others may suffer indirectly (e.g. through the creation of sediment plumes by impacts of fishing gear in sensitive areas). Seabed communities include cold-water corals, rocky reefs, carbonate mounds, polygonal fault systems, sponge aggregations, and steep and gentle sedimented slopes. Cold-water corals provide diverse habitats for other invertebrates and fish.

This area spans more than one biogeography province; consequently, overall diversity is likely to be higher than in other areas with comparable depth and habitat range. Rare habitats such as cold seeps and highly diverse habitats such as cold-water coral reef and rubble further contribute to the overall diversity.

Proposal for a different configuration of EBSAs than those presented in the OSPAR/NEAFC/CBD Workshop report

Proposed EBSAs 1, 2, and 3 (Reykjanes Ridge south of Iceland EEZ, Charlie-Gibbs Fracture Zone and Subpolar Frontal Zone of the Mid-Atlantic Ridge, and Mid-Atlantic Ridge north of the Azores) all encompass the hard substrates running roughly north–south in the higher elevations of the Mid-Atlantic Ridge, and for proposed

EBSAs 1 to 3 the southern boundary of each aligns with the northern boundary of the next. The boundaries between them were defined primarily by the extreme limits of the position of the east–west-oriented Subpolar Front, a major pelagic oceanographic feature in proposed EBSA 2 that moves seasonally northward spring and summer) and southward (autumn and winter).

The Subpolar Front has affinities with the Charlie-Gibbs Fracture Zone, but not with the Mid-Atlantic Ridge. If the Charlie-Gibbs Fracture Zone, running roughly east to west, and associated Subpolar Frontal Zone were treated separately from the Mid-Atlantic Ridge, then all the areas delineated by the features of the Mid-Atlantic Ridge specified for the proposed EBSAs 1, 2, and 3 would share a consistent geomorphological feature (the emergent hard substrates primarily of volcanic origin) with associated benthic fauna present from the northern boundary of proposed EBSA 1 to the southern boundary of proposed EBSA 3, with the Charlie-Gibbs Fracture Zone itself simply serving as an interruption in this feature.

The entire Mid-Atlantic Ridge feature would score “Some” or “High” on several criteria, and for generally the same biological rationales for the entire ridge. The species composition of the benthic biota does change from north to south, but aside from the structural interruption caused by the transverse fractures, there is no strong evidence that discontinuities in benthic community composition exist along the ridge. Thus, an alternative area to proposed EBSAs 1, 2, and 3 can be justified along the entire Mid-Atlantic Ridge in the OSPAR/NEAFC area, defined by the features specified in the description of proposed EBSA 1, and ranked as “Some” or “High” on several EBSA criteria with a common justification for that entire area.

A second alternative EBSA could then be proposed, consisting of the Charlie-Gibbs Fracture Zone and Subpolar Frontal Zone, taken together. This area would have its own set of ecological properties and associated rankings on the EBSA criteria. It would be ranked “Some” or “High” on several criteria for justifications specific to the Fracture Zone and Subpolar Front, but in several cases for justifications very different from that of the Mid-Atlantic Ridge.

These two potential proposed EBSAs would replace proposed EBSAs 1, 2, and 3 from the OSPAR/NEAFC/CBD Workshop report. It would also require a separate consideration of seabird foraging in the southern third of the area, jointly with the additional analyses already recommended for the OSPAR/NEAFC/CBD Workshop proposed EBSAs 5–8.

Alternative proposed EBSA for the Mid-Atlantic Ridge

The Mid-Atlantic Ridge runs from the southern boundary of the Icelandic EEZ to the northern boundary of the Portuguese EEZ in the Azores and includes all area above a depth contour that runs in the deeper of two properties:

1. Including a large portion (arbitrarily, perhaps 90%) of all hard volcanic substrates; habitats are reported to host the larger known coral deposits and their associated communities.
2. Included a large portion (arbitrarily, 90%) of the records of large sponge communities in the overall Mid-Atlantic Ridge.

In addition the proposed area should include all known hydrothermal vents along the ridge, if any of these are deeper than the contours meeting the properties above.

Evaluation of the proposed area against the EBSA criteria

CBD EBSA Criterion	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don’t Know	**Low**	**Some**	**High**
Uniqueness or rarity	The area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations), or endemic species, populations, or communities, and/or (ii) unique, rare, or distinct habitats or ecosystems, and/or (iii) unique or unusual geomorphological or oceanographic features.			**X**	**(X)**

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<tr><th>Don’t Know</th><th>Low</th><th>Some</th><th>High</th></tr>
<tr><td colspan="6">Explanation for ranking
The qualified “High” ranking is for restricted areas of the few known hydrothermal vents along the ridge. These are globally rare features; only a small part of the area proposed here meets this EBSA criterion.

The MarEco sampling of corals and sponges reported several species new to science as it sampled the Mid-Atlantic Ridge. However, it is not possible to draw a firm conclusion on the presence of unique species along the ridge until more extensive sampling is undertaken.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

Although many populations undoubtedly complete their life cycles within the harder-substrate areas of the Mid-Atlantic Ridge, this would be true of any marine area of comparable size. There is no evidence that the life history of any species is strongly dependent on any specific features of the area proposed as an alternative EBSA.

There is evidence from other areas of the Northeast Atlantic that areas of high coral density may be important as egg-case and nursery areas of deep-water sharks and rays. The area proposed here is targeted on the depths and substrates associated with higher coral and sponge densities, and if sharks and rays also concentrate spawning and early development in these habitats, then the score would be “Some” or “High” on this criterion as well. However, it has not yet been documented that skates and rays do preferentially use the coral and sponge formations for these life history functions in the Mid-Atlantic Ridge.

For the more southern portions of the Mid-Atlantic Ridge in particular, there are reports of areas being important for foraging by seabirds, including Cory’s shearwater. The evidence available is not considered strong, however, and this aspect of the ecological functionality of the central ridge area should be considered as part of the reanalysis of EBSAs 5–8 proposed in the OSPAR/NEAFC/CBD Workshop report.</td></tr>
<tr><td>Importance for threatened, endangered, or declining species and/or habitats</td><td>Areas containing habitats for the survival and recovery of endangered, threatened, or declining species, or areas with significant assemblages of such species.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking

There are large deposits of corals and sponges found in the alternative area proposed by ICES as meeting this criterion. Habitats containing these species are listed by OSPAR and are also VME indicator species, and the majority of these would be included in the alternative proposed EBSA. Additional explanation regarding corals and sponges is included in the rationale for the criterion on Vulnerability.

The possible role of the alternative proposed Mid-Atlantic Ridge area in the life histories of sharks and rays is discussed in the criterion on Vulnerability and Sensitivity. If a dependency between the breeding or early life history of threatened or endangered skates or rays were documented, there would be additional justification for a “High” ranking of this criterion.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td>X</td><td></td></tr>
</table>

CBD EBSA Criterion	Description	Ranking of criterion relevance (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Explanation for ranking With regard to corals and sponges, Mortensen *et al.* (2008) found cold-water corals "*at every sample station … observed at depths between 800 and 2400 m, however were commonly found shallower than 1400 m …, with species richness being very high. … no major reef structures were recorded, with the maximum colony size approximately 0.5 m in diameter. The number of coral taxa was strongly correlated with the percentage cover of hard bottom substrate ….*" The area proposed here is targeted at the seamount peaks and slopes where hard substrates dominate. For sponges, no actual large expanses of sponge reef were reported in the OSPAR/NEAFC/CBD Workshop report. However, the pro forma in that report notes that overall sampling of the area is patchy and cites three studies that found local patches with high densities of sponges, although in no cases were the sizes of the patches documented. If research finds that deep-sea sharks and rays use the denser coral deposits as important spawning and nursery grounds, as has been reported in the Hatton–Rockall Bank area proposed by ICES, then there would be additional justification for a score of "Some" on this criterion.					
Biological productivity	Areas containing species, populations, or communities with comparatively higher natural biological productivity.		**X**		
Explanation for ranking Although benthic productivity of the alternative proposed Mid-Atlantic Ridge EBSA may be higher than benthic productivity on the abyssal plain, productivity integrated over the entire water column and seafloor seems typical of systems of comparable depth and latitude globally.					
Biological diversity	Areas containing comparatively higher diversity of ecosystems, habitats, communities, or species, or with higher genetic diversity.			**X**	
Explanation for ranking The presence of comparatively large coral and sponge formations, and the documented high diversity of benthic and associated fish when corals or sponges are present in moderate or high density imply that some areas along the ridge may have high diversity. From north to south there is a mingling of benthic and demersal fish faunas characteristic of both cooler northern and warmer southern ocean environments, giving the area as a whole a somewhat higher net biological diversity, even if the diversity in any individual site is not markedly enhanced. Aside from the benthic communities of somewhat restricted distribution associated with the biogenic habitats, the biodiversity otherwise appears typical of biotic communities at similar depths and latitude.					

Alternative proposed EBSA – The Charlie-Gibbs Fracture Zone and Subpolar Frontal Zone

The area would include:

i. *Subpolar Frontal Zone* (coinciding with the Charlie-Gibbs Fracture Zone): The northern and southern boundaries for this feature should be set according to the known northernmost and southernmost locations of the frontal system (at approximately 53°N and 48°N). The eastern and western boundaries for this feature should be set according to the eastern and westernmost extension of the Charlie-Gibbs Fracture Zone (at approximately 27°W and 42°W).

ii. *Charlie-Gibbs Fracture Zone*: The eastern and western boundaries for this feature should be set according to the east–west extension of the Fracture Zone (at approximately 27°W and 42°W). The northern and southern seabed boundaries for this feature should be set with a view to encompass the characteristic topography and substrates of the Fracture Zone.

Any area of the seafloor and associated benthos that lies *below* the pelagic feature i) (the total area occupied by the Subpolar Front during its annual movement) but does *not* meet feature ii) is *not* included in the area proposed as meeting EBSA criteria. Only those parts of the water column where the Subpolar Front is prominent at some time during the year are proposed as meeting one or more of the EBSA criteria. Moreover, in the entire *pelagic* area described by i), at any given time only that part of the total area where the Subpolar Front is located would be expected to meet some of the criteria. Although maps will show that the full pelagic area is proposed as part of this complex EBSA, any conservation measures for ecological properties of the water column would need to take into account the position of the Subpolar Front to be fully effective.

Evaluation of the proposed area against the EBSA criteria

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<tr><td colspan="6">Explanation for ranking

The Charlie-Gibbs Fracture Zone is a set of geomorphological features unique to the entire North Atlantic, and the Subpolar Front is an oceanographic feature also unique to the Northeast Atlantic. Together these features justify a "High" score for this criterion.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

No evidence is available suggesting a significant importance of the area for life-history stages of widespread species in comparison with other marine areas of similar size and depth range. It is possible that there are species with special affinities for the unique geophysical features of the deep faults, but clear documentation of species with such affinities was not found in the references provided by the OSPAR/NEAFC/CBD Workshop report, and was not otherwise known to ICES.</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Areas containing habitats for the survival and recovery of endangered, threatened, or declining species, or areas with significant assemblages of such species.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking

There is good evidence that the area contains a significant assemblage of species and habitats that are assessed to be threatened, endangered, or declining, including leafscale gulper shark (Centrophorus squamosus), gulper shark (Centrophorus granulosus), Portuguese dogfish (Centroscymnus coelepis), Sei whale (Balaenoptera borealis), sperm whale (Physeter macrocephalus), leatherback turtle (Dermochelys coriacea), as well as cold-water coral reefs and deep-sea sponge aggregations. Depending on the species, the special features of the Fracture Zone and the Subpolar Front are inferred to provide important biological functions to the species which aggregate along each one.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td>X</td><td></td></tr>
</table>

<table>
<tr><th rowspan="2">CBD EBSA Criterion</th><th rowspan="2">Description</th><th colspan="4">Ranking of criterion relevance
(please mark one column with an X)</th></tr>
<tr><th>Don’t Know</th><th>Low</th><th>Some</th><th>High</th></tr>
<tr><td colspan="6">Explanation for ranking

The Charlie-Gibbs Fracture Zone geophysical structure provides habitats for a number of sensitive/vulnerable species and communities both on soft and hard substrate and in the associated water column. In particular biogenic habitats such as those formed by cold-water corals and sponges are considered vulnerable, are often fragile, and slow (if at all) to recover from damage. Some fish species associated with the Fracture Zone and the Subpolar Front also show slow growth, late maturity, irregular reproduction, and long generation time, as well as community characteristics of high diversity at low biomass. However, the documentation that the species with vulnerable life histories are especially closely affiliated with the Fracture Zone and frontal habitats is weak, and it is clear that these vulnerable species and biogenic habitats are not consistently present throughout the entire Fracture Zone and Subpolar Front.</td></tr>
<tr><td>Biological productivity</td><td>Areas containing species, populations, or communities with comparatively higher natural biological productivity.</td><td></td><td></td><td>X</td><td>(X)</td></tr>
<tr><td colspan="6">Explanation for ranking

There is good evidence that, because of the Subpolar Front, the pelagic area where the front is located at any particular time is characterized by an elevated abundance and diversity of many taxa, including an elevated standing stock of phytoplankton. This justifies a ranking of “High” for the pelagic area around the Subpolar Front, as it moves seasonally. However, there is no evidence of relatively elevated productivity in the benthic communities of the Fracture Zone.</td></tr>
<tr><td>Biological diversity</td><td>Areas containing a comparatively higher diversity of ecosystems, habitats, communities, or species, or with higher genetic diversity.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking

The area of the Fracture Zone is characterized by a very high structural complexity, offering a diverse range of habitats. The area of the Subpolar Front is a feature where species are documented to assemble seasonally. Consequently, both features characterizing this area contribute to a relatively higher diversity of ecosystems, habitats, communities, and species in comparison to other areas of the Northeast Atlantic.</td></tr>
</table>

Proposed EBSAs for which there is insufficient scientific justification

For five of the ten areas proposed as meeting one or more EBSA criteria in the OSPAR/NEAFC/CBD Workshop report, ICES concluded that there is insufficient scientific justification at this time to propose their delineated area, or any subset of it, as meeting EBSA criteria. In all cases ICES recommends that additional information needs to be collated and analysed, and a new evaluation be conducted when those results are available. ICES provides reasoning for its advice and recommendations for further work in each of these areas below.

Area 5. Around the Pedro Nunes and Hugo de Lacerda seamounts **and**

Area 6. Northeast Azores–Biscay Rise

The OSPAR/NEAFC/CBD Workshop concluded that both areas ranked as “High” on criterion Special Importance to Life History of Species, and “Some” on criteria Uniqueness and Rarity; Importance to Threatened, Endangered, or Declining Species; and Vulnerability, Sensitivity, etc., the latter primarily for seabirds. ICES questions the basis for these conclusions, noting that the data used to assess all the criteria specified were incomplete and often incorrectly interpreted, with the proposed boundaries not matching the information in the cited sources.

ICES recommends that all available data on foraging activity of the Zino’s petrel, Cory’s shearwater, and other relevant species be examined. This should include published and any other available data. Occurrence data may be used as well, provided the rationale details how occurrence and foraging data are used to derive EBSA boundaries.

Area 7. Evlanov Seamount region

The OSPAR/NEAFC/CBD Workshop concluded that the area they delineated ranked as "High" on criterion Importance to Threatened, Endangered, or Declining Species, and "Some" on criteria Uniqueness and Rarity; Special Importance to Life History of Species; and Vulnerability, Sensitivity, etc., the latter primarily for seabirds. ICES questions the basis for these conclusions, noting that the data used to assess all the criteria specified were incomplete and often incorrectly interpreted, with the proposed boundaries not matching the information in the cited sources. In particular the sample sizes for Fea's petrel were very small, and the information for sooty shearwater did not seem to differentiate the proposed EBSA area from most of surrounding area.

ICES advises not to proceed with proposing any portion of this area as an EBSA at this time, but rather undertake further collation and analysis of information and reconsider when the additional work is completed.

Area 8. Northwest of Azores EEZ

The OSPAR/NEAFC/CBD Workshop concluded that the area they delineated ranked as "High" on criteria Special Importance for Life History of Stages of Species and Importance for Threatened, Endangered or Declining Species, and "Some" on criteria Uniqueness and Rarity; Vulnerability, Sensitivity, etc.; and Biological Diversity, the latter primarily for seabirds. ICES questions the basis for these conclusions, noting that the data used to assess all the criteria specified were incomplete and often incorrectly interpreted, with very small sample sizes for some of the species' (e.g. Zino's petrel) foraging areas, and questionable interpretation of the foraging areas of Cory's shearwater.

ICES does not support this area going forward as presented in the OSPAR/NEAFC/CBD EBSA Workshop report. ICES advises that improvements are needed to the supporting evidence in the narrative for criteria related to Special Importance for Life History Stages of Species and Importance for Threatened, Endangered or Declining Species and/or Habitats. It is necessary to augment information on how the area is being used (feeding, conditioning, migration) for the survival and recovery of the species and to put some scale on its importance to the species (some of which have very restricted breeding sites in the larger area). It is also necessary to document the proportion of species that are highly susceptible to degradation or depletion by human activity, in this case bycatch in longline fisheries.

Area 9. The Arctic Front – Greenland/Norwegian seas

The OSPAR/NEAFC/CBD Workshop concluded that the area they delineated ranked as "High" on criteria Special Importance to Life History of Species; Importance to Threatened, Endangered, or Declining Species; Biological Productivity; and Biological Diversity. ICES questions the basis for these conclusions, noting that (1) for several features the area proposed as meeting criteria were not noticeably different from the surrounding areas; (2) some of the rankings regarding importance appeared to be inferred from a belief that the area is high in productivity, but the rankings were not demonstrated otherwise; and (3) publications with contrasting conclusions were found for some of the key references cited in the OSPAR/NEAFC/CBD Workshop report.

ICES recommends not to proceed with the proposed Arctic Front EBSA. There is no evidence of enhanced productivity at the Arctic Front which is the main rationale used to justify the proposed EBSA. However, there seems to be circumstantial evidence for an enhanced production that may attract feeding animals in the areas around and south of Jan Mayen, including the Jan Mayen Front. If parts of this area are located in the high seas, further analyses should be undertaken to determine if this area meets the EBSA criteria.

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Annex 1.5.6.5.1 Revised pro forma for the Arctic Ice habitat

Annex 1

Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas (EBSAs) in the North-East Atlantic

Hyères (Port Cros), France: 8 – 9 September 2011

EBSA identification proforma for the North-East Atlantic - 10

Title/Name of the area - The Arctic Ice habitat - multiyear ice, seasonal ice and marginal ice zone

Presented by WWF and reviewed by Participants at the Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas in the North-East Atlantic

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Abstract

The permanently ice covered waters of the high Arctic provide a range of globally unique habitats associated with the variety of ice conditions. Multi-year sea ice only exists in the Arctic and although the projections of changing ice conditions due to climate change project a considerable loss of sea ice, in particular multiyear ice, the Eurasian Central Arctic high seas are likely to at least keep the ice longer than many other regions in the Arctic basin. Ice is a crucial habitat and source of particular foodweb dynamics, the loss of which will affect also a number of mammalian and avian predatory species. The particularly pronounced physical changes of Arctic ice conditions as already observed and expected for the coming decades, will require careful ecological monitoring and eventually measures to maintain or restore the resilience of the Arctic populations to quickly changing environmental conditions.

Introduction

Up until today most of the Eurasian part of the Arctic Basin, and in particular the high seas area in the Arctic Ocean (the waters beyond the 200 nm zones of coastal states, i.e. Norway, Russia, USA, Canada and Greenland/Denmark) is permanently ice covered. However, in recent years, much of the original multiyear pack ice has been replaced by seasonal (1 year) ice which made it possible for research and other vessels to reach the pole. In addition, the former fast pack-ice is now increasingly broken up by leads. This structural change in the Arctic ice quality will result in a substantial increase in light penetrating the thin ice and water column, in conjunction with the overall warming of surface waters and increased temperature and salinity stratification due to the melting of ice.

In the near future, up to the end of the century, the permanent ice cover is expected to disappear completely in some models (Anisimov *et al*., 2007). This will result in significant changes in the structure and dynamics of the high Arctic ecosystems (CAFF, 2010; Gradinger, 1995; Piepenburg, 2005; Renaud *et al*., 2008; Wassmann, 2008, 2011) which should be closely monitored (Bluhm *et al*., 2011) as already envisaged by the Arctic Council (Gill *et al*., 2011; Mauritzen *et al*., 2011).

Therefore, the area proposed here as EBSA is of particular scientific interest and may in the longterm, become relevant for the commercial exploitation of resources.

Location

The Ecologically or Biologically Significant Marine Area (EBSA) proposed focusses on the presently permanently ice-covered waters in the OSPAR/NEAFC maritime areas, including the high seas section in the Central Arctic Basin north of the 200 nm zones of coastal states (see Fig. 1 attached). Therefore, the boundaries proposed extend from the North Pole (northernmost point of OSPAR/NEAFC maritime areas) to the southern limit of the summer sea ice extent and marginal ice zone, including on the shelf of East Greenland.

The proposal currently only relates to features of the water column. Two legal states have to be distinguished: the Central Arctic high seas waters north of the 200 nm zones of adjacent coastal states, generally north of 84° N, and the waters within the Exclusive Economic Zones of Greenland, Russia and the fisheries protection zone of Norway around Svalbard. Figure 1 distinguishes between the high seas beyond national jurisdiction for which the „Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas (EBSAs) in the North-East Atlantic“ has a mandate[1], and national/nationally administered waters within the 200 nm zone, within which the OSPAR Contracting Parties have the responsiblity to report candidate EBSAs to the Convention on Biodiversity EBSA repository (OSPAR Commission, 2011).

The seafloor of the respective region will likely fall on the extended continental shelves of several coastal states. It belongs to the „Arctic Basin“ region of (Gill *et al*., 2011).

The coordinates of the overall area, as well as the high seas section are provided in Annex 1 (in decimals, shape files provided):

c.f. **Figure 1**: Location of the Arctic Ice „Ecologically or Biologically Significant Area“ (EBSA) proposed by WWF in September 2011. The position of the Arctic and polar fronts was redrawn after (Rey, 2004, Fig. 5.7).

Feature description

The Ecologically or Biologically Significant Marine Area (EBSA) proposed focusses on the presently permanently ice-covered waters in the OSPAR/NEAFC maritime areas, including the high seas section in the Central Arctic Basin north of the 200 nm zones of coastal states, and the marginal ice zone (where the ice breaks up, also called seasonal ice zone) along its southern margins (see Fig. 1 attached). Due to the inflow of Atlantic water along the shelf of Svalbard, and the concurrent outflow of polar water and ice on the Greenland side of Fram Strait, the southern limit of the summer sea ice extent is much further south in the western compared to the eastern Framstrait, and in former times extended all along the Greenland coast.

The high seas section of the OSPAR maritime area in the Central Arctic ocean is generally north of 84° N and is until today fully ice-covered also in summer, although the quantity of multiyear ice has already substantially decreased and the 1-year ice leaves increasingly large leads and open water spaces. The ice overlays a very deep water body of up to 5000 m depth far away from the surrounding continental shelves and slopes of Greenland and the Svalbard archipelago. The Nansen-Gakkel Ridge, a prolongation of the Mid-Atlantic Ridge north of the Fram Strait is structuring

[1] Participant Briefing for a Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas (EBSAs) in the North-East Atlantic. Invitation Annex 2, 2011

the deep Arctic basin in this section, separating the Central Nansen Basin to the south from the Amundsen Basin to the north. Abundant hydrothermal vent sites have been discovered on this ridge at about 85° 38 N (Edmonds *et al*., 2003).

North of Spitsbergen, the Atlantic water of the West Spitsbergen Current enters the Arctic basin as a surface current. At around 83° N, a deep-reaching frontal zone separates the incoming Atlantic and shelf waters from those of the Central Nansen Basin (Anderson *et al*., 1989), as reflected in ice properties, nutrient concentrations, zooplankton communities, and benthic assemblages (Hirche and Mumm, 1992, and literature quoted). This water subsequently submerges under the less dense (less salinity, lower temperature) polar water and circulates, in opposite direction to the surface waters and ice, counterclockwise along the continental rises until turning south along the Lomonossov Ridge and through Fram Strait as East Greenland Current south to Danmark Strait (Aagaard, 1989; Aagaard *et al*., 1985). Connecting the more fertile shelves with the deep central basin, these modified Atlantic waters supply the waters north of the Nansen-Gakkel Ridge, in the Amundsen basin, with advected organic material and nutrients which supplement the autochtonous production (Mumm *et al*., 1998). Due to the import of organic biomass from the Greenland Sea and the Arctic continental shelves, part of which may not be kept in the food web due to the polar conditions, the Arctic Ocean may also represent an enormous carbon sink (Hirche and Mumm, 1992).

In the Fram Strait, the region between Svalbard to the east and Greenland to the west, the East Greenland Current is the main outflow of polar water and ice from the Arctic Basin (Maykut, 1985) (Aagaard and Coachman, 1968). The polar front (0° C isotherm and 34.5 isohaline at 50 m depth) extends approximately along the continental shelf of Greenland, separating the polar surface water from the Arctic (Intermediate) water and the marginal ice zone to the east (e.g. Aagaard and Coachman, 1968; Paquette *et al*., 1985). The ice cover is densest in polar water, its extent to the east depends on the wind conditions (compare also Angelen *et al*., 2011; Wadhams, 1981).

The seasonal latitudinal progression of increasing and diminishing light levels, respectively, is the determining factor for the timing of the phytoplankton-related pelagic production. Therefore, the springbloom and ice break up progress from south to north in spring, reaching the Arctic area by about June/July. Because the currents in Fram Strait move in opposite direction, the polar East Greenland Current to the south, and the Atlantic West Spitsbergen Current to the north, there is a delay of about a month between biological spring and summer between the polar and the Atlantic side (Hirche *et al*., 1991). Therefore sea ice and the effect of melting ice are important determinants of the ecosystem processes all along the East Greenland polar front from the Greenland Sea through Fram Strait to the Arctic Basin (Legendre *et al*., 1992; Wassmann, 2011).

