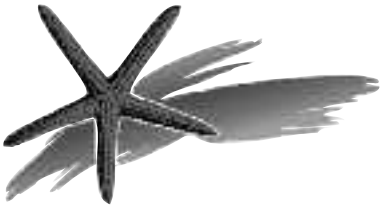
CIESM Workshop Monographs



Marine Peace Parks in the Mediterranean – a CIESM proposal

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Proposed CIESM Marine Peace Parks.

I - Executive Summary

The Summary begins with a presentation of the "Peace Park" concept – initially developed for terrestrial habitats – followed by a short description of, and a scientific rationale for, each of the eight selected areas in the Mediterranean Sea which are detailed in the rest of the volume.

This synthesis, elaborated by Frédéric Briand, benefited from inputs received from the workshop participants, with a special mention to Jean Mascle (geodiversity, maps) and Paula Moschella (biodiversity). Enric Sala did moderate (and stimulate) the workshop discussions; Frédéric Briand reviewed the entire volume with precious editorial support from Tim Wyatt; Valérie Gollino took care of the physical production and layout.

1. Introduction

Mediterranean marine biodiversity and the ecosystem services it provides to humanity are declining under the growing assaults of coastal development, tourism, fast-growing maritime traffic, oil and gas off-shore exploration, climate change, and overfishing. However, less than 2% of the Mediterranean is now under effective protection. The main reasons for this dismal level of protection are the fragmented nature of maritime governance, the poor enforcement of existing regulations, and the difficult harmonization between EU and non-EU countries in the Mediterranean Basin. Therefore there is an urgent need to rigorously define vast areas for conservation, straddling both open sea and coastal waters, if we are to preserve biodiversity and the essential services it provides. This was the main goal of CIESM workshop n. 41.

In opening the meeting, Drs Frédéric Briand and Enric Sala, respectively Director General of CIESM and Chair of the CIESM Committee on coastal systems, presented the overall background and objectives of the workshop to the 28 invited participants (see list at the end of volume). The main questions that framed the discussions were the following. How to circumvent the above obstacles to more effective conservation in the Mediterranean? How to reconcile such low protection levels with the targets defined by the Convention of Biological Diversity (CBD) at its most recent Conference in Nagoya (October 2010) – that is, protect at least 10% of the world ocean by 2020? How to move Governments of Mediterranean countries to multiply by five the coverage of marine protection within ten years?

Such was the background for the work of the international experts gathered by CIESM in the ancient, Sicilian town of Siracusa by the end of November 2011. They were asked to identify large, coast-to-coast, trans-frontier marine areas that represent key features of hydrodynamic, biological and geological importance. Protection of these areas would help achieve the CBD goals and ensure the preservation of critical Mediterranean marine ecosystems. In closing, the Director General remarked that this would provide a rare opportunity to apply the concept of 'Peace Parks' – already well tested in certain terrestrial regions of the globe – for the first time to the marine realm. In addition to strengthening marine conservation, marine Peace Parks would foster cooperation among neighbours, a rare commodity in one of the most sensitive and conflict-ridden region of the globe.

On the last day of the Meeting, the participants were joined by two high-level personalities: HSH Prince Albert II of Monaco, President of CIESM, and HE Stefania Prestigiacomo, Italian Minister for the Environment. Upon hearing the workshop conclusions and recommendations, both intervened to express their full support towards the ambitious goal of creating vast transboundary Marine Peace Parks in the Mediterranean Sea.

2. The concept of Peace Parks

Transboundary protected areas were first developed in terrestrial environments with the clear, explicit objective to conserve biodiversity while fostering regional cooperation, peace and security over countries whose relations are strained, or in regions where border disputes and conflicts are still unresolved (McNeil, 1990; Hamilton *et al.*, 1996). Even in areas clear of any trans-frontier political issue, peace parks contribute to develop collaboration, smooth cultural and technical imbalances, and enhance socio-economic exchanges (for more details on historic and political background, see Mackelworth, this volume).

The definition by Sandwith *et al.* (2001) adequately illustrates the Peace Park concept:

'transboundary protected areas that are formally dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, and to the promotion of peace and cooperation'

The benefits of trans-frontier peace parks for conservation purposes are many. From the biological perspective, the larger zone of protection so created (1) substantially preserves all the components of ecosystems straddling across countries; (2) embraces habitats for migratory or highly mobile species and increases regional connectivity for larval dispersal; and (3) helps face environmental changes. Further, from the management perspective, opportunities for staff exchange and joint training and initiatives at various levels promote mutual understanding between different approaches, different jurisdictions, and thus optimize conservation of large areas, as shown by the success of transboundary cooperation in the Wadden Sea shared by the Netherlands, Denmark and Germany <http://www.waddensea-secretariat.org/>.

The creation of trans-frontier 'peace parks' will safeguard and improve existing friendly relations between States, and lower the strain of existing disputes over contested territory. This is particularly desirable in the Mediterranean Sea, where historical conflicts and ideological tensions are the rule. To date, peace parks have been conceived only for the terrestrial environment. Recent attempts in the Gulf of Aqaba and the Korean Peninsula have met with considerable difficulties and are still at the stage of promises.

It remains that the trans-boundary dynamics of the marine environment, as well as the legal disputes regarding ownership over sea territories or boundaries, make the case for the establishment of marine peace park even more compelling.

3. An innovative, ecosystem-based solution

The CIESM proposal innovates in combining three powerful, unique features, which can be summarized as such: coast-to-coast, geo- and hydrodynamics diversity, trans-frontier.

3.1. Coast-to coast – the importance of marine connections for maintaining biodiversity

Marine peace parks will integrate contiguous coastal and open sea habitats, allowing for a coherent set of measures to protect a dynamic, inter-connected marine system. The dimension of the park will provide a more suitable range and connecting corridors to larger animals that actively move across the seascape, enhancing the robustness and resilience of the ecosystem in the face of climate change, and thus ultimately enhancing resource yields and local economies.

Traditional Marine Protected Areas (MPAs) have often been the object of debates on whether or not they exert effective conservation of marine species, especially with respect to population dynamics and larval dispersal (Willis *et al.*, 2003; Cowen *et al.*, 2007). In most cases MPAs are very limited in size and isolated, and they rarely extend beyond a few nautical miles offshore. The survival and perpetuation of populations of many benthic organisms, fish and cephalopods depend on their larval dispersal and on the connectivity between the sources and sinks of larvae.

Recruitment success of "local" populations may sometimes rely on sub-regional larval supply when local larval sources are hindered by environmental or anthropogenic factors (Bode *et al.*, 2006). The scale of connectivity also plays an essential role in genetic interchange and biogeography of coastal species (Cowen *et al.*, 2006).

Preserving the connections between coastal and marine ecosystems, including the open sea, is also vital to highly mobile animals, namely top predators such as tuna, sharks, turtles, seals, cetaceans and birds. Marine corridors, which are defined by oceanographic and geo-morphological features, are used as "channels" along which wide-ranging animals can migrate from one area to another, either to reproduce, feed or simply escape from environmental changes or anthropogenic threats (Good, 1998). In the Mediterranean Sea many endangered or threatened species migrate seasonally across sub-regional seas to reach remote breeding sites or feeding grounds. For example, different routes between the coast of Cyprus and Turkey have been observed for the green (*Chelonia mydas*) and leatherback (*Caretta caretta*) sea turtles and the monk seal *Monachus monachus* (Gucu *et al.*, this volume). Several important migratory routes in the Gibraltar/Alboran area, the North Ionian and the Levant are well known for fin whales (*Balaenoptera physalus*), sperm whales (*Physeter macrocephalus*), bluefin tuna (*Thunnus thynnus*), swordfish (*Xiphias gladius*) and other large predators (see in this volume: Aguilar *et al.*; Fraschetti *et al.*; Mascle *et al.*). Coastal-marine corridors are also important for migratory marine birds that cross the straits and use coastal and marine wetlands as well as islands to rest, feed and reproduce. The Sicily Channel is one of the main bird migration routes between Europe and Africa, and many procellariiforms (shearwaters, storm petrels) use offshore islands located in the Channel to breed (Vella *et al.*, this volume; RAC/SPA, 2010). Furthermore, the coastal region between southern Montenegro and northern Albania is also a part of one of the three migration routes of European birds in the direction north – south (Beqiraj *et al.*, this volume; Holcer *et al.*, 2010).

