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# "Identification of Potential SPAMIs in Mediterranean Areas Beyond National Jurisdiction"

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**Identification of Potential SPAMIs in Mediterranean Areas Beyond National Jurisdiction**

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## 1. Executive Summary

The Mediterranean Sea is at once highly treasured, and undervalued. While both ancient civilizations and modern societies have acknowledged the sea's importance, large swaths of the basin remain unmanaged and open to threats.

Areas Beyond National Jurisdictions (ABNJs) currently constitute the bulk of the Basin's volume of 2.5 million square kilometres. This vast area is diverse, with pockets of relatively high productivity, and largely unprotected. Creating an ecological network of representative marine protected areas under the aegis of the Barcelona Convention and its Specially Protected Areas of Mediterranean Importance (SPAMI) listings in the ABNJs could do much to preserve the integrity of this globally important region.

This report describes the first phase in the process of developing such a representative network. We describe a strategic and hierarchical process of using existing databases and analyses to delineate areas of conservation importance, using the SPAMI criteria harmonised with criteria from other site selection methodologies to suit Mediterranean conditions and information availability.

The first step in this hierarchical process was the assessment of subregions within the Mediterranean Basin. Subdividing the Basin into subregions ensures that the eventual MPA network will be truly representative of all regions, as well as all habitat types. While previous researchers have divided the Mediterranean either into two large subregions (East and West) or seven smaller subregions (see Spalding et al. 2007), we identify eight distinct subregions: Alborán Sea, Algero-Provencal Basin, Tyrrhenian Sea, Adriatic Sea, Ionian Sea, Tunisian Plateau – Gulf of Sidra, Aegean Sea, and Levantine Sea.

The second step in the process was to review existing criteria, adapt them, and add additional discriminating features to guide the selection of sites. A review of existing information bases reveals that data quality is inconsistent across taxa and geographical regions, yet much useful information is available. The region-specific criteria that we used, with the SPAMI criteria as a starting point, rely heavily on the CBD criteria that emerged from the Azores meeting (2008), but with additional criteria that guarantee that the resulting network will conserve biological diversity and ecological integrity to the maximum extent possible.

Data on benthic invertebrates, fish fauna, sharks, birds, marine turtles, pinnipeds, and cetaceans were particularly useful to the site selection process. In addition, information on key biogenic and physical habitats in the ABNJ domain helps create a useful baseline for the hierarchical methodology.

The site selection process entails three discrete steps: 1) identifying the priority regions (EBSAs) in each of the Mediterranean ABNJs subdivisions using the refined site selection criteria; 2) applying further analysis to the previously highlighted priority areas in order to identify potential sites that could be protected as SPAMIs; and 3) preparing a short list of potential sites in the ABNJs which could be protected as SPAMIs.

In order to select areas of conservation significance or concern, known as Ecologically or Biologically Significant Areas (EBSAs) within which potential SPAMI sites were elaborated, we surveyed key experts in various aspects of Mediterranean ecology and marine biodiversity to highlight especially important areas within each subregion, asking them to rank criteria according to the extent to which it helped them in their determination. The resulting polygons were overlaid to highlight especially critical areas, 10 EBSAs in all.

Further analysis allowed us to list 15 highest priority areas, within which RAC/SPA and the parties to the Barcelona Convention can develop SPAMI nominations.

Finally, we elaborated a road map for carrying this further in order to eventually develop an ecological and representative network of marine protected areas using SPAMI designations on ABNJs. Next steps include a threat and socio-economic factors analysis in order not only to identify vulnerable sites needing protection as SPAMIs, but also to be able to factor in feasibility. A subsequent initiative should have three essential components: 1) development of a strategic plan to elaborate the priorities within the SPAMI list; 2) targeted research to determine with greater specificity the ecological characteristics of each priority area, its boundaries, and direct threats to the biodiversity the area supports; and 3) analyses to determine the optimal spatial management scheme for each of the SPAMIs, including whether protected areas should be zoned, what sort of regulations should be instituted, how areas should be monitored and regulations enforced, and the appropriate governance regime for these ABNJ areas.

These results should help guide RAC/SPA in presenting possible options for the Contracting Parties to the Barcelona Convention to consider in future SPAMI designations, in order to take this important step toward protecting Mediterranean marine biodiversity.

# 2. General overview and analysis of existing information

## 2.1 Introduction

The Mediterranean High Seas encompass a large part of the Mediterranean Basin, which covers some 2,5 million km$^2$ of ocean area. The high seas support a wide array of marine life and have pockets of relatively high productivity, yet to date only a single marine protected area (the "Pelagos Sanctuary for Mediterranean Marine Mammals") exists to safeguard this biodiversity. This project aims to provide the foundation for a system of protected areas, designated as Specially Protected Areas of Mediterranean Importance (SPAMIs), which when implemented will contribute to staving off further biodiversity loss.

We are aware of the fact the jurisdictions are fluid and changing, as exemplified in recent efforts describing the situation (e.g., Suarez de Vivero and Slim, 2008). However, we are considering for the purpose of this report the Mediterranean High Seas as **all the seas beyond the riparian nations' territorial waters** (i.e., 12 nautical miles from the coast, except for Greece and Turkey, where territorial waters end at 6 n.m. from the coast). Figure 2-1, taken from Suarez de Vivero and Slim, 2008, shows the limit of these territorial seas, as well as other categories of jurisdiction for Mediterranean coastal countries.

Despite the dynamic nature of the legal framework for Mediterranean marine conservation, selection of priority areas will create important impetus for more effective management. We feel that if the legal regime in Mediterranean countries changes and countries move to declare EEZs up to 200 nautical miles out, the selection of High Seas SPAMI areas will bolster rationale for countries to move ahead with unilateral protection, and at the same time will act to bring international attention to these overlooked but valuable areas.

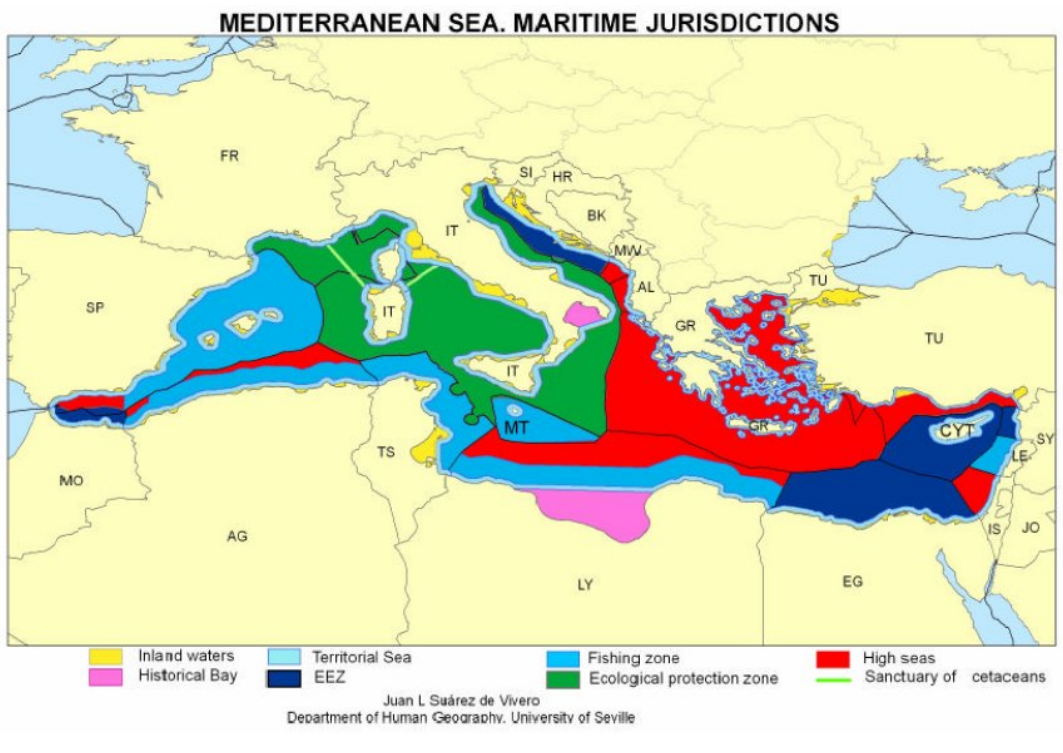


Fig. 2-1. A representation of the current status of maritime jurisdictions in the Mediterranean Sea, proposed by J.L. Suarez de Vivero, University of Seville.

## 2.2 Historical background

The Mediterranean Sea has been central to human civilization for millennia, and as such has been better travelled and longer studied than any other ocean body. Yet much of the ocean basin remains a mystery, in terms of knowledge about ecological processes, the distribution and abundance of marine organisms, the condition of its ecosystems, and the drivers of biodiversity loss.

Mediterranean Sea-wide assessments have been carried out in the last several decades, including those undertaken under the aegis of UNEP and the World Bank (notably the first Mediterranean Environment Programme, World Bank Report of 1993 and subsequent METAP reports). Most of these assessments, however, focused on the nearshore and the riparian influences of polluted freshwater reaching Mediterranean shores. The latter body of knowledge led to the development of the Blue Plan – yet high seas areas continue to lack attention.

A notable exception was the creation of the Pelagos Sanctuary for Mediterranean Marine Mammals. When in March of 1991 Tethys presented "Project Pelagos" to the public in Monaco, it had the support of local businessmen in the Rotary Club chapters in Italy (Milan), Monaco and France (Saint Tropez), and the European Association Rotary for the Environment. Prince Rainier III of Monaco received the proposal enthusiastically and granted support of the Principality. It was Prince Rainier III who then championed the idea that a sanctuary for cetaceans be eventually created in the Ligurian-Corsican-Provencal basin through a trilateral agreement among France, Italy and Monaco (Notarbartolo di Sciara et al. 2008).

Another exception to the lack of attention characterising the Mediterranean High Seas concerns the 2005 decision by the General Fisheries Commission for the Mediterranean (GFCM) to ban trawling on Mediterranean bottoms below the depth of 1,000 m, which includes the greatest portion of the Mediterranean High Seas seafloor; and the 2006 designation by the GFCM of three ecologically important areas off-limits to bottom trawling and dredges, which are all or in part within the high seas (i. a 10,295 $km^2$ wide area surrounding the Eratosthenes seamount south of Cyprus; ii. a 976 $km^2$ wide deepwater coral (*Lophelia*) reef off Capo Santa Maria di Leuca, Italy, in the Ionian Sea; and iii. a 4,374 $km^2$ wide area of cold hydrocarbon seeps and associated chemosynthetic communities offshore from the Nile Delta).

Recent attention has focused on previously ignored high seas areas, including widely distributed and ecologically significant sea mounts. Greenpeace (2004), in a report on Mediterranean marine reserves, flagged 32 priority sites that were suggested worthy of MPA designations, and many of these extend beyond territorial waters (Fig. 2-2).


Fig. 2-2. Proposals for areas to be considered for the establishment of marine reserves in the Mediterranean Sea by Greenpeace (2004). For locations corresponding to the numbers in the map please refer to the original report.

Greenpeace's (2004) proposal for the consideration of marine reserve establishment includes: the Alborán Sea, a number of seamounts in the Western Mediterranean, the waters surrounding the Balearic Islands, the Gulf of Lion, the Algerian stretch, the Carthaginian stretch, the Ligurian Sea, the Central Tyrrhenian Sea, the Strait of Messina, the Sicily Strait, the Maltese slope, the Medina Ridge, the Gulf of Sirte (=Sidra), the Libyan head, the Upper Adriatic, the Pomo/Jabuca Trench, the Otranto Channel, the Hellenic Trench, the Olimpi mud field, the Saronikos Gulf, the Northern Sporades Islands, the Thracian Sea, the Limnos-Gökçeada area in the north-eastern Aegean, a stretch between Crete and Turkey, the Central Levantine Sea, the Anaximander Mountains, the Cyprus Channel, the Eratosthenes Seamount, the Phoenician coast, and the Nile fan.

UNEP's World Conservation Monitoring Centre in Cambridge (UK) keeps a database on known seamount locations, and these and other bathymetric data should be considered to select High Seas SPAMI sites. Currently, efforts are ongoing to promote the case for the establishment of large international High Seas protected areas in the Alborán Sea (Ricardo Sagarminaga, pers. comm.) and in the Strait of Sicily [1].

An older attempt to draw attention to areas of the Mediterranean worthy of consideration for protection is represented by a gap analysis conducted over the whole region through the implementation of a GIS approach (Franzosini et al. 2001), which however concentrated efforts within a depth range of 0-250 m, thus excluding the High Seas from most of the analysis. Nonetheless, Franzosini et al.'s effort highlighted the need for resorting to proxies for biodiversity measures in large portions of the Mediterranean, because taxonomic and geographic gaps in protection still remain, in part due to the lack of systematic surveys. For this reason, we suggest the adoption of standard criteria used by many institutions and organizations for marine site selection (see Section 3 in this document).

[1] http://www.wwf.it/client/ricerca.aspx?root=13872&parent=11621&content=1

## 2.3 State of the art

### 2.3.1 Sub-regional classification

In a recent report (Notarbartolo di Sciara and Agardy 2008) we have argued that in planning a regional network of MPAs the adoption of a three-step hierarchical approach is recommended, which begins at the large scale and focuses in on ever-smaller scales. At the largest scale, in this case that of the Mediterranean Basin, the first recommended step in designing an ecological network is the identification of large scale ecological units. The purpose of this is to recognize ecological distinctions between different parts of the region, and ensure that something that is called a *Mediterranean Network of MPAs* is truly comprehensive and representative of all of its sub-regions. The first task is therefore to subdivide the Mediterranean into broadly homogeneous sub-units, which will help priority setting and planning for marine conservation in the region.

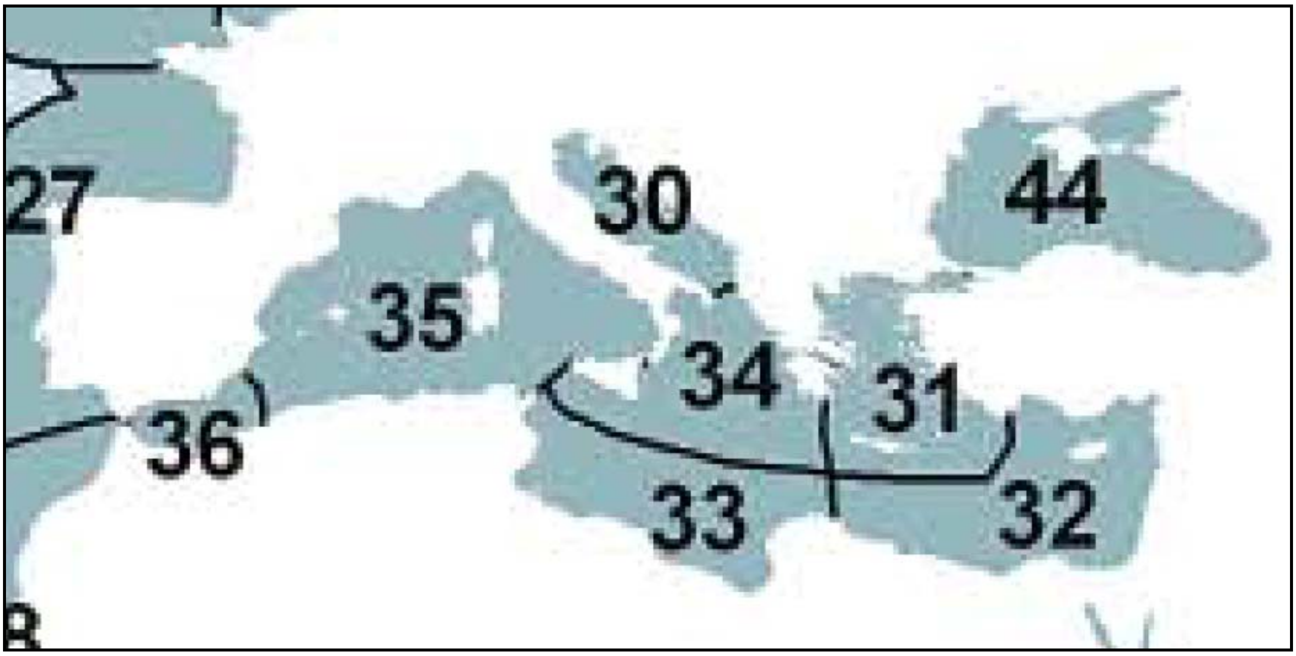


Fig. 2-3. The seven "ecoregions" proposed by Spalding et al. (2007) for the Mediterranean (36. Alborán Sea, 35. Western Mediterranean, 30. Adriatic Sea, 34. Ionian Sea, 33. Tunisian Plateau/Gulf of Sidra, 31. Aegean Sea, 32. Levantine Sea).

The most recent attempt at developing a detailed, comprehensive biogeographic system to classify the oceans was recently proposed by Spalding et al. (2007), who subdivided the world's coastal and shelf areas into a nested system of 12 realms, 62 provinces and 232 ecoregions. In Spalding et al.'s classification, the *Mediterranean Sea Province*, part of the *Temperate North Atlantic Realm*, is subdivided into seven ecoregions: Alborán Sea, Western Mediterranean, Adriatic Sea, Ionian Sea, Tunisian Plateau/Gulf of Sidra, Aegean Sea, and Levantine Sea (Fig. 2-3).

We consider Spalding et al.'s (2007) contribution a significant advance in the development of geographic tools for marine conservation planning, but suggest that the subdivision of the Mediterranean Province into ecoregions be slightly modified to fit more closely the region's existing geomorphological and biogeographic diversity. Our proposal contemplates eight subregions instead of Spalding et al.'s seven.

| Ecoregions by Spalding et al. 2007 (Fig. 2-3) | Marine Strategy Framework Directive | Our proposal (Fig. 2-4) |
|---|---|---|
| 1. Alborán Sea | 1. Western Mediterranean Sea | 1. Alborán Sea |
| 2. Western Mediterranean | | 2. Algero-Provencal Basin |
| | | 3. Tyrrhenian Sea |
| 3. Adriatic Sea | 2. Adriatic Sea | 4. Adriatic Sea |
| 4. Ionian Sea | 3. Ionian Sea and Central Mediterranean Sea | 5. Ionian Sea |
| 5. Tunisian Plateau – Gulf of Sidra | | 6. Tunisian Plateau – Gulf of Sidra |
| 6. Aegean Sea | 4. Aegean – Levantine Sea | 7. Aegean Sea |
| 7. Levantine Sea | | 8. Levantine Sea |

Table 2-1. Comparison among different subdivisions of the Mediterranean into subregions.

The proposed scheme will also allow encompassing subregions within the four main subdivisions of the Mediterranean Sea established by the 2008 EU Marine Strategy Framework Directive (Table 2-1, central column), which is relevant to those Mediterranean riparian nations that are European Union member states.

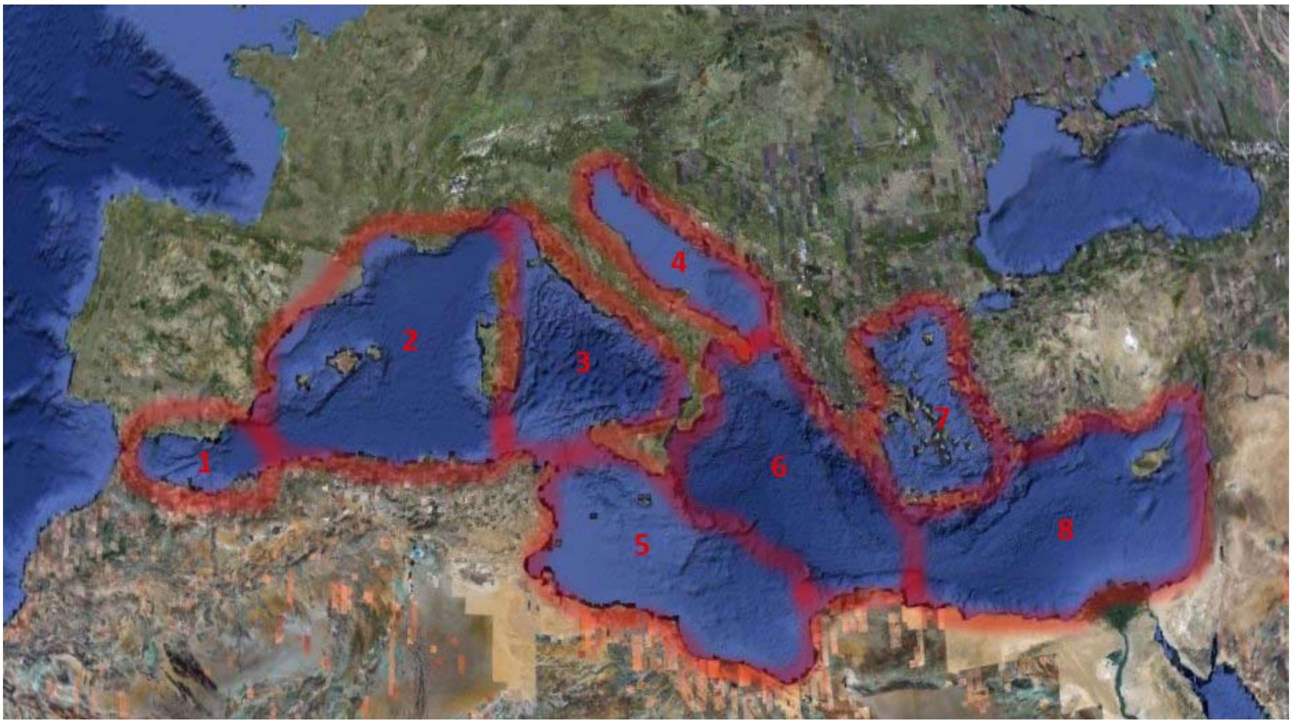


Fig. 2-4. Suggested subdivision of the Mediterranean into eight subregions (1. Alborán Sea, 2. Algero-Provencal Basin, 3. Tyrrhenian Sea, 4. Adriatic Sea, 5. Tunisian Plateau/Gulf of Sidra, 6. Ionian Sea, 7. Aegean Sea, 8. Levantine Sea).

In particular, compared to the subdivisions of the Marine Strategy Framework Directive, our proposal simply splits into three the “Western Mediterranean Sea”, into two the “Ionian Sea and Central

Mediterranean Sea", and into two the "Aegean – Levantine Sea". This is acceptable because the Directive states that " *… in order to take into account the specificities of a particular area, … [it is possible to] … implement this Directive by reference to subdivisions at the appropriate level of the marine waters … provided that such subdivisions are delimited in a manner compatible with the following marine subregions …. (i) the Western Mediterranean Sea; (ii) the Adriatic Sea; (iii) the Ionian Sea and the Central Mediterranean Sea; (iv) the Aegean-Levantine Sea.*"

Furthermore, compared to the ecoregional subdivision proposed by Spalding et al. (2007), our proposal: a) splits the "Western Mediterranean" into two, considering that morphological, oceanographic and biogeographical differences between Tyrrhenian Sea and the Algero-Provencal basin; b) moves the boundary between Ionian Sea and Tunisian Plateau – Gulf of Sidra to more closely reflect the depth profiles of the area; and c) moves the boundary between Aegean Sea and Levantine Sea to ensure the correct delimitation of the former.

### 2.3.2 Biophysical features of the Mediterranean High Seas

The Mediterranean is a semi-enclosed sea almost entirely landlocked between Europe, Africa and Asia. In spite of its small size compared to the world's oceans, the Mediterranean is considered a deep sea, with areas of seafloor exceeding the depth of 5,000 m (Fig. 2-5). The only connection with the Atlantic Ocean is the Strait of Gibraltar, 320 m deep and 14 km wide. The Mediterranean is also connected to the Black Sea through the Turkish Straits System, which is as shallow as 70 m in the Bosphorus. The Mediterranean's connection with the Red Sea, the man-made Suez Channel, opened in 1869, is irrelevant from the point of view of water mass exchanges with the world's oceans, but it has become a significant corridor for biological dispersion. A north-south ridge between Sicily and the African coast, with a minimum depth of 400 m, subdivides the basin into a western and eastern portion. With the exception of the Adriatic and Aegean Seas, off the coasts of Tunisia, Libya and southern Sicily, the continental shelf is very narrow and constitutes less than 25% of the total basin area (Sardà et al. 2004).

