OSPAR COMMISSION

Background Document on the Mid-Atlantic Ridge North of the Azores Marine Protected Area

Biodiversity Series

2011

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Union and Spain

Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998.
La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par l'Union européenne et l'Espagne

Acknowledgement

This report was prepared by the OSPAR Intersessional Correspondence Group on Marine Protected Areas as a contribution to OSPAR's work on MPAs in areas beyond national jurisdiction under the leadership of Dr Henning von Nordheim (German Federal Agency for Nature Conservation/BfN) with the assistance of Tim Packeiser. The report is based upon work by the University of York and carried out by Prof Callum Roberts, Beth O'Leary and Rachel Brown as commissioned by BfN Germany. The report has been enhanced by contributions of the University of the Azores (Prof Ricardo S. Santos), supported by the Government of the Azores, and the Portuguese Instituto da Conservação da Natureza e da Biodiversidade (Pedro I. Arriegas).

Contents

Executive summary

The Mid-Atlantic Ridge (MAR) is a range of underwater mountains and valleys separating the Eurasian and American tectonic plates and an active sea floor spreading centre. The region of the MAR North of the Azores has been identified for its representativity of the MAR, it is coincidently the area with the highest density of seamounts along the ridge. This area of the MAR is important for a wide diversity of marine species from invertebrates to fish species and seabirds, including those under threat.

In 2003, the OSPAR Commission agreed to establish a network of Marine Protected Areas (MPAs) with the aim that this should become an ecologically coherent network of well-managed sites. OSPAR agreed that the OSPAR Network of MPAs should comprise sites that are established as MPAs within the jurisdiction of OSPAR Contracting Parties as well as sites in the maritime area outside the jurisdiction of the Contracting Parties (area beyond national jurisdiction ABNJ). In the OSPAR Biodiversity and Ecosystems Strategy, OSPAR agreed to identify, on the basis of reports from Contracting Parties and observer organisations, possible components of the OSPAR Network in areas beyond national jurisdiction in order to achieve the purposes of the network.

This background document makes available the information which has been compiled and evaluated within the OSPAR framework on the biodiversity and ecosystems of the Mid Atlantic Ridge (MAR) North of the Azores, which was proposed to OSPAR as a potential MPA in ABNJ in 2009. On the basis of this information, the 2010 Ministerial Meeting of the OSPAR Commission adopted OSPAR Decision 2010/6 on the establishment of the MAR North of the Azores High Seas MPA to protect the biodiversity of the waters superjacent to the seabed of the MAR North of the Azores. In parallel the government of Portugal have established an MPA covering the seabed of the MAR North of the Azores, which is the subject of a submission by Portugal to the Commission on the limits of the Continental Shelf. This document also includes conservation objectives developed within the OSPAR framework for application to an MPA in the MAR North of the Azores High Seas MPA which have been formalised in OSPAR Recommendation 2010/17 on the management of the MAR North of the Azores High Seas MPA.

Récapitulatif

La dorsale médio-atlantique (MAR) est une chaîne de montagnes et vallées sous-marines séparant les plaques tectoniques eurasiennes et américaines et elle constitue un centre d‟expansion du fond marin. La région de la MAR au Nord des Açores a été identifiée car elle est représentative de la MAR et il se trouve qu‟elle correspond à la zone à plus forte densité de monts sous-marins le long de la dorsale. Cette zone de la MAR est importante car elle comporte une grande diversité d‟espèces marines allant des invertébrés aux espèces halieutiques et aux oiseaux de mer, notamment ceux qui sont menacés.

La Commission OSPAR est convenue, en 2003, de créer un réseau de zones marines protégées (ZMP) afin que celui-ci devienne un réseau de sites écologiquement cohérent et bien géré. OSPAR est convenue que le réseau OSPAR de ZMP devra englober les sites créés à titre de ZMP situés dans la juridiction des Parties contractantes OSPAR ainsi que les sites de la zone maritime situés au-delà de la juridiction des Parties contractantes (zone au-delà de la juridiction nationale (ABNJ)). OSPAR est convenue, dans sa Stratégie biodiversité et écosystèmes, de déterminer, en se fondant sur des rapports des Parties contractantes et d‟organisations observatrices, des composantes éventuelles du réseau OSPAR situées dans des zones au-delà de la juridiction nationale afin de parvenir aux objectifs du réseau.

Le présent document de fond comporte les informations qui ont été recueillies et évaluées dans le cadre de travail d‟OSPAR et portant sur la biodiversité et les écosystèmes de la dorsale médio-atlantique au nord des Açores qui a été proposée à OSPAR à titre de ZMP potentielle dans une ABNJ en 2009. La réunion ministérielle de 2010 de la Commission OSPAR a adopté, en se fondant sur ces informations, la Décision OSPAR 2010/6 sur la création de la ZMP de la dorsale médio-atlantique au nord des Açores pour protéger la biodiversité des eaux superjacentes au fond marin de la dorsale médio-atlantique au nord des Açores. Parallèlement, le gouvernement du Portugal a créé une ZMP couvrant le fond marin de la dorsale médio-atlantique au nord des Açores, qui fait l‟objet d‟une communication du Portugal à la Commission sur les limites du plateau continental. Ce document comporte également des objectifs de conservation développés au sein du cadre de travail d‟OSPAR à appliquer à une ZMP située dans la ZMP de la dorsale médio-atlantique au nord des Açores haute mer. Ces objectifs de conservation ont été officialisés dans la Recommandation OSPAR 2010/17 sur la gestion de la ZMP de la dorsale médio-atlantique au nord des Açores haute mer.

A. General information

1. Area

Mid-Atlantic Ridge north of the Azores

2. Aim of MPA – Conservation Objectives

2.1 Conservation Vision [1]

Maintenance and, where appropriate, restoration of the integrity of the functions and biodiversity of the various ecosystems of the Mid-Atlantic Ridge (north of the Azores) so they are the result of natural environmental quality and ecological processes[2].

Cooperation between competent authorities, stakeholder participation, scientific progress and public learning are essential prerequisites to realize the vision and to establish a Marine Protected Area subject to adequate regulations, good governance and sustainable utilization. Best available scientific knowledge and the precautionary principle form the basis for conservation.

2.2 General Conservation Objectives [3] [4]

(1) To **protect and conserve** the range of habitats and ecosystems including the water column of the Mid-Atlantic Ridge (north of the Azores) MPA for resident, visiting and migratory species as well as the marine communities associated with key habitats.

(2) To **prevent** loss of biodiversity, and promote its recovery where practicable, so as to maintain the natural richness and resilience of the ecosystems and habitats, and to

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1 The conservation vision describes a desired long-term conservation condition and function for the ecosystems in the entire Mid-Atlantic Ridge (north of the Azores) MPA. The vision aims to encourage relevant stakeholders to collaborate and contribute to reach the objectives set for the area.

2 Recognizing that species abundances and community composition will change over time due to natural processes.

3 Conservation objectives are meant to realize the vision. Conservation objectives are related to the entire Mid-Atlantic Ridge (north of the Azores) MPA or, if it is decided to subdivide, for a zone or subdivision of the area, respectively.

4 It is recognized that climate change may have effects in the area, and that the MPA may serve as a reference site to study these effects.

enable populations of species, both known and unknown, to maintain or recover natural population densities and population age structures.

(3) To **prevent** degradation of, and damage to, species, habitats and ecological processes, in order to maintain the structure and functions - including the productivity - of the ecosystems.

(4) To **restore** the naturalness and richness of key ecosystems and habitats, in particular those hosting high natural biodiversity.

(5) To **provide** a refuge for wildlife within which there is minimal human influence and impact.

