Title/Name of the area: Meteor

Presented by

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Abstract

Meteor EBSA includes a total of 10 seamounts. The Seamounts are hotspots of marine life and in general they represent areas of an enhanced productivity, especially when compared with nearby abyssal areas. This EBSA has a total area of 134079 km^2 with depths ranging from 265m (top of Atlantis seamount) to 4800m (bottom of Great Meteor seamount). The area presents particular features which make it eligible as an EBSA when assessed against the EBSA scientific criteria. All structures included in the Meteor EBSA fulfill four or more out of the seven EBSA scientific criteria. The Meteor bank is one of the best explored in the world. A total of 437 species are present in this EBSA of which 3,9% are protected under international or regional law. The EBSA area is totally located under Portuguese national jurisdiction, with 9 of the 10 structures located on the extended continental shelf (seabed) and 1 (Pico Sul) is included on the Portuguese EEZ close to Azores.

Introduction

The Meteor EBSA includes a total of 10 seamounts (Atlantis, Cruiser, Hyeres, Irving, Meteor Bank (Great Meteor, Closs and Small Meteor), Pico Sul, Plato and Tyro). These seamounts present particular features which make this area eligible as an EBSA when assessed against the EBSA scientific criteria.

Benthic biological communities on seamounts are highly vulnerable to human activities. Many benthic species are long-lived and slow-growing, and not resilient to human impacts. Seamounts can act as EBSA (Convention on Biological Diversity, 2008).

Seamounts are defined as isolated topographic features of the seabed that have a limited lateral extent and rise more than 1000m from abyssal depths (Menard, 1964). Large seamounts usually originate as volcanoes and are primarily associated with intraplate hotspots and mid-ocean ridges (Staudigel *et al.*, 2010). Generally, seamounts topography may act as an element to turn the structures in high complexity sites. Due to their more or less isolated location, these structures can be an obstacle to the free circulation of the oceans. This gives rise to different kinds of phenomena and disturbances, including an increase in the speed of sea currents, upwellings, turbulence, Taylor cones, eddies, and even jets in the zones where the seamounts interact with ocean currents (Richardson *et al.*, 2000; Kunze & Smith, 2004; White *et al.*, 2007; Pakhorukov, 2008).

Seamounts are hotspots of marine life (*e.g.* Rogers, 1994; Gubbay, 2003; Morato & Pauly, 2004; Pitcher *et al.*, 2007, 2010; Mendonça *et al.*, 2012), and in general represent areas of enhanced productivity in comparison with nearby abyssal areas. In most cases, around the seamounts there is an extensive anticyclonic eddy associated with the lifting of nutrients from the rich deep water, giving rise to high concentrations of nitrates and chlorophyll in shallow waters (Coelho & Santos, 2003), which encourages the development of a wealth of flora and fauna on the structures, leading to exposed hard substrates and improved food conditions for epibenthic suspension feeders (*e.g.* Cartes *et al.*, 2007 a), b); Genin & Dower 2007) such as cold water corals or deep water sponges (*e.g.* Samadi *et al.*, 2007; Sánchez *et al.*, 2008), tunas (*e.g.* Yasui 1986; Morato *et al.*, 2010, Ressurreição & Giacomello, 2013), marine mammals (*e.g.* Cañadas *et al.*, 2002; Correia *et al.*, 2015), and other organisms which apparently feed on prey aggregations (*e.g.* Boehler & Sasaki, 1988; Porteiro & Sutton, 2007; Tabachnick & Menchenina, 2007). Seamounts are biologically distinctive habitats of the open ocean exhibiting a number of unique features (Rogers, 1994; Probert, 1999; Morato & Clark, 2007). These structures can host very distinctive biological communities that are different to the communities on nearby soft sediment dominated abyssal plain, and these particular places may attract pelagic fish including larger, commercially valuable species and other marine top predators such as loggerhead sea turtles (*Caretta caretta*) and marine mammals (*e.g.* Holland & Grubbs, 2007, Kaschner, 2007, Santos *et al*., 2007).

The Meteor EBSA is compounded by a seamount group that is part of Macaronesian region. The EBSA is situated about 1500 km northwest of the African continent and contains ten banks which usually have flat summit plateaus, together with a few lesser seamounts. The complex forms a large volcanic complex in the central North Atlantic Ocean, situated some 700 km south of the Azores (Verhoef, 1984). It is the southernmost of a chain of large seamounts extending south from the Azores Plateau (Figure 1).

All the 10 structures included in the Meteor EBSA fulfill at least four EBSA Criteria. There are differences in the level of knowledge between the structures included in the EBSA but all of them have information. For example the Meteor bank is one of the best explored in the world, and since an expedition in 1998 detailed information on the meiofauna inhabiting its plateau is available for the first time. The Great Meteor resembles isolated "islands" in respect to the colonization by meiofauna. Other seamounts like Atlantis, Hyeres, Irving and Plato have more information than the others (see Table 1) included in the EBSA, due to a greater sampling effort. The majority of the older research was focused on geology.

Table 1 – Resume of the Meteor structures, EBSA scientific criteria fulfilled by each structure (Crit 1 (Uniqueness or rarity), 2 (Special importance for life-history stages of species, 3 (Importance for threatened, endangered or declining species and/or habitats), 4 (Vulnerability, fragility, sensitivity, or slow recovery), 5 (Biological productivity), 6 (Biological diversity) and 7 (Naturalness). Nº sps – total number of species in each structure. Nº refs - total number of references in each structure. n.i. – No information available.

Structures	**Crit 1**	**Crit 2**	**Crit 3**	**Crit 4**	**Crit 5**	**Crit 6**	**Crit 7**	**Nº sps**	**Nº Refs**
Atlantis seamount	√	√	√	√	√	√	√	209	18
Closs seamount	√	√		√	√	√	√	1	1
Cruiser seamount	√		√	√		√	√	29	13
Meteor seamount	√	√	√	√	√	√	√	298	49
Hyeres seamount	√	√		√		√	√	117	20
Irving seamount	√	√	√	√	√	√	√	128	25
Pico do Sul seamount	√		√			√	√	n.i.	n.i.
Plato seamount	√	√	√	√	√	√	√	89	14
Small Meteor	√	√		√	√	√	√	n.i.	n.i.
Tyro seamount	√			√		√	√	18	6

In terms of geology the structures of the proposed area have a different composition, location and different ages.

