

Mediterranean deep-sea corals: reasons for protection under the Barcelona Convention



Black coral *Antipathes dichotoma*
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Introduction

Deep-sea environments had been regarded as lifeless voids until relatively recently. However, ocean exploration over the past few decades through the increasing use of new technologies (e.g. ROV, acoustic technics) has slowly reversed this idea. Nowadays, it is generally accepted that the deep-sea is one of the greatest biodiversity reservoirs on the planet, hosting an extraordinary diversity of ecosystems. These unique areas also contain habitats and species that are found nowhere else on the planet (Marín & Aguilar; in Würtz, 2012; Roberts *et al.*, 2009).

Coral reefs and coral communities were once thought to be restricted to shallow waters in tropical and subtropical regions. However, improved technology has shown them to exist in deep, dark, cold and nutrient-rich waters in almost all of the world's oceans and seas (Freiwald *et al.*, 2004).

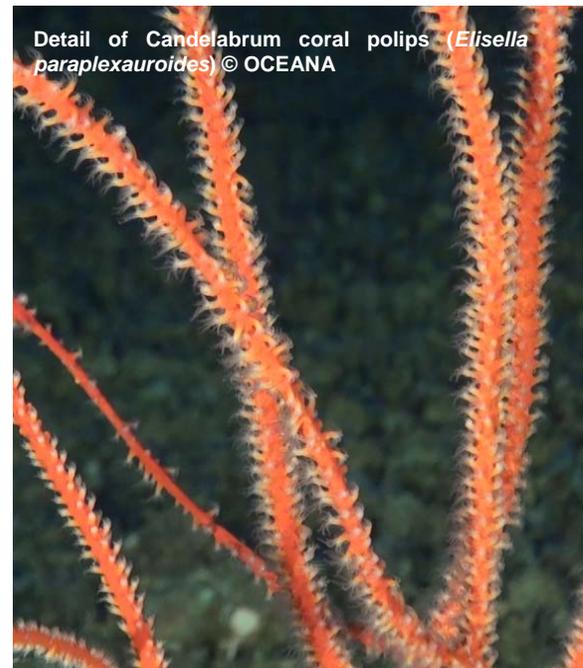
In fact, despite the fact that over half of the coral species known to date are found in deep waters, they have been poorly studied. What is well-known however is that they are generally located on sloping topography and at topographic heights such as along the continental shelf, slopes, and flanks of submarine canyons and seamounts, areas which boast accelerated currents and hard substrates, which are needed by the coral larvae to settle.

Common reef-building and habitat-forming corals in cold waters include colonial stony corals (Scleractinian), true soft corals (Octocorallia), black corals (Antipatharia) and calcifying lace corals (Hydrozoa) (Bongiorni *et al.*, 2010; Tsounis *et al.*, 2010; Freiwald *et al.*, 2004).

Deep marine environments are dominated by extremely slow growing invertebrates (Roberts & Hawkins, 2000). Deep-sea corals are no

exception, and are characterized by even slower growth than their shallow-water counterparts. Unlike their relatives, deep-sea coral renewal rates depend on stable environmental conditions, usually affected by currents, to assimilate plankton and organic matter for their own energy needs (NOAA, 2010). Thus, these fragile habitats are commonly found on summits and flanks of seamounts and promontories or submarine canyons (Tsounis *et al.*, 2010; Harris and Whiteway, 2010; WWF/IUCN, 2004; ZibroWius, 2003) among other deep-sea geological features.

Furthermore, their occurrence is frequently patched accompanying other ecologically significant habitats and filter species like sponge grounds (e.g. *Asconema setubalense*). Several species, in particular individual ones like black corals, can live for over a thousand years. Studies in Hawaii reflect that the growth rate for *Leiopathes glaberrima* is around 5 $\mu\text{m}/\text{year}$ (Roark *et al.*, 2007). This makes them, by quite a margin, the longest-living animals in the oceans (Roberts *et al.*, 2009; Deidun *et al.*, 2010).