Unfortunately, in the Mediterranean ecological corridors overlap with important shipping seaways, intensive fishery areas, and highly urbanized coastlines; thus the human pressures on these wide-ranging species are enormous and the protection efforts of small coastal areas remain irrelevant with respect to the scale of threats.

The proximity of the continental shelf of the north and south shore of the Basin makes most high seas, especially vulnerable deep-sea areas, strongly linked with the coastal ecosystems via oceanographic (currents, up-welling), physico-chemical (biogeochemical cycles) and biological (food chains) connections, which also imply unavoidable transfers of pollutants. Estuarine, coastal and marine ecosystems thus form a *continuum,* and large-scale marine conservation is credible only by means of harmonised protection measures across the different systems.

3.2. Geo- and hydrodynamic diversity – unique features essential to ecosystem functioning and resilience

Not only will Marine Peace Parks preserve an endemic, threatened biota (unique deep-sea communities, white coral beds, monk seals, rare endemic species, fin whales, spawning grounds of bluefin tuna, etc.), but they will also protect unique geological features (deep sea canyons, mud volcanoes, seamounts, hypersaline basins), and key oceanographic processes (surface sites of deep water formation, strait fluxes) from the fast-growing exploitation of marine resources by modern technology.

3.2.1 Geodiversity

The Mediterranean Sea has a long and complex geological history (see CIESM, 2003; 2007) characterized by dramatic long-term events, major catastrophes, past and recent tectonic deformations, which left peculiar geological imprints (outcrops, tectonics) in several areas of the Eastern and Western basins (Mascle, this volume) and large topographic features such as seamounts where site-specific ecosystems developed.

Seamounts are considered hotspots of biodiversity worldwide; these submarine mountains provide unique habitats and support a highly diverse benthic and mobile fauna, yet only few have been explored and studied to date (see CIESM, 2003; Galil and Zibrowius, 1998). At the same time, seamounts have attracted much interest from the fishing industry and until recently they were

exploited intensively with highly impacting techniques (e.g. bottom trawling, drift nets) leading to rapid decline of commercial deep-water fish and benthic species (CIESM, 2003). Although fishing impacts have been put under some control by the international ban of bottom trawling below 1000m, deep-sea oil exploration is intensifying, adding extra pressure to these highly vulnerable ecosystems. The protection of these geological features such as the dominant Eratosthenes seamount and the associated communities is thus highly advocated (Mascle *et al.*, this volume).

Along the steep continental slopes, other geological features such as rocky outcrops and marine canyons offer suitable habitats for settlement of hard bottom communities like gorgonians (*Paramuricea clavata*, *Eunicella* spp.) and deep-water corals (*Lophelia pertusa, Madrepora oculata*).

In addition to tectonic movements, the Basin is also subject to a variety of active volcanic and geochemical processes. Hydrothermal vents, particularly numerous in the Tyrrhenian Sea, South Aegean and Sicily Channel, are the site for specialized communities adapted to the hot temperature of waters surrounding the vents (Danovaro *et al.*, 2010). In the deep Eastern Mediterranean, several types of fluid seepages were recently discovered, making this region unique for its rich geo-diversity (Mascle, this volume). Around the Egyptian continental slope, hundreds of these cold fluid seepages are emitted from depressions pockmarks and mounds on the seabed (pockmarks), where highly specialized bacterial communities contribute to build peculiar carbonate structures (Mascle *et al.*, this volume).

Another geo-specific process leads to mud volcanoes and gas chimneys, mounds made of sediment rich in organic matter from which cold seeps containing methane and sulfide gases are produced. Hundreds of mud volcanoes are scattered across the Mediterranean Sea (CIESM, 2005), in particular along the Ibero-Moroccan Gulf (Aguilar *et al.*, this volume), on the Mediterranean Ridge, and on the Anaximander Mountains (Mascle *et al.*; Giakoumi *et al.*, this volume).

Pockmarks and mud volcanoes host a peculiar benthic macro- and megafauna, often in dense aggregations, consisting of bivalves, gastropods, giant tubeworms (*Siboglinidae*) sponges (*Rhizaxinella pyrifera*) and crabs (*Chaceon mediterraneus*) which are endemic to the Mediterranean (CIESM, 2003). Such communities exist thanks to a symbiotic association with an extremely rich and diverse chemosynthetic bacterial assemblage developed around these special geo-chemical environments.

On the Mediterranean Ridge, in particular on Napoli mud volcano (Mascle *et al.*, this volume), and on the foot of the Egyptian margin (Cheffren volcano, Mascle *et al.*, this volume) extensive deep sea hypersaline lakes and smaller brine ponds containing salt-rich fluids that emerge from sediments have been recently discovered. In these hyper-saline and anoxic basins, a large variety of microorganisms belonging to the *Bacteria* and *Archaea* worlds have been detected, including new prokaryotic taxa (CIESM, 2003).

3.2.2 Hydrodynamic diversity

The water circulation of the entire Mediterranean Basin, including the main Mediterranean deep out-flowing waters and the Atlantic surface inflowing waters, is strongly affected by a peculiar climate and wind regime that, together with the complex seabed morphology, determine the formation of deep, dense water masses as well as mesoscale features such as gyres and eddies (CIESM, 2005; 2009; Gacic, this volume;). These, in turn, play a major role in triggering phytoplankton blooms through water mixing and upwelling of nutrients, with effects on the entire food web. Coastal hydrodynamics (currents, tides, upwelling and water stratification) and other offshore meso- and large-scale processes are essential for larval transport and contribute significantly to population connectivity (Pineda *et al.*, 2007). Sea currents also mark the “routes” for migratory species such as tuna, cetaceans, sharks and marine turtles. Such hydrodynamic features have to be taken into account when considering the protection of species, especially highly mobile species. All the proposed parks enclose at least some of these important hydrodynamic features.

Straits represent often choke points where the exchange of water masses generates mesoscale features and upwelling phenomena; for example the area adjacent to the Strait of Gibraltar hosts two semi-permanent gyres, the Alboran Gyres, with distinct oceanographic and biogeochemical and properties and in the near Alboran Sea (Gacic *et al.*, this volume). Similarly, the Strait of Sicily (Pelagian Sea Park), the Strait of Otranto (North Ionian Park) and neighbouring areas are characterized by semi-permanent features, such as eddies and gyres. Periodical or semi-permanent gyres are also quite frequent in the Eastern Basin such as the Rhodes Gyre in the Aegean Sea (South Aegean Park), the Ierapetra eddy and Mersa-Matruth (Herodotus Park) gyre located south east of Crete. The special hydrodynamics and nutrient upwellings properties characterizing these structures have been found to generate primary productivity and bacterial biomass notably higher than in the surrounding oligotrophic waters (Denis *et al.*, 2010; Robarts *et al.*, 1996). The South Adriatic Gyre, located within the South Adriatic Park, is also the site of strong seasonal phytoplankton blooms resulting from vertical convection and nutrient input in the euphotic layer.

There are other important oceanographic structures that play an important role in Mediterranean biodiversity. It is the case for the peculiar circulation system between the South Adriatic and the Northern Ionian, characterized by a bimodal oscillating system (BiOS) that regulates the alternation of anticyclonic and cyclonic phases for the Northern Ionian Gyre (see North Ionian Park). These periodic inversions determine the influx of Modified Atlantic waters and Levantine waters into the Adriatic, which likely facilitate the presence of allochtonous species (and probably native species of different thermohaline affinity) from the Western Atlantic/Western Mediterranean and Eastern Mediterranean respectively (Civitarese *et al.*, 2010).