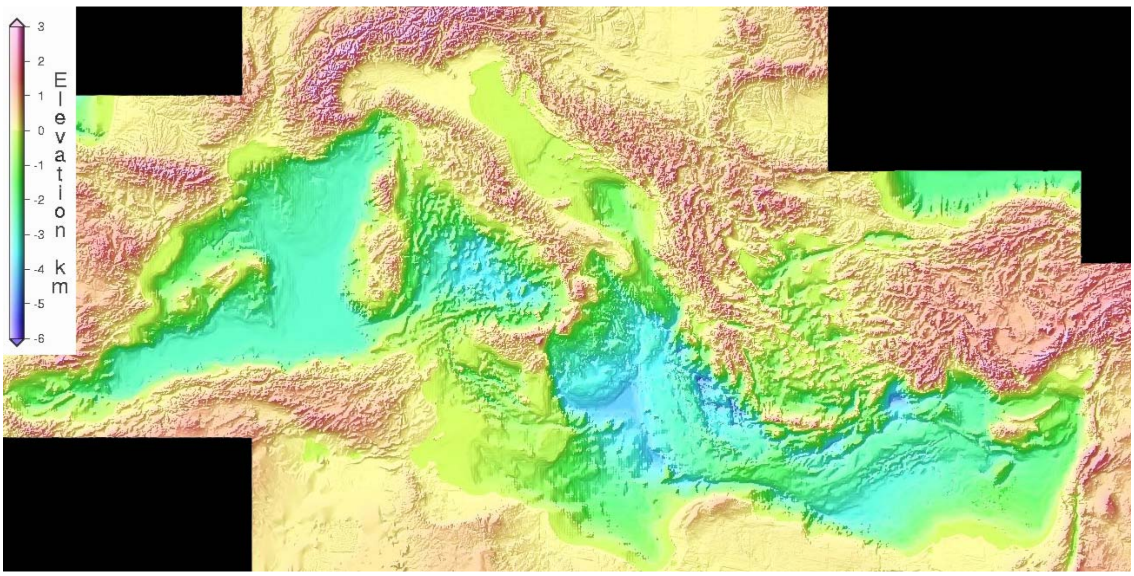


Fig. 2-5. Sea floor topography of the Mediterranean Sea (Smith and Sandwell 1997).

The Mediterranean Sea has a negative hydrological balance, with loss through evaporation exceeding the input of water through runoff and precipitation. This deficiency is mainly compensated by the flow of Atlantic surface waters through the Strait of Gibraltar (about 35,000 $km^3$ $year^{-1}$). The major feature of the surface current system of the Mediterranean is the movement of surface water from the Atlantic toward the east combined with numerous spin-off eddies along the way (Miller 1983). Circulation patterns in the Mediterranean Sea, and the progressive diversification of Atlantic surface water into a structured system of intermediate and deep layers, are now well understood and described (e.g., Millot and Taupier-Letage 2004).

The Mediterranean circulation system also includes strong vertical convection currents that determine the distribution of salinity and provide for vertical recycling of nutrients and other dissolved substances. However, the sea has relatively low concentrations of nutrients even in deeper waters. These chemicals are exported in the flow of deep water through the Strait of Gibraltar that in turn receives nutrient-poor surface Atlantic water. No deep nutrient-rich Atlantic waters take part in the Mediterranean circulation, and the input of nutrients is mostly due to river input and agricultural runoff or pollution (Miller 1983).

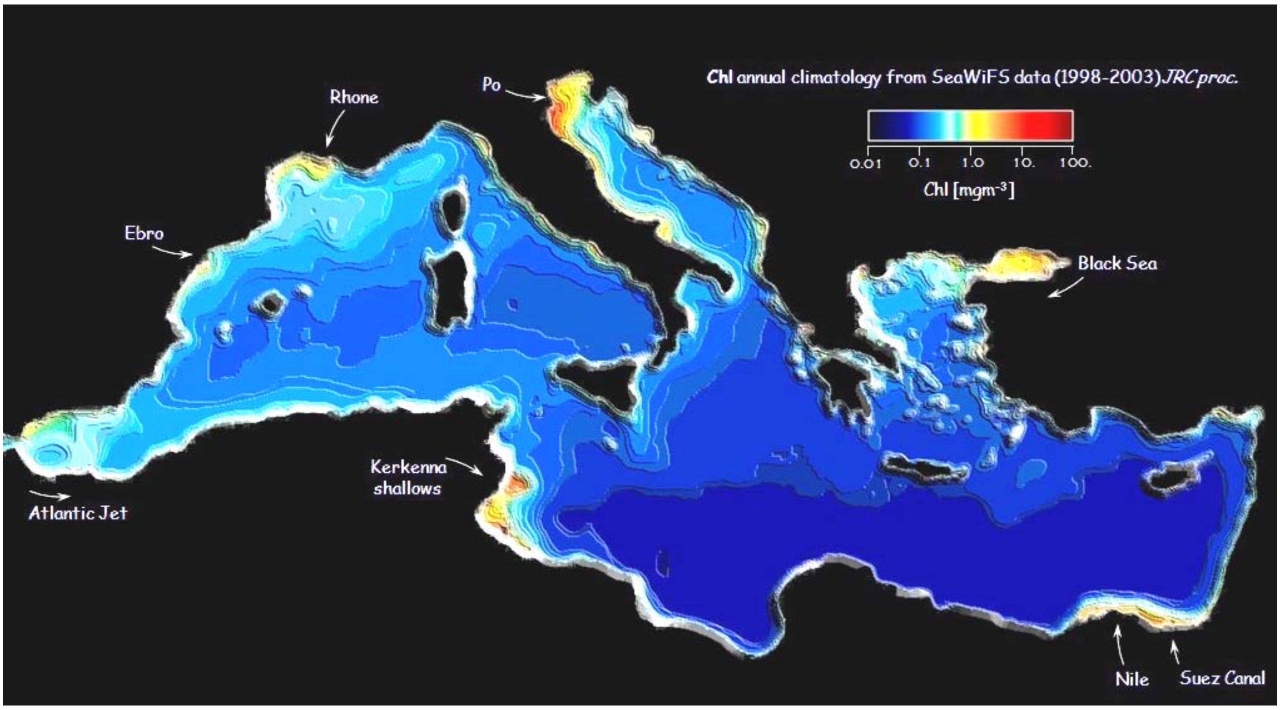


Fig. 2-6. Chlorophyll climatological annual mean (SeaWIfs data, 1998-2003, courtesy of V. Barale, JRC).

Compared to average oceanic productivity in temperate latitudes, Mediterranean waters are mostly oligotrophic, particularly in the eastern portion of the basin, except in the vicinity of large rivers, in areas where geomorphological, meteorological and oceanographic features cause localised upwellings and consequent higher levels of primary production (e.g., Jacques 1989, Bakun and Agostini 2001), and through gravity-induced sediment transport in underwater canyons (Canals et al. 2007). High Seas areas where primary productivity is above average include the Alborán Sea, the Gulf of Lion and Ligurian-Provencal

Basin, the waters offshore the Kerkenna shallows, the Northern Adriatic, the Northern Aegean and the waters offshore the Nile Delta (Fig. 2-6).

Sediments have in general low organic carbon content due to the low biological productivity of the waters and the presence of high oxygen concentrations in deep waters. Local oxygen deficiencies are always connected with eutrophication sources, mostly discharges of raw or treated urban or agricultural effluents. Their distribution around the region is uneven, with a maximum in the northwest and in the Adriatic Sea and a minimum on the southern shores. Owing to the strong stratification of surface waters, eutrophication is more acute in summer when ambient nutrient concentrations are low and oxygen transport through the thermocline is strongly reduced. Winter mixing allows for the required vertical transport of oxygen to keep the deep waters and the sediments oxidized all over the Mediterranean Sea (Cruzado 1985).

The Mediterranean High Seas also contain ecologically significant features such as slopes, seamounts, canyons, and undersea volcanoes. Clark et al. (2006) predicted the existence of 59 large seamounts in the Mediterranean and Black Seas, based on GIS technology. Such rudimentary information on the location and condition of some of these subsea features could be improved through a combination between observed features (e.g., Fig. 2-7) and GIS-based predicted locations of seamounts. This, together with information on frontal systems and other ecological significant features of the water column, can be used to identify priority conservation areas.

Aguilar at al. (2006) recognise a number of European habitats relevant to marine biodiversity, which they subdivide into physical habitats and biogenic habitats. **Physical habitats** include: a) raised features (seamounts, mounds, hills, canyons, trenches, etc.); b) constructive gases (submarine volcanoes, hydrothermal vents, cold water seeps, etc.); c) caves, caverns and overhangs; d) pelagic environments (convergence zones, divergence zones, marine currents, etc.); and e) marine deserts (sandy seabeds, muddy seabeds, stone and gravel seabeds, mixed sediments seabeds, etc.).

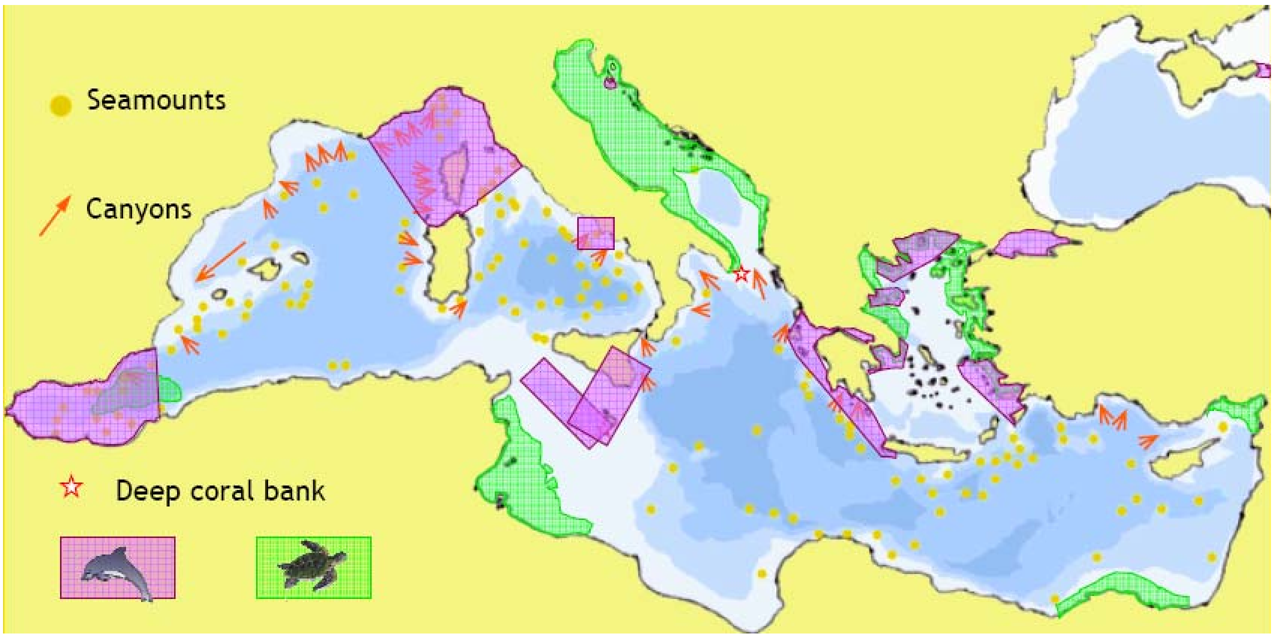


Fig. 2-7. Distribution of the major seamounts and canyons in the Mediterranean Sea (Pergent 2008).

**Biogenic habitats** include: a) coral reefs (*Coralliophila* reefs, oculinid reefs, deep-sea soft coral reefs, etc.); b) mollusc reefs (mytilid reefs, oyster reefs, vermetid reefs, Limidae reefs); c) crustacean reefs (lepadomorph reefs, balanomorph reefs, mixed crustacean reefs, etc.); d) polychaete worm reefs (sabellid reefs, mixed polychaete worm reefs, etc.); e) sponge fields and aggregations (calcareous sponge fields, Hexatinellida sponge fields, Desmospongia sponge fields, mixed sponge fields, etc.); f) gorgonian gardens (circalittoral gorgonian gardens, deep-sea gorgonian gardens, etc.); g) seagrass meadows (meadows of *Posidonia, Cymodocea, Zostera, Halophila*, etc.); h) green algae meadows (meadows of *Caulerpa, Halimeda*, etc.); i) brown algae forests (fucoid and laminarial forests); j) red algal concretions (coralline algae, Maerl beds, *Mesophyllum* reefs, laminar forests, trottoirs, Corallinacea seabeds, Peyssonnellinacea seabeds, etc.); and k) other types of habitats (understories of brown algae, mixed meadows of photophilic algae and/or carpets of mixed algae, beds of filamentous algae, rockpools, habitats formed by colonial species of hydrozoans, bryozoans and tunicates, colonial anthozoans or concentrations of cnidarians, etc.). Many of these habitats are present in (or confined to) the Mediterranean High Seas, and as host to significant concentrations of unique and vulnerable marine biodiversity urgently deserve inventorying, mapping and consideration for protection (Aguilar et al. 2006).

Tudela et al. (2004) identified a number of deep-sea habitat features in the Mediterranean (Fig. 2-8), including submarine canyons, cold seeps associated to mud volcanoes (harbouring chemosynthetic communities), cold water coral “reefs”, seamounts and brine pools.

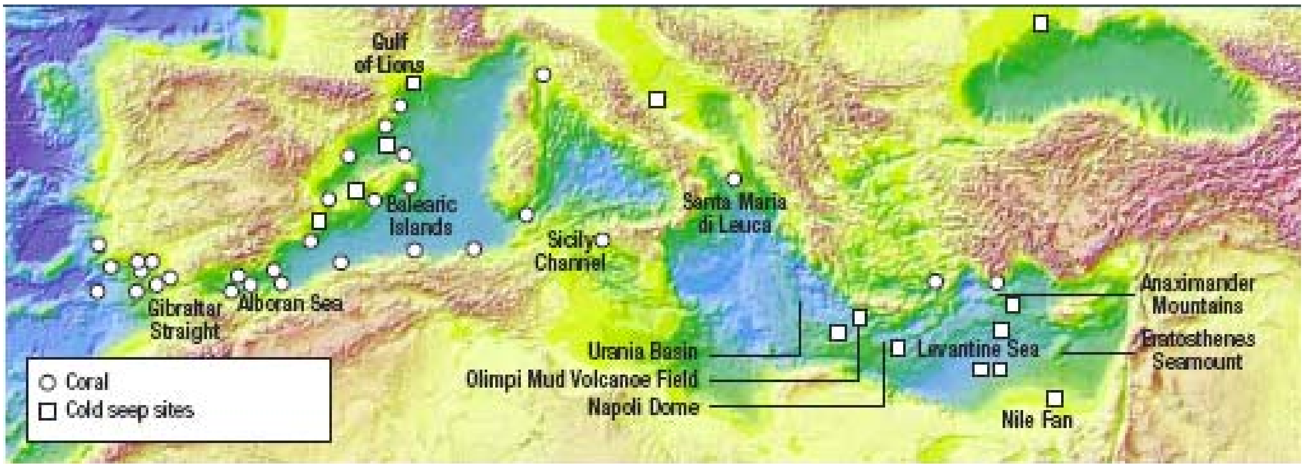


Fig. 2-8. Presently known distribution of deep-sea unique biocenoses in the Mediterranean and adjacent Atlantic waters (Tudela et al. 2004).

The same authors proposed a plan of action to address the conservation issues and management of human activities related to the protection of the Mediterranean deep seas, framed within the current relevant legal situation, and considering the international policy context and the current commitments to the relevant international conventions.

### 2.3.3 Biodiversity of the Mediterranean High Seas

While it exhibits a low overall level of biological productivity, the Mediterranean Sea as well as the surrounding lands is characterized by a relatively high degree of biological diversity (UNEP 1999). The fauna includes many endemic species and is considered richer than that of Atlantic coastal areas (Bianchi and Morri 2000). With few exceptions, the continental shelf is usually narrow, but the coastal marine area of the Mediterranean, which stretches from the shore to the outer extent of this continental shelf, shelters rich ecosystems and the main areas of high productivity in the sea. Whereas central zones of the Mediterranean are generally low in nutrients, coastal zones benefit from telluric nutrients that support higher levels of productivity.

The biota of the Mediterranean Sea consists primarily of Atlanto-Mediterranean species (62%) derived from the adjacent Atlantic biogeographic provinces beyond the Strait of Gibraltar. Many (>20%) Mediterranean species are endemic, while others are cosmopolitan or circumtropical (13%), or Indo-Pacific (5%). These proportions differ for different major taxonomic groups and also for different parts of the Mediterranean Sea, but the pattern remains essentially the same (Ketchum 1983).

Within the Mediterranean there is a gradient of decreasing species diversity from west to east. The number of species among all major groups of plants and animals is lower in the eastern Mediterranean than in the western and central parts of the sea. The southeast corner, the Levant Basin, is the most impoverished area. The benthic and littoral populations show a similar change in species diversity and abundance, which decrease from west to east, and from the northern Adriatic to the south (Ketchum 1983).

According to Zenetos et al. (2005), out of a total of about 6000 benthic invertebrate species in the Mediterranean, about 67% (4030) are found in the western Mediterranean, 38% (2262) in the Adriatic Sea, 35% (2119) in the Central Mediterranean, 44% (2637) in the Aegean, and 28% (1658) in the Levantine Sea. This trend in number of species demonstrates a west-east zoogeocline: a large number of geographic, climatic and trophic variables are highly correlated with this pattern which has been found to be similar for many taxonomic groups (Zenetos et al. 2005).

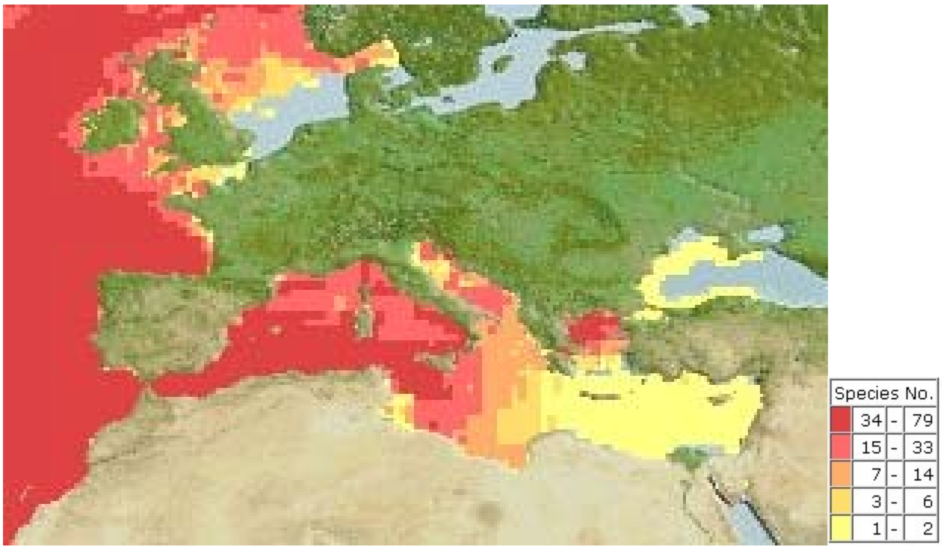


Fig. 2-9. Species-richness distribution of 79 deep sea marine species in the Mediterranean and adjacent seas proposed by AquaMaps (Kaschner et al. 2008).

This zoogeocline is also evident from a map (Fig. 2-9), available from the online project "AquaMaps" (www.aquamaps.org, Kaschner et al. 2008), representing the species-richness distribution of 79 deep sea fish species. AquaMaps is an approach to generating model-based, large-scale predictions of currently known natural occurrence of marine species. Models are constructed from estimates of the environmental tolerance of a given species with respect to depth, salinity, temperature, primary productivity, and its association with sea ice or coastal areas. Maps show the colour-coded relative likelihood of a species to occur in a global grid of half-degree latitude / longitude cell dimensions, which corresponds to a side length of about 50 km near the equator. Predictions are generated by matching habitat usage of species, termed environmental envelopes, against local environmental conditions to determine the relative suitability of specific geographic areas for a given species. Knowledge of species' distributions within FAO areas or bounding boxes is also used to exclude potentially suitable habitat in which the species is not known to occur. We anticipate that as data will continue flowing into the AquaMaps meta-database, this will soon become a very useful tool to support decisions concerning the establishment of High Seas MPAs networks.

The deep-water fauna of the Mediterranean is characterized by an absence of distinctive characteristics and by a relative impoverishment. Both are a result of events after the Messinian salinity crisis (Late Miocene). The three main classes of phenomena involved in producing or recording these effects are:

- historical: sequential faunal changes during the Pliocene and thereafter in particular those during the Quaternary glaciations and still in progress;
- bathymetric: changes in the vertical aspects of the Bathyal and Abyssal zones that took place under peculiar conditions, i.e. homothermy, a relative oligotrophy, the barrier of the Gibraltar sill, and water mass movement. The deeper the habitat of a species in the Mediterranean, the more extensive is its distribution elsewhere;
- geographical: there are strong affinities and relationships between Mediterranean and Atlantic faunas. Endemic species remain a biogeographical problem. Species always become smaller in size eastward where they occupy a progressively deeper habitat (Emig and Geistdoerfer, 2004).

The Mediterranean Sea includes 6% of the world's species for less than 1% of the world's ocean surface area and 0.3% of its volume. The number of endemic species is significantly higher than that for the Atlantic Ocean (Bianchi and Morri 2000). The percentage of endemism is very high for the sessile or sedentary groups such as ascidians with 50.4%, sponges with 42.4%, hydroids with 27.1%, echinoderms with 24.3%, but it is also considerable for the other groups such as decapod crustaceans with 13.2% and fish with 10.9%. An average of 28% of all species are endemic (Zenetos et al. 2002).

Of course, not all of these species are present on the high seas beyond the 12 n.m. limit of current territorial sea jurisdictions, but some of those that do frequent the High Seas are described below. These include a rich selection of marine top predators (also known as "charismatic megafauna"), having a special conservation importance by virtue of their *flagship* and *umbrella species* qualities.

The Mediterranean is host to a relatively diverse chondrichthyan fish fauna, with an estimated 80 species (approximately 7% of total living Chondrichthyans), comprising 45 species of sharks from 17 families, 34 batoid species from nine families and one species of chimaera (Cavanagh and Gibson 2007). Such fauna includes breeding populations of highly charismatic species such as great white sharks (*Carcharodon carcharias*), basking sharks (*Cetorhinus maximus*), and giant devil rays (*Mobula mobular*), all of which are listed in Annex II of the SPA Protocol to the Barcelona Convention (UNEP MAP RAC/SPA 2003a). A recent IUCN Red List assessment of the Mediterranean chondrichthyan fauna has determined that 42% of the species are considered threatened, of which 18% are Critically Endangered, 11% are Endangered and 13% are Vulnerable (Cavanagh and Gibson 2007). Ferretti et al. (2008) estimated that hammerhead (*Sphyrna* spp.), blue (*Prionace glauca*), mackerel (*Isurus oxyrinchus* and *Lamna nasus*), and thresher sharks (*Alopias vulpinus*) have declined today in the Mediterranean between 96 and 99.99% relative to their former abundance. Such dramatic decline, caused almost entirely by unsustainable levels of exploitation over the last decades, might be reversed in part through the establishment of High Seas MPAs encompassing these species' critical habitats.

The loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), and green (*Chelonia mydas*) marine turtles are all found in the region, and listed in Annex II of the SPA Protocol to the Barcelona Convention (UNEP MAP RAC/SPA 1989). While the loggerhead remains relatively abundant, it seems to have deserted many parts of the Western Basin where it is disturbed by fishing activity. The other two species are becoming increasingly rare. Nesting sites for an isolated, critically endangered population of the herbivorous and migratory green turtle can be found in Cyprus, Turkey, Egypt and Libya. There are only a total of 2,000 nesting females at these sites and this number is declining. The leatherback turtle is rarely seen in the Mediterranean, although there are some breeding records for Israel and Sicily. Important nesting sites for the loggerhead turtle are located on the coast from Turkey to Israel, on a number of Mediterranean islands, and at scattered sites along the North African coast.

The Mediterranean is of significant importance for migratory bird species. According to the Mediterranean Action Plan, some 150 migratory bird species biannually cross the narrow natural passages in the regions of Gibraltar, Cap Bon (Tunisia), Messina (Italy), Belen Pass (Turkey), the Lebanese coast and the Suez Isthmus, taking advantage of the wetlands occurring on their way (Ramade 1990). Pelagic bird species in the Mediterranean are relatively few, however colonies of Cory's shearwaters (*Calonectris diomedea diomedea*), Levantine shearwaters (*Puffinus yelkouan*), Balearic shearwaters (*P. mauretanicus*), and storm petrels (*Hydrobates pelagicus melitensis*) can still be found breeding along sea-cliffs or on small isolated rocky islands and islets (UNEP MAP RAC/SPA 2003b). Therefore, conservation of these species' feeding grounds in the Mediterranean High Seas will have to be coupled with conservation of the corresponding breeding grounds, clearly illustrating the need for networks of MPAs that will take into account the seasonally different life history traits of the species to protect. The SPA Protocol of the Barcelona Convention list 15 species[2] of marine birds in its Annex II, and an Action Plan for their protection was adopted by the Contracting Parties to the Barcelona Convention in Nov. 2003. Of all the listed species, several are threatened. The endemic Audouin's gull (*Larus audouinii*), in the order of 600-800 remaining pairs, has reached dangerously low population levels and depends on rocky islands and archipelagos, free from disturbance, as breeding sites. Several species of birds typical for the Mediterranean climatological region are threatened in their European, and possibly in the whole of their Mediterranean range, because of the loss of suitable disturbance-free habitat. Of particular note (UNEP MAP RAC/SPA 2003b) are the threatened species *Pelecanus onocrotalus* (white pelican), *P. crispus* (Dalmatian pelican), *Falco eleonorae* (Eleonora's falcon), *Phoenicopterus ruber* (greater flamingo), *Phalacrocorax aristotelis desmarestii* (Mediterranean shag), *P. pygmeus* (pigmy cormorant), *Pandion haliaetus* (osprey), *Numenius tenuirostris* (slender-billed curlew), *Sterna bengalensis* (lesser crested tern), *S. sandvicensis* (Sandwich tern), and *S. albifrons* (little tern).