Ice situation

The Arctic Ocean develops towards a one-year instead of a multi-year sea-ice system with consequences for the entire ecosystem, including ecosystem shifts, biodiversity loss, for water mass modifications and for its role in the global overturning circulation. At its maximum, sea-ice covers 4.47 million km² in the Arctic Basin (Gill *et al*., 2011): According to data from ice satellite observations in 1973-76 (NASA, 1987, in (Gill *et al*., 2011)), permanent ice occupied 70-80% of the Arctic Basin area, and the interannual variability of this area did not exceed 2%. Seasonal ice occupied 6-17% (before the melting period of the mid-1970s). Only in the first decade of the 21st century, the permanent-ice area decreased to 6% in February 2008, concurrent with a rapid increase in seasonal- ice. Whereas multiyear ice used to cover 50-60% of the Arctic, it covered less than 30% in 2008, after a minimum of 10% in 2007. The average age of the remaining multiyear ice is also decreasing from over 20 % being at least six years in the mid- to late 1980s, to just 6% of ice six years old or older in 2008.

c.f**. Figure 2:** Modelled ice age distribution in 1985-2000 (left) compared to February 2008 (right) (CAFF, 2010).

This trend is likely to amplify in the coming years, as the net ocean-atmosphere heat output due to the current anomalously low sea ice coverage has approximately trippled compared to previous years, suggesting that the present sea ice losses have already initiated a positive feedback loop with increasing surface air temperatures in the Arctic (Kurtz *et al*., 2011).

About 10% of the sea ice in the Arctic basin is exported each year through Fram Strait into the Greenland Sea (Maykut, 1985) which is therefore major sink for Arctic sea ice (Kwok, 2009). From 2001 to 2005, the summer ice cover was so low on the East Greenland shelf, that it was more of a marginal ice zone (Smith Jr and Barber, 2007), however the subsequent record lows in overall Arctic ice cover brought about an increase in ice cover off Greenland, which minimised the extent of the North East Water Polynia on the East Greenland shelf2, a previously seasonally ice-free stretch of water (Wadhams, 1981).

Ice related biota

Allover the Arctic, an inventory of ice-associated biota presently counts over 1000 protists, and more than 50 metazoan species (Bluhm *et al*., 2011). The regionally very variable ice fauna (depends i.e. on ice age, thickness, origin) consists of sympagic biota living within the caverns and brine channels of the ice, and associated pelagic fauna. The most abundant and diverse sympagic groups of the ice mesofauna in the Arctic seas are amphipods and copepods. Polar cod (Boreogadus saida) and partly Arctic cod (Arctogadus glacialis) are dependent on the sympagic macro- and mesofauna for food, themselves being important food sources for Arctic seals (such as ringed seal Phoca hispida) and birds, for example black guillemots Cephus grylle (Bradstreet and Cross, 1982; Gradinger and Bluhm, 2004 and literature reviewed; Horner *et al*., 1992; Süfke *et al*., 1998).

The higher the light level in the ice, the higher is the biomass of benthic algae as well as meiofauna and microorganisms within the ice (Gradinger *et al*., 1991). Decreasing snow cover induces a feedback loop with enhanced algal biomass increasing the heat absorption of the ice which leads to changes in the ice structure, and ultimately the release of algae from the bottom layer (Apollonio, 1961 in Gradinger *et al*., 1991). Because of the distance to land and shelves, and the thickness and internal structure of the multiyear pack ice over deeper water, this type of ice has a fauna of its own (Carey, 1985; Gradinger *et al*., 1991). Arctic multiyear ice floes can have very high algal biomasses in the brine channels and in the bottom centimeters which serves as food for a variety of proto- and metazoans, usually smaller than 1 mm, over deep water (Gradinger *et al*., 1999). In the central Arctic, ice algal productivity can contribute up to 50 % of the total primary productivity, with lower contributions in the sea ice covered margins (Bluhm *et al*., 2011).

In the boundary layer between ice floes and the water column, another specific community exists which forms the link between the ice based primary production and the pelagic fauna (Gradinger, 1995): large visible bands of diatoms hang down from the ice, exploited by amphipods such as *Gammarus wilkitzki*, and occacionally by water column copepods such as *Calanus glacialis*, which are important prey of for example polar cod *Boreogadus saida*. The caverns, wedges and irregularities of the ice provide important shelter from predators for larger ice associated species and provide an essential habitat for these species (Gradinger and Bluhm, 2004).

During melt, the entire sympagic ice biota are released into the water column where they may initiate the spring algal plankton bloom (Smith and Sakshaug, 1990) or they may sink to the sea floor and serve as an episodic and first food pulse for benthic organisms before pelagic production begins (Arndt and Pavlova, 2005). In particular the shallow shelves and the shelf slope benthos has been shown to profit of this biomass input, reflected in very rich benthic communities (Klitgaard and Tendal, 2004; Piepenburg, 2005).

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[2] http://www.issibern.ch/teams/Polynya/

The role of the polar front and marginal ice zone for the production system

Primary production in the Arctic Ocean is primarily determined by light availability, which is a function of ice thickness, ice cover, snow cover, light attenuation), the abundance of both ice algae and phytoplankton, nutrient availability and surface water stratification. Generally, the spring bloom occurs later further north and in regions with a thick ice and snow cover. The current production period in the Arctic Ocean may extend to 120 days per year, with a total annual primary production in the central Arctic Ocean of probably up to 10 g C m-2 (Wheeler *et al*., 1996).

Ice algae start primary production already at relatively low light levels when melting reduces the thickness of the ice and snow cover. Only after the ice breaks up, when melting releases the ice biota into the water column and meltwater leads to surface stratification, a major phytoplankton bloom of a few weeks develops, fuelling the higher trophic foodweb of the Arctic (Gradinger *et al*., 1999, and literature quoted).

The marginal ice zones, i.e. where the ice gets broken up in warmer Atlantic or Arctic water, therefore play an important role in the overall production patterns of the Arctic Ocean. Due to the strong water column stratification and increased light levels involved with the melting of the ice, the location and recession of the ice edge in spring and summer determines the timing and magnitude of the spring phytoplankton bloom, which is generally earlier than in the open water (Gradinger and Baumann, 1991; Smith Jr *et al*., 1987). Wind- or eddy-induced upwelling in the marginal ice zone, as well as biological regeneration processes replenish the surface nutrient pool and therefore prolong the algal growth period (Gradinger and Baumann, 1991; Smith, 1987). The hydrographic variability explains the patchy patterns of primary and secondary production observed, as well as consequently the patchy occurrence of predators.

The polar front separates to some degree the pelagic faunas of the polar and Arctic waters in the Greenland Sea and Fram Strait, each characterised by a few dominant copepod species with different life history strategies (Hirche *et al*., 1991; see also review in Melle *et al*., 2005): In polar waters, Calanus glacialis uses under ice plankton production and lipid reserves for initiating its spring reproduction phase, however depending on the phytoplankton bloom for raising its offspring (e.g. Leu *et al*., 2011). Somewhat later, on the warm side of the polar front in Arctic water, the Atlantic species Calanus finmarchicus uses the ice edge-related phytoplankton bloom for secondary production. Calanus hyperboreus, the third and largest of the charismatic copepod species has its core area of distribution in the Arctic waters of the Greenland Sea (Hirche, 1997; Hirche *et al*., 2006).

Zooplankton of the Arctic Basin

Overall zooplankton biomass decreases towards the central Arctic basin, reaching a minimum in the most northerly waters, i.e. the region with permanent ice cover (Mumm *et al*., 1998). However, investigations in recent years demonstrated increased biomasses compared to studies several decades earlier - possibly a consequence of the decrease in ice thickness and cover which only enabled the investigations to take place from ship board.

There is a south-north decrease in zooplankton biomass, with a sharp decline north of 83°N (Hirche and Mumm, 1992), coinciding with differences in the species composition of the biomass-forming zooplankton species. Whereas the southern Nansen basin plankton is dominated by the Atlantic species Calanus finmarchicus, entering the Arctic Basin with the West Spitsbergen Current, the northernmost branch of the North Atlantic current, the Arctic and polar species *Calanus hyperboreus* and *C. glacialis* dominate the biomass in the high-Arctic Amundsen and Makarov Basins (Auel and Hagen, 2002; Mumm *et al*., 1998). The zooplankton species communities generally can be differentiated according to their occurrence in Polar Surface Water (0-50 m, temperature below –1.7°C, salinity less than 33.0), Atlantic Layer (200–900 m; temperature 0.5–1.5°C); salinity 34.5–34.8) and Arctic Deep Water (deeper than 1000 m, temperature -0,5--1° C, salinity > 34.9) (Auel and Hagen, 2002; Grainger, 1989; Kosobokova, 1982). The polar surface community in the upper 50 m of the water column consists of original polar species as well as species emerging from deeper Atlantic waters, alltogether leading to a high abundance and biomass peak in summer. Diversity and biomass are minimal in the impoverished Arctic basin deepwater community (Kosobokova 1982). Apart from a limited exchange with the Atlantic Ocean via the Fram Strait, the central Arctic deep-sea basins are isolated from the rest of the world ocean deepsea fauna. Therefore, the bathypelagic fauna consists of a few endemic Arctic species and some species of Atlantic origin. Due to the separation of the Eurasian and Canadian Basins by the Lomonosov Ridge, significant differences in hydrographic parameters (Anderson *et al*. 1994) and in the zooplankton composition occur between both basins (Auel and Hagen, 2002).

Fish

Polar cod, *Boreogadus saida*, is a keystone species in the ice-related foodwebs of the Arctic. Due to schooling behavior and high energy content polar cod efficiently transfer the energy from lower to higher trophic levels, such as seabirds, seals and some whales (Crawford and Jorgenson, 1993).

Seabirds

Ice cover is a physical feature of major importance to marine birds in high latitude oceans, providing access to resources, refuge from aquatic predators (Hunt, 1990). As seabirds are dependant on leads between ice floes or otherwise open water to access food, they search for the most productive waters in polynias (places within the ice which are permanently ice free) and marginal ice zones (Hunt, 1990). Here they forage both on the pelagic and sympagic ice-related fauna, especially the early stages of polar cod and the copepods *Calanus hyperboreus* and *C. glacialis*. Likely, they benefit of the structural complexity and good visibility of their prey near the ice (Hunt, 1990).

In the Greenland Sea and Fram Strait, major breeding colonies exist on Svalbard, Greenland and on Jan Mayen, all of these within reach of the seasonally moving marginal ice zone or a polynia (North East Water Polynia on the East Greenland shelf). Breeding seabirds like Little auks (*Alle alle*), from colonies in the northern Svalbard archipelago feed their offspring with prey caught in the vicinity of the nests, however intermittently travel at least 100 km to the marginal ice zone at 80° N to replenish their body reserves (Jakubas *et al*., Online 03 June 2011). Therefore, the distance of the marginal ice zone to the colony site is a critical factor determining the breeding success (e.g. Joiris and Falck, 2011). Opportunistically, the birds also use other zooplankton aggregations such as a in a cold core eddy in the Greenland Sea, closer to the nesting site (Joiris and Falck, 2011).

A synopsis of seabird data for the period 1974–1993 (Joiris, 2000) showed that the little auk is one of the most abundant species, together with the fulmar *Fulmarus glacialis*, kittiwake *Rissa tridactyla* and Brünnich's guillemot *Uria lomvia* in the European Arctic seas (mainly the Norwegian and Greenland Seas). In the Greenland Sea and the Fram Strait, little auks represented the main species in polar waters, at the ice edge and in closed pack ice, reaching more than 50% of all bird species (Joiris and Falck, 2011). In spring and autumn, millions of seabirds pass through the area when migrating between their breeding sites on Svalbard or the Russian Arctic and their wintering areas in Canada (Gill *et al*., 2011).

There are several seabird species in the European Arctic which are only met in ice-covered areas, for example the Ivory gull *Pagophila eburnea* and the Thick-billed guillemot *Uria lomvia* (see e.g. CAFF, 2010): Both species spend the entire year in the Arctic, and breed in close vicinity to sea ice although Thick-billed guillemots were observed to fly up to 100 km from their colonies over open water to forage at the ice edge (Bradstreet 1979). The relatively rare Ivory gulls are closely associated with pack-ice, favouring areas with 70 – 90% ice cover near the ice edge, where they feed on small fish, including juvenile Arctic cod, squid, invertebrates, macro-zooplankton, carrion, offal and animal faeces (e.g. OSPAR Commission, 2009b). Ivory gulls have a low reproductive rate and breeding only takes place if there is sufficient food, which makes the population highly vulnerable to the effects of climate warming (e.g. OSPAR Commission, 2009b). Thick-billed guillemots are relatively long lived and slow to reproduce and has a low resistance to threats including oil pollution, by-catch in and competition with commercial fisheries operations, population declines due to hunting – particularly in Greenland (OSPAR Commission, 2009c).

Ivory gull and Thick-billed guillemots are both listed by OSPAR as being under threat and/or decline, (OSPAR Commission, 2008) and in 2011 recommendations for conservation action were agreed (OSPAR Commission, 2011) which will be implemented in conjunction with the circumpolar conservation actions of CAFF (CAFF, 1996; Gilchrist *et al*., 2008).

Marine mammals

Several marine mammal species permanently associate with sea ice in the European Arctic. These include polar bear, walrus, and several seal species: bearded, *Erignathus barbatus*; ringed, *Pusa hispida*; hooded, *Cystophora cristata*; and harp seal *Pagophilus groenlandicus*. Three whale species also occupy Arctic waters year- round – narwhal, *Monodon monoceros*; beluga whale, *Delphinapterus leucas*; and bowhead whale, *Balaena mysticetus*.

Polar bears Ursus maritimus are highly specialized for and dependent on the sea ice habitat and are therefore particularly vulnerable to changes in sea ice extent, duration and thickness. They have a circumpolar distribution limited by the southern extent of sea ice. Three subpopulations of polar bears occur in the European high Arctic: the East Greenland, Barents Sea and Arctic Basin sub-populations, all with an unknown population status (CAFF, 2010). Following the young-of-the-year ringed seal distribution, polar bears are most common close to land and over the shelves, however some also occur in the permanent multi-year pack ice of the central Arctic basin (Durner *et al*., 2009). Due to low reproductive rates and long lifetime, it is expected that the polar bears will not be able to adapt to the current fast warming of the Arctic and become extirpated from most of their range within the next 100 years (Schliebe *et al*., 2008).

Walrusses, *Odobenus rosmarus*, inhabit the Arctic ice year-round. They are conservative benthic feeders, diving to 80-100 m depth for scaping off the rich mollusc fauna of the continental shelves, and need ice floes as resting and nursing platform close to their foraging grounds. Walrusses have been subject to severe hunting pressure from the end of the 18th century to the mid 20th century, and are still hunted today in Greenland (NAMMCO). By 1934, the estimated 70000-80000 individuals of the Atlantic population were reduced to 1200-1300, with none left on Svalbard (Weslawski *et al*., 2000). Todays relatively small sub-populations on the East Greenland and Svalbard-Franz Josef Land coasts have recently shown a slightly increasing trend, in the latter case reflecting the full protection of the species since the 1950´s (CAFF, 2010; NAMMCO). Apart from their sensitivity to direct human disturbance and pollution, it is expected that walrusses will suffer from the changing ice conditions (location, thickness for being used as haul-out site) as well as changes in ice-related productivity.

The Atlantic subspecies of the **bearded seal**, *Erignathus barbatus* occurs south of 85° N from the central Canadian Arctic east to the central Eurasian Arctic, but no population estimates exist (Kovacs, 2008b). Because of their primarily benthic feeding habits they live in ice covered waters overlying the continental shelf. They are typically found in regions of broken free-floating pack ice; in these areas bearded seals prefer to use small and medium sized floes, where they haul out no more than a body length from water and they use leads within shore-fast ice only if suitable pack ice is not available (Kovacs, 2008b, and literature quoted).

The **Arctic ringed seal** *Pusa (Phoca) hispida hispida* has a very large population size and broad distribution, however, there are concerns that future changes of Arctic sea ice will have a negative impact on the population, some of which have already been documented in some parts of the subspecies range (Kovacs *et al*., 2008). As the other seals, the ringed seal uses sea ice exclusively as their breeding, moulting and resting (haulout) habitat, and feed on small schooling fish and invertebrates. In a co-evolution with one of their main predators, the polar bear, they developed the ability to create and maintain breathing holes in relatively thick ice, which makes them well adapted to living in fully ice covered waters allover the year.

The West Ice (or Is Odden) to the west of Jan Mayen, at approx. 72-73° N, in early spring a stretch of more of less fast drift ice, is of crucial importance as a whelping and moulting area for harp seals and hooded seals (summarised e.g. by ICES, 2008). Discovered in the early 18th century, up to 350000 seals (1920s) were killed per year, decimating the populations from an estimated one million individuals in the 1950s (Ronald *et al*., 1982) to today´s 70000 and 243000 of hooded and harp seals, respectively (Kovacs, 2008a, c).

Hooded seal, *Cystophora cristata*, is a pack ice species, which is dependent on ice as a substrate for pupping, moulting, and resting and as such is vulnerable to reduction in extent or timing of pack ice formation and retreat, as well as ice edge related changes in productivity (Kovacs, 2008a, and literature quoted). Hooded Seals feed on a wide variety of fish and invertebrates, including species that occur throughout the water column. After breeding an moulting on the West Ice they follow the retreating pack ice to the north, but also spend significant periods of time pelagically, without hauling out (Folkow and Blix 1999) in (Kovacs, 2008a). The northeast Atlantic breeding stock has declined by 85-90 % over the last 40-60 years. The cause of the decline is unknown, but very recent data suggests that it is on-going (30% within 8 years), despite the protective measures that have been taken in the last few years. The species is therefore considered to be vulnerable (Kovacs, 2008a).

Harp seals *Pagophilus (Phoca) groenlandicus* are the most numerous seal species in the Arctic seas. Their reproduction takes place in huge colonies, for example on the pack ice of the ‘’West Ice’’ north of Jan Mayen, and after the breeding season they follow the retreating pack ice edge northwards up to 85° N, feeding mainly on polar cod under the ice (Kovacs, 2008c) .

Narwhals *Monodon monoceros* primarily inhabit the ice-covered waters of the European Arctic, including the ice sheet off East Greenland (Jefferson *et al*., 2008b). For two months in summer, they visit the shallow fjords of East Greenland, spending all the rest of the year offshore, in deep ice-covered waters along the continental slope in the Greenland Sea and Arctic Basin (Heide-Jørgensen and Dietz, 1995). Narwhals are deep diving benthic feeders and forage on fish, squid, and shrimp, especially Arctic fish species, such as Greenland halibut, Arctic cod, and polar cod at up to 1500 m depth and mostly in winter. A recent assessment of the sensitivity of all Arctic marine mammals to climate change ranked the narwhal as one of the three most sensitive species, primarily due to its narrow geographic distribution, specialized feeding and habitat choice, and high site fidelity (Laidre *et al*. 2008 in (Jefferson *et al*., 2008b)).

Bowhead whales *Balaena mysticetus* are found only in Arctic and subarctic regions and a Svalbard-Barents population occurs from the coast of Greenland across the Greenland Sea to the Russian Arctic. They spend all of their lives in and near openings in the pack ice feeding on small to medium-sized zooplankton. They migrate to the high Arctic in summer, and retreat southward in winter with the advancing ice edge (Moore and Reeves 1993 in (Reilly *et al*., 2008)). Whaling has decimated the original bowhead whale populations to be rare nowadays, listed by OSPAR as being under threat and/or decline (OSPAR Commission, 2008). The species is considered to be very sensitive to changes in the ice-related ecosystem as well as sound disturbance, possible consequences of a progressive reduction of ice cover (OSPAR Commission, 2009a).

Belugas *Delphinapterus leucas* prefer coastal and continental shelf waters with a broken-up ice cover. They have never been surveyed around Svalbard. Pods numbering into the thousands are sighted irregularly around the archipelago, and pods ranging from a few to a few hundred individuals are seen regularly (Gjertz and Wiig 1994; Kovacs and Lydersen 2006 in (Jefferson *et al*., 2008a)).

Little is known about the populations of the larger fauna in the Central Arctic Basin over the deepsea basins and ridges. But it is not likely that it is currently an area of great abundance - too far from the coastal nesting sites of marine birds, and over too deep water to allow feeding on benthos, as most of the larger mammals would need, and currently of too low plankton production to feed the large whales. All of these groups have their distribution center along the continental shelves presently - however, following the receeding ice edge out to the central Arctic basin may be one of the options for the future.

Feature condition, and future outlook

This high Arctic region is particularly vulnerable to the the loss of ice cover and other effects of the anticipated global warming, including elevated UV radiation levels (Agustí, 2008). (Wassmann *et al*., 2010) summarise what changes may be expected within the subarctic/Arctic region:

- northward displacement (range shifts) of subarctic and temperate species, and cross-Arctic transport of organisms;
- increased abundance and reproductive output of subarctic species, decline and reduced reproductive success of some Arctic species associated with the ice and species now preyed upon by predators whose preferred prey have declined;
- increased growth of some subarctic species and primary producers, and reduced growth and condition of animals that are bound to, associated with, or born on the ice;
- anomalous behaviour of ice-bound, ice-associated, or ice-born animals with earlier spring events and delayed fall events;
- changes in community structure due to range shifts of predators resulting in changes in the predator–prey linkages in the trophic network.

(Wassmann, 2008) expects radical changes in the productivity, functional relationships and biodiversity of the Arctic Ocean. He suggests that a warmer climate with less ice cover will result in greater primary production, a reduction of the stratified water masses to the south, changes in the relationship between biological processes in the water column and the sediments, a reduction in niches for higher trophic levels and a displacement of Arctic by boreal species. On the shelves, increased sediment discharges are expected to lower the primary production due to higher turbidity, and enhance the organic input to the deep ocean. A more extensive review of expected or suspected consequences of climate change for the marine system of the Arctic is given in (Loeng *et al*., 2005).

Figure 3, extracted from (Gill *et al*., 2011), presents the conceptual ideas about possible Arctic ecosystem changes mediated by human impact:

The normal situation shown in the upper left panel consists of ice-dependent species and species that tolerate a broader range of temperatures and are found in waters with little or no sea ice. Primary production occurs in phytoplankton (small dots in the figure) in ice-free waters and in ice-attached algae and phytoplankton in ice-covered waters. Phytoplankton (small t-shaped symbols in the figure) and ice algae are the main food sources for zooplankton and benthic animals. The fish community consists of both pelagic and demersal species. Several mammals are ice-associated, including polar bears and several species of seals. A number of sea bird species are also primarily associated with ice-covered waters.

At moderate temperature increases (upper right) populations of ice-dependent species are expected to decline as sea ice declines, and sub-Arctic species are expected to move northwards. Arctic benthic species are expected to decline, especially if their distributions are pushed close to or beyond the continental slope.

The expected effects from fisheries relate to the continental shelves. Two major effects are reductions in populations of benthic organisms due to disturbance from bottom trawling and removal of large individuals in targeted fish stocks. In addition, the size of targeted stocks, both demersal and pelagic, may be reduced.

In addition, the effects of ocean acidification are considered (lower right). Ocean acidification will result in depletion of carbonate phases such as aragonite and calcite. This will alter the structure and function of calcareous organisms, particularly at lower trophic levels. Changes in pH can also alter metabolic processes in a range of organisms. It is not known how these changes will propagate to higher trophic levels, but the effects could be substantial.

c.f. Figure 3: Conceptual models showing potential impacts on Arctic marine ecosystems under different scenarios (Gill *et al*., 2011).

(Gill *et al*., 2011) conclude that the central part of the Arctic Basin is not a region for fisheries or oil and gas exploration. However, this region has played and will continue to play a very important role in the redistribution of pollutants, due to ice drift and/or currents between coastal and shelf areas and the Arctic Basin peripheries, far from sources of pollution.

Assessment against CBD EBSA Criteria

Table 1. relation of each of the CBD criteria to the proposed area relating to the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, the boundaries of the EBSA need not be defined with exact precision.

<table>
<tr><td rowspan="2">CBD EBSA Criterion</td><td rowspan="2">Description</td><td colspan="4">Ranking of criterion relevance

(please mark one column with an X)</td></tr>
<tr><td>Don't Know</td><td>Low</td><td>Some</td><td>High</td></tr>
<tr><td>Uniqueness or rarity</td><td>The area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td colspan="6">Explanation for ranking

Arctic sea ice, in particular the multiyear ice of the Central Arctic is globally unique and hosts endemic species such as the Gammarid amphipod Gammarus wilkitzki and sea ice meiofauna which will disappear with the melting of the ice. Polar bears, walrusses, bowhead whales, narwhales, belugas, several seal species and many bird species are endemic to the high Arctic ice.

While sea ice species such as G. wilkitzki are not endemic to the proposed EBSA they are endemic to the Arctic and unique within the OSPAR area</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td colspan="6">Explanation for ranking

Sea ice is essential for its sympagic fauna, and to some extent also for the pelagic associated fauna which also depends on the right timing of biomass production (match/mismatch with bloom periods). The marginal ice zone and other openings in the ice are essential feeding grounds for a large number of ice-associated species which exploit the seasonallly high production there.

At present the area covered by the proposed EBSA is ice-covered throughout the summer but although there is no marginal ice zone there will be an ice zone community present, thus the sea ice is essential to maintain the sympagic biological community and associated ecosystem functions.</td></tr>
</table>

Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species			x	
Explanation for ranking The high arctic ice hosts endemic species such as the Gammarid amphipod *Gammarus wilkitzki* and sea ice meiofauna which will disappear with the melting of the ice. Many of the obligatory ice-related species are listed as vulnerable by IUCN, and/or listed as under threat and/or decline by OSPAR, examples include the Ivory gull, thick-billed guillemot, bowhead whale, hooded seal and polar bear. With the overall trend of retreating sea ice extent, the proposed EBSA may become increasingly important for all ice-dependent species in the future.					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery				x
Explanation for ranking The ice-related foodweb and ecosystem is highly sensitive to the ecological consequences of a warming climate. Beyond this the Arctic is at the forefront of the impacts of ocean acidification (Wicks & Roberts 2012). The largest changes in ocean pH will occur in the Arctic Ocean, with complete undersaturation of the Arctic Ocean water column predicted before the end of this century (Steinacher *et al*. 2009). Many of the seabird and mammal populations are particularly sensitive to changes due to their already low population numbers, and low fertility. If the retreat of the ice to the north will lead to increased shipping and oil and gas exploitation in Arctic waters, the increased risk of spills would also pose a potential hazard for example for guillemots, which are extremely susceptible to mortality from oil pollution (CAFF, 2010). In addition, some species like Ivory gull are sensitive to an increased heavy metal load in their prey.					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity				
Explanation for ranking This criterion was not evaluated in the *OSPAR/NEAFC/CBD Workshop*. ICES did not have enough information to evaluate this criterion.					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity				

Explanation for ranking

This criterion was not evaluated in the *OSPAR/NEAFC/CBD Workshop*. ICES did not have enough information to evaluate this criterion.