The complexity and variability of Mediterranean hydrodynamics is not completely independent from anthropogenic pressures. While the main oceanographic features result from regional climate and wind regime, the thermohaline and other dynamic properties of the Mediterranean circulation can be severely affected by human activities. For instance the drastic reduction of freshwater input to the eastern Basin following the Assuan damming of the Nile led in the long-term to an increased salinity, which affected not only the thermohaline dynamics of the Cretan Sea and the Eastern Mediterranean climatic transient, but also the deep water formation process in the Gulf of Lions and South Adriatic (CIESM, 2000; Skliris and Lascaratos, 2004).

3.3 Trans-frontier

On land, internationally designated protected areas are relatively spread worldwide and in most cases their management requires coordination of conservation measures over a territory that encompasses two or more countries and where borders are clearly defined. Each country then applies the commonly agreed conservation policy on its own territory, where it exerts sovereign rights.

At sea, political borders are often disputed, and there are still a lot of discussions and negotiations over legal definitions and rights of use related to sea ownership issues. Further, beyond Economic Exclusive Zones (EEZs), the high seas do not fall under the control of any particular State and can be used and exploited by all (part V, UNCLOS, 1982). This has led to various controversies related to the use of the sea for fishing, oil exploitation, maritime transport and military activities (Ronzitti, 2010).

The complex historical and political context of the Mediterranean Basin, and its geographic conformation, where few coastal areas are farther than 200 nautical miles away from waters under another jurisdiction, makes even more difficult a correct interpretation of the law of the sea and increasingly hampers international scientific research. To date, a large number of legal disputes, some very ancient, others quite modern, are still unresolved.

The trans-frontier structure of the CIESM Marine Peace Parks puts this problem aside: it will encourage, without prejudice to current national claims, the Governments of those countries directly concerned to join forces and develop joint planning in the pursuit of a cause higher than their national interest. In addition, the ‘borders’ of the proposed marine peace parks do not follow political boundaries, but delimit coastal and marine ecosystems hosting key features of high natural value.

3.3.1. Beyond national jurisdiction – legal and policy implications for transboundary marine peace parks in the Mediterranean

The 'High Seas' (international waters) are less and less considered as a sort of "no man's land". The sustainable conservation of marine habitats and species is explicitly considered in the UN Convention of the Sea (UNCLOS) and several international conventions and treaties (Shine and Scovazzi, 2007). At the regional level, the Protocol concerning specially protected areas and biological diversity in the Mediterranean (Barcelona Convention, 1976, amended 1995) provides a well-constructed policy framework to establish specially protected areas of Mediterranean interest (SPAMI) that would include both coastal and open seas.

In the Mediterranean, the progressive establishment of Exclusive Economic Zones (EEZs) (Fig. 1) may help resolve the inconsistency of conservation policies on the high seas since their extension, up to 200 nautical miles from the baseline of territorial waters, would in fact cover all of the Mediterranean. While EEZs attribute exclusive rights to the coastal State, they also involve duties as detailed in the part V of UNCLOS. In particular, Art. 61 to Art. 68 specifically address the conservation and management of marine resources in EEZs, including marine mammals and highly migratory species, with clear indications given on the legal rights a coastal State can exercise to implement and enforce conservation legislation. Thus the legal framework of EEZs may increase, rather than diminish, the efficiency of conservation regulations in the Mediterranean Sea, provided that these are ratified by a formal agreement between the concerned countries.

Figure 1. Current and potential exclusive zones in the Mediterranean Sea.

CIESM Marine Peace Parks, by providing an explicit, formal agreement of cooperation between two or more signatory countries, will improve their political relations and facilitate settlement of unresolved claims over territorial waters, as well as ensure a correct interpretation/use of EEZs. The implementation of a common conservation policy over large sectors of coastal and offshore waters will complement and strengthen the framework of existing conventions.

3.3.2 The Pelagos Sanctuary – lessons to learn

In 1999 the Ministries of the Environment of France, Italy and the State Ministry of Monaco signed an agreement to designate within the Corsican-Ligurian-Provençal Basin a large sector of territorial and high seas as the International Sanctuary for Mediterranean Marine Mammals. The agreement of the Pelagos Sanctuary, which came into force in 2002, aimed at protecting Mediterranean cetaceans and their feeding and breeding grounds from the effects of increasing human pressures in the region (for a detailed review of the Sanctuary; see Notarbartolo di Sciara *et al.*, 2008).

From the legal point of view, the Sanctuary represented an unprecedented achievement: for the first time in the Mediterranean, the proposal of creating a large, internationally protected area on the high seas was endorsed at high political level and a solid legislative basis was established to implement a wide range of conservation measures. Still, nine years after its creation, the efficiency of the Sanctuary in protecting marine mammals is an open question, as many researchers and NGOs see no improvement in the conservation status of cetacean populations which, for certain species such as the fin whale (*Balaenoptera physalus*) and striped dolphins (*Stenella coeruleoalba*) apparently has worsened.

The lack of an *ad hoc* management body with clear mandates, executive power and sufficient human and financial resources, has been pointed out has one of the main reasons for failure in meeting the conservation goals (Notarbartolo di Sciara *et al.*, 2009). An intrinsic weakness of the Sanctuary resides however in the reluctance of the three concerned countries in establishing EEZs, which would cover the open sea sector of the Sanctuary; without such zones, the full enforcement of protection regulations remains limited to territorial waters, since in high seas the third States are not bound by the Agreement. This means that any vessel (fishing boats, ferries, cargoes, etc.) flying other than French, Italian or Monegasque flags, is not obliged to comply with protection measures beyond the 12 nautical miles limits unless these overlap with other international or European treaties/directives. This legal limitation is not negligible: more than 50% of the Sanctuary covers high seas where threats such as illegal driftnet fishing, acoustic pollution, oil exploration and collisions are out of control (Notarbartolo di Sciara *et al.*, 2008).

4. Potential links with existing and planned national protection schemes

In the Mediterranean Sea, despite the minimal total area protected, a large variety of designation schemes exist (RAMSAR, Biosphere, MPA, SPAMI, PSSA, etc.), and several international, regional and national conservation organizations work to meet the 2020 CBD objective. The eight Marine Peace Parks proposed by CIESM, which embrace a variety of existing marine reserves (Fig. 2), could act as a convenient umbrella and forum to promote dialogue and develop synergies among the different conservation actors and stakeholders involved in these areas. A further, more concrete step would be to establish within each area a sub-regional network of MPA managers. Each sub-regional network could be:

- coordinated by all involved countries using or a common Secretariat (pooling resources to enhance the network); such a system has been adopted by the Pelagos Sanctuary;
- initiated by one MPA management body, considered to be particularly dynamic or managing a considerable protected zone; the network can then remain informal or become more institutional (with members officially appointed); as an example, in the Adriatic the MPA “Torre del Cerrano” created the Adriapan network; as above, but initiated by one country rather then a management body, it would be the case for the Pelagian Sea Park;
- managed by an international organization or a Foundation.

Figure 2. The eight CIESM Marine Peace Parks proposed by CIESM including the existing marine protected areas.

The MedPAN regional network could have the role of facilitating the creation and linking of sub-regional networks. The progress made by MPA networks should be monitored with the establishment of a Mediterranean MPA database shared between the regional, national and local network partners. The aim is to evaluate the progress made in the Mediterranean with respect to the CBD objectives and to draw up a regional report to be used as a discussion document for the MPA managers, the socio-economic stakeholders and the international, European, Mediterranean and national decision-makers.