2.3 Specific Conservation Objectives [5] [6]

2.3.1 Water Column

a. To prevent deterioration of the environmental quality of the bathypelagic and epipelagic water column (e.g. toxic and non-toxic contamination[7]) from levels characteristic of the ambient ecosystems, and where degradation from these levels has already occurred, to recover environmental quality to levels characteristic of the ambient ecosystems.

b. To prevent other physical disturbance (e.g. acoustic).

c. To protect, maintain and, where in the past impacts have occurred, restore where appropriate the epipelagic and bathypelagic ecosystems, including their functions for resident, visiting and migratory species, such as: cetaceans, and mesopelagic and bathypelagic fish populations.

2.3.2 Benthopelagic Layer

To protect, maintain and, where in the past impacts have occurred, restore where appropriate:

a. Historically exploited **fish populations** (target and bycatch species) at/to levels corresponding to population sizes above safe biological limits[8] with special attention also given to **Deep water elasmobranch species**, including threatened and/or declining species, such as Portuguese dogfish, Leafscale gulper shark.

b. Benthopelagic habitats and associated communities to levels characteristic of natural ecosystems.

2.3.3 Benthos

To protect, maintain and, where in the past impacts have occurred, restore where appropriate to levels characteristic of natural ecosystems:

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5 Specific Conservation Objectives shall relate to a particular feature and define the conditions required to satisfy the general conservation objectives. Each of these specific conservation objectives will have to be supported by more management orientated, achievable, measurable and time bound targets.

6 Norway has a reservation on Section 2.3 “Specific Conservation Objectives”.

7 This includes synthetic compounds (e.g. PCBs and chemical discharge), solid synthetic waste and other litter (e.g. plastic) and non-synthetic compounds (e.g. heavy metals and oil).

8 “Safe biological limits” used in the following context: “Populations are maintained above safe biological limits by ensuring the long-term conservation and sustainable use of marine living resources in the deep-seas and preventing significant adverse impacts on Vulnerable Marine Ecosystems (FAO International Guidelines for the Management of Deep-Sea Fisheries in the High Seas, 2008).

a. The **epibenthos and its hard and soft sediment habitats,** including threatened and/or declining species and habitats such as seamounts, deep-sea sponge aggregations, *Lophelia pertusa* reefs[9] and coral gardens.

b. The **infauna of the soft sediment benthos**, including threatened and/or declining species and habitats.

c. The **habitats associated with ridge structures.**

2.3.4 Habitats and species of specific concern

Those species and habitats of special interest for the Mid-Atlantic Ridge (north of the Azores)-MPA, which could also give an indication of specific management approaches, are listed at Annex 1.

3. Status of the location

The designated area has been designed to be located beyond the limits of national jurisdiction of the coastal states in the OSPAR Maritime Area.

However, on 11 May 2009 the Portuguese Republic has submitted to the Commission on the Limits of the Continental Shelf (UN CLCS), information on the limits of the Portuguese continental shelf beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured, in accordance with Article 76, paragraph 8, of the Convention of the Law of the Sea. These claims submitted by Portugal – if approved by the UN CLCS - would encompass the seabed in the area of the Mid-Atlantic Ridge north of the Azores MPA.

The water column in the area of the MAR north of the Azores MPA is located beyond the limits of national jurisdiction of the coastal states in the OSPAR Maritime Area. The international legal regime that is applicable to this area is comprised of, *inter alia*, the UNCLOS, the Convention on Biological Diversity, the OSPAR Convention and other rules of international law. This regime contains, among other things, rights and obligations for states on the utilization, protection and preservation of the marine environment and the utilization and conservation of marine living resources and biodiversity as well as specifications of the competence of relevant international organizations.

4. Marine region

OSPAR Marine Region V; Atlantic Ocean

5. Biogeographic region

Atlantic Subregion: North Atlantic province; Warm-temperate Waters

6. Location

The marine protected area is located on the Mid-Atlantic Ridge within OSPAR Maritime Region V in the sub-tropical North Atlantic. It is situated south of the major biogeographic divide along the Mid-Atlantic Ridge, the Charlie-Gibbs Fracture Zone, and north of the Azores archipelago (Figure 1).

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[9] *Lophelia pertusa* is present, although reef structures have not yet been confirmed in the designated area.

The co-ordinates of the marine protected area boundaries are:

Latitude	Longitude
43.30°N	24.80°W
43.30°N	32.30°W
44.70°N	32.30°W
44.70°N	24.80°W

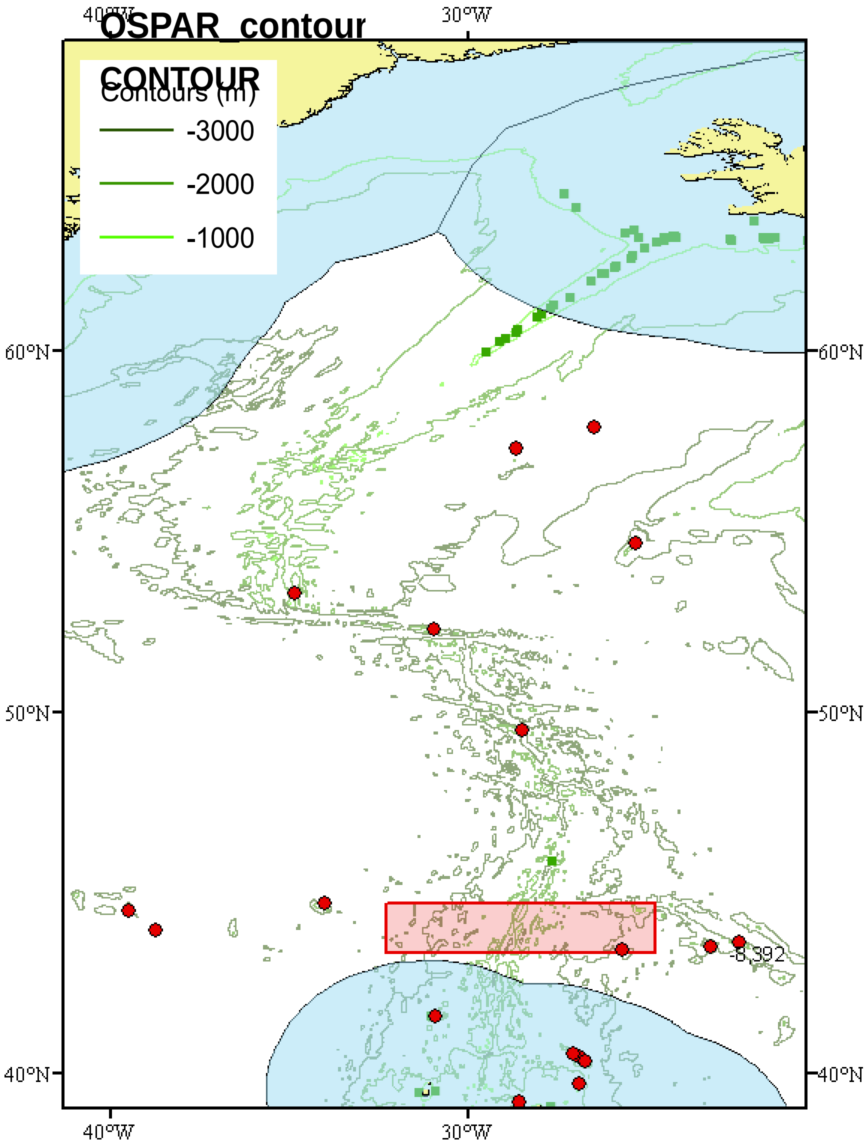

Figure 1. Location of the marine protected area on the section of the Mid-Atlantic Ridge between the Azores and Charlie-Gibbs Fracture Zone. Light blue shaded areas represent the Exclusive Economic Zones of nearby coastal states. Red circles are the known locations of major seamounts in the OSPAR Maritime Area. Green squares are the current records for *Lophelia pertusa*.