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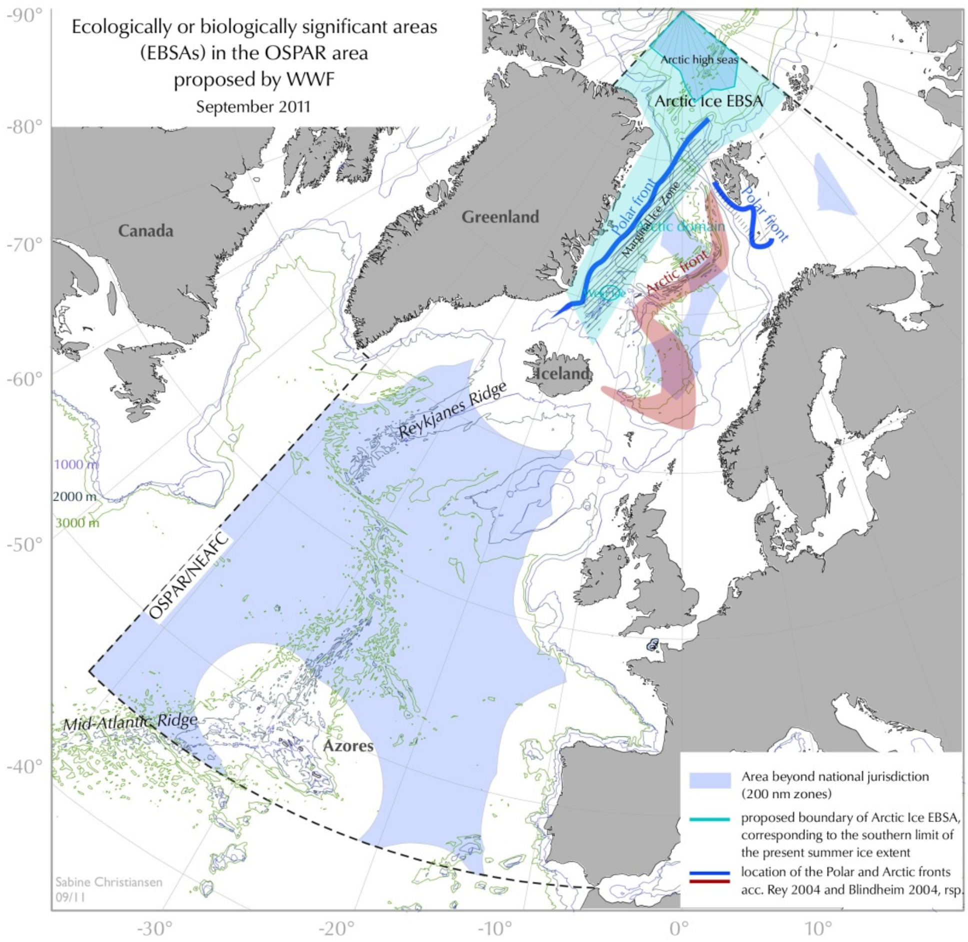
Maps and Figures



Arctic Ice EBSA proposal:

The boundaries proposed comprise all waters within the OSPAR/NEAFC maritime area which are permanently covered by ice, i.e. limited to the south by the summer sea ice extent, including the marginal ice zone. Only the high Arctic (light blue shading) is in Areas beyond national jurisdiction, the high seas. To the south, the waters fall into the 200 nm zone of Greenland and the Fishery protection zone around Svalbard.

Figure 1: Location of the Ecologically or biologically significant areas (EBSA) proposed by WWF in September 2011. The position of the Arctic and polar fronts was redrawn after (Rey, 2004, Fig. 5.7).

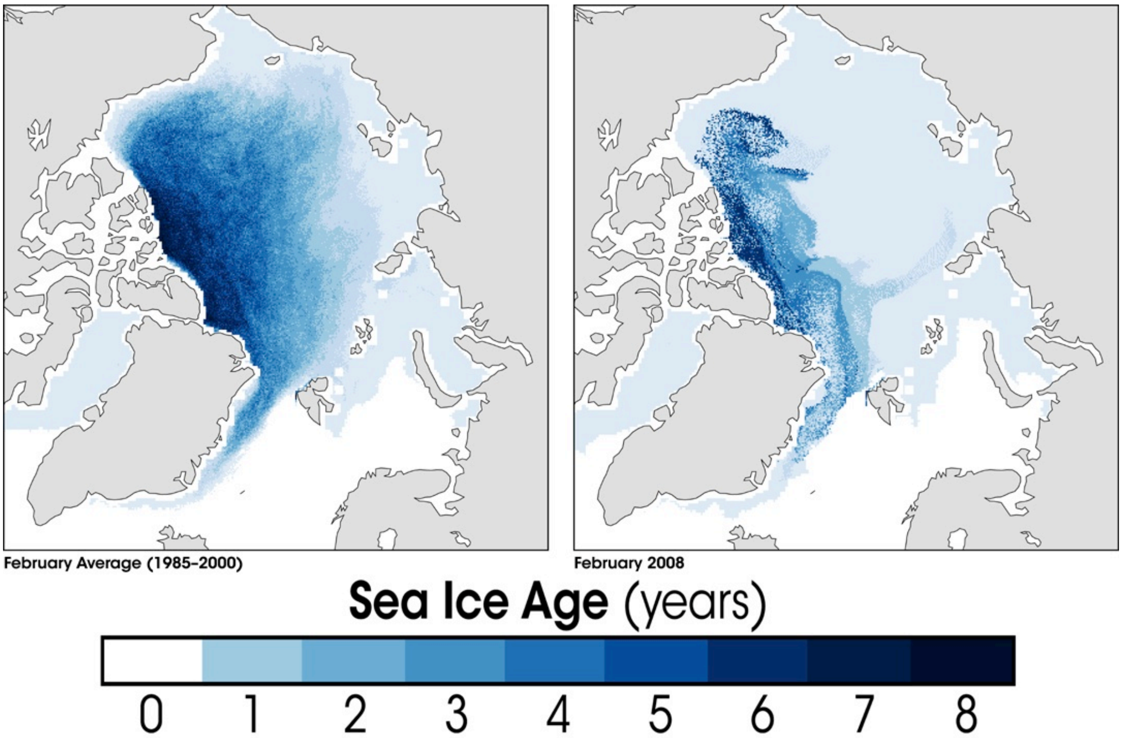


Figure 2: Modelled ice age distribution in 1985-2000 (left) compared to February 2008 (right) (CAFF, 2010).

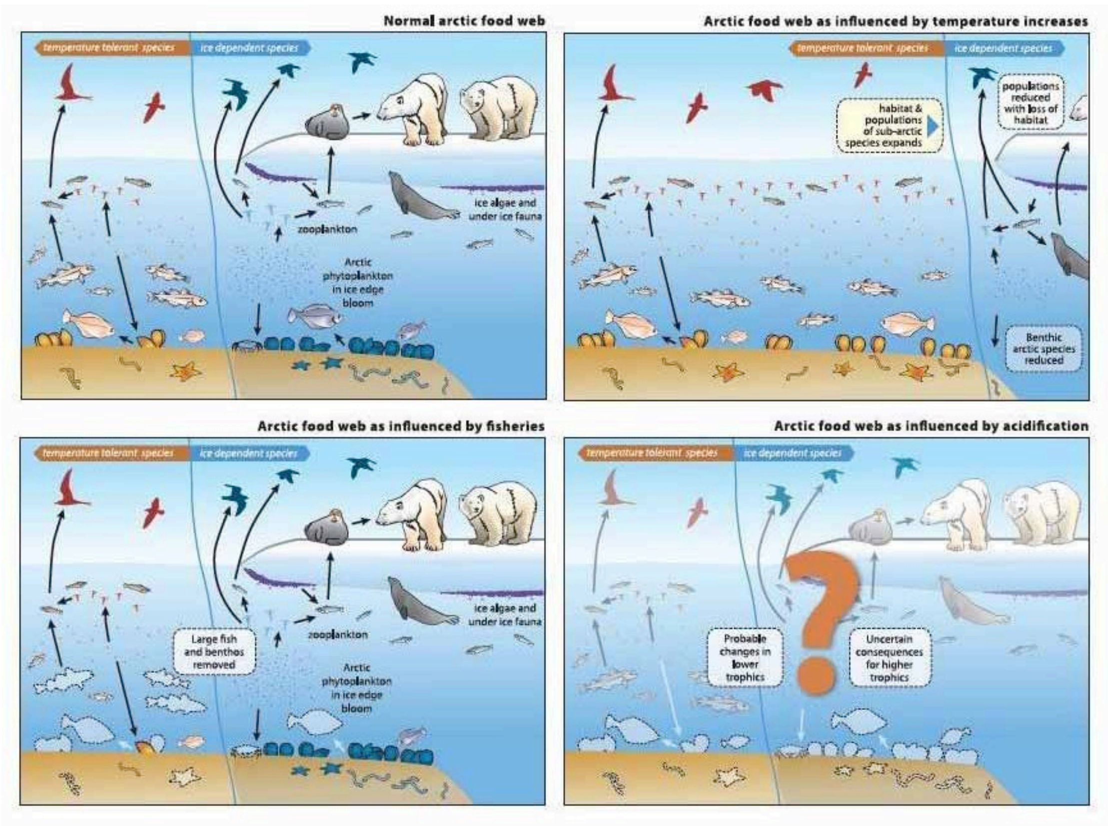


Figure 3: Conceptual models showing potential impacts on Arctic marine ecosystems under different scenarios (Gill *et al*., 2011).

Version 2, 19-12-213

ECOREGION General advice

SUBJECT OSPAR/NEAFC special request on review and reformulation of four EBSA Proformas

Advice summary

ICES provided advice to OSPAR and NEAFC in June 2013 (OSPAR/NEAFC special request on review of the results of the Joint OSPAR/NEAFC/CBD Workshop on Ecologically and Biologically Significant Areas (EBSAs) (ICES Advice 2013 Section 1.5.6.5).

Following discussion with OSPAR and NEAFC, ICES (using experts of the review group) agreed to reformulate and revise four of the EBSAs and provide new updated maps.
The material consists of scientifically updated Proformas for the following EBSAs:

- Mid-Atlantic Ridge North of the Azores and South of Iceland
- Charlie-Gibbs Fracture Zone (and the Sub-Polar Front)
- The Hatton and Rockall Banks and the Hatton-Rockall Basin
- The Arctic Ice habitat – multiyear ice, seasonal ice – marginal ice zone

During the update on the Charlie-Gibbs Fracture Zone (CGFZ) it appeared that the Sub-Polar Front, which was included in the previous version of the Proforma, could not be scientifically supported with the evidence to hand at the time and was therefore excluded from the CGFZ Proforma. A short note explains the reasons and consequences for the exclusion.

- Note on the Sub Polar Front.

The five documents are scientifically updated technical documents and appended to this advice.

ANNEX 1

Draft Proforma: The Hatton and Rockall Banks and the Hatton-Rockall Basin

Presented by: The Joint OSPAR/NEAFC/CBD Scientific Workshop. Reviewed by an ICES expert group and revised by Francis Neat and J. Murray Roberts.

Based on an original proposal submitted by: Dr David Billett and Dr Brian Bett (Deepseas Group, Ocean Biogeochemistry and Ecosystems Department, NOC, UK), Prof. Philip Weaver (Seascape Consultants Ltd and National Oceanography Centre, UK), Prof Callum Roberts and Ms Rachel Brown (Environment Department, University of York), Dr Murray Roberts and Dr Lea-Anne Henry, (Centre for Marine Biodiversity and Biotechnology, School of Life Sciences, Heriot-Watt University), Dr Kerry Howell and Dr Jason Hall-Spencer (Marine Biology and Ecology Research Centre, Marine Institute, University of Plymouth); Dr Andrew Davies (School of Ocean Sciences, Bangor University); Dr Bhavani Narayanaswamy (Scottish Association for Marine Science, Oban), Prof. Monty Priede (OceanLab, University of Aberdeen); Dr David Bailey (Division of Environmental and Evolutionary Biology, University of Glasgow); Prof. Alex Rogers (University of Oxford) and Mr Ben Lascelles (Global Seabird Programme, Bird Life International)

Abstract

The Hatton and Rockall Banks, associated slopes and connecting basin, represent offshore bathyal habitats between 200 to 1500 m that constitute a unique and prominent feature of the NE Atlantic. The area has high habitat heterogeneity and supports a wide range of benthic and pelagic species and ecosystems. There is significant fishing activity in the area, including bottom trawling, long-lining, and midwater fisheries.

Introduction

The Hatton and Rockall Banks are large isolated geomorphological features in the NE Atlantic. Formed from continental crust, they span depths from c. 200 to 2000m. The banks are linked by the Hatton-Rockall Basin at a depth of approximately 1300 m which has particular geomorphological features and habitats. The gently sloping banks and the basin provide a contrasting geological setting to the tectonically active Mid-Atlantic Ridge to the west and the generally steeper slopes of the European continental margin to East. The banks encompass a large depth range with strong environmental gradients (e.g. temperature, pressure, and food availability) that give rise to a high diversity of species and habitats (Billett, 1991; Bett, 2001; Howell *et al.*, 2002; Davies *et al.* 2006; Roberts *et al.* 2008; Howell *et al.*, 2009; Howell *et al.* 2010). Environmental heterogeneity is positively correlated with biological diversity at a variety of scales (Menot *et al.* 2010) as indicated by significantly elevated levels of species change across space (in areas such as Hatton Bank (Roberts *et al.* 2008).

Changes in pressure and temperature have significant effects on the biochemistry of species, influencing cell membrane structure and enzyme characteristics (Gage and Tyler, 1991). In general, each species is adapted to a particular range of environmental conditions. Each may occur over a depth range of about 500 m, but the depths where any particular species is abundant, and therefore able to form viable populations, is generally limited to a much more restricted depth range of 100 to 200 m (Billett, 1991; Howell *et al.*, 2002). There is evidence that such depth-related effects promote speciation (Howell *et al.*, 2004). In addition, the progressive decrease in organic matter availability with increasing depth (with some patchiness depending on geomorphology) leads to a reduction of carnivores and an increase in detritus feeders (Billett, 1991). Taken together such environmental changes lead to a continuous sequential change in species composition with depth, and biological community characteristics that are radically different to those known in shelf seas.

The area is influenced by a number of different water masses and there is considerable interaction between the topography and physical oceanographic processes, in some areas focusing internal wave and tidal energy (Ellett *et al.* 1986) which results in strong currents and greater mixing. This may give rise to highly localized and specialised biological communities such as sponge aggregations and coral gardens. The mixing of Arctic and Atlantic water in the North of the area means that species from both ecosystems are represented causing enhanced species diversity.

The Rockall Bank supports shallow demersal fisheries targeting haddock, gurnard and monkfish (Neat & Campbell 2010). The slopes and the Hatton Bank are target areas for deep-water bottom fisheries for Ling (*Molva molva*), Blue Ling (*Molva dypterygia*), Tusk (*Brosme brosme*), Roundnose Grenadier (*Coryphaenoides rupestris*) and Black Scabbardfish (*Aphanopus carbo*). In the past deepwater sharks were also caught in the area, but this is now prohibited. A wide variety of other fish species are also taken as by-catch (Gordon *et al.*, 2003; Large *et al.*, 2003; ICES 2010). Some of the deep-water target species have characteristic low productivity and extended generation times. Deep-water fisheries have significant effects not only on target fish species, but also on the benthic fauna (Le Guilloux *et al.,* 2009; Clark *et al.* 2010).

Major wide-ranging Northeast Atlantic epipelagic fish stocks, e.g. mackerel and blue whiting, use the Hatton-Rockall area for parts of their life cycle and are targeted by international fisheries. The slopes of the banks and channels between the banks have a diverse bathy- and mesopelagic fish community sustained by the zooplankton production in the epipelagic zone. The pelagic communities are similar to, and probably extensions of, those in adjacent oceanic waters along the European continental margin.

Some invertebrate species, such as cold-water corals and sponges, provide important structural habitat heterogeneity. These habitats are highly susceptible to physical damage and may take hundreds, if not thousands, of years to reform (Hall-Spencer *et al.* 2002; Roberts *et al.* 2009; Söffker *et al.,* 2011).

Current fisheries control measures on Hatton and Rockall Bank have focused mainly on the protection of corals (Hall-Spencer *et al.,* 2009) and sponges (ICES 2013).

There is no evidence currently that the seabed at depth greater than 1500 m in the area is significantly different from comparable depths in the rest of the NE Atlantic. The majority of the features considered here occur at depths shallower than 1500 m and this therefore forms an appropriate delimitation of the EBSA.

Location

The EBSA would comprise the seabed and pelagic zones shallower than 1500 m above the Rockall and Hatton Banks and the adjoining Hatton-Rockall Basin. This extends into adjacent EEZs, but the current proposal refers to the ABNJ only. The area beyond national jurisdiction lies wholly within regions under consideration by the Commission on the Limits of the Continental Shelf.

Feature description

Benthic and pelagic communities to depths of 1500 m in and around the Hatton and Rockall Banks and Basin. Seabed communities include cold-water coral formations and sponge aggregations. Geomorphologically complex seabed types include rocky reefs, carbonate mounds, polygonal fault systems and sedimentary slopes, slides and fans. Pelagic communities include those inhabiting bathy-, meso- and epi-pelagic zones, including zooplankton, fish, cetaceans, turtles and seabirds.

1. Benthic and benthopelagic communities

Cold-water coral

Observations in the early 1970s found cold-water coral communities on the Rockall Bank down to a depth of 1,000 m (Wilson, 1979a). Thickets of *Lophelia pertusa* occurred principally at depths between 150-400m[1]. Large coral growth features have recently (2011) been discoveredto be still present on the northern Rockall Bank (Huvenne *et al.*, 2011, Roberts *et al.* 2013). Bottom-contact fishing can result in significant adverse impacts to these habitats.

Frederiksen *et al.* (1992) reported a high diversity of corals on the northern Hatton Bank, including *Paragorgia*, *Paramuricea*, Isididae and Antipatharia as well as the scleractinians *L. pertus*a and *M. oculata*. Since these observations further records of coral frameworks have been noted throughout the Rockall, Hatton area, including the Logachev Mounds and the Western Rockall Bank Mounds (Kenyon *et al.,* 2003; Roberts *et al.,* 2003; Narayanaswamy *et al.,* 2006; Howell *et al.,* 2007; Durán Muñoz *et al.* 2009).

Recent surveys identified many areas that contained the cold-water coral *L. pertusa* throughout the Rockall and Hatton Banks (Narayanaswamy *et al.,* 2006; Howell *et al.,* 2007; Roberts *et al.* 2008; Durán Muñoz *et al.* 2009). Several areas on the Hatton Bank contained pinnacles and mounds with extensive biogenic structures including areas of coral rubble around the flanks of the coral mounds. Coral frameworks are known from the Hatton Bank (Durán Muñoz *et al.* 2009), and are predicted to occur over focused regions of the Hatton Bank (Howell *et al.*, 2011). Geophysical evidence suggests that these have formed by successive coral growth and sedimentation episodes, as in other regions (Roberts *et al.*, 2006), forming coral carbonate mounds (Roberts *et al.* 2008). Single and clustered coral carbonate mounds have also been discovered on the southeast of Rockall Bank. These structures are comprised mostly of *L. pertusa* and can reach heights of 380 m in water depths of between 600-1000 m (Kenyon *et al.,* 2003; Mienis *et al.,* 2006; Mienis *et al.,* 2007).

[1] http://www.lophelia.org/lophelia/case_4.htm

Cold-water coral frameworks have been reported to support over 1,300 species in the Northeast Atlantic, some of which have yet to be described (Roberts *et al.,* 2006). New species and associations have been reported recently (e.g. Myers & Hall-Spencer 2007; Le Guilloux *et al.,* 2010; Söffker *et al.* 2011). The corals may provide an important habitat for certain fish species (Fosså *et al.,* 2002; Söffker *et al.* 2011; Henry et al 2013), including commercial species *Sebastes* sp., *Molva molva*, *Brosme brosme*, *Anarhichas lupus* and *Pollachius virens* (Mortensen *et al.,* 1995; Freiwald, 2002; Hall-Spencer *et al.,* 2002). Pregnant *Sebastes viviparus* may use the reef as a refuge or as a nursery ground to raise their offspring (Fosså *et al.,* 2002) as recently observed on the northern Rockall Bank (Huvenne *et al.,* 2011, Roberts *et al.* 2013). As well as living reefs, dead coral framework and coral rubble provide a structural habitat. Jensen and Frederiksen (1992) collected *Lophelia* and found 256 species; a further 42 species were identified amongst coral rubble.

There has been only limited research into linkages between coral and other deep-water ecosystems. Compared to the south-eastern US and Gulf of Mexico, molecular research has shown that northeastern Atlantic populations of *L. pertusa* are moderately differentiated (Morrison *et al.* 2011) and form distinct subpopulations, but also that Rockall Bank corals show some genetic similarity to those occurring on the New England Seamounts indicating some degree of connectivity (Morrison *et al.* 2011). *Lophelia pertusa* exhibits high levels of inbreeding through asexual reproduction at several sites in the NE Atlantic, suggesting a high incidence of self-recruitment in local populations (Le Goff-Vitry and Rogers, 2005). Further molecular studies are required in local areas to gauge the importance of the Rockall and Hatton Banks in the life history of regional coral populations.

In summary the cold-water corals fit the following EBSA criteria:

Uniqueness or rarity

- Large areas of cold-water corals and sponges have been reported in the area. Some of these have been destroyed by demersal trawling, but in certain areas, e.g. SW Rockall Bank, extensive patches of coral framework still exist.

Special importance for life-history stages

- Cold-water corals and areas of natural coral rubble provide highly diverse habitats

Importance for threatened, endangered or declining species/habitats

- The cold-water corals and natural rubble contain very large numbers of invertebrate species including giant protozoans on nearby sedimentary habitats (xenophyophores), vase shaped white sponges, actiniarians, antipatharian corals, hydroids, bryozoans, asteroids, ophiuroids, echinoids, holothurians and crustaceans.
- The distribution of cold-water coral has been severely reduced in the area over the last 30 years

Vulnerability, fragility, sensitivity, or slow recovery

- There is a high diversity of corals, including bamboo coral (Isididae), black coral (Antipatharia) as well as the reef forming stony corals (Scleractinia), though some of these may now be reduced in distribution occurring in patches.
- Cold-water coral habitats are easily impacted and recover very slowly, if at all.

Biological diversity

- Cold-water corals provide diverse habitats for other invertebrates and fish.

Sediment communities

The Hatton and Rockall Banks support many different habitats each with their own depth-related species assemblages (Narayanaswamy *et al.,* 2006; Howell *et al.,* 2007; Roberts *et al.* 2008; Howell *et al.,* 2009). Local seabed morphology in this region is ultimately controlled by hydrography and oceanography (Due *et al.* 2006; Sayago-Gil *et al.* 2010), which creates heterogeneity in sediment types including mud, exposed bedrock, fine sediments, living coral framework and coral debris that – this habitat heterogeneity has a major influence on species diversity and turnover (Roberts *et al.* 2008). A great variety of large invertebrate fauna (megafauna) occur in this region including giant protozoans (xenophyophores), vase shaped white sponges, actiniarians, antipatharian corals, hydroids, bryozoans, asteroids, ophiuroids, echinoids, holothurians and crustaceans (Narayanaswamy *et al.,* 2006; Howell *et al.,* 2007; Roberts *et al.* 2008). Large mega-infauna such as echiuran worms are evident from observations of their feeding traces. Little is known, however, of the smaller fauna living within the sediment. The Hatton-Rockall Basin is known to host a particular geomorphology known as a polygonal fault system (Berndt et al 2012). The faults in the Hatton-Rockall

Basin have surface expression, i.e. a network of interlinked channels across the level seafloor. These fault structures were confirmed again in 2011 (Huvenne *et al.,* 2011). The flanks of the gullies appear to support extensive, dense aggregations of mixed species sponge communities. A key interest / conservation concern in such a geological setting would be the occurrence of cold-seep communities. Large carbonate blocks were encountered that were likely formed as a result of seafloor fluid escape. In 2012 the first evidence of an active cold-seep ecosystem in the area was suggested by the collection of chemosynthetic bivalves and polychaete worms (ICES 2013) on the eastern margin of Hatton-Rockall Basin at a depth of 1200 m. The species are new to science and suggest there is a lot still to learn of the seafloor and ecology of the Hatton and Rockall Banks.

The megafauna on the Hatton and Rockall Banks are largely species known from the wider NE Atlantic continental margin (Gage *et al.* 1983; Gage *et al.,* 1985; Mauchline *et al.,* 1986; Harvey *et al.,* 1988; Rice *et al.,* 1991). These studies focused on sedimented areas within the EEZs of the UK and Ireland and provide a lot of information on the life history characteristics of the species including information on growth and reproduction. Apart from some species that produce small eggs (indicative of planktotrophic development) in a seasonal cycle, most species conform to the life history characteristics typical of the deep sea of larger egg size, lower fecundity and greater generation times (Gage and Tyler, 1991). This is an adaptation to the low food input to the deep sea, which leads to the rapid decrease in biomass with increasing depth (Lampitt *et al.,* 1986; Wei *et al.,* 2010). Fauna adapt to lower food availability in the deep sea by a number of trade-offs, one of which is a reduction in reproductive effort and longer generation times. The majority of species, therefore, are highly susceptible to repeated physical disturbance.

In summary the sediment communities fit the following EBSA criteria:

Uniqueness or rarity

- The area has considerable environmental heterogeneity, and therefore biological diversity, as a result of its large depth range and strong environmental gradients. Habitat-forming sessile benthic communities, such as those of giant protozoans and sponges, are common.
- The area of polygonal faults may be a unique seabed feature and the presence of newly described chemosynthetic bivalves and polychaete worms suggests the area may have unique communities.

Importance for threatened, endangered or declining species/habitats

- The area comprises a patchwork of habitats with species changing consistently with both habitat type and increasing to depths of 1500 m. Some habitats are threatened by direct impacts (e.g. trawling).

Vulnerability, fragility, sensitivity, or slow recovery

- Many of the species have reproductive cycles with long generation times leading to very slow and episodic recoveries following human impact. Most deep-sea species are particularly susceptible to degradation and depletion by human activity.