5. Marine peace parks in the Mediterranean – the challenges and the opportunities

Moving towards the implementation of Marine Peace Parks in the Mediterranean will be a huge challenge, as the fate of recent attempts (Gulf of Aqaba, Korean Peninsula) amply demonstrates. The Mediterranean Basin is also one of the most impacted, semi-enclosed seas, where human pressures (maritime transport, coastal development, overfishing, etc.) are at peak levels. Against such a background, the idea is not to establish full protection over vast areas of the Mediterranean that depend on maritime resources and economics. Marine Peace Parks should be considered rather as dynamic "conservation experiments" where sound, harmonised spatial planning is adopted by the concerned countries to allocate within each park distinct zones with different levels of protection. For example, vessels transporting dangerous substances would follow well-defined maritime corridors, away from particularly vulnerable areas. Other zones would be temporarily restricted to fishing during the spawning season, allowing for the replenishment of fish stocks. Such dynamic conservation measures will be possible only by close, formal cooperation among the countries, starting from high political levels to conservation managers and local councils.

5.1. Coordinated scientific research – making the case for 2020 conservation target

While a lot of efforts are invested in pushing decision makers to designate coastal and marine reserves, relatively little resources are used to provide scientific evidence of the natural value of the candidate area. The implementation of a proper spatial planning and zonation to protect not only the target species and habitats but also key geo-oceanographic hotspots, requires harmonised multidisciplinary research to fully understand the dynamic processes and ecological interactions regulating ecosystem functioning and sustainability. Often, there is virtually no information on the ecological features of the zone, especially on the high seas. In June 2010, the Eratosthenes seamount was proposed as candidate SPAMI but subsequently rejected by Cyprus due to its potential for oil exploration (UNEP-RAC/SPA report, Istanbul, 2010). If valid scientific data supporting the extreme value of geological and biological features associated to this seamount

were available – the only published biological data being by Galil and Zibrowius in 1998 – this might help Cyprus to reconsider its position, at least with respect to the use and exploitation priorities of this zone.

As recognized in UNCLOS and other treaties and conventions, countries should co-operate in order to achieve the best scientific evidence prior to the implementation of proper conservation and management measures (EEZ, Art. 61), coordinate their scientific research policies and undertake joint programmes of scientific research in the area concerned (UNCLOS, Art. 123). International research can be an influential instrument to improve political relations between countries and promote transboundary cooperation in many sectors. The century-old experience of the Mediterranean Science Commission demonstrates how scientific collaborations overcome the political and cultural barriers.

5.2. Goals for concerned countries

The creation, development and maintenance on a long-term basis of efficient marine peace parks involve a complex, time-consuming process. Clearly the political, administrative and scientific challenges should not be underestimated. In particular the following steps:

reach formal agreement at high political level within (through dialogue among the relevant Ministries) and between countries (through dialogue between State leaders) for cooperation over the concerned marine park area to develop a common conservation policy and legislation, especially when EEZs are in effect or are being established by the interested countries;

jointly design and enforce pragmatic, dynamic measures, such as spatial zoning, temporary restrictions of fishing, restricted navigation corridors, optimal location of off-shore drilling operations, etc.;

increase cooperation, training and coordination between national agencies across the border and establish sub-regional networks linking national and international nature designated areas;

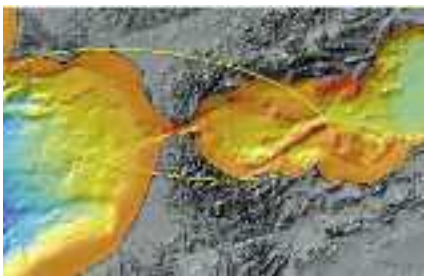
develop and manage joint research programs and data sets that will provide ground scientific knowledge for sound spatial planning as well as monitoring the effectiveness of conservation measures following the marine peace park designation.

Creating a marine peace park, setting up its conservation objectives and the measures to achieve them, will have to be a dynamic, adaptive process. If we consider nature as a fixed, static compartment, there will be always a mismatch between what advocated on paper and the marine world.

6. Preview of Marine Peace Parks proposed by CIESM

The reader will find in the following pages a synthesis of the key geological, oceanographic and biological features of high conservation value, together with the main anthropogenic threats, that characterize each selected area.

6.1 The Near Atlantic Peace Park



The whole area of Ibero-Moroccan Gulf, Strait of Gibraltar and the Alboran Sea constitutes the transition from the Atlantic Ocean to the Mediterranean Sea, with all the special interest that this entails from geological, oceanographic, and biological perspectives. This area presents a very high level of species richness due the co-existence of species from three marine biogeographic regions (Mediterranean, Lusitanian and Mauritanian provinces), plus some endemic species restricted to this zone. It also represents an obligate pathway for migratory vertebrates between the Atlantic and the Mediterranean: large pelagic fishes, cetaceans and sea turtles are very frequently observed in the area.

Key features in need of protection

- The area constitutes the "engine" where the Mediterranean water originates, playing a key control of the exchanges and modifications of the biogeochemical cycles and circulation of the entire Mediterranean;

- More than 100 mud volcanoes and many fluid escape structures have been detected scattered around the whole Ibero-Maroccan Gulf;

- A major hotspot of biodiversity, with the highest species richness in the European/North African waters;

- Unique communities, dominated by Atlantic seaweed, such us forests of *Laminaria ochroleuca* and *Saccorhyza polyschide*s, or by the north African gorgonian *Ellisella paraplexauroides*;

- Some living deep coral banks (*Lophelia pertusa*, *Madrepora oculata*) have been found near the Alboran Island and on the Chella Seamount;

- It hosts several threatened and endangered vertebrate species, including those migrating from the Atlantic to the Mediterranean; the most threatened invertebrate species of the Mediterranean, *Patella ferruginea*, concentrates most of its population in this area.

Complementary information

Extensive volcanism is expressed in the Alboran Sea with several seamounts (Chella, Djbouti, and Motril seamounts in its northern part, and Alidae, Cabliers, Porvençaux, Tofiño and Xauen in its southern parts). The Gulf of Cadiz, which is located west of the Gibraltar Arc, is characterized by mud volcanoes and fluid escape structures that formed in connection to a complex tectonics history with several episodes of extension, strike-slip and compressions. Other mud volcanoes and diapiric structures with carbonate chimneys and crusts were discovered along or in close proximity of the main channels of the Mediterranean outflow water for a total of 100 volcanoes in the whole area. All these geological features host a unique and highly diverse fauna, including living white coral reefs (*Madrepora oculata, Lophelia pertusa*) and other deep sea benthic species such as corals and gorgonians (*Desmophyllum dianthus, Dendrobrachia sarmentosa*) and sponges (*Asconema setubalense, Asbestopluma hypogea*).

The entire area is of prime importance for hydrological processes. The stratification of waters in the Strait of Gibraltar, with a top layer of less saline inflowing Atlantic water, and a deeper and narrower outflowing layer of more saline, Mediterranean waters, facilitates the passing from the Atlantic to the Mediterranean of pelagic fauna and planktonic organisms, including larvae. The Alboran Sea hosts key oceanographic features that significantly contribute to the diversity and distribution of the biota. Two large anticyclonic gyres generate upwellings in the deep waters inshore of Malaga and Granada and a dense oceanic front, the Almeria-Oran front, separates the Alboran Sea from the rest of the Basin, acting as a biogeographic barrier for many plankton species and larvae.

The region displays the highest values of species richness in the Mediterranean Sea, probably due to a wide range of physico-chemical conditions, to the co-existence of species from three marine biogeographical regions (Atlantic, north Africa and Mediterranean), plus some locally endemic species. The Gibraltar Strait is an obligate migration path for many marine mammals, large pelagics (*Xiphias gladius, Istiophorus albicans*, *Thunnus thynnus*) and sea turtles (*Caretta caretta, Dermochelys coriacea)*. Many of these species are commonly observed or even resident in the Alboran Sea (*Balaenoptera acutorostrata, Balaenoptera physalis, Physeter macrocephalus, Globicephala melas, Tursiops truncatus*). Among resident species, the short-beaked common dolphin (*Delphinus delphis*) merits particular attention, because its population in the Alboran Sea is the healthiest in the Mediterranean, after a dramatic decline of this species in most of its Mediterranean range.

