Proforma for compiling the characteristics of a potential MPA

A  General information

1. Proposed name of MPA

**Mid Atlantic Ridge/Charlie Gibbs Fracture Zone**

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:

<table>
<thead>
<tr>
<th>Latitude N</th>
<th>Longitude W</th>
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<tbody>
<tr>
<td>58</td>
<td>-30</td>
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<td>58</td>
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<td>53.5</td>
<td>-30</td>
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<tr>
<td>58</td>
<td>-30</td>
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</tbody>
</table>
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](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.

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 egg production 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 Brünnich's guillemot (Uria lomvia).
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, occurred 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.

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 occurred 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

For the benthic fauna, the Mid-Atlantic Ridge is a major barrier for east-west dispersal (see e.g. review of Mironov & Gebruk 2002). Gebruk et al. 2006 noted that in particular in the area south of the Charlie-Gibbs Fracture Zone 48% of the 150 identified species occurred 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 ostrur 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).

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. 18 of the 25 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.

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. (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.

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 delphis). 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 registered 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

Also the Greater Shearwater (*Puffinus gravis*) was observed only in the frontal area just north of the CGFZ, whereas a close relative, Corys Shearwater (*Calonecrtic diomedea*), is found only south of it.

Bibliography


Hareide, N.-R., Garnes, G. (2001). The distribution and catch rates of deep water fish along the Mid-Atlantic Ridge from 43° to 61° N. Fischeries Res. 51, 297-310


MAR-ECO project – see http://www.mar-eco.no


### B Selection criteria

#### a. Ecological criteria/considerations

1. Threatened and declining species and habitats

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat Type</th>
<th>Threat Level</th>
<th>Habitat Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Hoplostethus atlanticus</em> (Collett, 1889)</td>
<td>Orange roughy</td>
<td>I, V</td>
<td>All where it occurs</td>
</tr>
<tr>
<td>Caretta caretta (Linnaeus, 1758)</td>
<td>Loggerhead turtle</td>
<td>IV, V</td>
<td>All where it occurs</td>
</tr>
<tr>
<td>Dermochelys coriacea (Vandelli, 1761)</td>
<td>Leatherback turtle</td>
<td>All</td>
<td>All where it occurs</td>
</tr>
<tr>
<td>Balaenoptera musculus (Linnaeus, 1758)</td>
<td>Blue whale</td>
<td>All</td>
<td>All where it occurs</td>
</tr>
</tbody>
</table>

Habitats:

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Level I, II, III, IV, V</th>
<th>Habitat Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep-sea sponge aggregations</td>
<td>I, III, IV, V</td>
<td>All where they occur</td>
</tr>
<tr>
<td>Lophelia pertusa reefs</td>
<td>All</td>
<td>All where they occur</td>
</tr>
<tr>
<td>Seamounts</td>
<td>I, IV, V</td>
<td>All where they occur</td>
</tr>
</tbody>
</table>

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.

5. Representativity

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1 A search for further evidence will be made.
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.

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.

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 reversible. 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 know yet.

2. Degree of acceptance

Fishing: Presently, the fishing effort exerted 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 safeguarding 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 amounting 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