The shallower parts of the EBSA Meteor are elevated structures and, with the exception of the Atlantis seamount, are oriented roughly parallel to the ridge or to the transform directions, implying a lithospheric control for these volcanic constructions (Gente *et al*., 2003). The seamount with the highest proportion of studies recorded in the Atlantic was the Great Meteor seamount (Kvile *et al*., 2014)

The Meteor bank situated south of the Azores is one of the largest banks in the NE Atlantic with a wide plateau of ∼1500 km2 developed between 400 m and its summit at 275 m water depth. Great Meteor has a volcanic core and is capped by 150-600 m of post-Middle Miocene carbonate and pyroclastic rocks and covered by highly reworked, residual bioclastic sands. During the late Miocene to Pliocene it was levelled by wave truncation (Mironov & Krylova, 2006). Since the Pliocene the summit plateau subsided, probably isostatically, to its present water depth of 275 m, interrupted by eustatic sea level fluctuations during the Plistocene. The Great Meteor is also capped by a sedimentary section around 400 m in thickness (Hinz, 1969). In these areas the sediments are mainly comprised of carbonated biogenic remains, with very low sedimentation rates. For the last 450,000 years, the pelagic sedimentation rate of deep-sea sediments has been calculated to average 0.25–0.6 cm per thousand years (Kuijpers *et al*., 1984; Brandes, 2011). As a tablemount, the bank is covered by reef sediments and debris thereof on the slopes. Seismic reflection and refraction profiles indicate that the

Great Meteor seamount mainly consists of volcanic rock superimposed by a cap of sediments probably consisting of biogenic limestones and calcareous sands (Hinz, 1969; Aric *et al.*, 1970; von Rad, 1974).

Between the geographical coordinates 30°45'N and 32°50'N and around 28°W lies a complex of seamounts coupouded by the Cruiser, Irving and Hyeres, in total the deep is less than 3000 m. Southward of the the Cruiser plateau, the Irving seamount is one of three major volcanic peaks: the Hyeres seamount in the southwest (crestal depth 300 m), the large, flat-topped guyot Irving seamount in the north-central area (265 m) and the Cruiser seamount in the northeast (735 m). These seamount crests are mostly unsedimented (Tucholke and Smoot, 1990).

The most northeastern structure is Cruiser seamount with a maximum height of 590 m below sea level. The seamount rise up to 735 m and its length is about 70 km. Cruiser seamount contains no flat surface (Verhoef, 1984).

Irving seamount is situated at about 32°N/28°W. It rises up to 250 m below sea level and is a tablemount. The general direction of Irving seamount is NW-SE, but due to its oval shape it is difficult to assign a distinct orientation to this seamount. The length of the structure is about 100 km.

Between Irving and Hyeres seamounts we find several structures which are not as shallow as the other seamounts. The directions found here are the same as for the other seamounts inside the complex. Hyeres seamount is the most southwestern structure (Verhoef, 1984).

The Hyeres seamount has a recorded minimum depth of 330 m at 31°20'N/28°50'W. The seismic profiles over Hyeres seamount show no flat surface. Coming from the northwest Hyeres rises up abruptly from the ocean floor. It then seems to divide in two branches in the south-east. Hyeres seamount has a length of about 100 km (Verhoef, 1984).

Inside the complex formed by Cruiser, Irving and Hyeres seamounts, several sedimentary basins are to be found, e.g. between Cruiser and Irving seamounts. On several profiles a sedimentary cover of the seamounts has been recorded, e.g. the profiles over the northwestern part of Irving seamount (Verhoef, 1984).

Plato seamount is aligned in a general E-W direction. It consists of an echelon structure with a WNW-ESE direction. The overall length of Plato seamount is about 110 km, the recorded minimum depth is 580 m. Plato seamount forms the connection with another complex structure, the Atlantis seamount group (Verhoef, 1984).

The Atlantis seamount complex consists of several elevations, separated by deep saddles and with a common base at about 2400m. Some summits and slopes have composite relief with hills and peaks with 100-200 m. Therefore the horizontal dimensions of these two seamounts on the contour charts are only schematic. From dredged limestone cobbles Heezen et al. (1969) concluded that Atlantis seamount must have been an island within the past 12000 years. The smaller structures in the Atlantis seamount group roughly have the same strike as the major elements.

Tyro seamount is situated at 34°40'N/27°30'W with a minimum depth of 1370 m and a not clearly defined SE direction.

Seamounts are locations for a broad range of current-topography interactions and biophysical coupling, with implications for both phyto and zooplankton. Seamounts appear to support relatively large planktonic and higher consumer biomass when compared to surrounding ocean waters, particularly in oligotrophic oceans. It has been a widely held view that *in situ* enhancement of primary production fuels this phenomenon, but this has recently been challenged (Genin & Dower 2007).

Productivity in oceanic settings depends on light and nutrient availability, while overall production is the result of productivity and accumulation of the phytoplankton. At a seamount, either a seamount-generated, vertical nutrient flux has to be shallow enough to reach the euphotic zone and the ensuing productivity retained over the seamount long enough to allow transfer to higher trophic levels, or the seamount must rely on allochthonous inputs of organic material to provide a trophic subsidy to resident populations (Clark *et al.*, 2010).

In terms of biology, these structures have a relatively small number of studies. A total of 437 species is identified all over the EBSA (see feature description of the proposed area). Although seamounts are ecologically important and abundant features in the world's oceans (Hillier & Watts, 2007), biological research on same seamounts has been rare (see table 1) (Consalvey *et al.*, 2010).

The most detailed investigations on biodiversity, composition and distribution of the seamount benthic macrofauna and meiofauna have been carried out in the North Atlantic, particularly at the Great Meteor Seamount (Emschermann, 1971; Grasshoff, 1977; Bartsch, 1973, 2003, 2004, 2008; Hartmann-Schröder, 1979; George & Schminke, 2002; George 2004; Gad 2004, 2009; Gad & Schminke, 2004; Piepenburg & Müller, 2004; Mironov & Krylova, 2006).