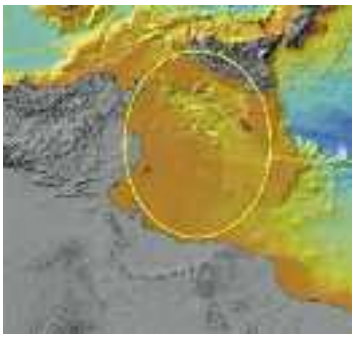
A population of the green turtle *Caretta caretta* also thrives in the area thanks to periodic proliferations of the swimming crab *Polybius henslowii*, which is its primary food resource there.

Major pressures

The entire area concentrates a large variety of human activities and a very intense maritime traffic. Coastal development, chemical pollution, military manoeuvres, oil facilities and pipelines, off-shore energetic developments, harbour constructions, sea bottom mining, sand dredging, are just some of the threats. Fishery is the main threat for this zone, with several fishing ports exerting enormous pressures on this system through an intensive fishing effort. Not only large pelagics, but also demersal and deep sea fishes, are intensively exploited causing serious decline of fish stocks as well as bycatch impacts on cetaceans and turtles passing through the Strait of Gibraltar.

Countries : Monaco, Spain

6.2 The Pelagian Sea Peace Park



Being a transitional zone between the Eastern and Western basins of the Mediterranean Sea, the Sicily Channel is an area of high productivity – coupled with important pelagic and demersal fisheries – and one of the Mediterranean marine biodiversity hotspots. Because of its geographical position, the area is influenced by human activities, in particular maritime traffic and coastal development that generate a heavy pressure on the marine environment.

Key features in need of protection

- A complex and shallow orography with seamounts, volcanic islands and submerged volcanoes, slow-flux seeps and pockmarks;
- Active volcanic processes, leading to expulsions of warm fluids that may be leading to hot spots of specific symbiotic biological communities;
- An "ocean triad" – enrichment processes (upwelling, mixing), concentration processes (convergence) and processes favouring retention of eggs and larvae within - or drift towards – appropriate habitat (fronts, vortices);
- A feeding, spawning and nursery ground for many species of ecological (white shark, fin whale, bottlenose dolphin, devils' ray, loggerhead turtle, white corals) and economic importance (bluefin tuna, sword fish, greater fork beard, hake, red mullet and pink shrimp);
- Rare or endemic species unique of this area, such as the Maltese ray *Leucoraja melitensis* and the colonial scleractinian coral *Cladopsammia rolandi*;
- One of the main bird migration routes between Europe and Africa and an important breeding site for procellariiforms.

Complementary information

Located along the African/ Europe plate boundary, the Pelagian Sea is an area of active tectonics cut by large grabens (Pantelleria, Malta)

and intruded by few active submerged and emerged volcanoes.

The two main currents, the W-E Atlantic surface water and the denser, deeper E- W Mediterranean water, convey high amounts of energy which interact with the complex seabed orography and the dominant winds, forming peculiar hydrographic features (upwelling, mixing, gyres) in the area. These generate high biological productivity, resulting in high diversity and biomass of pelagic and demersal fish. The Sicily Strait and the area around Malta still remain a major fishing ground for the bluefin tuna *Thunnus thynnus,* whose stocks are declining.

Essential Fish Habitats (EFH) have been identified in the form of spawning aggregations and nursery grounds of hake (*Merluccius merluccius*) at 100 - 200m on the Adventure and Malta Banks; nursery grounds of the greater fork beard (*Phycis blennoides*) at 200 - 400m on Adventure Bank and in the eastern Straits; spawning and nursery grounds of the red mullet (*Mullus barbatus*) to 100m on Adventure and Malta Banks. Pink shrimp (*Parapenaeus longirostris*) spawning and nursery grounds do coincide with the Adventure Bank and the Ionian Shelf vortices, respectively.

Nesting colonies of the endangered loggerhead turtle (*Caretta caretta*) still exist on the islands of Lampedusa and Linosa in the Pelagie Archipelago. The area off the coastline of Lampedusa is a feeding ground for the fin whale (*Balaenoptera physalus*) and possibly bottlenose dolphin (*Tursiops truncatus*).

The region is also one of the main migration pathways for many birds such as shearwaters, storm petrels. Breeding colonies of Cory's shearwater (*Calonectris diomedea*) exist on islands and rocky coastline of the Sicilian Straits.

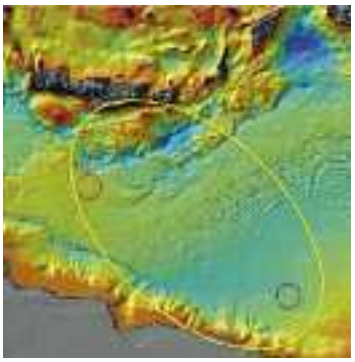
Habitat forming key species are a rare feature of this area: the Mediterranean endemic scleractinian coral *Cladopsammia rolandi*, white coral mounds composed of *Lophelia pertusa, Madrepora oculata,* the yellow tree coral *Dendrophyllia cornigera*, the octocorals *Isidella elongata*, red coral *Corallium rubrum* and *Funiculina quadrangularis* create unique habitats characterised by high biodiversity.

Major pressures

In the area several human activities are present, mainly fishing, aquaculture, shipping and tourism while others are planned like wind farm plants. Furthermore, extensive oil exploration takes place in the zone. As several concessions for oil exploration in the Sicily Strait have been recently granted by the Italian government, creating a marine park in the region represents a urgent priority. The windmill development (59 marine windmills planned in the Bank of Talbot) adds up further threats to the ecosystem. The intensive fishing efforts, especially for pelagic species (bluefin tuna, swordfish) and the dolphin fish *Coryphaena hippurus* are seriously undermining the important stocks in the area.

Countries : Italy, Malta, Tunisia

6.3 Herodotus Peace Park



The proposed Herodotus Marine Peace Park extends between the coasts of Greece (South-eastern Crete) and of Egypt (Western Desert) and covers parts of the Libyan EEZ.

The area covers three main geological domains: (a) the passive African continental margin of Egypt (and partly Libya), including the northwestern most corner of the Nile deep sea fan sedimentary construction, (b) the seismically active continental margin which borders the island of Crete and, (c) between both continental margin segments, a huge pile of tectonized sediments - 'the Mediterranean Ridge' - which results from the pilling up and strong deformations of sediments squeezed between the two rigid margins.

Key features in need of protection

- The occurrence of very abrupt and rocky continental slopes, particularly south of Crete, where deep sea corals and others fixed organisms have been observed but are still poorly studied;

- The temporary presence of some of the most popular migratory species, which should be better preserved in regions where they are reproducing or nesting; among them several species of Cetaceans (sperm whales, Cuvier's beaked whales, four dolphin species) and of sea turtles;

- The area is a major corridor for the migration of many bird species;

- Several persistent gyres (Ierapetra gyre for example), inducing local important variation in productivity, characterize the domain;

- Another specificity of the area, and particularly of the deep sea (2000 to 3000m) is the presence of deep-sea cold fluid seep fields, whose activities induce the developments of unique deep-sea environments and of microbial-related biodiversity hot spots.

Complementary information

Fluid seepage is an example of specific "geo-diversity" and its impact on deep-sea environments. In the Herodotus zone, fluids are emitted directly on the seafloor in two distinct settings: (a) within the Mediterranean ridge where they are closely linked to massive emissions of under-compacted and over-pressured mud known as mud volcanoes, and (b) at the foot of the Nile submarine sedimentary construction on the Egyptian continental slope.

