

Part 2

The Mediterranean deep-sea ecosystems

A proposal for their conservation

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The first part of this document presents that scientific information which is currently available to guide policy and decision makers in deep-sea-related issues. To translate this into action regarding the management of anthropogenic activities in the various sites, it is important to understand the current legal situation with respect to these areas, as well as to consider the international policy context and the current commitments of the UN and of partners to the relevant international conventions. Part 2 seeks to describe this background, and then to make proposals for conservation action.

6. Deep-water habitat protection and fisheries management

6.1. The particular legal status of Mediterranean waters

Unlike in other regions of the world, Mediterranean coastal states have generally renounced their right to extend national jurisdiction across true 200-mile wide Economic Exclusive Zones (EEZ's) as provided for by the United Nations Convention on the Law of the Sea (UNCLOS). The semi-enclosed nature of the Mediterranean and the large number of coastal states explain this cautious approach, aimed at avoiding territorial frictions.

However, in recent years, some countries have tried to adopt tailor-made, *sui generis* solutions to enlarge their fisheries jurisdiction beyond the 6-12 mile territorial waters, whilst avoiding a formal EEZ declaration. This would be the case for the so-called fishing zone (“*zone de pêche réservée*”) in Algeria (1994) or the fisheries protection zones unilaterally declared by Spain (1997) and Croatia (“ecological and fishing protection zone”; 2003). Malta, in turn, has had its 25-mile “management zone” recognized after its recent accession to the European Union. The final declaration of the Ministerial Conference on the Sustainable Development of Fisheries in the Mediterranean, held in Venice in November 2003, acknowledges the beneficial role to be played by extending fisheries protection zones for fisheries management in the region, and calls for the need to follow a concerted approach in their declaration.

As for unilateral extensions of jurisdiction for purposes other than fishing, France has enacted a law in April 2004 creating an ecological protection zone in the Mediterranean beyond its territorial waters, mainly aimed at implementing controls to fight pollution. Also, Italian legislation provides for the establishment of zones of biological protection beyond the Italian territorial sea on the high seas; use of this provision was made to create a zone of biological protection covering a stretch of water in the vicinity of the island of Lampedusa.

Nevertheless, in spite of the occasional attempts by some countries to partly apply UNCLOS provisions referred to above, about 80% of the Mediterranean still lies in the High Seas, which poses specific problems for the governance of fisheries management and biodiversity conservation in this region. This doesn't mean, however, that there are no legal instruments in place allowing for

the protection of the Mediterranean deep-sea biodiversity beyond national jurisdiction. In this regard, it must be pointed out that the particular situation discussed above relates to the lack of EEZ's, which mostly deal with the use of biological resources found *within the water column*. Indeed, the use of those found on the seabed beyond national jurisdiction is specifically covered by the International Seabed Authority (ISA), which establishes that coastal states have exclusive rights over seabed resources on the continental shelf, a juridical concept that encompasses all the seafloor in the Mediterranean basin. Sedentary species, legally defined in Article 77 of UNCLOS, are fully subject to this legislation. Also, the Barcelona Convention Protocol relative to Specially Protected Areas and Biological Diversity in the Mediterranean (SPA Protocol) provides for the creation of marine protected areas beyond territorial waters, as exemplified by the Ligurian Sea Cetacean Sanctuary. This protected area was originally established in Mediterranean High Seas by the governments of France, Monaco and Italy, being then listed as a Specially Protected Area of Mediterranean Importance (SPAMI) under the Barcelona Convention.

6.2. International policy context

The Plan of Implementation resulting from the World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002 includes, among other commitments, the maintenance of the productivity and biodiversity of important and vulnerable marine and coastal areas, including areas within and *beyond national jurisdiction*; the establishment by 2012 of representative networks of marine protected areas; and the development of national, regional and international programmes for halting the loss of marine biodiversity.