This designation was made alongside a proposal for a marine protected area on Reykjanes Ridge. Together these two marine protected areas will complement existing proposals made by WWF, the Netherlands, Portugal and the University of York for a marine protected area around the Charlie-Gibbs Fracture Zone area of the Mid-Atlantic Ridge (Figure 2). Following a scientific meeting at ICG-MPA 2008 it was agreed that such proposals would represent the different biogeographic regions found over the Mid-Atlantic Ridge in Areas Beyond National Jurisdiction in the OSPAR area. The marine protected areas are intended to represent the range of species and habitats across the Mid-Atlantic Ridge, and incorporates a range of depths from 1000m to approximately 2500m (Figure 1). The boundaries of these (candidate) MPAs enclose areas of habitat important to a wide variety of species living from the seabed to the surface layers.

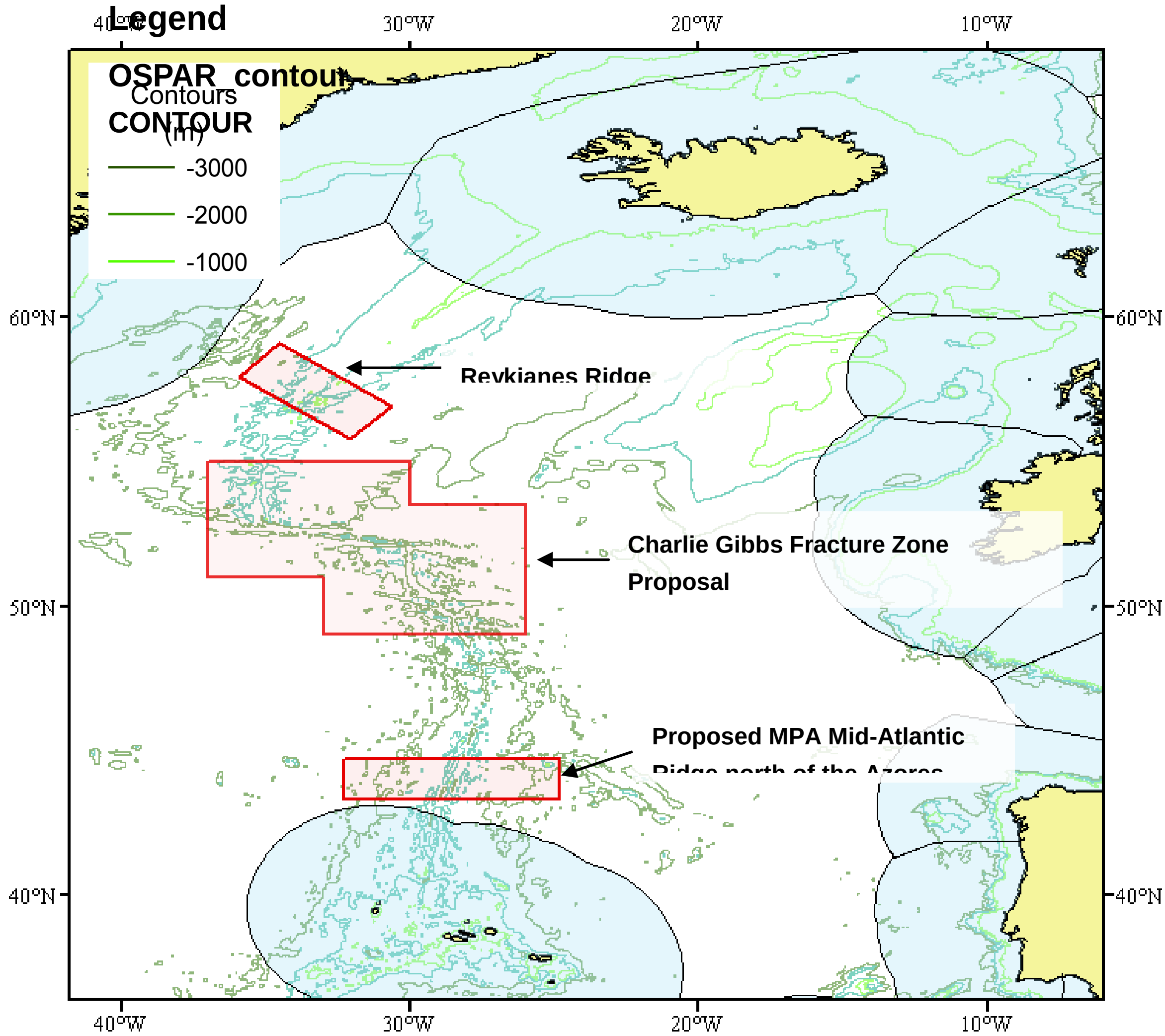

Figure 2. *The three areas of the Mid-Atlantic Ridge within the OSPAR Maritime area proposed and or designated as marine protected areas representing the three main biogeographical regions found during the MAR-ECO investigations. Light blue shaded areas represent the Exclusive Economic Zones of coastal states.*

7. Size

93 568km^2

8. Characteristics of the area

The Mid-Atlantic Ridge is a range of underwater mountains and valleys that separates the Eurasian from the American plate as an active seafloor spreading centre (Dinter 2001; Heger *et al* 2008). It stretches from Arctic waters through the entire length of the Atlantic Ocean, essentially dividing the Atlantic into two equal parts (Bergstad *et al* 2008a). Within the OSPAR maritime area it separates the Newfoundland and Labrador basins from the West-European basin, and the Irminger from the Iceland basins (Dinter 2001). The southern section of the Mid-Atlantic Ridge within the OSPAR area has no connection to a major land mass, unlike the Reykjanes Ridge, but the Azores archipelago constitutes a significantly more shallow area (Bergstad *et al* 2008b).

The dominant water masses over the Mid-Atlantic Ridge between Iceland and the Azores show three different hydrographic regimes (Pierrot-Bults, 2008; Søiland *et al* 2008). These regimes basically divide the pelagic environment into cold, sub-polar conditions north of the Sub-Polar Front; warm, sub-tropical conditions south of the Sub-Polar Front; and the frontal region itself which blends the characteristics of both areas (Søiland *et al* 2008). The Sub-Polar Front, is a mobile oceanographic feature which is usually found just south of the Charlie-Gibbs Fracture Zone (Søiland *et al* 2008). The faunal assemblages along the Mid-Atlantic Ridge from Iceland to the Azores appear to be determined by these major water masses. For example, Doksæter *et al* (2008) found that white-sided dolphins and to a certain degree pilot whales inhabited areas dominated by cold, sub-arctic water, whereas common and striped dolphins were found in the warmer, sub-tropical waters. Not only does species composition of dolphins change between these two water masses, but abrupt changes are also seen in fish, cephalopods and zooplankton (Hareide & Garnes, 2001, Bergstad *et al* 2008b, Doksæter *et al* 2008, Fossen *et al* 2008, Gaard *et al* 2008, Sutton *et al* 2008). This pattern suggests that the Sub-Polar Front acts as a barrier to many taxa at several trophic levels (Doksæter *et al* 2008).