[2] One of which, *Puffinus yelkouan*, was later split into *P. yelkouan* and *P. mauretanicus*, thus bringing the number of bird species *de facto* concerned by Annex II to 16.

Several species of marine mammals have reached dangerously low population levels, and their survival has become questionable unless immediate measures are taken for their conservation. The species in which this is most evident is the Critically Endangered Mediterranean monk seal (*Monachus monachus*), which depends on rocky islands and archipelagos free from disturbance as breeding sites. The population of these seals in the Mediterranean is probably less than 300 individuals. Their greatest concentration occurs along the Turkish and Greek coasts and around the Aegean islands.  Very small numbers are also thought to remain in Morocco, Algeria and probably Libya. The home ranges of these pinnipeds are not known, nor is the frequency of their occurrence in High Seas areas.

Twenty one cetacean species have been reported in the Mediterranean Sea, about half of which come Atlantic populations entering the sea only sporadically (Reeves and Notarbartolo di Sciara 2006).  The Mediterranean Sea contains critical habitat of only one large mysticete (fin whale, *Balaenoptera physalus*) and nine odontocetes (sperm whale, *Physeter macrocephalus*; Cuvier's beaked whale, *Ziphius cavirostris*; killer whale, *Orcinus orca*[3]; long-finned pilot whale, *Globicephala melas*; Risso's dolphin, *Grampus griseus*; common bottlenose dolphin, *Tursiops truncatus*; short-beaked common dolphin, *Delphinus delphis*; striped dolphin, *Stenella coeruleoalba*; and harbour porpoise, *Phocoena phocoena*[4]), all of which all found regularly

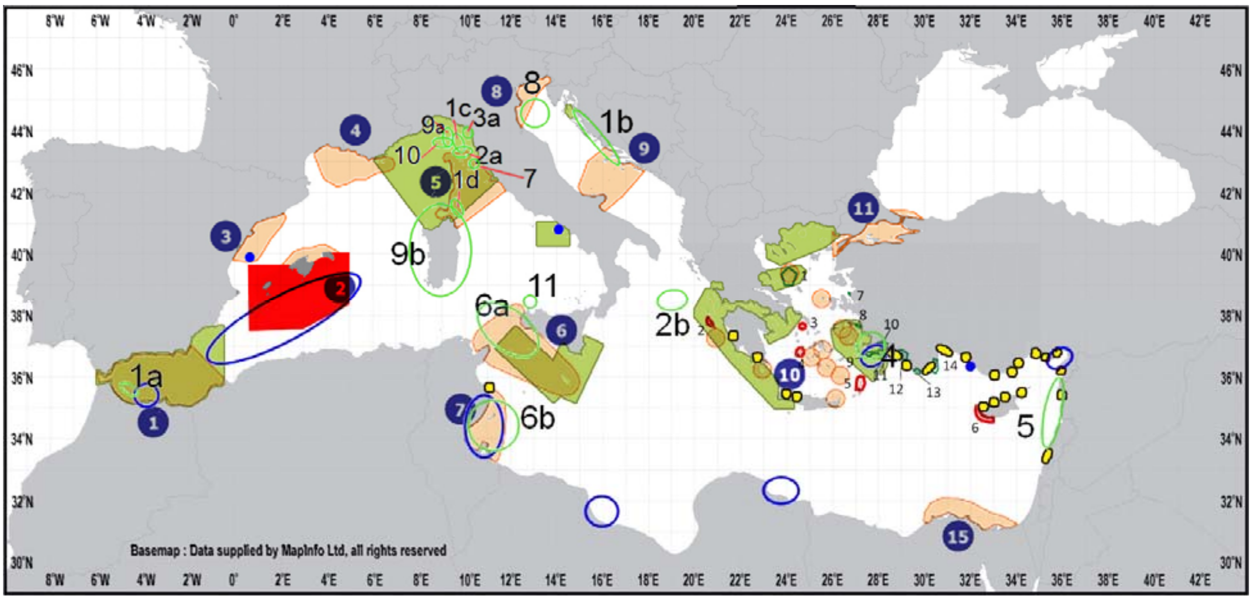


Fig. 2-10.  Cetaceans, monk seal, seabirds, turtles, sharks and bluefin tuna critical habitats.  Cetaceans: light green polygons; monk seal: dark green small circles (established areas) and red small circles (areas to be established); birds: pink areas; turtles: yellow circles (nesting beaches) and blue circles (feeding areas); sharks: light green circles (nursery areas of various species); bluefin tuna: red polygon (from Hoyt and Notarbartolo di Sciara, 2008).

in the region.  Four other species (minke whale, *Balaenoptera acutorostrata*; humpback whale, *Megaptera novaeangliae*; false killer whale, *Pseudorca crassidens*; and rough-toothed dolphin, *Steno bredanensis*) have been reported from the Mediterranean several times during the past few decades, and may be more regular in the region than previously thought (particularly *S. bredanensis*: D. Kerem, pers. comm.).  All marine mammals occurring in the Mediterranean are listed in Annex II to the SPA Protocol, and all cetacean

[3] Limited to the area of the Strait of Gibraltar.
[4] Limited to the Northern Aegean Sea.

species are protected by the UNEP CMS "Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area" (ACCOBAMS). A joint IUCN-ACCOBAMS effort to assess the conservation status of the populations belonging to ten cetacean species regularly occurring in the Mediterranean Sea, for their inclusion in the Red List, determined that 60% are threatened (Critically Endangered, Endangered and Vulnerable), and 40% are Data Deficient (Reeves and Notarbartolo di Sciara 2006). Guidelines for the establishment in the Mediterranean of MPAs for cetaceans were developed by the RAC/SPA (Notarbartolo di Sciara 2007). A recent effort to identify the Mediterranean distribution of critical habitats of six groups of top marine predators (cetaceans, monk seal, seabirds, turtles, sharks and bluefin tuna), to help identifying concentration areas where the establishment of MPAs might support conservation (Fig. 2-10), was presented during the World Conservation Congress in Barcelona (Hoyt and Notarbartolo di Sciara 2008).

The map represented in Fig. 2-10 is a combination of information provided by sources of expertise in the respective fields (cetacean areas were adopted by the Contracting Parties to ACCOBAMS by recommendation of the Agreement's Scientific Committee; monk seal areas were proposed by MOm and SAD AFAG; seabird areas were proposed by regional experts of Birdlife International; turtle areas were proposed by Mediterranean exponents of IUCN's Marine Turtle Specialist Group; shark areas were proposed by Mediterranean exponents of IUCN's Shark Specialist Group). Hoyt and Notarbartolo di Sciara's effort should be considered a still crude geographical representation of important habitat areas for a selection of the region's main marine top predators, due to the partly conjectural nature of the original data and to the lack of information from a significant portion of the region (mostly across the Ionian, Aegean and Levantine seas); however it has the merit of providing a strawman – prepared cooperatively by groups of experts who have rarely worked together in the past – to be further developed and improved through reiterations of Delphic methods and software-supported designations.

### 2.3.4 Current status of protection in the Mediterranean High Seas

Echoing the plan of implementation adopted in 2002 by the world's nations at the World Summit on Sustainable Development (WSSD)[5], the World Parks Congress in Durban 2003 recommended that "networks [of protected areas] should be extensive and include strictly protected areas that amount to at least 20-30% of each habitat." Currently, fully marine protected areas of all kinds – whether coastal and pelagic - cover less than one percent of the Mediterranean Sea - a far cry from the WPC recommendation (Greenpeace 2004, Abdulla et al. 2008b). The situation is significantly worse concerning the Mediterranean High Seas, where only the Pelagos Sanctuary for Mediterranean marine mammals and the areas off-limits to bottom trawling designated by the GFCM enjoy formal protection. Whether these few areas also benefit from real protection, however, is a question open to debate. In the Pelagos Sanctuary, actual management and conservation actions are severely limited by the evident reluctance by the Agreement's Contracting Parties to mandate such actions to an adequately empowered management body[6]. In the deep trawling-banned areas designated by the GFCM, actual enforcement is unknown, but probably non-existent, and

[5] "Develop and facilitate the use of diverse approaches and tools, including ... the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012".

[6] Annex I, D. 6. to the SPA Protocol to the Barcelona Convention states that "To be included in the SPAMI List, a protected area must have a management body, endowed with sufficient powers as well as means and human resources to prevent and/or control activities likely to be contrary to the aims of the protected area." This is clearly not the case of the Pelagos Sanctuary.

preliminary evidence indicates that permanent damage to some of these delicate biocenoses might have already occurred (X. Pastor, Oceana, pers. comm.).

### 2.3.5 Distribution of human threats

While a detailed analysis of the threats affecting biodiversity in the Mediterranean High Seas is beyond the remit of this report, as it will be addressed in full in a more advanced stage of this project, a brief overview of such threats will help to place the current effort in perspective.

No marine area is unaffected by human influence and a large fraction (41%) is strongly affected by multiple drivers (Halpern et al. 2008). The marine biodiversity in the Mediterranean is particularly at risk, due to the limited volume of this marine body of water compared to the growing intensity of human pressures that are exerted on it (European Environment Agency 1999). Severe and mounting demographic pressures along the Mediterranean coastal zone are impacting on the marine environment in several ways: overfishing and illegal fishing, pollution, disturbance, noise, invasions by alien species, climate changes are among the main impacting factors affecting the Mediterranean biodiversity (for a recent review see Greenpeace 2004).

The Mediterranean fish fauna is diverse but fisheries are generally declining. Of the 900 or so known fish species, approximately 100 are commercially exploited. Unsustainable catch rates of rays (including the disappearance of certain taxa from commercial catches) and other demersal species are of special concern (Tudela 2004); in recent years, the Mediterranean populations of bluefin tunas raise the highest concerns due to overfishing (WWF 2007, MacKenzie et al. 2009). Fisheries impacts extend beyond elasmobranchs, finfish, or other target species: longline fishing is a main cause of seabird mortality in the Mediterranean; while longline and other fisheries kill sea turtles incidentally (Tudela, 2004). Longline fleets are a particular threat to the loggerhead turtle population, as are trawlers and small-scale gears in some areas, such as in the Gulf of Gabès. Driftnet fisheries and, to a much lesser extent, small-scale fisheries using fixed nets and purse seine fisheries appear to account for the highest impact on the region's cetaceans and are also responsible for the highest rates of direct human-induced mortality. The population of monk seal in the Mediterranean continues to be at risk from direct mortality by artisanal fishing gears and deliberate killing by fishermen, and are affected by an increasing scarcity of food resources driven by overfishing (e.g., Notarbartolo di Sciara et al. 2009).

Maritime traffic is negatively affecting Mediterranean biodiversity in a variety of ways, including ship movement, noise, grounding and anchoring, ship-generated oil discharges and exhaust emissions, the introduction in the environment of persistent organic pollutants, sewage and debris, and alien species introduction and diffusion (for a review, see Abdulla and Linden 2008). The change in marine biodiversity is proceeding at an unprecedented pace, as hundreds of exotic species -- mostly of tropical Indo-Pacific origin -- have settled in recent decades in the Mediterranean Sea. The trend in invasive species appears to be accelerating with the rapid growth of maritime traffic which brings with it alien fauna (introduced via ballast waters or attached to the hull). "Present-day warming ultimately favours the spread of warm water species through direct and indirect effects, and especially by changing water circulation. It is impossible at present to foresee to what extent the exuberance of warm-water species will affect the trophic web and the functioning of marine ecosystems in the Mediterranean Sea of tomorrow" (Bianchi 2007).

Furthermore, like throughout the world's oceans (Hildebrand 2005), the Mediterranean is becoming an increasingly noisy environment, caused by shipping, military sonar, and oil & gas prospecting, which is impacting on various species, in particular cetaceans (Pavan 2006).

# 3. Definition of operational criteria for the site selection process

In this Section of the document we first examine a number of marine protected area selection criteria (3.1), most notably the SPAMI selection criteria of the SPA/BD Protocol to the Barcelona Convention (3.1.1), but also the CBD criteria for the identification of ecologically or biologically significant areas (3.1.2) as well as other criteria such as those developed by IMO for Particularly Sensitive Sea Areas, natural criteria for the identification of marine sites having outstanding universal value developed within the framework of the World Heritage Convention, and site selection criteria listed in the EU 'Habitats' Directive (3.1.3).

Secondly, we present an adaptation of the SPAMI selection criteria to Mediterranean ABNJ site selection (3.2), with a combination of useful elements from other sets of criteria, in particular those developed with the CBD.

## 3.1 Currently existing marine protected area selection criteria

### 3.1.1 SPAMI selection criteria (Annex I of the SPA/BD Protocol to the Barcelona Convention)

The SPAMI criteria (*Common criteria for the choice of protected marine and coastal areas that could be included in the SPAMI List*), are included in Annex I of the Protocol to the Barcelona Convention "concerning Specially Protected Areas and Biological Diversity in the Mediterranean" (also known as the "SPA/BD Protocol"). The SPA/BD Protocol subdivides the criteria into: a) general principles; b) general features of the areas that could be included in the SPAMI List , c) legal status, and d) protection, planning and management measures.

A. The general principles include a description of the basic aim characterizing the SPAMIs, state the need for a scientific basis in the selection, the need for representativeness, require the creation of a network of protected areas based on international cooperation, and emphasize the model role of SPAMIs for the region's marine conservation efforts.

B. Among the general features of the areas that could be included in the SPAMI List, a requirement is that any area, to qualify for SPAMI status, must fulfil <u>at least one of the following fundamental criteria</u> (as stated in Art. 8, paragraph 2 of the Protocol):

1. the area must be of importance for conserving the components of biological diversity in the Mediterranean;
2. the area must contain ecosystems specific to the Mediterranean area or the habitats of endangered species;
3. the area is of special interest at the scientific, aesthetic, cultural or educational levels.

To support assessment of the regional value of the area, the Annex lists the following criteria:

- Uniqueness. The area contains unique or rare ecosystems, or rare or endemic species.
- Natural representativeness. The area has highly representative ecological processes, or community or habitat types or other natural characteristics. Representativeness is the degree to which an area represents a habitat type, ecological process, biological community, physiographic feature or other natural characteristic.

- Diversity. The area has a high diversity of species, communities, habitats or ecosystems.
- Naturalness. The area has a high degree of naturalness as a result of the lack or low level of human-induced disturbance and degradation.
- Presence of habitats that are critical to endangered, threatened or endemic species (a list of species formally declared endangered of threatened is included in Annex II to the Protocol).
- Cultural representativeness. The area has a high representative value with respect to the cultural heritage, due to the existence of environmentally sound traditional activities integrated with nature which support the well-being of local populations.

Another general feature that an area having scientific, educational or aesthetic interest must possess to be considered for inclusion in the SPAMI List is to "present a particular value for research in the field of natural sciences or for activities of environmental education or awareness or contain outstanding natural features, landscapes or seascapes."

In addition to the fundamental criteria numbered above, the Annex lists a set of other characteristics and factors of an area that <u>should be considered as favourable</u> for its inclusion in the List:

- the existence of threats likely to impair the ecological, biological, aesthetic or cultural value of the area;
- the involvement and active participation of the public in general, and particularly of local communities, in the process of planning and management of the area;
- the existence of a body representing the public, professional, non-governmental sectors and the scientific community involved in the area;
- the existence in the area of opportunities for sustainable development;
- the existence of an integrated coastal management plan within the meaning of Article 4 paragraph 3 (e) of the Convention.

C. The legal status requirements for areas to be eligible for inclusion in the SPAMI List include a set of conditions that will guarantee the area's effective long-term protection: i. that the area be awarded formal legal status; ii. that the Party exercising sovereignty or jurisdiction over the zone where the area is situated recognises the area's protected status; and iii. if the area is "situated, partly or wholly, on the high sea or in a zone where the limits of national sovereignty or jurisdiction have not yet been defined, the legal status, the management plan, the applicable measures and the other elements provided for in Article 9, paragraph 3, of the Protocol will be provided by the neighbouring Parties concerned in the proposal for inclusion in the SPAMI List."

D. The "Protection, planning and management measures" section of the Annex details post-institutional features that any area must possess to be able to retain its status of SPAMI and to continue to be included in the SPAMI List. These include: a clear definition of conservation and management objectives; a detail of protection, planning and management measures that must adequately address the conservation and management objectives and the existing threats, and be based on adequate knowledge; should such knowledge be insufficient, scientific programmes should be implemented; a clear definition of the administrative, implementation and enforcement competences and responsibilities, including protection measures addressing aspects of pollution, species introduction, and regulation of harmful human activities. This section further states a number of institutional, operational and administrative requirements for areas to be included in the SPAMI List, such as the existence of an adequately empowered management body, an implemented management plan, and a functional monitoring programme.

While all the four sections of Annex I are of fundamental importance to guarantee the well-functioning of SPAMIs, the part of the Annex that is most relevant to the purpose of the current effort, i.e. the definition of criteria for the selection process, is Section B ("General features of the areas that could be included in the SPAMI List"). However, these criteria alone are insufficient to ensure that a representative network of MPAs – including in the Open Seas – will develop in the Mediterranean Sea. Unfortunately, the current process for progressively enlisting MPAs in the SPAMI List (i.e., with the responsibility for proposing additions to the List resting solely on the initiative and goodwill of the individual Contracting Parties to the Barcelona Convention), important as it is, is not necessarily conducive to the development of a Mediterranean network of MPAs that is ecologically representative and that will afford protection to the full range of the region's biodiversity.

To achieve this, it will be necessary to integrate the SPAMI selection criteria with criteria that were recently developed to address building of representative networks of MPAs, especially in areas with limited scientific information, such as the high seas (Convention on Biological Diversity 2008). In addition, it will be important to ensure that the programme of MPA network development in the Mediterranean is in harmony with an articulated regional planning process (Agardy 2005), which is widely shared, as advocated years ago by the World Commission on Protected Areas during an *ad hoc* scoping meeting (Livorno, Italy, December 2004: Notarbartolo di Sciara 2006).

### 3.1.2 CBD ecological criteria and biogeographic classification systems for marine areas in need of protection

New guidelines and useful criteria were developed during an "Expert workshop on ecological criteria and biogeographic classification systems for marine areas in need of protection", organised in the Azores in October 2007 under the auspices of CBD (Convention on Biological Diversity 2008). These criteria were later adopted during the 13th SBSTTA Meeting held in Rome in Feb. 2008. We consider these criteria quite relevant to the current effort. In particular, the Azores workshop produced:

1. Scientific criteria for identifying ecologically or biologically significant marine areas ("EBSAs") in need of protection, in open-ocean waters and deep-sea habitats, including examples of features that would meet such criteria.
2. Scientific criteria and guidance for selecting areas to establish a representative network of marine protected areas, including in open-ocean waters and deep-sea habitats.

The criteria for EBSAs identified by the workshop include:

- Uniqueness or rarity (to the best of the available knowledge),
- Special importance for life history stages of species,
- Importance for threatened, endangered or declining species and/or habitats,
- Vulnerability, fragility, sensitivity or slow recovery,
- Biological productivity,
- Biological diversity,
- Naturalness.

The workshop report (Convention on Biological Diversity 2008) details, for each criterion, a definition, the rationale, examples in different habitats, and considerations for its application.

Even though not all the above listed criteria are novel, the fact that they were developed for global application but are here applied to the regional scale of the Mediterranean is indeed novel.

In light of this regional application, one question with particular relevance to the Mediterranean is how to select the species to be used as reference for some of the above criteria. For instance, species could be selected: a) if they are listed in Annexes II or III to the SPA Protocol; b) if they are assigned to a threat category within IUCN's Red List; c) if they include top marine predators; or d) if they can be classified as umbrella, flagship, keystone or indicator species.

A non-exhaustive list of examples of features that would meet the above criteria for identifying ecologically or biologically significant marine areas (or species), provided in the CBD workshop report, include many features that are relevant to the protection of Mediterranean biodiversity in the Open Seas.

These are:

*Benthic features*

- Seamount communities,
- Cold water coral reefs,
- Coral, sponge and bryozoan aggregations,
- Hydrothermal vent ecosystems,
- Cold seeps,
- Canyons,
- Trenches.

*Pelagic habitats*

- Upwelling areas,
- Fronts,
- Gyres.

*Vulnerable and/or highly migratory species critical habitats and corridors*

- Whales and other cetaceans,
- Seabirds,
- Sea turtles,
- Sharks,
- Highly migratory fish,
- Discrete deep-sea fish populations.

The workshop also provided a useful set of guidelines for the selection of areas to establish a representative network of MPAs, including in open-ocean waters and deep-sea habitats. We suggest that these criteria be taken into account during the process of implementing a network of SPAMIs in Mediterranean Areas Beyond National Jurisdiction (Section 5). Starting from an overarching goal of a global representative network of MPAs ("*Maintain, protect and conserve global marine biodiversity through conservation and protection of its components in a biogeographically representative network of ecologically coherent sites*"), the Azores meeting suggested that the coherence of such network "can be attained by diverse mechanisms that promote the genetic flow, through connectivity, among populations of marine organisms with planktonic life history phases. Amongst others are ocean currents providing homogeneity within a dispersal area and geographical distance and barriers that promote isolation and associated biological diversity." All of the above considered, the Azores meeting recommended following four initial steps:

- Identify an initial set of ecologically or biologically significant areas, using the criteria listed under 1 above, considering the best scientific information available, and applying the precautionary approach.
- Develop/choose a biogeographic habitat and/or community classification system, to reflect the scale of the application and address the key ecological features of the area (most likely, this will entail a separation between the pelagic and benthic realms).
- Drawing upon the two steps above, iteratively use qualitative and/or quantitative techniques to identify sites to include in a network. Selection should reflect recognised ecological importance, vulnerability, and address the requirements of ecological coherence through representativity, connectivity and replication.
- Finally, assess the adequacy and viability of the selected sites as functional MPAs based on considerations of size, shape, buffering and management feasibility.

Table 2 in the CBD 2008 report (page 55 and following) provides helpful details on the required network criteria (ecologically and biologically significant areas, representativity, connectivity, replicated ecological features, and adequate & viable sites), including definitions and examples of applicable site-specific considerations.

### 3.1.3 Other criteria

Although the most relevant and useful for the task, the CBD criteria are not the only criteria that were examined in the effort of updating and complementing the applicability of the SPA Protocol criteria to the identification of Mediterranean EBSAs. Other relevant tools examined include:

- Four natural criteria for the identification of marine sites having outstanding universal value within the framework of UNESCOS' World Heritage Convention (UNESCO 2008);
- Site selection criteria listed in the EU Habitats Directive (Anon. 2006);
- The criteria for Particularly Sensitive Sea Areas (PSSAs) developed by IMO (International Maritime Organisation 2006).

Considering the intensity of shipping in the Mediterranean Sea, which makes this region particularly vulnerable to impact from maritime transport, a special attention was attributed to the "ecological, socio-economic, or scientific criteria for the identification of a Particularly Sensitive Sea Area" (International Maritime Organisation 2006), which relate to PSSAs within and beyond the limits of territorial seas.