On the Mediterranean ridge the Olympic field (red circle on figure), a group of several mud volcanoes discovered some 15 years ago, has been studied in detail since 2000, in particular the Napoli mud volcano. This structure, which lies by 2000m water depth, shows on its active top small sub-circular brine ponds, brine rivers, resulting from a mixing of mud, fluids and remobilized salt-rich sediments; the emitted gas, particularly biogenic and thermogenic methane, are degraded by specific Bacteria/Archeo *consortia* which favour chemosynthetic symbiosis with worms, lamellibranches, sea urchins and others species, such as crabs and fishes taking advantage of this seabed food supply. In others words cold fluid seeps are at the basis of oasis of life created in particularly extreme environments.

Similar processes are operating at the foot of the Egyptian continental margin by 3000m water depth (blue circle on figure); there the fluids are clearly originating from a deeply buried petroleum system and are similarly mixing with dissolved salt layers and over-pressured mud to generate small mud volcanoes and important gas chimneys. They also participate through chemosynthesic processes initiated by Bacteria/Archea *consortia*, degrading CH_4 and others components, to specific biodiversity hot spots, which were totally unknown until very recently. It is most important to study and preserve such bio/geo-diversity environments.

Major pressures

Maritime traffic and its potential risks such as accidents, pollution, ballast water pollution, remains probably the most important threat to be considered. In addition, the area, particularly south of Crete, is a zone of unregulated and uncontrolled fisheries activities in international waters; this impacts on biodiversity and leads to stock depletion. Underwater noises generated by oil exploration and military activities are other problems to be considered.

Countries : Egypt, Greece

6.4 Eratosthenes Peace Park

The proposed Eratosthenes Marine Peace Park extends between the coasts of Egypt and of Cyprus and covers parts of their respective EEZs.

The area covers three main geological domains: (a) the wide passive African continental margin of Egypt (and particularly large domains of the Nile submarine delta and of its sedimentary fan), (b) the seismically active continental margin which borders the island of Cyprus and, (c) a breaking African continental margin fragment, the Eratosthenes seamount, which is entering continental collision with Cyprus; this flat seamount was an island during the Messinian desiccation crisis which affected the Mediterranean Sea nearly 6 millions years ago and was thus submitted to intense continental erosion.

Key features in need of protection

- The temporary presence of migratory species of Cetaceans, such as Cuvier's beaked whales and at least three dolphin species;

- The presence of at least two species of sea turtles nesting and feeding on the Cyprus and Egyptian coasts, as well as monk seals still living on the western coast of Cyprus;

- The occurrence of very abrupt and rocky continental slopes, particularly south of Crete, where deep sea corals and other sessile organisms have been observed but are still poorly studied;

- The presence of blue fin tuna spawning ground off the Egyptian coasts;

- Important migration corridors used by many bird species do cross the area;

- Very oligotrophic waters are known around Cyprus while high productive zones exist near the Egyptian coasts (nutrients from the Nile river input);

- In addition several current gyres, inducing variations in productivity, characterize the domain;

- Another specificity of the area, and particularly of the Egyptian margin (around 500 to 1000m) relates in the presence of many cold fluid releasing features (pockmarks, gas chimneys), whose activities induce the development of specific deep sea environments and of microbial-related biodiversity hot spots. Cold fluids have also been reported to occur along active faults on top of Eratosthenes seamount.

Complementary information

Fluid seepage is an example of specific "geo-diversity" and its impact on deep-sea environments. In the southern region of Eratosthenes zone fluids are emitted directly on the seafloor following two different mechanisms: (a) along fault zones used as a sort of "plumbing" system, and where fluids appear closely linked to massive emissions of under-compacted and over-pressured mud known as mud volcanoes or gas chimneys, several kilometers in diameter, and chiefly detected on the eastern upper continental slope (red circle on figure) and, (b) through hundred of pockmarks, sub-circular and small (only a few meters in diameters), depressions, which affect wide areas of the Nile submarine delta continental slope and indicate important degassing processes.

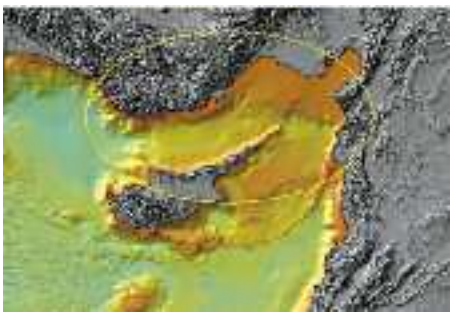
Concerning the gas chimneys it seems important to concentrate the conservation efforts on a group of several gas chimneys discovered about 10 years ago and on which *in situ* researches have been conducted in the past 7 years. One of these features, Amon gas chimney has particularly been studied. Amon GC, which lies by 1100m water depth, shows, on its active top, quite disturbed sediments believed to result from explosive mud/gas emissions; the emitted gas, particularly thermogenic methane, are assimilated by bacteria/archea *consortia* facilitating chemosynthetic symbiosis with many invertebrate species, as well as fish which feed on the seabed. Similarly to those in the Herodotus zone, cold fluid seeps located in the southern part of Eratosthenes Park form *oases of specialized life* in extreme environments.

Major pressures

Growing oil and gas exploration with current offshore production (off Egypt), underwater noises generated by oil exploration and military activities are other problems which should be considered. The area is also subject to illegal fishing. The area is one of diffusion for newly arrived exotic species from the Red Sea via the Suez Canal.

Countries : Cyprus, Egypt

6.5 The north Levant Peace Park



The Levantine Sea has almost become a sea within the Mediterranean Sea, because of the arrival and spread of Red Sea fauna and flora. Besides, it represents the most oligotrophic part of the Mediterranean. The northeast area presents special hydrological conditions and critical habitats that are vital to many endangered species. The monk seal and the bluefin tuna can still find in this area suitable sites for their breeding and feeding activities.

Key features in need of protection

- A peculiar circulation characterized by interanual variability, which triggers phytoplankton blooms via the intrusion of modified Atlantic water into the Taseli Strait;

- A greater productivity compared to the extreme oligotrophy of the Levantine Basin, offering more nutritious waters for the marine life at early life stages;

- A high diversity of fish species, especially in small pelagics such as anchovy and Atlantic horse mackerel, that find suitable spawning and nursery areas in the nutrient-rich waters of Taseli Strait;

- One of the four major spawning grounds of blue fin tuna (*Thunnus thynnus*), with the highest larval concentrations in the Taseli Strait; the commercially important hake (*Merluccius merluccius*) also uses this area as nursery ground during the juvenile stage;

- Several nesting sites for the leatherback (*Caretta caretta*) and green (*Chelonia mydas*) turtles are located on the north coast of Cyprus as well as on the Turkish coast of Taseli Strait, nearby Anamur and Akkuyu. The same area also hosts a few nesting sites of the nearly threatened Audouin's Gull (*Larus audouinii*);

- Important breeding habitats of the endangered Mediterranean monk seal (*Monachus monachus*), mainly located on the west coast of Mersin and on both sides of the Taseli Strait.

Complementary information

In the North Levant basin, which results from large scale extension between southern Turkey and Cyprus a few million years ago, phytoplankton productivity, mainly induced by the riverine inputs and eutrophic waters of the north-east Levantine Sea, is relatively high with respect to the extreme oligotrophy of the Eastern Basin. The productivity in the lower trophic levels provides suitable spawning and nursery areas for the small pelagics (*Engraulis encrasicolus, Trachurus trachurus, Sardinella aurita, Etrumeus teres*) that represent an important food resource for large pelagics such as the blue fin tuna (*Thunnus thynnus*) and hake (*Merluccius merluccius*).

The most important large pelagic fish of the region is the endangered blue fin tuna. One of the four major spawning grounds is located within the Taseli Strait which hosts the largest concentration of BFT larvae. The area between Iskenderun and the north east coast of Cyprus represent an important migration route for this species but also for, albacore (*Thunnus alalunga*), little tunny (*Euthynnus alletteratus*), and bullet tuna (*Auxis rochei*).

