OSPAR CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC

MEETING OF THE WORKING GROUP ON MARINE PROTECTED AREAS SPECIES AND HABITATS (MASH)

BREST (FRANCE): 5 - 8 NOVEMBER 2007

Marine Protected Areas in areas beyond national jurisdiction

High Seas MPA proposals in the North-East Atlantic (1998 – 2006)

Presented by WWF

This document provides MASH with an overview of High Seas MPA proposals made by WWF to date, including the state of affairs for each site concerned.

Background

1. OSPAR Recommendation 2003/3 envisages the establishment of an ecologically coherent network of well-managed marine protected areas (MPAs) in the OSPAR Maritime Area, including in Areas Beyond National Jurisdiction (ABNJ), by the year 2010. A revised proforma proposal for nomination of a section of the Mid Atlantic Ridge as the first OSPAR MPA in ABNJ is contained in document MASH 07/6/7.

2. In more general terms, WWF has promoted a whole set of proposals for “High Seas MPAs” in the North-East Atlantic since 1999 with a view to informing the intergovernmental process of biodiversity conservation in ABNJ. In the meantime, the mandate of Regional Fisheries Management Organisations such as NEAFC has been reviewed and sectoral measures to regulate destructive fishing practices have been applied to protect key habitats and ecosystems of certain areas (Rockall). Other proposals have changed their status due to the extended continental shelf of coastal states (e.g. Rainbow). Cooperation between OSPAR and NEAFC is being intensified, and a joint effort to map and protect vulnerable marine ecosystems in international waters is needed according to the 2006 UN General Assembly Resolution on Sustainable Fisheries (Res 61/105). OSPAR has entered a discussion on how to establish marine spatial planning for the High Seas (see MASMA 07/6/1).

3. In light of these developments, the background document at **Annex 1** provides a review of the state of affairs for each site originally proposed, including a comparison of different options to apply spatial management and protection tools in ABNJ.

Action requested

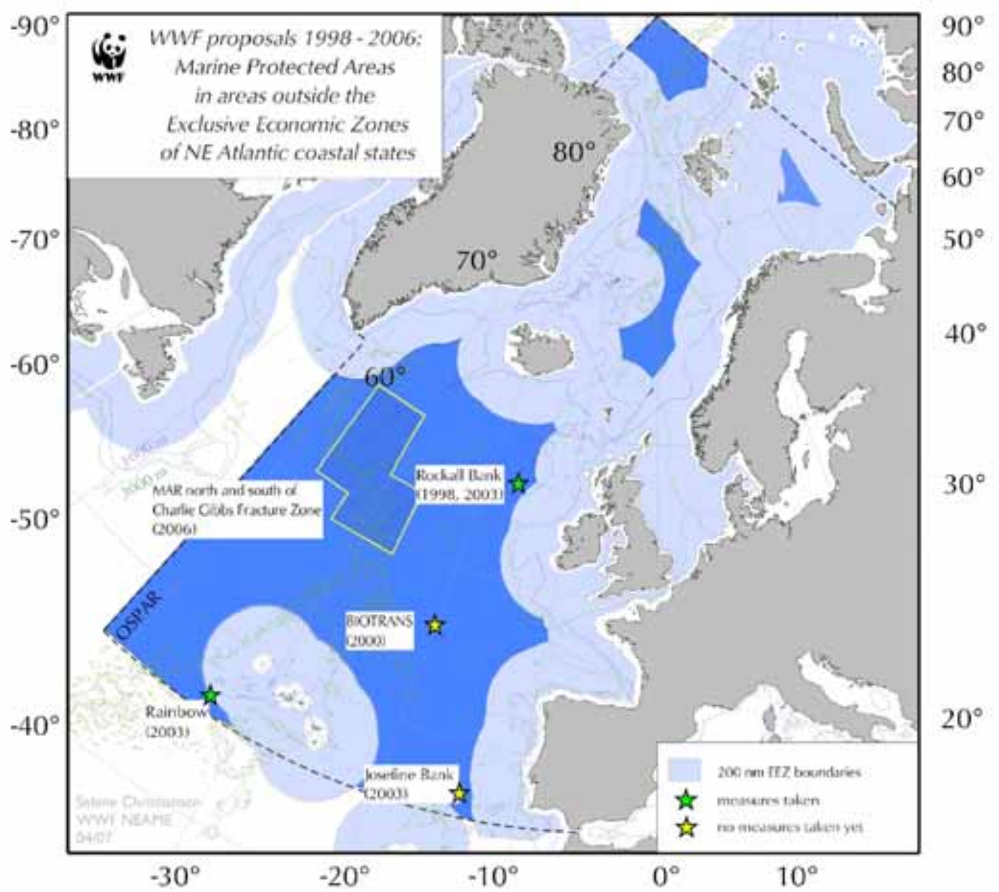
4. MASH is invited to make use of this background information as appropriate.

WWF

Marine Protected Areas in areas beyond national jurisdiction

Proposed High Seas MPAs in the North East Atlantic by WWF 1998 – 2006

Sabine Christiansen, for WWF NEAME



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1. Towards nature conservation in areas beyond national jurisdiction

Scientists initialized the debate on a need for conservation measures, and in particular also the development of a legal framework for the conservation of biodiversity in areas beyond national jurisdiction in 2001. From the beginning, WWF, in cooperation with IUCN, sought to find solutions for this, initially by formulating " A strategic approach to protecting areas on the high-seas"[1] and by commissioning a first report on the "Status of natural resources on the high-seas"[2] . Important steps towards building a global initiative to promote MPAs in waters beyond national jurisdiction were the 2003 Malaga workshop which delivered a "Ten year high seas marine protected areas strategy[3]" and led to the World Parks Congress, where a first set of 5 ecologically significant MPAs was recommended to be established and effectively managed by 2008. Since 2003, WWF, IUCN and the "Deep Sea Conservation Coalition" of NGOs have contributed significantly to achieving the substantial global policy progress we can see today.

The 2006 UN General Assembly Resolution on Sustainable Fisheries (Res 61/105) outlines an important new set of obligations on fishing nations to protect sensitive marine ecosystems from bottom fishing in areas beyond national jurisdiction (ABNJ), effectively calling for the implementation of the precautionary approach: It calls on States and Regional Fisheries Management Organizations (RFMOs) to assess the impacts of all types of bottom fishing on the high seas, and within 1-2 years prohibit any high seas bottom fisheries which cannot be managed to prevent “significant adverse impacts” to vulnerable marine ecosystems. The resolution further calls on States to close areas of the high seas to all bottom fishing where vulnerable marine ecosystems are known or *likely* to occur, unless or until they are able to regulate such fisheries to prevent significant adverse impacts on vulnerable marine ecosystems (VMEs).

If effectively implemented, this resolution could significantly enhance the conservation of deep sea habitats in areas beyond national jurisdiction with fisheries management tools. In the North East Atlantic, several regional conventions cover the high seas, notably the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic and the responsible Regional Fisheries Management Organisation for non-migratory stocks (North East Atlantic Fisheries Commission, NEAFC). NEAFC adopted the first closed areas for the protection of cold water corals already in 2004, followed by further gear closures in 2006 (in total 43000 km^2). This is a very promising start in acknowledging the ecosystem impacts of deep water fishing, however, a lot more needs to be done to fulfil the requirements of the UNGA resolution.

For example, the latest report by UNEP, IOC and the Census of Marine Life "Seamounts, deep sea corals and fisheries"[4] assesses the likely association of stony, reef building, cold-water corals (such as *Lophelia pertusa*) with large seamounts (defined as those over 1,000m from base to peak) throughout the world’s oceans, using predictive modeling, based on the best scientific information available. The report concludes that stony corals – one type of vulnerable marine ecosystem – are highly likely to occur on seamount summits in the OSPAR area at depths ranging between 250 m and 2,500 m. Currently most deepwater fisheries are conducted at depths between 250m and 1,250m. The report provides the basis for closure to bottom fishing of all large seamounts found in the high seas of the OSPAR area (predicted to be more than 200) at the depths described above. OSPARs role should be to inform NEAFC on the best available knowledge on

[1] Cripps, S. and S. Christiansen (2001). A strategic approach to protecting areas on the high-seas. In: (Eds. Thiel, H., Koslow, A.). *Managing risks to Biodiversity and the Environment on the High Sea, Including tools such as Marine Protected Areas – Scientific and Legal Aspects.* BfN Skripten 43, 113-121

[2] WWF/IUCN (2001). The status of natural resources on the high-seas. WWF/IUCN, Gland, Switzerland.

[3] http://www.iucn.org/themes/marine/pdf/10ystrat.pdf

[4] http://www.unepwcmc.org/resources/publications/UNEP_WCMC_bio_series/25/seamounts_deep_seas_fisheries_LR.pdf

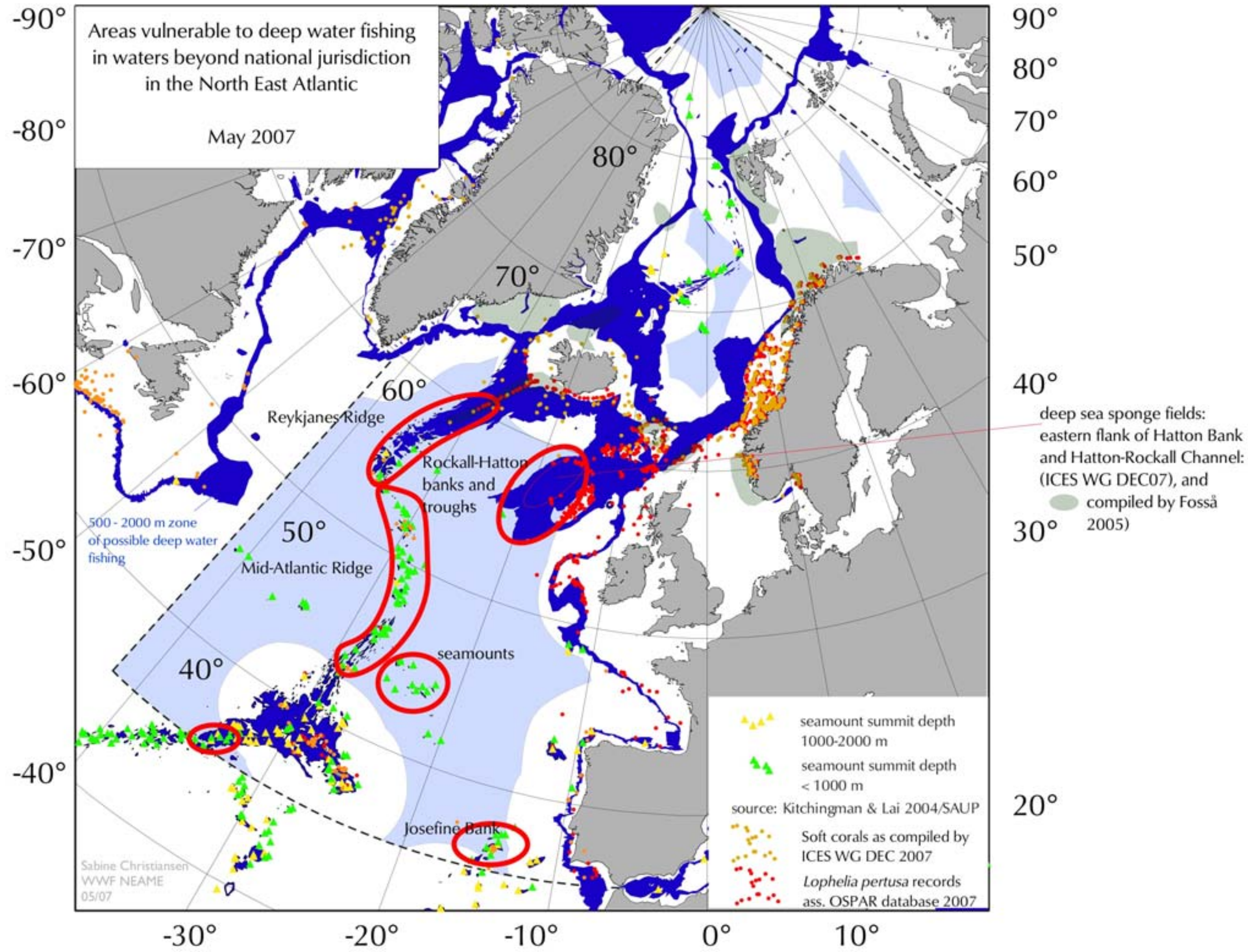

Fig. 1: First attempt to map those sea areas beyond national jurisdiction in the North East Atlantic which are most vulnerable to demersal fishing activities sensu UNGA Resolution 61/105.

vulnerable marine ecosystems in order to enable NEAFC to act responsibly.

Further to the means of pure fishing gear closures at/near vulnerable marine habitats, the OSPAR Convention allows for and Contracting Parties are committed to establishing a network of (conservation) MPAs across all the OSPAR maritime area, including in areas beyond national jurisdiction.

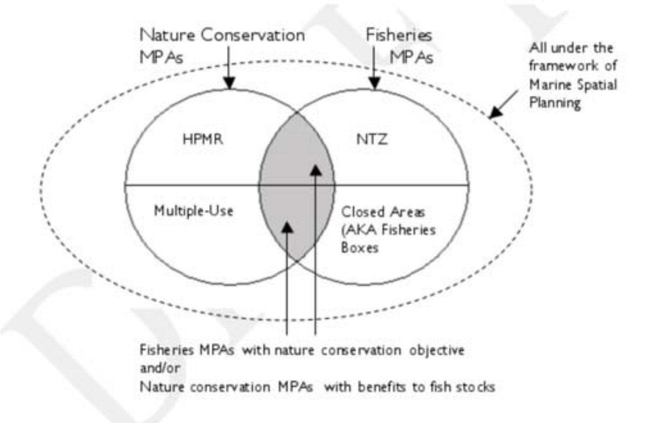

Fig. 2: Different tools for different objectives: Types of management in Fisheries MPAs and Nature Conservation MPAs: Highly Protected Marine Reserves (HPMR), Multiple-use MPAs, No-Take Zones /NTZ) and fisheries gear closures and overlap (modified after WWF UK 2007[5]).

The designation and mangement of conservation MPAs will have several advantages over pure fisheries gear closures:

- MPAs are meant to be permanent and provide for the longterm conservation and/or recovery of the entirety of its constituent ecosystems
- MPA management therefore follows an assessment of all present and likely threats and impacts from human activities
- MPA management should be adjusted via a regular monitoring and assessment process

Therefore it seems desirable to combine the fisheries measures requested by UNGA Resolution 61/105 with the establishment of a set of MPAs fulfilling the criteria for wider marine conservation, e.g. according to the aims of the OSPAR network of MPAs.

[5] WWF UK (2007). Fisheries MPAs – WWF Position Statement/Factsheet.

2. HSMPAs in the OSPAR framework

Under OSPAR Annex V on the protection and conservation of the ecosystems and biological diversity of the maritime area, Contracting Parties have the following obligations:

a. *to take the necessary measures to protect and conserve the ecosystems and the biological diversity of the maritime area, and to restore, where practicable, marine areas which have been adversely affected; and;*

b. *to cooperate in adopting programmes and measures for those purposes for the control of the human activities identified by the application of the criteria in Appendix 3 to the Annex.*

This was substantiated in 2003, when the Ministers of the Environment of the 15 Contracting Parties to OSPAR adopted Recommendation 2003/3, demonstrating their will to establish by 2010 an ecologically coherent network of well-managed marine protected areas, including in areas beyond national jurisdiction.

OSPAR Recommendation 2003/3 defines a marine protected areas (MPAs) as

"*an area within the maritime area for which protective, conservation, restorative or precautionary measures, consistent with international law have been instituted for the purpose of protecting and conserving species, habitats, ecosystems or ecological processes of the marine environment*."

The "OSPAR Network of Marine Protected Areas" means those areas

"*which have been, and remain, reported by a Contracting Party ..., together with any other area in the maritime area outside the jurisdiction of the Contracting Parties which has been included as a component of the network by the OSPAR Commission*."

The aims of the joint OSPAR/HELCOM network of marine protected areas are:

a. *protect, conserve and restore species, habitats and ecological processes which have been adversely affected by human activities;*

b. *prevent degradation of, and damage to, species, habitats and ecological processes, following the precau-tionary principle*

c. *protect and conserve areas that best represent the range of species, habitats and ecological processes in the maritime area*

For those areas reported by Contracting Parties and adopted by the OSPAR Commission to be part of the OSPAR Network of MPAs, Contracting Parties shall develop a management plan in accordance with the OSPAR management guidelines to achieve the aims for which the area has been selected, and implement measures within its competence, or seek measures from the other competent authorities, respectively.

OSPAR state of affairs: To date, the OSPAR Commission has not yet had to decide upon a nomination for inclusion of an MPA in areas beyond national jurisdiction into the OSPAR network of MPAs.