These are:

Ecological criteria

*4.4.1 Uniqueness or rarity – An area or ecosystem is unique if it is "the only one of its kind". Habitats of rare, threatened, or endangered species that occur only in one area are an example. An area or* *ecosystem is rare if it only occurs in a few locations or has been seriously depleted across its range. An ecosystem may extend beyond country borders, assuming regional or international significance. Nurseries or certain feeding, breeding, or spawning areas may also be rare or unique.*

*4.4.2 Critical habitat – A sea area that may be essential for the survival, function, or recovery of fish stocks or rare or endangered marine species, or for the support of large marine ecosystems.*

*4.4.3 Dependency – An area where ecological processes are highly dependent on biotically structured systems (e.g. coral reefs, kelp forests, mangrove forests, seagrass beds). Such ecosystems often have high diversity, which is dependent on the structuring organisms. Dependency also embraces the migratory routes of fish, reptiles, birds, mammals, and invertebrates.*

*4.4.4 Representativeness – An area that is an outstanding and illustrative example of specific biodiversity, ecosystems, ecological or physiographic processes, or community or habitat types or other natural characteristics.*

*4.4.5 Diversity – An area that may have an exceptional variety of species or genetic diversity or includes highly varied ecosystems, habitats, and communities.*

*4.4.6 Productivity – An area that has a particularly high rate of natural biological production. Such productivity is the net result of biological and physical processes which result in an increase in biomass in areas such as oceanic fronts, upwelling areas and some gyres.*

*4.4.7 Spawning or breeding grounds – An area that may be a critical spawning or breeding ground or nursery area for marine species which may spend the rest of their life-cycle elsewhere, or is recognized as migratory routes for fish, reptiles, birds, mammals, or invertebrates.*

*4.4.8 Naturalness – An area that has experienced a relative lack of human-induced disturbance or degradation.*

*4.4.9 Integrity – An area that is a biologically functional unit, an effective, self-sustaining ecological entity.*

*4.4.10 Fragility – An area that is highly susceptible to degradation by natural events or by the activities of people. Biotic communities associated with coastal habitats may have a low tolerance to changes in environmental conditions, or they may exist close to the limits of their tolerance (e.g., water temperature, salinity, turbidity or depth). Such communities may suffer natural stresses such as storms or other natural conditions (e.g., circulation patterns) that concentrate harmful substances in water or sediments, low flushing rates, and/or oxygen depletion. Additional stress may be caused by human influences such as pollution and changes in salinity. Thus, an area already subject to stress from natural and/or human factors may be in need of special protection from further stress, including that arising from international shipping activities.*

*4.4.11 Bio-geographic importance – An area that either contains rare biogeographic qualities or is representative of a biogeographic "type" or types, or contains unique or unusual biological, chemical, physical, or geological features.*

Social, cultural and economic criteria

*4.4.12 Social or economic dependency – An area where the environmental quality and the use of living marine resources are of particular social or economic importance, including fishing, recreation, tourism, and the livelihoods of people who depend on access to the area.*

*4.4.13 Human dependency – An area that is of particular importance for the support of traditional subsistence or food production activities or for the protection of the cultural resources of the local human populations.*

*4.4.14 Cultural heritage – An area that is of particular importance because of the presence of significant historical and archaeological sites.*

Scientific and educational criteria

*4.4.15 Research – An area that has high scientific interest.*

*4.4.16 Baseline for monitoring studies – An area that provides suitable baseline conditions with regard to biota or environmental characteristics, because it has not had substantial perturbations or has been in such a state for a long period of time such that it is considered to be in a natural or near-natural condition.*

*4.4.17 Education – An area that offers an exceptional opportunity to demonstrate particular natural phenomena.*

For the purpose of the current work, which focuses on the selection of new areas, only the ecological criteria of the PSSA system (4.4.1 to 4.4.11) are relevant. Matters related to human aspects (social, cultural, economic, scientific and educational) are more relevant to the second phase of the project. A comparison between the CBD and PSSA criteria (Table 3-1 below) reveals that all elements contained in the PSSA criteria also figure in the CBD criteria, albeit at times with a slightly different formulation.

| **CBD selection criteria** | **PSSA criteria relating to the corresponding CBD criteria** | **Notes** |
|---|---|---|
| a. Uniqueness or rarity | 1. Uniqueness or rarity<br>11. Bio-geographic importance | |
| b. Biological productivity | 3. Dependency<br>6. Productivity | |
| c. Biological diversity | 5. Diversity | |
| d. Special importance for life history of species | 3. Dependency<br>7. Spawning or breeding grounds | |
| e. Naturalness | 8. Naturalness<br>9. Integrity | |
| f. Importance for threatened, endangered or declining species and/or habitats | 2. Critical habitat | |

| | | |
|---|---|---|
| g. Vulnerability, fragility, sensitivity, slow recovery | 10. Fragility | |
| | 4. Representativeness | Relevant in the case of MPA networks |

Table 3-1. Comparison between CBD EBSAs and PSSA criteria.

## 3.2 Criteria adapted for Mediterranean ABNJ site selection

In a recent report on the creation of representative networks of MPAs in the Mediterranean Sea (Notarbartolo di Sciara and Agardy 2008), the adoption of a three-step hierarchical planning approach was recommended, which begins at the large scale and focuses in on ever-smaller scales:

1. At the widest scale, in this case that of the Mediterranean Basin, the baseline for designing an ecological network involves the identification of large scale ecological units. The purpose of this is to recognize ecological distinctions between different parts of the sea, and ensure that something that is called a "Mediterranean Network of MPAs" is truly comprehensive and representative of all of its sub-regions. Such subdivision should be considered in very general terms, as a broad indication of areas where planning attention should be focused, without necessarily separating subregions through well-defined borders ("lines on a map") which may easily lead to endless and irrelevant controversy.
2. At the next scale, priority conservation areas, or EBSAs, are identified within each ecological unit. These areas do not correspond to what would become MPAs in the future, but would be focal areas for individual MPA networks.
3. Once such priority conservation areas are identified, the task of identifying sites to develop true ecological networks can be initiated. Individual MPAs within these networks should protect what is ecologically most important – i.e., they should focus on habitats where a concentration of ecological processes results in a high diversity of species. To become a network, it will be important not only to establish MPAs to protect these key areas, but also to maintain the ecological linkages between these areas (Notarbartolo di Sciara and Agardy 2008).

To identify EBSAs within each Mediterranean ecoregion, an adaptation of the SPA Protocol criteria in light of the recent developments promoted within the framework of CBD is recommended.

The following is a more detailed explanation of how the criteria may be applied to the identification of EBSAs (in **bold**: the SPA Protocol criteria; in *italics*: the corresponding CBD criteria).

I. **Uniqueness: "The area contains unique or rare ecosystems, or rare or endemic species"**.

*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.*

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

NOTE: We suggest that the CBD "Biological productivity" criterion, not explicitly included within the SPAMI criteria, may be broadly included under the "Uniqueness" SPAMI criterion because discretely delineated high productivity areas in the Mediterranean Open Seas are rare.

II. **Natural representativeness: "The area has highly representative ecological processes, or community or habitat types or other natural characteristics. Representativeness is the degree to which an area represents a habitat type, ecological process, biological community, physiographic feature or other natural characteristic".**

NOTE: This SPA Protocol criterion does not readily find a correspondent in the CBD criteria for EBSAs, since representativeness should be a means to gauge the value of the network as a whole, not to evaluate individual sites. This is logical. We recommend that the application of the 'representativeness' criterion be applied to the construction of networks (see Section 5.1) rather than to the selection and siting of individual SPAMIs.

III. **Diversity: "The area has a high diversity of species, communities, habitats or ecosystems".**

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

*Special importance for life history stages of species: Areas that are required for a population to survive and thrive.*

IV. **Naturalness: "The area has a high degree of naturalness as a result of the lack or low level of human-induced disturbance and degradation".**

*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.*

V. **Presence of habitats that are critical to endangered, threatened or endemic species.**

*Importance for threatened, endangered or declining species and/or habitats: Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.*

*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.*

VI. **Cultural representativeness**: **"The area has a high representative value with respect to the cultural heritage, due to the existence of environmentally sound traditional activities integrated with nature which support the well-being of local populations".**

> NOTE: This SPA/BD Protocol criterion does not readily find a correspondent in the CBD criteria for EBSAs, since the CBD is not especially concerned with cultural representativeness. The SPA Protocol definition of the criterion has limited application in the identification of EBSAs in the Mediterranean open seas, however it should be taken into account assessing the value of traditional activities such as fisheries.

Table 3-2 lists the SPA/BD Protocol criteria to be applied to EBSA identification and compares them with the corresponding CBD criteria, also providing guidance in their application where correspondence between different sets of criteria is not complete.

| **SPA/BD Protocol selection criteria** | **CBD selection criteria** | **Notes** |
|---|---|---|
| I. Uniqueness | a. Uniqueness or rarity | |
| | b. Biological productivity | High productivity is a rare feature in oligotrophic Mediterranean Open Seas |
| II. Natural representativeness | | The CBD uses representativeness as a way to gauge the value the network as a whole, not to evaluate individual sites |
| III. Diversity | c. Biological diversity | |
| | d. Special importance for life history of species | Enhances the biodiversity of an area |
| IV. Naturalness | e. Naturalness | |
| V. Presence of habitats that are critical to endangered, threatened or endemic species | f. Importance for threatened, endangered or declining species and/or habitats | |
| | g. Vulnerability, fragility, sensitivity, slow recovery | These attributes render a species or habitat particularly susceptible to threats |
| VI. Cultural representativeness | | The CBD is not concerned with cultural representativeness |

Table 3-2. Comparison between the SPAMI criteria and the CBD criteria for the identification of EBSAs.

For the third step in the development of a blueprint of a Mediterranean network of MPAs, i.e., the identification of sites within each priority conservation area where the creation of SPAMIs is actually proposed, our recommendation is to follow the process detailed in the CBD report. The report suggests that planners:

- separately consider the priority conservation area into pelagic and benthic realms;
- identify sites addressing ecological importance and vulnerability;
- address the requirements of ecological coherence through representativity, connectivity and replication; and finally
- assess the adequacy and viability of the selected sites as functional MPAs based on considerations of size, shape, buffering and management feasibility.

In this context, the introduction of dynamic MPA boundaries (*sensu* Hyrenbach et al. 2000) for the protection of fluctuating habitats should be considered if appropriate, as was recently proposed by Shillinger et al. (2008) to protect leatherback turtles in the Central Eastern Pacific, and implemented as Dynamic Area Management fishery closures by the U.S. National Marine Fisheries Service to protect right whales from entanglements in fishing gear of Massachusetts (Johnson 2005).

A major challenge in applying the above described process resides in the lack of adequate data, in particular due to the fragmentary ecological knowledge currently existing for part of the southern and eastern portions of the Mediterranean basin. Suggested strategies to overcome constraints related to limited data availability: (i) use stakeholder and expert knowledge, (ii) identify best examples, and (iii) identify the best-known examples (Convention on Biological Diversity 2008). When possible, in instances where there are few data or where data are inconsistent in different portions of the Basin, the selection of proxies for some of the criteria may significantly help. Some of these proxies are oceanographic, and reflect the strong ecological drivers that the physical environment exert on the ecological communities. Other proxies have to do with surmised ecosystem condition, and the corollary degree of naturalness. This problem is addressed in considerable detail in the "Guidelines for the establishment of the *Natura* 2000 network in the marine environment" (Anon. 2006).

**In conclusion, we list in Table 3-3 the eight proposed criteria for the selection of EBSAs in the Mediterranean Sea, based on the SPA/BD Protocol criteria for SPAMIs harmonised with other currently adopted criteria, most notably those adopted by CBD.**

| **Proposed Criterion** | ***Correspondences and notes*** |
|---|---|
| 1. 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. | *As defined by CBD (2008). Also corresponds to:*<br>• *Uniqueness (SPA/BD Protocol)*<br>• *Uniqueness or rarity (IMO 2006)*<br>*May also correspond to:*<br>• *Bio-geographic importance (IMO 2006)* |
| 2. Special importance for life history stages of species: areas that are required for a population to survive and thrive. | *As defined by CBD (2008). May also correspond to:*<br>• *Presence of habitats that are critical to endangered, threatened or endemic species (SPA/BD Protocol)*<br>• *Diversity (SPA/BD Protocol)*<br>• *Critical habitat (IMO 2006)*<br>• *Dependency (IMO 2006)*<br>• *Spawning or breeding grounds (IMO 2006)* |
| 3. Importance for threatened, endangered or declining species and/or habitats: area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species. | *As defined by CBD (2008). May also correspond to:*<br>• *Presence of habitats that are critical to endangered, threatened or endemic species (SPA/BD Protocol)*<br>• *Critical habitat (IMO 2006)* |
| 4. 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. | *As defined by CBD (2008). Also corresponds to:*<br>• *Fragility (IMO 2006)*<br>*May also correspond to:*<br>• *Presence of habitats that are critical to endangered, threatened or endemic species (SPA/BD Protocol)* |
| 5. Biological productivity: area containing species, populations or communities with comparatively higher natural biological productivity. | *As defined by CBD (2008). Also corresponds to:*<br>• *Productivity (IMO 2006).*<br>*May also correspond to:*<br>• *Uniqueness (SPA/BD Protocol)*<br>• *Integrity (IMO 2006)* |
| 6. Biological diversity: area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | *As defined by CBD (2008). Also corresponds to:*<br>• *Diversity (SPA/BD Protocol)*<br>• *Diversity (IMO 2006)* |
| 7. 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. | *As defined by CBD (2008). Also corresponds to:*<br>• *Naturalness (SPA/BD Protocol)*<br>• *Naturalness (IMO 2006)*<br>*May also correspond to:*<br>• *Integrity (IMO 2006)* |
| 8. Cultural representativeness: area has a high representative value with respect to the cultural heritage, due to the existence of environmentally sound traditional activities integrated with nature which support the well-being of local populations. | *As defined in the SPA/BD Protocol, Annex I* |

Table 3-3. Proposed criteria

# 4. Potential SPAMI sites in Mediterranean Areas Beyond National Jurisdiction

## 4.1 Overview of Process for Selecting Potential SPAMI Sites

1. On the basis of an analysis of the information available to us regarding the presence of important elements of marine biodiversity in the Mediterranean High Seas, we have identified 10 Mediterranean *Ecologically or Biologically Significant Areas* (EBSAs), where potential future SPAMI sites in areas beyond national jurisdiction (ABNJ) can be proposed.

2. Recognising that the state of the art described in Section 2 of this document is insufficient as a baseline to develop effective representative networks of MPAs in the High Seas, in order to delineate EBSAs and to identify high priority areas, and considering that large portions of the Mediterranean Sea are very data-poor, the existing regional databases were supplemented with locally derived indicators (e.g., geomorphological features of the sea floor, areas of high primary productivity) as proxies of marine biodiversity hotspots, and expert opinion. Information being obtained include data on physical oceanography of the Mediterranean Sea, modelling to pinpoint areas of importance for select species and ecological integrity, and more detailed information on the distribution and abundance of key marine species.

3. The EBSAs we have identified occur in each of the eight subdivisions of the Mediterranean, which were proposed for consideration to the First Meeting of the Steering Committee on the *Identification of Possible SPAMIs in the Mediterranean Areas Beyond National Jurisdiction (ABNJ),* Tunis, 17 March 2009 (UNEP (DEPI)/MED WG. 330/6, 24 February 2009; see also Section 2.3.1 of this document, and Fig. 2-4), thus facilitating regional representativeness.

4. Using the eight selection criteria we put forward to the RAC/SPA in a previous report (Notarbartolo di Sciara and Agardy 2009b; see also Section 3 and Table 3-3), and keeping in special consideration Art. 8 of the SPA/BD Protocol ("*2. The SPAMI List may include sites which: are of importance for conserving the components of biological diversity in the Mediterranean; contain ecosystems specific to the Mediterranean area or the habitats of endangered species; are of special interest at the scientific, aesthetic, cultural or educational levels*"), we filtered the aforementioned data in order to prioritize the importance of the various EBSAs and identify high priority sites in Mediterranean ABNJ.

5. The method that was used to collect the information needed to identify the 10 Mediterranean EBSAs is described in Notarbartolo di Sciara and Agardy (2009a). All the information obtained from our correspondents is summarised in Table 4-1.

6. We do not suggest that the information we collected represents a complete description of the distribution of relevant marine biodiversity in the Mediterranean; however, given the short time available for this compilation, and considering that we were asked by RAC/SPA not to include information on fisheries and deep-sea biota, we suggest that what we present here is a good initial representation of the ABNJ biota to be considered for place-based protection in the region.

7. The 10 Mediterranean EBSAs mentioned above are described in greater detail in Section 4.2 (below). A kmz file readable on Google Earth (version 5.0 or greater) is submitted together with this document for a best representation of the complex of polygons used in the current analysis and proposal.

8. Within the 10 EBSAs mentioned above, we have identified a first list of 15 potential SPAMI sites in the Mediterranean ABNJ, classified according to perceived conservation priority. The 15 potential SPAMI sites are described in greater detail in Section 4.4.

## 4.2 Overview of Mediterranean EBSAs

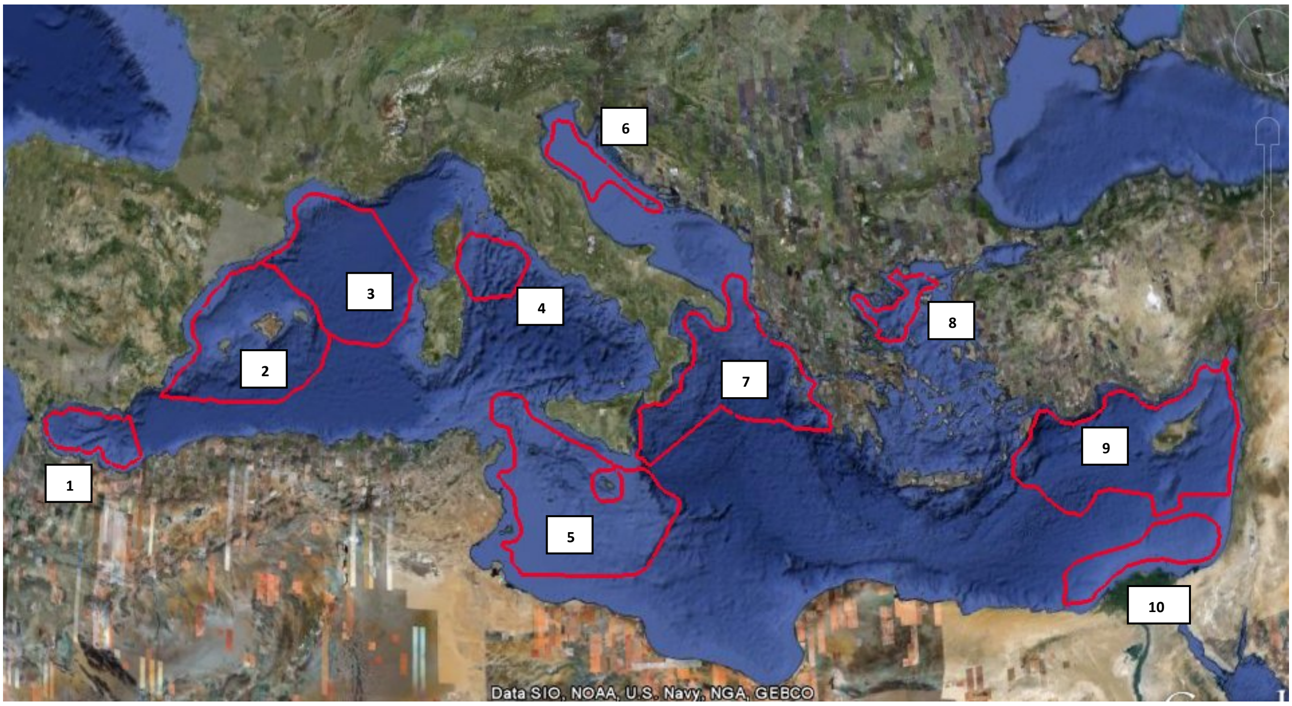


Fig. 4-1. EBSAs identified in the Mediterranean Sea. 1. Alborán Sea; 2. Balearic Islands area; 3. Gulf of Lion area; 4. Tyrrhenian Sea; 5. Tunisian Plateau; 6. Adriatic Sea; 7. Ionian Sea; 8. Aegean Sea; 9. Levantine Sea; 10. Nile Delta area.

Fig. 4-1 shows the 10 EBSAs which were identified using expert opinion and proxies for biodiversity hotspots. Table 4-1 gives source information for each of the datasets used to identify EBSAs.

From the survey results we were able to rank these ten EBSAs according to the criteria used to identify the polygons that formed the basis for the outer bounds of each ecologically significant area. Those EBSAs that were identified as important for a number of criteria, as opposed to a single criterion, were accorded higher ranking. In order to account for discrepancies in data coverage and the number of respondents from each region, we averaged criteria values across all responses pertaining to each EBSA region.

The ranking of the ten EBSAs is as follows:

| | |
|---|---|
| **1** | Alborán Sea |
| **2** | Gulf of Lion area |
| **3** | Nile Delta area |
| **4** | Aegean Sea |
| **5** | Ionian Sea |
| **6** | Tyrrhenian Sea |
| **7** | Balearic Islands area |
| **8** | Tunisian Plateau |
| **9** | Levantine Sea |
| **10** | Adriatic Sea |

Given that the purpose of the project is to identify priority sites for possible SPAMI designation, with the goal of creating a future representative network of marine protected areas to safeguard Mediterranean biodiversity, we acknowledge that certain areas of the Mediterranean are underrepresented and thus should be given first priority in work to establish SPAMI sites. Apropos, we have placed the eastern and southern Mediterranean ecoregions first and foremost in the list of potential SPAMI sites (Section 4.4).

We also note that the outstanding dearth of proposed EBSAs in the south-eastern portion of the Mediterranean (Fig. 4-1) is more likely caused by lack of information than by a real scarcity of biodiversity features deserving protection, and therefore recommend that adequate investigation effort be devoted in those areas as soon as possible.

Table 4-1. Source information for the datasets used to identify Mediterranean EBSAs.