The importance of deep-sea coral communities

Deep-water coral ecosystems are biodiversity hotspots (Tsounis *et al.*, 2010; Mastrototaro *et al.*, 2010). Some create reefs and complex three-dimensional forest-like structures, which act like islands in the normally flat, featureless and muddy surroundings. This has been demonstrated in recent years for scleractinian corals in Santa María di Leuca (off southern Italy), where sediment around living colonies and coral rubble is characterized by a higher meiofaunal biodiversity than the slope sediments (Bongiorni *et al.*, 2010). In some cases, these reef structures can be over 40 m tall and extend for several kilometers.

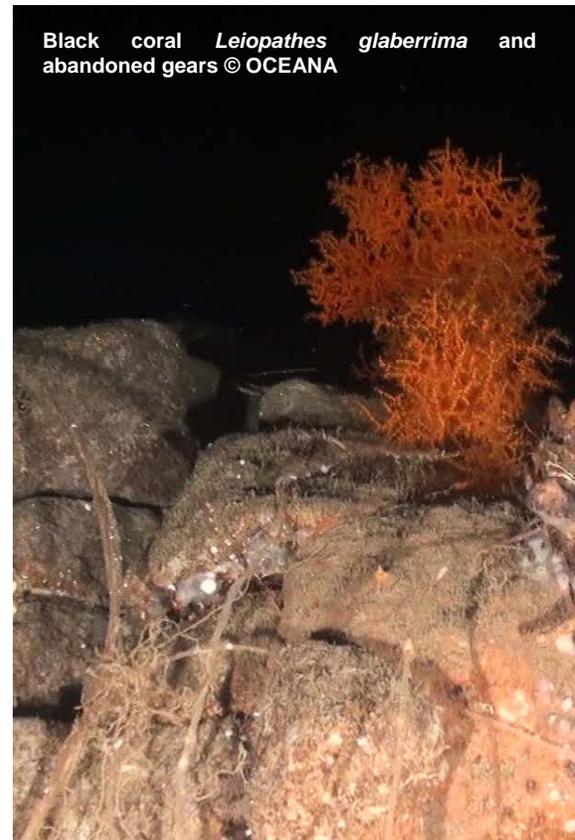
They harbor rich ecosystems and provide shelter to a huge variety of organisms, including commercial species (Freiwald *et al.*, 2004), which use them as nursery grounds. According to Roberts *et al.* (2006), cold-water corals are arguably the most three-dimensionally complex habitats in the deep sea.

Deep-water corals are important to evolution and to preserving the resilience of marine species and ecosystems in deep environments, and contribute to maintaining ecosystem functioning (UNEP, 2007; Bongiorni *et al.*, 2010). Their fragility however, makes them extremely vulnerable to any physical impact. Consequently, the lack of management or mismanagement of ecosystems that depend on deep-sea corals may have permanent or irreversible consequences that are likely to affect the entire ecosystem (Tsounis *et al.*, 2010).

Deep-sea coral habitats in danger: impacts and threats

The impacts of human activities on corals are evident in almost every scientific survey, regardless of the depth at which the corals occur. However, intensive **bottom trawling** and other bottom gears are some of the major threats. Destruction or damage caused to deep-sea corals

has been documented worldwide and the presence of coral rubble has increased over the past decades (OSPAR, 2008; WWF/IUCN, 2004).



Black coral *Leioopathes glaberrima* and abandoned gears © OCEANA

It is also worth highlighting the disturbance on sediment gravity flows caused by the re-suspension of particulate material triggered by different types of trawls (Norse *et al.*, 2012; Palanques *et al.*, 2010; Puig *et al.*, 2010; Durrieu de Madron *et al.*, 2005). This reduces the original complexity of the deep-sea floor and negatively affects filter feeding sessile organisms. A secondary threat from fishing also includes damage from entanglement in lost long lines and netting.

Deep-water corals are also highly vulnerable to other direct and indirect impacts (Bongiorni *et al.*, 2010), including **hydrocarbon and mineral exploration** and development, cable

and pipeline placement and dumping (Freiwald *et al.*, 2004; OSPAR, 2008).

Furthermore, the effects of **climate change** and ocean acidification on the Mediterranean Sea may affect corals' ability to grow and maintain the carbon-based structures of certain species (Otero *et al.*, 2013; Maier *et al.*, 2012; OSPAR, 2010). Organisms that have aragonite shells or skeletons (e.g. cold water corals) are unlikely to survive below the aragonite carbonate compensation depth (CCD) (Harris & Whiteway, 2010), which is expected to decrease as a consequence of global warming.