Location

The Meteor EBSA is located on the Atlantic Ocean (Figure 2) and the polygon is defined by 19 points, see Table 2. This EBSA has a total area of 134079 km2 with depths ranging from 265m (top of Atlantis seamount) to 4800m (bottom of Great Meteor seamount). The datum used is World Geodetic System 1984 (WGS84).

Table 2 – Geographic coordinates in two different formats: Decimal degrees and Degrees, Minutes and Seconds, corresponding to the vertices of the polygon that defines the Meteor EBSA

Vertices	Latitude	Longitude	Latitude	Longitude
1	31,00000000°	-29,00000000°	31° 0' 0,000'' N	-29° 0' 0,000'' W
2	31,60000000°	-29,30000000°	31° 36' 0,000'' N	-29° 18' 0,000'' W
3	32,00000000°	-28,60000000°	32° 0' 0,000'' N	-28° 36' 0,000'' W
4	32,90000000°	-28,60000000°	32° 54' 0,000'' N	-28° 36' 0,000'' W
5	33,00000000°	-30,50000000°	33° 0' 0,000'' N	-30° 30' 0,000'' W
6	34,00000000°	-31,40000000°	34° 0' 0,000'' N	-31° 24' 0,000'' W
7	35,00000000°	-31,50000000°	35° 0' 0,000'' N	-31° 30' 0,000'' W
8	35,00000000°	-30,30000000°	35° 0' 0,000'' N	-30° 18' 0,000'' W
9	34,00000000°	-29,50000000°	34° 0' 0,000'' N	-29° 30' 0,000'' W

10	34,00000000°	-28,70000000°	34° 0' 0,000" N	-28° 42' 0,000" W
11	35,50000000°	-28,50000000°	35° 30' 0,000" N	-28° 30' 0,000" W
12	35,40000000°	-27,00000000°	35° 24' 0,000" N	-27° 0' 0,000" W
13	33,30000000°	-27,60000000°	33° 18' 0,000" N	-27° 36' 0,000" W
14	32,20000000°	-27,00000000°	32° 12' 0,000" N	-27° 0' 0,000" W
15	30,70000000°	-28,20000000°	30° 42' 0,000" N	-28° 12' 0,000" W
16	29,30000000°	-28,00000000°	29° 18' 0,000" N	-28° 0' 0,000" W
17	29,20000000°	-29,30000000°	29° 12' 0,000" N	-29° 18' 0,000" W

The Meteor EBSA includes 10 seamounts structures. The EBSA area is totally located under Portuguese national jurisdiction (Figure 3), 9 of the 10 structures are situated on the extended continental shelf (seabed) and 1 (Pico Sul) is on the Portuguese EEZ (seabed and water column), close to Azores.

Feature description of the proposed area

The knowledge of the Meteor EBSA area is based on the analysis of 146 scientific articles containing relevant information about the proposed area. Several of the seamounts are well known with a great number of geological and biological studies. The total number of 437 species reported was estimated from scattered taxonomical literature and the species number is probably underestimated. The knowledge of each structure is not even and it is possible to observe these differences in table 1. In the same table it is also possible to evaluate how many EBSA scientific criteria each structure meet.

Around of 4% of the 437 species identified in all seamounts on this EBSA, are under some type of legal protection or threatened status from CITES, IUCN Red List, European Union Habitats and Birds Directives, VMEs, Bern Convention and OSPAR Convention. For example OSPAR identified as endangered or declining the deep water sharks *Centroscymus coeleopsis* and *Centrophorus squamosus*. Other examples of species with legal protection (CITES Appendix II) are the corals, *Antipathella subpinnata*, *Aulocyathus atlanticus*, *Caryophyllia abyssorum*, *Deltocyathus eccentricus*, *Deltocyathus moseleyi*, *Dendrophyllia cornigera*, *Desmophyllum dianthus*, *Flabellum alabastrum*, *Flabellum chuni*, *Lophelia pertusa* among others. For example the species of sea urchin *Centrostephanus longispinus* is protected by the EU Habitats Directive and *Ranella olearia* is protected by Annex II of the Bern Convention.

The species studied in the EBSA belong to several phylum, class or order (figure 4). The Meteor EBSA includes various species of scleractinians and gorgonians. In some seamounts the gorgonian and sponge species were reported to form dense gorgonian coral habitat-forming aggregations of *Callogorgia verticillata* and *Elisella flagellum* which may represent important feeding and sheltering grounds for seamount fishes and also potential shark nurseries (WWF, 2001; Etnoyer & Warrenchuk, 2007; OSPAR, 2011). Cold water, deep, habitat forming corals can shelter higher megafauna in association to the corals than other habitats without corals community (Roberts *et al*, 2006; Mortensen *et al*, 2008, Rogers *et al*, 2008). Seamounts also harbour large aggregations of demersal or benthopelagic fish (Koslow, 1997; Morato & Pauly, 2004; Pitcher *et al.*, 2007; Morato *et al.*, 2009, 2010).

Feature condition and future outlook of the proposed area

The majority of the study cruises that has visited the EBSA area, focus in Great Meteor bank with sampling of the demersal vertebrate fauna (fish). Most studies are qualitative, and often focus on specific taxonomic groups, such as copepods or gastropods (George & Schminke, 2002; Gofas, 2007; Pitcher *et al.*, 2010).

The unique ecosystems of seamounts are highly vulnerable and sensitive to external actions. Most of the fauna found on seamounts are long-lived, slow-growing organisms with low fecundity and natural mortality, so called K-selected species (Brewin *et al.*, 2007). Recruitment events of long-lived seamount fauna seem to be episodic and rare (Brewin *et al.*, 2007). The type of gear (usually rock-hopper trawls) used to fish over the rough and rocky substrata that can be found on seamounts is particularly destructive of benthic habitat, destroying the very long lived and slow-growing sessile suspension feeding organisms that dominate these habitats (Brewin *et al.*, 2007). Benthic seamount communities are highly vulnerable to the impacts of fishing because of their limited habitat, the extreme longevity of many species, apparently limited recruitment between seamounts and the highly localized distribution of many species (de Forges *et al.*, 2000; Samadi *et al.*, 2006, 2007).