Decision VII/5, adopted by the 7th Conference of the Parties to the Convention on Biological Diversity (CBD COP-7), in Kuala Lumpur in February 2004, endorsed the Johannesburg Plan of Implementation mentioned above. Indeed, it set up a biodiversity management framework to be adopted by Parties (appendix 3 to annex I) that aims to deliver on a set of previously agreed objectives, among them:

- “*To enhance the conservation and sustainable use of biological diversity of marine living resources in areas beyond the limits of national jurisdiction.*”

This entails a) “*to identify threats to biological diversity in areas beyond national jurisdiction, in*

particular areas with seamounts, hydrothermal vents and cold-waters corals, and certain other underwater features”; and b) *“to urgently take the necessary measures to eliminate/avoid destructive practices, consistent with international law, on a scientific basis, including the application of precaution, for example, consideration, on a case by case basis, of interim prohibition of destructive practices adversely impacting the marine biological diversity associated with marine areas beyond the limits of national jurisdiction, in particular areas with seamounts, hydrothermal vents, and cold-water corals, other vulnerable ecosystems and certain other underwater features.”*

- *“To establish and strengthen national and regional systems of marine and coastal protected areas integrated into a global network and as a contribution to globally agreed goals.”*

This objective includes the setting up of representative marine protected areas where extractive uses are excluded, and other human impacts are minimized or removed, to enable the integrity, structure and functioning of ecosystems to be maintained or recovered.

The Decision adopted by the CBD COP-7 includes a call on the utilization of the precautionary and ecosystem approaches when addressing the conservation of biological diversity beyond national jurisdiction, and proposes a general two-level approach for conservation in which *“the marine and coastal protected areas network would be sitting within a framework of sustainable-management practices over the wider marine and coastal environment”*. This means combining a site-based approach (networks of protected areas) with general restrictions that would apply to the entire area (*“e.g. measures to eliminate/avoid destructive practices, consistent with international law, on scientific basis, including the application of precaution, for example, consideration on a case by case basis, of interim prohibition of destructive practices”* CBD Decision VII/5-60”).

Resolution 58/240 of the United Nations General Assembly, approved earlier in December 2003, already called for the urgent management of risks to the marine biodiversity of seamounts, cold waters coral reefs and certain other underwater features, and invited the relevant regions and regional bodies to address the conservation of vulnerable and threatened marine ecosystems and biodiversity in areas beyond national jurisdiction. It also reaffirmed the WSSD commitment to establish represent-

ative networks of marine protected areas by 2012. In addition, it recommended that the fifth meeting of the Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS), scheduled in June 2004, included in its agenda *“the conservation and management of the biological diversity of the seabed in areas beyond national jurisdiction”*.

UNICPOLOS, in turn, welcomed CBD decision VII/5 on marine and coastal biodiversity and encouraged the adoption of restrictive measures on a regional basis, and within existing regional fisheries management organizations. It reaffirmed the concern over the ineffective conservation and management of seabed biodiversity beyond national jurisdiction and, among other aspects, proposed to the UN General Assembly (UN GA) to encourage Regional Fisheries Management Organizations (RFMOs) with a mandate to regulate deep sea bottom fisheries to address the impact of bottom trawling on vulnerable marine ecosystems, as well as to urge States, either by themselves or through RFMOs, to consider on a case-by-case basis, including the application of precaution, the interim prohibition of destructive fishing practices that have an adverse impact on vulnerable marine ecosystems in areas beyond national jurisdiction, including hydrothermal vents, cold water corals and seamounts.

During the meeting, delegates from several countries, along with NGO's, supported a moratorium on bottom trawling in the High Seas. A few months before, in August 2003, deep-sea biologists from around the world met in Coos Bay (Oregon, USA), and launched a statement of concern to the UN General Assembly recommending immediate measures for the protection of biodiversity of the deep sea on the High Seas, as well as within areas of national jurisdiction. *Inter alia*, *“consistent with the precautionary approach”*, concerned scientists:

- called on the UN GA to adopt *“a moratorium on deep-sea bottom trawl fishing on the High Seas, effective immediately”*, and
- recommended the development of *“representative networks of [deep-sea] marine protected areas (MPAs), as called for by the World Summit on Sustainable Development and endorsed by the UN General Assembly”*.

UNICPOLOS also welcomed decision VII/28 of CBD COP-7 in the sense of exploring options for cooperation for the establishment of MPA's beyond national jurisdiction, consistent with international law and on the basis of the best available scientific information.