Biological productivity

- There are localised areas of concentrated production depending on geomorphology and hydrography, but little evidence that the area has an enhanced productivity relative to other areas.

Biological diversity

- Benthic and pelagic communities occupy all depths in and around the Hatton and Rockall Banks and Basin. Seabed communities include cold-water corals and sponge aggregations. Seabed geomorphology is diverse with examples of rocky reefs, carbonate mounds, polygonal fault systems, and steep and gentle sedimentary slopes. This high habitat heterogeneity supports a high number of species and diverse communities.

Demersal fish

The deep-water fish of the NE Atlantic continental margin are generally well-known following comprehensive and extensive surveys of the region (e.g. Gordon & Duncan, 1985; Merrett *et al.,* 1991; Mauchline *et al.* 1986 and Rice *et al.* 1991). Species of commercial importance are reviewed by Gordon *et al.* (2003) and Large *et al.* (2003) and for fish associated with cold-water corals by Söffker *et al.* (2011). Fish species diversity increases to depths of approx. 1500 m on the continental slopes and declines thereafter (Campbell *et al* 2011). The shallow water fish assemblage on Rockall can be described as an impoverished sub-set of that found in adjacent continental shelf areas, but one that has a significantly different community composition (Neat & Campbell 2010). Recent surveys have found that the western slope of the Rockall Bank has a slightly different fish assemblage than the adjacent European slope with several species of a more southern affinity present (F. Neat unpublished data). Blue ling is known to spawn in a few locations on Rockall bank and at Hatton bank (Large *et al* 2008).

The detailed sampling in the Porcupine Seabight in the 1970s and 1980s took place before the start of deep-water commercial fishing. More recent sampling of the same area in the 1990s and 2000s can be used to compare fish communities before and after bottom trawling (Bailey *et al.* 2009). These data show that over 70 fish species have been impacted by the fishing activity, of which only 4-5 are target commercial species. The area impacted is up to 2.5 times larger than the area fished because the home range of many the fish extends into considerably deeper waters. In the past decade, however, there is evidence that this initial steep decline in abundance has been halted, at least in one of the major groups of fishes, the grenadiers (Neat & Burns 2010). At the northern limits of the area where Arctic water masses mix with Atlantic water cold-water species such as Greenland Halibut and Roughhead Grenadier are present adding to the diversity of species in the area.

In summary the demersal fish fit the following EBSA criteria:

Vulnerability, fragility, sensitivity, or slow recovery

- Many of the deep demersal fish have very slow recovery times as a result of their slow reproductive rate compared to pelagic fish.

2. Pelagic communities (plankton, nekton, birds)

Fish: Mackerel, blue whiting and other wide-ranging pelagic fish such as epipelagic sharks and tuna-like species use the area during parts of their life-cycle, for feeding or as migration corridors. For blue whiting the slope area is used as a spawning area. Mackerel eggs and larvae from spawning areas further south drift through the area.

Cetaceans: *Phocoena phocoena* have been observed over the shallower parts of Rockall Bank, but It is unlikely that the area is of particular importance for the species. Limited numbers of the endangered Blue whale (*Balaenoptera musculus*) and the critically endangered northern right whale (*Eubalaena glacialis*) have also been observed in this area (Cronin and Mackey, 2002; Hammond *et al.*, 2006).

Seabirds: Analyses of satellite tracking data hosted at www.seabirdtracking.org (Table 1) found the area to be used by multiple species through the year. The site is used by Manx Shearwaters (*Puffinus puffinus*) during the breeding season (Apr-Sept) from Iceland and UK colonies. From September until November tracked individuals of Cory's Shearwater (*Calonectris diomedea*) from 3 colonies, Sooty Shearwater (*Puffinus griseus*), Fea's Petrel (*Pterodroma* feae) and Zino's Petrel (*Pterodroma madeira*) used the area. Studies of tracked Atlantic Puffin (*Fratercula arctica*) from Skomer and Isle of May colonies found the site to be important during the overwintering phase (Aug-Apr) (Harris *et al.* 2010, Guilford *et al.* 2011). In addition to tracking data, at-sea survey data confirms many more species within the area (e.g. Cronin and Mackey, 2002).

Feature condition, and future outlook

Demersal fish have been targets of extensive fisheries for decades, expanding primarily in the latter half of the 1980s. Although satisfactory stock assessments were seldom achieved, the probable declines in abundance and vulnerability of many of the target species have been reflected in advice from ICES for many years (ICES 1996 onwards, Large *et al.*, 2003). A range of management actions by NEAFC and relevant coastal states have been implemented to reduce fishing effort and facilitate recovery of target species and some associated by-catch species. A similar range of measures applies to species inhabiting the shallowest areas, e.g. haddock.

Epipelagic species such as mackerel and blue whiting, and large pelagic sharks and tuna-like species occurring in the area straddle between ABNJ and several EEZs and the fisheries are managed by relevant coastal states, NEAFC and ICCAT. Cetaceans are managed by the IWC. The management is based on recurrent stock assessments by ICES and other advisory bodies.

Records of the physical impact of deep-water trawling west of Scotland extend back to the late 1980s (Roberts *et al.*, 2000; Gage *et al.*, 2005) and studies using VMS data show that fishing activity potentially affects much of the Hatton-Rockall area (Hall-Spencer *et al.* 2009; Benn *et al.* 2010). Damage may occur to structural species such as corals and sponges, which may take hundreds to thousands of years to recover (Hall-Spencer *et al.*, 2002; Davies *et al.* 2007; Roberts *et al.*, 2009; Hogg *et al.* 2010).

A recent survey (2011) has documented extensive destruction of coral framework on the northern Rockall Bank (Huvenne *et al.* 2011) in waters adjacent to the area currently being described. This expedition also encountered evidence of trawling impact on the megafauna of open sedimented areas, with photographic surveys in the area of the 'Haddock Box' (Rockall Bank) showing frequent occurrence of physically damaged holothurians - thought to be net escapees or discarded by-catch. Cold seep communities are vulnerable to trawling impacts; they are typically highly localised and are of a relatively small scale such that they could be eliminated by a single trawl. Cold seeps are OSPAR priority habitats for which there are considerable concerns regarding the effects of bottom trawling (van Dover *et al.* 2011a, b).

Some of the benthic communities of the Hatton and Rockall Banks have already been significantly affected by deep-water fishing (ICES WGDEC, 2007). The effects on deep-water fish may extend to waters deeper than those utilised by trawl fisheries (Bailey *et al.,* 2009). Broad-scale multibeam surveys have revealed a diverse range of geomophological features and sediment types on Hatton Bank (Jacobs and Howell, 2007; Stewart and Davies, 2007; MacLachlan *et al.,* 2008; Sayago-Gil *et al.,* 2010). These physical environment maps, coupled with targeted biological surveys have resulted in the production of biological habitat maps for the region (Howell *et al.,* 2011) which highlight the range and diversity of non-coral seabed features present in the area.

Assessment against CBD EBSA Criteria

Table 1. Relation of each of the CBD criteria to the proposed area relating to the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, the boundaries of the EBSA need not be defined with exact precision.

<table>
<tr><th rowspan="2">CBD EBSA Criterion</th><th rowspan="2">Description</th><th colspan="4">Ranking of criterion relevance
(please mark one column with an X)</th></tr>
<tr><th>Don’t Know</th><th>Low</th><th>Some</th><th>High</th></tr>
<tr><td>Uniqueness or rarity</td><td>The area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking
The area has considerable environmental heterogeneity, and therefore biological diversity, as a result of its large depth range and strong environmental gradients. Habitat-forming sessile benthic communities, such as those of giant protozoans and sponges, are common.
Large areas of cold-water corals and sponges have been reported in the area. Some of these have been destroyed by demersal trawling, but some areas of large coral frameworks still exist.
An area of polygonal faults may be a unique seabed feature and the recent discovery of cold-seep species that are new to science suggests the area is very likely to be unique.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking
Cold-water corals and areas of natural coral rubble provide highly diverse habitats
Parts of the Hatton-Rockall area are important as spawning areas for blue whiting, and the area is used as a corridor for a range of migrating species including turtles.</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking
The cold-water corals and natural rubble contain very large numbers of invertebrate species including giant protozoans (xenophyophores), vase shaped white sponges, actiniarians, antipatharian corals, hydroids, bryozoans, asteroids, ophiuroids, echinoids, holothurians and crustaceans.
The distribution of cold-water coral has been severely reduced in the area over the last 30 years
The area comprises a patchwork of habitats with species changing consistently with both habitat type and increasing depth. Some habitats are threatened by direct impacts (e.g. trawling), others may suffer indirectly e.g. through the creation of sediment plumes by impacts of fishing gear in sensitive areas.</td></tr>
</table>

Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery				**X**

Explanation for ranking

- There is a high diversity of corals, including bamboo coral (Isididae), black coral (Antipatharia) as well as the reef forming stony corals (Scleractinia), though some of these may now be reduced in distribution occurring in patches.
- Cold-water coral habitats are easily impacted and recover very slowly, if at all
- Many of the species have reproductive cycles with long generation times leading to very slow and episodic recoveries following human impact. Most deep-sea species are particularly susceptible to degradation and depletion by human activity and natural events.
- Many of the demersal fish have very slow recovery times as a result of their slow reproductive rate compared to pelagic fish. Stocks have already been diminished in some areas.

Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity		**X**		

Explanation for ranking

- While pelagic organisms may be more concentrated over the banks in the area, there is little evidence to suggest overall enhanced productivity of the area.

Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity				**X**

Explanation for ranking

- Benthic and pelagic communities occupy all depths in and around the Hatton and Rockall Banks and Basin. Seabed communities include cold-water corals, rocky reefs, carbonate mounds, polygonal fault systems, sponge aggregations, steep and gentle sedimented slopes.
- The Hatton and Rockall Banks and the Hatton-Rockall Basin have a high habitat heterogeneity that supports diverse seabed communities.
- Cold-water corals provide diverse habitats for other invertebrates and fish.

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Maps and Figures

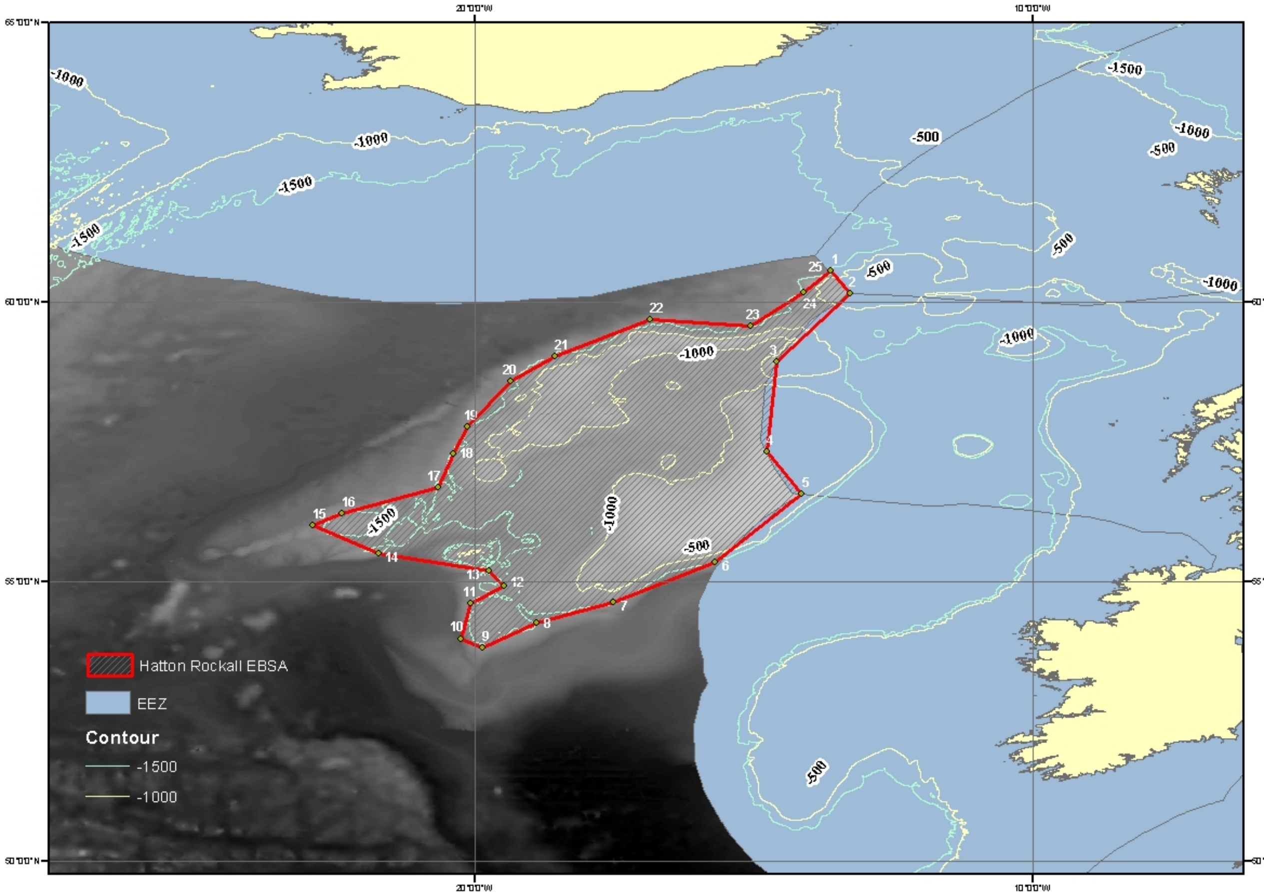

Figure 1 Map of the ABNJ area in the NE Atlantic with boundary of the Hatton-Rockall EBSA outlined in red. This boundary approximates the 1500 m contour**.**

Table 2 Contributors of data for the analysis of seabird satellite tracking are as follows; full details about each dataset are available via *www.seabirdtracking.org*

Species	Site	Owner
Corys Shearwater	Azores	J. González-Solís
Corys Shearwater	Balearics	J. González-Solís
Corys Shearwater	Canaries	J. González-Solís
Corys Shearwater	Chafarinas	J. González-Solís
Corys Shearwater	Berlengas	P. Catry, J.P. Granadeiro
Corys Shearwater	Selvagens	M.A. Dias, P. Catry
Corys Shearwater	Selvagens	M.A. Dias, J.P. Granadeiro
Corys Shearwater	Veneguera	J. González-Solís
Sooty Shearwater	Bay Fundy	R. Ronconi
Sooty Shearwater	Falklands	A. Hedd
Sooty Shearwater	Gough	A. Hedd
Great Shearwater	Bay Fundy	R. Ronconi
Great Shearwater	Inaccessible Island	R. Ronconi, P. Ryan, M. Caroline Martin
Manx Shearwater	Iceland	I.A. Sigurðsson, Y. Kolbeinsson, J. González-Solís
Manx Shearwater	UK	A. Ramsay, J. González-Solís
Fea's Petrel	Bugio	I. Ramirez, V. Paiva
Black-legged Kittiwake	Norway	T. Boulinier, D. Gremillet, J. González-Solís
Little Shearwater	Azores	V. Neves, J. González-Solís
Zino's Petrel	Madeira	F. Zino, R.A. Phillips, M. Biscoito

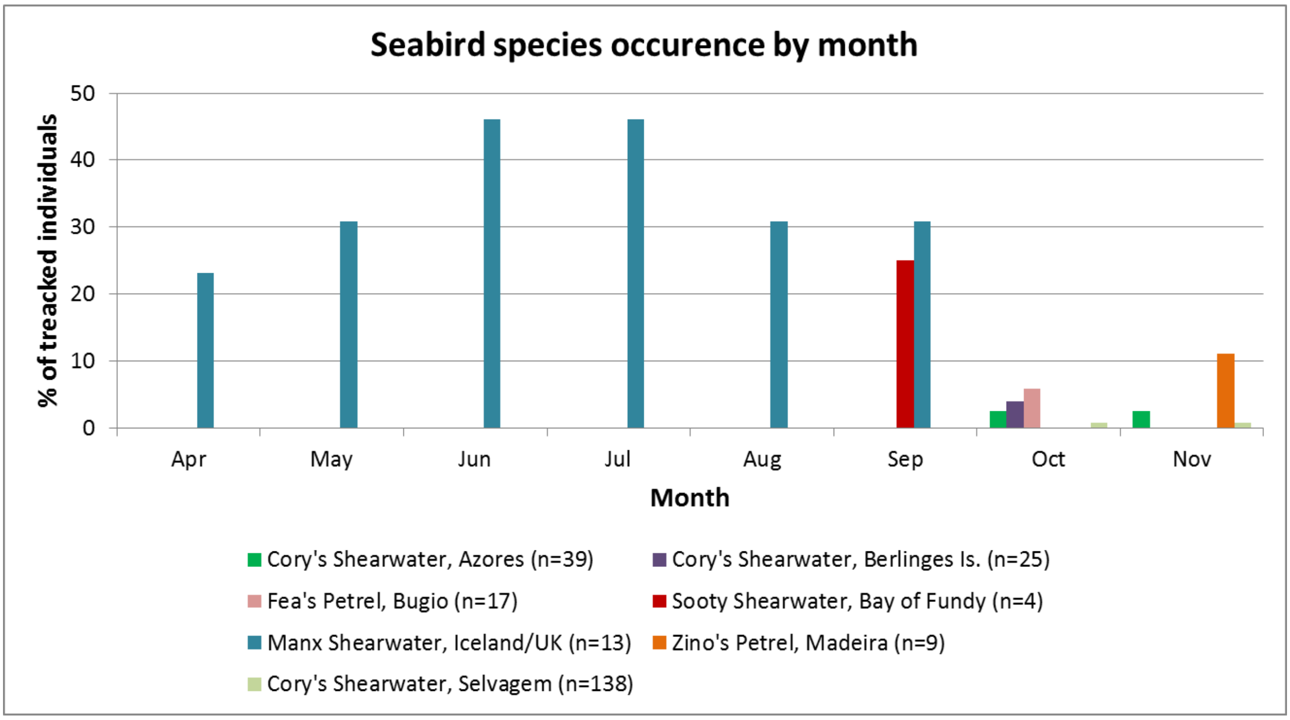

Figure 2 Species occurrence by month within the Hatton-Rockall area, showing percentage of tracked population for each species (and where relevant subpopulation) found within the area each month.

Rights and permissions – Any requests to use the seabird tracking data shown for this site in any publication need to be agreed with the data owners. An initial request should be sent to BirdLife International to coordinate this process. See http://www.seabirdtracking.org/terms.php for full terms of reference

ANNEX 2

Draft Proforma: Mid-Atlantic Ridge North of the Azores and South of Iceland

Presented by: Based on the Joint OSPAR/NEAFC/CBD Scientific Workshop. Reviewed and revised by an ICES expert group.

Abstract

The Mid-Atlantic Ridge (MAR) is the major topographic feature of the Atlantic Ocean. Within the OSPAR/NEAFC area the Northern MAR separates the Newfoundland and Labrador Basins from the West-European Basin and the Irminger from the Iceland Basin. The ridge crest is generally cut by a deep rift valley along its length, bordered by high rift mountains, which are bordered by high fractured plateaus. This region is largely composed of volcanic rock and is the foundation of the proposed EBSA. Hydrothermal venting occurs along the ridges and small-scale physiographic features, including many small volcanoes (seamounts) and canyons, form near the ridge axis. The Moytirra vent field, within this EBSA, is the only high temperature hydrothermal vent known between the Azores and Iceland. Endemic vent fauna are associated with thermally active areas. The 2,500 m depth contour is used to inform the EBSA boundary.

Introduction

Mid-ocean ridge systems occupy a third of the ocean floor and are the site of the formation of new Earth's crust (Heezen 1969). The Mid-Atlantic Ridge (MAR), a tectonic continental plate boundary, is the major topographic feature of the Atlantic Ocean, extending over 12,000 km from Iceland to the Bouvet Triple Junction in the South Atlantic (Figure 1). It divides the ocean longitudinally into two halves, each cut by secondary transverse ridges and interrupted by strike-slip transform faults that offset the ridge in opposing directions on either side of the axis of seafloor spreading (e.g., the Charlie Gibbs Fracture at 53ºN). Compared with other mid-ocean ridges, the MAR is a slow-spreading ridge where new oceanic floor is formed with an average spreading rate of 2.5 cm per year (Malinverno 1990). Hydrothermal venting occurs along the ridges and small-scale physiographic features, including many small volcanoes (seamounts) and canyons, form near the ridge axis; the crest consists mostly of hard volcanic rock. The MAR is an area which captures the Earth's geological history, with outstanding representation of the major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms and significant geomorphic or physiographic features.

The general physiography of the MAR was documented some time ago (Heezen el al. 1959). The ridge crest is generally notched by a deep rift valley along its length, bordered by high rift mountains, which in turn are bordered by high fractured plateaus (Heezen *et al.* 1959). These crest zones are generally well defined and present along the full length of the MAR (Malinverno 1990). At approximately 50 -75 km from the axis of the ridge, the crest merges with sediment covered flanks which extend down to the abyssal plain (van Andel and Bowin 1968). The flanks are composed of a succession of smooth shelves, each from 2 to 100 km from the central axis and subdivided into upper, middle, and lower steps (Heezen el al. 1959) extending in some areas to depths of 4,572 m (Tolstoy and Ewing 1949). The flanks are generally covered with soft sediments. However, van Andel and Bowin (1968) describe considerable variability in sediment depth in the southern MAR, where the foothill region west of the ridge and the ridge slope are only thinly covered, while sedimentation in some valleys can range from nothing to a thickness of several hundred meters. The depth of the ridge crest is highly variable along its length. Malinverno (1990) conducted 46 profiles across the ridge axis from 0° to 50°N, with most of those conducted south of the Azores between 10° and 35°N. The average depth of the axial crest in those profiles was approximately 2,300 m but Malinverno demonstrated that depth was correlated with distance from the Azores and fracture zone characteristics.

The MAR is divided into the Northern and Southern ridges near the equator by the deep Romanche Trench. Within the OSPAR area the Northern MAR separates the Newfoundland and Labrador Basins from the West-European Basin and the Irminger from the Iceland Basin. It has a profound role in the circulation of the water masses in the North Atlantic (Rossby 1999, Bower *et al.* 2002, Søiland *et al.* 2008) with currents crossing the MAR over deep gaps in the ridge and influencing upper-ocean circulation patterns (Bower *et al.* 2002). Canyons cut into the flanks may influence upward fluxes of water and abyssal mixing (Speer and Thurnherr 2005).

Studies of volcanic rocks from the submerged MAR suggest that it consists largely of tholeiitic basalt with low values of K, Ti, and P. In contrast, the volcanic islands which form the elevated caps on the Ridge are built of alkali basalt with high values of Ti, Fe^{3+}, P, Na, and K (Engel and Engel 1964). Variations in mineral content result from chemical and isotopic heterogeneity in the mantle (White and Schilling 1978).

Moytirra Vent Field

The Moytirra vent field is the only fully described high temperature hydrothermal vent known between the Azores and Iceland, making it a unique geophysical structure in the high seas of the North Atlantic and within the MAR. It is situated at 45°N on the 300 m high fault scarp of the eastern axial wall of the MAR, 3.5 km from the axial volcanic ridge crest (Wheeler *et al.* 2013). It is basalt-hosted and its position suggests that it is heated by an off-axis magma chamber. This type of base rock causes precipitation of iron and sulphide-rich minerals during mixing of the hot hydothermal vent fluids (200-400°C) with cold, oxygenated sea water- hence the term "black smoker" (Figure 2). The Moytirra vent field consists of three active vent sites emitting "black smoke" and producing a complex of chimneys and beehive diffusers. The largest chimney is 18 m tall and very actively venting.

There may also be further unconfirmed vent sites on the MAR at 43 N, at 45 N and on the Reykjanes Ridge. In these areas, plumes and/or anomalously high concentrations of Mn in the water column have been detected http://www.interridge.org/irvents/

Location

The Mid-Atlantic Ridge (MAR) extends over 12,000 km from Iceland to the Bouvet Triple Junction in the South Atlantic (Figure 1) and falls within the national jurisdictions of Iceland and the Azores. The proposed EBSA *Mid-Atlantic Ridge North of the Azores and South of Iceland* is for a portion of the MAR within the high-seas areas of OSPAR and NEAFC (Figure 3). Although the crest has an average depth of approximately 2,300 m (Malinverno 1990) it is variable, and the 2,500 m depth contour was used to inform the boundaries of the proposed EBSA as this captures the majority of the ridge crest, and known distribution of deep-water corals (maximum 2,400 m) (Figure 3, Table 1). Within the proposed EBSA the smaller physiographic feature, the Moytirra Vent Field, is located at latitude 45.833 and longitude -27.85 (Table 1).

Feature description

The *Mid-Atlantic Ridge North of the Azores and South of Iceland* is a unique geomorphological feature to the North Atlantic Ocean and to the high-seas areas of NEAFC and OSPAR. Within this feature is a smaller unique feature, the Moytirra vent field. The Moytirra vent field is the only high temperature hydrothermal vent known between the Azores and Iceland, making it a unique geophysical structure in the high seas of the North Atlantic and within the MAR.

The fauna of the Northern MAR have not been fully described and it is premature to speculate on whether any species are endemic, excepting vent-endemic organisms associated with the hydrothermal vents. Some new species have been described and these may prove to be endemic to the proposed EBSA with further sampling.

The benthic fauna associated with the Northern MAR are known from detailed observations at a few locations. Priede *et al.* (2013) used a variety of sampling gears to survey habitat, biomass and biodiversity in a segment of the Northern MAR as part of a multinational and multidisciplinary project (MAR-ECO). They found that primary production and export flux over the MAR were not enhanced compared with a nearby reference station over the Porcupine Abyssal Plain and biomass of benthic macrofauna and megafauna were similar to global averages at the same depths. Also as part of MAR-ECO, Mortensen *et al.* (2008) used an ROV to conduct video surveys along the MAR at 8 sites between the Reykjanes Ridge and the Azores. Deep-water corals were observed at all locations at depths less than 1400 m (range 800-2400 m) and 40 coral taxa were observed, including observations of patches of *Lophelia pertusa*. Crinoids, sponges, the bivalve *Acesta excavata*, and squat lobsters were associated with the *Lophelia*. None of those corals were recognized as new species to science and all likely have broader distributions extending along the continental slopes and seamounts at similar latitudes in the North Atlantic. Inevitably, 11 new species have been described arising from the MAR-ECO work and more are likely to be discovered as the samples are fully processed. These include a new genus and species of foram (*Incola arantius* gen. et sp. nov.), two new species of glass sponges of the genus *Sympagella* (Rossellidae), mushroom corals (*Anthomastus gyratus* sp. nov. and *Heteropolypus sol* sp. nov.), a deep-sea scavenging amphipod (*Hirondellea namarensis* sp. nov.), two new starfish (species of *Hymenaster*) and three species of elasipodid holothurians (Gebruk *et al.* 2013).