The impact of pollution and siltation from coastal development has not yet been studied, but secondary threats also include natural smothering by sediments, infection by parasites and invasion by alien species. Consequently corals are facing an uncertain future (Roberts *et al.*, 2009).

Current protection

Several initiatives have been undertaken to better protect deep-sea corals. **Internationally**, coral aggregations have been identified as special ecological features that require protection under the Convention of Biological Diversity (UNEP, 2007). On the other hand, under the FAO umbrella, they are considered sensitive habitats, which may contribute to forming Vulnerable Marine Ecosystems (VMEs) potentially impacted by deep-sea fisheries. For those reasons, the FAO recommends closing areas where such VMEs are known to be or likely to occur (FAO, 2009).

The OSPAR Commission added to the “*List of threatened and/or declining species and habitats*” the “*Coral Garden*” habitat in 2007 and “*Lophelia pertusa reefs*” in 2010 (OSPAR Recommendation 2010/8). The “coral garden” denomination describes a relatively dense aggregation of colonies or individuals of one or more deep-sea coral species which occur on a wide range of soft and hard bottoms. For instance, soft-bottom coral gardens may be dominated by solitary scleractinians, sea pens or

certain types of bamboo corals, whereas hard-bottom coral gardens are often found to be dominated by gorgonians, stylasterids, and/or black corals.



Prior to 2010, neither coral gardens, nor any of the soft coral species which characterize them, were subject to a national or international protection regime in the convention area. However, although the presence of deep-sea corals in the OSPAR area was of little global or regional relevance, they were added to the List because of the high fishing pressure in the deep-sea (OSPAR, 2010).

Little more evidence on the habitat had been reported to date and the degree of threat from fishing has remained the same. Since coral gardens were included in OSPAR list, several MPAs have been designated to protect them, both within national waters and in areas beyond national jurisdiction (OSPAR MPA database).

At the **European** level, and bearing in mind the Directive 93/43/CEE, different Mediterranean

experts consider deep-sea coral communities to fall under the 1170 *Reefs* habitat type (Issaris *et al.*, 2012; Templado *et al.*, 2009).

Nowadays, at the **national** level, several countries including Canada, Norway, UK, and USA have responded by closing cold water coral habitats to bottom fishing to safeguard coral populations. In the case of the United States, it is worth noting that authorities decided to protect deep-sea coral ecosystems without having to prove that they constitute essential fish habitats (Tsounis *et al.*, 2010).

THE PROTECTION OF CORALS IN THE MEDITERRANEAN SEA

The Mediterranean Sea, despite its small size, contains a large number of known marine species, including a high percentage of endemisms (Mouillot *et al.*, 2011). Dating indicates that deep-sea corals have existed in the Mediterranean region for over 480,000 years (McCulloch *et al.*, 2010). Many living deep-sea corals species have been identified in new Mediterranean locations over the past years (Gori *et al.*, 2013; Angiolillo *et al.*, 2012; Pardo *et al.*, 2011; Taviani *et al.*, 2011; Deidun *et al.*, 2010; Bo *et al.*, 2009; Bo *et al.*, 2008; Opresko & Försterra, 2004). A new stage for their protection has begun as they are now associated with rich biodiverse environments and very specific assemblages (D'Onghia *et al.*, 2012; Bo *et al.*, 2011) which are sometimes related to commercial species. Furthermore, they are a common component of the lower fringe of the circalittoral twilight environment (Mastrototaro *et al.*, 2010; Bo *et al.*, 2009; Bo *et al.*, 2008), which is barely represented in the current Mediterranean MPA network (Marín *et al.*, 2011).

Since the entry into force of the SPA Protocol to the Barcelona Convention and its Annexes in 1995, several amendments have been adopted, bringing the number of species listed in Annex II (algae, sponges, fish, mollusks, birds, marine mammals...) up to more than 150 and the

number of species listed in Annex III to more than 40. Such modifications have corresponded to different additions of species of flora, fish and birds although the cnidarians group has not been modified since the Protocol was endorsed.