With respect to the Mediterranean basin, the issue of the protection of the local deep-sea biodiversity from impacting fishing practices was dealt with in the 2004 meeting of the Sub-Committee on Marine Environment and Ecosystems (SCMEE) of the Scientific and Advisory Committee (SAC) of the General Fisheries Commission for the Mediterranean (GFCM), the RFMO with the mandate for the Mediterranean region. The SCMEE concluded in its report that:

“Current scientific advice does not support any expansion in the range of depths at which fishing takes place. There is a strong opinion from some scientists from the NW Mediterranean that fishing at depths greater than 1000 m should not take place, based on a precautionary approach. The Subcommittee recommends that SAC (the Scientific and Advisory Committee of the GFCM) should analyze the conservation benefits to be gained from setting limits to the depths at which fishing takes place and balance these against the cost to fishermen.”

6.3. A conservation proposal tailored to the Mediterranean

6.3.1. Overview

According to the detailed analysis presented in this report, the general ‘two-level approach’ embedded in the CBD outcomes summarized above that combines a) the interim prohibition of destructive practices adversely impacting the marine biological diversity (a *general approach*), with b) the establishment of national and regional systems of marine and coastal protected areas integrated into a global network (a *site-based approach*), is fully valid also for the Mediterranean region.

However, a successful strategy for the protection and conservation of the Mediterranean deep-sea biodiversity, including the overarching ecosystems and the related biological and ecological processes, should be designed so as to take into account the regional geographical, socioeconomic and political specificities. Such specificities include the predominantly narrow continental shelves, the vast expanses of High Seas, and the existence of regional bodies with a mandate for marine biodiversity conservation and fisheries management, such as the Barcelona Convention, the GFCM and, to some extent, the EU.

The two-level approach detailed here was first presented for discussion to a specialized scientific audience on

the topic, by means of a presentation - and later debate - to the round table “Potential Mediterranean Protected areas in High Sea and Deep Sea”, held on June 11th 2004 in Barcelona, within the framework of the 37th CIESM Congress. The proposal received wide support from the Mediterranean scientific community, being based around the following elements:

- a general approach, based on preventing an extension of fishing practices beyond 1000 m depth as a precautionary measure, seeking the agreement of stakeholders and implementing the CBD recommendations; and
- a site based approach aiming at the creation of a Mediterranean representative network of deep-sea protected areas, including the following habitats: submarine canyons, deep-sea chemosynthetic communities (associated to cold seeps in mud volcanoes), cold-water corals, seamounts and deep-sea brine pools.

Both elements are complementary (i.e. not all biologically valuable deep sea ecosystems are found below the 1000 m isobath, whereas all communities found at those deeper grounds are assumed to be poorly resilient and vulnerable) and should be developed in parallel, using adequate policy instruments.

We need to stress that most of the unique deep sea environments here proposed as future MPAs in the Mediterranean have been discovered only recently, enhanced by the use of newly available techniques (deep submersibles, ROVs). A further increase in our knowledge on Mediterranean deep-sea ecosystems, paying special attention to their dynamics and to the influence of anthropogenic impacts on their functioning and structure, is necessary for their effective management.

6.3.2. Conserving deep sea ecosystems in the Mediterranean:

Element 1. Interim precautionary prohibition of deep-sea fisheries > 1000 m in depth

Rationale

As discussed earlier, notwithstanding the potential effects of other anthropogenic perturbations, such as global warming and pollution, fishing constitutes the most immediate, foreseeable short-term threat to Mediterranean deep-sea ecosystems. As happens throughout the world, the progressive depletion of traditional fishing grounds, together with “technological creep”, is push-

ing fishing activities towards offshore areas, on much deeper grounds. Medium-scale bottom trawlers (some with a deck length of barely 15 m) targeting deep-sea shrimps already reach fishing grounds at a depth of 800 m in some Mediterranean areas on a regular basis (depending on the season), and are increasingly approaching the 1000 m isobath, particularly when shrimp availability is low. However, such fishery has not yet affected those important fish communities occurring at a depth of around 1000-1500 m.

The scientific basis supporting this measure has been extensively discussed earlier in this document, on the basis of specific Mediterranean studies. Indeed, deep-sea biological communities have an intrinsic higher vulnerability to external perturbations (which may be extreme in the case of particularly impacting fishing systems, such as bottom trawling). Also, the few fish resources abundant enough to support commercial fisheries there in the Mediterranean are currently non-marketable species. Furthermore, any eventual exploitation of these populations would lead to a rapid depletion of the stocks, would strongly disrupt the particular trophic webs there, and would cause a deep impact on the structure and functioning of Mediterranean deep-sea ecosystems, which have started being scientifically explored at a significant scale only in recent decades. In addition, as scientific studies point out, a further expansion of fisheries down the bathymetric range would threaten the sustainability of current deep-sea fisheries in the region, namely those of deep-water aristeid shrimps, for which deeper grounds currently play the role of natural refuges and nursery grounds for the juvenile population fraction.