MAR-ECO midwater and bottom trawls collected 54 species of cephalopods in 29 families (Vecchione *et al.* 2010). The squid *Gonatus steenstrupi* was the most abundant cephalopod in the samples, followed by the squids *Mastigoteuthis agassizii* and *Teuthowenia megalops*. A multispecies aggregation of large cirrate octopods dominated the demersal cephalopods.

The demersal fish fauna of the MAR form two distinct groups with a faunal divide between 48 and 52°N (Hareide and Garnes 2001) and species-specific differences with depth (King *et al.* 2006, Bergstad *et al.* 2008). Hareide and Garnes (2001), using one trawl and three longline surveys, identified 56 species from 27 families of fish from between 400 and 2000 m depth along the MAR. In the northern part of the Ridge (north of 52°N) relatively common sub-Arctic species such as *Sebastes* spp., tusk (*Brosme brosme*) and Greenland halibut (*Reinhardtius hippoglossoides*) were dominant while sub-tropical species such as golden eye perch (*Beryx splendens*) and cardinal fish (*Epigonus telescopus*) were dominant species below 48°N. During the 2004 MAR-ECO expedition to the MAR, 8518 fish, representing 40 species and 17 families were caught with longlines (Fossen *et al.* 2008). The 59 longline sets were distributed across the ridge axis at depths ranging from 400 to 4300 m at two locations: just north of the Azores archipelago and in the Charlie–Gibbs Fracture Zone. Chondrichthyans (primarily *Etmopterus princeps*) dominated the catches and contributed nearly 60% to both total biomass and abundance. King *et al.* (2006) recorded the scavenging fishes of the MAR using a baited autonomous lander equipped with a time-lapse camera between 924 and 3420 m water depth along 3 east–west transects at 42, 51 and 53°N across the MAR. They photographed 22 taxa with *Synaphobranchus kaupii*, *Antimora rostrata* and *Coryphaenoides* (*Nematonurus*) *armatus* dominant. Abyssal species in the axial valley region were *C. armatus*, *Histiobranchus bathybius* and *Spectrunculus* sp. No endemic demersal species have been reported although the zoarcid eelpout *Pachycara thermophilum*, is a vent-endemic species associated with hydrothermal vents of the MAR (Geistdoerfer 1994).

Sutton *et al.* (2008) examined the assemblage structure and vertical distribution of deep-pelagic fishes relative to MAR with acoustic and discrete-depth trawling surveys in association with MAR-ECO. A 36-station, zig-zag survey along the Mid-Atlantic Ridge from Iceland to the Azores covered the full depth range (0 to >3000 m), from the surface to near the bottom, using a combination of gear types to sample the pelagic fauna. Dominant families of pelagic fish included Gonostomatidae, Melamphaidae, Microstomatidae, Myctophidae, and Sternoptychidae and 99 species of pelagic fish were found concentrated particularly north of the Charlie-Gibbs Fracture Zone. Sutton *et al.* (2008) found that abundance per volume of deep-pelagic fishes was highest in the epipelagic zone and within the benthic boundary layer (BBL; 0-200 m above the seafloor) while minimum fish abundance occurred at depths below 2300 m but above the BBL. Biomass per volume of deep-pelagic fishes over the MAR reached a maximum within the BBL, revealing a topographic association of a bathypelagic fish assemblage with the mid-ocean ridge system. The dominant component of deep-pelagic fish biomass over the MAR was a wide-ranging bathypelagic assemblage that was remarkably consistent along the length of the ridge from Iceland to the Azores. The authors conclude that special hydrodynamic and biotic features of mid-ocean ridge systems cause changes in the ecological structure of deep-pelagic fish assemblages relative to those at the same depths over abyssal plains.

Moytirra Vent Field

Due to the unique nature of the Moytirra vent field, the specialized vent fauna associated with it are also unique to the North Atlantic high-seas area. Wheeler *et al.* (2013) have documented aggregations of gastropods (*Peltospira* sp.) and populations of alvinocaridid shrimp (*Mirocaris* sp. and *Rimicaris* sp.) on the surfaces of the vent chimneys in addition to bythograeid crabs (*Segonzacia* sp.) and zoarcid fish (*Pachycara* sp.), all considered hydrothermal vent fauna (van Dover 1995).

Feature condition, and future outlook

Given the geophysical nature, location and size of the MAR it is unlikely that it will be affected by human activities. Despite its remoteness, the fauna associated with the MAR are not pristine. Starting in the early 1970s with Soviet/Russian trawlers stocks of roundnose grenadier (*Coryphaenoides rupestris*), orange roughy (*Hoplostethus atlanticus*) and alfonsino (*Beryx splendens*) associated with the MAR were exploited (Clark *et al.* 2007, ICES 2007). It can be assumed that most hills along the ridge were at least explored (usually by midwater trawls operating close to the seafloor), and at least 30 seamounts were also exploited for *C. rupestris*. After 1982, the targeted fishery for redfish developed, dwarfing the catches of roundnose grenadier. After the transition from Soviet to Russian fisheries, the Russian fishing effort and absolute catch on the MAR was significantly reduced, although catch per fishing day settled at relatively low levels by the end of 1990s and the fishery was still conducted periodically (ICES 2007). The fishery on *C. rupestris* takes deepwater redfish (*Sebastes* spp), orange roughy (*H. atlanticus*), blackscabbard fish (*Aphanopus carbo*) and deepwater sharks as bycatch (Clark *et al.* 2007). Longline fishing and near-bottom pelagic trawls have the potential to damage fragile benthic species such as deep-water corals and sponges. The scale of the impact that fishing and other human activities may have had on the MAR fauna is at present unquantified. In 2009 NEAFC adopted measures that close more than 330,000 km^2 to bottom fisheries on the MAR until 2015 (Figure 4).

According to the International Seabed Authority, exploratory mining for sulfide deposits has already been undertaken on the MAR, while ferromanganese nodules and cobalt-rich ferromanganese crusts have potential for mining interests. The potential impacts on the marine environment are removal of organisms and their habitats along with the mineral deposits and the smothering of adjacent communities by any sediment plume that may be created (http://www.isa.org.jm/en/about/faqs#16).

Representatives from Norway, Iceland, Azores,the United Kingdom, IUCN and UNESCO have met to review the geological and biological heritage of the MAR in the North Atlantic (http://whc.unesco.org/en/activities/504/). Discussions focused on the areas where the highest peaks of the mountain chain reach sea-level and form islands. Most of the underwater ridge was not considered because it lies outside any national territory and therefore is not covered by provisions of the World Heritage Convention. There was agreement to encourage cooperation with other conventions in order to better protect the biological, cultural and geological heritage of the ridge.

Assessment against CBD EBSA Criteria

CBD EBSA Criterion	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Uniqueness or rarity	The area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features				**X**
Explanation for ranking The Mid-Atlantic Ridge (MAR) qualifies as a unique geomorphological feature in the North Atlantic. The Moytirra vent field is the only known high temperature hydrothermal vent between the Azores and Iceland, making it a unique geophysical structure in the high seas of the North Atlantic and within the MAR.					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive	**X**			
Explanation for ranking Data deficient					
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species	**X**			
Explanation for ranking Data deficient					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery			**X**	
Explanation for ranking Deep-water corals were observed at all 8 sites from 3 locations along the proposed EBSA at depths less than 1400 m (range 800-2400 m) and 40 coral taxa were observed, including observations of patches of *Lophelia pertusa*. These taxa are fragile with slow recovery and highly susceptible to degradation or depletion by human activities including contact with bottom fishing gear (longlines, pots, trawls).					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity		**X**		
Explanation for ranking The research conducted through the MAR-ECO project found that primary production and export flux over the MAR were not enhanced compared with a nearby reference station over the Porcupine Abyssal Plain and biomass of benthic macrofauna and megafauna were similar to global averages at the same depths. There is some evidence for pelagic fish concentrating in the benthic boundary layer (to 200 m above the seafloor) over the MAR in association with topographic features.					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity	**X**			
Explanation for ranking Data deficient. Diversity of habitats is greater than that of surrounding abyssal plain but with the exception of the vent fauna, habitats and species are generally shared with continental margins and seamounts not associated with the MAR.					

Sharing experiences and information applying other international criteria (Optional)

CBD EBSA Criterion	Description	Ranking of criterion relevance (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Dependency:	An area where ecological processes are highly dependent on biotically structured systems (e.g., coral reefs, kelp forests, mangrove forests, seagrass beds). Such ecosystems often have high diversity, which is dependent on the structuring organisms. Dependency also embraces the migratory routes of fish, reptiles, birds, mammals, and invertebrates.				
Explanation for ranking					
Representativeness:	An area that is an outstanding and illustrative example of specific biodiversity, ecosystems, ecological or physiographic processes				
Explanation for ranking					
Biogeographic importance:	An area that either contains rare biogeographic qualities or is representative of a biogeographic "type" or types, or contains unique or unusual biological, chemical, physical, or geological features				**X**
Explanation for ranking The Mid-Atlantic Ridge (MAR) qualifies as a unique geomorphological feature in the North Atlantic. The Moytirra vent field is the only known high temperature hydrothermal vent between the Azores and Iceland, making it a unique geophysical structure in the high seas of the North Atlantic and within the MAR. Fauna endemic to the vents have adapted to the chemical and thermal properties of the environment.					
Structural complexity:	An area that is characterized by complex physical structures created by significant concentrations of biotic and abiotic features.				
Explanation for ranking					
Natural Beauty:	An area that contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.				
Explanation for ranking					
Earth's geological history:	An area with outstanding examples representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.				**X**
Explanation for ranking The Mid-Atlantic Ridge is the site of significant on-going geological processes (plate tectonics, formation of new Earth's crust) and of significant physiographic features (axial rift valley, hydrothermal vent fields).					
[Other relevant criterion]					
Explanation for ranking					
[Other relevant criterion]					
Explanation for ranking					

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Tables, Maps and Figures

Table 1 Boundaries for the proposed EBSA *Mid-Atlantic Ridge North of the Azores and South of Iceland* and location of the Moytirra Vent Field (see Figure 3).

Feature	Latitude (dd)	Longitude (dd)	Details of Location	Reference
Point 1	63.59	-30.91		
Point 2	55.85	-37.51		
Point 3	52.97	-36.70		
Point 4	52.50	-33.00		
Point 5	47.11	-28.09		
Point 6	43.18	-30.59		
EEZ of the Azores			easterly following the EEZ boundary for the Azores to Point 7	
Point 7	42.50	-27.55		
Point 8	46.43	-25.91		
Point 9	49.43	-26.63		
Point 10	52.50	-29.80		
Point 11	53.78	-33.69		
Point 12	60.13	-22.84		
EEZ of Iceland			westerly following the EEZ boundary for Iceland to join Point 1	
Moytirra Vent Field	45.4833	-27.85	300 m high fault scarp of the eastern axial wall, 3.5 km from the axial volcanic ridge crest	Wheeler *et al.* (2013)

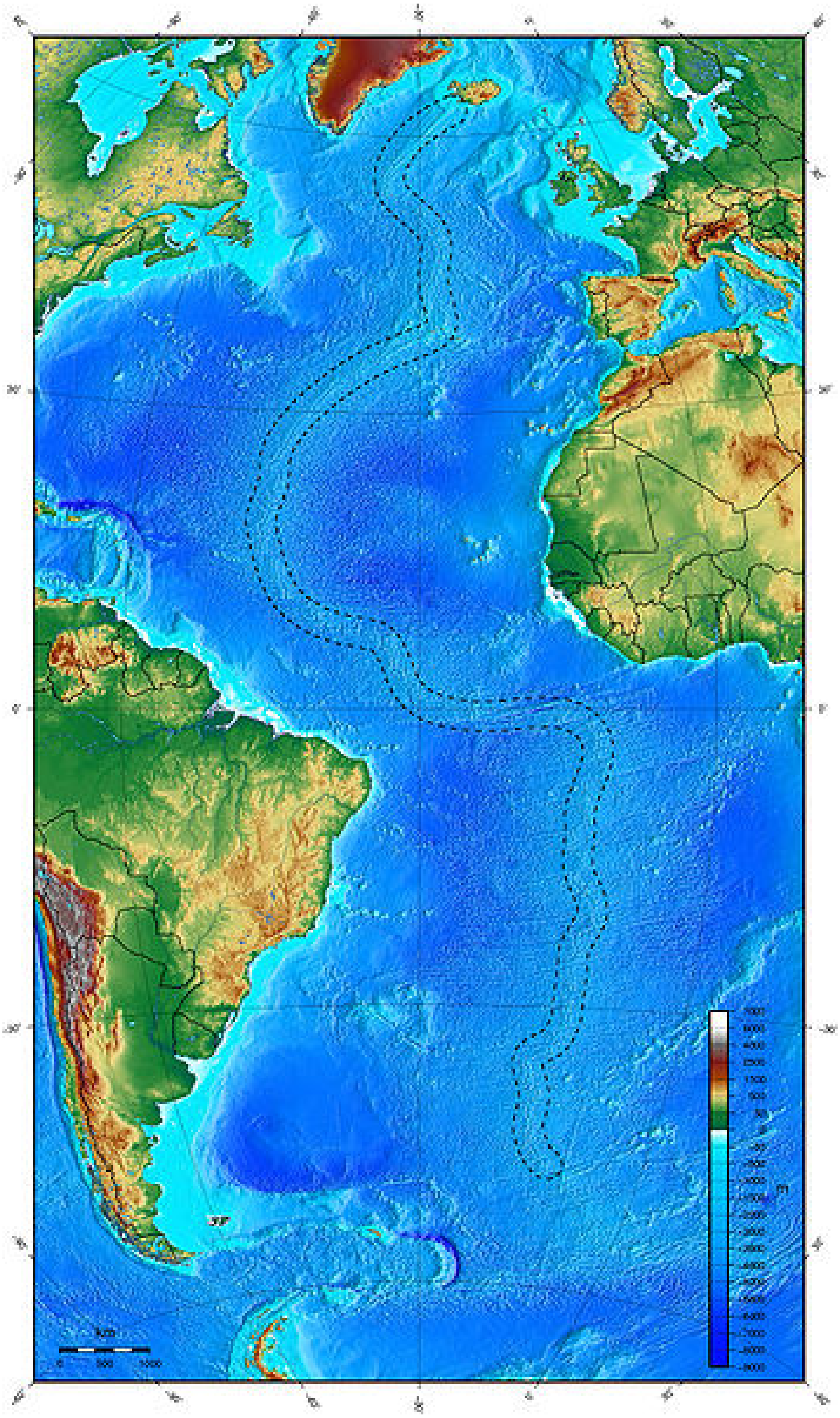

Figure 1 Location of the Mid-Atlantic Ridge (dashed lines). Image downloaded from: commons.wikimedia.org File:Mid-atlantic ridge.jpg - Wikimedia Commons.

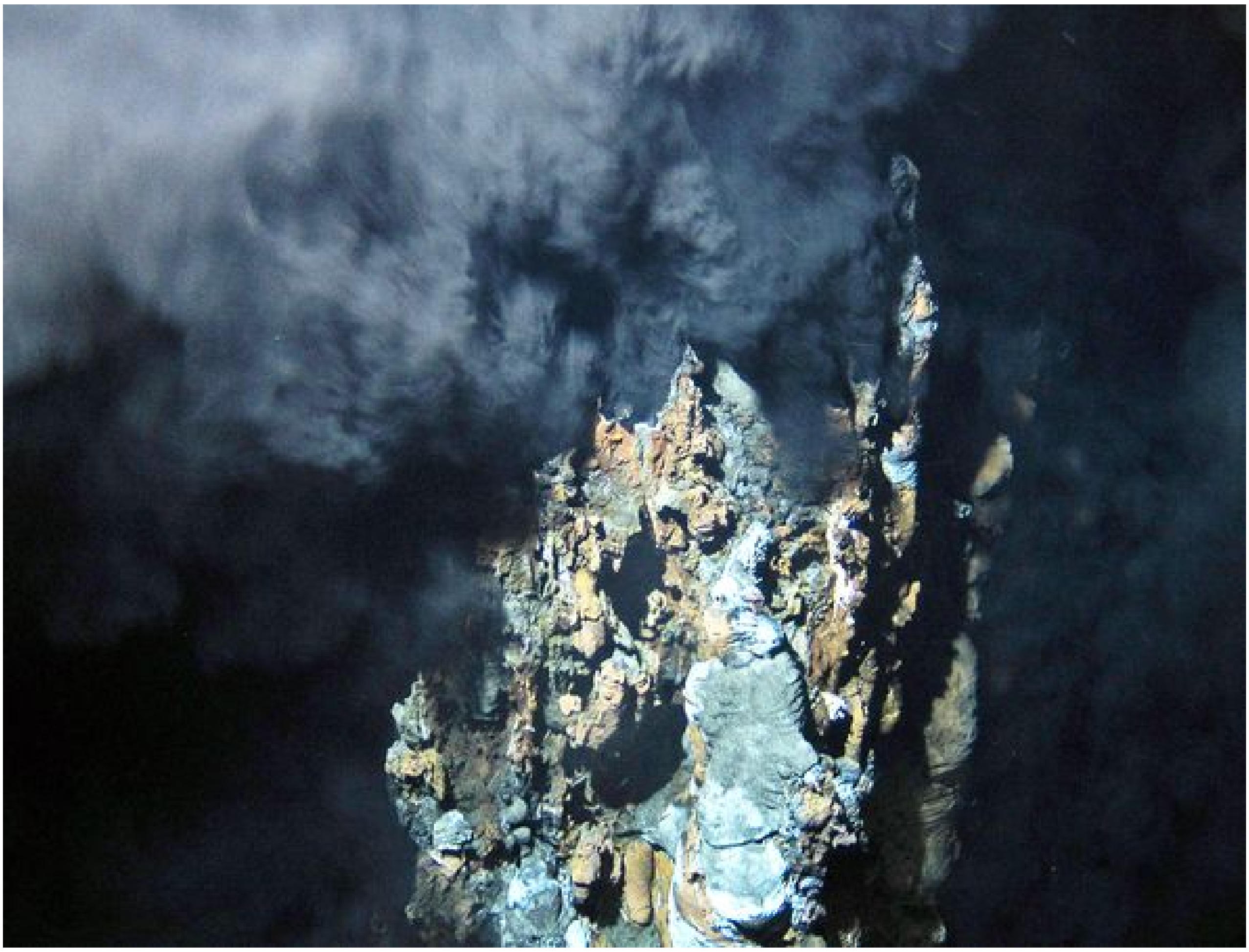

Figure 2 Volcanically heated fluid rises from a deep-sea "black-smoker" in the Moytirra vent field. (Photo downloaded from http://news.nationalgeographic.com/news/2011/08/110808-hydrothermal-vents-volcanic-animals-ocean-deep-sea-science-alien/)

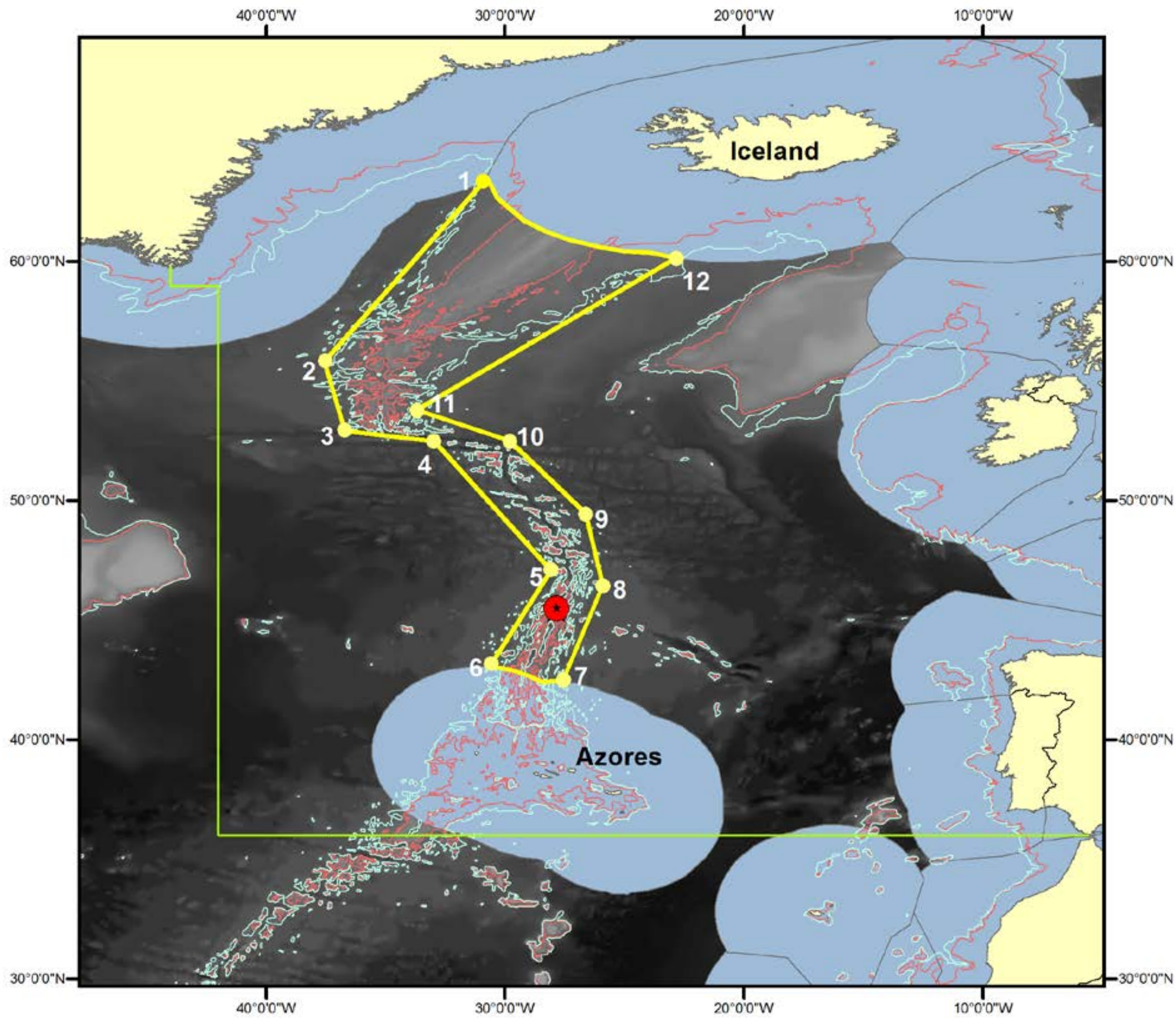

Figure 3 Location of the proposed EBSA *Mid-Atlantic Ridge North of the Azores and South of Iceland*. The perimeter of the proposed boundary follows Table 1 with points numbered 1 through 12. The blue shaded areas represent the Exclusive Economic Zones of countries in the region. The light green line outlines the outer boundary of the OSPAR Convention Area which coincides with the NEAFC Convention Area at its western and southern boundary. Seafloor bathymetry is indicated in grayscale with the 2000 m (red) and 2500 m (light blue) General Bathymetric Chart of the Oceans (GEBCO) depth contours indicated. The red circle with the central star marks the location of the Moytirra Vent Field. See Table 1 for positional information (latitude and longitude).

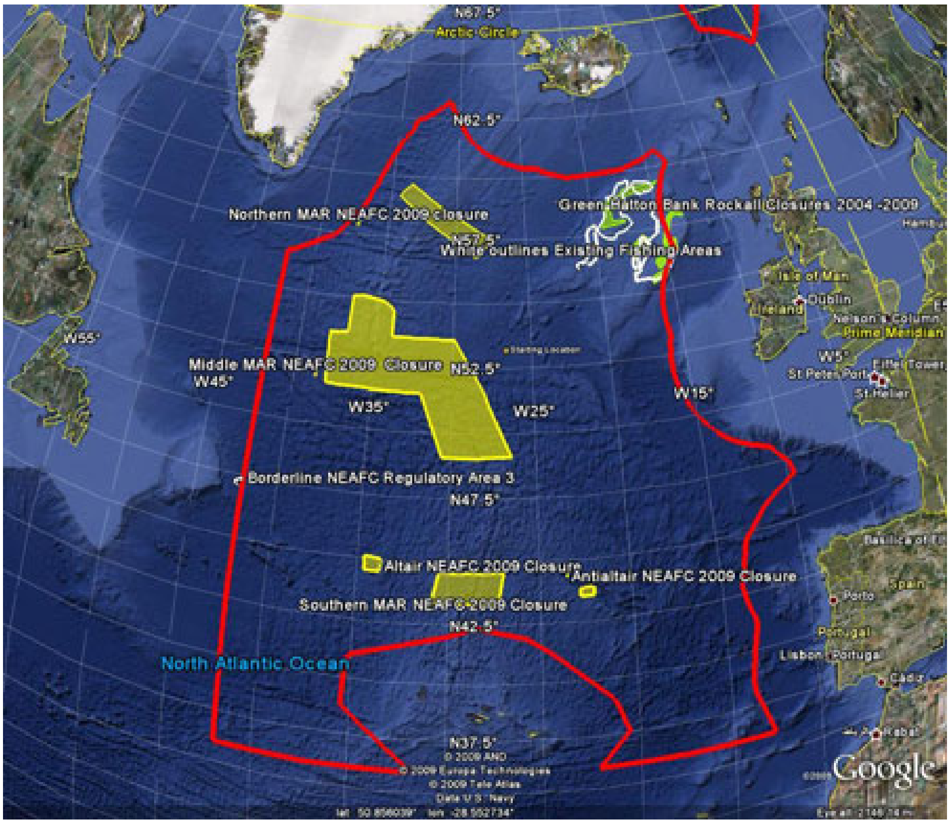

Figure 4 Location of areas closed to bottom fishing (2009-2015) in the NEAFC regulatory area which includes the MAR http://www.neafc.org/page/closures. There is a small seasonal closure for Blue Ling near the boundary with Iceland EEZ which is not visible at this scale.