The three different biogeographical regions of the Mid-Atlantic Ridge have been studied by the MAR-ECO project (see Scientific Value criterion for further information) in their field work, by targeting three clear areas in the northern, southern and Charlie-Gibbs Fracture Zone regions. Results from the MAR-ECO project have been presented in two special journal editions (Deep-Sea Research II and Marine Biology Research). A significant amount of new information has been gathered about the Mid-Atlantic Ridge through this project. For example, when the area between the Charlie-Gibbs Fracture Zone and the Azores was sampled, *Rajella pallida* (Pale ray) was caught, providing the first record of this species for this area (Orlov *et al* 2006). Two newly born individuals of *Rajella bigelowi* (Bigelow"s ray) were also captured, indicating that the central Atlantic is part of their spawning ground (Orlov *et al* 2006). Fourteen specimens of *Amblyraja jensei* (Jensen"s skate) were recovered, which until this study were not known in the open waters of the Atlantic, and with other new data has suggested a continuous distribution for this species across the Atlantic (Orlov *et al* 2006).

In terms of the benthic community, the Mid-Atlantic Ridge provides a significant amount of hard substrate in the open ocean of the OSPAR area (Dinter, 2001). In addition the hydrographic conditions over the Mid-Atlantic Ridge are thought to be favourable for sessile suspension feeders such as cold-water corals (Mortensen *et al* 2008). During ROV dives on an area of the Mid-Atlantic Ridge just south of the MPA area, Mortensen *et al* (2008) observed 28 different coral taxa (including *Lophelia pertusa*). Of those, seven were unique to the area (*Madrepora oculata, Solenosmilia variabilis, Stephanocyathus moseleyanus, Scleroptilum grandiflorum,* and three *Radicipes* species), as compared to sample sites around and north of the Charlie-Gibbs Fracture Zone (Mortensen *et al* 2008). The number of megafaunal taxa was higher in areas with coral than those without, a finding common to other regions (Mortensen *et al* 2008). At one of the sampling stations, north of this area a pelagic trawl was found lying over coral rubble, indicating that fishing has occurred and had an impact (Mortensen *et al* 2008). The data collected by Mortensen *et al* (2008) were too limited to draw firm conclusions about the geographical distribution of coral taxa on the Mid-Atlantic Ridge. However, it does suggest corals are present within the area.

The Mid-Atlantic Ridge between the Charlie-Gibbs Fracture Zone and the Azores archipelago has the highest concentration of seamount features on the Mid-Atlantic Ridge (Epp & Smoot, 1989). Hareide & Garnes (2001) studied the summit living species of seamounts along the Mid-Atlantic Ridge, they found that the dominant deep water fish species changed with latitude. Sub-tropical species such as Golden-eye perch (*Beryx splendens*) and Cardinal fish (*Epigonus telescopus*) dominated the seamount summits in the area between the Azores and the Charlie-Gibbs Fracture Zone, and sub-polar species dominated those north of the Charlie-Gibbs Fracture Zone (Hareide & Garnes, 2001). Seamounts are recognised in many different fora as being vulnerable to the effects of fishing pressure (e.g. UN, OSPAR, FAO, NEAFC, NAFO, UNEP). The area here is designated not on the basis of the presence of seamounts, but as a representative section of the Mid-Atlantic Ridge habitat between the Azores and the Charlie-Gibbs Fracture Zone. However, the presence of seamounts within the area was also considered significant in justifying protection for a particularly vulnerable ecosystem.

Fossen *et al* (2008) sampled the Mid-Atlantic Ridge between Iceland and the Azores in 2004 as part of the MAR-ECO expedition. In total 59 long-lines were set across the ridge axis at depths ranging from 400 to 4300 metres (Fossen *et al* 2008). Chondrichthyans (sharks, rays and chimaeras) dominated the catches overall, which was expected given the gear used (Fossen *et al* 2008). The southern sample station (in the vicinity of this marine protected area) produced fish that were significantly larger than either of the other sample stations (Fossen *et al* 2008). The catches from here were mainly dominated by large chondrichthyans and at deeper stations, the large cusk eel (*Spectrunculus* spp.) (Fossen *et al* 2008). This pattern may indicate a more fundamental difference in production and biomass compared to other parts of the Mid-Atlantic Ridge, however the data available was not enough for a more detailed study (Fossen *et al* 2008).

Of the large shark species along the Mid-Atlantic Ridge *Centrophorus squamosus* and *Centroscymnus coelolepis* were both caught only in the area just north of the Azores (Fossen *et al* 2008). These two species have been recently accepted by OSPAR for inclusion on the OSPAR list of Threatened and/or Declining Species and Habitats by BDC/MASH 2007. The fact that this marine protected area is the only part of the Mid-Atlantic Ridge in which these species were caught during the most recent investigations, indicates that it may be important as representative habitat in the OSPAR area. It is also likely that other deep-water shark species will be included on the OSPAR List of Threatened and/or Declining Species and Habitats in the future given their life-history characteristics and their vulnerability to fishing impacts. The International Union for the Conservation of Nature (IUCN) Shark Specialist Group has assessed the threatened status of deepwater sharks globally. It concluded that all deepwater chondrichthyan species have limited productivity and therefore should be considered as having limited ability to sustain high levels of fishing pressure and will be slow to recover from overfishing (Kyne & Simpfendorfer, 2007).

Among birds, Cory‟s shearwater (*Calonectris diomedea*) breeding in the Azores have been shown to forage over this region of the Mid-Atlantic Ridge (Magalhaes *et al*, 2008). This species performs a dual-foraging strategy that combines short and long foraging trips. The majority of short trips were confined to the Mid-Atlantic Ridge just north of the Azores (within about 300km) (Magalhaes *et al*, 2008). The core foraging areas for long-trips were areas of the Mid-Atlantic Ridge further north, including the designated area (Figure 3: Magalhaes *et al*, 2008). It appears that no birds make foraging trips south of the Azores, which Magalhaes *et al* (2008) suggest indicates that the Mid-Atlantic Ridge south of the Azores is less productive than that to the north. This section of the Mid-Atlantic Ridge, north of the Azores, is thought to have enhanced productivity in comparison to other open ocean areas, resulting from nutrient rich upwellings and eddies, particularly in the vicinity of seamounts. Seamounts as described above are found in high concentrations on the Mid-Atlantic Ridge between the Azores and Charlie-Gibbs Fracture Zone (Epp & Smoot, 1989; Gubbay, 2003; Magalhaes *et al* 2008). The breeding colony of Cory‟s shearwater found on the Azores represents more than 70% of the total breeding population of the Atlantic subspecies *C. diomedea borealis* (50,000 – 90,000 breeding pairs). There has been concern raised over the incidental mortality of adults in longline fisheries of the Mediterranean and Macaronesia, which consists of the Canary Islands, the Azores archipelago, and Madeira all found in the North-East Atlantic just to the west of the Straits of Gibraltar (Cooper *et al* 2003, Gonzales-Solis *et al* 2007, Magalhaes *et al* 2008). Therefore the breeding adults foraging over the Mid-Atlantic Ridge may interact with fisheries in this area and be vulnerable to long-line gear (Magalhaes *et al* 2008).