2. WWFs North East Atlantic work

Since 1998, when the adoption of Annex V to the OSPAR Convention on the Protection of the Marine Environment of the North-East Atlantic enabled the transposal of the Convention on Biodiversity goals into regional context, one focal area of WWFs work was to promote the implementation of conservation measures in particular in waters off the coast down to the deep sea. The members of an expert panel which WWF organised as a side-meeting of the OSPAR Commission meeting in 2005, emphasized the leadership role of OSPAR to establish MPAs in areas beyond national jurisdiction – being one of the very few regions globally, with an established convention regime.

But which powers does UNCLOS give the OSPAR Commission and the Contracting Parties under the OSPAR Convention to manage areas beyond national jurisdiction, and in particular on the extended continental shelves? In order to start the discussion, WWF published a first legal opinion in 2006[6] .

Among the 21 example sites proposed for inclusion in an OSPAR network of MPAs, there are 5 sites which fully or partly lie outside the Exclusive Economic zones of coastal states (BIOTRANS, Josefine seamount, Rainbow hydrothermal vent field, Rockall Bank, section of the Mid Atlantic Ridge, see cover map). In addition, a hydrothermal vent field, Logachev, south of the OSPAR area was proposed as a possible pilot HSMPA in 2002. All but the latest site proposal were made in a briefing formate, giving a description of the location, the biological values, reasoning for protection, and an outline for management measures required (see annexed documents). The first site, a longterm research area on the western European abyssal plain was proposed in 2000, followed by further HSMPA proposals in 2003 to build momentum for the inclusion of areas beyond national jurisdiction into the MPA network of OSPAR (see 3. below). The latest proposal, featuring a large section of the Mid-Atlantic Ridge, was formally submitted according to the rules of OSPAR to the relevant OSPAR working group in 2006.

The site selection rationales for the proposed MPAs in areas beyond national jurisdiction can be grouped as follows:

1. **Representative sites that are in a fairly natural state**, with no imminent threat and no commercial interest. A precautionary approach is needed to provide a long-term perspective for scientific investigations.

   Example: The **BIOTRANS** research area[7] and other proposed "Unique Science Priority Areas" (see Thiel 2002, 2006[8]): This deep sea site (4500-4560 m) in the western European Basin represents one type of abyssal plain in the North Atlantic and has been subject to long-term research on the pelagic and benthic ecosystem interactions and energy flow. The near-bottom

[6] Owen, D. (2006). The powers of the OSPAR Commission and coastal State parties to the OSPAR Convention to manage marine protected areas on the seabed beyond 200 nm from the baseline. WWF, 48 pp.

http://www.ngo.grida.no/wwfneap/Projects/Reports/WWF_Owen_Jurisdiction.pdf

[7] http://www.wwfneap/Publication/briefings/BIOTRANS.pdf

[8] Thiel, H. (2002). Science as stakeholder. Ocean Challenge 12 (1), 44-47

Thiel, H. (2007). Priority areas for Scientific Research: protecting scientific investments. Ocean Challenge 15 (1), 6-7 water layer is enriched with suspended matter ("marine snow") supporting the deep-sea benthic fauna. Seasonal pulses of organic matter flow can be detected. Bare at first view, the sedimentary deep seafloor supports a remarkable faunal diversity, with a single square meter harbouring at least 250 species of invertebrates and an important benthopelagic community living in the water column just above the seafloor.

BIOTRANS state of affairs: No conservation actions taken so far.

2. **Unique sites with a potential for overexploitation** by science and commercial interests. Sites already impacted by human activities. A precautionary approach is needed to maintain the natural state of ecosystems, provide for a long-term perspective for scientific investigations, facilitate a spatial and temporal separation of incompatible activities and minimise potentially unsustainable human disturbance.

Example 1: The **Rainbow** hydrothermal vent field[9] comprises more than 30 groups of active small sulphide chimneys over an area of 15 square kilometres. About 32 different species have been recorded in the Rainbow area so far including several ones new to the MAR. Due to the environmental conditions, the species community differs considerably between Rainbow and the two shallower fields Lucky Strike and Menez Gwen in the Azorean Exclusive Economic Zone (EEZ). While shrimps prevail at the chimneys, mussels dominate the community on surrounding blocks within the active area. Bursts of venting fluid cause temperatures to vary between 3-6° C in the mussel beds and 11-13° C in the shrimps environment. The small spatial extent and site-specific communities make the vent field highly vulnerable to the increasing levels of scientific and commercial exploitation, including sampling, bioprospecting and mineral mining.

Rainbow State of play: First proposed as a potential pilot high seas MPA in 2002, WWF launched a formal nomination of the Rainbow vent field to the OSPAR Commission in March 2005. In 2006, the Portuguese government formally nominated Rainbow as an MPA to OSPAR[1]. Portugal considers the site to be situated *on the sea-bed of the natural submerged prolongation of the landmasses of the Archipelago of Azores, at an approximate distance of 235 nautical miles from the baselines ... (or) 35 miles beyond the outer limits of the exclusive economic zone (EEZ) and within the juridical continental shelf generated by the Azores Islands.* While preparing a submission to be presented to the Commission on the Limits of the Continental Shelf (CLCS), Portugal recognizes its obligations under Article 192 UNCLOS to protect and preserve the marine environment, and the precautionary principle and therefore takes responsibility for the site prior to the final conclusions by CLCS.

Example 2: The **Logatchev** hydrothermal vent field (15° N)[10]: At the time of proposal in 2003, Logatchev was the largest known vent area on the Mid Atlantic Ridge, hosting a remarkably high diversity of species and biotopes and therefore presenting a unique opportunity to study how the structure and composition of hydrothermal hot vent communities is controlled by their geological settings.

[9] http://www.ngo.grida.no/wwfneap/Publication/briefings/Rainbow.pdf

http://www.ngo.grida.no/wwfneap/Publication/Submissions/OSPAR2006/WWF_ICG-MPA06_cover.doc

OSPAR MASH 06/5/4-E, ANNEX 6

[10] http://www.wwfneap/Publication/briefings/Logatchev.pdf

Logachev state of affairs: Subject to longterm geological and biological research project studying the spatial and temporal variability of vent ecosystems. No conservation actions taken so far.

3. **Vulnerable sites most probably impacted by human activities**, e.g. supporting habitat-forming cold-water coral reefs and other fragile hard bottom and/or deep-water fauna with critical life histories, as well as sites including soft bottom offshore slopes. In many cases, site-specific knowledge and information is poor and impacts to the offshore features in question only unsufficiently documented despite a high level of historic or ongoing human activities. A precautionary approach is needed to prevent further damage, provide for a long-term perspective for scientific investigations and maintain or restore the natural state of vulnerable ecosystems by managing the risks to biodiversity:

Example 1: **Josefine Bank**[11]: Josefine is the westernmost extension of the east-west trending Horseshoe Seamount chain that also includes the Ormonds and Gorringe Banks. It rises from 2000-3700 m depth to within 170 m below the surface. Due to its patchwork of various hard and soft substrates, it probably serves as a stepping stone for the dispersal, via pelagic larvae, of a wide variety of benthic species from similar habitats on the continental shelf and other seamounts. The species-rich fauna of Josefine Bank, comprising inter alia 16 species of horny and black corals, 13 species of stony corals and 26 species of benthopelagic fish is typical for east Atlantic islands, offshore banks and seamounts. Fishing is known to occur above the seamount.

Josefine state of affairs: Josefine is situated in international waters between the Exclusive Economic Zones (EEZ) of continental Portugal and Madeira (Portugal). However, Portugal endeavors to extend its EEZ, then including Josefine on its extended continental shelf. A fisheries management zone prohibiting the use of bottom touching fishing gear may remove the most substantial threat. No conservation actions taken so far.

Example 2: The proposed section of the **Mid Atlantic Ridge**[12], including the Charlie Gibbs Fracture zone, represents a unique part of the OSPAR maritime area: Seamount clusters form ridge structures which extend roughly in north south direction. The rough topography provides for regular cold water coral occurrence (most commonly at 800-1400 m depth).

The ridge constitutes a biogeographic east-west (MAR) divide, and the CGFZ a north-south divide for benthic and fish species. The CGFZ seems to be important whale feeding area, triggered by a subpolar front which enriches pelagic production. Deep water fishing, in particular trawling was conducted since the 1970s and has led to overexploitation of demersal fish species. The impact of trawling on benthic habitats is unknown, but lost gears are documented.

MAR state of play: In 2004, the North East Atlantic Fisheries Commission (NEAFC) closed the seamounts Faraday, Hekate, and a section of the Reykjanes Ridge to bottom touching fishing gear, in total covering 22000 km^2 of the 620000 km^2 proposed. The MPA proposal submitted to OSPAR by WWF in 2006 is currently under revision and will be re-submitted in fall 2007.

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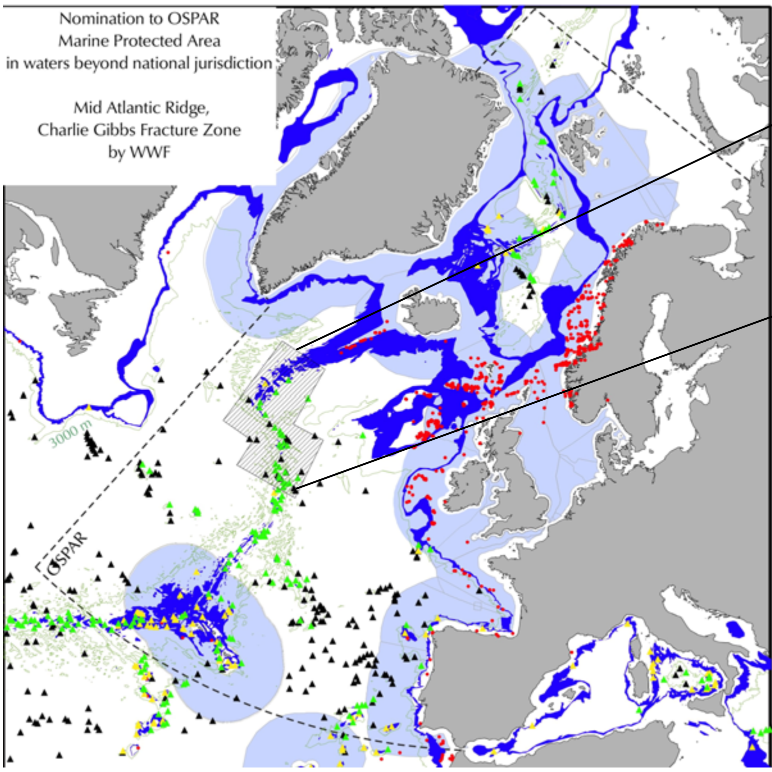
[11] http://www.wwfneap/Publication/briefings/Josefine.pdf

[12] http://www.wwfneap/Publication/Submissions/OSPAR2006/WWF_MASH06_HSMPA_MAR_Annex.pdf

Mid Atlantic Ridge, incl. Charlie Gibbs Fracture Zone



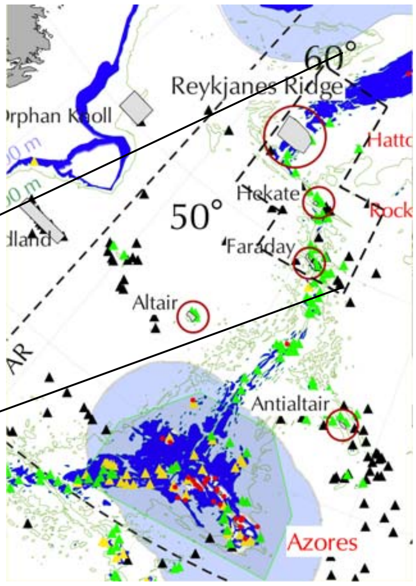


Figure 3: Location of the WWF proposal to OSPAR of a possible MPA on the northern Mid Atlantic Ridge, taking account of OSPAR criteria for the selection.

Location, area	Mid Atlantic Ridge 49° 58° N, approx. 620 000 sqkm, or roughly 10 % of OSPAR Region V
Aim of the MPA (acc. OSPAR guidelines)	Aims to conserve a) representative areas, b) areas which are adversely affected, c) prevent degradation
Management goals	a. Maintain and restore the natural deepwater ecosystem of the Mid Atlantic Ridge and adjacent areas including its function for migratory species b. Improve the scientific understanding c. Improve the public understanding
Management objectives	a. Recovery of deepwater fish stocks and benthic ecosystem b. Ensure longterm sustainable scientific research c. Ensure that the increasing scientific knowledge contributes to public education. d. Monitor the state of the ecosystem
Proposed management	IUCN management category 1, no take area

OSPAR Ecological criteria		**Ecological features of MAR section proposed**
Threatened and/or declining species and habitats	yes	orange roughy, seamount, Lophelia reef
Other important species and habitats	yes	octocorals, deep water fish community incl. endangered sharks, whales
Ecological significance	yes	biogeographic divide, productivity hotspot, characteristic habitats
High natural biological diversity	yes?	little knowledge, but mountain range provides variety of habitats vertically and horizontally
Representativity	yes	important and characteristic feature in OSPAR maritime area
Sensitivity	yes	generally high in deep sea biota
Naturalness	partly	overharvesting of fish top predators, destruction of benthic habitats

4. **Sites with a good knowledge base showing that ongoing human activities substantially and/or irreversibly alter and deteriorate the ecosystem in its structure and function.** A preventive approach is needed to save what is left in terms of natural environment, give a long-term perspective to restore diversity and structure as far as possible, conduct long-term research to monitor the development, and stop the destructive human activities:

Example: **Rockall Bank**[13] is probably the best known offshore bank rising from the deep sea in the north Atlantic. It represents a continuum of ecosystems from typical deep sea environments in Rockall Trough and the Hatton-Rockall Basin to the shallow and shelf-like upper plateau conditions. It is of great significance in the north east Atlantic region due to its extensive coral-associated communities from 150-1000 m depth which harbour rich biological resources in terms of fish populations. Probably, decades of trawling have already caused substantial damage to the *Lophelia pertusa* colonies, thickets and reefs, as well as to the soft-sediment slope regions.

On the shallow parts of the bank, Rockall haddock is one of the principal target species since 2 centuries. Deep water fishing emerged in the 1970s when Russian, and later German and French trawlers started to exploit first blue ling, later roundnose grenadier, black scabbardfish and deep water sharks. Since the UK relinquished its claim to a 200 mile fishery zone around Rockall, an international fishery has developed both on the top of the bank and over the slopes into deeper water. Recently, in preparation of licensing rounds for the oil and gas industry, the UK and Ireland have set up strategic environmental assessments for the wider sea area.

Rockall Bank state of Affairs: Within OSPAR, WWF has been lobbying for protective measures on Rockall Bank and Trough as two of its pilot offshore MPA proposals since 1998 and submitted an elaborated site proposal in 2005. Based on ICES advice (ICES ACE 2005), and after an OSPAR letter raising concerns on the state of the area, the North East Atlantic Fisheries Commission, NEAFC, closed the international parts of three areas on Rockall Bank (NW Rockall Bank, Logachev Mounds, West Rockall Mounds) to bottom trawling and static gears (NEAFC Recommendation IX, 2007). The EU closed both North West Rockall and Logachev Mounds (both within and outside the EEZ) on 20 January 2007 (EC 41/2006 of 21 December 2006). Based on Russian advice, several further coral areas are recommended for closure by the ICES working group on deep water ecology (draft report 2007).

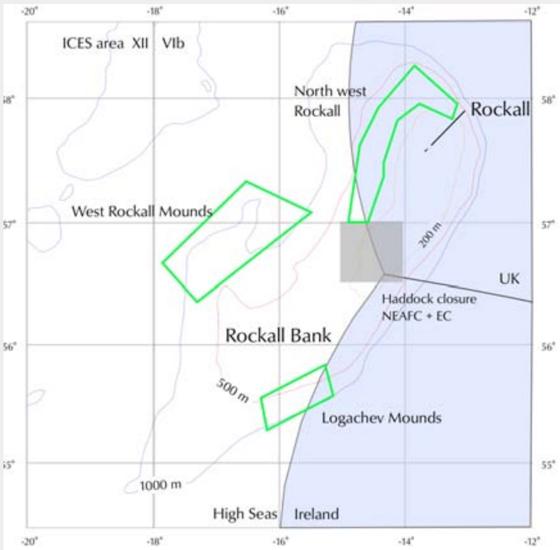


Fig. 2: Temporary fisheries closures on Rockall Bank in force since January 2007 (NEAFC 2006, EC 2006)

Currently, the designation of MPAs on Rockall Bank outside the EEZ of UK and Ireland is hampered by unresolved issues over the delimitation of extended continental shelves of the above two states and Iceland and the Faroes.