ANNEX 3

Draft Proforma: Charlie-Gibbs Fracture Zone

Presented by: Based on the Joint OSPAR/NEAFC/CBD Scientific Workshop. Reviewed by revised by an ICES expert group

Abstract

Fracture zones are common topographic features of the global oceans that arise through plate tectonics. The *Charlie-Gibbs Fracture Zone* is an unusual left lateral strike-slip *double* transform fault in the North Atlantic Ocean along which the rift valley of the Mid-Atlantic Ridge is offset by 350 km near 52º30′N. It opens the deepest connection between the northwest and northeast Atlantic (maximum depth of approximately 4500 m) and is approximately 2000 km in length extending from about 25°W to 45°W. It is the most prominent interruption of the MAR between the Azores and Iceland and the *only* fracture zone between Europe and North America that has an offset of this size. Two named seamounts are associated with the transform faults: Minia and Hecate. The CGFZ is considered a unique geomorphological feature in the North Atlantic under the EBSA criteria; further, it captures the Earth's geological history, including significant on-going geological processes.

Introduction

Fracture zones are common topographic features of the global oceans that arise through plate tectonics. They are characterized by two strongly contrasting types of topography. Seismically active *transform faults* form near mid-ocean ridges where the continental plates move in opposing directions at their junction. Seismically inactive *fracture zones*, where the plate segments move in the same direction, extend beyond the transform faults often for 100s of kilometers. Their atypical crust thickness that can be as little as 2 km (Mutter *et al.* 1984, Cormier *et al.* 1984, Calvert and Whitmarsh 1986) allowing direct seismic investigations of the internal structure and composition of oceanic crusts used to model processes of seafloor spreading. In the Atlantic Ocean most fracture zones originate from the Mid-Atlantic Ridge (MAR) and are nearly perfectly west - east oriented. There are about 300 fracture zones occurring on average every 55 km along the ridge, with the offsets created by transform faults ranging from 9 to 400 km in length (Müller and Roest 1992).

The *Charlie-Gibbs Fracture Zone* (CGFZ) is an unusual left lateral strike-slip *double* transform fault in the North Atlantic Ocean along which the rift valley of the MAR is offset by 350 km near 52º30′N (Figure 1). It opens the deepest connection between the northwest and northeast Atlantic (maximum depth of approximately 4500 m; Fleming *et al.* 1970) and is approximately 2000 km in length extending from about 25°W to 45°W. It is the most prominent interruption of the MAR between the Azores and Iceland and the *only* fracture zone between Europe and North America that has an offset of this size[2]. Knowledge of its geomorphology is considered essential to the understanding of the plate tectonic history of the Atlantic north of the Azores (Olivet *et al.* 1974). For these reasons it is consider a unique geomorphological feature in the North Atlantic under the EBSA criteria; further, it captures the Earth's geological history, including significant on-going geological processes.

The CGFZ is comprised of *two* narrow parallel fracture zones (Fleming *et al.* 1970) which form deep trenches located at 30ºW (Charlie-Gibbs South Transform Fault) and at 35º15′W (Charlie-Gibbs North Transform Fault) and separated by a short (40 km) north-south seismically active (Bergman and Solomon 1988) spreading center (median transverse ridge) at 31º45'W (Figure 2; Searle 1981; Fleming *et al.* 1970, Olivet *et al.* 1974). The southern fault displaces the MAR, coming from the Azores, to the west over a distance of 120 km. It is at most 30 km wide (Searle 1981). The northern fault displaces the spreading ridge over another 230 km to the west before it connects to the northern part of the MAR going to Iceland. Both transform faults continue eastward and westward as inactive fracture zones (Figure 2).

The CGFZ is characterized by rough morphology and the walls of the fracture valleys and the ridge in between them are broken and irregular with slopes of up to 29° (Fleming *et al.* 1970). The height of the ridge between the faults is at least 1000 m below the surface and as shallow as 636 m in parts (Fleming *et al.* 1970). Rock samples show the walls of the fracture zone to be both basaltic and ultramafic while the median transverse ridge contains gabbro (Hekinian and Aumento 1973). Earthquake epicentres are associated with the transform faults (Kanamori and Stewart 1976, Bergman and Solomon 1988) and an almost continuous belt of epicentres follow the southern end of the Reykjanes Ridge, along the northern transform valley, the central median valley and the southern transform valley to the north end of the MAR (Lilwall and Kirk 1985). Two named seamounts are associated with the transform faults: Minia Seamount (53°01′N

[2] The Spitzbergen and Jan Mayen fracture zones, of comparable offset (145 and 211 km respectively), lie between Greenland and Europe.

34°58′W) located near the junction of the Reykjanes Ridge and the northern transform fault and Hecate Seamount (52°17′N 31°00′W) located on the northern wall of the southern transform fault east of the short median transverse ridge (Figure 2; Fleming *et al.* 1970).

Ridge and troughs along the CGFZ are mostly covered with muddy sediments (Fleming *et al.* 1970) although outcrops of sedimentary rock and boulder fields are exposed by recent faulting and current scour (Shor *et al.* 1980, Searle 1981) and the southern transform near 30°30′W has no sediment cover (Searle 1981). Considerable thicknesses of sediment are deposited in the northern transform valley from the Iceland-Scotland Overflow Water (ISOW) which carries a significant load of suspended sediment (25 $\mu g\ l^{-1}$) as it passes through (Shor *et al.* 1980). Transverse ridges prevent the sediment reaching the southern valley (Searle 1981) which has less sediment cover, although it is still considered a depositional environment (Shor *et al.* 1980).

The topography of the CGFZ has a major influence on deep water oceanographic circulation (Harvey and Theodorou 1986). A large component of the North Atlantic Deep Water originates in the Norwegian Sea and flows south over the sills between Scotland and Iceland (ISOW). It meets the CGFZ near the intersection of the transform faults and the spreading centre (Shor *et al.* 1980). There is then a westward movement of deep water passing through the fracture zone from east to west through to the Irminger Sea occurring from the core depth of the ISOW at about 2500 m to the sea floor (Garner 1972, Shor *et al.* 1980, Saunders 1994). Most of this water is carried through the northern transform fault where the overflow water first encounters the fracture zone.

The topography of the CGFZ also is thought to have some influence on the circulation of surface waters, although they are not locked to the bottom features to the same extent as the ISOW (Rossby 1999, Bower *et al.* 2002). The northern branch of the North Atlantic Current defines the location of the sub-polar front between colder Sub Arctic Intermediate Water to the north and warmer North Atlantic Intermediate Water to the south (Søiland *et al.* 2008). The sub-polar front meanders between 48-53°N and surface flow is predominantly eastward. The CGFZ is therefore not only a topographic discontinuity in the MAR but the area also constitutes an oceanographic transition zone between waters of different temperatures and flow regimes (Priede *et al.* 2013).

Location

The Charlie-Gibbs Fracture Zone occurs at 52º30′N and extends from about 25°W to 45°W with the transform faults occurring between 30°W and 35°W (Olivet *et al.* 1974). The proposed Charlie-Gibbs Fracture Zone EBSA within the high-seas area of NEAFC and OSPAR takes the co-ordinates provided in Table 1 and illustrated in Figure 3. These are based on Olivet *et al.* (1974) and the location of the Minia Seamount which influences the northern boundary of the EBSA. The eastern boundary of the CGFZ is detectable beyond 42°W, the outer boundary of the NEFAC/OSPAR jurisdictions. The southern ridge continues uninterrupted to 45°W (Olivet *et al.* 1974).

Feature description

The Charlie-Gibbs Fracture Zone (CGFZ) is a unique geomorphological feature to the North Atlantic Ocean and to the high-seas areas of NEAFC and OSPAR. Owing to its remoteness, the fauna associated with the CGFZ are poorly studied and it is premature to speculate on whether any species are endemic based on first descriptions. For example, Gebruk (2008) described two species of holothurians and believed them to be endemic to the Mid-Atlantic Ridge but they subsequently were found on the European continental margin in the Whittard Canyon (Masson 2009).

As part of the MAR-ECO project (Priede *et al.* 2013) manned submersibles were deployed on the axis (52°47′N) and the northern slopes (52°58′N) of the Charlie–Gibbs North transform fault and surveyed macroplankton (Vinogradov 2005), demersal nekton (Felley *et al.* 2008) and invertebrate megafauna (Gebruk and Krylova 2013). Pelagic shrimps, chaetognaths and gelatinous animals were numerically dominant in the plankton, with peak densities corresponding to the main pycnocline. Mucous houses of appendicularians were abundant at 150 m above the seabed, although this is common throughout the central Atlantic and not associated with specific bottom topography (Vinogradov 2005). Nekton included large and small macrourids (*Coryphaenoides* spp.), shrimp (infraorder Penaeidea), *Halosauropsis macrochir*, *Aldrovandia* sp., *Antimora rostrata*, and alepocephalids (Felley *et al.* 2008).

Glass sponges were common between 1700 and 2500 m while the deeper parts of the fracture wall and the sea floor were dominated by isidid corals, other anthozoans, squat lobsters and echinoderms, especially holothurians. The elpidiid holothurian, *Kolga nana*, occurred at high density in the abyssal depression (Gebruk and Krylova 2013). Rogacheva *et al.* (2013) recorded 32 holothurian species from the CGFZ area through the ECOMAR project (http://www.oceanlab.abdn.ac.uk/ecomar/), including three elasipodid holothurian species new to science.

In general, none of the fauna documented from the CGFZ showed distributions atypical of similar habitats in the broader North Atlantic, although Gebruk and Krylova (2013) discuss the known distribution of the holothurian *Peniagone longipaillata* and remark on the differences in relative abundance observed between the occurrence of this species, where it is common in the lower bathyl of the CGFZ, and the continental slopes in the Porcupine Seabight and Abyssal Plain areas and Whitard Canyon where it appears less so. There is weak evidence that the CGFZ may be important for juvenile zoarcids based on a high percentage of those observed with baited cameras being <100 mm in length (Kemp *et al.* 2013).

General knowledge of seafloor benthos suggests that where the geo-morphological processes of the fracture zone have created steep walls along the fractures, the greater three-dimensional topographic complexity, combined with the strong water flows through the fractures, creates habitat that is likely to be more productive and support greater concentrations of fragile taxa such as deep-water corals and sponges than adjacent habitats (Miller *et al.* 2012). The sampling done along the fracture zone supports these inferences but the differences from other habitats in similar depths and latitudes have not been quantified yet.

Feature condition, and future outlook

Given the geophysical nature, location and size of the Charlie-Gibbs Fracture Zone (CGFZ) it is unlikely that it will be affected by human activities, although there is potential for mining of the rare minerals associated with the transform faults. In 2010 the Environmental Ministers of the OSPAR countries officially designated a marine protected area of 145,420 km^2 in the southern part of the Charlie-Gibbs Fracture Zone (Figure 4) and adopted “significant and innovative measures to establish and manage the southern part of the originally proposed Charlie-Gibbs Fracture Zone MPA – “Charlie-Gibbs South MPA”-, for which the seabed and super adjacent waters are situated in areas beyond national jurisdiction” (OSPAR Commission 2010). That same year (2010) the OSPAR Commission and the International Seabed Authority signed a memorandum of understanding in order to conciliate the development of mineral resources with comprehensive protection of the marine environment. In this MOU, the Charlie Gibbs Fracture Zone is highlighted as an area where consultation between the two parties had been initiated. In 2012 OSPAR countries designated “ Charlie-Gibbs North High Seas Marine Protected Area”, an area of high seas of approximately 177,700 km^2 (OSPAR Commission 2012), complementing the Charlie-Gibbs South MPA established previously (Figure 4).

The scale of the impact that fishing and other human activities have had on the fauna of the CGFZ is at present unquantified and likely to be minor, although fishing has been reported on the Hectate Seamount (ICES 2007). In 2009 NEAFC closed more than 330,000 km^2 to bottom fisheries on the Mid-Atlantic Ridge, including a large section of the CGFZ which includes the transform faults and median transverse ridge (http://www.neafc.org/page/closures) (Figure 4).

Assessment against CBD EBSA Criteria

[Discuss the case study in relation to each of the CBD criteria and relate the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, the boundaries of the EBSA need not be defined with exact precision. And modeling may be used to estimate the presence of EBSA attributes. Please note where there are significant information gaps.]

CBD EBSA Criterion	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don’t Know	**Low**	**Some**	**High**
Uniqueness or rarity	The area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features				**X**
Explanation for ranking The Charlie-Gibbs Fracture Zone (CGFZ) is a unique geomorpholical feature in the high-sea between the Azores and Iceland. It is the *only* fracture zone with an offset of its size (350 km) between Europe and North America and opens the deepest connection between the northwest and northeast Atlantic. The fact that it is a double transform fault is an unusual feature.					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive	**X**			
Explanation for ranking Data deficient					

Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species	**X**			
Explanation for ranking Data deficient					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery			**X**	
Explanation for ranking Glass sponges were observed on hard substrates on the fault wall at depths between 1700 and 2500 m. These taxa are fragile with slow recovery and highly susceptible to degradation or depletion by human activities including contact with bottom fishing gear (longlines, pots, trawls).Inferring from the frequently documented presence of such species and communities in structurally complex deep-sea habitats elsewhere, further sampling is likely to document additional presence of sensitive habitats, biotopes, or species in the CGFZ fractures,					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity	**X**			
Explanation for ranking There is no evidence that the CGFZ contains comparatively higher natural productivity. The strong current flows through the fractures and complex three dimensional habitats create conditions that may enhance productivity, but at present there are insufficient data to rank on this criterion.					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity			**X**	
Explanation for ranking Diversity of habitats is greater than that of surrounding abyssal plain but biotic diversity is poorly quantified and there is little basis for a comparative assessment on this criterion at this time.					

Sharing experiences and information applying other international criteria (Optional)

CBD EBSA Criterion	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Dependency:	An area where ecological processes are highly dependent on biotically structured systems (e.g., coral reefs, kelp forests, mangrove forests, seagrass beds). Such ecosystems often have high diversity, which is dependent on the structuring organisms. Dependency also embraces the migratory routes of fish, reptiles, birds, mammals, and invertebrates.				
Explanation for ranking					
Representativeness:	An area that is an outstanding and illustrative example of specific biodiversity, ecosystems, ecological or physiographic processes				
Explanation for ranking					
Biogeographic importance:	An area that either contains rare biogeographic qualities or is representative of a biogeographic "type" or types, or contains unique or unusual biological, chemical, physical, or geological features				**X**
Explanation for ranking The CGFZ qualifies as a unique geomorphological feature in the North Atlantic being the largest transform fault separating Europe from North America.					
Structural complexity:	An area that is characterized by complex physical structures created by significant concentrations of biotic and abiotic features.				

Explanation for ranking					
Natural Beauty:	An area that contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.				
Explanation for ranking					
Earth's geological history:	An area with outstanding examples representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.				**X**
Explanation for ranking Fracture zones are of great geological interest due to their anomalous crust thickness that can be as little as 2 km allowing direct seismic investigations of the internal structure and composition of oceanic crusts used to model processes of seafloor spreading. Knowledge of the geomorphology of the CGFZ is considered essential to the understanding of the plate tectonic history of the Atlantic north of the Azores.					
[Other relevant criterion]					
Explanation for ranking					
[Other relevant criterion]					
Explanation for ranking					

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Tables, Maps and Figures

Table 1. Boundaries for the proposed EBSA *Charlie-Gibbs Fracture Zone* and location of the Minia and Hecate Seamounts (see Figure 3).

Feature	**Latitude (dd)**	**Longitude (dd)**	**Details of Location**	**Reference**
CGFZ Proposed EBSA Point 1	51°N	42°W		
CGFZ Proposed EBSA Point 2	53°05′N	42°W		
CGFZ Proposed EBSA Point 3	53°05′N	30°W		
CGFZ Proposed EBSA Point 4	52°30′N	25°W		
CGFZ Proposed EBSA Point 5	51°45′N	25°W		
Northern Fracture (eastern portion)	53°05′N	42°W		Olivet *et al.* 1974 (p. 2062, fig. 8)
Southern Fracture (eastern portion)	51°N	45°W		Olivet *et al.* 1974 (p. 2062, fig. 8)
Northern Fracture (western portion)	52°30′N	27°W		Olivet *et al.* 1974 (p. 2063, fig. 11)
Southern Fracture (western portion)	51°45′N	25°W		Olivet *et al.* 1974 (p. 2064, fig. 11)
Minia Seamount	53°01′N	34°58′W	located near the junction of the Reykjanes Ridge and the northern transform fault	Fleming *et al.* 1970
	53º 00.60' N	34º 49.80' W		Seamount Catalogue http://earthref.org/SC/SMNT-530N-0348W/
Hecate Seamount	52°17′N	31°00′W	located on the northern wall of the southern transform fault east of the short median transverse ridge	Fleming *et al.* 1970
	52º 15.60' N	31º 03.00' W		Seamount Catalogue http://earthref.org/SC/SMNT-530N-0348W/

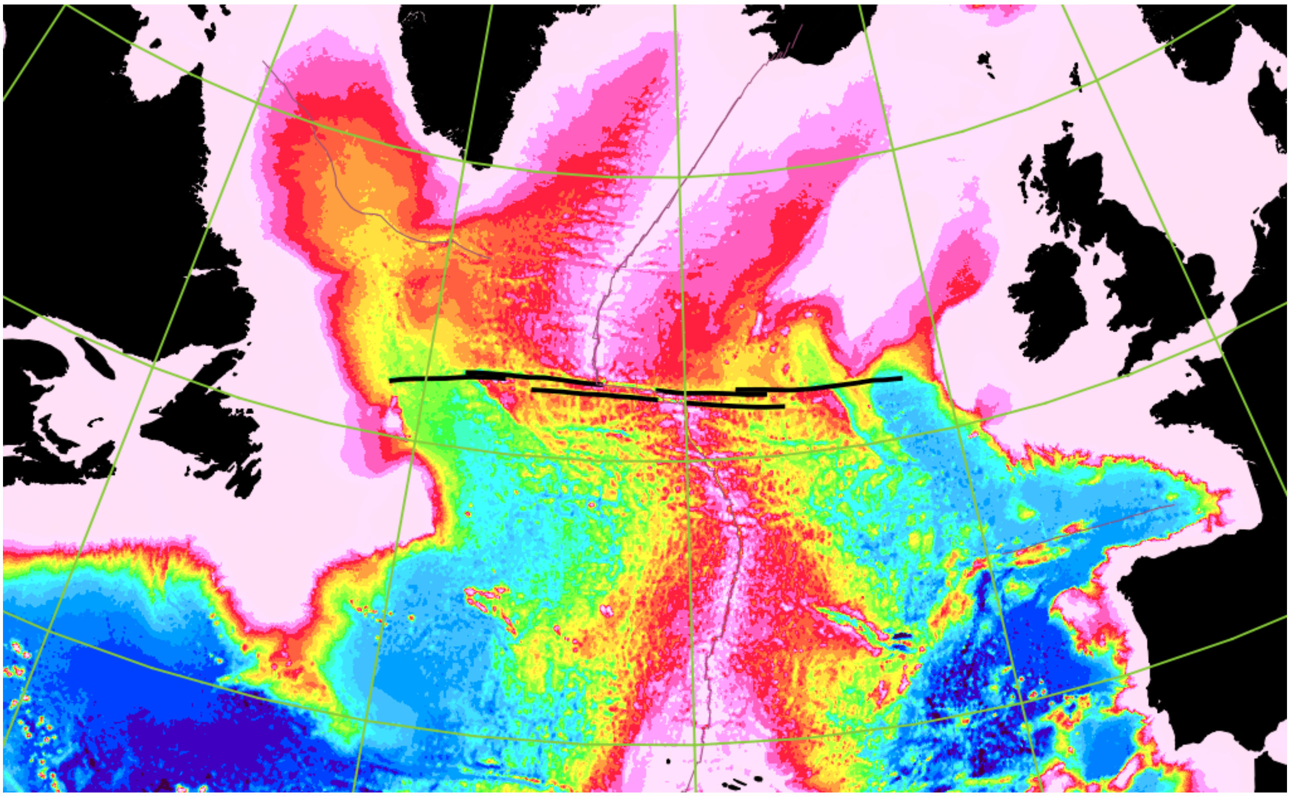

Figure 1 Location of the Charlie-Gibbs Fracture Zone (black lines) in the North Atlantic. The Mid-Atlantic Ridge runs through the centre of the Atlantic Ocean and its left lateral displacement can be clearly seen. Image downloaded from: commons.wikimedia.org File:Charlie-gibbs-full-extent.png - Wikimedia Commons.

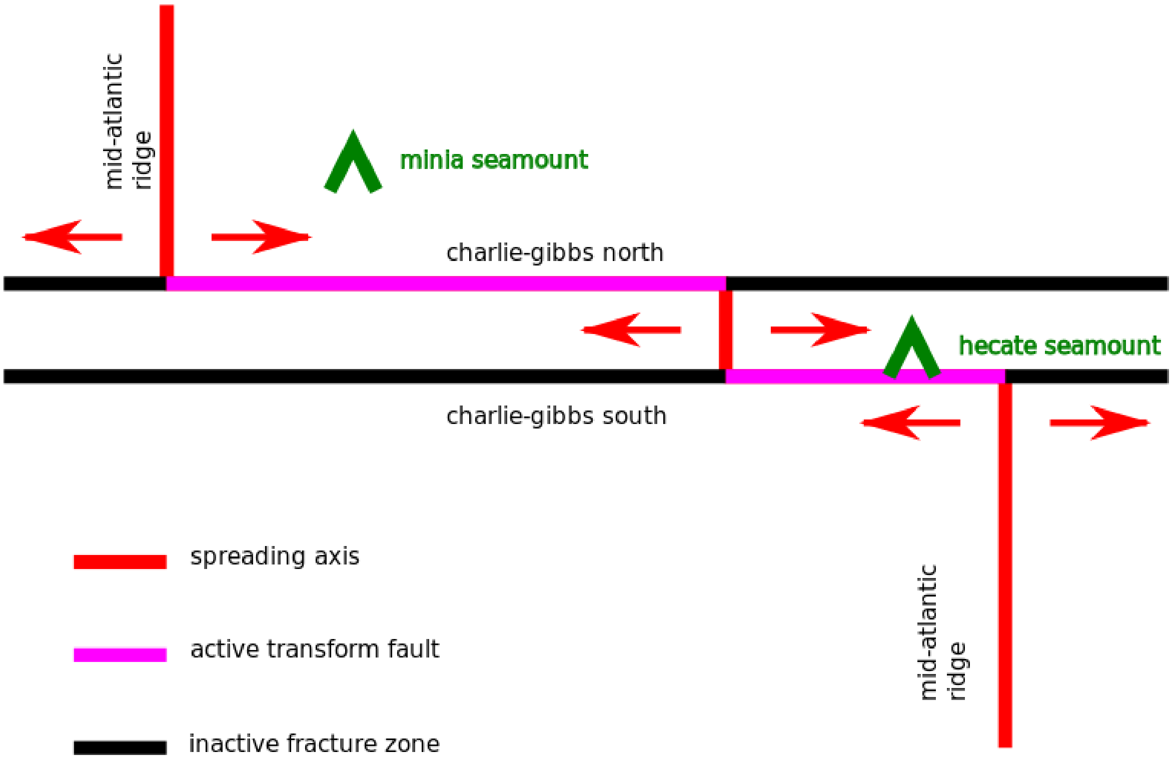

Figure 2 Schematic of the Charlie-Gibbs Fracture Zone and the Mid-Atlantic Ridge (MAR) indicating the left lateral displacement of the MAR, the North and South transform faults and the central spreading axis. The relative location of two seamounts, Hecate and Minia are illustrated. Image downloaded from: commons.wikimedia.org File:Charliegibbsschema-en.svg- Wikimedia Commons.

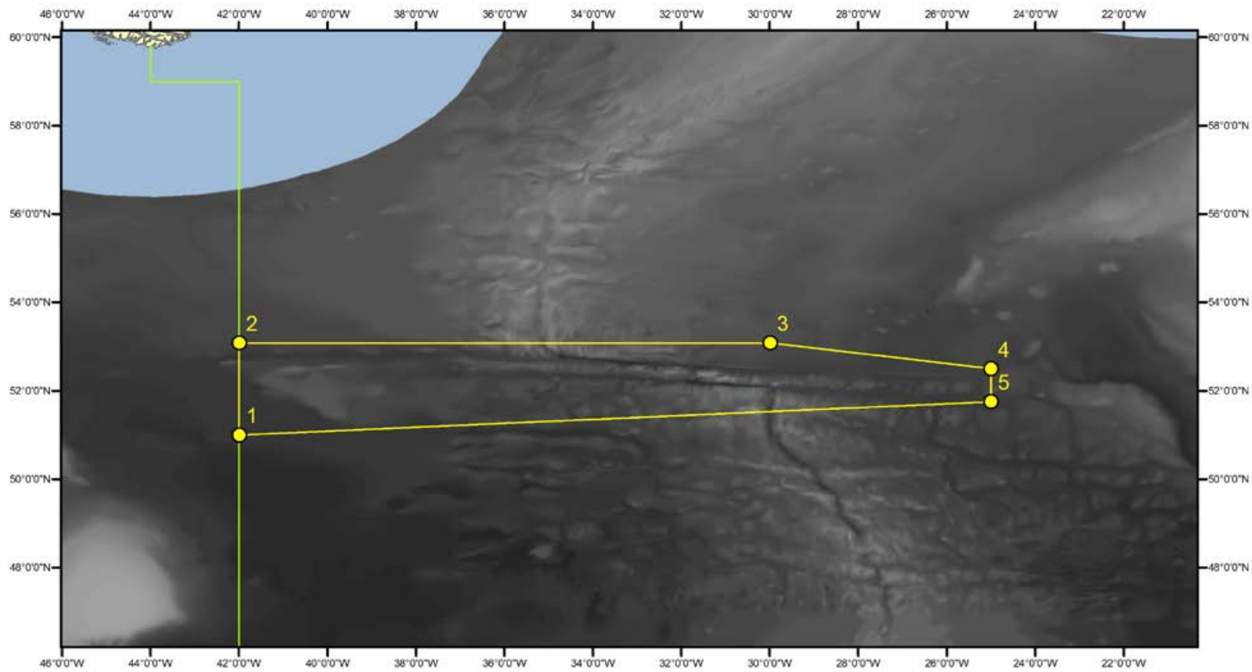

Figure 3. Proposed Charlie-Gibbs Fracture Zone EBSA (yellow lines). Numbers refer to the points in Table 1. The green line is the NEAFC/OSPAR outer boundary.