In a few decades, fishermen attention has been drawn to the high abundances of commercially valuable fish species in many seamounts (Koslow, 1997). The reasons for the fish aggregations can be explained by the hypotheses that seamount areas can be ‘‘meeting points’’ of usually dispersed fish stocks, for example to aggregate for spawning, or that an enhanced food supply caused by special current conditions is the basis for locally maintaining large fish stocks. The importance of seamounts for fisheries is very well documented (Boehlert & Sasaki, 1988, Koslow, 1997, Morato *et al.*, 2006). The fisheries for horse mackerel (*Trachurus trachurus*, Carangidae), mackerel (*Scomber* sp., Scombridae), and scabbardfish (family Trichiuridae) and orange roughy (*Hoplostethus atlanticus*) have been operating in the seamounts of the EBSA. There are some types of fishing techniques that can trawl corals out of the ocean and their age can be estimated over the 300 – 500 years (Tracey *et al.*, 2003; Samadi *et al*., 2007). Structural deep-sea sponge habitat is also vulnerable to bottom fishing and has been shown to suffer immediate declines in populations through the physical removal of sponges, which then reduces the reproductive potential of the population, thereby reducing recovery capacity or even causing further declines (Freese, 2001). Experimental trawling over sponge communities in Alaska showed that one year after the experiment, individuals within the community showed no sign of repair or growth and there was no indication of the recovery of the community (Freese *et al.*, 1999).

The BIOMETORE project, coordinated by IPMA (Instituto Português do mar e da Atmosfera), has several national and international partners and involves many scientific disciplines. The main goal is to collect information on the NE Atlantic seamounts, namely in and around the “Great Meteor”, south of the Azores. The general objective of the project is to increase the scientific knowledge on the biodiversity and oceanographic characteristics of these regions. Funded by the EEA-Grants, the information collected by this project will be an important contribution.

Assessment of the area against CBD EBSA Criteria

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		No information	**Low**	**Medium**	**High**
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.				X

The Meteor EBSA includes 10 seamounts. The Seamounts are defined as isolated topographic features of the seabed. Large seamounts usually originate as volcanoes and are primarily associated with intraplate hotspots and mid-ocean ridges, being singular and rare in the middle of the ocean. The seamounts are considered to support a relative higher biomass and a higher biodiversity than surrounding open ocean ecosystems and are recognized as "hotspots" of marine life (see introduction). The seamounts have an important role in the colonization and dissemination of species. Seamounts have been considered as stepping stones, vicariant pathways, and points of endemic isolation (Leal & Bouchet, 1991; Keppel, 2009).

The Great Meteor seamount is one of the best explored seamounts in the world, and since an expedition in 1998 some detailed information on the meiofauna inhabiting its plateau is available for the first time. Seamounts such as the Great Meteor Seamount resemble isolated "islands" in respect to the colonization by meiofauna, but the question is whether they can nevertheless function as "stepping stones" for long-distance dispersal (Gad & Schminke, 2004; Surugiu *et al*., 2008). The Great Meteor seamount is also one of the largest seamounts in the Atlantic Ocean, rising from 4200 m depth at the seafloor to 270 m depth beneath the sea surface. The registry of *Protogrammus sousai* as an endemic fish species to Great Meteor seamount (Uiblein *et al*., 1999) reinforces the uniqueness of the EBSA.

The Atlantis Seamount imposes strong effects on the composition of the mesopelagic fish community. Instead of a specific seamount-associated mesopelagic fish assemblage, studies found a thinned-out oceanic community above the slopes of the seamounts. The large plateau areas seem to represent hostile habitats for the mesopelagic fish community (Pusch *et al*., 2004)

Other studies made in the EBSA area with the fish fauna prove also that the species living in the seamounts are ecologically distinct and present some evidence of morphologic adaption of populations (e.g., *Phycis phycis*) to the special food-poor conditions at the seamount (Uiblein *et al*., 1999). Same meiofaunal groups exhibit pronounced endemism, nominally in copepod species also with a Harpacticoida new to science (George & Schminke, 2002).

The northern margin of Cruiser plateau, bounded by the Hayes Fracture Zone (FZ), closes to the southern edge of the east-west ridge in the east central Comer seamounts. The fracture zone inferred to be present at the southern edge of the Comer seamounts aligns with the large structural offset through the Cruiser plateau between Hyeres and Irving seamounts. We presume that this offset marks the continuation of a fracture zone trace that now is mostly buried below volcanic rocks of Cruiser plateau