[13] http://www.wwfneap/Publication/briefings/Rockall_upd.pdf
http://www.wwfneap/Publication/briefings/Rockall_Hatton.pdf

WWF

briefing

BIOTRANS - A Potential MPA

Justification for the Potential Selection of the BIOTRANS Deep Sea Abyssal Plain as an Offshore Marine Protected Area

Location

BIOTRANS is the acronym for the study site of two successive long term research projects on the carbon flux in the near-bottom water layers and sediments in the deep sea. The research box is situated at 47°-47°30´N, 19°-20° W in the West European Basin, at the foothills of the Mid-Atlantic-Ridge, close to its junction with the Porcupine Abyssal Plain.

Potential Reasons for Selection

The BIOTRANS site was subject to intensive investigations from 1984-1994 and was later revisited several times. The data provide an excellent picture of deep sea abyssal energy flow and an insight into the food webs of the benthic boundary layer and the sediments. This area depicts an example for one type of abyssal plain present in the North-East Atlantic and should be incorporated in a representative network of marine protected areas.

Site description

The BIOTRANS research area in the West European Basin is part of a larger study area investigated by the Northeast Atlantic Monitoring Programme (NOAMP, 1982-1985) in connection with the dumping of nuclear wastes at the Nuclear Energy Agency (NEA) dump site (46° N 17° W). The area is structured by ridges and furrows stretching more or less parallel to the Mid-Atlantic-Ridge (NNE-SSW). Further, a seamount characterized by 3 peaks is rising to about 700 m above the surrounding of an average depth range of 4500-4560 m (Fig.1). The hydrography is characterized by only slight variations of temperature (2.54-2.63° C) and salinity (34.9 PSU). Vertically, the gradients of temperature, salinity and current velocity decrease with decreasing distance to the bottom whereas particle concentration increases. The seafloor shows many „footprints" of biological activity.

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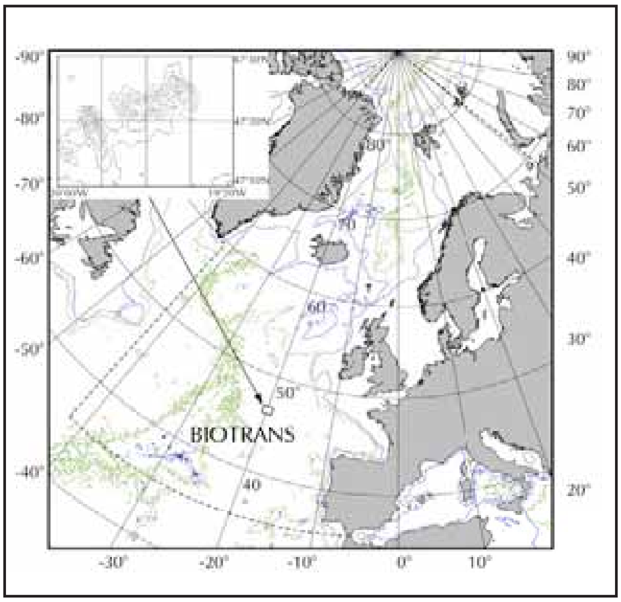

Fig. 1: The BIOTRANS research area. A deep sea abyssal plain in the West European Basin.

Benthic boundary layer

The near-bottom water layer is enriched with suspended matter („marine snow") up to 1000 m above the seafloor in the plains, caused by the topographically influenced bottom flow resuspending the very fine material, and sometimes significantly enhanced by aperiodic, so-called „benthic storms". Here, organic material is accumulating as well which seasonally sediments out from the photic zone, finally forming layers or aggregations of phytodetritus on the seafloor. This material is in turn the major food source for the organisms living above, on and in the sediment. Short- and medium-term reactions to pulses of organic material were observed in the benthos and bacteria. In other words, the seasonal pulses of organic matter drive the deep-sea ecosystem.

The fauna of the benthic boundary layer

The deep sea floor is known to support a remarkable faunal biodiversity. At a global scale, deep sea sediments have been estimated to contain between 500,000 and 10 million species of macrobenthos alone. A single square meter of sediment may accomodate 250 species of macro- and meiobenthic invertebrates. Polychaetes, nematodes and copepods are the most abundant groups within the meio- and macrofauna at the usually soft-bottomed BIOTRANS site. Occasional stones and pebbles give substrate to sea anemonies and sea pens which are the most commonly found members of the megafauna, the larger animals living on the sediment. Sponges, sea cucumbers and crinoids also frequently appear on bottom photographs, whereas crustaceans, gastropods, cephalopods, sipunculids and madreporarians only occur in low numbers. The density of the larger animals living on the sediment, the megafauna, amounts to 2.5 per m^2.

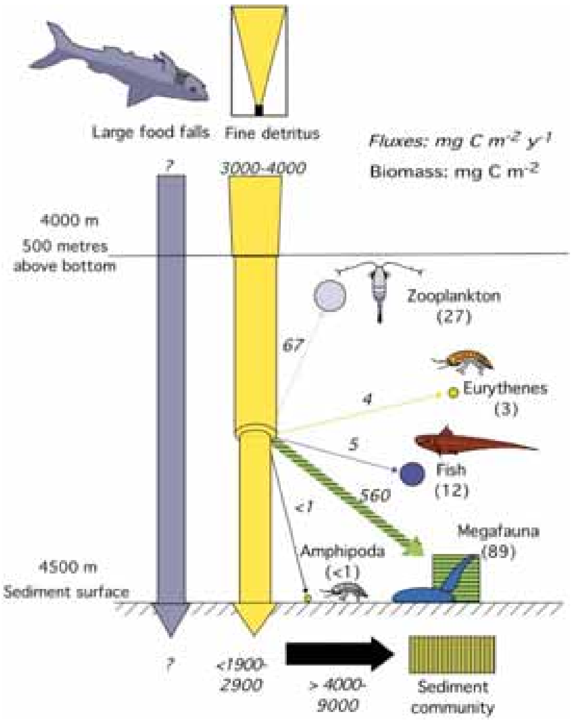

Fig. 2: Carbon flux in the deep sea benthic boundary layer. Episodic large food falls and sedimentation events directly reach the seafloor. Courtesy of B. Christiansen, GEOMAR Kiel.

The benthopelagic community which lives in the water column, but is associated to the seafloor, consists of a wide variety of zooplankton and nekton species, including large scavenging amphipods and fishes. Apart from planktic bacteria, zooplankton accounts for more than 60 % of the total benthopelagic biomass at the BIOTRANS site, whereas fish species contribute 31 % and amphipods 2 %. The fish fauna at BIOTRANS is dominated by several species of rattails, only deep sea eels also occurring in significant numbers. They are generalist feeders with a very low metabolism. Little is known about their reproduction patterns, generation times and longevity. This composition of the megafaunal and benthopelagic communities is site-specific and probably depends on the surface production pattern. At the BIOTRANS site, a fine rain of detritus seems to support a comparatively large biomass of suspension feeding megabenthos and zooplankton, whereas in other deep-sea areas, a more or less regularly occurring input of large food falls, e.g. in the form of dead cephalopods, sustains high abundance of scavenging fish and amphipods.

Threats

At present, no immediate threats are evident. The site is in an (almost) natural state, irrespective of the remainders of ship traffic on the surface. However, options for disposal of wastes of several kind in the deep sea are discussed.

Management Issues

This area should be set aside as a Marine Protected Area (MPA) for research purposes. With regard to the recent developments in climate research, long term datasets from the deep sea are precious reference points for undisturbed natural variability of the ecosystem, particularly in the light of observed long-term faunal changes in the deep sea.

Legal aspects

The BIOTRANS site is located in the OSPAR Maritime Area in international waters - in the „High Sea" according to the UN Convention on the Law of the Sea (UNCLOS). Special provisions apply to the seabed beyond the continental margin, „the Area". The Area and its resources are declared to be the „Common Heritage of Mankind". Contracting parties to UNCLOS have the general obligation to „protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life" (Article 194(5)). It may adopt appropriate rules, regulations and procedures for, *inter alia*., the protection and conservation of the natural resources of the Area and the prevention of damage to flora and fauna of the marine environment. Furthermore, the Convention on Biological Diversity obliges its Contracting Parties to conserve and sustainably use biodiversity by *inter alia* creating protected areas (Article 8(a)). This obligation is reflected by Annex V of the OSPAR Convention. However, no legal regulations exist for the establishment and implementation of Marine Protected Areas (MPAs) in „the Area". So far, the mandate of the International Seabed Authority (ISA) is limited to environmental protection in the context of exploitation of mineral resources, having developed a mining code for manganese nodules and being in the state of developing similar codes for the exploitation of polymetallic sulphides and cobalt crusts (by 2001), and further envisaging regulations on genetic resources and gas hydrates to be in place at a later stage.

Action required

Legal regulations for the establishment and implementation of marine protected areas in „the Area" are required. This should be part of the Law of the Sea, hence it is a matter of the United Nations. In order to raise this at the UN General Assembly in the framework of its debate on „Oceans and the Law of the Sea", OSPAR should formally support Contracting Parties to put the issue of MPA s in „the Area" onto the UN agenda.

Text prepared by Sabine Christiansen

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Fig. 3: Deep-sea abyssal plain at the BIOTRANS site. Anemonies and „footprints" of life. Photograph by B. Christiansen

WWF

briefing

Logatchev - A Potential MPA

Location

The Logatchev vent area consists of two distinct hydrothermal vent fields. Logatchev-1 is located at 14°45’N 44°58’W and Logatchev-2 at 14°43.22’N, 44°56.27’W. It is the southernmost hydrothermal vent field on the Mid-Atlantic Ridge (MAR) known today.

Potential Reasons for Selection

Logatchev is the largest known vent area on the MAR encompassing about 200 000 m^2 as observed so far. It hosts the highest diversity of species and biotopes known from the MAR. The high diversity of biotopes presents a unique opportunity to understand how the structure and composition of hydrothermal hot vent communities is controlled by their geological settings. Located approximately 1000 km from the next known vent field (Snake Pit), Logatchev to date is the most isolated vent field on the ridge. As the faunal exchange between the vents decreases with distance, the fauna found at Logatchev might differ considerably from the others and have a high degree of endemism.

Site Description

The Logatchev vent area is located on an uplifted rock at the eastern slope of the rift valley, an unusually shallow location. In contrast to many other known vent fields, it is not based on basalt but ultramafic rocks with a high methane content in the fluids. The Logatchev-1 field consists of three distinct sites, a large sulphide mound with smoking craters, an active chimney complex known as Irina-2 and a diffuse flow through soft sediment called Anya’s garden. Within these areas, highly variable biotopes are found, including black smokers, smoking craters, diffuse flow areas, bacterial mats, mussel beds and sedimented areas. Two different types of smokers occur, the more common vertically flowing ones, and the so-called creeping smokers that spread horizontally. Logatchev-2 consists of six sulphide mounds within a field of about 550 times 200 m. There are extensive massive sulphide deposits in the area containing an unprecedented high concentration of copper, zinc, gold and with an anomalously high uranium level. The cobalt concentration is also higher than in other hydrothermal vent fields. Further hydrothermal activities have been recorded north-east and south of the Logatchev-1 field but nothing is known yet about them except that they are showing a high concentration of commercially valuable minerals as well.

The Logatchev vent field - a Showcase Example for a High Seas Network of Marine Protected Areas

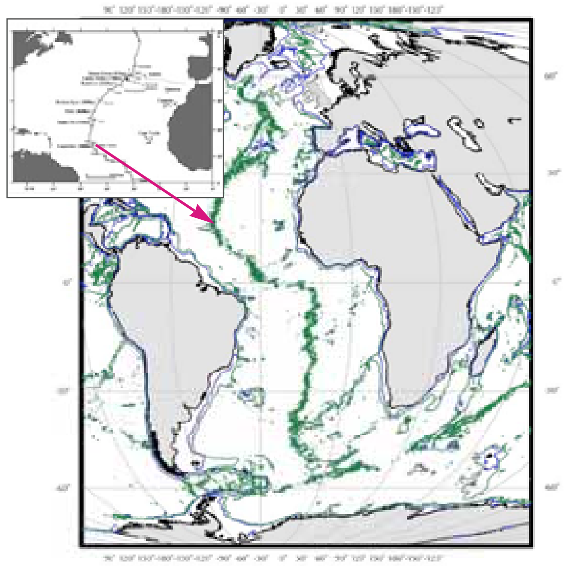

Fig. 1: Location of the Logatchev hydrothermal vent field on the Mid-Atlantic Ridge (MAR). The inserted map depicts the eight active hydrothermal vent fields known to date on the MAR between the equator and the Azores Archipelago. The major transform faults are also drawn on the map (from Desbruyères et al. 2000).

Biological Features

With an estimated number of 50 species from several different taxa including sea anemones, crabs, mussels and starfish, Logatchev hosts the highest species diversity known in the region at present. It is likely that it also has the highest biomass, as estimates for mussels alone are significantly higher than in other vent fields. As in other vent fields, mussels from the genus *Bathymodiolus* are quite abundant, yet the represented species differs significantly from other sites. Several taxa have been found which are new to the region, including vesicomyid and thyasirid bivalves and cerithiacean gastropods. The vesicomyid clam population is the first living clam population that has been recorded from the MAR and is of special scientific interest. At the Logatchev-2 field, no modern hydrothermal activity has been observed so far and thus no living associated fauna. However, the subfossil

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valves of two bivalve species of the family *Vesicomyidae* found are new records for hydrothermal vents and give further insight into the biogeography and composition of the Atlantic hot vent fauna.

Fig. 2: Population of vesicomyid clams in Anya´s Garden. Also seen on the photograph are the mussels *Bathymodiolus sp. aff. puteoserpentis*, ophiuorids *Ophioctenella acies*, galatheid crab *Munidopsis* sp. and unidentified fish (in: Gebruk *et al*. 2000)

Threats

The Logatchev hydrothermal vent area has been visited by several expeditions since its discovery in 1994 and a further one is planned for 2003. Research activities can adversely affect vent systems e.g. by sampling when not managed and monitored adequately. The area's extensive massive sulphide deposits with their high copper and uranite concentration and its high species and biotope diversity makes the Logatchev area especially susceptible to harm from prospective mining activities and bioprospecting. In case of mining, an increased level of radioactivity might be released due to the high uranite content in the massive sulphides. The effect of radioactivity to deep-sea ecosystems is totally unknown. Screening for valuable massive sulphides has already taken place in the area and sites close to the vent field have been declared as being promising for massive sulphides. Bioprospecting, while not necessarily harmful, needs to be managed carefully to ensure that sampling techniques are not damaging.

Legal aspects

The Logatchev vent field is located on the High Seas, in the "Area", and therefore falls within the jurisdiction of the International Seabed Authority (ISBA), a body established under the UN Convention on the Law Of the Sea (UNCLOS, 1982). The "Area" and its resources have been designated as the "common heritage of mankind"[sic]. Pursuant to UNCLOS, all rights to the resources are vested in mankind [sic] as a whole, on whose behalf the ISBA shall act. In accordance with the terms of UNCLOS and other provisions of international law, States are under an obligation to *„protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life*". To give effect to this binding commitment to protect and preserve the marine environment, the ISBA is required to adopt and implement measures for the protection and preservation of the marine environment in the Area. The ISBA is currently developing regulations for future mining of massive sulphides and cobalt crusts in the Area, including provisions to control and reduce the environmental impact of these activities. These regulations could include provisions to designate particular areas as sensitive no-mining areas, as well as establishing procedures for designation of further sites as they are identified in the future.

Moreover, the World Summit on Sustainable Development (WSSD, 2002) called for action to maintain the productivity and biodiversity of important and vulnerable marine areas both within and beyond national jurisdiction. It urged nations to make significant progress within a concrete time frame, calling for adoption of the ecosystem approach by 2010 and the establishment of representative networks of MPAs by 2012. The resolution of the UN General Assembly A/57/L.48 (2002) endorses the Plan of Implementation adopted at WSSD and further calls for urgent and coordinated action to protect vulnerable benthic habitats.

Action required

In order to facilitate a spatial and temporal separation of incompatible activities, and to minimise potentially unsustainable human disturbance it is proposed to designate the Logatchev vent field as no-mining site. As a first step, the need for effective implementation of conservation measures in certain areas of the High Seas and the Area should be acknowledged. 2 -Pilot case studies, for example on the case of Logatchev, should be instrumental to developing management schemes, identifying stakeholders, responsibilities, cooperation and coordination and enforcement. 3 - A framework agreement, e.g. on a regional basis, will secure the international commitment and buy-in prior to developing 4 - the hard law.

Text prepared by Stefanie Schmidt, Sabine Christiansen, Andrey Gebruk, Kristina Gjerde, David Leary, and updated with comments from Colin Devey (2003)

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The Josefine Bank - A Potential MPA

briefing

Location

The Josefine Bank is located at 36° 35’ N, 14° 15’ W in international waters, between the Exclusive Economic Zones of continental Portugal and Madeira (Portugal).