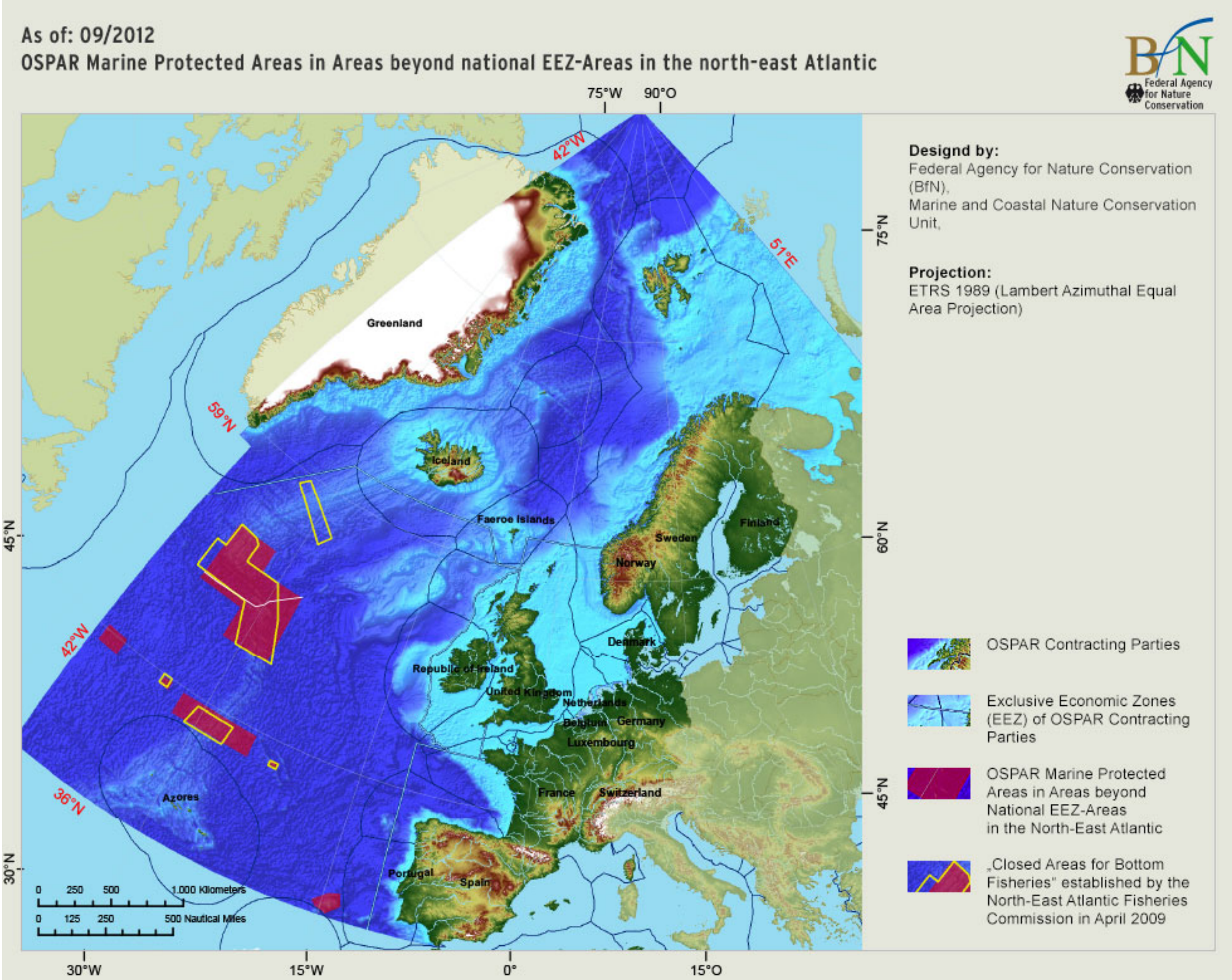

Figure 4. Location of the OSPAR MPAs in the North Atlantic including the large Charlie-Gibbs South and Charlie-Gibbs North MPAs in the central area. The areas closed to bottom fishing by NEAFC are indicated by the yellow boundaries. Downloaded 10 Sep 2013 from: http://charlie-gibbs.org/charlie/node/70

ANNEX 4

Draft Proforma - The Arctic Ice habitat - multiyear ice, seasonal ice and- marginal ice zone

Presented by WWF and reviewed by Participants at the Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas in the North-East Atlantic. Reviewed and revised by an ICES expert group.

Abstract

The permanently ice covered waters of the high Arctic provide a range of globally unique habitats associated with the variety of ice conditions. In the northern hemisphere multi-year sea ice only exists in the Arctic and although the projections of changing ice conditions due to climate change project a considerable loss of sea ice, in particular multiyear ice, the Eurasian Central Arctic high seas are likely to at least keep the ice longer than many other regions in the Arctic basin. Ice is a crucial habitat and source of particular food web dynamics, the loss of which will affect also a number of mammalian and avian predatory species. The particularly pronounced physical changes of Arctic ice conditions as already observed and expected for the coming decades, will require careful ecological monitoring. Eventually measures will be needed to maintain or restore, to the extent possible the resilience of the Arctic populations to changing environmental conditions.

Introduction

Over many past millennia, most of the Eurasian part of the Arctic Basin, and in particular the high seas area in the Arctic Ocean (the waters beyond the 200 nm zones of coastal states, i.e. Norway, Russia, USA, Canada and Greenland/Denmark) have been permanently ice covered. However, in recent years, much of the multiyear permanent pack ice has been replaced by seasonal (1 year) ice. In addition, the former fast pack-ice is now increasingly broken up by leads. This structural change in the Arctic ice quality will result in a substantial increase in light penetrating the thin ice and water column, in conjunction with the overall warming of surface waters and increased temperature and salinity stratification due to the melting of ice.

Some models predict that before the end of the century the permanent ice cover may disappear completely (Anisimov *et al.,* 2007). The reduction and possible loss of permanent ice cover will result in significant changes in the structure and dynamics of the high Arctic ecosystems (CAFF, 2010; Gradinger, 1995; Piepenburg, 2005; Renaud *et al.,* 2008; Wassmann, 2008, 2011).

Understanding and studying the area proposed as EBSA is of particular scientific relevance as already envisaged by the Arctic Council (Gill *et al.,* 2011; Mauritzen *et al.,* 2011). Such studies may in the long-term, become relevant for the commercial exploitation of resources.

Location

The Ecologically or Biologically Significant Marine Area (EBSA) proposed focuses on the presently permanently ice-covered waters in the OSPAR/NEAFC maritime areas, including the high seas section in the Central Arctic Basin north of the 200 nm zones of coastal states, and the area of contiguous seasonal ice directly connected to the multi-year permanent ice (see Fig. 1 attached). Therefore, the boundaries proposed extend from the North Pole (northernmost point of OSPAR/NEAFC maritime areas) to the southern limit of the summer sea ice extent and marginal ice zone, including on the shelf of East Greenland.

The proposal currently only relates to features of the water column and the ice surface itself. Two legal states have to be distinguished: the Central Arctic high seas waters north of the 200 nm zones of adjacent coastal states, generally north of 84° N, and the waters within the Exclusive Economic Zones of Greenland, Russia and the fisheries protection zone of Norway around Svalbard. Figure 1 distinguishes between the high seas beyond national jurisdiction for which the "Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas (EBSAs) in the North-East Atlantic" had a mandate[3] and national/nationally administered waters within the 200 nm zone (national EEZs), within which the OSPAR Contracting Parties have the competence to report candidate EBSAs to the Convention on Biodiversity EBSA repository (OSPAR Commission, 2011).

[3] Participant Briefing for a Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas (EBSAs) in the North-East Atlantic. Invitation Annex 2, 2011

The seafloor of the respective region will likely fall on the extended continental shelves of several coastal states. It belongs to the "Arctic Basin" region of (Gill *et al.,* 2011). Seafloor features were not considered in this assessment.

Figure 1 shows the location of the Arctic Ice „Ecologically or Biologically Significant Area" (EBSA) proposed.

Feature description

The Ecologically or Biologically Significant Marine Area (EBSA) proposed focusses on the presently permanently ice-covered waters in the OSPAR/NEAFC maritime areas, including the high seas section in the Central Arctic Basin north of the 200 nm zones of coastal states, and the marginal ice zone (where the ice breaks up, also called seasonal ice zone) along its southern margins (see Fig. 1 attached). Due to the inflow of Atlantic water along the shelf of Svalbard, and the concurrent outflow of polar water and ice on the Greenland side of Fram Strait, the southern limit of the summer sea ice extent is much further south in the western compared to the eastern Fram Strait, and in former times extended all along the Greenland coast.

Several of the key ecosystem functions and species dependencies are associated with the ice front. Statements made about those functions and dependencies apply to the area where the front is located at any particular time of the year, and not necessarily to either areas fully ice covered (permanently or seasonally) or open waters distant from the ice front in summer.

The high seas section of the OSPAR maritime area in the Central Arctic ocean is generally north of 84° N and much is fully ice-covered also in summer, although the quantity of multiyear ice has already substantially decreased and the 1-year ice leaves increasingly large leads and open water spaces. The ice overlays a very deep water body of up to 5000 m depth distinct from the surrounding continental shelves and slopes of Greenland and the Svalbard archipelago. The Nansen-Gakkel Ridge, a prolongation of the Mid-Atlantic Ridge north of the Fram Strait is structuring the deep Arctic basin in this section, separating the Central Nansen Basin to the south from the Amundsen Basin to the north. Abundant hydrothermal vent sites have been discovered on this ridge at about 85° 38 N (Edmonds *et al.,* 2003).

North of Spitsbergen, the Atlantic water of the West Spitsbergen Current enters the Arctic basin as a surface current. At around 83° N, a deep-reaching frontal zone separates the incoming Atlantic and shelf waters from those of the Central Nansen Basin (Anderson *et al.,* 1989), a transition reflected in ice properties, nutrient concentrations, zooplankton communities, and benthic assemblages (Hirche and Mumm, 1992, and literature quoted). This water subsequently submerges under the less dense (less salinity, lower temperature) polar water and circulates, in opposite direction to the surface waters and ice, counterclockwise along the continental rises until turning south along the Lomonossov Ridge and through Fram Strait as East Greenland Current south to Danmark Strait (Aagaard, 1989; Aagaard *et al.,* 1985). Connecting the more fertile shelves with the deep central basin, these modified Atlantic waters supply the waters north of the Nansen-Gakkel Ridge, in the Amundsen basin, with advected organic material and nutrients which supplement the autochtonous production (Mumm *et al.,* 1998). Due to the import of organic biomass from the Greenland Sea and the Arctic continental shelves, part of which may not be kept in the food web due to the polar conditions, the Arctic Ocean may also represent an enormous carbon sink (Hirche and Mumm, 1992).

In the Fram Strait, the region between Svalbard to the east and Greenland to the west, the East Greenland Current is the main outflow of polar water and ice from the Arctic Basin (Maykut, 1985) (Aagaard and Coachman, 1968). The polar front (0° C isotherm and 34.5 isohaline at 50 m depth) extends approximately along the continental shelf of Greenland, separating the polar surface water from the Arctic (Intermediate) water and the marginal ice zone to the east (e.g. Aagaard and Coachman, 1968; Paquette *et al.,* 1985). The ice cover is densest in polar water, its extent to the east depends on the wind conditions (compare also Angelen *et al.,* 2011; Wadhams, 1981).

The seasonal latitudinal progression of increasing and diminishing light levels, respectively, is the determining factor for the timing of the phytoplankton-related pelagic production. Therefore, the spring bloom and ice break up progress from south to north in spring, reaching the Arctic area by about June/July. Because the currents in Fram Strait move in opposite direction, the polar East Greenland Current to the south, and the Atlantic West Spitsbergen Current to the north, there is a delay of about a month between biological spring and summer between the polar and the Atlantic side (Hirche *et al.,* 1991). Therefore, sea ice and the effect of melting ice are important determinants of the ecosystem processes all along the East Greenland polar front from the Greenland Sea through Fram Strait to the Arctic Basin (Legendre *et al.,* 1992; Wassmann, 2011).

Ice situation

The Arctic Ocean is changing towards a one-year instead of a multi-year sea-ice system with consequences for the entire ecosystem, including ecosystem shifts, biodiversity changes, water mass modifications, and role in the global overturning circulation. At its maximum, sea-ice covers 4.47 million km² in the Arctic Basin (Gill *et al.,* 2011): According to data from ice satellite observations in 1973-76 (NASA, 1987, in (Gill *et al.,* 2011)), permanent ice occupied 70-80% of the Arctic Basin area, and the inter-annual variability of this area did not exceed 2%. Seasonal ice occupied 6-17% (before the melting period of the mid-1970s). By the end of the first decade of the 21st century, the permanent-ice area had decreased greatly, concurrent with a rapid increase in seasonal- ice. Whereas multiyear ice used to cover 50-60% of the Arctic, it covered less than 30% in 2008, after a minimum of 10% in 2007. The average age of the remaining multiyear ice is also decreasing from over 20 % being at least six years in the mid- to late 1980s, to just 6% of ice six years old or older in 2008.

Figure 2: Modelled ice age distribution in 1985-2000 (left) compared to February 2008 (right) (CAFF, 2010).

This trend is likely to amplify in the coming years, as the net ocean-atmosphere heat output due to the current anomalously low sea ice coverage has approximately tripled compared to previous years, suggesting that the present sea ice losses have already initiated a positive feedback loop with increasing surface air temperatures in the Arctic (Kurtz *et al.*, 2011).

About 10% of the sea ice in the Arctic basin is exported each year through Fram Strait into the Greenland Sea (Maykut, 1985) which is therefore major sink for Arctic sea ice (Kwok, 2009). From 2001 to 2005, the summer ice cover was so low on the East Greenland shelf, that it was more of a marginal ice zone (Smith Jr and Barber, 2007). However the subsequent record lows in overall Arctic ice cover brought about an increase in ice cover off Greenland, which minimised the extent of the North East Water Polynia on the East Greenland shelf[4], a previously seasonally ice-free stretch of water (Wadhams, 1981).

Ice related biota

An inventory of ice-associated biota covering the entire Arctic presently counts over 1000 protists, and more than 50 metazoan species (Bluhm *et al.*, 2011). The regionally variable ice fauna (dependent on, *inter alia*, ice age, thickness, origin) consists of sympagic biota living within the caverns and brine channels of the ice, and associated pelagic fauna. The most abundant and diverse sympagic groups of the ice mesofauna in the Arctic seas are amphipods and copepods. Polar cod (*Boreogadus saida)* and to a lesser extent Arctic cod (*Arctogadus glacialis*) are dependent on the sympagic macro- and mesofauna for food. The fish themselves are important food sources for Arctic seals (such as ringed seal Phoca hispida) and birds, for example black guillemots Cephus grylle (Bradstreet and Cross, 1982; Gradinger and Bluhm, 2004 and literature reviewed; Horner *et al.*, 1992; Süfke *et al.*, 1998).

The higher the light level in the ice, the higher is the biomass of benthic algae as well as meiofauna and microorganisms within the ice (Gradinger *et al.*, 1991). Decreasing snow cover induces a feedback loop with enhanced algal biomass increasing the heat absorption of the ice which leads to changes in the ice structure, and ultimately the release of algae from the bottom layer (Apollonio, 1961 in Gradinger *et al.,* 1991). Because of the distance to land and shelves, and the thickness and internal structure of the multiyear pack ice over deeper water, this type of ice has a fauna of its own (Carey, 1985; Gradinger *et al.*, 1991). Arctic multiyear ice floes can have very high algal biomasses in the brine channels and in the bottom centimeters which serves as food for a variety of proto- and metazoans, usually smaller than 1 mm, over deep water (Gradinger *et al.,* 1999). In the central Arctic, ice algal productivity can contribute up to 50 % of the total primary productivity, with lower contributions in the sea ice covered margins (Bluhm *et al.,* 2011).

In the boundary layer between ice floes and the water column, another specific community exists which forms the link between the ice based primary production and the pelagic fauna (Gradinger, 1995). Large visible bands of diatoms hang down from the ice, and are exploited by amphipods such as *Gammarus wilkitzki*, and occasionally by water column copepods such as *Calanus glacialis*, which are important prey of for example polar cod *Boreogadus saida*. The caverns, wedges and irregularities of the ice provide important shelter from predators for larger ice associated species and provide an essential habitat for these species (Gradinger and Bluhm, 2004).

During melt, the entire sympagic ice biota are released into the water column where they may initiate the spring algal plankton bloom (Smith and Sakshaug, 1990) or they may sink to the sea floor and serve as an episodic and first food pulse for benthic organisms before pelagic production begins (Arndt and Pavlova, 2005). In particular the shallow shelves and the shelf slope benthos has been shown to profit of this biomass input, reflected in very rich benthic communities (Klitgaard and Tendal, 2004; Piepenburg, 2005).

The role of the polar front and marginal ice zone for the production system

Primary production in the Arctic Ocean is primarily determined by light availability, which is a function of ice thickness, ice cover, snow cover, light attenuation), the abundance of both ice algae and phytoplankton, nutrient availability and surface water stratification. Generally, the spring bloom occurs later further north and in regions with a

[4] http://www.issibern.ch/teams/Polynya/

thick ice and snow cover. The current production period in the Arctic Ocean may extend to 120 days per year, with a total annual primary production in the central Arctic Ocean of probably up to 10 g C m-2 (Wheeler *et al.,* 1996).

Ice algae start primary production when light levels are relatively low, as melting reduces the thickness of the ice and snow cover. The major phytoplankton bloom develops only after the ice breaks up, when melting releases the ice biota into the water column and meltwater leads to surface stratification. The bloom lasts a few weeks, fuelling the higher trophic food web of the Arctic (Gradinger *et al.,* 1999, and literature quoted).

The marginal ice zones, i.e. where the ice gets broken up in warmer Atlantic or Arctic water, play an important role in the overall production patterns of the Arctic Ocean. Due to the strong water column stratification and increased light levels involved with the melting of the ice, the location and recession of the ice edge in spring and summer determines the timing and magnitude of the spring phytoplankton bloom, which is generally earlier than in the open water (Gradinger and Baumann, 1991; Smith Jr. *et al.,* 1987). Wind- or eddy-induced upwelling in the marginal ice zone, as well as biological regeneration processes replenish the surface nutrient pool and therefore prolong the algal growth period (Gradinger and Baumann, 1991; Smith, 1987). The hydrographic variability explains the patchy patterns of primary and secondary production observed, as well as consequently the patchy occurrence of predators.

The polar front separates to some degree the pelagic faunas of the polar and Arctic waters in the Greenland Sea and Fram Strait, each characterised by a few dominant copepod species with different life history strategies (Hirche *et al.,* 1991; see also review in Melle *et al.,* 2005): In polar waters, *Calanus glacialis* uses under ice plankton production and lipid reserves for initiating its spring reproduction phase, but depends on the phytoplankton bloom for raising its offspring (e.g. Leu *et al.,* 2011). Somewhat later, on the warm side of the polar front in Arctic water, the Atlantic species *Calanus finmarchicus* uses the ice edge-related phytoplankton bloom for secondary production. *Calanus hyperboreus*, the third and largest of the charismatic copepod species has its core area of distribution in the Arctic waters of the Greenland Sea (Hirche, 1997; Hirche *et al.,* 2006).

Zooplankton of the Arctic Basin

Overall zooplankton biomass decreases towards the central Arctic basin, reaching a minimum in the most northerly waters, i.e. the region with permanent ice cover (Mumm *et al.,* 1998). However, investigations in recent years demonstrated increased biomasses compared to studies several decades earlier - possibly a consequence of the decrease in ice thickness and cover which only enabled the investigations to take place from ship board.

There is a south-north decrease in zooplankton biomass, with a sharp decline north of 83°N (Hirche and Mumm, 1992), coinciding with differences in the species composition of the biomass-forming zooplankton species. Whereas the southern Nansen basin plankton is dominated by the Atlantic species *Calanus finmarchicus,* entering the Arctic Basin with the West Spitsbergen Current, the northernmost branch of the North Atlantic current, the Arctic and polar species *Calanus hyperboreus* and *C. glacialis* dominate the biomass in the high-Arctic Amundsen and Makarov Basins (Auel and Hagen, 2002; Mumm *et al.,* 1998). The zooplankton species communities generally can be differentiated according to their occurrence in Polar Surface Water (0-50 m, temperature below –1.7°C, salinity less than 33.0), Atlantic Layer (200–900 m; temperature 0.5–1.5°C); salinity 34.5–34.8) and Arctic Deep Water (deeper than 1000 m, temperature -0,5--1° C, salinity > 34.9) (Auel and Hagen, 2002; Grainger, 1989; Kosobokova, 1982). The polar surface community in the upper 50 m of the water column consists of original polar species as well as species emerging from deeper Atlantic waters, altogether leading to a high abundance and biomass peak in summer. Diversity and biomass are minimal in the impoverished Arctic basin deepwater community (Kosobokova 1982). Apart from a limited exchange with the Atlantic Ocean via the Fram Strait, the central Arctic deep-sea basins are isolated from the rest of the world ocean deepsea fauna. Therefore, the bathypelagic fauna consists of a few endemic Arctic species and some species of Atlantic origin. Due to the separation of the Eurasian and Canadian Basins by the Lomonosov Ridge, significant differences in hydrographic parameters (Anderson *et al.* 1994) and in the zooplankton composition occur between both basins (Auel and Hagen, 2002).

Fish

Polar cod, *Boreogadus saida*, is a keystone species in the ice-related foodwebs of the Arctic. Due to schooling behavior and high energy content polar cod efficiently transfer the energy from lower to higher trophic levels, such as seabirds, seals and some whales (Crawford and Jorgenson, 1993).

Seabirds

Ice cover is a physical feature of major importance to marine birds in high latitude oceans, providing access to resources, and refuge from aquatic predators (Hunt, 1990). As seabirds are dependent on leads between ice floes or otherwise open water to access food, they search for the most productive waters in polynias (places within the ice which are permanently ice free) and marginal ice zones (Hunt, 1990). Here they forage both on the pelagic and sympagic ice-related fauna, especially the early stages of polar cod and the copepods *Calanus hyperboreus* and *C. glacialis*. Likely, they benefit from the structural complexity and good visibility of their prey near the ice (Hunt, 1990).

In the Greenland Sea and Fram Strait, major breeding colonies exist on Svalbard, Greenland and on Jan Mayen, all of these within reach of the seasonally moving marginal ice zone or a polynia (North East Water Polynia on the East Greenland shelf). Breeding seabirds like Little auks (*Alle alle*), from colonies in the northern Svalbard archipelago feed their offspring with prey caught in the vicinity of the nests, however intermittently travel at least 100 km to the marginal ice zone at 80° N to replenish their body reserves (Jakubas *et al.,* Online 03 June 2011). Therefore, the distance of the marginal ice zone to the colony site is a critical factor determining the breeding success (e.g. Joiris and Falck, 2011). Opportunistically, the birds also use other zooplankton aggregations such as a in a cold core eddy in the Greenland Sea, closer to the nesting site (Joiris and Falck, 2011).

A synopsis of seabird data for the period 1974–1993 (Joiris, 2000) showed that the little auk is one of the most abundant species, together with the fulmar *Fulmarus glacialis*, kittiwake *Rissa tridactyla* and Brünnich's guillemot *Uria lomvia* in the European Arctic seas (mainly the Norwegian and Greenland Seas). In the Greenland Sea and the Fram Strait, little auks represented the main species in polar waters, at the ice edge and in closed pack ice, reaching more than 50% of all bird species (Joiris and Falck, 2011). In spring and autumn, millions of seabirds pass through the area when migrating between their breeding sites on Svalbard or the Russian Arctic and their wintering areas in Canada (Gill *et al.,* 2011).

There are several seabird species in the European Arctic which are only met in ice-covered areas, for example the Ivory gull *Pagophila eburnea* and the Thick-billed guillemot *Uria lomvia* (see e.g. CAFF, 2010): Both species spend the entire year in the Arctic, and breed in close proximity to sea ice although Thick-billed guillemots were observed to fly up to 100 km from their colonies over open water to forage at the ice edge (Bradstreet 1979). The relatively rare Ivory gulls are closely associated with pack-ice, favouring areas with 70 – 90% ice cover near the ice edge, where they feed on small fish, including juvenile Arctic cod, squid, invertebrates, macro-zooplankton, carrion, offal and animal faeces (e.g. OSPAR Commission, 2009b). Ivory gulls have a low reproductive rate and breeding only takes place if there is sufficient food, which makes the population highly vulnerable to the effects of climate warming (e.g. OSPAR Commission, 2009b). Thick-billed guillemots are relatively long lived and slow to reproduce and has a low resilience to threats including oil pollution, by-catch in and competition with commercial fisheries operations, population declines due to hunting **–** particularly in Greenland (OSPAR Commission, 2009c).

Ivory gull and Thick-billed guillemots are both listed by OSPAR as being under threat and/or decline, (OSPAR Commission, 2008) and in 2011 recommendations for conservation action were agreed (OSPAR Commission, 2011) which will be implemented in conjunction with the circumpolar conservation actions of CAFF (CAFF, 1996; Gilchrist *et al.,* 2008).

Marine mammals

Several marine mammal species permanently associate with sea ice in the European Arctic. These include polar bear, walrus, and several seal species: bearded, *Erignathus barbatus*; ringed, *Pusa hispida*; hooded, *Cystophora cristata*; and harp seal *Pagophilus groenlandicus*. Three whale species also occupy Arctic waters year- round – narwhal, *Monodon monoceros*; beluga whale, *Delphinapterus leucas*; and bowhead whale, *Balaena mysticetus*.

Polar bears *Ursus maritimus* are highly specialized for and dependent on the sea ice habitat and are therefore particularly vulnerable to changes in sea ice extent, duration and thickness. They have a circumpolar distribution limited by the southern extent of sea ice. Three subpopulations of polar bears occur in the European high Arctic: the East Greenland, Barents Sea and Arctic Basin sub-populations, all with an unknown population status (CAFF, 2010). Following the young-of-the-year ringed seal distribution, polar bears are most common close to land and over the shelves, however some also occur in the permanent multi-year pack ice of the central Arctic basin (Durner *et al.,* 2009). Due to low reproductive rates and long lifetime, it has been predicted that the polar bears will not be able to adapt to the current fast warming of the Arctic and become extirpated from most of their range within the next 100 years (Schliebe *et al.,* 2008).