| n. | name of polygon | sub-region | referent | Type | crit 1 | crit 2 | crit 3 | crit 4 | crit 5 | crit 6 | crit 7 | Crit 8 | notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Djibouti Seamount | Alborán | S. Tudela | MPA | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 0 | |
| 2 | Alborán Crest | Alborán | S. Tudela | MPA | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 0 | |
| 3 | Motril Seamount | Alborán | S. Tudela | MPA | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 0 | |
| 4 | Seco de los Olivos Seamount | Alborán | S. Tudela | MPA | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 0 | |
| 5 | E Malaga coast | Alborán | C. Carboneras | IBA | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 0 | not ABNJ: Important foraging ground for seabirds within the Alborán context. |
| 6 | Bay of Almeria | Alborán | C. Carboneras | IBA | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 0 | not ABNJ: important breeding colonies of gulls and terns that use the adjacent sea to forage |
| 7 | Alborán island | Alborán | C. Carboneras | IBA | 3 | 3 | 3 | 3 | 2 | 2 | 4 | 0 | holds one of the most important colonies of Audouin's gull in the world |
| 8 | Chafarinas Islands | Alborán | C. Carboneras | IBA | 3 | 4 | 4 | 4 | 3 | 3 | 4 | 0 | not ABNJ: holds the second most important colony of Audouin's gull at global level |
| 9 | Al-Mansour Seamount | Alborán | S. Tudela | MPA | | | | | | | | | |
| 10 | Torrox Seamount | Alborán | S. Tudela | MPA | | | | | | | | | |
| 11 | Gibraltar Strait | Alborán | C. Carboneras | EBSA | 4 | 3 | 3 | 2 | 3 | 4 | 1 | 0 | Unique location is key for long-term survival of seabird populations that move between Mediterranean Sea and Atlantic Ocean |
| 12 | Alborán Sea | Alborán | C. Carboneras | EBSA | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 0 | Area of high (primary) productivity: acts as feeding area for locally-breeding bird populations, as winter area and most importantly for migration/passage |
| 13 | Seco de los Olivos Seamount | Alborán | X. Pastor | EBSA | 3 | 3 | 4 | 4 | 3 | 4 | 2 | 0 | presence of black corals, red coral, sponges, gorgonian gardens, coralligenous, maerl, marine turtles, cetaceans and commercial species. |
| 14 | Alborán and Algerian | Alborán, W Medit | P. Casale | EBSA | 0 | 2 | 3 | 1 | 2 | 1 | 2 | 0 | loggerhead turtle habitat |
| 15 | Polygon 4 | Alborán | F. Serena | EBSA | | 3 | | | | | | | *Scyliorhinus canicula* nursery area |
| 16 | Alborán Sea | Alborán | ACCOBAMS | EBSA | 2 | 4 | 4 | 3 | 4 | 3 | 1 | 0 | Common dolphin, striped dolphin, bottlenose dolphin, Cuvier's beaked whale, pilot whale |
| 89 | SW Alborán | Alborán | V. Agostini | EBSA | 2 | 3 | 0 | 0 | 3 | 2 | 0 | 0 | important suitable habitat for small pelagics (sardines and/or anchovies) |
| 17 | Aguilas Seamount | W Medit | S. Tudela | MPA | | | | | | | | | |
| 18 | Emile Baudot Seamount | W Medit | S. Tudela | MPA | | | | | | | | | |
| 19 | Palamos Canyon | W Medit | S. Tudela | MPA | | | | | | | | | |
| 20 | Cap de Creus Canyon | W Medit | S. Tudela | MPA | 4 | 3 | 4 | 4 | 2 | 4 | 3 | 0 | *Lophelia, Madrepora,* 218 m, ROV, submersible (Orejas et al. 2008) |
| 21 | Balearic Sea | W Medit | S. Tudela | EBSA | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 0 | Bluefin tuna spawning ground, sperm whale habitat |
| 22 | Gulf of Lion | W Medit | V. Barale | EBSA | 3 | 3 | 3 | | 4 | | | | High primary productivity of pelagic waters |
| 23 | Ebro River system | W Medit | C. Carboneras | EBSA | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | Key area for feeding of globally-threatened and other seabird species of conservation concern that concentrate for breeding in Ebro Delta (gulls, terns) and in Balearic Is (shearwaters) |
| 24 | Gulf of Lion - Hyères Islands | W Medit | C. Carboneras | EBSA | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | High-productivity area; important for feeding of globally-threatened and other seabird species of conservation concern: Procellariiforms from Hyères, Corsica & Balearics, gulls & terns from Camargue, wintering seabirds from Atlantic |
| 25 | Palos Seamount | W Medit | X. Pastor | EBSA | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 0 | corals, gorgonian gardens, sponges, marine turtles, cetaceans, elasmobranchs and |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | commercial species. |
| 26 | Emile Baudot Seamount | W Medit | X. Pastor | EBSA | 3 | 3 | 4 | 3 | 2 | 4 | 3 | 0 | coralligenous, maërl, gorgonian gardens, corals (included some black corals), bryozoans, marine turtles, cetaceans and commercial species. |
| 27 | Menorca Canyon | W Medit | X. Pastor | EBSA | 3 | 3 | 3 | 3 | 4 | 4 | 2 | 0 | gorgonian gardens, corals, sponges, coralligenous, maërl, sharks and commercial species. |
| 28 | Gulf of Lion - fin whale habitat | W Medit | S. Panigada | EBSA | 3 | 4 | 1 | 2 | 4 | 4 | 0 | 0 | |
| 29 | Gulf of Lion - striped dolphin habitat | W Medit | S. Panigada | EBSA | 2 | 2 | 1 | 2 | 2 | 4 | 0 | 0 | |
| 30 | Spanish shelf + Balearic | W Medit | P. Casale | EBSA | 0 | 2 | 3 | 2 | 2 | 2 | 2 | 0 | loggerhead turtle habitat |
| 31 | Polygon 5 | W Medit | F. Serena | EBSA | | 3 | | | | | | | *Galeus melastomus* nursery area |
| 73 | Gulf of Lion canyons | W Medit | Freiwald et al 2009 | literature | | | | | | | | | Lacaze-Duthiers Canyon, *Madrepora,* at 300 m, submersible, dredges (Zibrowius 2003), Cassidaigne Canyon, *Madrepora,* 210-510 m, submersible (Bourcier & Zibrowius 1973) |
| 81 | Catalan coast | W Medit | V. Agostini | EBSA | 1 | 3 | 0 | 0 | 3 | 2 | 0 | 0 | important suitable habitat for small pelagics (sardines and/or anchovies) |
| 90 | Balearic Sea | W Medit | A. Cañadas | EBSA | | | | | | | | | important habitat for sperm whales |
| 32 | N Tyrrhenian | Tyrrenian | V. Barale | EBSA | 2 | 1 | | | 2 | | | | High primary productivity of pelagic waters |
| 33 | Corsica - Sardinia - Tuscan Is. | Tyrrenian | C. Carboneras | EBSA | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 0 | Important area for feeding of endemic and other seabird species of conservation concern that concentrate for breeding in Corsica-Sardinia-Tuscan archipelagos |
| 34 | Aceste Seamount | Tyrrenian | X. Pastor | EBSA | 2 | 3 | 3 | 2 | 4 | 3 | 3 | 0 | corals, elasmobranchs (specially high quantity of sharks) and commercial species. |
| 35 | Enareta Seamount | Tyrrenian | X. Pastor | EBSA | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 0 | corals, sponges and sharks. |
| 36 | Polygon 10 | Tyrrenian | F. Serena | EBSA | | 3 | 3 | 3 | 3 | 3 | | 0 | *Scyliorhinus canicula, Raja clavata, R. asterias, Carcharinus brachyurus, Galeus melastomus, Etmopterus spinax* nursery area |
| 37 | Polygon 11 | Tyrrenian | F. Serena | EBSA | | 3 | | | | | | | *Squatina oculata* probable nursery area |
| 38 | Polygon 5 bis | Tyrrenian | F. Serena | EBSA | | 3 | | | | | | | *Scyliorhinus canicula* nursery area |
| 39 | Waters around Ischia | Tyrrenian | ACCOBAMS | EBSA | 2 | 3 | 4 | 3 | 2 | 2 | 1 | 0 | Common dolphin, striped dolphin, Risso's dolphin, sperm whale |
| 40 | Bluefin tuna breeding area | Tunisia Plateau | S. Tudela | EBSA | 3 | 4 | 4 | 4 | 1 | 3 | 3 | 0 | |
| 41 | Tunisia Plateau area 1 | Tunisia Plateau | M. Bradai | EBSA | | 2 | 3 | | | 3 | | | *Carcharodon carcharias* nursery area |
| 42 | Tunisia Plateau area 2 | Tunisia Plateau | M. Bradai | EBSA | | 2 | 3 | | | 3 | | | Several batoids and white shark nursery, loggerhead turtle feeding and wintering area, Maerl beds |
| 43 | Strait of Sicily | Tunisia Plateau | C. Carboneras | EBSA | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 0 | High-productivity area: important for feeding of Procellariiforms nesting in Tunisia (Zembra is), Sicily (Egadi is) and Pantelleria |
| 44 | Malta - Outer Gabés | Tunisia Plateau | C. Carboneras | EBSA | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 0 | New data from BirdLife Malta LIFE Yelkouan Shearwater Project show importance of the extensive area SE of Malta for feeding of this Mediterranean endemic species. |
| 45 | Tunisian - Inner Gabés | Tunisia Plateau | P. Casale | EBSA | 0 | 3 | 3 | 3 | 3 | 3 | 3 | 0 | loggerhead turtle habitat |
| 46 | Strait of Sicily, Ionian | Tunisia Plateau, Ionian | P. Casale | EBSA | 0 | 2 | 3 | 1 | 2 | 1 | 2 | 0 | loggerhead turtle habitat |
| 47 | Polygon 8 | Tunisia Plateau | F. Serena | EBSA | | 3 | | | | | | | *Carcharodon carcharias* probable nursery area |
| 48 | Polygon 9 | Tunisia Plateau | F. Serena | EBSA | | 3 | | | | 3 | | | *Carcharodon carcharias* probable nursery area |
| 49 | Waters around Lampedusa | Tunisia Plateau | ACCOBAMS | EBSA | 2 | 4 | 3 | 3 | 4 | 2 | 2 | 0 | Fin whale winter feeding grounds |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | Waters around Malta | Tunisia Plateau | ACCOBAMS | EBSA | 1 | 4 | 3 | 3 | 2 | 1 | 2 | 0 | Common dolphin |
| 74 | *Lophelia, Madrepora* in Strait of Sicily | Tunisia Plateau | Freiwald et al 2009 | literature | | | | | | | | | Urania Bank, *Lophelia, Madrepora,* 509-613 m, ROV (this study), Linosa Trough, *Lophelia, Madrepora,* 669-679 m, ROV (this study), off Malta, *Lophelia, Madrepora,* 453-612 m, ROV (this study), off Malta, *Lophelia, Madrepora,* 392-617 m, demersal trawl (Schembri et al. 2007) |
| 87 | Inner Tunisian Plateau, N part | Tunisia Plateau | V. Agostini | EBSA | | 2 | | | | | | | |
| 88 | SW Sicily | Tunisia Plateau | V. Agostini | EBSA | 2 | 3 | 0 | 0 | 3 | 2 | 0 | 0 | important suitable habitat for small pelagics (sardines and/or anchovies) |
| 51 | Northern and central Adriatic | Adriatic | P. Casale | EBSA | 0 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | loggerhead turtle habitat |
| 52 | Polygon 1 | Adriatic | F. Serena | EBSA | | 2 | 2 | 2 | | | | | *Squalus acanthias* nursery area |
| 53 | Polygon 2 | Adriatic | F. Serena | EBSA | | 3 | | | | | | | *Scyliorhinus canicula* nursery area |
| 76 | *Lophelia* and *Madrepora* in S Adriatic of Puglia | Adriatic | Freiwald et al 2009 | literature | | | | | | | | | Bari Canyon, *Lophelia, Madrepora,* 306-640 m, ROV (this study), Gondola Slide, *Lophelia, Madrepora,* 674-714 m, ROV (this study) |
| 82 | Central western Adriatic | Adriatic | V. Agostini | EBSA | 1 | 3 | 0 | 0 | 3 | 2 | 0 | 0 | important suitable habitat for small pelagics (sardines and/or anchovies) |
| 54 | Ionian | Ionian | P. Casale | EBSA | 0 | 2 | 3 | 1 | 2 | 1 | 2 | 0 | loggerhead turtle habitat |
| 55 | Polygon 6 | Ionian | F. Serena | EBSA | | 3 | | | | | | 0 | *Raja clavata* nursery area |
| 56 | Eastern Ionian Sea | Ionian | ACCOBAMS | EBSA | 1 | 4 | 4 | 3 | 3 | 2 | 2 | 0 | Common dolphins, bottlenose dolphins, Cuvier's beaked whales, fin whales, sperm whales |
| 57 | Hellenic Trench | Ionian, Levantine | ACCOBAMS | EBSA | 2 | 4 | 4 | 3 | 4 | 3 | 2 | 0 | Sperm whales, Cuvier's beaked whales |
| 75 | *Lophelia* and *Madrepora* in Gulf of Taranto | Ionian | Freiwald et al 2009 | literature | | | | | | | | | Santa Maria di Leuca, *Lophelia, Madrepora,* 300-1100 m, dredges, ROV (Taviani et al. 2005a, this study), off Gallipoli, *Lophelia, Madrepora,* 603-744 m, ROV (this study) |
| 78 | *Lophelia* reefs | Ionian | GFCM | | | | | | | | | | |
| 58 | Polygon 3 | Aegean | F. Serena | EBSA | | 3 | | | | | | | *Carcharinus plumbeus* breeding area |
| 59 | Northern Aegean Sea | Aegean | ACCOBAMS | EBSA | 2 | 4 | 4 | 3 | 3 | 2 | 2 | 0 | Common dolphin, harbour porpoise, monk seal, beaked whale |
| 60 | Eastern Aegean Sea | Aegean | ACCOBAMS | EBSA | 2 | 4 | 4 | 3 | 3 | 2 | 2 | 0 | Common dolphin, monk seal, beaked whale |
| 77 | *Lophelia* and *Madrepora* reefs off Thasos | Aegean | Freiwald et al 2009 | literature | | | | | | | | | off Thasos, *Lophelia, Madrepora,* 300-350 m, dredging (Vafidis et al. 1997) |
| 83 | N West Aegean | Aegean | V. Agostini | EBSA | 2 | 3 | 0 | 0 | 3 | 2 | 0 | 0 | important suitable habitat for small pelagics (sardines and/or anchovies) |
| 84 | N Aegean | Aegean | V. Agostini | EBSA | 2 | 3 | 0 | 0 | 3 | 2 | 0 | 0 | important suitable habitat for small pelagics (sardines and/or anchovies) |
| 85 | SW Aegean | Aegean | V. Agostini | EBSA | 3 | | | | | | | | |
| 61 | Bluefin tuna breeding area | Levantine | S. Tudela | EBSA | 3 | 4 | 4 | 4 | 1 | 3 | 3 | 0 | |
| 62 | Bluefin tuna breeding area | Levantine | A. Gucu | EBSA | 3 | 4 | 3 | 1 | 0 | 0 | 0 | 0 | Importance: One of the 3 spawning grounds of Blue Fin Tuna (Thunnus thynnus) |
| 63 | Monk seal 1 | Levantine | A. Gucu | MPA | 4 | 4 | 4 | 2 | 0 | 0 | 2 | 0 | not ABNJ. Importance: The largest and the only viable monk seal colony along the Turkish coast |
| 64 | Monk seal 2 | Levantine | A. Gucu | MPA | 4 | 3 | 3 | 4 | 2 | 2 | 3 | 0 | not ABNJ. Importance: Very pristine area, intact Cystoseira and Posidonia meadows; important (breeding) habitat for seal, breeding site for Audouin's Gull (Larus audouini). |
| 65 | Keldag | Levantine | A. Gucu | MPA | 4 | 3 | 3 | 4 | 2 | 2 | 4 | 0 | not ABNJ. Importance: May be the last spot representing intact rocky Levantine coast. Also holds a small breeding monk seal colony |
| 66 | Rhodes Gyre | Levantine | A. Gucu | EBSA | 4 | 3 | 2 | 1 | 4 | 2 | 0 | 0 | Very significant oceanographic feature driven by strong upwelling. Biological importance is not well known however we have sampled significant amount of egg |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | and larvae (Clupeid and Swordfish) on the periphery of the upwelling region. The region is rich in Cephalopods. Therefore the region may also be important for Cetaceans. (the largest number of whale stranding from Turkish fishermen are reported there). |
| 67 | Rhodes Gyre | Levantine | V. Barale | EBSA | 3 | 2 | | | 4 | | | 0 | High primary productivity of pelagic waters |
| 68 | Egyptian shelf | Levantine | P. Casale | EBSA | 0 | 3 | 3 | 3 | 3 | 3 | 2 | 0 | loggerhead and green turtle habitat |
| 69 | Cyprus - Turkey - Syria | Levantine | P. Casale | EBSA | 0 | 3 | 3 | 3 | 3 | 3 | 3 | 0 | loggerhead and green turtle habitat |
| 70 | Polygon 7 | Levantine | F. Serena | EBSA | | 3 | | | | | | | *Rhinobatos rhinobatos* nursery area |
| 71 | Off S Turkey, Syria | Levantine | ACCOBAMS | EBSA | 1 | 4 | 4 | 3 | 4 | 2 | 2 | 0 | beaked whales, monk seal |
| 72 | Off Nile Delta, S Israel | Levantine | ACCOBAMS | EBSA | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 0 | Common dolphin |
| 79 | Eratosthenes Seamount | Levantine | GFCM | | | | | | | | | | |
| 80 | Cold seeps | Levantine | GFCM | | | | | | | | | | |
| 86 | Rhodes Gyre | Levantine | V. Agostini | EBSA | 3 | | | | | | | | |

## 4.3 Details of polygons used to designate EBSAs.

Fig. 4-2. Alborán Sea. Outer limits of the Alborán EBSA.

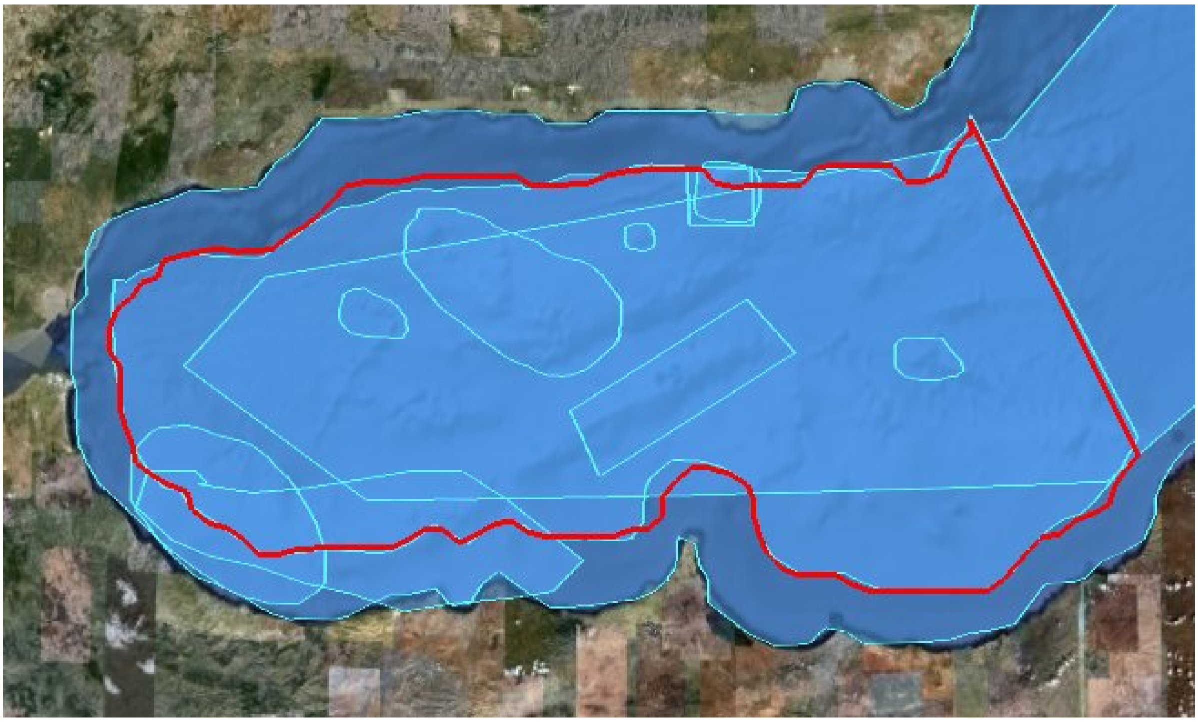

Fig. 4-3. Alborán Sea. Alborán EBSA, all polygons combined.

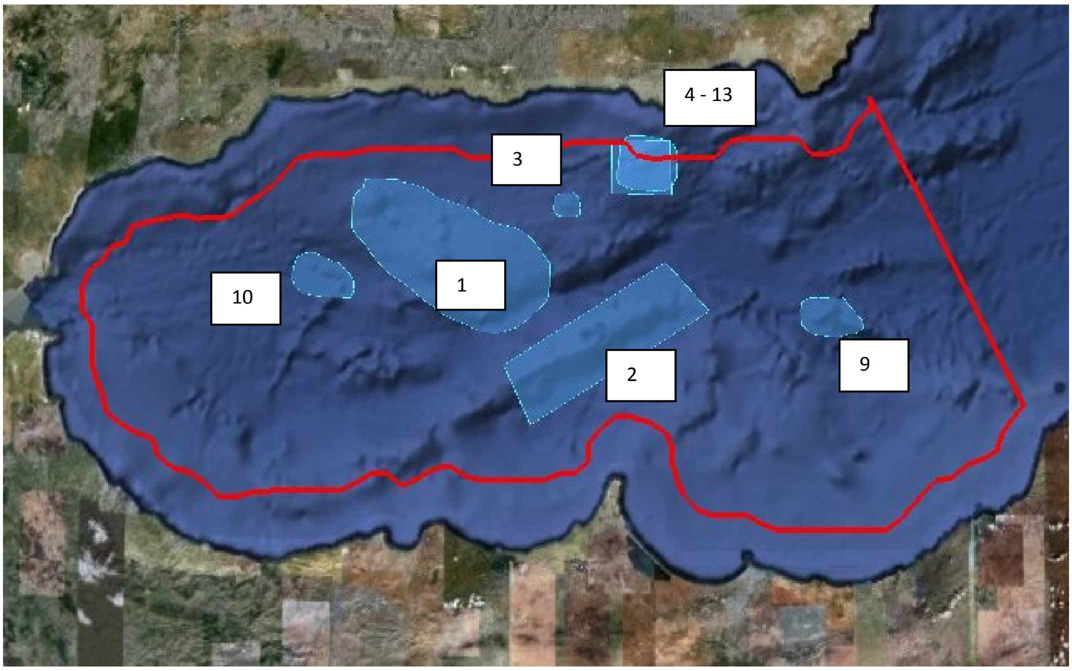


Fig. 4-4. Alborán Sea. Geomorphological features: 1: Djibouti Seamount; 2: Alborán Crest; 3: Motril Seamount; 4-13: Seco de los Olivos Seamount; 9: Al-Mansour Seamount; 10: Torrox Seamount (S. Tudela, X. Pastor).

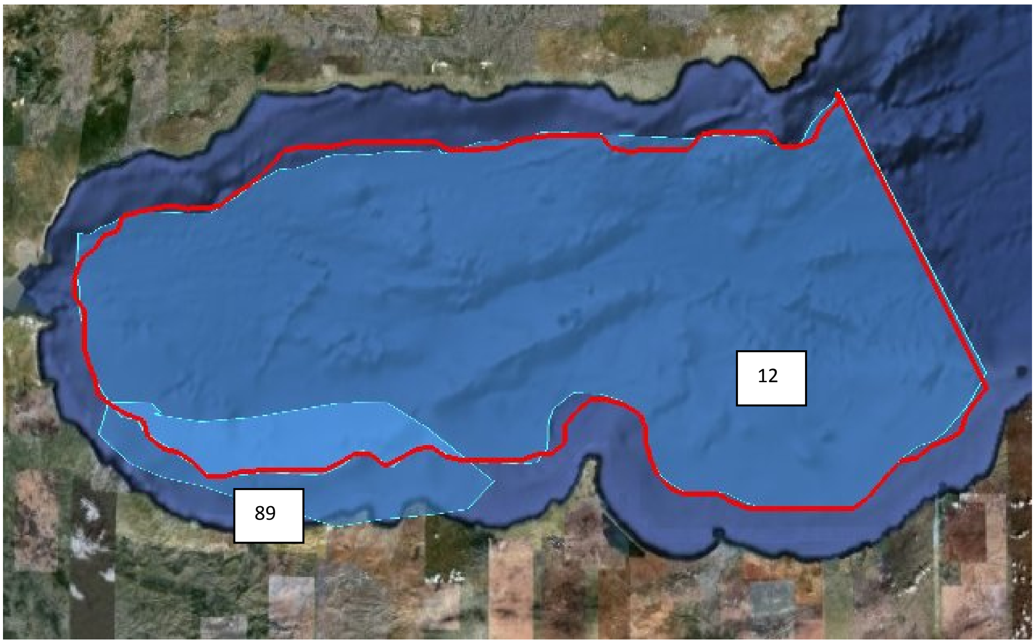


Fig. 4-5. Alborán Sea. High productivity areas: 12: Important feeding area for locally-breeding bird populations (C. Carboneras); 89: Important suitable habitat for small pelagics (V. Agostini).

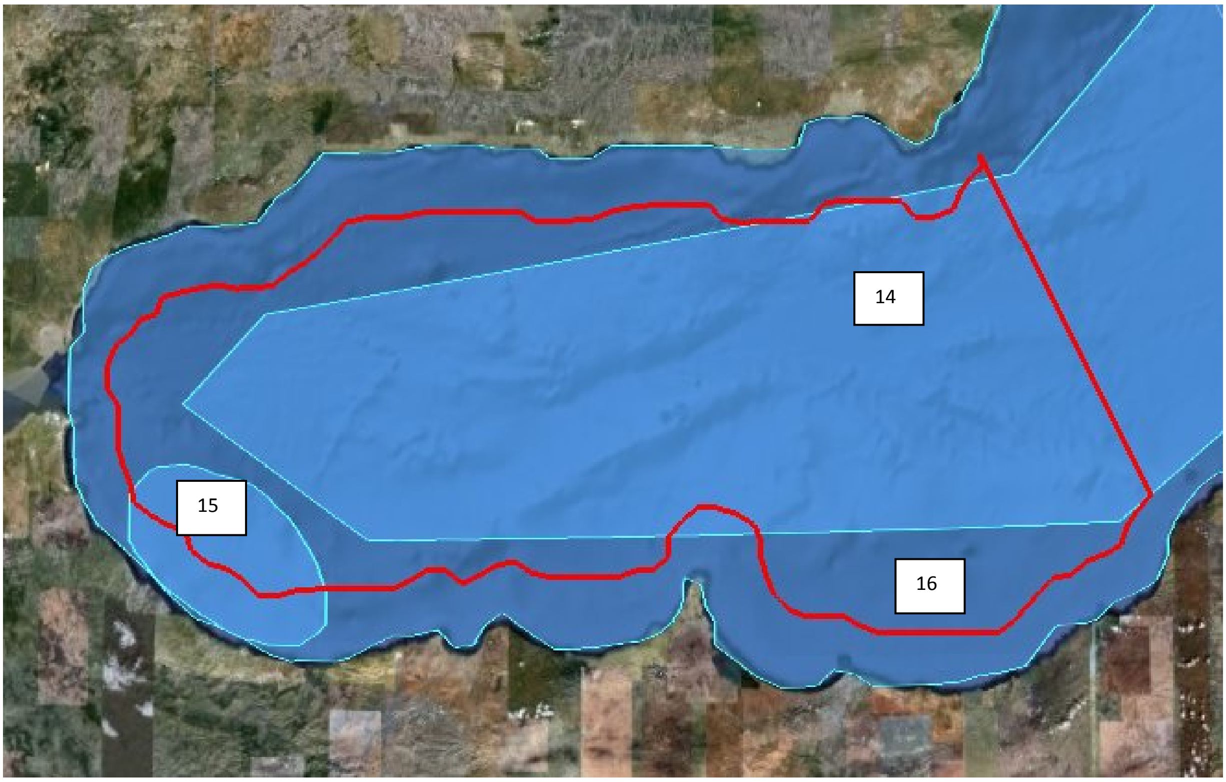


Fig. 4-6. Alborán Sea. Important habitat for significant species: 14: Loggerhead turtles (P. Casale); 15: *Scyliorhinus canicula* nursery area (F. Serena); 16: Common dolphins, striped dolphins, bottlenose dolphins, Cuvier's beaked whales, pilot whales (A. Cañadas and R. Sagarminaga, ACCOBAMS).

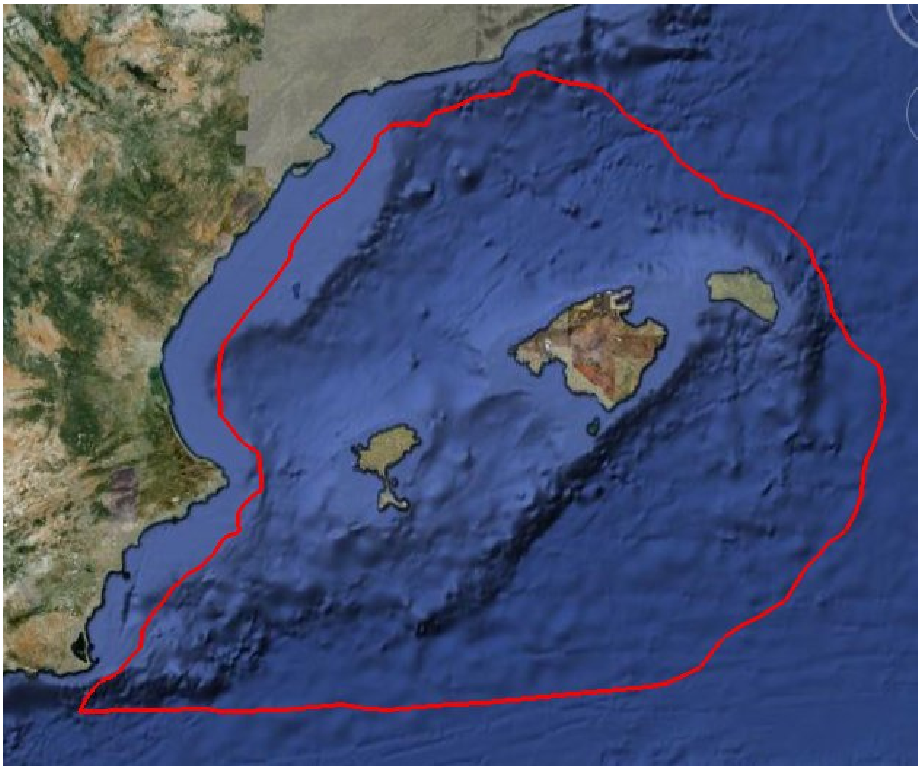

Fig. 4-7.  Balearic Sea. Outer limits of Balearic Sea EBSA.