<table>
<tr><td colspan="6">(Tucholke & Smoot, 1990; Gente et al., 2003)</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td>x</td><td></td></tr>
<tr><td colspan="6">The area of Meteor contains a high number of species associated to the structures, particularly to the seamounts (see Feature description of the proposed area). Species present different characteristics. A number of species present are considered as a local aggregation and are classified as resident or transient. The former type indicates an aggregation of individuals that have lived for a long time (> week) at the same site, while the latter refers to ephemeral (< week) accumulations that disperse once the accumulation mechanism ceases to operate. A special case of transient accumulation is that of highly mobile animals (e.g., birds, marine mammals) that follow accumulations (resident or transient) of planktonic prey. Most noteworthy trends are: many seamounts harbor resident aggregations of demersal fish, open-ocean, migrating species (Genin & Dower, 2007).
The tremendous productivity of these EBSA seamount structures means that they can be used by migratory species (highly mobile animals) or those with a wide area of distribution as places for feeding or spending key periods in their lifecycles, such as mating and reproduction. For example the Atlantis and Great Meteor Banks are vital stopping points for certain migratory species of whales and cetaceans, including sperm whales (e.g. Physeter microcephalus), fin whales (e.g. Balaenoptera acutorostrata), striped (e.g. Stenella coeruleoalba) and bottlenose dolphins (e.g. Tursiops truncatus). The Meteor EBSA seamounts receive many species of seabirds that use these places to feed (e.g. Calonectris diomedea, Oceanodroma castro, Puffinus myasthenia).
Various species at different biological phases (larva, juvenile, adult or reproductive) may visit these marine oases, guided by one of the oceanic currents that cross them. Indeed, it is known that the long–living orange roughy (Hoplostethus atlanticus) undertakes migrations of thousands of kilometers to lay its eggs on the seamounts Atlantis, Hyeres and Plato.
Another relevant characteristic to these criteria is the fact that seamounts are very relevant to the aggregation of commercially important fish species which use this ecosystem for spawning and as nursery grounds (e.g. Aphanopus carbo, Beryx splendens, Zenopsis conchifer). All of the 10 seamounts are “house” for some corals (e.g. Antipathella wollastoni, Antipathes furcate). (see Feature description of the proposed area).</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td></td><td></td><td>x</td><td></td></tr>
<tr><td colspan="6">Around 4% of the species identified in Meteor EBSA are under some type of legal protection or threatened status from different sources: CITES (e.g. Antipathes furcate, Desmophyllum dianthus), European Union Habitats (e.g. Centrostephanus longispinus), FAO VMEs (e.g. Bebryce mollis), Bern Convention (e.g. Ranella olearium) and OSPAR Convention (e.g. Centroscymnus coelolepis) (see</td></tr>
</table>

Feature description of the proposed area). It is also known that the protected by CITES loggerhead turtle (*Caretta caretta*) tracks indicate use of seamount as habitat (Pitcher *et al*., 2010).					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.				x

Seamounts are unique marine ecosystems, which often support fragile habitats and vulnerable species of flora and fauna (Alder & Wood, 2004). These unique characteristics and their associated biodiversity, high potential endemism (de Forges *et al*., 2000). In general, our knowledge of seamounts is far less comprehensive than for many other marine ecosystems and, so the importance of and need to protect these ecosystems is only just being recognized. However, the fragility of seamount ecosystems, and the magnitude of threats posed to them (Koslow, 1997; Morato *et al*., 2010), renders an assessment of their management needs an urgent task.

Benthic biological communities on seamounts are highly vulnerable to human activities. Many benthic species are long-lived and slow-growing, and not resilient to human impacts. Concerns have developed about the vulnerability of the EBSA seamount communities to human impacts, especially with the development of large-scale bottom trawl fisheries in the deep sea in recent decades and the future prospect of seabed mining.

The EBSA Meteor polygon contains 35 species of cold-water corals (*e.g. Antipathella wollastoni*; *Caryophyllia smithii*; *Flabellum macandrewi*). These corals are particularly fragile and recover very slowly (Rogers *et al.,* 2007).

Prominent megafaunal taxa of sponges (eg. *Haliclonia* sp), gorgonian species (eg. *Elisella flagellum*), antipatharian and madreporarian corals (eg. *Antipathes glabberima* and *Dendrophyllia* cf.*cornigera*) and sea urchins (*Cidaris cidaris*), would be vulnerable to bottom-contact fishing gear.

Other species with some legal protection have characteristic features particularly attending to biological factors such as longevity, low fecundity, and slow growth rates (*e.g.* sharks and rays) (*e.g.*, Clark, 2001; Morato *et al*. 2008). In the EBSA area there are present 22 species of sharks and rays (*e.g. Dalatias licha* (shark), *Raja clavata* (ray)).

Eight of the 10 seamounts have the presence of anthozoa and/or elasmobranchii species: Atlantis (7 anthozoa and 6 elasmobranchii); Cruiser (4 anthozoa); Great Meteor, Closs and Small Meteor (27 anthozoa and 15 elasmobranchii); Hyeres (3 anthozoa and 1 elasmobranchii); Irving (13 elasmobranchii); Plato (2 anthozoa and 6 elasmobranchii). In total the EBSA Meteor contain 12.8 % of the total species as a potential vulnerable, fragile, sensitive and slow recovery belonging to a Class Anthozoa (7,8%) and Subclass Elasmobranchii (5%) (see Figure 5).

There are a high number of threats to the biodiversity of seamounts (*e.g.* Rogers, 1994; Koslow *et al.*, 2001; Gubbay, 2003; Butler *et al.,* 2010). The most significant threat in terms of this EBSA is undoubtedly the geographic spread and scale of impact of the commercial fishing.

The recovery of vulnerable species, and the assemblages which they form, from human impacts is predicted to be very slow in the deep sea (*e.g.* Roark, *et al.*, 2006; Probert *et al.*, 2007), and the recruitment can be intermittent as a consequence of the also intermittent dispersal between seamount populations (Rogers *et al.*, 2007; Shank, 2010). In the area a big number of commercial species is recognized, particulary fishes: *Alepocephalus bairdii* - Baird's slickhead, *Allocyttus verrucosus* - Warty dory, *Antigonia capros* - Deepbody boarfish, *Aphanopus carbo* - Black scabbardfish, *Arnoglossus imperialis* - Imperial scaldfish, *Aulopus filamentosus* - Royal flagfin, *Beryx decadactylus* – Alfonsino, *Beryx splendens* - Splendid alfonsino, *Callanthias ruber* - Parrot seaperch, *Chlorophthalmus agassizi* - Shortnose greeneye, *Coelorinchus caelorhincus* - Hollowsnout grenadier, *Coelorinchus occa* - Swordsnout grenadier, *Conger conger* - European conger, *Coryphaena hippurus* - Common dolphinfish, *Cyttopsis rosea* - Rosy dory, *Diodon hystrix* - Spot-fin porcupinefish, *Diplospinus multistriatus* - Striped escolar, *Epigonus telescopus* - Black cardinal fish, Gadella maraldi – Gadella, *Gnathophis mystax* - Thinlip conger, *Gymnothorax maderensis* - Sharktooth moray, *Helicolenus dactylopterus* - Blackbelly rosefish, *Lepidopus caudatus* - Silver scabbardfish, Lepidorhombus boscii - Four-spot megrim, *Lophius piscatorius* - Angler, *Macroramphosus scolopax* - Longspine snipefish, Malacocephalus laevis - Softhead grenadier, Mora moro - Common mora, Nezumia aequalis - Common Atlantic grenadier, *Phycis phycis* – Forkbeard, *Physiculus dalwigki* - Black codling, *Polymixia nobilis* - Stout beardfish, *Polyprion americanus* – Wreckfish, *Pontinus kuhlii* - Offshore rockfish, *Pseudopentaceros wheeleri* - Slender armorhead, *Ruvettus pretiosus* – Oilfish, *Scomber japonicas* - Chub mackerel, *Setarches guentheri* - Channeled rockfish, *Sphagemacrurus grenadae* - Pugnose grenadier, *Trachurus picturatus* - Blue jack mackerel, *Xiphias gladius* – Swordfish, *Zenopsis conchifer* - Silvery John dory). The fishing impacts in this area, attending to the biology characteristics can have a slow recovery (*e.g.*, Clark, 2001, Morato *et al.*, 2008) with unknown possibility to total ecosystem recovery. (See Feature condition and future outlook of the proposed area).

Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.			x	

The biological productivity has become one of the best-studied aspects in the seamounts area, with research aimed at better understanding the connections between oceanic motion around seamount structures and biological distribution patterns. Meincke (1971) was the first to identify a circulation system in the form of an anticyclonic vortex trapped in the top of Great Meteor Bank, with the potential to accumulate mesopelagic zooplankton, micronekton, and even fish species with weak swimming capabilities. Later studies revealed a more complex flow spectrum at the seamount, dominated by tidal and internal tidal motions (e.g., van Haren, 2005) and a high level of spatial and temporal variability (e.g., Mouriño *et al*., 2001). These findings, together with similar studies at other seamounts (see WilliaM laVelle & Mohn, 2010, for an overview), indicate that seamounts play a role in ocean biology far beyond the classical view of particle retention inside stationary and closed circulation cells. Despite the geographic isolation and poor nutritional conditions of the North Atlantic subtropical gyre, the fauna around and at Great Meteor seamount and other EBSA seamounts hosts a rich and diverse species composition.

Productivity of area in general is characterized as low; however, physical oceanography of seamount leads to relatively high productivity. A circulation system in the form of an anticyclonic vortex trapped atop of the Meteor EBSA Seamounts, has the potential to accumulate mesopelagic zooplankton, micronekton, and even fish species with weak swimming capabilities (Boehlert & Mundy, 1993; Dong *et al*., 2007).

Nutrients like nitrates and phosphates, which are critical to the growth of phytoplankton, are lifted from the deep to the sunlit surface waters. These nutrients fuel an explosion of planktonic plant and animal growth – biological productivity. Biological production on seamounts is often manifested in dense aggregations of benthopelagic and demersal fish that represent concentrations of high biomass for these species (Genin & Dower, 2007; Pitcher & Bulman, 2007) (see Introduction).

Studies with plankton prove that the EBSA Meteor (Mouriño *et al.*, 2001; Beckmann & Mohn, 2002; Fock *et al.*, 2002; Martin & Nellen, 2004; Morato *et al.*, 2013) have a relatively high biological productivity.

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

These are poorly known environments, like much of the deep sea, in terms of their biodiversity. Like other seamounts, these EBSA structures have been conceptualized as habitat ‘islands’ in the deep-sea because of their elevated topographies and high biomass and biodiversity compared to surrounding benthic and pelagic habitats (McClain, 2007). It is well known that the EBSA structures are hotspots of biodiversity and the EBSA Meteor structures have high species diversity, with 437 different species registered with some of them new to science. The likelihood that the number of species present is far greater than the number currently recorded in the seamounts is big (Gubbay, 2003; Clark & Bowden, 2015).

Records tell us that most of the structures included in the EBSA (see Table 1) harbor a rich benthic fauna typically dominated by suspension-feeding organisms, of which cold-water corals and sponges are the dominant elements. The structures host also large aggregations of demersal or benthopelagic fish.

In the Atlantis, Hyeres, Irving and Meteor bank there are evidences of a great diversity, with records of midwater fish as major predators of zooplankton. For example, the highly abundant and very common species, snipefish (*Macroramphosus scolopax*), seabass (*Anthias anthias*), boarfishes (*Capros aper* and *Antigonia capros*), flatfish (*Arnoglossus rueppelli*) and aulopid (*Aulopus filamentosus*). Also the presence of Corals (*e.g. Antipathella subpinnata*, hydroids (*e.g. Acryptolaria conferta*), Echinoderms (*e.g. Centrostephanus longispinus*), Molluscs (e.g. *Dermomurex gofasi*), sponges (*e.g. Craniella longipilis*). These kind of species Oftenly form extensive and reef-like structures which themselves provide a diverse habitat for other animals for example Cephalopoda (*e.g. Ornitoteuthis antillarum*, *Tremoctopus violaceus*) and Elasmobranchii (*Heptranchias perlo*).

Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.				X

Naturalness was evaluated as lack of known bottom-contact fishing for individual seamounts. Data on the distribution of bottom trawling was sourced from a number of national databases, and from scientists that had access to unpublished data (Clark *et al.*, 2007; Bensch *et al.*, 2008).

For a total of the EBSA seamounts there is no information on historic or current fishing effort in this area, although there are reports of illegal/unreported fishing by vessels using unmarked monofilament gill nets and small drift nets, which are abandoned when they are detected (Morato *et al*., 2001).

Seamount fisheries have typically proven difficult to research and manage sustainably. Many deep-sea commercial species have characteristics that generally make them more vulnerable to fishing pressure than shallower shelf species. They can form large and stable aggregations over seamounts for spawning or feeding, which enables very large catches and rapid depletion of stock size (Clark *et al.*, 2010).