The north Levant hosts the Mediterranean easternmost meadows of *Posidonia oceanica,* on the north coast of Taseli Strait. Historical records show that the meadow has regressed almost 10km westwards within the last 25 years, probably due to changes in temperature, salinity and disturbance by bottom trawlers. Protection measures for *Posidonia* meadows are thus sought to help slow down this regression in its Mediterranean distribution range.

Marine turtles are important elements of the conservation value of the Taseli Strait, especially on the north coast of Cyprus. The area offers suitable beaches for nesting by the green turtle *Chelonia mydas* and leatherback turtle *Caretta caretta*. Marine turtles, especially the juveniles and subadults of *Chelonia mydas,* are also observed on the shallow waters rich of *Cymodocea nodosa* beds, which represent the major feeding grounds of the species.

One of the very few nesting sites of Audouin's Gull (*Larus audouinii*) in the region is on the Gilindire islands in Aydincik. The others are located on the northern part of Cyprus. The nesting is on spring and the hatchings turn to juveniles in summer, that feed in the region before migrating off in late summer. The main concentration of feeding juveniles is observed in flocks around Sancak cape and Besparmak Island.

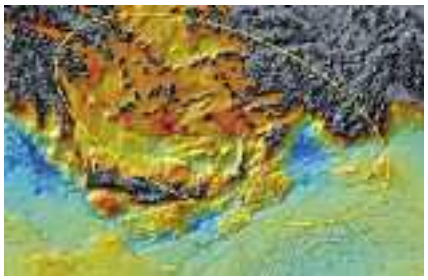
The endangered Mediterranean monk seal (*Monachus monachus*) is perhaps the most critical element of the ecosystem. Important breeding habitats have been found in the NE Levant Sea, on the west coast of Mersin and north of Cyprus. It has been estimated that the small seal population inhabiting the area consists of approximately 40 individuals, with an average fecundity of 0.22. The surroundings of the breeding caves, and the foraging area have been designated as "No-take-zone" in the sea and as "1st Degree Natural Asset" on land.

Major pressures

The north Levantine Basin is one of the Mediterranean areas most affected by exotic species, with potential risk for decline of endangered native and endemic species due to competition of habitat and resources. Anthropogenic activities such as over-fishing and by-catch, oil pollution by vessels and coastal degradation make the habitats and the associated fauna and flora more vulnerable to the invasion of exotics.

Countries : Cyprus, Turkey, Syria

6.6 The south Aegean Sea Peace Park



The Aegean Sea hosts the highest biodiversity in the Eastern Mediterranean and the second highest species richness in the whole Mediterranean. The region, because of its diversified topography and bathymetry is characterized by a great variety of habitats for populations of rare and endangered species essential to the regional ecosystems – from seagrasses to some of the most important marine mammals in the Mediterranean. It also provides important feeding and breeding grounds for sea turtles, sharks and the monk seals.

Key features in need of protection

- The so-called volcano arch, characterized by several submarine volcanoes such as Santorini and Kolumbo crater, surrounded by high-temperature venting and vigorous gas emission plumes more than 10m high;

- The Anaximander Mountains, where numerous active mud volcanoes have been discovered in the past 10 years along with associated cold fluids and gas hydrates;

- The Rhodes Gyre, a distinct vertical rotating cylinder of water generating strong upwellings that make the area the most productive in the Mediterranean Eastern Basin;

- Subpopulations of the most endangered pinniped species in the world, the Mediterranean monk seal (*Monachus monachus*) as well as important breeding sites can still be found in the area;

- An important feeding and breeding ground for sperm whales (*Physeter macrocephalus)* in the deep sea area near the island of Rhodes and one of the world' most important breeding zone of the Sandbar shark (*Carcharhinus plumbeus*);

- An important site for the *Cystoseira* meadows, including the threatened *Cystoseira amentancea*, *C. spinosa* and *C. zosteroides* species.

Complementary information

The southern Aegean Sea is a major biodiversity hotspot; it also offers highly diverse seascapes: several islands of metamorphic rock, the so-called volcanic arc, which includes the well-known Milos and Santorini volcanoes, and several submarine volcanoes among which the Kolumbo, producing gas emissions and fluids made of polymetallic massive sulfides and sulfates at temperatures up to 220 °C. The Anaximander Mountains and their numerous mud volcanoes, also provide cold fluids and gas hydrates leading to development of bacterial mats and symbiotic colonies of worms, molluscs, sea urchins and crabs.

The most prominent oceanographic feature in the area is the quasi-permanent cyclonic Rhodes Gyre – located to the south of the island of Rhodes – formed by wind-driven basin circulation and the interaction of the Mid-Mediterranean Jet and the Asia Minor Current. The anticlockwise rotation causes strong concentration of nutrients, making it the most productive area of the oligotrophic Eastern Mediterranean Sea, with the largest phytoplankton biomass. The Aegean Sea occasionally becomes the site of the dense water formation for the entire Eastern Mediterranean.

Important sub-populations of the Mediterranean monk seal (*Monachus monachus*) reside in the area of Kimolos, Gyaros and Karpathos. The Kimolos-Polyegos island complex is one of the two most important reproduction areas for the species.

The southern Aegean is a significant nesting and feeding area, predominantly for loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) turtles. Furthermore, Boncuk Bay in Gökova, Turkey, is reported as the most important breeding zone of the Sandbar shark (*Carcharhinus plumbeus*) after the southern coasts of North America. Other vulnerable shark species such as *Cetorhinus maximus* and *Carcharodon carcharias* are normally found in the area.

The area is selected as feeding and breeding grounds for several endangered/threatened dolphins (*Delphinus delphis, Tursiops truncates, Grampus griseus, Stenella coeruleoalba*) and whales (*Physeter macrocephalus, Ziphius cavirostris, Balaenoptera physalus*) that can still be regularly found in the area.

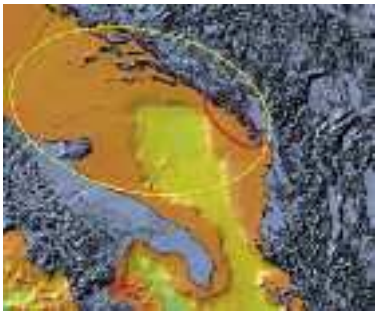
Posidonia and *Cystoseyra* meadows, which are conspicuous in the area, represent important habitat-forming species for many benthic organisms, including threatened species like *Pinna nobilis*, *Charonia tritonis* and *Hippocampus hippocampus.*

Major pressures

Maritime traffic and military activities represent the two main threats for marine mammals especially due to noise pollution and accidental collisions. The Aegean Sea experiences one of the most intense maritime traffic in the world. The lack of shipping lanes and the unregulated dense traffic present different levels of hazards for cetaceans. In addition, some zones that are used for military activities by Greece, Turkey and NATO coincide with the main marine mammal migration routes; the use of sonars has been associated with disease, loss of orientation, starvation and the stranding of the animals. Habitat degradation due to coastal urbanization and development of mass tourism and illegal fishing practices contribute to the decline of many vulnerable species.

Countries : Greece, Turkey

6.7 The south Adriatic Sea Peace Park



Despite the relatively scarce knowledge on biodiversity in the south eastern part of this area, there is a large variety of coastal and marine biological features of high ecological value, some of which already classified under national and international conservation schemes. The presence of numerous small islands, islets and semi-submerged reefs in the northern part provides for different habitats and for the development of a highly diverse fauna and flora, often rare or endemic. Several endangered and threatened species (from marine invertebrates to cetaceans, reptiles and birds) inhabit the region. The area is also well known to fisheries for the presence of many commercially important species (including picarel, red mullet, hake, squid and cuttlefish).