Black coral *Antipathella subpinnata*
© OCEANA

The Cnidarians group is represented in the Protocol by the presence of only three species in Annex II “**List of endangered or threatened species**”: *Astroides calycularis*, *Errina aspera* and *Gerardia savaglia* (*Savalia savaglia*); and by *Antipathes* sp.plur. and *Corallium rubrum* in Annex III “**List of species whose exploitation is regulated**”.

Despite the important role of deep-sea corals in ecosystem functioning, they are neither sufficiently represented in the SPA Protocol, nor protected by the existing MPA network, which is weak in its coverage of deep-sea benthic habitats (Gabrié *et al.*, 2012). Years ago, this could have been justified by the lack of information on offshore and deep-sea environments in the

Mediterranean basin. However, according to recent findings and scientific publications there is an imperative need to amend the Annexes to include deep-sea corals.

This year, the modification of Annexes was proposed during the SPA Focal Points meeting in order to improve the representativeness of deep-sea corals as follows (UNEP-MAP RAC/SPA, 2013; see Appendix I for details on species proposed):

- Inclusion in Annex II:
 - o *Callogorgia verticillata*
 - o *Cladocora caespitosa*
 - o *Cladocora debilis*
 - o *Ellisella paraplexauroides*
 - o *Lophelia pertusa*
 - o *Madrepora oculata*
 - o *Antipathella subpinnata*
 - o *Leiopathes glaberrima*
 - o *Parantipathes larix*
- Uplisting *Antipathes* sp. plur from Annex III to Annex II, which includes:
 - o *Antipathes dichotoma*
 - o *Antipathes fragilis*

Based on the available information, there is no excuse to leave these cnidarian species out Annex II. Furthermore, the aforementioned reasoning also applies to *Antipathes* sp. However, given their inclusion in Annex III as exploitable species, further justification follows.

Why should *Antipathes* sp. be uplisted to Annex II?

For years, information on black corals in the Mediterranean Sea has been scarce. However, according to coral experts (Bo & Bavestrello, 2013), records of antipatharians have increased over the past few years (see Figure 1) particularly in the western basin, which has helped to improve existing knowledge on its biology and ecology.

Mediterranean black corals have never been found at depths shallower than 50 m, and so far only five species are known to live in this sea:

Antipathes dichotoma, *Antipathes fragilis*, *Parantipathes larix*, *Leiopathes glaberrima* and *Antipathella subpinnata* (Opresko & Försterra, 2004). All have been included in the draft list of species proposed for inclusion into Annex II.

Figure 1. Distribution of black coral species after 2007 (Bo & Bavestrello, 2013).



It is first worth highlighting why *Antipathes* sp. plur. was initially incorporated into the “List of species whose exploitation is regulated” in the Mediterranean. According to UNEP MAP (1995), one of the criteria for listing species in Annex III was if they had been covered under **CITES**. In fact, the entire order of black corals has been in the CITES Appendix II, under the denomination “*Antipatharia* spp.”, since 1981.

Precious corals (red, pink, gold and black corals), some of the most valuable living marine resources, have been commercially exploited for jewelry for centuries. This has resulted in a significant black market, which is said to make up around 50% of recorded trade (Tsounis *et al.*, 2010).

Over 90% of the black coral trade is reported in three categories: *Antipatharia* spp., *Antipathes* spp. and *Cirripathes* spp (CITES, 2010). While the majority of specimens in international trade are identified at the species level, in the case of black corals, a significant proportion is identified only at the genus level. Being antipatharians genus is one of the least studied groups of non-scleractinian corals (Bo *et al.*, 2009), limiting the identification of these corals to this level has created a scenario wherein it is impossible to identify how detrimental fishing activities may

be to the most threatened species within the genus (IWMC, 2010).

According to the CITES database, the majority of the global trade of raw and processed black corals is carried out by Taiwan and USA, the major exporter and importer respectively (CITES, 2010). However, the quantities traded by these countries are not comparable with the Mediterranean trade of black corals. Taiwan exports around 90% of the worked black coral in the market (Tsounis *et al.*, 2010). Records of *Antipatharia* spp. and *Antipathes* spp. originating from Mediterranean countries during the period 1981-2012 have been analyzed (UNEP-WCMC, 2013), and several results follow:

Antipatharia spp. trade activity for, Cyprus and France:

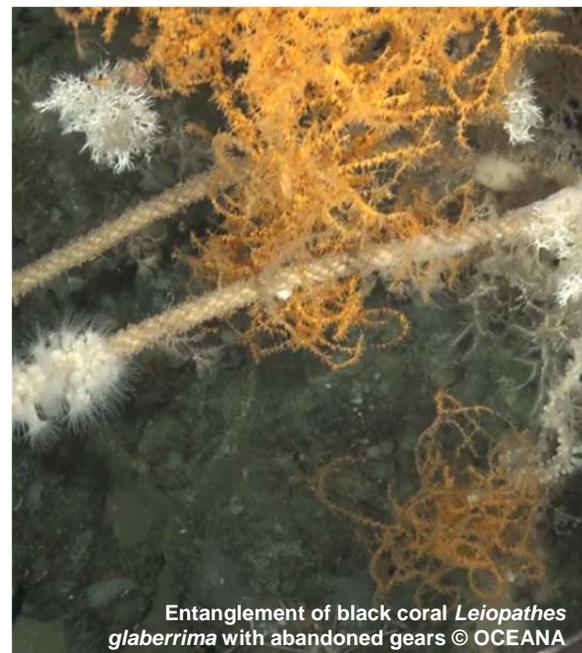
- Cyprus exported 1381 kg of raw coral to the United Kingdom (“confiscated or seized specimens”) between 1997 and 1998;
- In 2002 and 2004, 6 kg of specimens were collected in France from the wild to import/export for scientific purposes;
- In 2009, France traded 0.11 kg of wild specimens for “personal” purposes.
- In 2010, France exported 10 kg of raw coral and 9 kg of carvings. Materials were taken from the wild for commercial purposes and were likely to have been traded between France and its overseas territories.
- Other data were recorded for exporter Mediterranean countries (Croatia, France and Morocco) during the last decade (2003-2011), but in these cases, the origin country remains unknown. Most of these transactions were reported as being used for educational or scientific purposes.

In the case of *Antipathes* spp. records, France was the only exporter country:

- France exported *Antipathes* spp. between 1984 AND 2007, but the product did not originate from the Mediterranean (Origin: Philippines, New Caledonia, Unknown). 200kg of “confiscated or seized specimens” were exported to the US between 1984 and

1989. In 2005, 2006, and 2007, 153 kg of wild specimens were traded within France (likely with its overseas territories)

Therefore, according to the CITES database, France is the most active country in the Mediterranean region for coral trade. However, most of the export transactions recorded have France also listed as an importer. It could be deduced that such trade is carried out from French overseas territories, and thus, that the origin of the corals is not likely to be the Mediterranean Sea.



Entanglement of black coral *Leiopathes glaberrima* with abandoned gears © OCEANA

Despite the aforementioned evidence suggesting otherwise, most literature has suggested that red coral (*Corallium rubrum*) is the only precious coral species that has been harvested in the Mediterranean. However, according to Deidun *et al.* (2010) other precious coral species, such as *Gerardia* spp. (already included in Annex II) in Turkey and antipatharian species in Malta, have also been targeted, albeit on a smaller scale. According to the author, black coral jewelry from Maltese stocks was mainly sold to the German market. This fishery landed around 250 kg of black coral (*Antipathes* spp) between 1984 and 1987. Surprisingly, there is no record in CITES of

this fishery which was ceased in 1987. Very few black coral specimens and fragments retrieved from the company's operations can be located, and it is not clear if the fishery exploited one or several species, although there is a high probability that it was *Leiopathes glaberrima*. Because of the EU-wide ban on coral dredging in 1994 and the depths at which they are found (ie. not reachable for harvesting by scuba divers), black coral populations are no longer exploited in Maltese nearshore waters. In fact, it remains the only known black coral fishery in the Mediterranean (Deidun *et al.*, 2010).



In the case of red coral, 75% of the biomass is wasted during the sculpting phase. This statistic is even higher for black coral species due to their softer skeleton, which is less malleable to mechanical manipulation (Deidun *et al.*, 2010). Furthermore, up to 44% of black corals are colonized by encrusting epibionts (Bo *et al.*, 2009), which makes the extraction of the raw material more difficult. Given their relatively low

value when compared to other precious corals, black corals are not a profitable species.

Lastly, according to the CITES database, *Leiopathes glaberrima*, *Antipathes dichotoma*, *Parantipathes larix* and *Antipathella subpinnata* were assigned the status of "Commercially Threatened" by the Red List 1990.