Potential Reasons for Selection

The Josefine Bank is a seamount in international waters that is not isolated but relatively close to the continental shelf and connected to other seamounts by its topography and location in the reach of Mediterranean outflow of water. Due to its patchwork of various hard and soft substrates, it probably serves as a stepping stone for the dispersal, via pelagic larvae, of a wide variety of benthic species from similar habitats on the continental shelf and other seamounts. The area is also important for fish species that live around topographic elevations including several commercially valuable species.

Seamounts

Seamounts are undersea mountains of volcanic origin, either isolated or as part of a chain of elevations, rising steeply at least 1000 m from the surrounding flat abyssal plain. Due to their size and shape, seamounts have complex effects on oceanic circulation, often leading to upwelling. This provides ample nutrients for the enhancement of primary and, depending on the retention time, higher trophic production compared to the surrounding waters. The most striking biological feature of seamounts is their richness in hard bottom suspension feeders which benefit from the enhanced currents transporting rich planktonic life: corals can be particularly abundant. with horny, stony and black corals being recorded where the currents are strongest, such as on vertical walls and on crests of seamounts with wide peaks. Further, sponges, hydroids, ascidians as well as crinoids, holothurians, shrimps a.o. occur and provide ample food and diverse habitats for fishes and other nekton to grow. Owing to this wealth, the density of large predatory fish near oceanic seamounts including swordfish, tuna, sharks and rays can be quite high, and aggregations of some otherwise dispersed species such as orange roughy (*Hoplostethus atlanticus)* often occur. Seamounts function as a stepping stone to transoceanic dispersal of species, and their degree of isolation is reflected in their richness in endemic species. The hard substrates on the tops and flanks of seamounts are made up of ancient hydrothermal precipitates, the so-called cobalt-rich ferromanganese crusts, rich in precious minerals such as cobalt, titanium, cerium, platinum, as well as manganese, copper and nickel.

The Josefine Bank - a Showcase Example for the OSPAR System of Marine Protected Areas

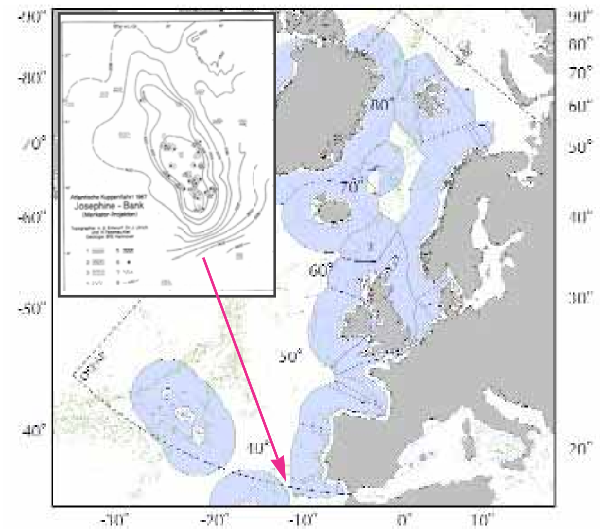

Fig. 1: Location of the Josefine Bank (detailed map indicates geological formations, from Closs et. al. 1969)

Site Description*

The Josefine Bank is the westernmost extension of the east-west trending Horseshoe Seamount chain that also includes the Ormonds and Gorringe Banks. It rises from 2000-3700 m depth to within 170 m below the surface. The summit is almost flat with an area of 150 km² within the 400 m isobath. Towards the south, the seamount has very steep slopes down to depths between but to the NNW, the seamount extends into a northwards ridge. The summit is swept by currents, with finer sediments possibly frequently being reorganised, while biogenic and gravelly sand, limestone and basaltic rock characterise the substrates of the plateau and slopes. Water temperatures of 13-14° C and elevated salinity indicate the influence of Mediterranean outflow.

*** The Josefine Bank was subject to multidisciplinary investigations during the „Atlantische Kuppenfahrten“ by R. V. Meteor in 1967. The knowledge gained with regard to the distribution of various taxa provides the background for this site description.**

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Biological Features of Josefine Bank

The species-rich fauna of Josefine Bank is typical for east Atlantic islands and possibly other offshore banks and seamounts. The particularly well investigated summit region offers a wide variety of substrates which are readily populated by sometimes high densities of mostly sessile suspension feeding species. 16 species of horny and black corals, 13 species of stony corals, but no pennatulids and neither shelf nor deep sea benthic species have been recorded. The gorgonian coral *Ellisella flagellum* was found to be very common on both the Josefine and Great Meteor Seamounts but morphologically different between these sites which points to some degree of isolation. Dense beds of another gorgonian, *Callogorgia verticillata,* coincide with large sponges on the top of Josefine, quite different from other seamounts (Fig. 2). Sandy substrates are inhabited by the ascidian *Seriocarpa rhizoides*. The meroplanktic larvae of most of the 18 benthic decapod species do not occur over deep water and show few similarities to the shelf. Holozooplankton and euphausid populations are of oceanic origin, their densities modified by the bank. 26 species of benthopelagic fish have been determined from non-commercial trawls along the slopes and summit of Josefine, among these commercial species such as a long-lived rockfish (*Helicolenus dactylopterus),* the splendid perch (*Callanthias ruber*), a gamefish, and the longspine snipefish which is caught for aquaria.

Fig. 2: Dense beds of horny corals, mostly *Callogorgia verticillata* on the top of Josefine Bank. (by A.L. Rice, in Gage & Tyler 1991)

Threats

The presence of commercially valuable species of deep-sea fish in this area (e.g. *Helicolenus dactylopterus*) implies that this area may have been targeted by commercial fisheries in recent years. It is unknown whether such fishing activities will have damaged the seamount ecosystem and this depends on the intensity of fishing and the type of fishing gear deployed. However, corals in general are long-lived and very vulnerable to physical impact. It is not known whether the black coral (*Anthipathes dichotoma*), a precious coral with very low resilience, is commercially harvested. A current-swept seamount such as Josefine, with exposed volcanic rocks may one day also be targeted for mining of its mineral-rich crust.

Management Considerations

The "freedom of the high seas" guaranteed by the UN Convention on the Law of the Sea (UNCLOS) has led to unregulated exploitation of the living resources which were thought to be shared by all nations. In the North-East Atlantic, despite advice from the International Council for the Exploration of the Sea (ICES) to the European Commisson and the North-East Atlantic Fisheries Council (NEAFC) to agree on a moratorium for deep water fishing until there is a scientific basis for stock assessments, both fora failed to implement adequate management measures. Lack of knowledge is typical for offshore features in general, and for possible alterations of the natural state at seamounts within reach of fisheries in particular. Here, the precautionary approach has to be applied in order to minimise and control future human impacts.

Legal Aspects

Josefine Bank is located in the High Seas sector of the OSPAR Maritime Area and no conservation measures have yet been applied outside national jurisdiction. However, the World Summit on Sustainable Development (WSSD) in 2002 called for action to maintain the productivity and biodiversity of important and vulnerable marine areas both within and beyond national jurisdiction. It urged nations to make significant progress within a concrete time frame, calling for adoption of the ecosystem approach by 2010 and the establishment of representative networks of MPAs by 2012. The resolution of the UN General Assembly A/57/L.48 endorses the Plan of Implementation adopted at WSSD and further calls for urgent and coordinated action to protect seamounts and other vulnerable benthic habitats.

Action Required

OSPAR is the regional seas agreement under which the commitment to implement a representative network of MPAs by 2010, including the High Seas, has been adopted. OSPAR has the opportunity to lead the global endeavours to protect vulnerable seamounts. The rapid increase in fishing pressure in the High Seas further emphasizes the need to get actively involved in developing measures to achieve enduring and sustainable conservation of seamounts and related features in the OSPAR Maritime Area.

Text prepared by Sabine Christiansen

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briefing

Rainbow - A Potential MPA

Location

The Rainbow hydrothermal vent field is located at 36°13.8'N, southwest of the Azores on the Azorean segment of the Mid-Atlantic Ridge (MAR) at 2270-2320 m depth in international waters.

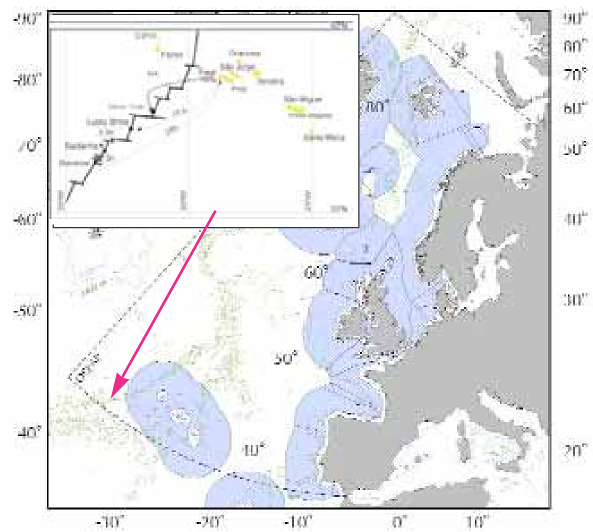

Fig. 1: Location of the Rainbow vent field on the Mid Atlantic Ridge, to the southwest of the Azores in international waters. The detailed map shows the location of the vent fields and distances in cruising hours to Horta, Faial, Azores .

Potential Reasons for Selection

Hydrothermal vents are sensitive ecosystems and limited in their spatial extent. The location of the relatively shallow Rainbow hot vent field close to the Azores makes it rather easily accessible, just as the Saldanha (a warm methane vent field) and the Famous (cold) vent fields nearby.

Since its discovery in 1997, Rainbow has been the frequent focus of scientific expeditions and is the only vent field on the Mid-Atlantic ridge that has been visited by tourist operators already several times. Different types of investigations such as long-term monitoring activities, manipulative experiments and geological sampling interfere with each other and with other activities like tourism and mining. As little is known about the ecosystem structure, the impact of such human interferences is unpredictable. The designation of the Rainbow hydrothermal vent field as a marine protected area under OSPAR and the resulting coordination and management of activities would facilitate a spatial and temporal separation of incompatible activities and prevent unsustainable damage to the unusual and unique ecosystem the vent field supports

Rainbow vent field - a Showcase Example for the OSPAR System of Marine Protected Areas

Hydrothermal vents of the Mid Atlantic Ridge

Both community composition and structure of deep-sea hydrothermal vents are affected by linking and isolating mechanisms between vent fields, by local conditions (chemistry and particle content of fluids and substratum patterns), and temporal variation in venting, which induces a complex dynamic of extinction and colonisation. In the MAR, a combination of source rock, depth, alteration of fluid composition and stability seem to be the determinants for the species compositon. The fraction of species endemic to hydrothermal vents increases with depth. The lower toxicicity of the venting fluids at shallower vent fields allows the mobile deep sea fauna from the surrounding abyssal plain to penetrate and use the accumulated biomass. The vent fields of the MAR can be divided into the shallow northern and the southern abyssal vent fields (Fig. 1). Their differences in geological origin and depth-related variations in the nature of the venting systems are reflected by the benthopelagic and planktonic communities. Two mussel species of the genus *Bathymodiolus* show the same differentiation between northern and southern species with a potentially intermediate form in the middle part of the vent fields.

Site Description

The Rainbow vent field comprises more than 30 groups of active small sulphide chimneys over an area of 15 km^2. There are numerous inactive structures among a large number of rather short-lived active venting sites. Together with the vent fields of Lucky Strike and Menez Gwen it forms the group of the northern bathyal vent fields. Rainbow is based on ultramafic rocks, with the acid vent fluids having a particularly low organic but high inorganic content of methane, sulphur, calcium, iron and copper. Bursts of venting fluid cause temperatures to vary between 3-6° C in the mussel beds and 11-13° C in the shrimps environment.

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Biological Features

About 32 different species have been recorded in the Rainbow area so far including several ones new to the MAR like the zoarcid fish species *Pachycara sp*. Due to the environmental conditions, the species community differs considerably between Rainbow and the two other shallower fields Lucky Strike and Menez Gwen in the Azorean Exclusive Economic Zone (EEZ). Similarities to the southern vent fields, namely TAG and Broken Spur are evident from the occurrence of the brisiliid shrimp *Rimicaris exoculata* prevailing over mussels at the chimneys. Mussels of the species *Bathymodiolus azoricus* and *B. seepensis* dominate the community on surrounding blocks within the active area. Several other species like *Mirocaris fortunata* and *Amatys lutzi* are found in addition.

Fig. 2: *Rimicaris exoculata* aggregation at one of the Rainbow vents. Photograph courtesy of © ATOS/Ifremer

Threats

The small spatial extent and site-specific communities make vent fields highly vulnerable to the increasing levels of scientific and commercial exploitation. Immediate concern is arising from the direct effects of sampling (substrate and specimens), the related risk of unintended species transfer between vents within a field, as well as impacts caused by movement of vehicles and litter. The Rainbow vent field is part of a larger study area to the southwest of the Azores (MOMAR) which is designated for long-term monitoring of biological and geological evolution. Uncoordinated activities are likely to counteract these long-term studies. As the two adjacent vent fields Lucky Strike and Menez Gwen will be managed as marine protected areas by the Regional Government of the Azores, human activities might shift to Rainbow in response and commercial interests in bioprospecting and mineral mining increase the pressure.

Legal Aspects

The Rainbow vent field is located in the High Seas sector of the OSPAR Maritime Area. The regional delivery mechanism for the Convention on Biological Diversity (CBD) is based on Annex V to the OSPAR Convention. Even though conservation measures have never been applied to sites in international waters the 15 Contracting Parties to OSPAR committed themselves to establish an ecologically coherent network of MPAs in the OSPAR Maritime Area by 2010, including the High Seas. The World Summit on Sustainable Development (WSSD) in 2002 encouraged nations to establish representative networks of MPAs by 2012 and to take action at the regional and global level to halt the loss of marine biodiversity. Furthermore, under the United Nations Convention on the Law of the Sea (UNCLOS), all states have the responsibility to '*protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life in the marine environment*'. Also, the International Seabed Authority (ISA) established under UNCLOS, is currently developing regulations for future mining activities in the Area, including provisions to prevent harm to sensitive and important ecosystems such as hydrothermal vents from seabed mining for polymetallic sulphides. Under Article 162(2)(x), the Council of the ISA has a duty to disapprove areas for exploitation in cases where '*substantial evidence indicates the risk of serious harm to the marine environment*'. Hydrothermal vents figure on the OSPAR priority list of habitats and species and are considered to be of special concern all over the OSPAR Maritime Area. The distinctiveness of the vent fields in the OSPAR area from those further south on the MAR re-emphasises the responsibility of the OSPAR Commission to develop measures for enduring and sustainable conservation and use of the vent fields in its remit.

Action Required

In order to facilitate a spatial and temporal separation of incompatible activities, and to minimise potentially unsustainable human disturbance to these rare and sensitive ecosystems, it is proposed that OSPAR designates the Rainbow vent field (in conjunction with Saldanha and Famous) as an obligatory part of the OSPAR Convention´s system of marine protected areas. As a first step, a voluntary agreement is proposed, setting the terms of reference for the development of a management plan to be implemented by all Contracting Parties to OSPAR. As a second step, OSPAR may seek global implementation under UNCLOS.

Text prepared by Sabine Christiansen and Kristina Gjerde

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Rockall Bank - A Potential MPA

briefing

Location

The Rockall Bank extends in SE-NW direction between 55-58.30° N and 18-13° W (1000 m isobath). Its eastern slopes are within the UK offshore limits of jurisdiction and/or EEZ of Ireland, the western part lies in international waters, however claimed by the UK and/or Ireland with regard to the continental shelf.

Potential Reasons for Selection

Despite the patchiness of data, the Rockall Bank is probably the best known offshore bank rising from the deep-sea in the north Atlantic. It represents a continuum of ecosystems from typical deep sea environments in the Rockall Trough and Hatton-Rockall Basin to the shallow and shelf-type upper plateau conditions. It is of great significance in the North-East Atlantic region due to its extensive coral-associated communities from 150-1000 m depth which support rich biological resources in terms of fish populations. Probably, decades of trawling have already caused substantial damage to the *Lophelia pertusa* colonies, thickets and possibly reefs, as well as to the soft sediment of the slope regions. Oil and gas exploration has been licensed on its eastern margins.

Offshore Banks

Underwater elevations from the seafloor with extended summit regions are called banks, in comparison to small topped seamounts. However, as both features modify the oceanographic conditions in a similar way, they are often considered together as '*seamounts and related underwater features*'. Ocean currents are enhanced at offshore banks, amplifying the overall food web production. In current-swept regions, sessile suspension feeder communities may predominate and form habitats such as cold water corals and deep-water sponges. These may form essential fish habitat, e.g. by providing spawning grounds and refuges.