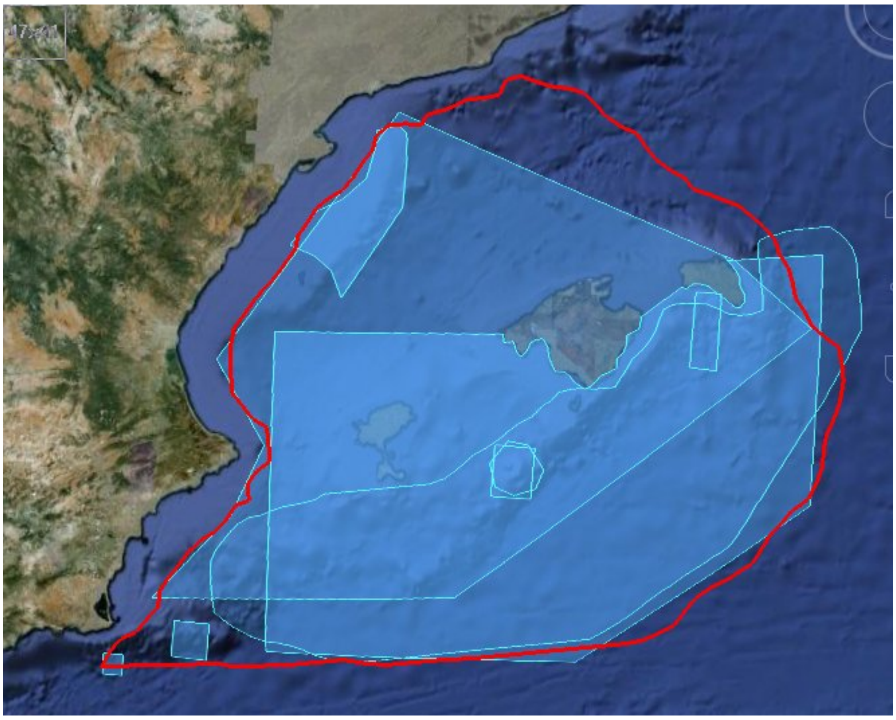

Fig. 4-8.  Balearic Sea.  All polygons combined.

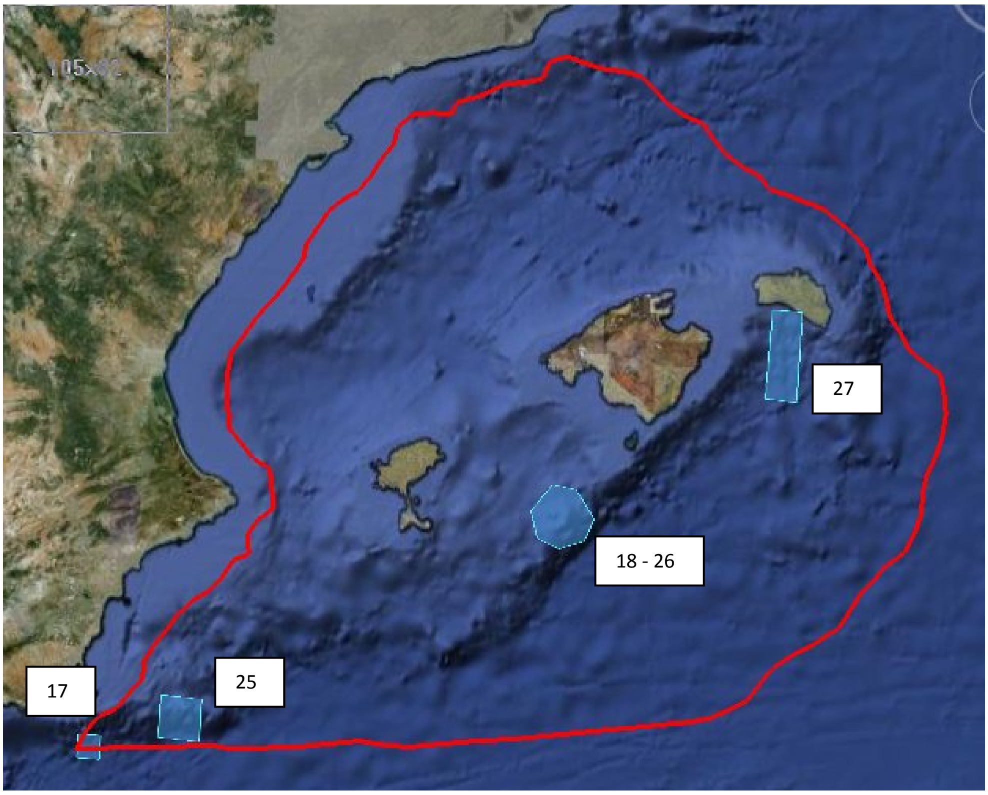


Fig. 4-9. Balearic Sea. Geomorphological features: 17: Aguilas Seamount; 18-26: Emile Baudot Seamount; 25: Palos Seamount; 27: Menorca Canyon (S. Tudela, X. Pastor).

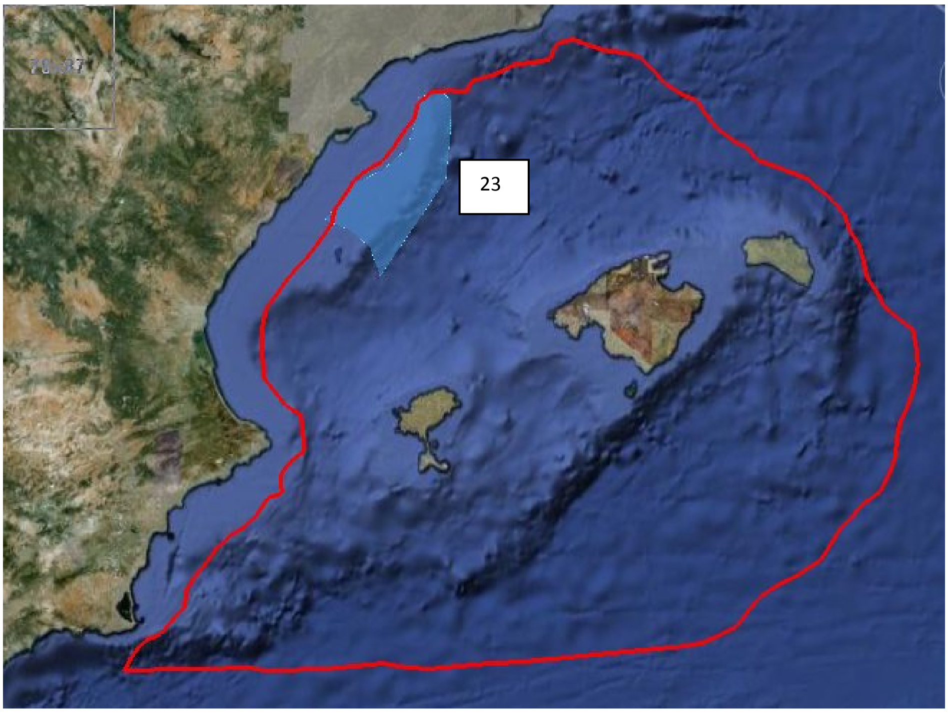


Fig. 4-10. Balearic Sea. High productivity areas: 23: Ebro River System (C. Carboneras).

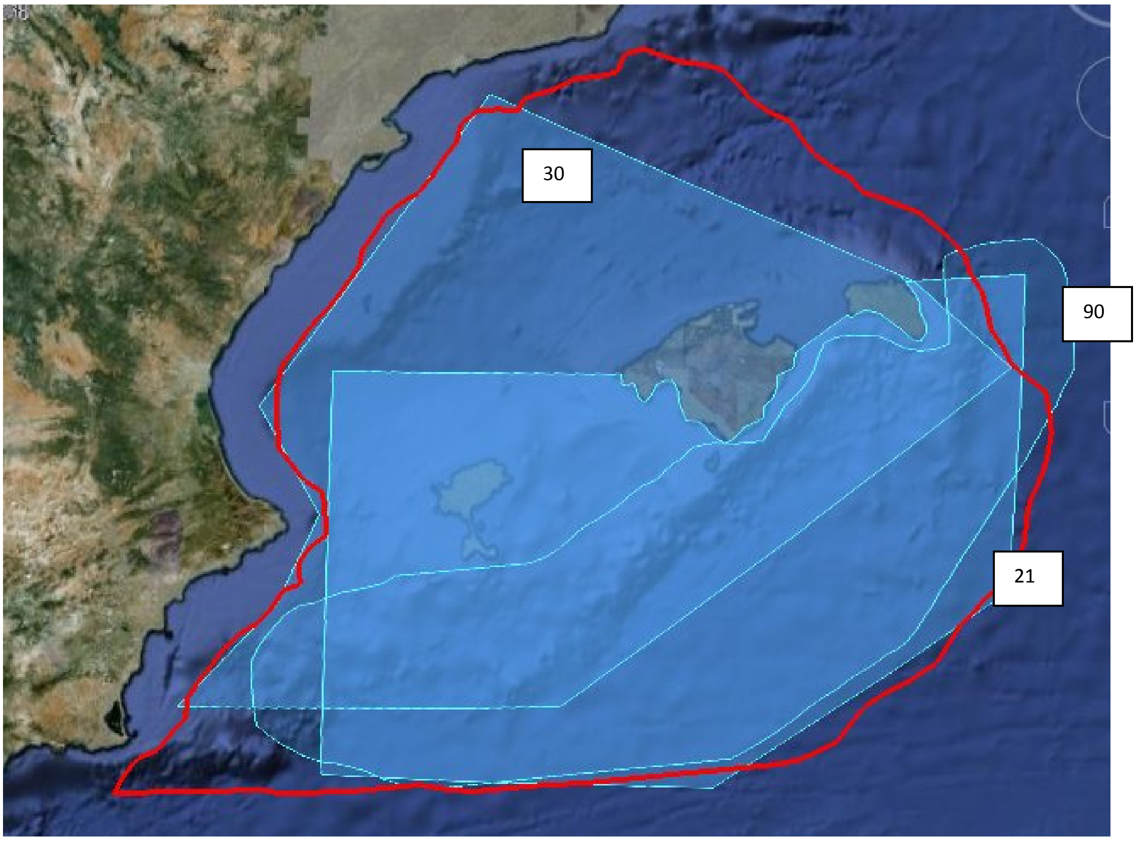


Fig. 4-11. Balearic Sea. Important habitat for significant species: 21: Bluefin tuna spawning grounds (S. Tudela; WWF 2008); 30: Important loggerhead turtle (P. Casale) and various odontocete (Rendell and Cañadas 2005) habitats; 90: Important sperm whale habitat (Rendell and Cañadas 2005).

Fig. 4-12. Gulf of Lion. Outer limits of Gulf of Lion EBSA. The yellow area to the East of the Gulf of Lion EBSA is the Pelagos Sanctuary, the only High Seas SPAMI currently established.

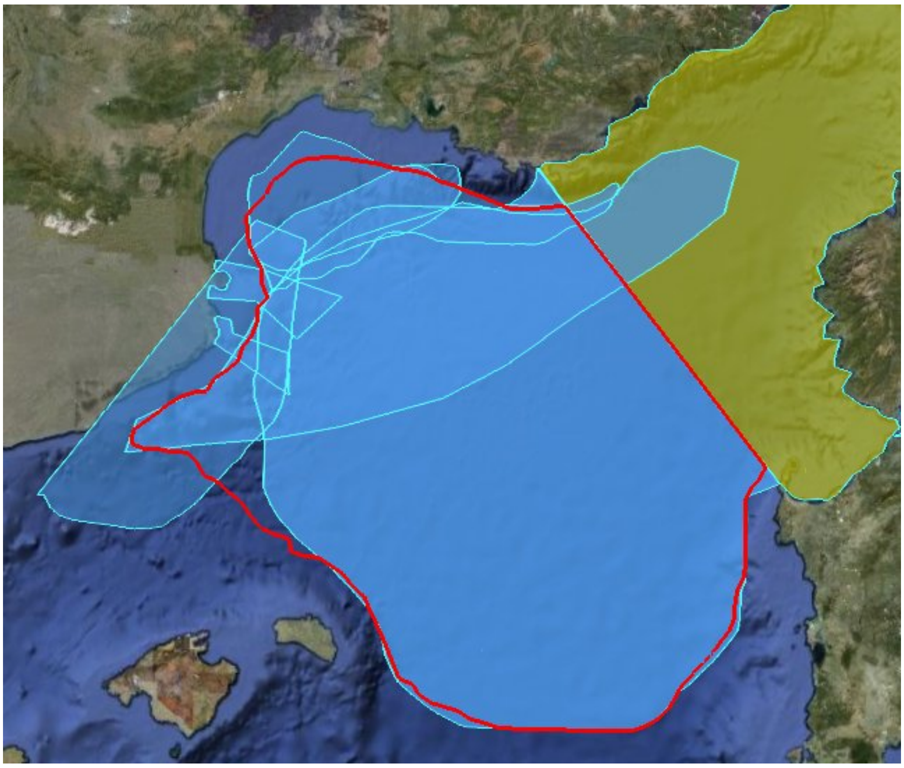

Fig. 4-13. Gulf of Lion. All polygons combined.

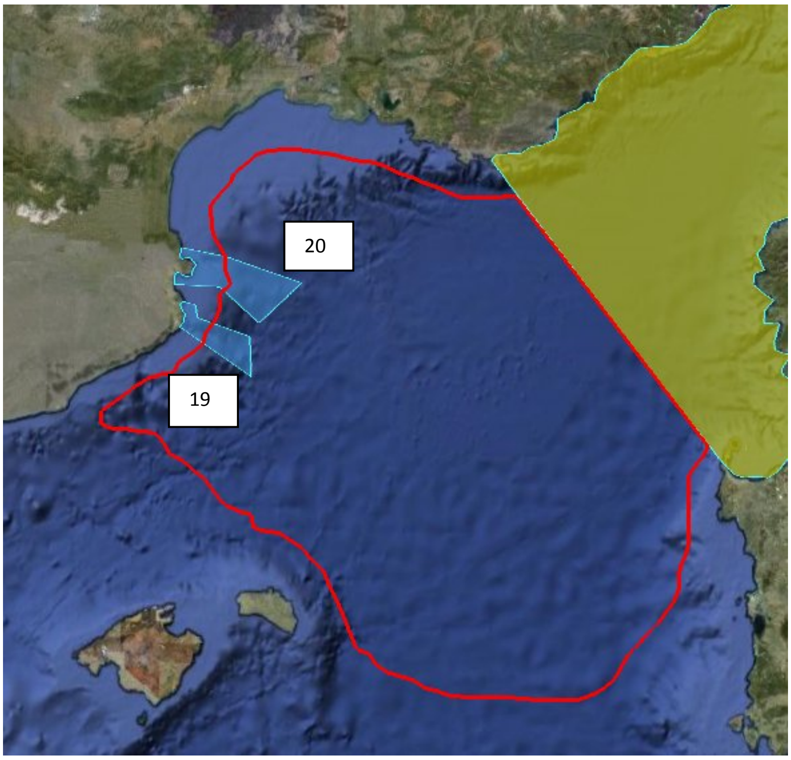


Fig. 4-14. Gulf of Lion. Geomorphological features: 19: Palamos Canyon; 20: Cap de Creus Canyon (S. Tudela).

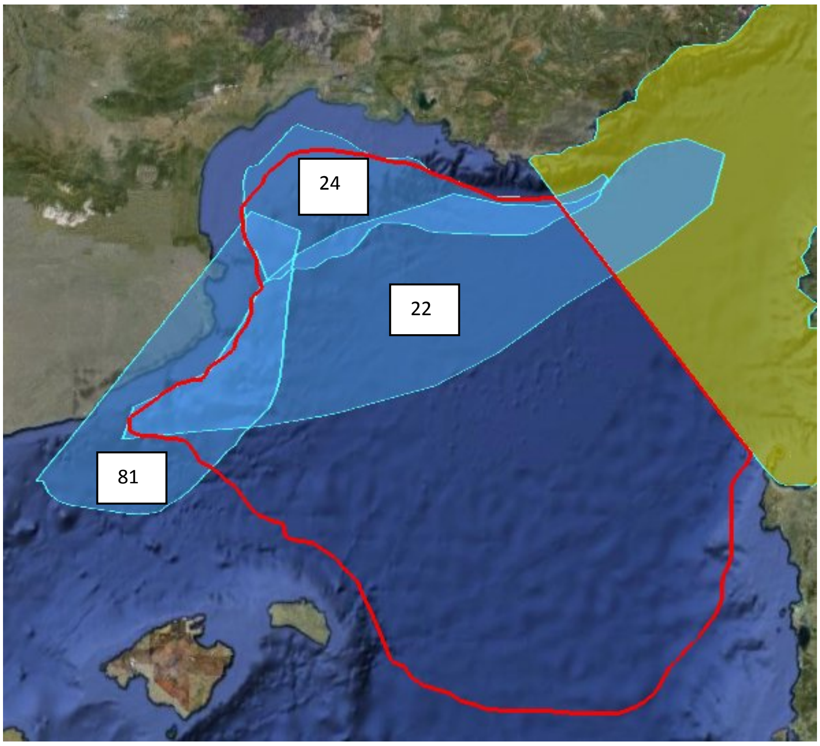


Fig. 4-15. Gulf of Lion. High productivity areas: 22: High primary productivity of pelagic waters (V. Barale); 24: High productivity area, important for globally-threatened and other seabird populations (C. Carboneras); 81: Important suitable habitat for small pelagics (V. Agostini).

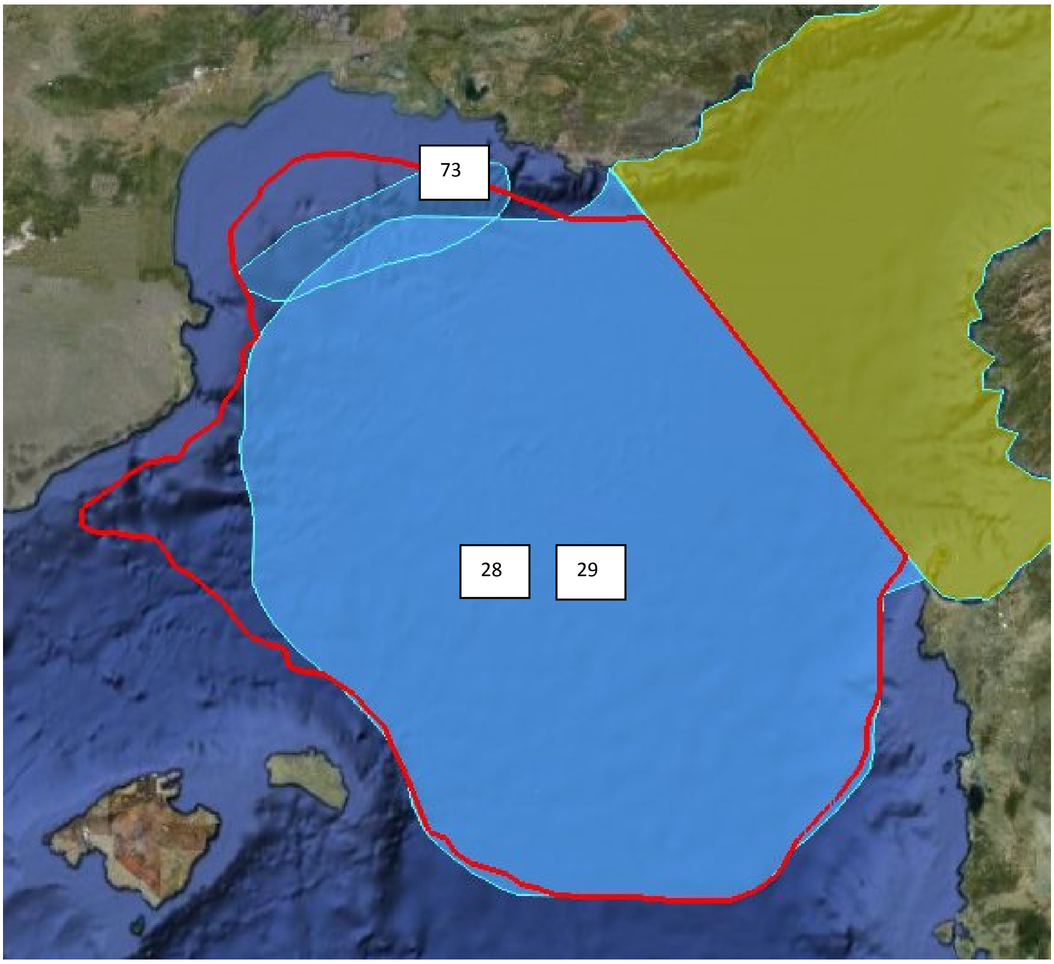


Fig. 4-16. Gulf of Lion. Important habitat for significant species: 28: fin whales (S. Panigada); 29: striped dolphins, Risso's dolphins, sperm whales (ACCOBAMS); 73: *Madrepora* reefs in Lacaze-Duthiers and Cassidaigne Canyons, and possibly beyond (Freiwald et al. 2009). The important areas for fin whales and striped dolphins extend into the Pelagos Sanctuary (yellow area to the east), and are not shown here.

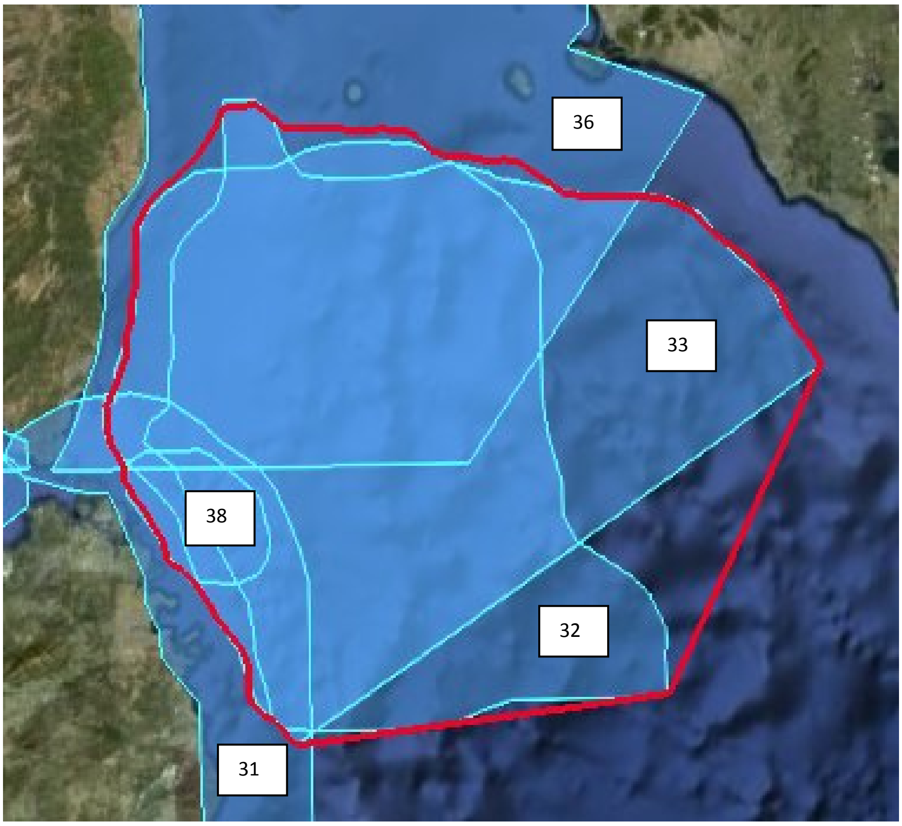


Fig. 4-17. Central Tyrrhenian Sea. 31: *Galeus melastomus* nursery area (F. Serena); 32: High primary productivity of pelagic waters (V. Barale); 33: Important area for feeding of endemic and other seabird species of conservation concern that concentrate for breeding in Corsica-Sardinia-Tuscan archipelagos (C. Carboneras); 36: *Scyliorhinus canicula, Raja clavata, R. asterias, Carcharhinus brachyurus, Galeus melastomus, Etmopterus spinax* nursery areas (F. Serena); 38: *Scyliorhinus canicula* nursery area (F. Serena).