Implementation

It is important to point out that limiting the maximum depth in the Mediterranean susceptible to exploitation by fishing to the isobath of 1000 m would be a precautionary measure supported by sound scientific evidence, in the line recommended by Decision VII/5 adopted by CBD COP-7.

Furthermore, the proposed deep-sea fishing limitation should be considered more a restriction on potential fishing development than a true fishing ban, since no regular fisheries are taking place at those depths at present. In this sense, it is important that stakeholders fully understand the rationale supporting this measure – that clearly benefits the sustainability of fishing activity – and support the proposal as well.

According to the particular legal status of Mediterranean waters discussed above, it appears that the adoption and implementation of this measure should be done through a binding resolution, aimed both at the domestic level of coastal states (including the European Union through the new regulation on Mediterranean fisheries management), and also at the level of the relevant Regional Fisheries Management Organization, that is the General Fisheries Commission for the Mediterranean.

6.3.3. Conserving deep sea ecosystems in the Mediterranean:

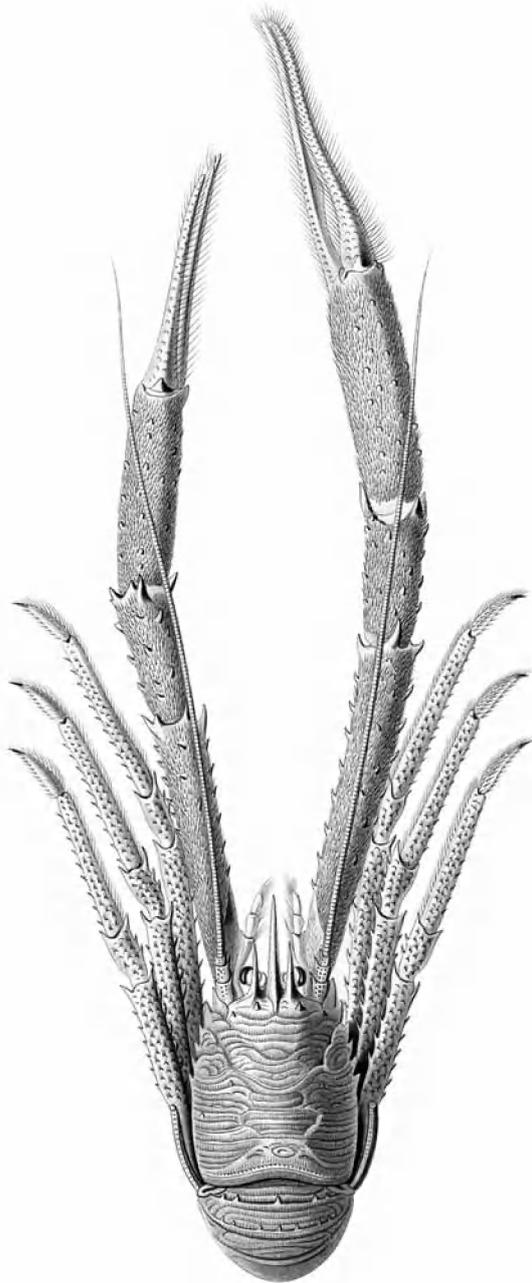
Element 2.

Representative network of deep-sea protected areas

Rationale

As described in detail in this report, there are a number of specific habitats with particular biodiversity importance in the Mediterranean deep-sea. These include submarine canyons, cold seeps associated to mud volcanoes (harbouring chemosynthetic communities), cold water coral “reefs”, seamounts and brine pools. Also, there is increasing consensus on the importance of the abyssal areas – currently poorly studied – to biodiversity in the region. Based on our present knowledge, the locations of these habitats are represented in fig. 9, but this figure should not exclude protection of other unique sites of similar characteristics that we expect might be discovered in the future.