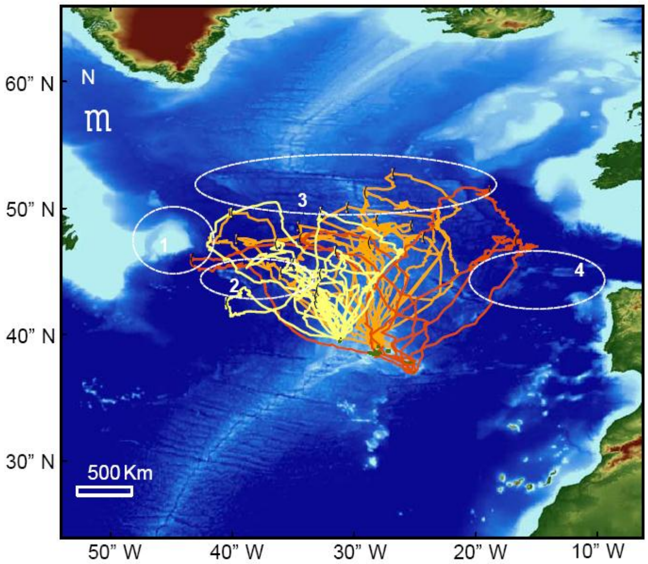

Figure 3. *Foraging ranges and destinations of long trips (5-18 days) of breeding Cory's shearwater (*C. diomedea*) from three islands in western (yellow), central (orange) and eastern (red) Azores. Circles mark maximum ranges for individual foraging trips. Oceanographic features: 1. Flemish Cap; 2. Milne Seamounts; 3. Charlie-Gibbs Fracture Zone; 4. Charcot Seamounts. Sea depths: pale <1000m; medium 1000 – 2000m; dark blue >2000m. Reproduced from Magalhaes et al (2008)*

B Selection criteria

1. Ecological criteria/considerations

1.1 Threatened and/or declining species and habitats

The designated area includes seamount habitats and potentially *Lophelia pertusa* reefs, which are listed as priority threatened or declining habitats by OSPAR (OSPAR Commission 2003). It includes cold water coral and seamount habitats that qualify as Vulnerable Marine Ecosystems in relation to high seas fisheries according to criteria developed by FAO (FAO 2007, Rogers *et al*, 2008). It also contains seamount communities and coral aggregations, habitats listed as examples of ecologically or biological significant marine areas according to criteria developed by the CBD for identifying candidate sites for protection on the high seas (UNEP 2007).

In addition to the above listed habitats there are records of *Centrophorus squamosus* and *Centroscymnus coelolepis* being caught within the marine protected area (Fossen *et al* 2008). Both of these shark species have been accepted by OSPAR for inclusion on the OSPAR list of Threatened and/or Declining Species and Habitats by BDC/MASH 2007.

1.2. Important species and habitats

As noted above, the designated area includes habitats and species which are listed as priority threatened or declining habitats by OSPAR (OSPAR Commission 2003).

The Mid-Atlantic Ridge plays a pivotal role in circulation of water masses within the OSPAR Maritime Area and the whole North Atlantic (Rossby, 1999; Bower *et al* 2002; Heger *et al* 2008; Søiland *et al* 2008). The complex hydrographic setting around the Mid-Atlantic Ridge in general and the presence of the ridge itself leads to enhances vertical mixing and turbulence that results in areas of increased productivity over the Ridge (Falkowski *et al* 1998; Heger *et al* 2008; see also Ecological Significance (B3) criterion below). The Sub-Polar Front (usually found around the Charlie-Gibbs Fracture just south of 52^{o}N) acts to separate the turbulent, nutrient-rich, cool waters to the north and the stratified-nutrient-poor warm waters in the southern part of the North Atlantic (Richardson & Schoeman, 2004; Opdal *et al* 2008). Fish biomass on the section of the Ridge between the Azores and the Charlie-Gibbs Fracture Zone is thought to be sustained by zooplankton advection over the Ridge, rather than local nutrient enrichment and/or phytoplankton production (Rogers, 1994; Opdal *et al* 2008).

Ecologically the Mid-Atlantic Ridge (like all mid-ocean ridges) is fundamentally different from both isolated seamounts surrounded by deep-ocean and continental slopes where effects of coastal processes are pronounced (Opdal *et al* 2008). The Ridge provides the only extensive hard substrate habitat available for benthic suspension feeders off the continental shelves and the isolated seamounts provide suitable habitats for benthic or benthopelagic species. In addition the topography of the Ridge strongly shapes the habitat characteristics in the water column, through its effects on currents (see e.g. Opdal *et al* 2008).

The marine protected area is in sub-tropical waters and the species present reflect this. The MPA offers protection to representatives of this distinctive group of species.

1.3. Ecological significance

Important Feeding Area

The designated area is part of the Mid-Atlantic Ridge used as core foraging area by breeding Cory‟s shearwater (C. diomedea) from the Azores (see Fig 3; Magalhaes et al 2008). The breeding pairs found on the Azores make up >70% of the total breeding population of the Atlantic subspecies *C. diomedea borealis* (Magalhaes *et al* 2008). Therefore a significant amount of this population relies on this area as foraging habitat. There is also concern over this species incidental mortality with longline fishing gear (Magalhaes *et al* 2008).

Biological Productivity

The complex hydrographic setting and the physical presence of the Mid-Atlantic Ridge leads to enhanced vertical mixing and turbulence (Falkowski *et al* 1998; Mauritzen *et al* 2002; Heger *et al* 2008), resulting in areas of increased natural biological productivity (Falkowski *et al* 1998; Heger *et al* 2008). Recent work as part of the MAR-ECO project found that the abundance of deep bioluminescence (indicative of high biomass of water column fauna) was significantly higher at a southern sample station (in the vicinity of the designated area) as compared to a reference site (Sub-Polar Frontal Zone) (Heger *et al* 2008). The surface layers of the reference site exhibited lower abundance. This raised abundance seen in the deeper layers may be a result of a change in faunal composition south of the Sub-Polar Front (Heger *et al* 2008).

Observations from the MAR-ECO project showed that surface chlorophyll concentrations, zooplankton abundance and meso- and bathypelagic nekton density were considerably higher in the cool waters to the north of and in the frontal zone compares with the warmer southern waters (Bergstad *et al* 2008b, Sutton *et al* 2008, Gaard *et al* 2008, Opdal *et al* 2008). Therefore in comparison to the rest of the Mid-Atlantic Ridge the designated area does not exhibit outstandingly high biological productivity. However, as a representative section of the Mid-Atlantic Ridge in warm temperate waters, with the presence of sub-tropical species assemblages it is likely to exhibit a higher biological productivity of these features than the surrounding open ocean.

Important Nursery/Juvenile/Spawning Area

The capture of two juvenile *R. bigelow* (Bigelow"s Ray) indicates that the central Atlantic is part of this species spawning ground (Orlov *et al* 2006). The specimens collected by Orlov *et al* (2006) were morphologically different from specimens from other areas, suggesting the possibility of a local population of this ray.

1.4. High natural biological diversity

The Mid-Atlantic Ridge between the Azores and Iceland has until recently been relatively unexplored (Hareide & Garnes, 2001; Bergstad *et al* 2008a). However, since 2001 it has been subject to scientific investigation from a consortium of scientists in the form of the MAR-ECO project (Bergstad *et al* 2008). This has provided a great amount of new data about the ridge ecosystem and the species and habitats that occur there. However, the data are insufficient to make comparisons with other mid-ocean ridges or other areas such as isolated seamounts, continental slopes and island slopes. The Mid-Atlantic Ridge is the main hard substrate within the middle of the Atlantic and as such increases the diversity of habitats and niches available to be exploited. Demersal fish along the Mid-Atlantic Ridge show a concentration of biomass and numbers near the summit of the ridge, declining with depth, together with an associated depth-related change in species composition (Bergstad *et al*., 2008). This indicates the importance of protecting a variety of depth zones to encompass as diverse species richness and biomass as possible. The designated area incorporates examples of shallower ridge environments, surrounding abyssal plains, open ocean ecosystems and a seamount. Together these will enhance the variety of species that can be protected here.