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Maps and Figures

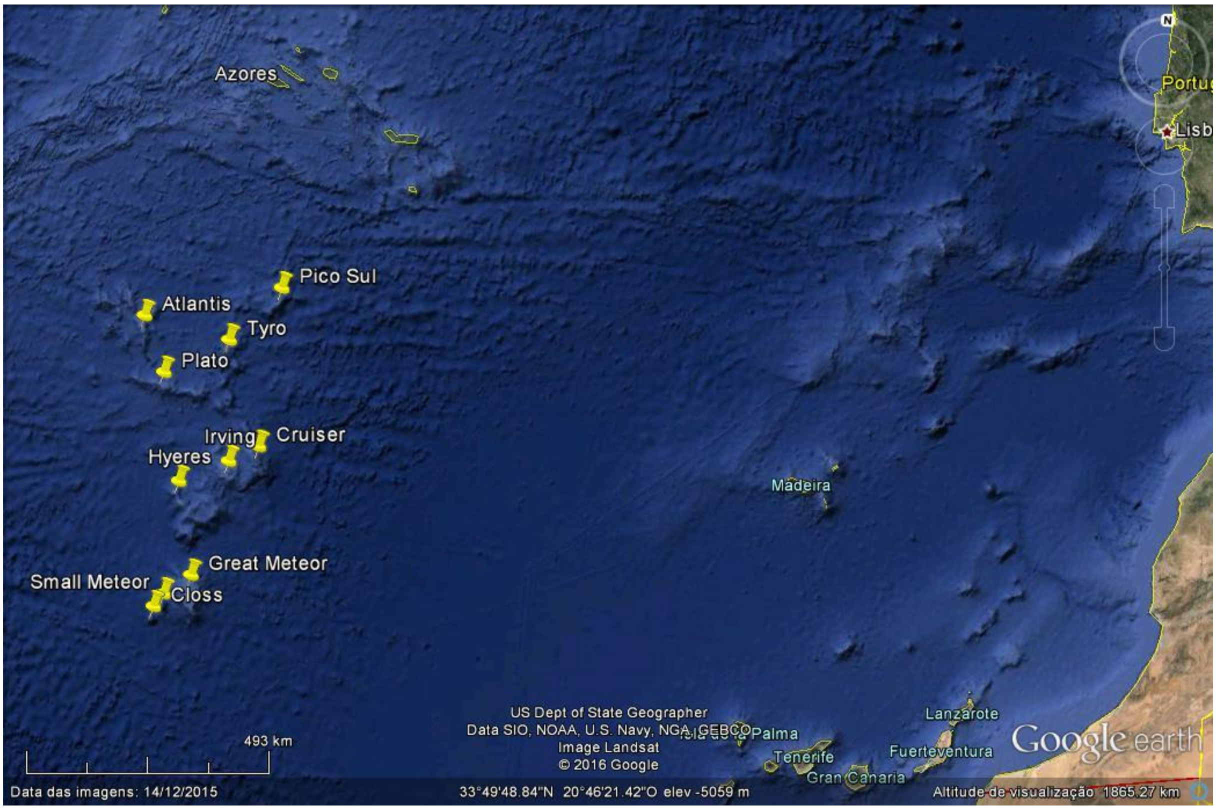

Figure 1 – Structures included in Meteor EBSA area

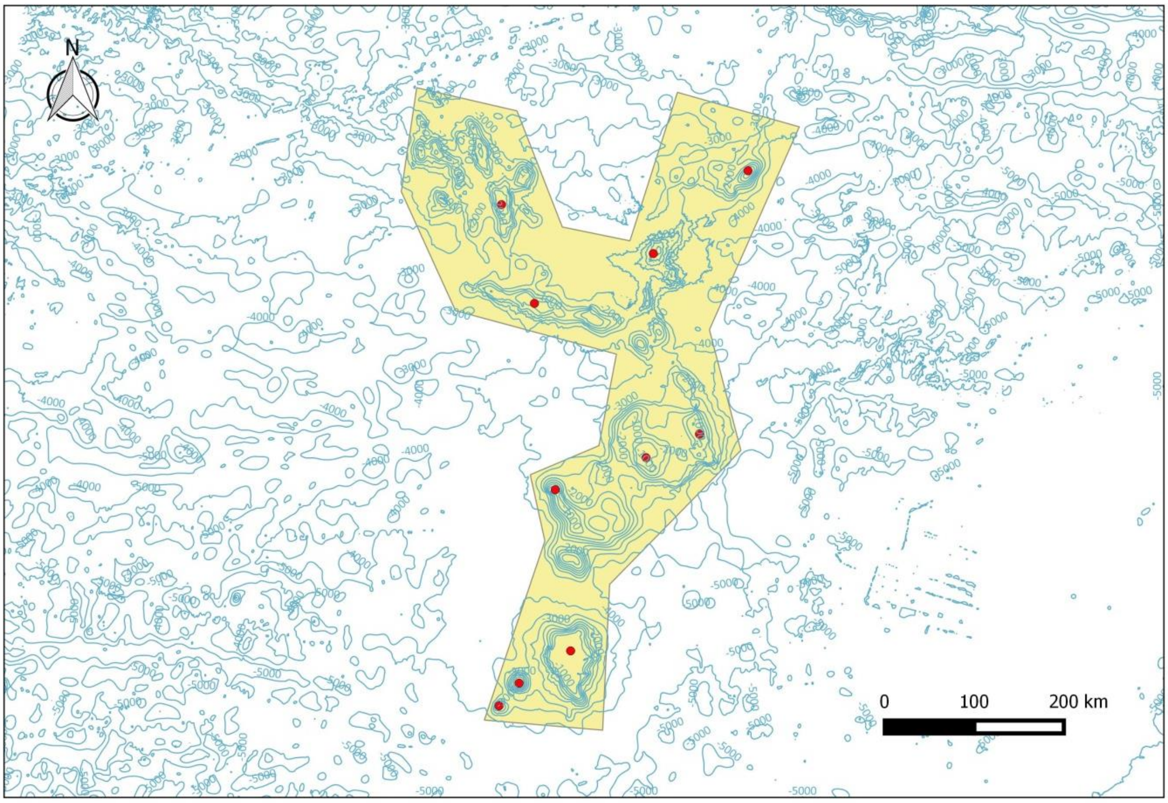

Figure 2 – Meteor EBSA. Yellow shadow - EBSA total area.