The implementation of a general limitation on deep-sea fisheries below the isobath of 1000 m as proposed above would eliminate the risk of a profound anthropic impact due to the large-scale removal of biomass from the ecosystems, strongly altering their structure and functioning, and would prevent the introduction of damaging fishing techniques like bottom trawling in sensitive deep-sea environments. However, this general measure alone needs to be completed with a parallel site-based approach to ensuring adequate protection of the more biologically valuable deep-sea Mediterranean habitats. Indeed, some of the habitats listed above lie totally or partially above the 1000 m isobath, as with *Lophelia* reefs in the Ionian Sea, some chemosynthetic communities, and submarine canyons and seamounts. Besides, even in those habitats fully covered by the 1000 m fishing ban, fishing is not the only possible threat to be avoided or alleviated: pollution, seafloor drilling, etc. would also merit specific attention in any conservation scheme.



Munida rugosa.

Prince Albert de Monaco. *Camp. scient. Crustacés podophyt. pl. VII*.
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For these reasons, the setting up of a representative network of deep-sea protected areas, endowed with a strict management of major anthropic impacts, should be a second key element of a regional policy for the conservation of deep-sea biodiversity, in full agreement with decisions adopted at the CBD COP-7. Implementation of this measure would certainly benefit from a wide consensus among stakeholders, including all potential sectors with an influence in the Mediterranean sea.

Submarine canyons

As described earlier in this report, submarine canyons are geological structures key to biological and ecological processes in the entire Mediterranean basin. Indeed, canyons are crucial in channelling energy and matter from coastal areas to the deep-sea, and – by changing the vorticity of currents – creating local upwellings that are crucial to the life-cycle biology of certain species, including pelagic fish and marine mammals. Besides, important biocoenoses such as those linked to cold-water corals are associated with their flanks.

Canyons are also significant for Mediterranean fisheries, being tightly linked to the life cycle of aristeid shrimps, natural reproductive refuges for overexploited demersal species, and important spawning grounds for anchovy.

Due to the three-dimensional importance of canyons, affecting both benthic and pelagic biodiversity, protection should be afforded at least to the entire ‘canyon system’, i.e. the sea floor and the entire water column associated with it.

Scientific literature shows that canyons are relevant to Mediterranean biodiversity and biological processes all around the region, though they are especially important in the NW Mediterranean (Catalonia, Gulf of Lions and Ligurian coast), as well as in certain parts of the Eastern Basin (i.e. those associated with the Nile fan, in the Levantine basin). A complete and fully representative network of deep-sea protected areas in the Region should contain protected canyons systems from at least these two areas.

Cold seeps (chemosynthetic communities)

Deep-sea cold seeps are of maximum ecological and biodiversity importance in the Mediterranean since, in the absence of deep-sea hydrothermal vents, cold seeps are the only fully chemosynthetic ecosystems in the basin.

Candidate sites for protection include those cold seeps where live chemosynthetic communities have been identified to date: the Olympic field (South of Crete), the Anaximander mountains (South of Turkey) and a limited area off Egypt and Gaza.

It is likely that further research will demonstrate the existence of more live chemosynthetic communities in other areas harbouring mud volcanoes and cold seeps. Accordingly, the network of deep-sea protected areas could, on a precautionary basis, also include some of the areas where cold seeps have been detected, and the presence of chemosynthetic communities is presumed.

Cold water coral “reefs”

Cold water corals reefs or mounds are of high biodiversity value in the Mediterranean. Only few relictual colonies of the main cold water reef-builder *Lophelia pertusa* remain in the Mediterranean, where it appears that current environmental conditions are considerably below the optimum for this species. *Madrepora oculata* is another important reef-building species in the Mediterranean.

Cold water reefs or mounds are biodiversity hotspots, since the associated three-dimensional structure provides ecological niches to Mediterranean deep-sea species such as the Mediterranean orange roughy (*Hopllostethus mediterraneus*) and others.

Obvious candidate sites for protection include the only known live *Lophelia* mounds in the Mediterranean – the site found 20-25 miles offshore Santa Maria di Leuca (Italy), where this biocoenosis has been found at a depth range of 425-1110 m – and a few scattered areas in the Alboran Sea, the Gulf of Lions and the Catalan Sea (associated to canyons) where the species has been confirmed to occur. Other areas of important *Madrepora oculata* presence could also be included. Increased prospecting will probably lead to the discovery of more live *Lophelia* colonies in the Mediterranean.