1.5. Representativity

The designated area is considered to be representative of the area of the Mid-Atlantic Ridge south of the Sub-Polar Front. This area is described as being the warm sub-tropical section of the Mid-Atlantic Ridge within the OSPAR area (Bergstad *et al* 2008b, Søiland *et al* 2008). A previous proposal has focused on the Charlie-Gibbs Fracture Zone area, including the Sub-Polar Front as an area of high productivity and the area with the biogeographic divide between the northern and southern Mid-

Atlantic Ridge populations (Figure 2). Alongside this proposal an area of the Reykjanes Ridge (i.e. the northern cold section of the Mid-Atlantic Ridge) is proposed (Figure 2). Combined these three proposals are thought to protect representative sections of all of the biological communities and oceanographic processes found on the Mid-Atlantic Ridge in the OSPAR area (Figure 2 and Important Species and Habitats criterion (B1.2)).

1.6. Sensitivity

There is little direct information about the sensitivity of habitats and species in this area. However, when sampling the Mid-Atlantic Ridge Mortensen *et al* (2008) found coral at every location sampled. Cold water corals are particularly vulnerable to damage by fishing gear such as trawl and longline (Koslow *et al*, 2001, Krieger, 2001, Fosså *et al* 2002, Mortensen *et al*, 2005, Mortensen *et al*, 2008). Their recovery from damage is expected to be slow given their extremely slow growth rates, often in the order of <2cm yr^{-1} (Wilson, 1979, Mortensen & Rapp, 1998, Andrews *et al* 2002, Risk *et al* 2002, Mortensen & Buhl-Mortensen, 2005, Gass & Roberts, 2006, Mortensen *et al* 2008).

Deep-water fish species are also known to be highly vulnerable to human exploitation as a result of their life history characteristics, i.e. long-lived, slow growing and low fecundity (e.g. Hall-Spencer *et al*, 2002; Devine *et al*, 2006; Fossen *et al*, 2008). This part of the Mid-Atlantic Ridge was once a significant fishing ground for *Beryx splendens* (alfonsino), a deepwater species, which is described as having a very high vulnerability to fishing by Froese & Pauly (2008). This species has been targeted since the late 1970s. However, in the mid-1990s Vinnichenko (1998) described the population in this area to be commercially extinct. Rapid declines like this, highlight, the vulnerability of such deep-water fish species to the effects of fishing over a relatively short-period of time and also the need to take action to prevent further declines. Some encouragement can be gained from Hariede & Garnes (2001), who reported dense schools of *B. splendens* close to the tops of seamounts within the area, perhaps indicating the potential for recovery, or the presence of less exploited populations.

As inshore fish stocks are depleted and technological advances are made with fishing gear, fishers begin to explore new grounds, even those that have previously been considered unfishable (although recent rises in fuel costs may provide some de facto protection to isolated areas like the Mid-Atlantic Ridge). Importantly scientific investigation lags behind the collapse of deep-sea fisheries and few deep-sea fish species have been evaluated by the International Union for the Conservation of Nature (IUCN) (Devine *et al* 2006). A recent study by Devine *et al* (2006) took catch data from Canadian waters over 1978 – 94. They studied several deep-water fish species and found according to IUCN criteria, the declines seen in these species over Northwest Atlantic continental slopes qualify them as critically endangered for this area (Devine *et al*, 2006). Not only did abundance decline, but there was a decline in the mean size of all six species over the 17-year period of between 25-57% (Devine *et al*, 2006).

Recent investigations of this section of the Mid-Atlantic Ridge during the 2004 R.V. *G.O. Sars* expedition (as part of MAR-ECO) studied the distribution patterns of deep-water fish (Bergstad *et al* 2008b). The most abundant species caught included *Coryphaenoides armatus* (Abyssal grenadier), *C. leptolepis* (Ghostly grenadier), *C. mediterraneus* (Mediterranean grenadier), *Halosauropsis macrochir* (Abyssal halosaur), *Rouleina attrita* (Softskin smooth-head) and *Synaphobranchus affinus* (Grey cutthroat). All of these species are described by Froese & Pauly (2008) as deep-water species that have high to very high vulnerability to adverse impacts from exploitation based on their life-history traits.

Chondrichthyan fishes, including deep-water sharks and rays, have life history characteristics that include slow-growth, late maturity and a low reproductive output, all of which render them vulnerable to rapid population decline from exploitation (Kyne & Simpfendorfer, 2007). In recognition of their sensitivity to human impact *C. squamosus, C. coelolepis* and *Centrophorus granulosus* (Gulper shark, not recorded in the designated area) have all been accepted by OSPAR for inclusion on the OSPAR list of Threatened and/or Declining Species and Habitats by BDC/MASH 2007. A recent assessment conducted by Gibson et al. (2008) states that 26% of chondrichthyan fishes known to occur within the North-east Atlantic are threatened („Critically Endangered" - 8 species; „Endangered" - 8 species; „Vulnerable" - 14 species) while 20% are classed as being „Near Threatened". In addition, 31 species are defined as being „Data Deficient" however this group may contain some of the most threatened chondrichthyans (Gibson et al., 2008). Of the 116 species found within the North-east Atlantic, several have a globally restricted range and nine are wholly endemic to the region (Gibson et al., 2008).

Few fisheries actively target commercially valuable chondrichthyans and all those that do are now in decline as a result of the reduced availability of stocks rather than falling market values (Gibson et al., 2008). However at present, two major types of fisheries conducted in the wider Atlantic take chondrichthyans including high seas pelagic and deep-water fisheries (Hareide et al. 2007). Until recently, the total landings of chondrichthyans in the North-east Atlantic have remained relatively stable, fluctuating around 100,000 t (Gibson et al., 2008). Since 2000 landings have significantly declined to ~51,000 t in 2006 (Gibson et al., 2008). There are currently no international catch limits for Northeast Atlantic chondrichthyans (Gibson et al., 2008) and consequently they are offered little protection from fishing activities.

Trade and landings data for deep-water sharks in general, are lacking and many deepwater species are taken as bycatch, often discarded or landed under generic species codes such as „shark" or „other", making investigations about the status of stocks difficult at best (Kyne & Simpfendorfer, 2007). However, both *C. squamosus* and *C. coelolepis* were caught using longlines within the designated section of the Mid-Atlantic Ridge during the 2004 MAR-ECO field investigations (Fossen *et al* 2008). The dominant shark species caught within the marine protected area was *Entmopterus princeps*, along with other squaliform shark species (Fossen *et al* 2008). As compared to parts of the Mid-Atlantic Ridge sampled further north of this area was dominated by large chondrichthyans that were mainly caught at shallower stations (Fossen *et al* 2008). Therefore any fishing using long-lines within the area is likely to capture these vulnerable species.

1.7. Naturalness

The deep-water fisheries of the wider Atlantic (OSPAR area V) are relatively poorly described (ICES, 2008b). The deep-water bottom-trawl fisheries are mainly concentrated around the Rockall and Hatton Bank, the Mid-Atlantic Ridge and to the west of the Azores, indicating the potential for the designated area to be, if not already, targeted by fishers (ICES, 2008b). Gear damage can be high in many of these fisheries (ICES, 2008b) demonstrating the difficulty of fishing these areas even with rockhopper trawls due to the presence of structurally complex environments.