Rockall Bank - a Showcase Example for the OSPAR System of Marine Protected Areas

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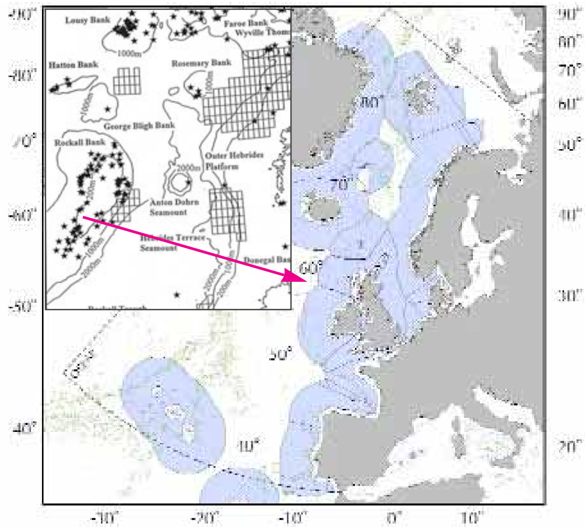

Fig. 1: Location of the Rockall Bank in UK, Irish and international waters. The detailed map shows the tranches licenced for oil and gas exploration up to 1998 and sampling positions of *Lophelia pertusa* (from: Rogers 1999).

Deep-Water Fishing

The fishery around Rockall dates back about two centuries. It first targeted cod, haddock and halibut on the shallower parts of the bank. In the 1970s, Russian, German and French trawlers started exploiting blue ling, roundnose grenadier, black scabbardfish and deep-water sharks. Since the UK relinquished its claim to a 200 nm fishery zone around Rockall, an international fishery has developed both on the top of the bank and the deeper water. The unregulated fishery for haddock in the shallower water is currently a concern. The more recent deep-water fisheries concentrate on the slopes of the continental shelf as well as comparable banks and seamounts. They mainly target anglerfish on the upper slope (trawl, gillnet), roundnose grenadier and blue ling with black scabbardfish and deep-water shark by-catch on the mid slope (bottom trawl), and orange roughy on the lower slope. At depths greater than 1500 m, the fish biomass declines and the species caught have little or no commercial value. Demersal trawling is considered to cause the highest damage to benthic habitats and fish populations due to its physical impact and unselectivity. Longlining is more selective, but discard rates for both gears often exceed 50 % of the catch, most of it being true deep-sea fishes like grenadiers, smoothheads and sharks. The rapid expansion of deep-water fisheries by far exceeds the advance in knowledge on fish biology, stock structures and the ecosystem. Adaptation to the deep-sea environment has produced life history traits such as increased longevity, slow growth rates and high age at sexual maturity, and low reproduction. This led Merrett & Haedrich (1997) to consider deep-sea fish to be a non-renewable resource.

Site Description

The Rockall Bank is a very large feature, oriented SW-NE and rising from more than 1000 m depth to break the surface towards the NE (Rockall). The shallow part of the bank is about 150 km long and max. 60 km wide at depths ranging from 220 m to 65 m. The substrate changes gradually, from low rock ridges and boulder fields covered in coarse sand to a cover of fine sand. While the near-bottom currents appear to circulate clockwise, the surface currents circulate in an anti-clockwise direction. The resulting gyre produces upwelling conditions for a rich planktonic life.

Fig. 2: Neither coral-associated communities and food webs nor their role in the oceanic ecosystems are understood yet - nonetheless exploitation increases. © André Freiwald, University of Erlangen

Biological Features

Surveys on the flanks of the Rockall Bank and along the UK continental margin have revealed cold-water coral communities down to 1000 m depth consisting of *Lophelia pertusa, Madrepora oculata*, coral debris and an associated community. Coral colonies and thickets are scattered around the shallower parts of the bank from 150-400 m depth whereas large reef structures are found below 500 m on the eastern flank. These reefs partly form mounds up to 350 m high. The fauna of the sampled mounds consists of sponges, hydroids, bryozoans, ascidians, including the coral *Desmophyllum dianthus* and the hydroid *Stylaster sp*. Polychaetes such as *Eunice norvegicus,* the common inarticulate brachiopod *Crania anomala* and molluscs including *Arca sp., Acesta excavata, Heteronomia squamula, Epitonium clathratus* have been found as well. Between 400 m and abyssal depths, there is a diverse demersal fish fauna (>130 species). At any given depth down to 1500 m, a research trawl will yield between 40 -50 species of fish. Further below, the number rapidly declines.

Threats

The Rockall Bank has been targeted by trawlers for cod, hake and blue whiting for many years, and for deep-water fish more recently. Hence, *Lophelia pertusa* on the shallower parts of the bank is almost certainly impacted. Whether or not the deeper reefs have been significantly impacted is still uncertain. It is known, however, that the UK continental margin to the east of the Rockall Bank shows trawl scars from as early as 1988. The exploitation of hydrocarbon resources remains an unquantified threat.

Management Considerations

The establishment of an MPA at Rockall Bank will be most beneficial to the benthic habitats and species, and to a lesser extent to target and non-target fish species. Since 1998, ICES ACFM has been pointing to the fact that deep-water stocks including anglerfish, are being exploited '*outside safe biological limits*'. Information on age distribution and stock identification is inadequate and more reliable assessments need to be carried out. Landings data are not always at species level and there are concerns about the accuracy and location of the landings. In 2002, the EC has stopped short of implementing a moratorium on these fisheries but instead, from January 2003, begun the process of regulation by introducing quotas and various methods of reducing the fishing effort. In international waters, the Contracting Parties to the North-East Atlantic Fisheries Commission (NEAFC) agreed to freeze fishing effort at current levels from January 2003.

Legal Aspects

The "freedom of the high seas" guaranteed by the UN Convention on the Law of the Sea (UNCLOS) has led to unregulated exploitation of the living resources which were thought to be shared by all nations. However, as recognised at the World Summit on Sustainable Development (WSSD) and endorsed by the UN General Assembly in its resolution A/57/L.48 in 2002, it is time for nations to take action to „*develop ... programmes for halting the loss of marine biodiversity, in particular fragile ecosystems*" through „*tools including ... the elimination of destructive fishing practices, the establishment of MPAs ...*".

Action Required

Gordon (2001a) concluded that „*there is general agreement amongst scientists, the fishing industry and the politicians that the deep-water stocks are seriously overexploited but political imperatives dictate that uncertainties and inconsistencies in the scientific assessment and advice are used to postpone the urgent action that is required*". OSPAR has to take responsibility for the preservation of the species and habitats in the North-East Atlantic by *inter alia* advocating a management of human activities including deep-water fisheries which helps conserve, and where necessary, restore ecosystems and biological diversity.

Text prepared by Sabine Christiansen and John Gordon

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Conservation in areas beyond national jurisdiction - the role of regional seas organisations

briefing

At the OSPAR Commission Meeting in Malahide, Ireland (June 2005), WWF invited delegates to attend an expert panel session addressing options for conservation measures in areas beyond national jurisdiction in the OSPAR Maritime Area; and the development of international co-operation to discuss the aspects of establishing Marine Protected Areas on the High Seas. This side event was chaired by Dr Sian Pullen, Head of WWF's European Marine Programme.

Background: Following up on the commitments given at the World Summit on Sustainable Development (WSSD) in Johannesburg 2002, the Environment Ministers of OSPAR Contracting Parties agreed in Bremen in June 2003 to establish, by 2010, an ecologically coherent network of well-managed Marine Protected Areas (OSPAR Recommendation 2003/3 on a Network of Marine Protected Areas MPAs), including in areas beyond national jurisdiction. A large portion (appr. 60%) of the OSPAR Maritime Area is beyond national jurisdiction according to the provisions of the UN Law of the Sea (UNCLOS), being located either beyond the Exclusive Economic Zones' or claimed continental shelf's delimitations. In 2005, WWF prepared the first ever comprehensive proposal for a marine protected area in areas beyond national jurisdiction within the OSPAR Maritime Area (ICG-MPA 05/3/1 & MASH 05/5/11): the Rainbow Vent Field was proposed for nomination to the OSPAR network to provide a concrete example of a „High Seas MPA“ (HSMPA) for which to develop the necessary steps towards conservation action at regional and global level.

Expert Panel

Malahide, Ireland
28 June 2005

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The panel speakers introduced different aspects of conservation in areas beyond national jurisdiction:

Dr Alex Rogers, **Principal Investigator on biodiversity with the British Antarctic Survey**, highlighted important deep-water habitats, represented in areas beyond national jurisdiction, including

- abyssal plains, sedimentary environments which show a high diversity of small organisms;
- cold-water coral reefs, occurring on continental slopes, offshore banks and seamounts, probably associated with high surface production and strong bottom currents. In Europe, so far 1,300 species have been identified associated to cold-water corals;
- chemosynthetic environments such as hydrothermal vents, usually with a low species diversity (hundreds of species), but very high endemism rates;
- canyons, which ecologically connect the continental shelf to the deep sea, characterised by high abundances of *i.a.* fish and squid.and serve as feeding grounds for large marine mammals; and
- seamounts, which often provide hard substrate habitat to an associated fauna, like cold-water corals, otherwise rare in the deep sea. Biogeographically they can be stepping stones across ocean basins though neighbouring seamounts may also be very different. Still, many of the species are new to science.

Dr. Rogers also pointed out the importance of seamounts for commercially exploited deep-water fish stocks and the vulnerability of these stocks to exploitation, especially considering the "boom & bust"-example of the orange roughy fishery. He reported the widespread, devastating effect bottom trawling has on cold-water coral reefs: "In every set of observations of where bottom-trawling and deep-sea coral ecosystems coincide severe damage has been recorded.".

Dr. Rogers identified various threats to the deep-sea environment, such as mining, bioprospection and CO2-sequestration. Climate change may have a serious impact through changes in the quality of the phytoplankton supporting deep-sea life. He considered fishing to be the main threat to species and habitats dwelling in ocean areas.

Map of the OSPAR Maritime Area provided by Germany/BfN BDC 04/3/Info.2

Dr. Yoshifumi Tanaka, expert on international law at the National University of Ireland in Galway, highlighted that in the North-East Atlantic so far only three States, namely Iceland, Denmark and Ireland, claimed continental shelf areas beyond 200 nm in accordance with Article 76 (4) of the UNCLOS, and these claims largely overlap. In these areas, the question of coastal States' jurisdiction remained unresolved, and the seaward limits of the continental shelf beyond 200 nm were not yet determined. A distinction was made between the High Seas located within a potential Exclusive Economic Zone (EEZ) of a coastal state and those areas beyond 200 nm. Only within 200 nm a coastal state may exercise jurisdiction over the exploitation as well as conservation of marine living resources, including the establishment of HSMPAs - although the area remains within the High Seas as long as an EEZ has not been declared. Dr. Tanaka addressed the interrelationship between the conservation of marine biodiversity and the regulation of marine pollution. The OSPAR Convention could provide for the protection of MPAs from pollution from land-based sources, although not from other sources such as shipping. OSPAR constituted an interesting model for institutional inter-linkage between the conservation of marine biodiversity and the protection of the marine environment, as a global agreement dealing with pollution from land-based sources is not in place. He also emphasised the need for co-operation between the North-East Atlantic Fisheries Commission (NEAFC) and OSPAR to tackle the main threat to biodiversity in the North-East Atlantic.

Kristina Gjerde, International Maritime Law expert, Pew Fellow on marine conservation and High Seas Policy Advisor to IUCN, emphasised OSPAR's leadership in marine conservation. Despite a 1970 UN General Assembly Resolution pointing out that "*the problems of the ocean space are closely interrelated and need to be considered as a whole*", human activities in areas beyond national jurisdiction were currently regulated on a sectoral basis globally (shipping, mining) or internationally (fishing), if at all. The mandates of Regional Fisheries Management Organisations (RFMOs) did not usually go beyond the management of individual fish stocks.

Ms Gjerde regarded HSMPAs as a cornerstone of an integrated, precautionary and ecosystem-based management, providing the opportunity to secure protection from known threats and a higher level of protection against potential threats. While certain conventions (such as the Convention on Biological Diversity CBD, the UN Fish Stocks Agreement, the Convention on Migratory Species and CITES) would provide for the establishment of HSMPAs through general obligations and principles, others like the International Whaling Commission (IWC), the International Maritime Organisation (IMO) and the International Seabed Authority (ISA) provide for specific area designations. At the regional level, the Antarctic Treaty and the Barcelona Protocol had already been used to designate MPAs beyond national jurisdiction.

The recent example of the Titanic Memorial Site demonstrated that it was possible to come to new types of agreements using the existing tools. This should be done more effectively to progress towards conservation.

An MPA at the Rainbow Vent Field would enable coordinated management of marine scientific research, and integrated precautionary management of other human activities. Management through OSPAR could provide a useful example of regional co-operation on which other regions could build.

Dr. Charlotte Johnston, Marine Strategy and Sites Coordinator for UK's Joint Nature Conservation Committee, saw a clear remit of OSPAR to identify HSMPAs through the 2003 Ministerial Commitment to establish an ecologically coherent network of well managed MPAs by 2010. Criteria and guidelines for the management developed by BDC and MASH would serve as the basis. The main problems for the creation of HSMPAs were the need for an agreement by all Contracting Parties and the mixed competences for management of human activities (ISA for mining, IMO for shipping, NEAFC for fishing, etc.). Any agreement would only bind the respective Contracting Parties. Therefore, there was a need to extend the regulations to a global level and to address all activities.

Ms. Gjerde and Dr. Johnson saw three steps to promote HSMPA establishment in the North-East Atlantic:

1. support a time-out on destructive fishing practices within the Maritime Area until NEAFC has the legal mandate to regulate for biodiversity conservation purposes. Such a moratorium would be a first step towards implementation of the ecosystem approach to fisheries management
2. establish MPAs such as the Rainbow Vent Field where the information and willingness to cooperate exist.
3. promote the development of the UNCLOS framework that would install a common mandate for conservation and sustainable use of biodiversity in all sectoral bodies, and could provide enhanced capacity to effectively monitor and control activities on the High Seas, including in MPAs.

In the following **discussion** it was pointed out that OSPAR, unique in having a clear mandate, was playing a leadership role and was seen as an example by other countries and global regions. For the establishment of HSMPAs, the identification of pilot areas was considered an important first step, which could be followed by a Ministerial level meeting later on.

WWF documents to assist OSPAR and NEAFC in their efforts to promote and establish conservation measures in areas beyond national jurisdiction, e.g.

a. presenting candidate sites for designation as High Seas MPAs – e.g. Josefine Bank (seamount) see http://www.ngo.grida.no/wwfneap/Publication/briefings/Josefine.pdf

b. preparing a comprehensive nomination for the first potential OSPAR MPA in areas beyond national jurisdiction under the provisions and criteria of OSPAR Recommendation 2003/3 – Rainbow Vent Field see http://www.ngo.grida.no/wwfneap/Publication/Submissions/OSPAR2005/WWF_MASH05_Rainbow_annex..pdf

c. providing proposals and data evidence with regard to vulnerable deep-water habitats (coral reefs, seamounts) and scenarios for their protection from fishing impacts – see document BDC 05/05/03-E* Protection of cold-water coral reefs in the OSPAR Maritime Area- Review of progress and proposal for additional measures, including on Rockall and Hatton Bank: http://www.ngo.grida.no/wwfneap/Publication/briefings/Rockall_Hatton.pdf

d. providing scientific information about the occurrence of and/or threats to such habitats and related communities in the North-East Atlantic - see
http://www.ngo.grida.no/wwfneap/Projects/Reports/Seamount_Report.pdf
http://www.ngo.grida.no/wwfneap/Projects/Reports/Offshore.pdf

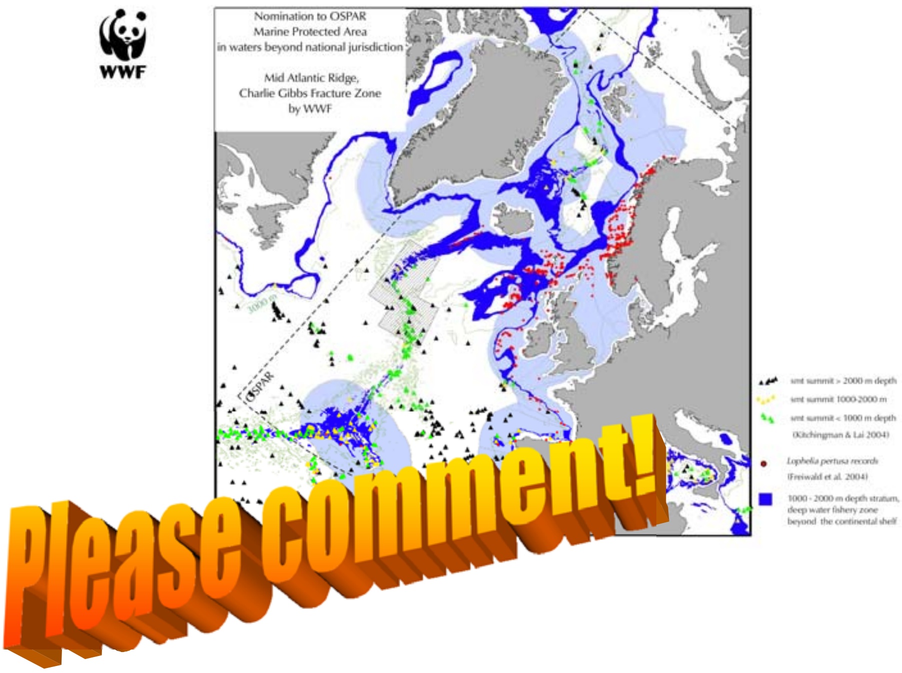
WWF proposal

for a

Marine Protected Area in areas beyond national jurisdiction

in the North East Atlantic

Section of the Mid Atlantic Ridge



any comment welcome – please send to:

Sabine Christiansen

christiansen@wwfneap.org

Proforma for compiling the characteristics of a potential MPA

A General information

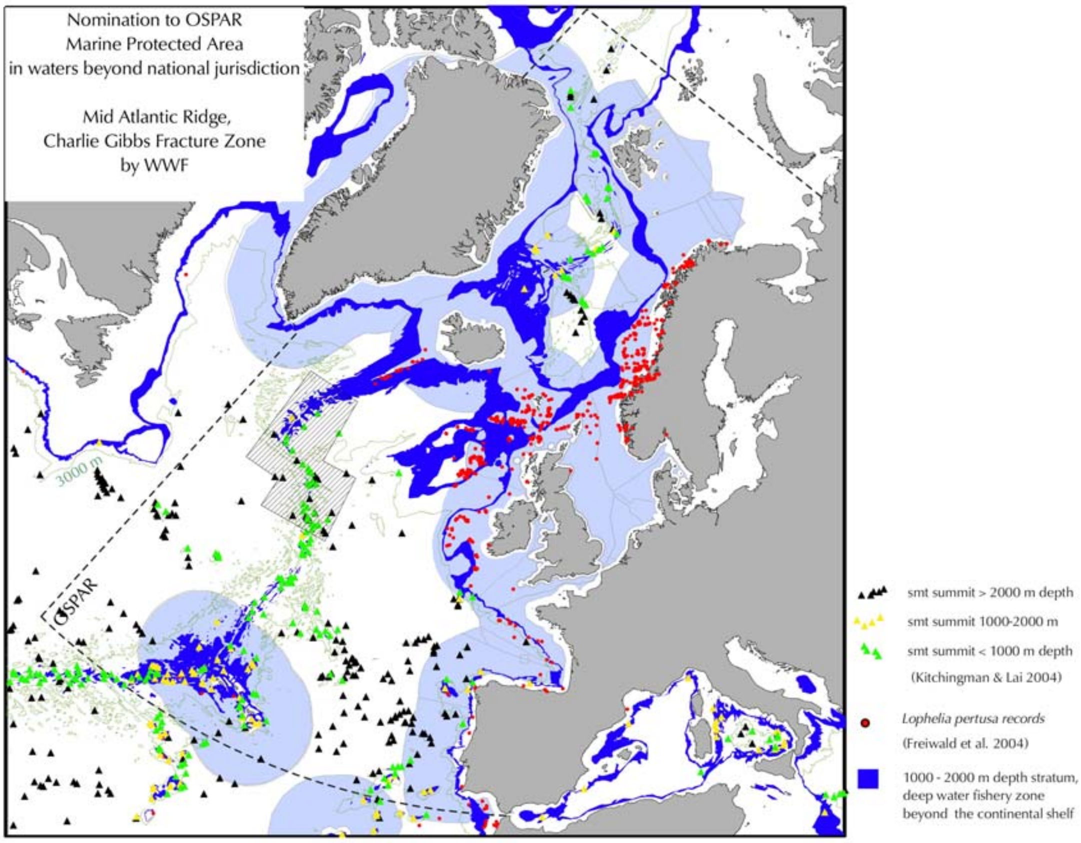


Fig. 1: Location in the OSPAR Maritime Area of the proposed MPA on the Mid-Atlantic Ridge

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1. Proposed name of MPA

Mid Atlantic Ridge/Charlie Gibbs Fracture Zone

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2. Aim of MPA

- Protect and conserve areas that best represent the range of species, habitats and ecological processes in the OSPAR area.
- Protect, conserve and restore species, habitats and ecological processes which are adversely affected as result of human activities;
- Prevent degradation of and damage to species, habitats and ecological processes following the precautionary principle.

3. Status of the location

The Mid Atlantic Ridge is located beyond the limits of national jurisdiction of the coastal States in the OSPAR Maritime Area and Canada. The site proposed is also outside the potential Outer Continental Shelf of Iceland and Greenland (acc. Part IV, Art. 76 UNCLOS).

According to Article 134 (2) UNCLOS, activities in the Area (sea-bed, ocean floor and subsoil thereof) shall be governed by the provisions of Part XI. According to Article 137 (2) UNCLOS "All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. The Minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority."

According to Article 86 *et seq*. UNCLOS the superjacent waters are considered as High Seas, which are open to all States, including the freedom of scientific research.

According to Article 238 UNCLOS all States have the right to conduct marine scientific research.

4. Marine region

OSPAR Region V, Mid Atlantic Ridge

5. Biogeographic region

Atlantic Realm; Atlantic Subregion, North Atlantic Province; South Iceland-Faroe Shelf, Cool-temperate Waters

6. Location

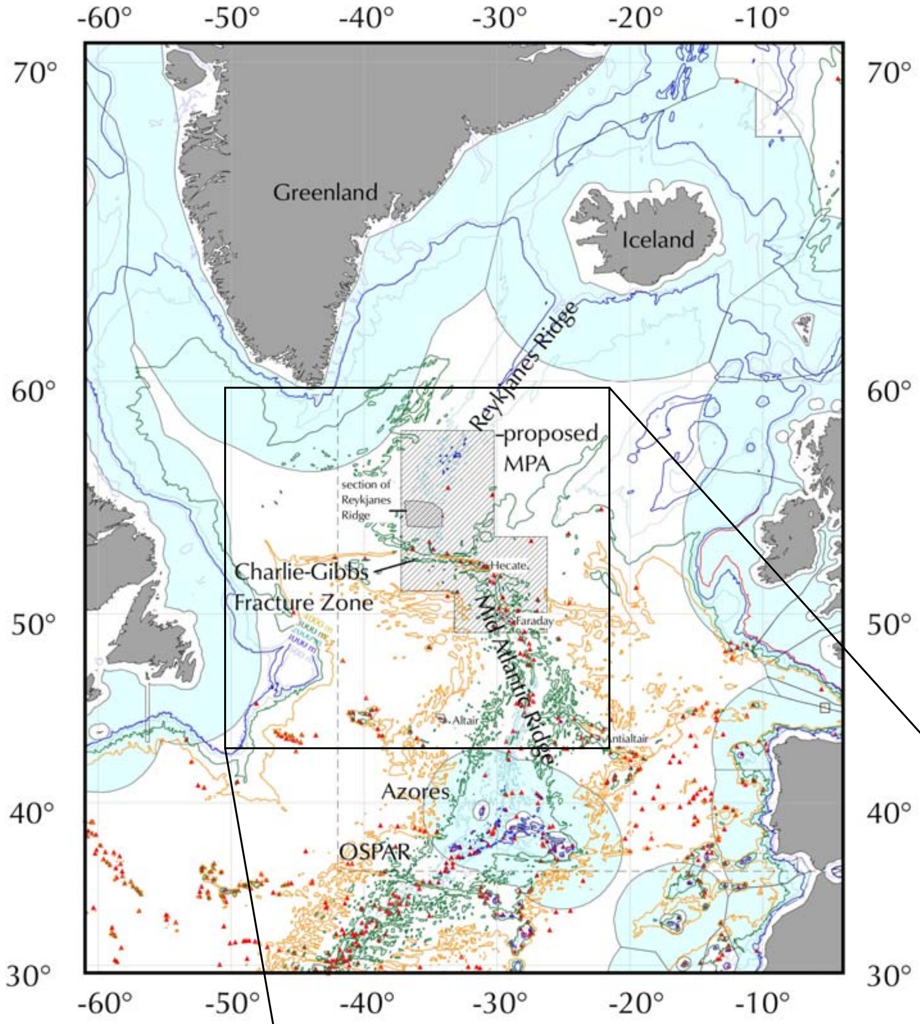
The area proposed covers a part of the northern Mid Atlantic Ridge, south of Iceland, including the Charlie Gibbs Fracture zone. Also included are the seamounts Faraday, Hekate, and the section of the Reykjanes Ridge which were closed to bottom touching fishing gear by the North East Atlantic Fisheries Commission in 2004 (presently a temporal closure until 2007).

7. Boundaries of the proposed MPA:

The boundaries proposed are meant to be indicative and open to revision when better knowledge allows for a more accurate drawing of the boundaries. The area enclosed by the coordinates below is meant to include both, the full east-west extent of the mid Atlantic Ridge around the Charlie Gibbs Fracture Zone, including substantial areas north and south of it, and the adjacent deep sea abyssal plains.

The northern boundary was set outside the potential extended continental shelf of Iceland for not crossing different jurisdictional zones. The southern boundary extends just south of Faraday seamount, one of the seamounts already closed to fishing by the North East Atlantic Fisheries Commission (NEAFC). The area enclosed corresponds approximately to the area investigated by the MARECO project in 2004, and will be subject to further investigations 2007 – 2009 (satellite projects to MARECO from UK and Danmark).

Latitude N	Longitude W
58	-30
58	-37
51	-37
51	-33
49	-33
49	-26
53.5	-26
53.5	-30
58	-30



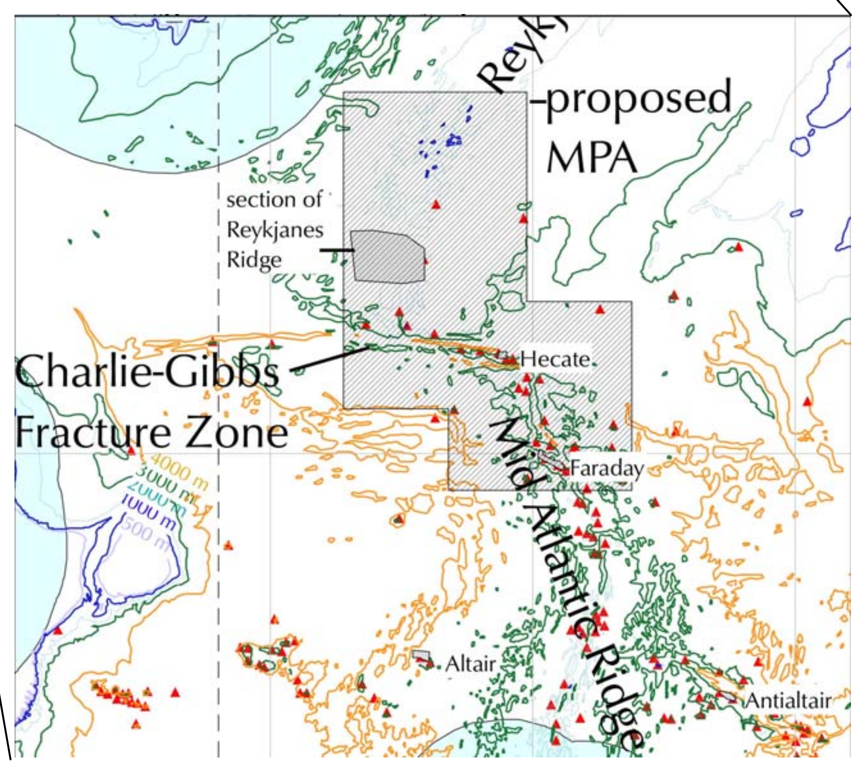


Fig. 2: Map of the proposed MPA on the Mid-Atlantic Ridge. Source: GEBCO (bathymetry), Kitchingman & Lay 2004 (seamounts, red triangles). The NEAFC closures (2004, Altair, Antialtair, Hekate, Faraday Seamounts and Reykjanes Ridge) are indicated as hatched areas.

8. Size

The marine protected area proposed has an extent of approx. 620000 sqkm.

9. Characteristics of the area

In the OSPAR Maritime Area, the mid-Atlantic Ridge (MAR) extends from Iceland where it is known as Reykjanes Ridge, south to the Azores. At the ridge new oceanic floor is formed and western and eastern parts of the North Atlantic basin spread at a speed of 2-6 cm/year.
Relief of the axial part of the MAR is presented by systems of separated volcanic rocky mountains. More than 170 seamounts with depths less than 1500 meters were found in the northern part of MAR between 43° and 60°N during Russian explorations in 1972-1984. The majority of seamounts is concentrated in the central (rift) zone of the ridge and in the zone of the transversal (transformed) cracks. Intermountain slashes and smooth slopes are covered with irregular granular sand aleurite, silt, coral and shelly and benthos detritus (Shibanov *et al.* 2002 and literature therein).

Along the reef, the Charlie Gibbs Fracture Zone (CGFZ) is a major transversal feature at about 52°N. At the CGFZ the axis of the southern part of ridge shifts of about 6° east from that of the northern part. This feature has major interaction with the hydrology, and flow of deep-water between the western and eastern deep-sea basins of the North Atlantic occur through these deep channels and affects to whole circulation (see http://www.mar-eco.no).

The general circulation in the epipelagic zone (0-200m) is well understood as a warm current flowing from the Southwest Atlantic towards the European coast with several branching. Cold current flow south form the Labrador sea and Irminger sea (Figure 3). The subpolar front - 61-62°N and 30-31°W is an area of high biological production in the pelagial and intense fishing activity (ICES WG RED 2006).

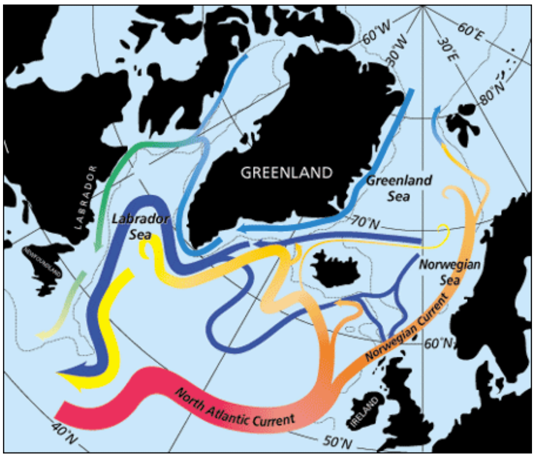
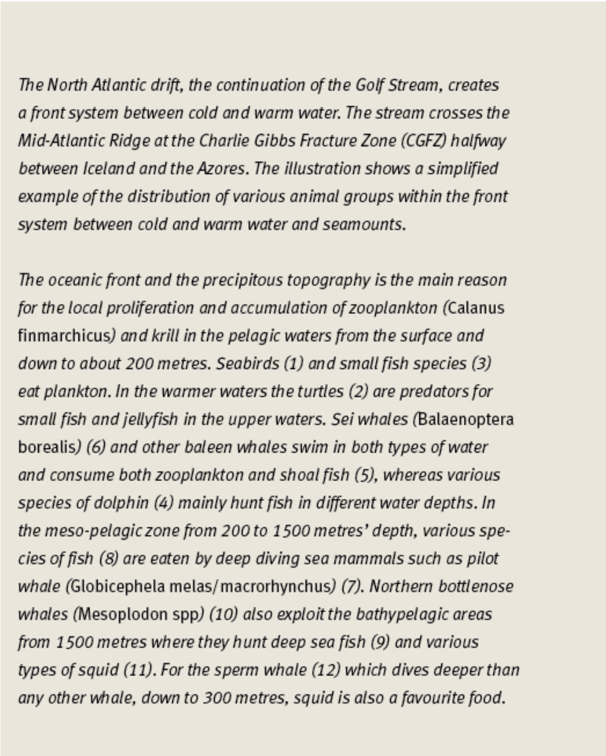


Fig 3: Pathways associated with the transformation of warm subtropical waters into colder subpolar and polar waters in the northern North Atlantic. Along the subpolar gyre pathway the red to yellow transition indicates the cooling to Labrador Sea Water, which flows back to the subtropical gyre in the west as an intermediate depth current (yellow). **More information** Credit: ©Jack Cook, Woods Hole Oceanographic Institution
http://www.nasa.gov/centers/goddard/images/content/95324main_v39n2-mccartneycurry1en.gif

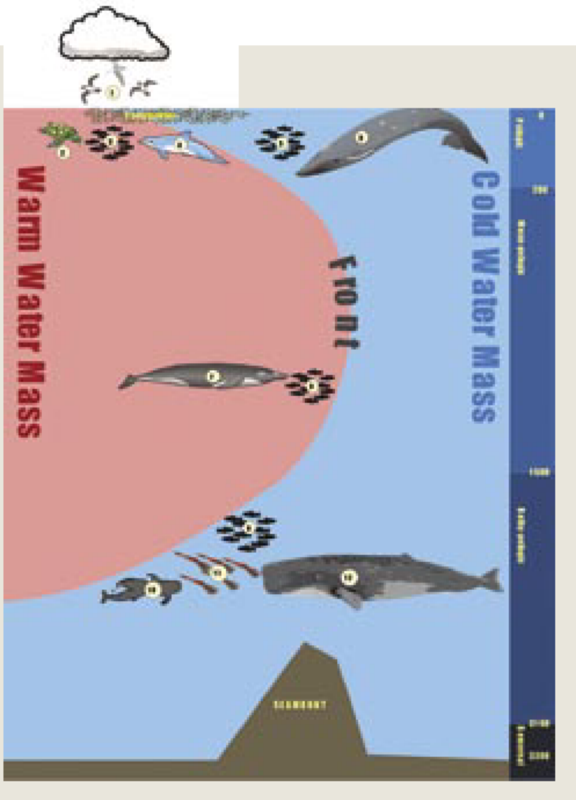
Charlie-Gibbs Fracture Zone

At around 52°N, a major topographical feature known as the Charlie-Gibbs Fracture zone divides the MAR into a northern and southern section. The CGFZ is a system of two main parallel deep rift valleys running perpendicular to the main ridge axis. Previous studies by current meter moorings and deep drifters have shown major flow of deep-water between the western and eastern deep-sea basins of the North Atlantic through these deep channels.