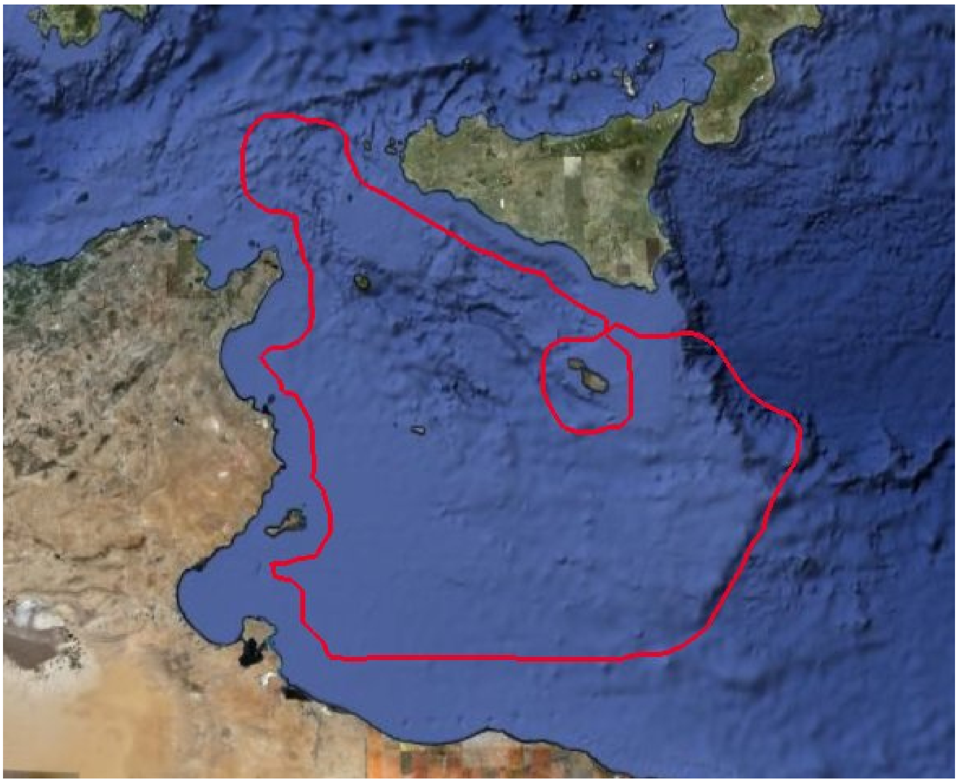

Fig. 4-18.  Tunsian Plateau.  Outer limits of the Tunisian Plateau EBSA.

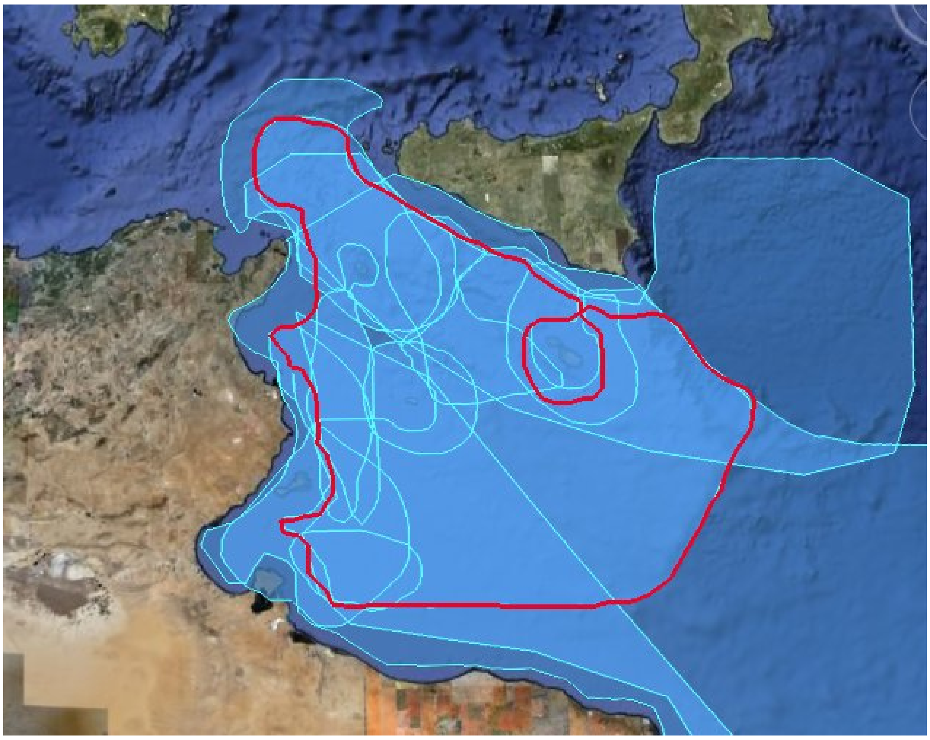

Fig. 4-19.  Tunisian Plateau EBSA, all polygons combined.

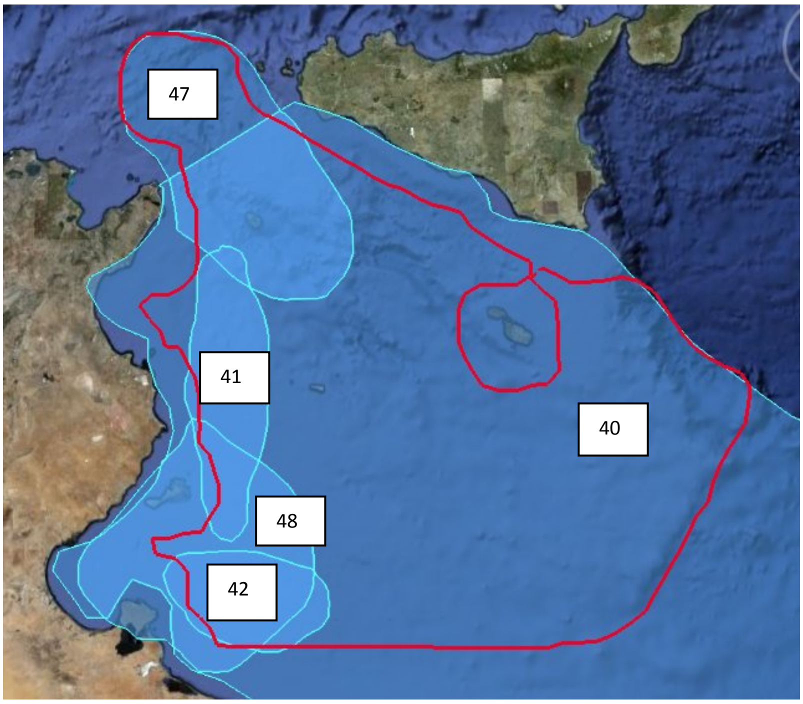


Fig. 4-20. Tunisian Plateau. Fish breeding areas: 40: Bluefin tuna breeding area (S. Tudela); 41: White shark nursery area (M.N. Bradai); 42: Several batoid species and white shark nursery area (M.N. Bradai); 47: White shark probable nursery area (F. Serena); 48: White shark probable nursery area (F. Serena).

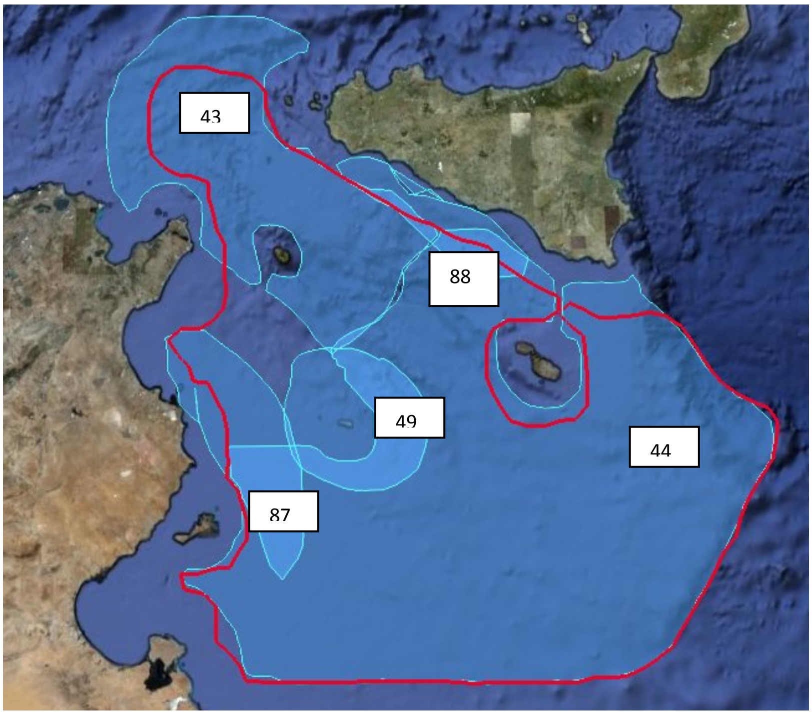


Fig. 4-21. Tunisian Plateau. High productivity areas: 43: Important feeding area for Procellariiforms (C. Carboneras); 44: Important feeding area for endemic marine birds (C. Carboneras); 49: Winter feeding grounds for fin whales (Canese et al. 2006; note: limits may be much wider); 87: Potential important suitable habitat for small pelagics (V. Agostini); 88: Important suitable habitat for small pelagics (V. Agostini).

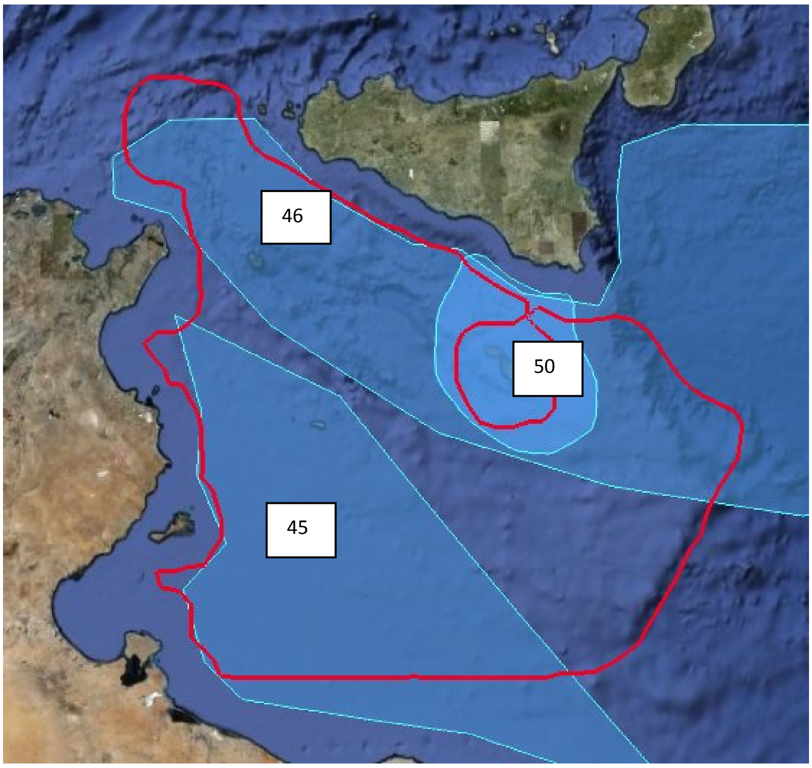


Fig. 4-22. Tunisian Plateau. Important habitat for threatened species: 45: Loggerhead turtles (P. Casale); 46: Loggerhead turtles (P. Casale); 50: Short-beaked common dolphins (ACCOBAMS - Note: area may be much wider than that).

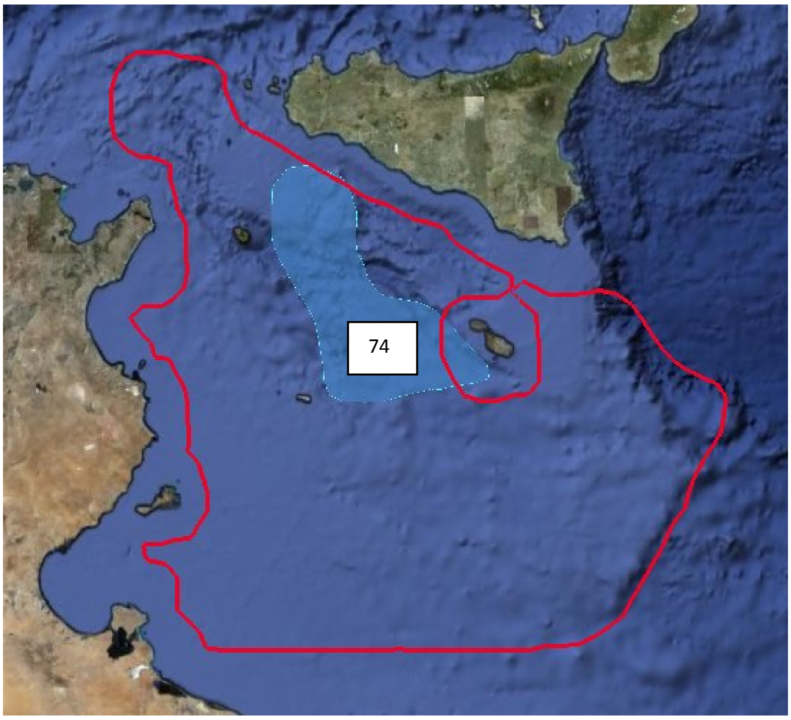


Fig. 4-23 . Tunisian Plateau. *Lophelia* and *Madrepora* reefs: 74: Urania Bank, Linosa Trough, off Malta (Freiwald et al. 2009; note: important area may be spread much wider, and extend to other banks and abundant seamounts).

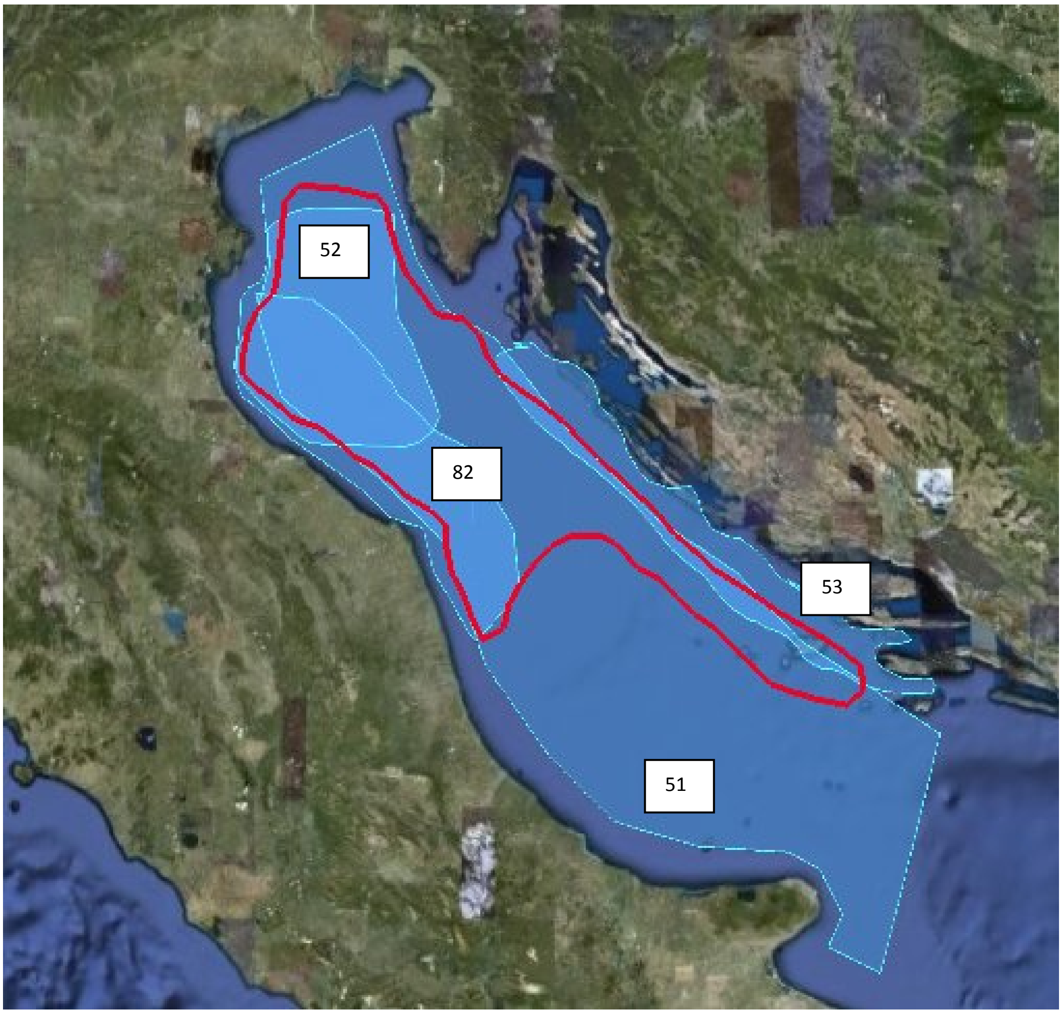


Fig. 4-24. Northern Adriatic Sea. 51: Loggerhead turtle feeding habitat (P. Casale); 52: *Squalus acanthias, Prionace glauca* nursery area (F. Serena); 53: *Scyliorhinus canicula* nursery area (F. Serena); 82: Important suitable habitat for small pelagics (sardines and/or anchovies) (V. Agostini).

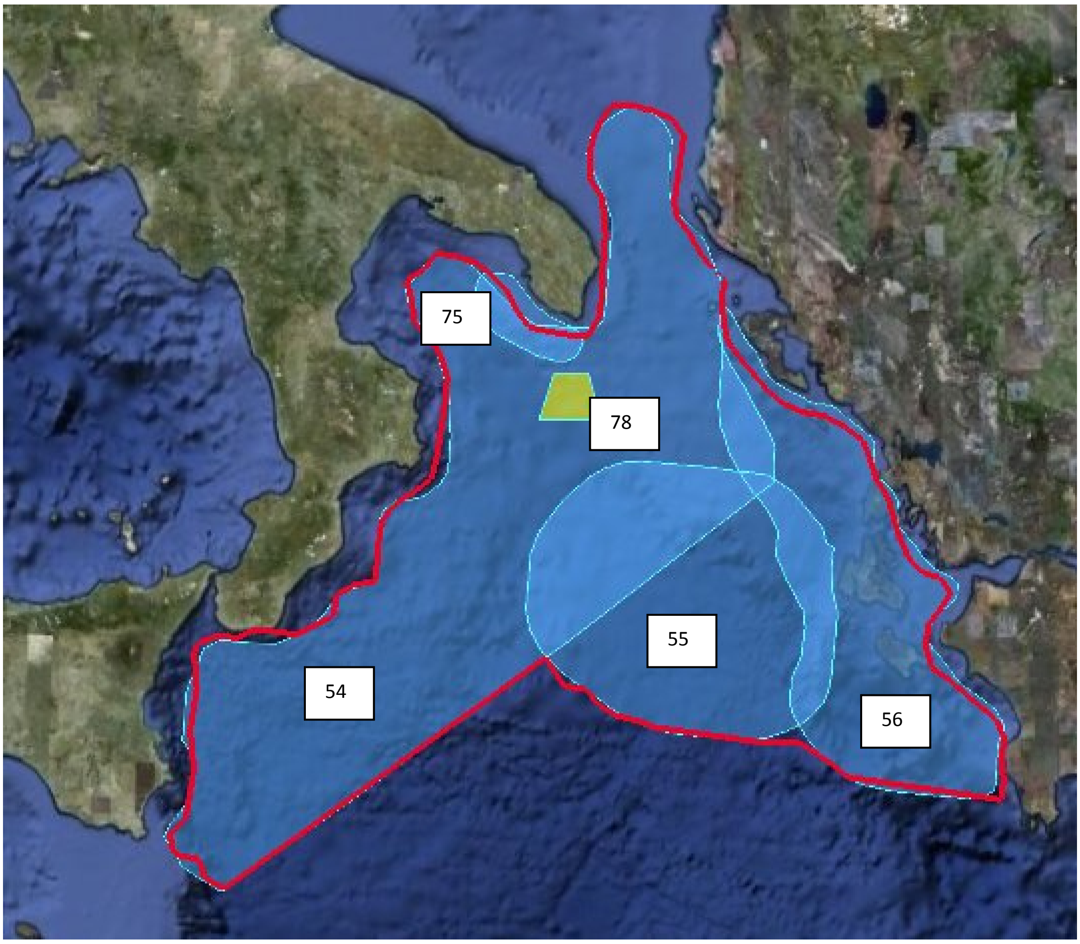


Fig. 4-25. Northern Ionian Sea. 54: Loggerhead turtle feeding habitat (P. Casale); 55: *Raja clavata* nursery area (F. Serena); 56: Common dolphin, bottlenose dolphin, beaked whale, fin whale, sperm whale habitat (ACCOBAMS); 75: *Lophelia* and *Madrepora* reefs (Freiwald et al. 2009); 78: *Lophelia* reefs (GFCM).

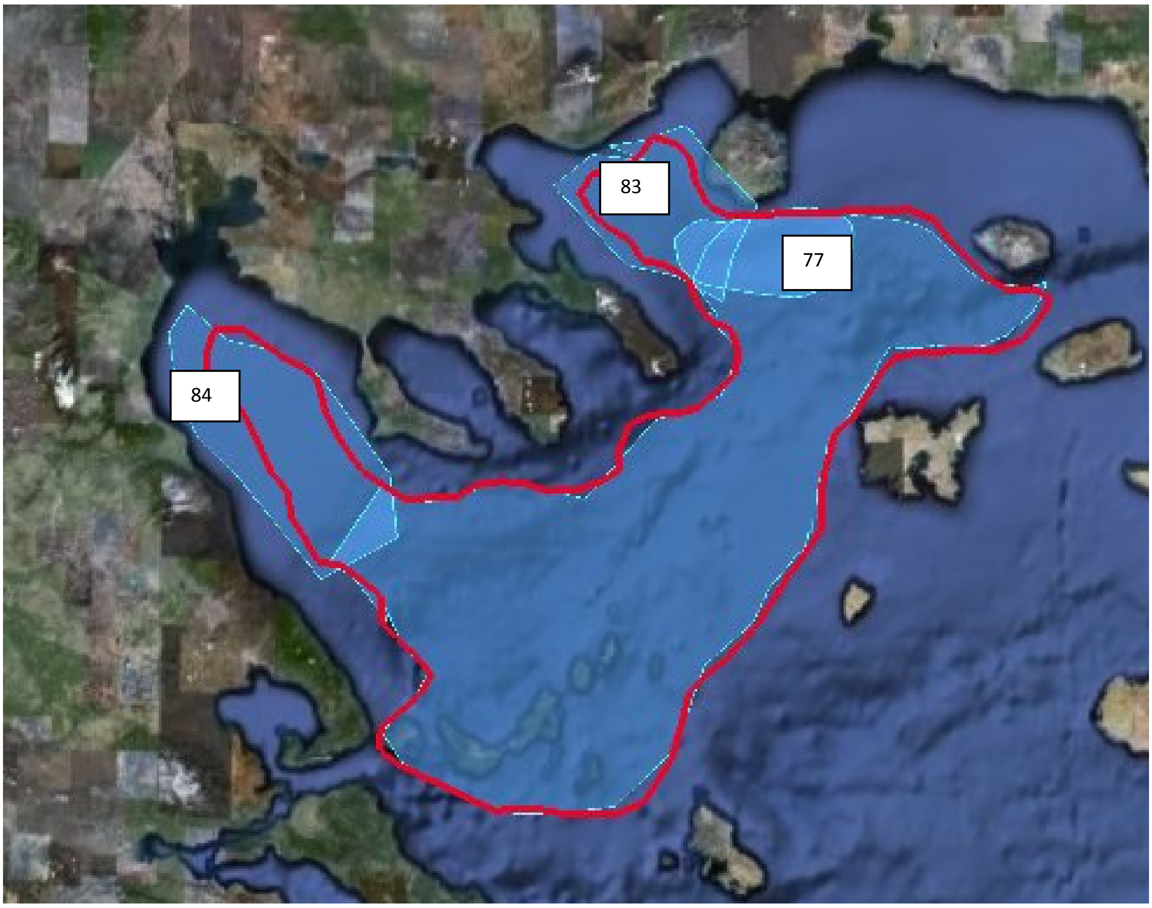


Fig. 4-26. Northern Aegean Sea. 59: Common and bottlenose dolphins, harbour porpoise, beaked whale, monk seal habitats (ACCOBAMS, MOm); 77: *Lophelia* and *Madrepora* reefs off Thasos (Freiwald et al. 2009); 83: Important suitable habitat for small pelagics (V. Agostini); 84: Important suitable habitat for small pelagics (V. Agostini; see also: Agostini and Bakun 2002).