Fishing with bottom gears has been conducted on the Mid-Atlantic Ridge and adjacent seamounts since at least 1973. There have also been exploratory efforts made by a range of nations in the following decades (For example Pechenik & Troyanovskii, 1971; Danke, 1987; Magnusson & Magnusson, 1995; Draganik *et al* 1998; Vinnichenko, 1998; Magnusson *et al* 2000; Hareide & Garnes, 2001; Muňoz, 2001; Kukuev, 2004; Gerber *et al* 2006; ICES, 2007, 2008). The Mid-Atlantic Ridge just north of the Azores has over 20 seamounts with a depth less than 1000m, which have been intensively fished over the last three decades (Clark *et al* 2007; ICES, 2008a). It is likely that all fishable hills/peaks in this region with a summit depth of 1500m or less have been either explored or exploited commercially at some point in the last few decades (Clark *et al* 2007). However, bottom trawling on the Mid-Atlantic Ridge in this area has been described as „difficult", with surveys indicating that that the area is unlikely to have been subjected to intensive bottom trawling in the past (Hareide & Garnes, 2001).

In addition there has also been pressure on some epi- and mesopelagic fish species that are associated with these seamounts (WGDEC 2008). Throughout the 1970s and 1980s tuna were regularly taken by Soviet research and exploratory vessels from seamounts between 43° and 52°N (WGDEC 2008). Albacore (*Thunnus alalunga*) was taken most frequently with catch rates as high as 20t/haul (Clark *et al* 2007; WGDEC 2008). Swordfish (*Xiphias gladius*) and Bluefin tuna (*Thunnus thynnus*) were also found (Clark *et al* 2007). In addition, Portuguese vessels operate surface longline fisheries targeting swordfish around the Azorean EEZ and are able to conduct trips of a month or longer as they have freezing capabilities on board (ICES, 2008b). However, as these fisheries have little impact on the benthic community the ICES Working Group on Deep Water Ecology (2008a) states that they „are of little concern at present", at least to bottom living species in the deep sea.

The ICES Working Group on Ecosystem Effects of Fishing Activities lists the two most critical issues regarding the impact of fisheries as: „trends in commercial fish stocks" and „physical disturbance of the sea bottom and related impacts on benthic communities and habitats", although other impacts are detailed (ICES, 2008b). The Mid-Atlantic Ridge populations of alfonsinos of the OSPAR region are known to have been significantly depleted in the 1970s (Vinnichenko, 1998; Froese & Pauly, 2008) although there is evidence indicating their recovery (Hariede & Garnes, 2001; ICES, 2008c). ICES (2008b) identifies that the primary priority within the wider Atlantic is to continue to improve the management of fisheries and to continue to investigate the area in order to identify vulnerable marine ecosystems.

In terms of the naturalness of the designated area, it is clear that fishing activity has been on-going for at least three decades. This may not have been at an intensity comparable to inshore fishing grounds, due to the high risk and running costs associated with offshore, deep-water fishing (Hareide & Garnes 2001; WGDEC 2008). However, it is certain to have had some impact on pelagic and deep-water communities of this area, especially those on and around the shallower seamounts. Therefore the area is by no means pristine, however given its location in the middle of the Atlantic it can be assumed that it is in a more natural state than ecosystems around populated coasts in terms of pollution and physical degradation.

2. Practical criteria/considerations

2.1. Potential for restoration

The effect of past anthropogenic disturbance has not been quantified, therefore it is difficult to determine the potential the designated area has for restoration. Indeed it is not known what the ecosystem prior to any human disturbance was like giving no baseline to measure restoration against. What is known is that deep-water species tend to have life history characteristics that make their recovery slow (e.g. long-lived, slow growing, low fecundity). Therefore recovery of any depleted populations such as alfonsino or cold-water corals is likely to take a considerable amount of time (decades at least). The designation of a marine protected area in this location will help prevent any further damage to the ecosystem and also allow it to begin recovering from historical damage.

2.2. Degree of acceptance

Fisheries on the Mid-Atlantic Ridge have additional difficulties and increased commercial risk associated with them as compared to those on the continental shelf and slope (WGDEC 2008). Many of the seamounts that are targeted by fishing vessels are in offshore areas quite far from coastlines (WGDEC 2008). Therefore large fishing vessels with high running costs are required (WGDEC 2008). In addition to this catches and catch rates have shown large fluctuations and fishing operations can be hard because of rugged bottom topography, complex water circulation and the unpredictability of fish concentrations (Hareide & Garnes 2001; WGDEC 2008). This area of the Mid-Atlantic Ridge was once significant fishing ground for alfonsino until described as commercially extinct to ICES (Vinnichenko, 1998) However, fishing for alfonsino was resumed in 1999 – 2000 (ICES, 2008c) indicating that recovery is possible with a reduction in fishing effort. At present, it is thought to be unlikely that major fisheries occur in the designated area. Recent work mapping existing fisheries areas in the NEAFC Regulatory Area supports this, indicating that no fishing activity from Russian or Icelandic vessels is currently occurring in this area (Figure 4) (NEAFC, 2008). Consequently, the level of acceptance from the fishing community may be relatively high.

This MPA is designated as a representative section of the Mid-Atlantic Ridge between the Azores and the Charlie-Gibbs Fracture Zone. It was agreed at ICG-MPA 2008 by scientists that have worked on the Mid-Atlantic Ridge and OSPAR contracting parties, that representing the biogeographic areas of the Mid-Atlantic Ridge by three separate marine protected areas was appropriate. As one of these marine protected areas the level of acceptance in the scientific community and by OSPAR contracting parties is also likely to be high.

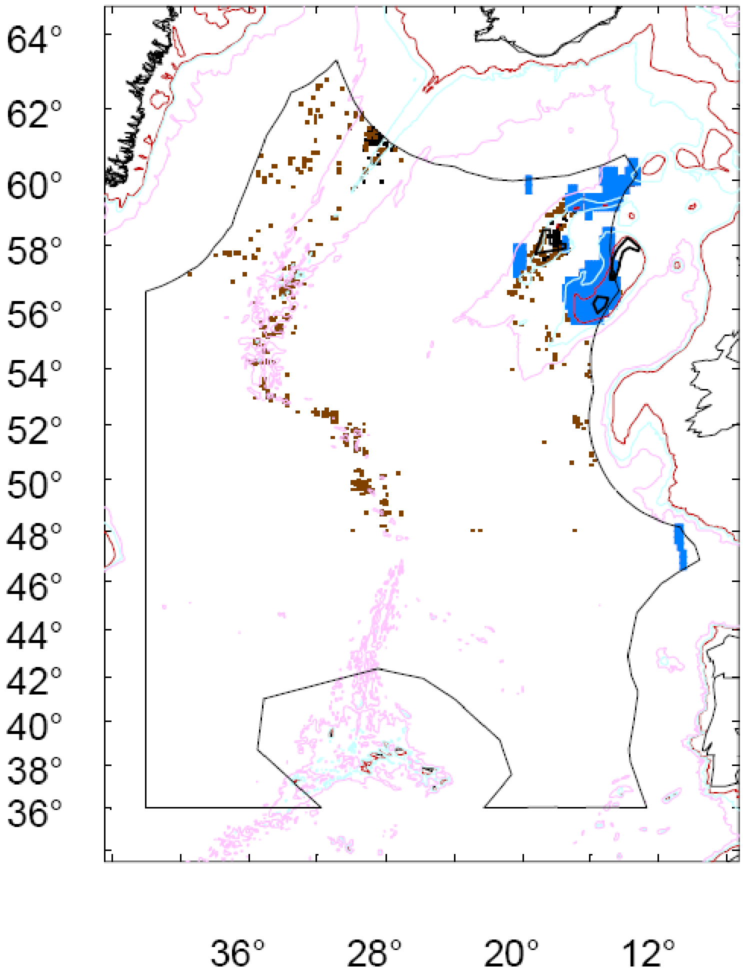

Figure 4. Existing fisheries areas in the NEAFC Regulatory Area based on Icelandic and Russian VMS data (1987 – 2007) and the NEAFC VMS database (2005 – 2007). Brown areas indicate Russian data (all gears), black refers to Icelandic data (all gears) and blue areas show the location of the main effort. Note that VMS data from the northern Reykjanes Ridge area are excluded. The deadline for submission of VMS data from all Contracting Parties is 1st September 2009 after which more comprehensive existing fishing areas will be mapped. Source: NEAFC (2008)