Seamounts

Seamounts are particular marine geomorphological structures that are considered of great biodiversity importance worldwide. In areas of the Indian and Pacific oceans, particularly, the discovery of significant biomasses of commercial fish resources occurring around the slopes of seamounts has given way in recent years to the development of new deep-sea fisheries. These have systematically resulted in a strong decline of fish biomass after only a few years of exploitation, due to the very high vulnerability that the related deep-sea fish communities face to commercial exploitation.

Although the biodiversity of Mediterranean seamounts has seldom been explored, the first benthos samples recovered from the top of the Eratosthenes Seamount, in the Eastern Mediterranean, revealed a relatively rich

and diverse fauna that included the first occurrences of two scleractinian species in the Levant Sea, both of them constituting the deepest records in the whole Mediterranean. This and other scattered evidence suggest that Mediterranean seamounts are not an exception in relation to its biodiversity importance.

Even if a general limitation on deep-sea fisheries as proposed earlier could entail the partial protection of some Mediterranean seamounts, in most cases the summit and upper slopes would remain unprotected faced with potentially harmful fishing techniques such as bottom trawling. Consequently, a site-based approach for the protection of Mediterranean seamounts appears to be necessary. In this sense, a Mediterranean representative network of deep-sea protected areas should include the best known Mediterranean seamounts, that is, Eratosthenes, as well as, on a precautionary basis, those of presumed biodiversity importance most threatened by the potential development of anthropic activities (notably deep-sea fisheries).

Brine pools (deep hypersaline habitats)

Deep hypersaline structures known as brine pools are deep-sea habitats of high biodiversity importance, particularly to extremophilic bacteria and metazoan meiofaunal assemblages.

Reported sites in the Mediterranean are restricted to the Eastern Basin, at beds below 3000-m. All illustrated deep hypersaline anoxic basins should be included in a Mediterranean representative network of deep-sea protected areas, to be preserved from potential anthropic impacts, such as seafloor drilling or waste disposal.

Implementation of a Mediterranean network of deep-sea protected areas

Different legal possibilities exist for the establishment of deep-sea protected areas in the Mediterranean, ranging from national (including EU) legislation, to international treaties with competence on the Mediterranean High Seas, either dealing with integral conservation aspects – such as the Barcelona Convention – or relating to a particular sector – such as GFCM on fisheries.

Given this complex picture, during the discussion held at the CIESM thematic round table on the protection of the Mediterranean deep-sea in June 2004, a need was clearly identified by those experts present. A coordinating platform should be created gathering together all relevant treaties with mandates for the protection of the Mediterranean and the management of human activities in this sea, to move towards a harmonized approach for the establishment of a representative network of deep-sea protected areas in the Mediterranean Sea.

This said, and given the usual slow pace of institutional processes, the principle outlined above should not prevent selected Mediterranean deep-sea habitats, such as those proposed in the sections above (see map below), already being created under the most appropriate legal framework, to secure immediate protection. In this sense, it is worth referring to the Ligurian Sea Cetacean Sanctuary, created in 1999 by France, Italy and Monaco on the Mediterranean High Seas, that was then designated as one of the first Specially Protected Areas of Mediterranean Importance (SPAMI) under the Barcelona Convention Protocol relative to Specially Protected Areas and Biological Diversity in the Mediterranean.