The exploitation of corals has been generally characterized by the 'boom-and-bust' principle; that is, quickly depleting a discovered stock and then moving on to the next one. Consequently, most known stocks are overexploited and their populations are in decline. This clearly reveals the unsustainability nature of most fisheries (Tsounis *et al.*, 2010) and gives some clues about the present status of affected species' populations (Deidun *et al.*, 2010). The impact of the black coral fishery on its populations is still unknown. However, since the Maltese fishery has ceased, it is possible that some species are recovering.

Landings reported through the **FAO** Statistics and Information Service (2013), show Antipatharia registered as "*Black corals and thorny coral*". However, in the **GFCM** area, these kinds of coral have never been recorded. The only existing records for precious corals correspond to *Corallium rubrum* which have been reported as "*Sardinia coral*" since 1978.

To conclude, historical records for black corals do not suppose a significant trade in the Mediterranean Sea, neither from a trade perspective (CITES) nor from the fisheries point of view (GFCM).

Other considerations

While biological, ecological and economical aspects have been discussed throughout this document, others are worth considering to properly evaluate the need for the inclusion of deep-sea corals into the Annex II of the SPA Protocol.

First of all, black-corals' status as a species that was once harvested for commercial purposes, does not exclude it for being listed under Annex II. Several examples of such species currently listed, include *Gerardia savaglia*, *Charonia lampas*, *Zonaria pyrum*, *Schilderia achatidea* or *Hippocampus hippocampus*.

In fact, several shark and ray species, which were exploited for a long time, were the most recent additions to the Annexes (e.g. *Galeorhinus galeus*, *Isurus oxyrinchus*, *Lamna nasus*, *Rhinobatos rhinobatos*, *Sphyrna lewini* among others). The main reason behind this move was their current degree of threat in the Mediterranean.

Some European countries and the European Commission take part in other regional conventions, which have taken some steps towards protecting these corals (OSPAR area, Natura 2000 sites). Thus, in order to be consistent and coherent with these the Mediterranean basin should follow.

Reasons to amend Annex II of the SPA/BD PROTOCOL

For the following reasons, Annex II is an obsolete instrument to protect deep-sea corals:

- (1) Deep-water corals are important ecosystem engineers and biodiversity hotspots that provide shelter to other species; such characteristics contribute to the resilience of deep-sea ecosystems;
- (2) Deep-sea corals face many threats from the fishing industry, oil exploration, mining and climate change;
- (3) Most known coral stocks are overexploited and populations are in decline. As a consequence of previous black coral harvesting and other human impacts, populations are not likely to return to pre-fishing levels;
- (4) When Annex II was adopted in 1995, very little information on threats to deep-sea corals was available;
- (5) An update of the Annex is needed, particularly to incorporate deep-sea

benthic species and habitats; the entry on cnidarians should also be modified;

- (6) The very slow growth rates and extremely old ages of black corals (especially for *Leiopathes glaberrima*) suggest that any exploitation of these species in any location is unlikely to be sustainable and should not be allowed;
- (7) International conventions and bodies (e.g. CBD, FAO) agree that there is an urgent need to take action to improve the conservation of coral communities and other VMEs;
- (8) Other regional trends, which are generating solid conservation efforts for the protection of deep-sea species (e.g. OSPAR Commission in the NE Atlantic) should be followed;
- (9) Based on the low rates of performance for carving, it is likely not worth it to exploit these corals commercially;
- (10) Other formerly exploited coral species have been included in Annex II, including *Gerardia savaglia*. Non-cnidarian species also included in Annex II that used to be exploited include *Charonia lampas*, *Zonaria pyrum*, and *Hippocampus hippocampus*.

Oceana's General Recommendations for Mediterranean deep-sea corals

Oceana recommends to the Barcelona Convention Parties:

In the short-term:

- Include deep-sea coral species in the Annex II to the SPA/BD Protocol
- Recalling the MoU signed with GFCM, develop research programs on deep-sea environments in line with GFCM activities for the next year period.