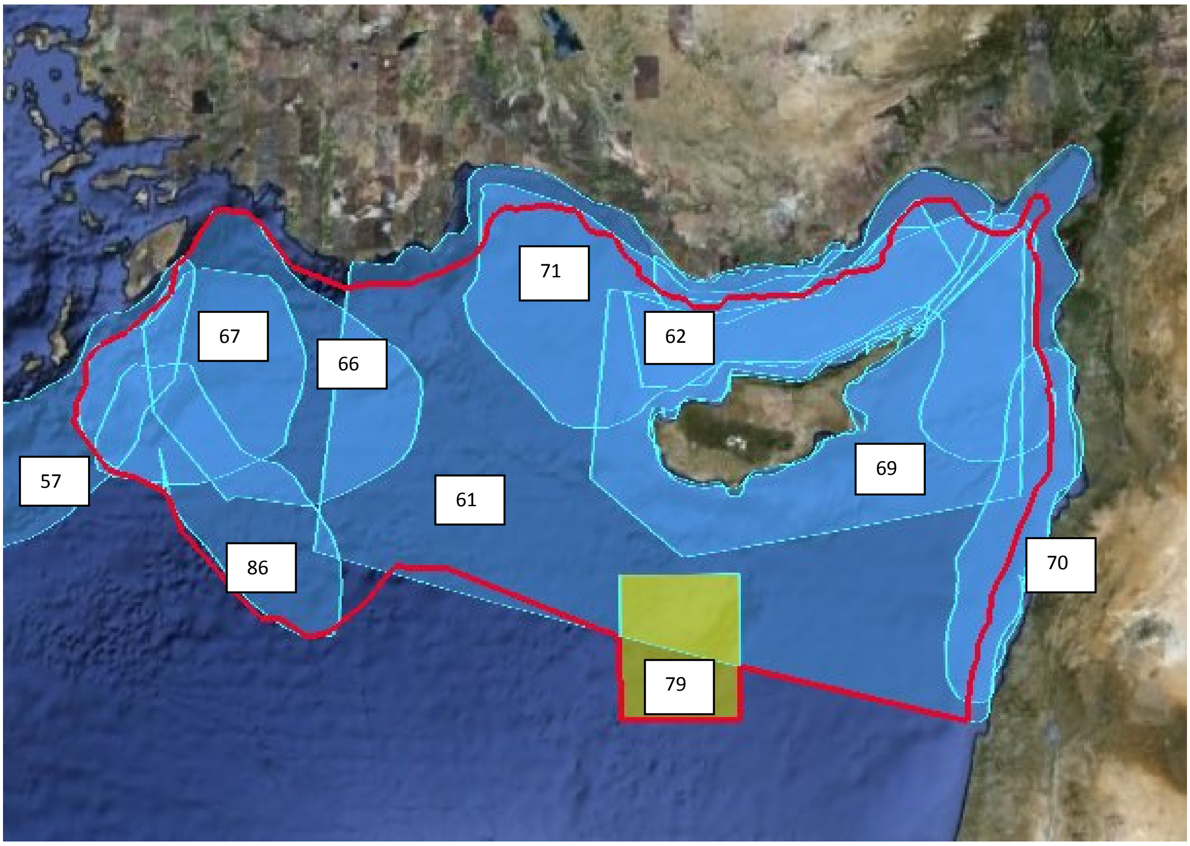


Fig. 4-27. Northern Levantine Sea. 57: Hellenic Trench sperm whale and beaked whale habitat (ACCOBAMS); 61: Bluefin tuna spawning ground (S. Tudela); 62: Bluefin tuna spawning ground (A. Gücü, Heinisch et al. 2008); 66: Significant oceanographic feature driven by strong upwelling, rich in cephalopods, clupeid and scombriform eggs and larvae, possibly cetaceans (A. Gücü), 67: High primary productivity of pelagic waters (V. Barale; Fig. 4-28):

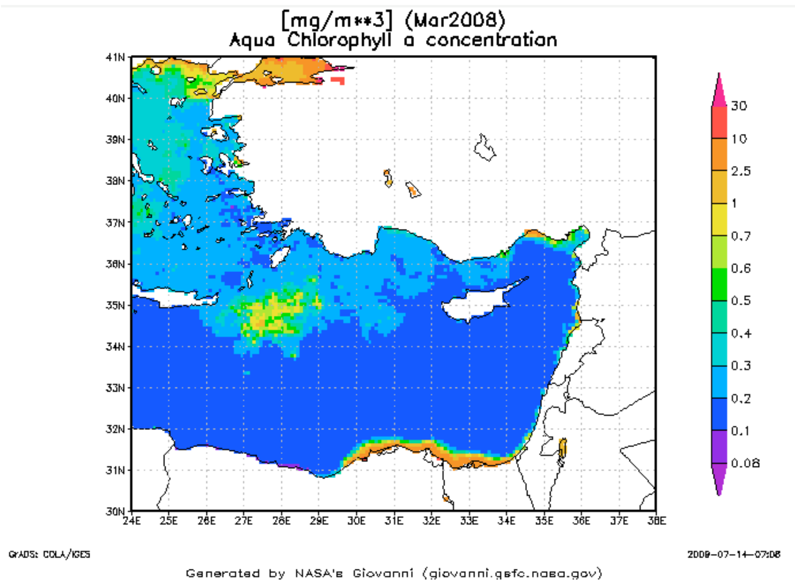


Fig. 4-28. Primary productivity induced by the Rhodes Gyre in March 2008.

69: Loggerhead and green turtle habitat (P. Casale); 70: *Rhinobatos* spp. nursery area (F. Serena); 71: Beaked whale (ACCOBAMS), monk seal (A. Gücü) habitat; 79: Eratosthenes Seamount (GFCM; Galil and Zibrowius 1998); 86: High primary productivity of pelagic waters (V. Agostini).

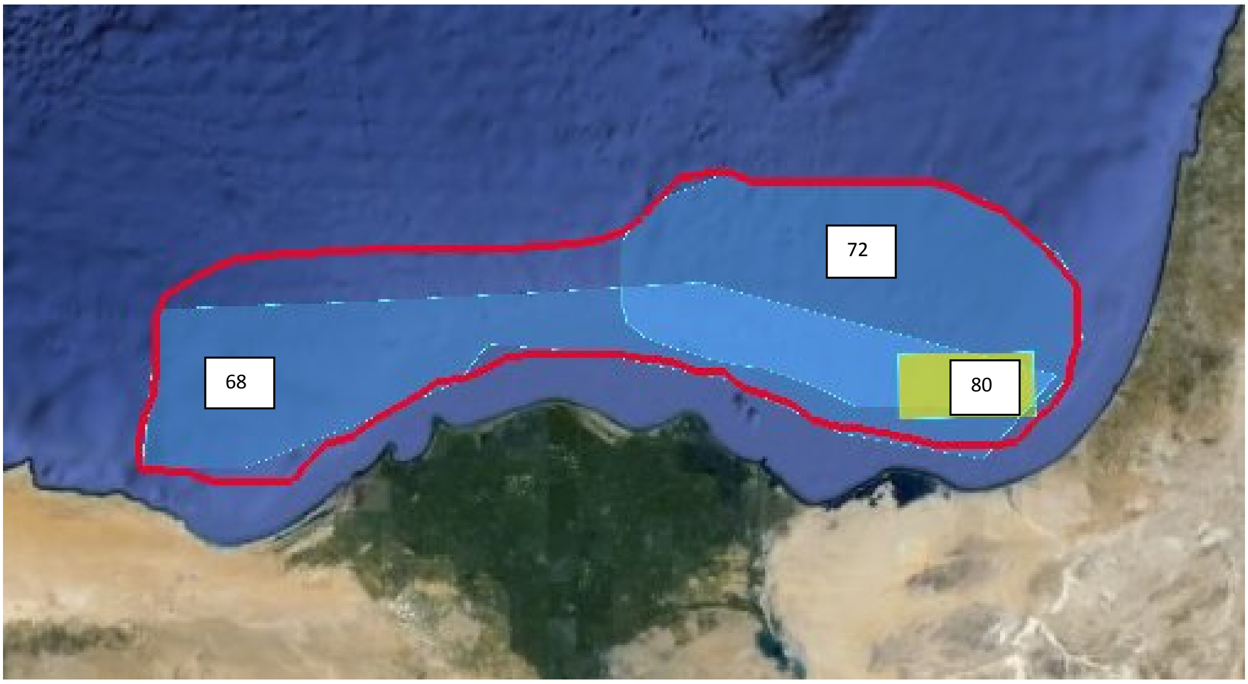


Fig. 4-29. Nile Delta area. 68: Egyptian shelf loggerhead and green turtle habitat (P. Casale); 72: Possible common dolphin habitat (ACCOBAMS); 80: Cold seeps (GFCM).

### 4.4 Resulting potential SPAMI sites in the Mediterranean ABNJ.

Keeping in special consideration Art. 8 of the SPA/BD Protocol ("*2. The SPAMI List may include sites which: are of importance for conserving the components of biological diversity in the Mediterranean; contain ecosystems specific to the Mediterranean area or the habitats of endangered species; are of special interest at the scientific, aesthetic, cultural or educational levels*"), we have identified 15 potential SPAMI sites within 10 EBSAs, across eight Mediterranean subregions, for consideration by the Contracting Parties to the Barcelona Convention. Fig. 4-30 (below) shows the distribution of these fifteen sites, with the centrum of each pinpointed on the map. The actual boundaries for each of these SPAMI proposals cannot be determined at this time, but can be elaborated with further, more focused research, to take into account: a) physical and biological features of the site, b) considerations of network-wide connectivity and representativity, c) allowances for feasibility issues to influence protected area design, so that conservation effectiveness can be maximised (Convention on Biological Diversity 2008), and d) an analysis of the current and potential threats to marine biodiversity features occurring in each site, which could be best addressed through place-based conservation and management measures.

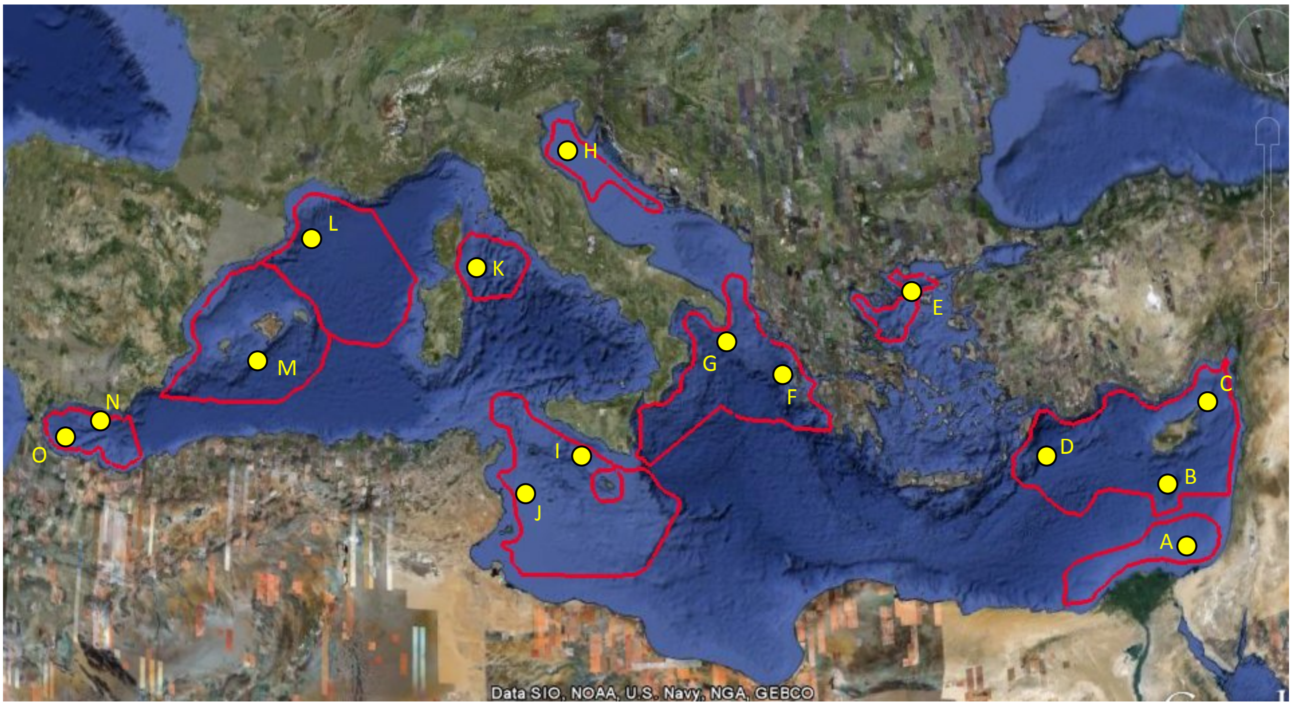


Fig. 4-30. Prospective SPAMI sites.

The fifteen prospective SPAMI sites are deliberately recommended without indicating an order of ecological priority, considering that the overarching priority is not one of designating one site instead of another, but rather of increasing the ecological representativeness of the overall regional network by filling the current wide gaps in the central and eastern Mediterranean, and along its southern shore.

The prospective SPAMI sites, with the main ecological characteristics that drive biodiversity importance, are as follows (for greater details, please see the single EBSA descriptions and maps in Section 4.3):

| Proposed site centrum (indicative) | Sub-region |
|---|---|
| **A. Nile Delta Region**:<br>This southern portion of the Levantine Sea includes recently discovered cold seeps, as well as important sea turtle - and possibly cetacean - habitat. | Levantine Sea |
| **B. Eratosthenes Seamount**:<br>The seamount has been identified by the GFCM as a critical fisheries habitat and represents high productivity of pelagic and deepwater species, and rich and diverse benthic fauna. | |
| **C. Northeastern Waters off Cyprus**:<br>This area encompasses important bluefin tuna spawning grounds as well as key marine mammal habitat. | |
| **D. Rhodes Gyre**:<br>This oceanographic feature is the most productive in eastern Mediterranean pelagic waters and is likely to provide critical habitat for both fishery species and marine mammals. | |
| **E. Northern Aegean**:<br>This portion of the Aegean Sea is highly productive and includes key habitat for the Mediterranean monk seal and other marine mammals, as well as deepsea coral habitat. The corresponding EBSA encompasses the Greek National Marine Park of Alonissos and the Northern Sporades. | Aegean Sea |
| **F. Northeastern Ionian**:<br>The northestern Ionian Sea includes cetacean critical habitat and important nursery areas for several shark species. | Ionian Sea |
| **G. Northern Ionian**:<br>In addition to supporting a broad array of Mediterranean diversity, this northern extent of the Ionian has significant deepsea coral habitat. | |
| **H. Northern Adriatic**:<br>This portion of the Adriatic has a high natural productivity that supports an extensive food web, including loggerhead sea turtles and several shark species. Considering the high level of degradation of the North-western Adriatic Sea, establishing a protected area in this site would require significant marine restoration effort. | Adriatic Sea |
| **I. Northern Strait of Sicily**: | Tunisian Plateau |

| | |
|---|---|
| This portion of the south-central Mediterranean contains critical cetacean habitat, deepsea corals, seamounts, and highly productive banks. | |
| **J. Tunisian Plateau:**<br>The Tunisian Plateau region of the Sicily Strait supports a high productivity and nursery areas for several shark species. | |
| **K. Central Tyrrenian**:<br>This portion of the Tyrrenian Sea, adjacent to the Pelagos Sanctuary, is highly productive, supporting marine mammal and shark species. | Tyrrhenian Sea |
| **L. Gulf of Lion Shelf and slope**:<br>This highly productive shelf region of the greater Gulf of Lion also contains deepsea canyons of biodiversity significance. The area also shares important cetacean habitats with the contiguous Pelagos Sanctuary, and is likely inhabited by the same cetacean populations that occur in the Sanctuary. It this represents the natural continuation westward, involving waters off France and Spain, of cetacean conservation measures foreseen in the Pelagos Sanctuary. | Western Mediterranean Sea |
| **M. Southern Balearic**:<br>This area of the Western Mediterranean contains seamounts and provides critical spawning habitat for bluefin tuna and critical cetacean habitat as well. | |
| **N. Alborán Seamounts**:<br>The seamounts in this portion of the Alborán Sea support a wide array of marine biodiversity, and the site contains cetacean critical habitat. | Alborán sea |
| **O. Southwestern Alborán**:<br>The southwestern protion of the Alborán Sea is highly productive and is also a transit corridor for species travelling between the eastern Atlantic and Mediterranean Sea. | |

## 5. Roadmap for the successful implementation of SPAMIs in Mediterranean Areas Beyond National Jurisdiction

As per the methodology elaborated in Notarbartolo di Sciara and Agardy (2008), we have delineated the major subregions of the Mediterranean Basin (8), the outstanding Ecologically and Biologically Significant Areas within those subregions (10), and several potential SPAMI sites within those EBSAs (15). However, much remains to be done in providing guidance to the Contracting Parties to the Barcelona Convention concerning additional research and analysis needed, the optimal order for SPAMI planning and implementation, and how each protected area should be designed.

Despite a dearth of data on the nature and status of biodiversity in Mediterranean ocean areas beyond national jurisdiction (ABNJ), a survey of expert opinion has revealed both large scale areas having ecological significance (herein referred to as EBSAs), and smaller areas within these EBSAs that stand out as noteworthy for conservation. However, declaring protected areas spanning each of these identified priority areas would not necessary assure that a representative network would be created to maximize biodiversity conservation in the Mediterranean. Nor is a wholesale designation of this many large sites, in areas not controlled by any single nation, necessarily feasible.

Given that the overall objective of establishing a network of representative marine protected areas is to capture the full suite of Mediterranean biodiversity and utilise protected areas to conserve it, the entire network of SPAMI sites must be evaluated in terms of its geographical representation (i.e. giving equal weight to underrepresented areas like the eastern and southern portions of the Basin), as well as its representation of all major habitat types and cultural regimes. Further analysis, with more statistically rigorous methodologies (e.g., through a combination of Delphic methods and decision support tools such as MARXAN, see Ardron et al. 2008), is needed to ensure that the proposed network of SPAMIs is maximally effective and representative.

Additional research and analysis is also needed to help guide the design of each individual SPAMI site. Considerations that influence design include assessing threats to biodiversity at each site, so that management within the SPAMI addresses true threats, as well as feasibility considerations. It must be emphasized that the potential SPAMI list contained herein provides centra for each priority area and deliberately omits providing outer bounds for prospective SPAMI sites, since these boundaries must be determined by both directed research on the area's biodiversity and a robust analysis of threats.

Finally, given that resources and time are limited, a strategic plan for phasing in SPAMI design and implementation must be developed. Such a strategic plan will not only ensure that individual SPAMIs are as effective as possible, but that the whole is greater than the sum of its parts: i.e. that the network of ABNJ SPAMIs captures biodiversity through adequate sizes of protected areas, effective connectivity between sites, and appropriate management at each location.

We therefore propose a subsequent initiative with three essential components:

1. Development of a strategic plan to elaborate the priorities within the SPAMI list, including considerations of the chronology with which a region-wide SPAMI network should be planned and implemented;

2. Targeted research to determine with greater specificity the ecological characteristics of each priority area, its boundaries, and direct threats to the biodiversity the area supports; and

3. Analyses to determine the optimal spatial management scheme for each of the SPAMIs, including whether protected areas should be zoned, what sort of regulations should be instituted, how areas should be monitored and regulations enforced, and the appropriate governance regime for these ABNJ areas.

At the same time, we suggest that continuing or periodic research should be organised in data-poor Mediterranean subregions (e.g., Levantine Sea, Aegean Sea, S. Ionian Sea, Gulf of Sidra) to ensure that the inventory of the region's EBSAs is complete and that biodiversity-relevant areas are not left out of the process.

Recommendations on how to approach these three components are provided in detail below.

## 5.1 Strategic plan for catalyzing SPAMI planning and designation

Our survey of the literature and our consultation with Mediterranean experts has allowed us to quantify the extent to which particular criteria were most pivotal in leading to a site being identified as a priority. We can now use this data to develop a strategic plan that could prioritize the sites, indicating which of them should be the focus of immediate attention from RAC/SPA and the Conference of Parties to the Barcelona Convention, and which sites could be considered at a later date. The recommended chronology of site-specific planning, as well as the design of the final Mediterranean ABNJ SPAMI network, could be derived through a number of different optimization methodologies, including spatial criteria analysis and decision-support software such as MARXAN (e.g., Ardron et al. 2008).

We recommend that in designing a final Mediterranean ABNJ SPAMI network, due consideration be given to the criteria of a) representativity, b) connectivity, and c) replication, as detailed in Annex III of the CBD report of the 13th SBSSTA Meeting (Convention on Biological Diversity 2008), and summarised in Table 5-1 (see also section 3.2 of this document for a more detailed description of these criteria).

We also recommend that the next important step along our roadmap is the development of a strategic plan using these tools, so as not to lose crucial time in implementing a SPAMI network that most effectively conserves the representative biodiversity of the Mediterranean Basin.

## 5.2 Targeted research in potential SPAMI sites

Given the paucity of information about species distributions, abundances, and ecosystem dynamics in areas beyond the nearshore coastal zones of the Mediterranean, and the inconsistency of knowledge across the Basin (with large parts of the southern and eastern portions of the sea largely unknown), it is clear that further information must be obtained to guide the effective design of SPAMIs. We recognize that the Delphic process of consulting a large sampling of experts in order to determine collective priorities has a fundamental weakness in that the extent to which results are supported by data vary, as does the conceptual process that led each expert to identify important sites. That said, there was a high degree of concordance across the opinions of experts specializing in divergent fields, suggesting that the resulting list of potential SPAMI sites does point to ecological significance.

| Required network criteria | Definition | Applicable site-specific considerations (inter alia) |
|---|---|---|
| **Ecologically and biologically significant areas** | Ecologically and biologically significant areas are geographically or oceanographically discrete areas that provide important services to one or more species/populations of an ecosystem or to the ecosystem as a whole, compared to other surrounding areas or areas of similar ecological characteristics, or otherwise meet the criteria as identified in annex II. | Uniqueness or rarity<br>Special importance for life history stages of species<br>Importance for threatened, endangered or declining species and/or habitats /<br>Vulnerability/ fragility/ sensitivity/ slow recovery<br>Biological productivity<br>Biological diversity<br>Naturalness |
| **Representativity** | Representativity is captured in a network when it consists of areas representing the different biogeographical subdivisions of the global oceans and regional seas that reasonably reflect the full range of ecosystems, including the biotic and habitat diversity of those marine ecosystems. | A full range of examples across a biogeographic habitat or community classification*;* relative health of species and communities; relative intactness of habitat(s); naturalness |
| **Connectivity** | Connectivity in the design of a network allows for linkages whereby protected sites benefit from larval and/or species exchanges, and functional linkages from other network sites. In a connected network, individual sites benefit one another. | Currents; gyres; physical bottlenecks; migration routes; species dispersal; detritus; functional linkages. Naturally unconnected sites may also be included (e.g., isolated seamount communities) |
| **Replicated ecological features** | Replication of ecological features means that more than one site shall contain examples of a given feature in the given biogeographic area. The term *features* means “species, habitats and ecological processes” that naturally occur in the given biogeographic area. | Accounting for uncertainty, natural variation and the possibility of catastrophic events. Features that exhibit less natural variation or are precisely defined may require less replication than features which are inherently highly variable or are only very generally defined. |
| **Adequate & Viable sites** | Adequate & viable sites indicate that all sites within a network should have size and protection sufficient to ensure the ecological viability and integrity of the feature(s) for which they were selected. | Size; shape; buffers; persistence of features; threats; surrounding environment (context); physical constraints; scale of features/processes; spillover/compactness; |

Table 5-1. Scientific criteria and guidance for selecting areas to establish a representative network of marine protected areas, including in open ocean waters and deep-sea habitats (Table 2, Annex III in Convention on Biological Diversity 2008).

Expert opinion can also be used to pinpoint which of the potential SPAMI sites are most in need of additional research. We therefore propose that an important first step in our roadmap be an analysis of the information collected – both through expert opinion regarding biodiversity and through additional studies that have been done on fisheries and deep sea aspects of the Mediterranean – in order to determine areas most needing attention for additional information gathering. This information could be in the form of directed oceanographic and ecological research, as well as directed literature review and further expert consultation specific to the geographies highlighted in the priority list.

## 5.3 Analyses to guide recommended MPA design at each SPAMI site

Once the priority list is elaborated in chronological order, the planning of each SPAMI must be undertaken, taking into account not only the threats to the particular site and the species within it, but also the political, economic, and logistical feasibilities of protecting the area. This must be done on a site-by-site basis, guided by the best possible information on ecology, human uses, and impacts of these uses.

We feel strongly that SPAMIs are only as good as their management regime: the difficult task is thus not the selection of SPAMI site so much as astute planning to provide appropriate and effective governance mechanisms, determine boundaries of the protected area, zoning within it, and regulations pertaining to each zone. In addition, SPAMIs should be planned with a research and monitoring protocol that not only furthers our scientific understanding but also acts to allow SPAMI management to be adapted as needs and conditions change.

While it is clear that time is of the essence, deliberate, strategic and robust planning should underpin each SPAMI designation in Areas Beyond National Jurisdiction. The reason for this is that it is in theory more difficult to adapt the management of the areas outside SPAMIs, in order to ensure that these 'islands of protection' are not undermined by degradation in surrounding ABNJ areas, than inside the EEZ or Territorial Seas of any coastal nation, where inputs and outputs can be better controlled. Thus, it is imperative that the SPAMI be well-designed, and managed adaptively.

In undertaking a strategic SPAMI planning process, the following are common elements:

1. Bounding ecosystems to determine scale and scope of management;
2. Assessing ecosystem conditions, threats, and drivers;
3. Appraising management needs;
4. Integrating management and evaluating trade-offs and choices;
5. Monitoring to determine efficacy of management.

Finally, it will be important to periodically evaluate the extent to which the entire Mediterranean SPAMI network is meeting the goals put forward by the Barcelona Convention. Evaluating the whole network will mean determining not only management effectiveness, but the extent to which the system is truly representative of the Mediterranean's great wealth of biodiversity.

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