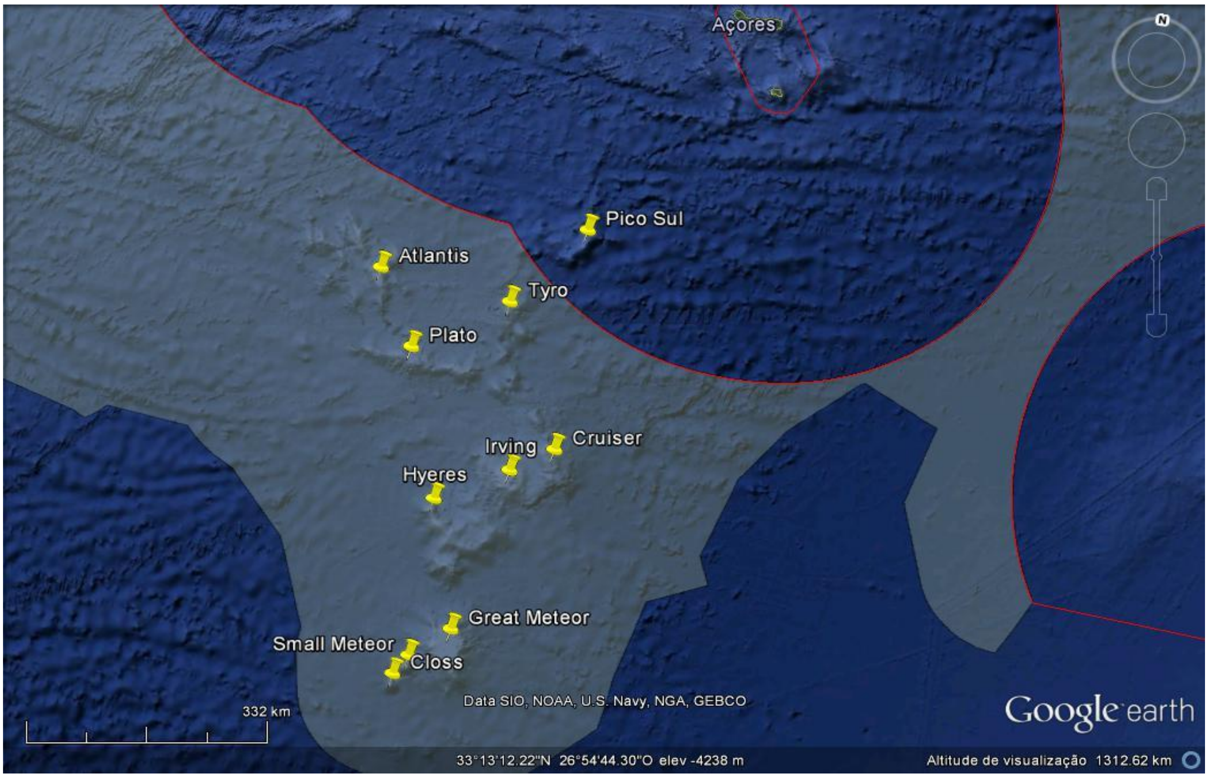

Figure 3 – Structures included in the Meteor EBSA. The grey area show the extended continental shelf while the area inside the red the lines show the exclusive economic zone.

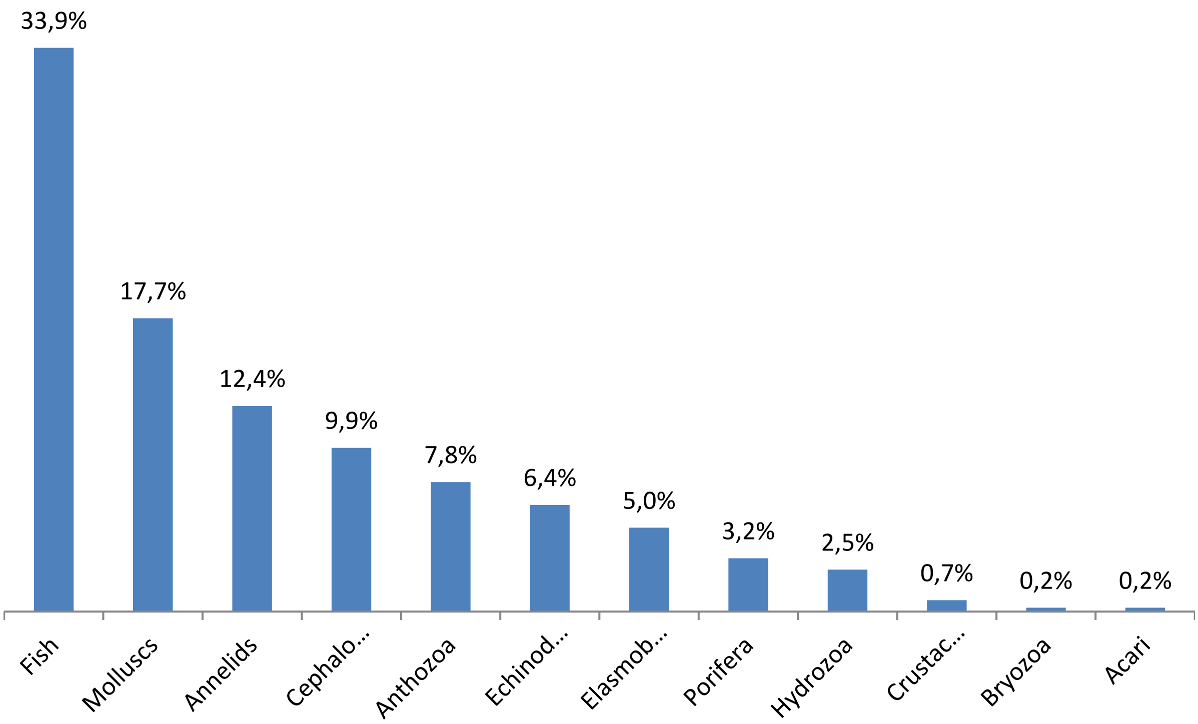

Figure 4 - Relative frequency (%) of the different phylum/class/order of the species identified in the Meteor EBSA.

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