In the medium-term:

- Include additional deep-sea species (e.g. sponges, soft corals) into the List of threatened species to improve deep-sea environments protection.
- Collaborate with regional and national bodies to eliminate destructive fishing practices through effective management measures.
- Identify potential open sea MPAs

In the long term:

- Designate new open sea MPAs including in deep-sea benthic habitats to establish a coherent and comprehensive network of MPAs.



APPENDIX I. Deep-sea coral species to be included in Annex II to the SPA/BD Protocol



Antipathella subpinnata

ORDER: Antipatharia

COMMON NAME: Black coral

COLONIES: up to 1.5 m tall

HABITAT: 55-600 m; hard substrata, on rocks; areas with moderate currents and clear water

THREATS: fishing (trawling, gill net, bottom longlines and traditional recreational fishing gears) may damage colonies enhancing epibionts' colonization

ASSEMBLAGES: refuge for numerous invertebrates and fish species; occasionally may act as fish nursery; supports a rich benthic and pelagic biodiversity including commercial fish species

CONVENTIONS: Listed in CITES Appendix II; Listed in SPA/BD' protocol Annex III under the wrong name *Antipathes* sp.plur.

REMARKS: - -



Antipathes dichotoma

ORDER: Antipatharia

COMMON NAME: Black coral

COLONIES: up to 2 m wide

HABITAT: 60-1500 m; rocky substrate; prefers silted environments characterized by low currents

THREATS: fishing (trawling, gill net, bottom longlines and traditional recreational fishing gears) may damage colonies enhancing epibionts' colonization

ASSEMBLAGES: refuge for numerous invertebrates and fish species; occasionally may act as fish nursery; supports a rich benthic and pelagic biodiversity including commercial fish species

CONVENTIONS: Listed in CITES Appendix II; Listed in SPA/BD' protocol under *Antipathes* sp.plur

REMARKS: - -

*IMAGE
NOT AVAILABLE*

Antipathes fragilis

ORDER: Antipatharia

COMMON NAME: Black coral

COLONIES: - -

HABITAT: 70-100 m; hard bottoms

THREATS: fishing (trawling, gill net, bottom longlines and traditional recreational fishing gears) may damage colonies enhancing epibionts' colonization

ASSEMBLAGES: refuge for numerous invertebrates and fish species; occasionally may act as fish nursery; supports a rich benthic and pelagic biodiversity including commercial fish species

CONVENTIONS: Listed in CITES Appendix II; Listed in SPA/BD' protocol Annex III under *Antipathes* sp.plur.

REMARKS: This is the less known black coral species for the Mediterranean Sea



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Leiopathes glaberrima

ORDER: Antipatharia

COMMON NAME: Black coral

COLONIES: over 2 m high

HABITAT: 90-600 m; rocky habitat with low to moderate currents (shallow rocky shoals moderate or heavily silted)

THREATS: fishing (trawling, gill net, bottom long lines and traditional recreational fishing gears) may damage colonies enhancing epibionts' colonization

ASSEMBLAGES: refuge for numerous invertebrates and fish species; occasionally may act as fish nursery; the arborescent colonies offer shelter to numerous species of crabs, shrimps and fish; supports a rich benthic and pelagic biodiversity including commercial fish species

CONVENTIONS: Listed in CITES Appendix II; Listed in SPA/BD' protocol Annex III under the wrong name *Antipathes* sp.plur.

REMARKS: one of the most long-living organisms known on Earth; estimated at more than 2000 years old



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Parantipathes larix

ORDER: Antipatharia

COMMON NAME: Black coral

COLONIES: roughly 2m high

HABITAT: 200-700 m; hard bottom; silted environments with low currents

THREATS: fishing impact that may drastically reduce their distribution by damaging the arborescent colonies and enhancing epibionts' colonization

ASSEMBLAGES: refuge for numerous invertebrates and fish species; occasionally may act as fish nursery; supports a rich benthic and pelagic biodiversity including commercial fish species

CONVENTIONS: Listed in CITES Appendix II; Listed in SPA/BD' protocol Annex III under the wrong name *Antipathes* sp.plur

REMARKS: characterized by a monopodial, pinnulated corallum, which at times can be ramified



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Callogorgia verticillata

ORDER: Alcyonacea

COMMON NAME: - -

COLONIES: up to 100 cm high

HABITAT: rocky bottoms at more than 100 meters depth, with no strong currents

THREATS: sensitive to the impact of human activities such as trawling, deep-sea fishing, oil exploration, drilling and dumping