2.3. Potential for success of management measures

On the one hand, high seas marine protection will be more difficult to implement than in places closer to land, where patrols and enforcement measures can be easily administered. However, on the other hand, protection may be easier to achieve because the number of users of the areas are much more limited, and their activities can be monitored remotely and in a cost-effective way by Vessel Monitoring Systems and satellites (Kourti *et al.*, 2001; Marr and Hall-Spencer, 2002; Deng *et al.*, 2005; Kourti *et al.*, 2005; Murawski *et al.*, 2005; Davies *et al*, 2007; Rogers *et al*, 2008). The challenge will be to bring illegal and unregulated fishing under control, which is known to take place around seamounts north and south of the Azores (Morato *et al*, 2001).

Any management or enforcement of fisheries will be the responsibility of NEAFC, and their cooperation will be needed. Existing NEAFC fisheries closures on the Altair, Faraday and Antialtair seamounts have failed to prevent fishing activity, with VMS data showing an increase in the level of bottom fishing effort (ICES, 2007a). However, in the subsequent year after the closure of part of the Reykjanes Ridge no effort was observed indicating that the closure of the area was effective in proving protection from fishing activities (ICES, 2007a). This indicates that while effective enforcement must be carried out, high seas marine protected areas can offer significant protection to areas.

2.4. Potential damage to the area by human activities

Bottom trawling on the Mid-Atlantic Ridge in this area has been described as difficult by Hareide & Garnes (2001). They found that in more than 90% of tows the trawling gear had to be freed from the seabed (Hareide & Garnes, 2001). This indicates that the area is unlikely to have been subjected to intensive bottom trawling in the past. However, seamount summits, particularly those shallower than 1000m within the vicinity of the designated area have been targeted over the years. In addition other gear types (i.e. longline and pelagic trawl) may be used over the Ridge itself. Indeed Mortensen *et al* (2008) found a net probably from a pelagic trawl lying over coral rubble in an area just south of this area, suggesting that fishing with pelagic gear has occurred. It is likely that as inshore fish stocks are depleted and technological advances are made with fishing gear, fishers will move to new grounds, even those that have previously been considered unfishable (although rises in fuel costs may provide some *de facto* protection to isolated areas like the Mid-Atlantic Ridge).

There is no information regarding bioprospecting and the mining of minerals in the designated area. There are several un-named seamounts within the area and seamounts may in the future be targeted by mining operations for their cobalt crusts (Probert, 1999). There is no information about the presence of such valuable minerals in the marine protected area. The removal of habitat and release of sediment by mining can be expected to heavily impact the benthic fauna and their predators (Rogers, 2004). Currently bioprospecting of deep-ocean habitats is likely to focus on hydrothermal vent areas rather than seamounts (Glowka, 2003; Synnes, 2007) and cannot be categorised as a threat to the designated areas at this time

No tourist activity is reported for the area, and it is unlikely that a tourist industry will emerge in the near future.

The Mid-Atlantic Ridge has also been subject to scientific research, which has included trawling and other extractive methods since the beginning of the first field phase of the MAR-ECO project in 2003. These impacts cover a very small area relative to the expanse of the habitat.

It is not envisaged that the designated area would interfere with ship passage unless it is shown to be important as an aggregation area for endangered cetaceans that could be threatened by vessel strikes

No information regarding cable laying operations in the area is available.

2.5. Scientific value

Mid-ocean ridges are vast features of all oceans (Heger *et al*, 2008; Hosia *et al*, 2008). Despite their importance, their fauna and ecological significance remain poorly understood, mainly because ridge studies in the past have concentrated on chemosynthetic ecosystems (Bergstad *et al*, 2008a). The Mid-Atlantic Ridge between the Azores and Iceland has until recently been relatively unexplored (Hareide & Garnes, 2001; Bergstad *et al* 2008a). However, since 2001 it has been subject to scientific investigation from a consortium of scientists in the form of the MAR-ECO project (Bergstad *et al* 2008). This project falls under the remit of the Census of Marine Life (CoML) and has already undergone a field phase (2003 – 2005), which yielded major new data sets (Bergstad *et al* 2008a). Further research cruises have been conducted since this initial field phase and more still are planned. The continued research focusing on the whole of the Mid-Atlantic Ridge illustrates its scientific value.

Our knowledge of mid-ocean ridges is sparse at best, even with the MAR-ECO project ongoing many questions remain unanswered or partially answered (Bergstad *et al*, 2008a). Ongoing monitoring and research is required, but as with any research is very expensive (Hall-Spencer *et al*, 2002). The vulnerability of the deep-sea to human impacts may mean that much of the diversity that is as yet unknown could be lost before we can catalogue it, unless protected areas, such as this are established quickly (Roberts, 2002).

C. Proposed management and protection status

1. Proposed management

The following actual or potential human activities taking place in the area will or might need regulation through a management plan:

- Deep sea and high seas fishing using fixed and mobile gears (both at the seabed and in the water column)
- Vessel traffic
- Seabed mining or other resource exploitation
- Bioprospecting
- Cable laying
- Military sonar

2. Any existing or proposed legal status

I National legal status (e.g., nature reserve, national park):
N/A Area beyond national jurisdiction

II Other international legal status (e.g., NATURA 2000, Ramsar): None

Presented by
Contracting Party: Portugal (Government of the Azores)
Organisation: Dept of Oceanography and Fisheries, (Contact person: Ricardo Serrão Santos), University of the Azores (on behalf of the Government of the Azores)
Date: 10 May 2010

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Annex 1

Species and habitats of special interest for the Mid-Atlantic Ridge (north of the Azores)-MPA

A. Habitats

Threatened and/or declining Habitats[10]

- Seamounts
- Deep Sea Sponge Aggregations
- *Lophelia pertusa* Reefs[9]
- Coral Gardens

Other Features of special concern

- Deepwater and epipelagic ecosystems, including their function for migratory species
- Habitats associated with ridge structures, including their function as recruitment and spawning areas
- Benthopelagic habitats and associated communities, including commercially fished species
- Hard substrate habitats and associated epibenthos, including cold water corals and sponges
- Soft sediment habitats and associated benthos, including "coral gardens" of non-scleractinian corals

B. Species

Threatened and/or declining Species

- Portuguese dogfish (*Centroscymnus coelolepis*)
- Leafscale gulper shark (*Centrophorus squamosus*)
- Juveniles of loggerhead sea-turtle (*Caretta caretta*)

- **Other Species of special concern**

  - Cetaceans
  - Deep water sharks
  - Pelagic fish (e.g. blue shark (*Prionace glauca*) sword-fish (*Xiphias gladius*)
  - Mesopelagic and bathypelagic fish stocks (e.g. Black scabbardfish (*Aphanopus carbo*), Orange roughy (*Hoplostethus atlanticus*)
  - Oceanic seabirds like Cory Shearwater

[10] According to the OSPAR List of threatened and/or declining Species and Habitats (OSPAR Ref. No.: 2008-6)

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OSPAR's vision is of a clean, healthy and biologically diverse North-East Atlantic used sustainably

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