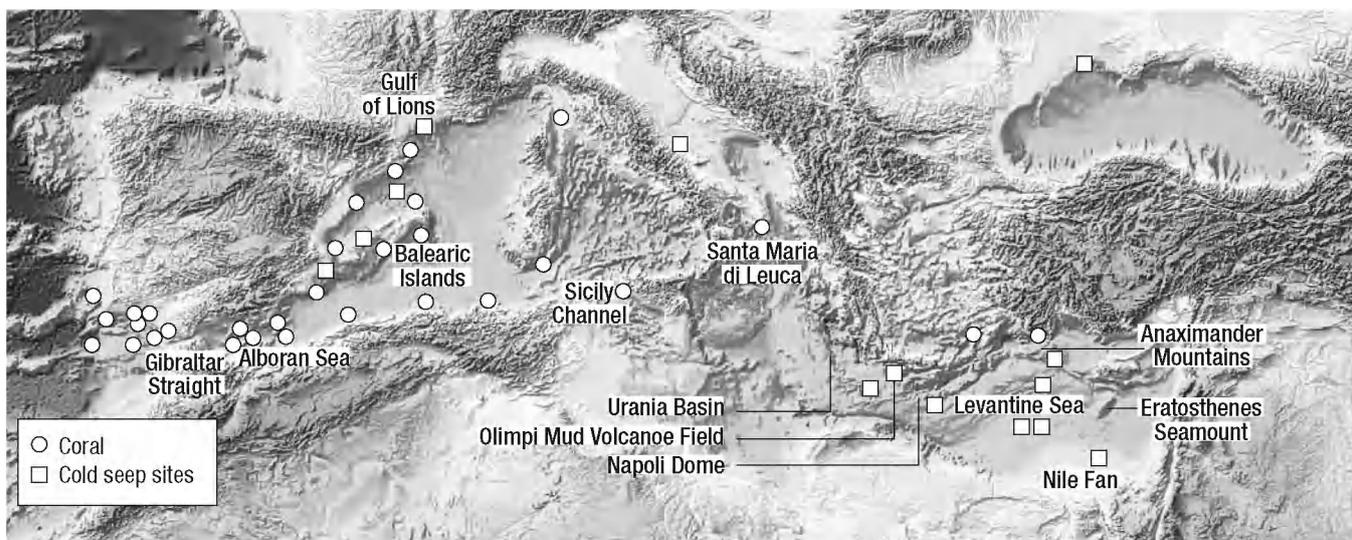


Fig.9. Presently known distribution of deep-sea unique biocenoses in the Mediterranean and adjacent Atlantic waters. Credit: Hermes (Hotspot Ecosystem Research on the Margins of European Seas), VI FP European Commission Project; and *An Interactive Global Map of Sea Floor Topography Based on Satellite Altimetry & Ship Depth Soundings*. Meghan Miller, Walter H.F. Smith, John Kuhn, & David T. Sandwell. NOAA Laboratory for Satellite Altimetry. <http://ibis.grdl.noaa.gov>. Modified.
See colour plate, p. 57.

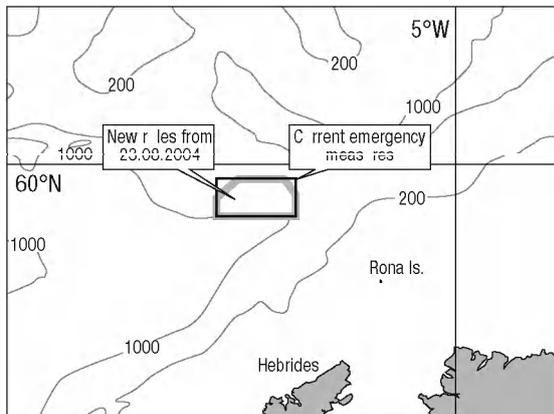
Box 10. Community initiatives for the protection of deep sea biodiversity in Atlantic waters

Recent initiatives undertaken at European level have seriously addressed the protection of fragile deep-sea habitats from trawling in the NE Atlantic. In March 2004, the European Council agreed to give permanent protection to Scotland's unique cold-water coral reefs, the Darwin mounds, by banning deep-water bottom trawling in the area.

Only discovered in 1998, the Darwin Mounds (see below) are a unique collection of cold-water coral mounds (*Lophelia pertusa*) at a depth of 1000 m, about 185km northwest of Scotland. They are made up of hundreds of coral reefs up to 5m high and 100m wide covering an area of approximately 100 sq km. The reefs support a wide diversity of marine life, such as sponges, starfish, sea urchins, crabs and deep-sea fish including the blue ling, round-nosed grenadier and orange roughy.

Earlier, in February 2004, the European Commission tabled a proposal to ban the use of bottom-trawled fishing gear around the Azores, Madeira and the Canary Islands (see map below). The declared aim is to eliminate the risk of the lasting or irreparable damage that such gear can cause to highly sensitive deep-water habitats found in these areas. A restrictive access regime has prevented until now the activity of deep-sea trawling in these areas. The continental shelf around the islands concerned by the proposed measures is very narrow or virtually non-existent. Several habitats are to be found at the bottom of these deep waters. These include deep-water coral aggregations, thermal vents and carbonate mounds, which give shelter and food to a highly diversified fauna and flora. Scientific evidence, including reports from the International Council for the Exploration of the Sea (ICES), shows that habitats such as those found around the islands concerned by the proposal are in need of special protection, especially against the physical damage caused by bottom trawls and similar fishing gear.

Darwin Mounds



Areas where bottom trawling would be prohibited