ASSEMBLAGES: creates refuge for numerous other species and may represent a nursery area for fish; use to form cnidarians assemblages; commonly found with *Viminella flagellum* forming mixed gardens; also associated with sponge aggregations, mainly of axinellids (e.g. *Phakellia robusta*, *P. ventilabrum*) and astrophorids (e.g. *Pachastrella monilifera*, *Poecilastra compressa*); favours the development of benthic communities in its vicinity

CONVENTIONS: No

REMARKS: plays an important ecological role; it is considered an ecosystem engineer species, creating complex three-dimensional habitats



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Ellisella paraplexauroides

ORDER: Alcyonacea

COMMON NAME: candelabrum coral

COLONIES: up to 2 m high

HABITAT: 15 to 700 m; rocky substrate

THREATS: fishing gear entanglement (direct damage from longlines, trawling lines, gillnetting, trap deployment, etc.); boat anchors

ASSEMBLAGES: mainly associated with assemblages of other gorgonians and corals and observed in very shallow waters (15–30 m)

CONVENTIONS: No

REMARKS: It is a rare species, with an extremely fragmented distribution in the Mediterranean and with a strong vulnerability to demographic collapse due to its slow growth rate. The only member of the genus *Ellisella* recorded in European waters; very little is known about its basic ecology, biology, and population organization; only found in isolated colonies on the Chella bank (Almeria, Spain), around the Alboran and Chafarinas Islands, along the Ceuta and Melilla coasts, at some locations off Algeria and Tunisia, and in the Strait of Sicily



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Lophelia pertusa

ORDER: Scleractinia

COMMON NAME: white coral, cold water coral

COLONIES: up to 1 m high

HABITAT: rocky bottoms usually in depths over 300 m

THREATS: extremely sensitive to the impact of human activities such as trawling (bottom trawl activity alters the hydrodynamic and sedimentary conditions), deep-sea fishing (otter boards and nets), oil exploration, drilling and illegal dumping

ASSEMBLAGES: provides ecological niches for a large diversity of associated species, including crustacean and fish of economic interest;

CONVENTIONS: listed in CITES Appendix II

REMARKS: is a hot spot for biodiversity; usually found forming mixed reefs with other corals such as *Lophelia pertusa* and the scleractinian coral *Desmophyllum dianthus*



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Madrepora oculata

ORDER: Scleractinia

COMMON NAME: white coral, cold water coral

COLONIES: up to 1 m high

HABITAT: on rocky bottoms usually in depths over 300 m

THREATS: extremely sensitive to the impact of human activities such as trawling (bottom trawl activity alters the hydrodynamic and sedimentary conditions), deep-sea fishing (otter boards and nets), oil exploration and illegal dumping

ASSEMBLAGES: three-dimensional structure provides ecological niches for a large diversity of associated species, including crustaceans and fish of economic interest; associated with crystal sponges (e.g. *Asconema setubalense*)

CONVENTIONS: listed in CITES Appendix II

REMARKS: is a hot spot of biodiversity; usually found forming mixed reefs with other corals such as *Lophelia pertusa* and the scleractinian coral *Desmophyllum dianthus*



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Cladocora caespitosa

ORDER: Scleractinia

COMMON NAME: pillow coral and cladocore

COLONIES: 50 cm in diameter in surface water, to more ramified colonies at greatest depths

HABITAT: up to 50 m; hard substrata, sometimes in *Posidonia* meadows

THREATS: highly vulnerable to water pollution, fishing activities that interact with the seafloor, and anchors; collected for decorative use in aquaria

ASSEMBLAGES: - -

CONVENTIONS: listed in CITES Appendix II

REMARKS: habitat-building species, able to create reefs; endemic to the Mediterranean Sea

**IMAGE
NOT AVAILABLE**

Cladocora debilis

ORDER: Scleractinia

COMMON NAME: thin tube coral

COLONIES: - -

HABITAT: 25-100 m; hard substrata

THREATS: highly vulnerable to water pollution, fishing activities that interact with the seafloor, and anchors; collected for decorative use in aquaria

ASSEMBLAGES: - -

CONVENTIONS: listed in CITES Appendix II

REMARKS: habitat -building species

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