Key features in need of protection

- The submerged Mezosoic Apulian platform, made of karstic limestone marked by numerous marine caves and undeground freshwaters circulations;

- Peculiar geo-morphological features – the Japuka pit, the Palagruza sill and the South Adriatic Pit – associated to key oceanographic processes;

- Sites of dense water formation, vertical mixing and seasonal up-welling, cyclonic circulations characterize the area, providing important biogeochemical exchange and circulation of nutrients between the east and West Adriatic coasts;

- Numerous wetlands (e.g. the Neretva delta) and saltmarshes make the Croatian coastline one of the most important area for bird diversity, hosting many endangered species such as the Great bittern, the Ferruginous Duck, the snowy plover and the Common Snipe;

- On the Italian coast, the Varano and Lesina lagoons are important habitats bird sheltering and nesting, as well as spawning and nursery grounds for fish;

- The Vis and Palagruza Archipelagos hosts the endangered fin whale *Baleanoptera physalus,* and the giant devil ray *Mobula mobular*.

Complementary information

The South Adriatic, which rests on a homogenous geological domain made of massive Mesozoic limestones is particularly important for coastal biodiversity and the presence of sensitive habitats; the Buna/Bojana delta shelters a high proportion of coastal populations of birds, fish, mammals, reptiles and amphibians. One of the most important ecological features of the area is the biological migration, especially for globally threatened species of fish (sturgeons, lampreys), sharks and bird species. The area represents also one of the three North-South migration routes for European birds.

Many endangered species still reside in the area: bottlenose dolphins (*Tursiops truncates)*, giant devil rays (*Mobula mobular*), blue-fin tuna (*Thunnus thynnus*), swordfish (*Xiphias gladius*), and birds like Eleonora's falcon (*Falco eleonorae*), Manx shearwater (*Puffinus puffinus*), Cory's shearwater (*Calonectris diomedea*) and European shag (*Phalacrocorax aristotelis*) have been regularly observed around the Vis archipelago. Other species of dolphins (*Stenella coeruleoalba, Grampus griseus*) and whales (*Balaenoptera physalus, Ziphius cavirostris*) are found in the region.

Other globally threatened species may also be encountered in the proposed area. The Mediterranean monk seal (*Monachus monachus*) is believed to be transient in the region. The loggerhead turtle (*Caretta caretta*) can be found in large numbers and is believed to reside year-round. Finally, the otter (*Lutra lutra*) inhabits the river mouths and deltas in the south-eastern part of the region.

Jabuka Pit, adjacent to the island of Jabuka, is the most important spawning and nursery ground for European hake (*Merlucius merlucius*) and Norway lobster (*Nephrops norvegicus*) in the Adriatic Sea. The cold, nutrient-rich waters generated in winter in the northern Adriatic accumulate in this depression, making the area a site of strong nutrient re-cycling processes leading to very high productivity.

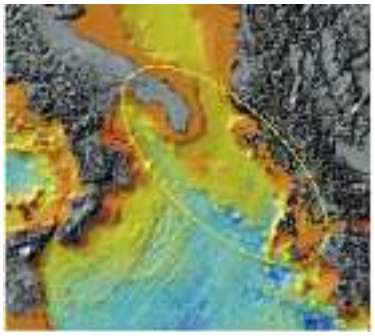
Rana e hedhun (Blown sand) in the Baks Rrjolli coastal zone represents an interesting combination of habitats with karstic caves, mountain slopes, sandy dunes, alluvial forest, tamarisks marshes, interstitial pools combined with a peculiar sandy beach. The Blown Sand is an active dune 50m high, 600m long and 100m wide, accumulated on a rocky coast by the wind activity, a unique habitat in the Adriatic. This area gives shelter to nesting bird species of regional and global concern.

Major pressures

Increasing human occupation of the coastal zone, with localised pollution, increasing fishing effort, maritime traffic, uncontrolled recreational use of the sea, habitat degradation, sewage discharge and discharges from agricultural activity and coastal erosion are the main threats for this area. Besides the numerous anthropogenic pressures which this area is subject to, there is a new potential threat represented by the wind farm industry, which is quickly expanding in areas where knowledge is still limited. In the Gulf of Manfredonia, previously considered an area essentially dominated by muddy assemblages and thus selected for development of windmills, extensive banks of coralligenous formation have been recently found. Uncontrolled and illegal fishing practices are an important threat to marine biodiversity in the Adriatic, having a significant impact in fish stock depletion. Further, intense fishing and non-selective fishing gear have already significantly affected the demersal ecosystem and species biodiversity around the regions of Jabuka Pit and the Palagruza Sill.

Countries : Albania, Croatia, Montenegro, Italy

6.8 The north Ionian Sea Peace Park



A hotspot of biodiversity: coastal wetlands hosting rare wild birds, rich coralligenous communities, seagrass meadows, deep sea white corals and many threatened and endangered species such as the common dolphin, sperm whale and Cuvier's beaked whales, sharks and rays. This section of the Mediterranean Sea combines high levels of marine diversity and a relatively low human population density, with a long history of exploitation of marine resources and an increasing alteration of coastal habitats.

Key features in need of protection

- A unique oceanographic circulation, which connects the South Adriatic Sea to the Northern Ionian Sea, establishing vital corridors for marine organisms between the East and West coasts;
- A site of deep water mass formation, essential to the functioning of the entire Mediterranean circulation;
- A seabed, derived from the Apulian platform and marked by a rich variety of marine canyons, caves and submarine valleys, the latter hosting extensive white coral banks;
- Deep hypersaline anoxic basins characterized by new, highly specialized microbial communities;
- Several submarine caves in the region represent a unique, vulnerable ecosystem, with specialized species assemblages, highly vulnerable to disturbance;
- Extensive deep sea white coral banks, considered biodiversity "hotspots" in the Mediterranean, have been found in two submerged "Messinian" valleys located in Ionian Sea and South Adriatic respectively.

Complementary information

Massive Mesozoic limestones characterize the area. About 6 million years ago, during the "Messinian" Salinity Crisis, the former Mesozoic Apulian platform was submitted to intense continental erosion and karsts processes. As a result, many caves and aerial valleys were cut into these rocks, to be later submerged in the lower Pliocene. These geomorphologic features provide hard rock settlements for fixed organisms such as deep water corals in the south of Italy and also probably along the steep Hellenic Ionian margin.

The recent exploration of the deep sea between the Southern Adriatic and the Ionian seas led to the discovery of important white-coral banks (*Lophelia pertusa*, *Madrepora oculata*): one South of Capo Santa Maria di Leuca and another, less known, between Italy and Albania (Canyon of Bari). The coral banks represent an important ''hot-spot'' of species diversity in the Mediterranean basin comparable to the *Posidonia* meadows and coralligenous bioconstructions on the shelf, and require urgent protection from trawl and long lines fishing. The North Ionian is also extremely rich in submarine caves, which are singled out the EU Habitat Directive as a special habitat in need of protection.

The eastern part of the Ionian Sea (Greece and Albania) is vital for biodiversity. Beyond the Amvrakikos Gulf, which is one of the most important wetland systems in Greece, there are important lagoons in Apulia (Aquatina, Alimini and Mar di Taranto) and in Albania (Butrinti). The Albanian part of this area, especially the Karaburuni Peninsula – Sazani Island, has also been identified as a priority area for marine biodiversity conservation by recent national and international environmental reports.

The northern part constitutes an important migrating corridor for cetaceans (*Delphinnus delphis, Physeter macrocephalus*), marine turtles and the monk seal (*Monachus monachus*) to and from the Adriatic Sea.

Major pressures

The region is a complex mosaic of relatively well-preserved stretches of coast interspersed with areas subjected to multiple stressors, in particular deep sea fishing and illegal harvest of date mussels, and heavy metal contamination.

Hundreds of kilometres of subtidal rocky coast have been destroyed in Apulia due to the illegal fishery of the date mussel *Lithophaga lithophaga* (L.). This rock-boring bivalve is extracted from the substrate with sledgehammers causing detrimental effects on communities colonising the surface. But deep sea fishing and illegal artisanal fishery are not the only threats; the Apulian area has been selected as a priority area for wind farms, with potential impacts on marine mammals due to noise and vibration generation.

Countries : Albania, Greece, Italy