The topography is spectacular with depths ranging from 4500 m in the deepest channel to only 700-800m on top of adjacent seamounts. 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.

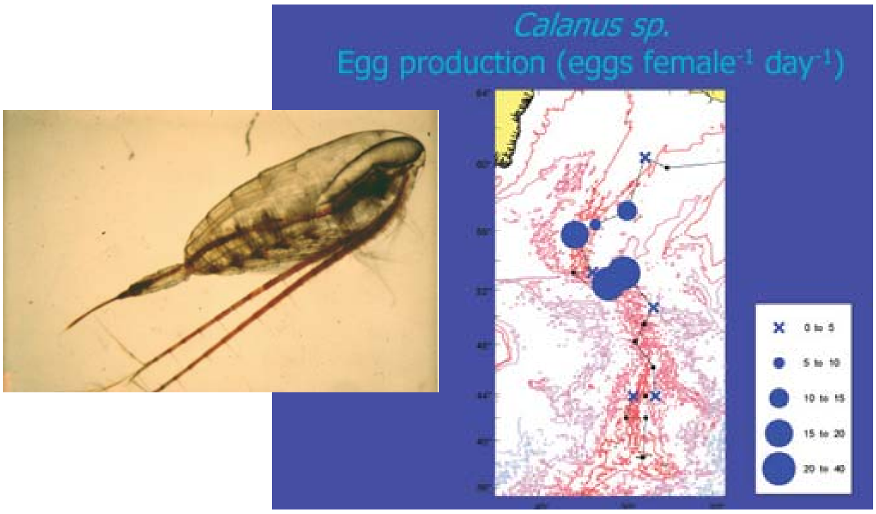

The North Atlantic drift, the continuation of the Golf Stream, creates a front system between cold and warm water. The stream crosses the Mid-Atlantic Ridge at the Charlie Gibbs Fracture Zone (CGFZ) halfway between Iceland and the Azores. The illustration shows a simplified example of the distribution of various animal groups within the front system between cold and warm water and seamounts.

*The oceanic front and the precipitous topography is the main reason for the local proliferation and accumulation of zooplankton (*Calanus finmarchicus*) and krill in the pelagic waters from the surface and down to about 200 metres. Seabirds (1) and small fish species (3) eat plankton. In the warmer waters the turtles (2) are predators for small fish and jellyfish in the upper waters. Sei whales (*Balaenoptera borealis*) (6) and other baleen whales swim in both types of water and consume both zooplankton and shoal fish (5), whereas various species of dolphin (4) mainly hunt fish in different water depths. In the meso-pelagic zone from 200 to 1500 metres' depth, various species of fish (8) are eaten by deep diving sea mammals such as pilot whale (*Globicephela melas/macrorhynchus*) (7). Northern bottlenose whales (*Mesoplodon spp*) (10) also exploit the bathypelagic areas from 1500 metres where they hunt deep sea fish (9) and various types of squid (11). For the sperm whale (12) which dives deeper than any other whale, down to 300 metres, squid is also a favourite food.*



Pelagic fauna

Copepod productivity: **Copepods** are important grazers of phytoplankton at the surface, and themselves major prey of vertically migrating mid-water predators such as small fish, large crustaceans and gelatinous zooplankton. They directly transfer the energy taken up by feeding into eggproduction which can therefore serve as an indicator of pelagic productivity. Nowhere along the MAR were the egg production rate higher than in the CGFZ and Sub-polar front. These zooplankton, particularly calanoid copepods and krill, are eaten by adult herring and capelin, juvenile stages of numerous other fish species as well as by baleen whales. The larvae of both pelagic and demersal fish also feed on eggs and juvenile stages of the zooplankton. In the pelagic ecosystem off Greenland and Iceland the population dynamics of calanoid copepods and to some extent krill are considered to play a key role in the food web as a direct link to fish stocks, baleen whales (*Mysticeti*) and some important seabirds, such as little auk (*Alle alle*) and Brünnitch's guillemot (*Uria lomvia*).

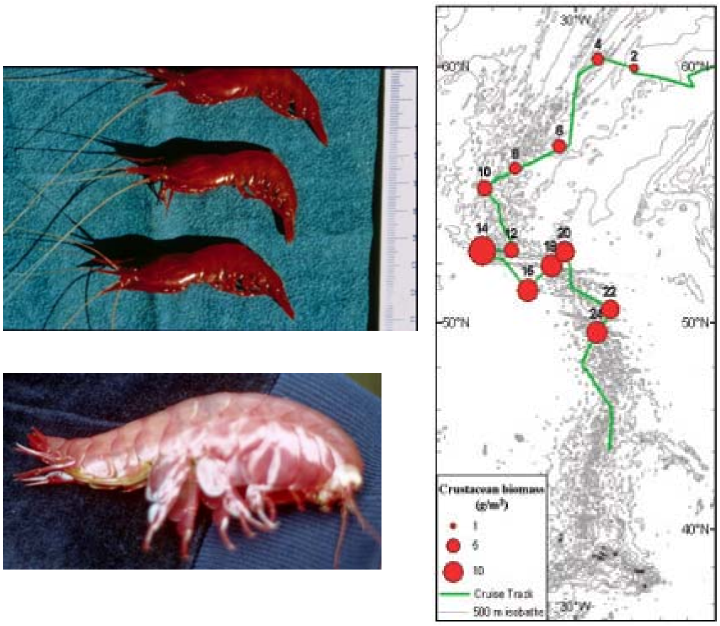


Geographical distribution of copepod egg production. (Photo: S. Christiansen)

Source: *http://www.mar-eco.no/mareco_news/2004/5_the_significance_of_the_charliegibbs_fracture_zone_and_the_subpolar_front*

The overall biodiversity of **gelatinous zooplankton** in the study area seemed to be low, with a higher diversity observed in the southern than in the middle box. A total of 47 taxa were identified from the net samples. There are indications that the species composition of gelatinous zooplankton differed between the two study areas: 14 taxa were found exclusively in the Southern box and 13 in the middle box, while 16 taxa occurred throughout the study area.

The highest abundance of large **mid-water crustaceans**, mainly decapods (shrimps) and amphipods, occured in the CGFZ. Further north and south, the abundance declined significantly. This indicates that the standing stocks of crustaceans are particularly high in the frontal zone near CGFZ. The crustacean fauna is characterised by large beautiful red shrimps and krill.



Geographical distribution of crustacean plankton catches. Photos: B. Christiansen

Source*: http://www.mar-eco.no/mareco_news/2004/5_the_significance_of_the_charliegibbs_fracture_zone_and_the_subpolar_front*

Cephalopods (from Mar-Eco cruise report Leg 2)

Approx. 53 species were found, representing 43 genera in 29 families. As with many taxonomic groups north-south differences were apparent in the cephalopod fauna. For example, two different squid species, *Gonatus* sp. and *Heteroteuthis dispar* occured north and south of the frontal zone, respectively. The highest number of species was collected in the southern box. Conversely, the maximum overall abundance (number collected per trawl) came from farther north, especially from the middle-box transect located southeast of the Charlie-Gibbs Fracture Zone.

Five of the ten most commonly collected taxa are cirrate octopods. These large animals appear to be an important component of the benthopelagic and deep bathypelagic nekton in MAR ecosystems.

Benthic fauna

Ridges like the Mid Atlantic ridge provide a large variety of benthic habitats. The hard bottoms areas are often colonised by erect megafauna such as gorgonians, sponges, hydroids, and black corals (Grigg, 1997). Mortensen et al. (in press) presume that to a large degree, the topography of the seabed controls the distribution of habitats along the MAR by providing different settings for sedimentation and retention of particulate matter. They found this illustrated by the accumulation of coral rubble near the bases of volcanic ledges, and deposits of pteropod shells on level sandy bottom some tens of metres away from rocky obstructions where currents will not sweep the light shells away. The topography also controls the current patterns and velocity (Genin et al., 1986), and hence the transport rate and concentration of food particle for suspension feeders.

For the benthic fauna, the Mid-Atlantic Ridge is a major barrier for east-west dispersal (see e.g. review of Mironov & Gebruk 2002, 2006). Gebruk et al. (2006) noted that in particular in the area south of the Charlie-Gibbs Fracture Zone 48% of the 150 identified species occured only to the west of the ridge, whereas 19 % of the species were restricted to the eastern Atlantic. Likewise, the Charlie-Gibbs Fracture Zone acts as a barrier in North-South direction: The areas south and north of the CGFZ share only 27 % of the species (of the groups used as indicators). Due to the transition of water masses at 800-1000m depth there is also a vertical zonation of the bathyal fauna. Comprehensive ostur and sponge grounds are known to occur off south Iceland, especially around the Reykjanes Ridge. (ICES WG RED06).

Cold water corals

The Reykjanes Ridge south of Iceland is an area where cold-water corals *(L. pertusa, M. oculata, S. variabilis)* are frequently dredged (Copley et al. 1996). In Icelandic waters, most of the existing coral areas are found on the shelf slope and on the Reykjanes Ridge (Figure 4.2.3.4). In some of the shelf areas off south Iceland remains of trawl nets and trawl marks were observed, providing evidence of the effects of trawling activities (ICES ACE 2005).

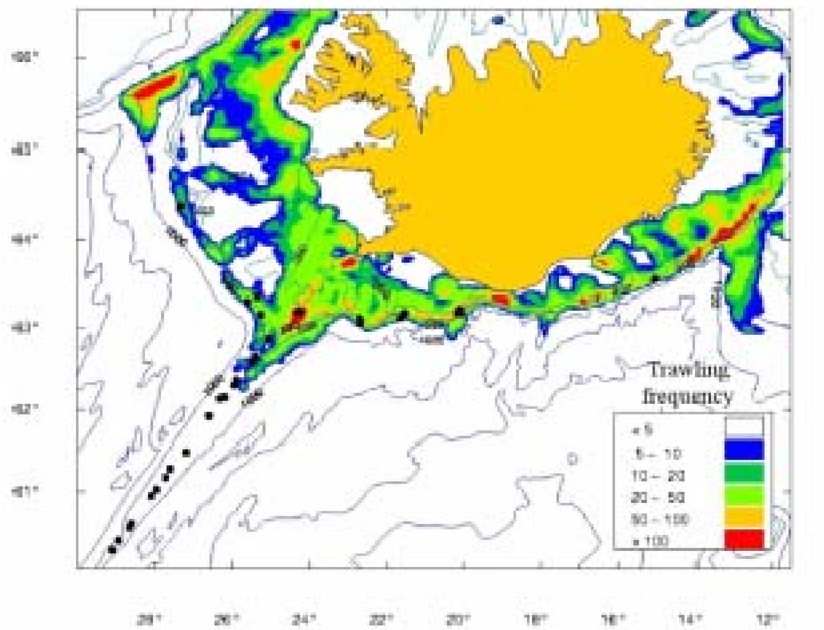
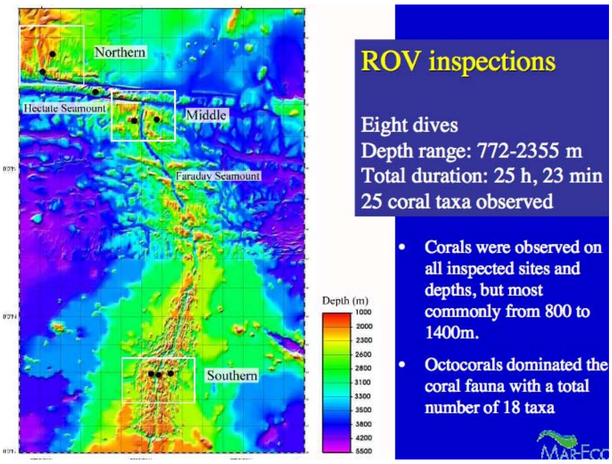
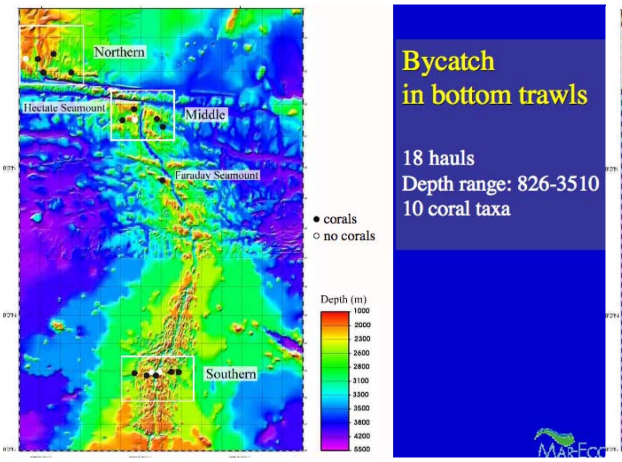


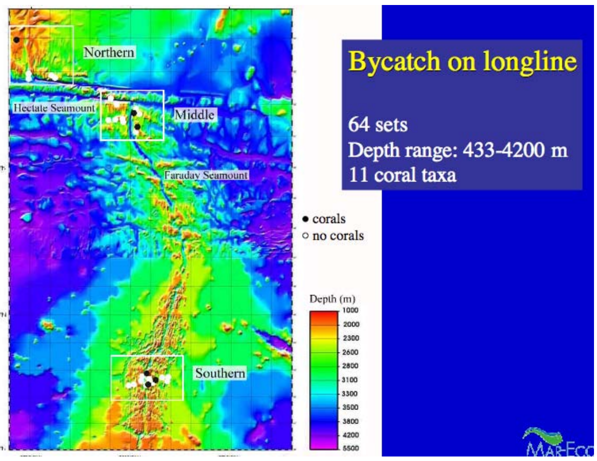
Figure 4.2.3.4 Occurrence of *Lophelia pertusa* off Iceland, based on information from the literature and from the BIOICE database, in relation to otter trawling effort (trawling frequency*nm^{-2} per year). Map by S.A. Steingrimsson.

Until the Mar-Eco project cruise (2004), the coral records mainly came from the upper ridge at depths of less than 1000 m (ICES ACE 2005, Fig. 4.2.3.4.). Video inspections in the areas south and north of the Charlie-Gibbs Fracture Zone found cold water corals at all sites, at depths of 772-2355 m, most commonly between 800 and 1400 m. 27 of the 40 coral taxa were octocorals. Otter trawls sampling at 826-3510 m depth came up with a bycatch of 10 coral taxa, and also the longlining experiments (433- 4200 m depth) brought up 11 coral taxa. Four of the coral taxa were only observed in the Charlie Gibbs Fracture Zone area (Mortensen et al. in press).



Source: Mortensen (pers. com): Coral habitats on the Mid-Atlantic Ridge. Presentation at 3rd Deep Sea Coral Symposium.