Walruses, *Odobenus rosmarus*, inhabit the Arctic ice year-round. They are conservative benthic feeders, diving to 80-100 m depth for scaping off the rich mollusc fauna of the continental shelves, and need ice floes as resting and nursing platform close to their foraging grounds. Walruses have been subject to severe hunting pressure from the end of the 18th century to the mid-20th century, and are still hunted today in Greenland (NAMMCO). By 1934, the estimated 70000-80000 individuals of the Atlantic population were reduced to 1200-1300, with none left on Svalbard (Weslawski *et al.,* 2000). Today's relatively small sub-populations on the East Greenland and Svalbard-Franz Josef Land coasts have recently shown a slightly increasing trend, in the latter case reflecting the full protection of the species since the 1950´s (CAFF, 2010; NAMMCO). Apart from their sensitivity to direct human disturbance and pollution, it is expected that walruses will suffer from the changing ice conditions (location, thickness for being used as haul-out site) as well as changes in ice-related productivity.

The Atlantic subspecies of the **bearded seal**, *Erignathus barbatus* occurs south of 85° N from the central Canadian Arctic east to the central Eurasian Arctic, but no population estimates exist (Kovacs, 2008b). Because of their primarily benthic feeding habits they live in ice covered waters overlying the continental shelf. They are typically found in regions of broken free-floating pack ice; in these areas bearded seals prefer to use small and medium sized floes, where they haul out no more than a body length from water and they use leads within shore-fast ice only if suitable pack ice is not available (Kovacs, 2008b, and literature quoted).

The **Arctic ringed seal** *Pusa (Phoca) hispida hispida* has a very large population size and broad distribution, however, there are concerns that future changes of Arctic sea ice will have a negative impact on the population, some of which have already been documented in some parts of the subspecies range (Kovacs *et al.*, 2008). As the other seals, the ringed seal uses sea ice exclusively as their breeding, moulting and resting (haulout) habitat, and feed on small schooling fish and invertebrates. In a co-evolution with one of their main predators, the polar bear, they developed the ability to create and maintain breathing holes in relatively thick ice, which makes them well adapted to living in fully ice covered waters the year round.

The West Ice (or Is Odden) to the west of Jan Mayen, at approx. 72-73° N, in early spring a stretch of more of less fast drift ice, is of crucial importance as a whelping and moulting area for harp seals and hooded seals (summarised e.g. by ICES, 2008). Discovered in the early 18th century, up to 350000 seals (1920s) were killed per year, decimating the populations from an estimated one million individuals in the 1950s (Ronald *et al.*, 1982) to today´s 70000 and 243000 of hooded and harp seals, respectively (Kovacs, 2008a, c).

Hooded seal, *Cystophora cristata*, is a pack ice species, which is dependent on ice as a substrate for pupping, moulting, and resting and as such is vulnerable to reduction in extent or timing of pack ice formation and retreat, as well as ice edge related changes in productivity (Kovacs, 2008a, and literature quoted). Hooded Seals feed on a wide variety of fish and invertebrates, including species that occur throughout the water column. After breeding and moulting on the West Ice they follow the retreating pack ice to the north, but also spend significant periods of time pelagically, without hauling out (Folkow and Blix 1999) in (Kovacs, 2008a). The northeast Atlantic breeding stock has declined by 85-90 % over the last 40-60 years. The cause of the decline is unknown, but very recent data suggests that it is on-going (30% within 8 years), despite the protective measures that have been taken in the last few years. The species is therefore considered to be vulnerable (Kovacs, 2008a).

Harp seals *Pagophilus (Phoca) groenlandicus* are the most numerous seal species in the Arctic seas. Their reproduction takes place in huge colonies, for example on the pack ice of the ‘‘West Ice’’ north of Jan Mayen, and after the breeding season they follow the retreating pack ice edge northwards up to 85° N, feeding mainly on polar cod under the ice (Kovacs, 2008c) .

Narwhals *Monodon monoceros* primarily inhabit the ice-covered waters of the European Arctic, including the ice sheet off East Greenland (Jefferson *et al.*, 2008b). For two months in summer, they visit the shallow fjords of East Greenland, spending all the rest of the year offshore, in deep ice-covered waters along the continental slope in the Greenland Sea and Arctic Basin (Heide-Jørgensen and Dietz, 1995). Narwhals are deep diving benthic feeders and forage on fish, squid, and shrimp, especially Arctic fish species, such as Greenland halibut, Arctic cod, and polar cod at up to 1500 m depth and mostly in winter. A recent assessment of the sensitivity of all Arctic marine mammals to climate change ranked the narwhal as one of the three most sensitive species, primarily due to its narrow geographic distribution, specialized feeding and habitat choice, and high site fidelity (Laidre *et al.* 2008 in (Jefferson *et al.*, 2008b)).

Bowhead whales *Balaena mysticetus* are found only in Arctic and subarctic regions and a Svalbard-Barents population occurs from the coast of Greenland across the Greenland Sea to the Russian Arctic. They spend all of their lives in and near openings in the pack ice feeding on small to medium-sized zooplankton. They migrate to the high Arctic in summer, and retreat southward in winter with the advancing ice edge (Moore and Reeves 1993 in (Reilly *et al.*, 2008)). Whaling has decimated the original bowhead whale populations to be rare nowadays, listed by OSPAR as being under threat and/or decline (OSPAR Commission, 2008). The species is considered to be very sensitive to changes in the ice-related ecosystem as well as sound disturbance, possible consequences of a progressive reduction of ice cover (OSPAR Commission, 2009a).

Belugas *Delphinapterus leucas* prefer coastal and continental shelf waters with a broken-up ice cover. They have never been surveyed around Svalbard. Pods numbering into the thousands are sighted irregularly around the archipelago, and pods ranging from a few to a few hundred individuals are seen regularly (Gjertz and Wiig 1994; Kovacs and Lydersen 2006 in (Jefferson *et al.*, 2008a)).

Little is known about the populations of the larger fauna in the Central Arctic Basin over the deepsea basins and ridges. But it is not likely that it is currently an area of great abundance - too far from the coastal nesting sites of marine birds, and over too deep water to allow feeding on benthos, as most of the larger mammals would need, and currently of too low plankton production to feed the large whales. All of these groups have their distribution center along the continental shelves presently - however, following the receding ice edge out to the central Arctic basin may be one of the options for the future.

Feature condition, and future outlook

This high Arctic region is particularly vulnerable to the the loss of ice cover and other effects of the anticipated global warming, including elevated UV radiation levels (Agustí, 2008). (Wassmann *et al.,* 2010) summarise what changes may be expected within the subarctic/Arctic region:

- northward displacement (range shifts) of subarctic and temperate species, and cross-Arctic transport of organisms;
- increased abundance and reproductive output of subarctic species, decline and reduced reproductive success of some Arctic species associated with the ice and species now preyed upon by predators whose preferred prey have declined;
- increased growth of some subarctic species and primary producers, and reduced growth and condition of animals that are bound to, associated with, or born on the ice;
- anomalous behaviour of ice-bound, ice-associated, or ice-born animals with earlier spring events and delayed fall events;
- changes in community structure due to range shifts of predators resulting in changes in the predator–prey linkages in the trophic network.

(Wassmann, 2008) expects radical changes in the productivity, functional relationships and biodiversity of the Arctic Ocean. He suggests that a warmer climate with less ice cover will result in greater primary production, a reduction of the stratified water masses to the south, changes in the relationship between biological processes in the water column and the sediments, a reduction in niches for higher trophic levels and a displacement of Arctic by boreal species. On the shelves, increased sediment discharges are expected to lower the primary production due to higher turbidity, and enhance the organic input to the deep ocean. A more extensive review of expected or suspected consequences of climate change for the marine system of the Arctic is given in (Loeng *et al.,* 2005).

Figure 3, extracted from (Gill *et al.,* 2011), presents the conceptual ideas about possible Arctic ecosystem changes mediated by human impact:

The normal situation shown in the upper left panel consists of ice-dependent species and species that tolerate a broader range of temperatures and are found in waters with little or no sea ice. Primary production occurs in phytoplankton (small dots in the figure) in ice-free waters and in ice-attached algae and phytoplankton in ice-covered waters. Phytoplankton (small t-shaped symbols in the figure) and ice algae are the main food sources for zooplankton and benthic animals. The fish community consists of both pelagic and demersal species. Several mammals are ice-associated, including polar bears and several species of seals. A number of sea bird species are also primarily associated with ice-covered waters.

At moderate temperature increases (upper right) populations of ice-dependent species are expected to decline as sea ice declines, and sub-Arctic species are expected to move northwards. Arctic benthic species are expected to decline, especially if their distributions are pushed close to or beyond the continental slope.

The expected effects from fisheries relate to the continental shelves. Two major effects are changes in populations of benthic organisms due to disturbance from bottom trawling and removal of large individuals in targeted fish stocks. In addition, the size of targeted stocks, both demersal and pelagic, may be reduced.

In addition, the effects of ocean acidification are considered (lower right). Ocean acidification will result in depletion of carbonate phases such as aragonite and calcite. This will alter the structure and function of calcareous organisms, particularly at lower trophic levels. Changes in pH can also alter metabolic processes in a range of organisms. It is not known how these changes will propagate to higher trophic levels, but the effects could be substantial.

Figure 3: Conceptual models showing potential impacts on Arctic marine ecosystems under different scenarios (Gill *et al.,* 2011).

Gill *et al.* (2011) conclude that the central part of the Arctic Basin is not a region for fisheries or oil and gas exploration. However, this region has played and will continue to play a very important role in the redistribution of pollutants, due to ice drift and/or currents between coastal and shelf areas and the Arctic Basin peripheries, far from sources of pollution.

Assessment against CBD EBSA Criteria

Table 1 Relation of each of the CBD criteria to the proposed area relating to the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, the boundaries of the EBSA need not be defined with exact precision.

<table>
<tr><th rowspan="2">CBD EBSA Criterion</th><th rowspan="2">Description</th><th colspan="4">Ranking of criterion relevance
(please mark one column with an X)</th></tr>
<tr><th>Don't Know</th><th>Low</th><th>Some</th><th>High</th></tr>
<tr><td>Uniqueness or rarity</td><td>The area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td colspan="6">Explanation for ranking

Arctic sea ice, in particular the multiyear ice of the Central Arctic is globally unique and hosts endemic species such as the Gammarid amphipod Gammarus wilkitzki and sea ice meiofauna which will disappear with the melting of the ice. Polar bears, walrusses, bowhead whales, narwhales, belugas, several seal species and many bird species are endemic to the high Arctic ice.

While sea ice species such as G. wilkitzki are not endemic to the proposed EBSA they are endemic to the Arctic and unique within the OSPAR area</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td colspan="6">Explanation for ranking

Sea ice is essential for its sympagic fauna, and to some extent also for the pelagic associated fauna which also depends on the right timing of biomass production (match/mismatch with bloom periods). The marginal ice zone and other openings in the ice are essential feeding grounds for a large number of ice-associated species which exploit the seasonally high production there.

At present the area covered by the proposed EBSA includes both the area of permanent ice and, the area covered by seasonal ice and the ice edge. The community associated with the ice edge requires it special structural features for a number of ecological processes, including increased primary and secondary productivity, and feeding and resting of seabirds and marine mammals.</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species</td><td></td><td></td><td>x</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking

The high arctic ice hosts endemic species such as the Gammarid amphipod Gammarus wilkitzki and sea ice meiofauna which will disappear with the melting of the ice. Many of the obligatory ice-related species are listed as vulnerable by IUCN, and/or listed as under threat and/or decline by OSPAR, examples include the Ivory gull, thick-billed guillemot, bowhead whale, hooded seal and polar bear. With the overall trend of retreating sea ice extent, the proposed EBSA may become increasingly important for all ice-dependent species in the future.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery</td><td></td><td></td><td></td><td>x</td></tr>
</table>

Explanation for ranking The ice-related foodweb and ecosystem is highly sensitive to the ecological consequences of a warming climate. Beyond this the Arctic is at the forefront of the impacts of ocean acidification (Wicks & Roberts 2012). The largest changes in ocean pH will occur in the Arctic Ocean, with complete undersaturation of the Arctic Ocean water column predicted before the end of this century (Steinacher *et al.* 2009). Many of the seabird and mammal populations are particularly sensitive to changes due to their already low population numbers, and low fertility. If the retreat of the ice to the north will lead to increased shipping and oil and gas exploitation in Arctic waters, the increased risk of spills would also pose a potential hazard for example for guillemots, which are extremely susceptible to mortality from oil pollution (CAFF, 2010). In addition, some species like Ivory gull are sensitive to an increased heavy metal load in their prey.					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity				
Explanation for ranking This criterion was not evaluated in the *OSPAR/NEAFC/CBD Workshop*. ICES did not have enough information to evaluate this criterion.					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity				
Explanation for ranking This criterion was not evaluated in the *OSPAR/NEAFC/CBD Workshop*. ICES did not have enough information to evaluate this criterion.					

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Maps and Figures

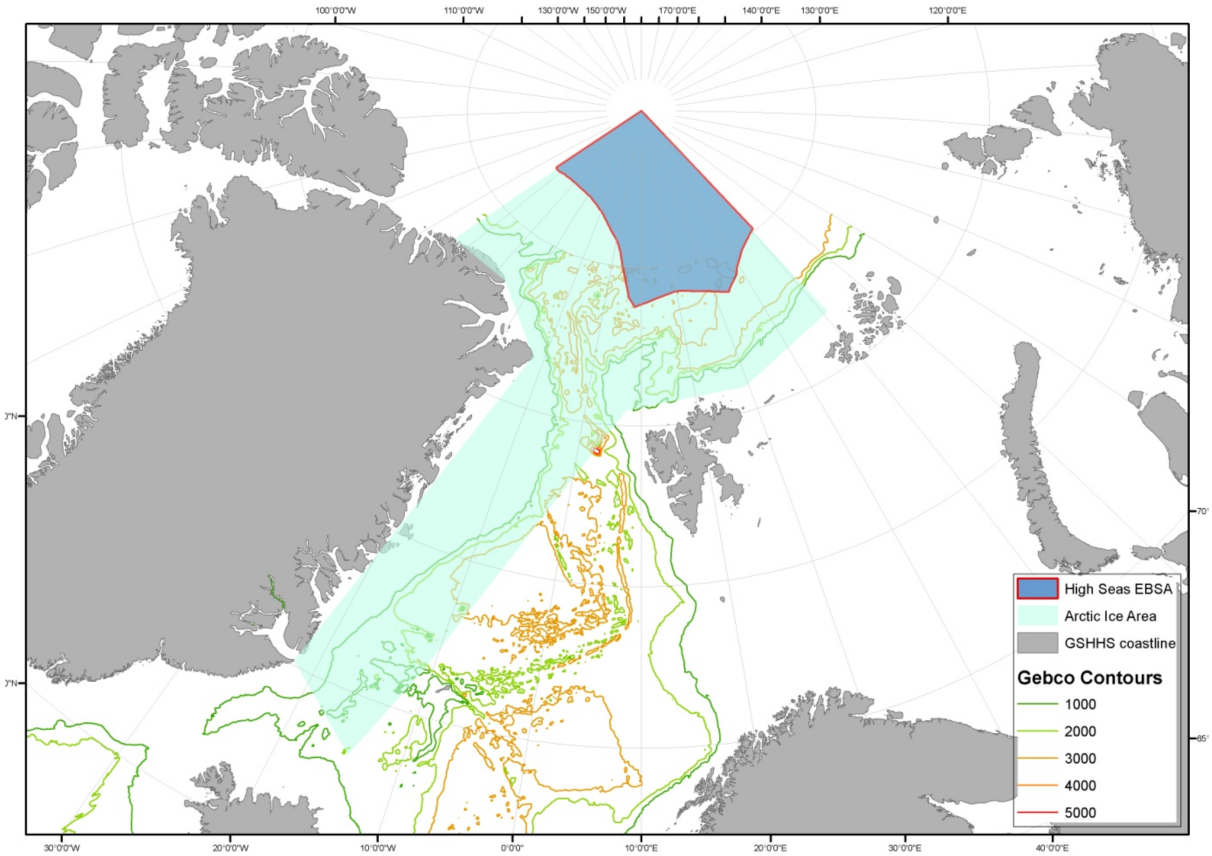

Figure 1 Location of the Ecologically or Biologically Significant Area (EBSA) in the High Seas of the Arctic, proposed initially by WWF in September 2011. No account has been taken of claims for extensions of the continental shelf[5].

[5] Version 2: Map updated

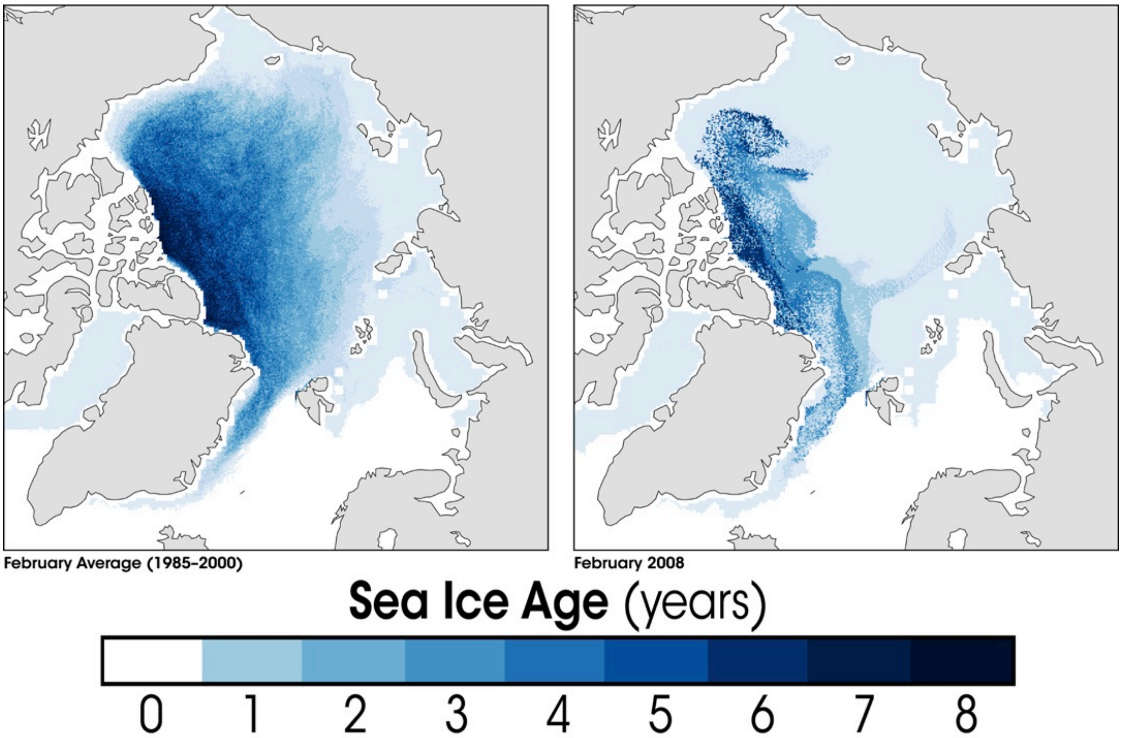

Figure 2 Modelled ice age distribution in 1985-2000 (left) compared to February 2008 (right) (CAFF, 2010).

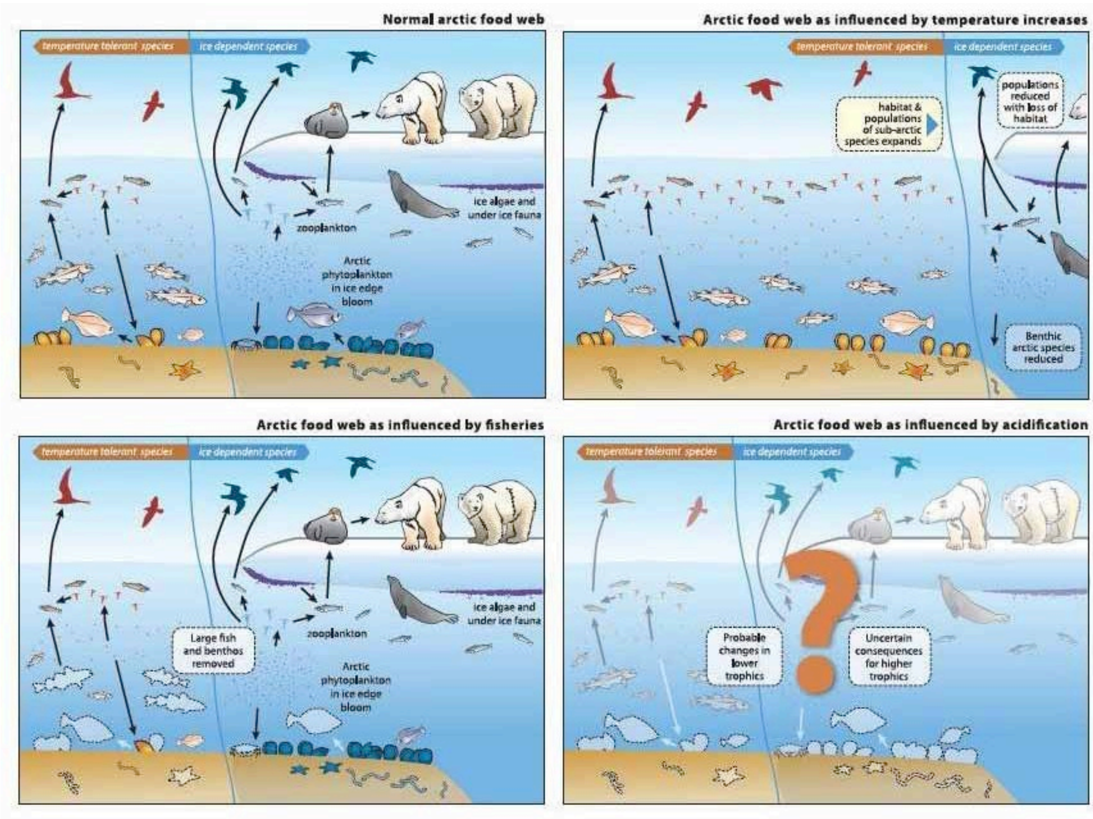

Figure 3 Conceptual models showing potential impacts on Arctic marine ecosystems under different scenarios (Gill *et al.*, 2011).

Annex 5

Note on the Sub-Polar Front

The OSPAR-NEAFC-CBD workshop report proposed an EBSA that included both the Sub-Polar Front (SPF) and the Charlie-Gibbs Fracture Zone (CGFZ). Although that report did not describe the physical oceanographic processes causing the linkage, it presented the information about the area in a way that implied there was a structural linkage between the benthic-seafloor features of the CGFZ and the pelagic features of the SPF. The ICES Review Group accepted the arguments in the earlier report for linkage between the two features. It only proposed an anchoring of the bottom of the SPF to CGFZ, so the front moved seasonally north and south in the water column but did not sweep over the entire seafloor between its northernmost and southernmost boundaries.

Following further study of the summary descriptions of the physical oceanography of the SPF since the ICES Review Group discussions, the secondary sources all indicate that there is little or no structural linkage between the pelagic feature of the SPF and the benthic feature of the CGFZ. Two illustrative quotes are given below, one from a NOAA – Univ of Florida website on north Atlantic Oceanography, and one from the Mar-Eco website.

"*It [North Atlantic Current that forms the Sub Polar front] is recognized as a shallow, widespread and variable wind-driven surface movement of warm water that covers a large part of the eastern subpolar North Atlantic and slowly spills into the Nordic Seas. It is also sometimes included as the Subarctic or Subpolar Front as it is thought of as the boundary between the cold, subpolar region and the warm, subtropical gyre of the Northeastern Atlantic.*". (Rosensteil Institute/NOAA)

"*Near the CGFZ is also the near-surface frontal zone between cold water to the north and warm saline water to the south, known as the Sub-polar Front.*" (MarEco)

The two features have some co-incidence in two-dimensional maps of the ocean, but much less (if any) connection in three dimensions.

Merging them as a single proposed EBSA weakens the science rationale for either feature as an EBSA. If we rank only the benthic CGFZ against the EBSA criteria, it scores highly considering only the geo-morphology, and the limited information available on the benthic community strengthens the case. The case for the CGFZ is considered strong enough to stand alone and can be advanced immediately.

In relation to the pelagic SPF, there appear to be several weaknesses in the case at present. First, we do not have a clear description of the three-dimensional structure of the SPF. Neither the description in the 2011 report (a huge rectangular box from surface to seabed) nor the May 2013 report (a sort of trapezoid, rectangular on the surface and for some hundreds of meters down, but then converging from both the northern summer and southern winter boundaries onto the CG fracture zone all along the east-west centre line of the fracture) appear to match the actual structure of the SPF. If the feature has not been described correctly, it is not possible to submit a reliable proforma about it.

In addition, a rechecking of the cited sources indicate that there is no direct evidence that, even for the first several hundred metres of the water column (wherever the front is at a given time) actually is more productive, more diverse, or more important to life histories of species than adjacent areas. This lack of evidence may be due to a lack of study (or a lack of time to find such studies). ICES has found few or no analyses of satellite data on primary productivity along the front as it moves seasonally, zooplankton productivity (possibly from analyses of CPR data), fish data from ICCAT, and bird foraging data to determine if seabirds concentrate on the front. ICES is aware of scientists who may be able to put together the analyses needed to better evaluate the case for the SPF, but this cannot be done within the timescale needed for this round of the CBD process. ICES is aware of the work done to advance the case for the North Pacific Front (which included expertise from the relevant tuna commission equivalent to ICCAT).

ICES concede that such a proforma on the SPF will miss this cycle for the CBD process, but considers that there is little cost to that miss. The threats to the biological features of such a pelagic EBSA are fishing and shipping. Both threats have been present for decades to centuries, and there are agencies that manage them at present. There is no knowledge of any imminent changes to either activity that would markedly increase risks before the next CBD cycle of reporting.

Separating the pelagic SPF from the benthic CGFZ would allow both proformas to be soundly drafted. Putting the CGFZ forward now ensures it is into the CBD process when a new and possible imminent threat of seabed mining is present, and the case is made on its merits. It is not weakened by present issues with the information for the SPF.

The case for the SPF can be evaluated better than it is now. It will go forward by the next cycle, and in the meantime, existing management authorities (in particular ICCAT) can be brought more fully into process. A stronger proforma for the SPF, with input directly from the regulatory authorities that will be most affected, mean that there is much less risk of opposition when it does go forward.