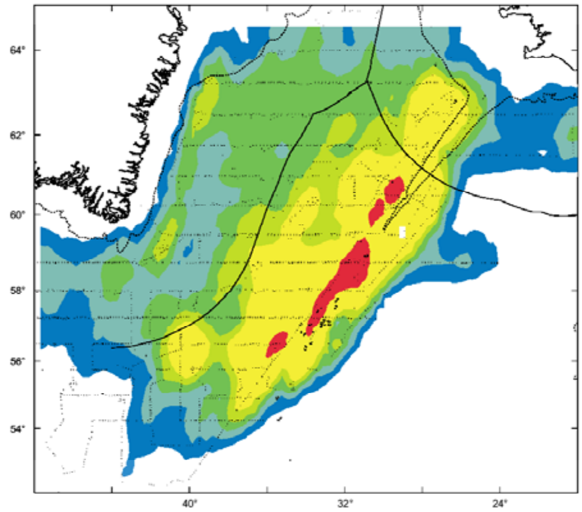




Lophelia pertusa and *Solenosmilia variabilis* were found to act as the main structure corals, probably Solenosmilia was most common in the deeper parts of the study areas. All Lophelia/Solenosmilia colonies were relatively small with a maximum diameter of less than 0.5m. Lophelia/Solenosmilia was most common on the video in the north and central sites, but rare on video in the south. The video-observations indicated that the diversity of corals is higher in the southern than the middle and northern study areas. Bycatch of corals was recorded in bottom trawl and on longline from all areas, but most species were caught in the southern area. (ICES WG DEC report 2006). The number of megafaunal species was higher in areas where corals dominated compared to areas without coral. Typical taxa that co-occurred with Lophelia were crinoids, certain sponges, the bivalve *Acesta excavata*, and squat lobster (Mortensen pers. com.).

Fish fauna

The biogeographic boundary of the CGFZ is also evident in the distribution of deep water fish (Hareide & Garnes 2001): North of 52 °N, sub-Arctic species such as *Sebastes* spp., tusk (*Brosme brosme*) and Greenland halibut (*Reinhardtius hippoglossoides*) are dominant. In the southern part (south of 48 ° N), subtropical species such as golden eye perch (Beryx splendens) and cardinal fish (*Epigonus telescopus*) are the dominant species. The area between 48 and 52 ° N is a region of faunal change with species mixtures according to the species-specific distribution limits. It was observed that all along the investigation area (43 – 61 °N) there was always one dominant species forming dense schools close to the top of seamounts: In the north, this is redfish (*Sebastes marinus*), between 53 and 46 °N this niche is taken by roundnose grenadier (*Coryphaenoides rupestris*) and south of 46 °N by goldeneye perch (*Beryx splendens*). The authors report about the quick exaustion of these seamount aggregations when commercially fished in the early 1990s and speculate about a changing balance between the species of the fish community. King et al. (2006) confirm the biogegraphic zones, however emphasize the importance of the CGFZ and the subpolar front for the location of the split between northern and transitional communities.



Source: Sigurðsson et al. (2002).
Redfish forming deep scattering layer (red shows highest concentration) over the northern Mid Atlantic Ridge, north of 56° N (June-July 2001).

Fock *et al*. (2002) found that pelagic fishes from depths of 250 m to 3200 m from 45 °N to 50 °N formed 6 assemblages, which were connected to ridge habitats, the continental shelf edge and oceanic habitats. Spatial boundaries for the clusters were set by frontal systems, of which the Southern Subarctic Front and the Mid-Atlantic Front determined the northern and western boundaries. Over the ridge, Melamphaidae, Serrivomeridae, Stomiidae and Centrolophidae increased in abundance. The increase of gelatinous plankton feeders over the ridge, may indicate a topographically induced increase of gelatinous plankton abundance in the area.

Mammals

The distribution of mammals and seabirds on the MAR is not very well known. Therefore the description below only relies on the most recent observations from the Mar-Eco cruise in 2004: Mammals occurred along the entire section of the MAR studied. Altogether 1,433 whales were observed during the Mar-Eco cruise. About half (727) were various species of dolphins. 273 individuals in 28 schools were defined as common dolphin (*Delphinus delpis*). This species was only observed south of the sub-polar front where the surface is warmer than 14 degrees. Another important dolphin spe-cies (*Lagernorhynchus acutus*) appeared only in areas where the water was colder than 11 degrees. 103 animals in seven schools were observed.

There were 50 observations of 83 sperm whales (*Physeter macrocephalus*). This large whale which dives as deep as 3,000 metres was reg-istered all along the MAR with a concentration north of the Charlie Gibbs Fracture Zone (CGFZ), in the same area as sei whales.

Baleen whales (particularly sei whale, and fin whale) where especially abundant near the CGFZ in association with steep topography. 85 sei whales (*Balaenoptera borealis*, endangered species acc. IUCN red list 2006), were observed, all of them north of the CGFZ. The observation area coincided with a zone of relatively high surface temperature and salinity, and large quantities of zooplankton (especially copepods) above the steep slopes between seamounts.

Seabirds

The MarEco cruise provided a snapshot of seabird distribution along the Mid Atlantic Ridge in Summer 2004: 22 species of seabirds were identified, however only the northern fulmar (*Fulmarus glacialis*), Great Shearwater (*Puffinus gravis*) and Cory´s Shearwater (*Calonectris diomedea*) were observed by the hundreds. The distribution of these species reflects the 3 broad characters of water masses in the area (from MarEco cruise report Nøttestad et al. 2004):

Northern fulmars were distributed along most of the study transect north of 47° N, and they were by far the most common species of seabird along the central and northern parts of the MAR. Densities were generally below 1 bird per km2, and no large-scale concentrations were noted. However, discrete elevations in densities were recorded both in the Reykjanes and the CGFZ regions.

The Greater Shearwater (*Puffinus gravis*) was observed only in the frontal area just north of the CGFZ. Most of the birds were recorded in the frontal area of the fracture zone, where concentrations of both sitting and flying birds were observed. The largest flock seen was of 160 birds, but flock sizes were generally between 3 and 10 birds. Outside the CGFZ frontal area great shearwaters were mainly seen in singles.

Corys Shearwater (*Calonectric diomedea*), on the other hand is found only south of the Greater Shearwater distribution area – usually not in flocks except forr an area where warm Gulf Stream water surfaced. Cory´s shearwater was commonly observed with cetaceans,, most notably dolphins, but also with other species, e.g. sperm whales.

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B Selection criteria

a. Ecological criteria/considerations

1. Threatened and declining species and habitats

Species:

**Hoplostethus atlanticus* (Collett, 1889)	Orange roughy	*hoplostète orange*	**I, V**	**All where it occurs**
Caretta caretta (Linnæus, 1758)	Loggerhead turtle	*caouanne*	**IV, V**	**All where it occurs**
Dermochelys coriacea (Vandelli, 1761)	Leatherback turtle	*tortue luth*	**All**	**All where it occurs**
Balaenoptera musculus (Linnæus, 1758)	Blue whale	*baleine bleue*	**All**	**All where it occurs**

Habitats:

Deep-sea sponge aggregations	**I, III, IV, V**	**All where they occur**
Lophelia pertusa reefs	**All**	**All where they occur**
Seamounts	**I, IV, V**	**All where they occur**[1]

2. Important species and habitats

see "Characteristics of the Area"

3. Ecological significance

1. High proportion of habitat in the OSPAR area

The northern part of the MAR lies entirely in the OSPAR area. The area proposed comprises but a section of the MAR including the Charlie Gibbs Fracture Zone and adjacent areas. Along the MAR, species communities change gradually from north to south however the CGFZ and coinciding the subpolar front represent an important barrier to this along ridge dispersal.

2. A high biological productivity system is represented.

The subpolar front at about 52 °N is a typical high production convergence zone of subpolar and Atlantic water. The high plankton production attracts a large number and variety of secondary consumers and top predators.

4. High natural biological diversity

Russian investigations revealed fish larvae of more than 200 demersal and pelagic fish species. This relatively well investigated part of the fauna could be an indicator for a rather high species diversity at the northern Mid-Atlantic Ridge.

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[1] A search for further evidence will be made.

5. Representativity

The area is nominated for its importance as a section of the northern Mid Atlantic Ridge, including a major biogeographic east-west and north-south divide. The MAR provides the only hard substrate and relatively shallow depths in the otherwise sedimentary abyssal plains of the North Atlantic.

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6. Sensitivity

In general, deep water fauna is more vulnerable to human disturbance than shelf sea fauna. Scarcity and patchiness of food favours longlived, large species with energy saving and storage capacities, and few offspring. On the MAR, the deep water ecosystem is entirely dependant on organic particles sedimenting down from surface production. Propagation and dispersal of larvae is largely unknown and therefore little can be said about a possible recovery of neither invertebrates nor fishes.

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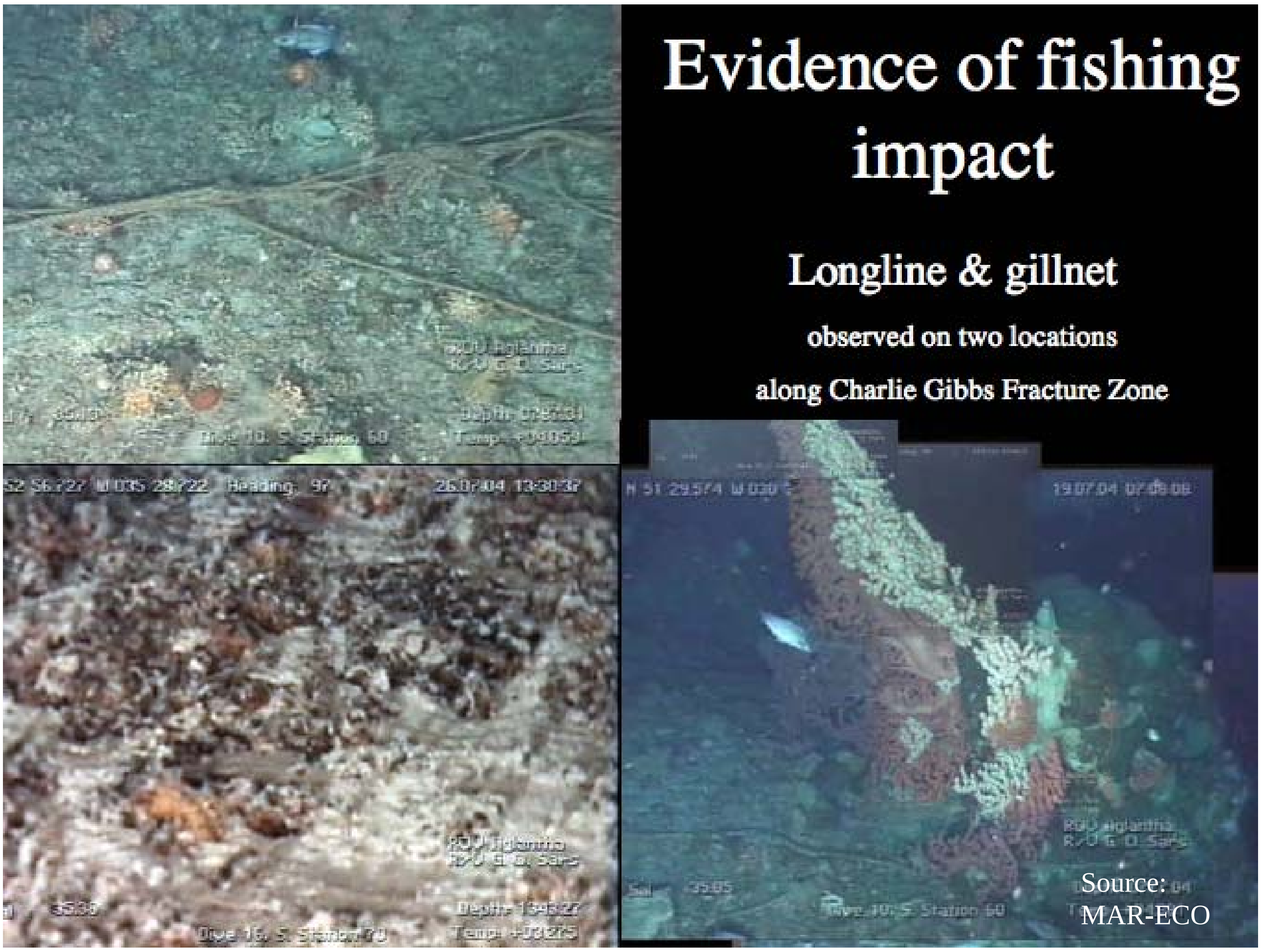
7. Naturalness

Despite the remoteness of the Mid Atlantic Ridge, the area is not pristine anymore. Soviet/Russian trawlers have intensively exploited the roundnose grenadier stocks of the MAR since the early 1970s. After the quick depletion of the local seamount stocks on the northern MAR the fishery was conducted only periodically. The fishery on roundnose grenadier takes deepwater redfish, orange roughy, blackscabbard fish and deepwater sharks as a bycatch. In the 1980s, a significant longline fishery for tusk developed on the seamounts between 51 and 57 ° N. It can be concluded therefore that the top predator fish stocks, in particular those of aggregation forming species, are depleted in the fishery sense, or at least significantly reduced. Changes of the overall ecosystem structure can therefore be expected.



The ICES working group on Regional Ecosystem Description (WG RED 2006) concluded: "Over the last 15 to 20 years, the deep-water ecosystem was significantly impacted by fishing as and when fishery extended deeper partly as a result of overexploitation of shelf stocks. Deepwater stock are typically low productive and their sustainable levels of exploitation are much smaller than those of shelf stocks. Towed fishing gears have severe impacts on benthic communities; this is a major problem on structurally complex habitat including biogenic reefs. On the same kind of reefs netting is also considered undesirable as it can generate (i) habitat disturbance because of lots nets and dumping of used nets and (ii) ghost fishing. Therefore deepwater trawling should be restricted to primarily sedimentary bottoms and where possible fisheries should shift to longlining and closely managed netting (out of coral areas) as was successfully done in some southern hemisphere fisheries (fishery for Patagonian toothfish, Disostichus eleginoides, in the South Georgia and South Shetland Islands)."

b. Practical criteria/considerations

1. Potential for restoration

The need for restoration measures, i.e. recovery from human impacts by excluding further human pressure, is not known. Possible shifts in species communities due to removing top predators from the ecosystem are not likely to be reversable. Judging from the slow growth rates, and given the low temperatures and food abundance, damages done to cold water coral communities and other sensitive habitats will take at least decades to be compensated – recovery patterns of deep water coral areas are not known yet.

2. Degree of acceptance

Fishing: Presently, the fishing effort excerted on the Mid Atlantic Ridge is very low. ICES (2005) in its advice to NEAFC summarizes the number of European and Russian vessels currently operating in the area. These were in 2004 1 Norwegian, 4 Russian, 1 Spanish, 1 Faroe, 1 Irish and 2 Portuguese vessels. Therefore, a MPA safegarding not only sensitive benthic habitats but also critical deep water species and stocks should be acceptable to all North Atlantic coastal states.

Science: Science will not be affected by any management regime other than being bound to a code of conduct to minimise impacts – see draft OSPAR guidelines for research (MASH06/3/4).

Tourism: no tourism

Bioprospection: unknown

Mining: subject to ISA licensing, no exploration nor exploitation plan known yet

Transport: will not be affected

Cable laying: not known, however, it seems likely that an agreement could be reached

3. Potential for success of management measures

See above, if measures can be agreed and are accepted then the management objectives will be reached.

4. Potential damage to the area by human activities

Fishing: Fishing is likely to have caused already a significant impact on the MAR ecosystem: Commercial deep water trawling activities by USSR/Russian vessels is ongoing since 1973, total catches amouting to 205000 t until 2001, of which 201000 t were roundnose grenadier, trawled at ca. 30 seamounts along the MAR (Shibanov et al. 2002). The large catches of roundnose grenadier, alfonsino and pelagic redfish of the virgin fisheries in the 70s could only be maintained for a few years due to decreasing fish densities and CPUE.

Science: Scientific sampling takes place on a very small scale compared to the overall size of the site and compared to the intensity and impact of fishing. It is unlikely that biological and also geological sampling causes any significant damage to habitats and/or species. However, science should be bound to a code of conduct to minimise impacts – see draft OSPAR guidelines for research (MASH06/3/4).

Bioprospection: see science

Mining: Would locally destroy the benthic habitat and cause toxic pollution and large scale sediment plumes in the pelagial, affecting the biota and sedimenting to the sea floor.

Transport: Risk of pollution

Military: Far-field effect of sonar, in particular LFASonar, on marine mammals

5. Scientific value

The Mid Atlantic Ridge is one of the least explored places in the world. And although fishing activities have been ongoing since 3 decades, the relative human pressure on the ecosystem in general is low. This is one of the last frontiers of science.

C. Proposed management and protection status

1. Proposed management

It is proposed to establish a marine protected area where no exploitation is permitted.

1.1. Management goals:

a. Maintain and restore the natural deepwater ecosystem of the Mid Atlantic Ridge, including its function for migratory species

b. Improve the scientific understanding

c. Improve the public understanding

1.2. Management objectives

d. Recovery of deepwater fish stocks and benthic ecosystem

e. Ensure longterm sustainable scientific research

f. Ensure that the increasing scientific knowledge contributes to public education.

g. Monitor the state of the ecosystem

MASH 2005 (MASH 05/8/1) agreed that the following sections are to be left empty for the time being.

1.3. Management measures:

1.4. Management enforcement and authority:

2. Any existing or proposed legal status

Presented by

Organisation: WWF

Date: September 2006, revised August 2007